

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

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% O₂ steps

Repeatability: Within $\pm 0.5\%$ FS

Linearity: Within $\pm 2\%$ FS

Response time: Within 4 to 7 sec, for 90% (from calibration gas inlet)

Warmup time: approx. 10 min

Analog output: 4 to 20mA DC (allowable load resistance less than 500 Ω) or 0 to 1V DC (output resistance more than 100 Ω)

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 consumption:

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 +306mmH₂O)

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:

ø6mm tube join or ø1/4-inch tube join (as specified)

Reference gas inlet (option):

ø6mm tube join or ø1/4-inch tube join (as specified)

Detector mounting:

Horizontal plane ±45°, ambient surrounding air should be clean.

Outer dimensions: (L × max. dia.) 215mm × 164mm (detector)

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/cm²}

Table 1

	Detector
TIIS	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) Thermocouples 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:

- Manual calibration with key operation
- Auto. calibration (option)
Calibration cycle; 00 day 00 hour to 99 days 23 hours
- All calibration

Calibration gas: • Range settings

Zero gas; 0.010 to 25.00% O₂

Span gas; 0.010 to 50.00% O₂

- Recommended calibration gas concentration

Zero gas; 0.25 to 2.0% O₂

Span gas; 20.6 to 21.0% O₂

(oxygen concentration in the air)

Blowdown: (option)

A function for blowing out with compressed 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:**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	Exd IIB T6
NEPSI	EExd IIC T6 Ex II2G

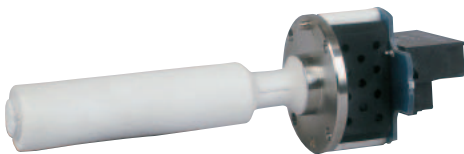
CODE SYMBOLS

(Detector)

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17																	Description
Z	F	K	E	R			5	-			Y	-			1		Cal. gas inlet Non (G3/8 female screw) For ϕ 6mm tube For ϕ 1/4 inch tube Ejector for ϕ 6mm tube Ejector for ϕ 1/4 inch tube
																	Power supply 100 to 120VAC 50/60Hz 200 to 240VAC 50/60Hz 
																	Flow guide tube None <Flange size> JIS 5K 65A JIS 5K 80A JIS 5K100A JIS 10K 65A JIS 10K 80A JIS 10K 100A ANSI 150LB 2B ANSI 150LB 3B ANSI 150LB 4B DIN DN50 PN10 DIN DN80 PN10
																	<Application / material> For corrosive gas / SUS316 With blow-down nozzle / SUS316 For high particular / SUS316 For high particular with cover / SUS316 For high particular / SUS310S For high particular with cover / SUS310S For high particular / titanium For high particular with cover / titanium
																	<Length> 300mm 500mm 750mm 1000mm
																	Reference gas inlet Non (G1/8 female screw) for ϕ 6mm tube For ϕ 1/4 inch tube
																	Filter Standard For high particular
																	Instruction manual language Japanese English Chinese
																	Specification name plate Standard
																	Ex. Standard NEPSI TIIS

(Replacement Detector element)

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



(Converter)

2	3	4	5	6	7	8	9	10	11	12	13	14	Description		
Z	K	M	E			1	1	-				1	-		Output signal 4 to 20mA DC 0 to 1V DC
								B							
								E							
								1							Communication function RS-232C
								2							RS-485
Optional Functions															
None															
								Y							Combustion efficiency display function Note1)
								1							Blowdown
								2							Auto calibration
								3							Combustion efficiency indication + Blowdown Note1)
								4							Combustion efficiency indication + Auto calibration Note1)
								5							Blowdown + Auto calibration
								6							Combustion efficiency indication + Blowdown + Auto calibration Note1)
								7							
Instruction manual language															
								J							Japanese
								E							English
								C							Chinese
Mounting Option															
								Y							None (Mounting on panel surface)
								1							With valve
								2							With valve + flowmeter
Specification name plate															
								1							Standard
Number of Cable Gland															
								3							3
								4							4
								5							5
								6							6
								7							7
Ex Standard															
								N							NEPSI
								T							TIIS

Note1) When you select this display, rich mode will be a simultaneous display.

(Exclusive-special cable)

	1	2	3	4	5	6	7	8	9	Description
Z	R	Z	E	R			1	-		Connectable devices For ZKME
E										
				R						Types For R thermocouple
										Cable length
					YA					6m
					YB					10m
					YC					15m
					YD					20m
					YE					30m
					YF					40m
					YG					50m
					YH					60m
					YJ					70m
					YK					80m
					YL					90m
					YM					100m
										Cable end treatment
						0				None
						1				One side (detector side)
						2				Both sides

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% O₂ range)

Type ZBM□NSJ4-01 (over 5% O₂ 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, H₂ 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.

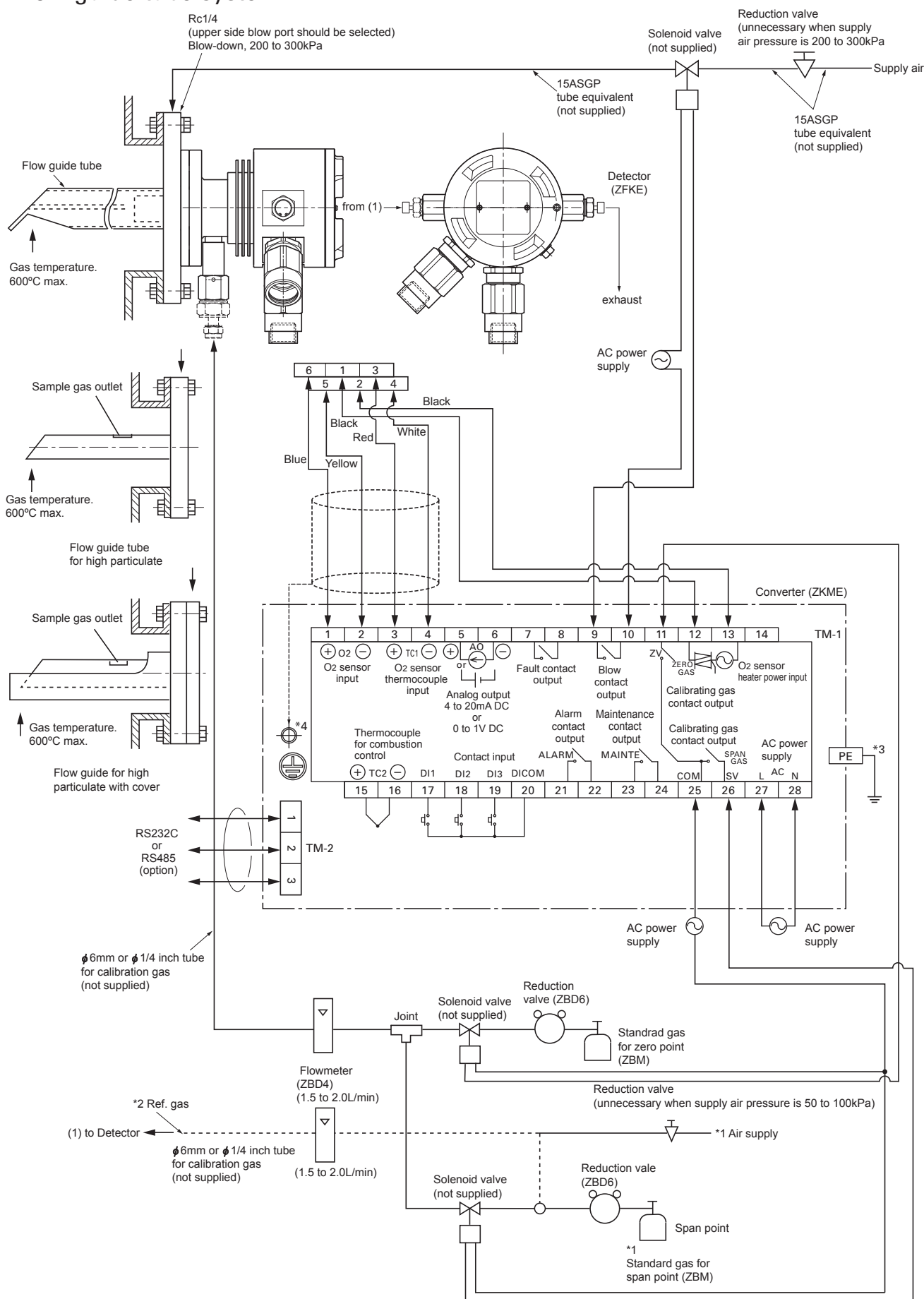
Measured gas					Device configuration	
Application	Temperature	Gas Flow	DUST	Note	Detector type	Converter type
General-use (boiler)	600°C or less	5 to 20m/s	Less than 0.2g/Nm ³	Fuel; gas, oil	ZFKER□□5-□□FY□□□□	ZKME
			Less than 10g/Nm ³	Fuel: coal with blow down	ZFKER□□5-□□GY□□□□	ZKME
For corrosive gas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

Note (1) Dust volume is approximate value.

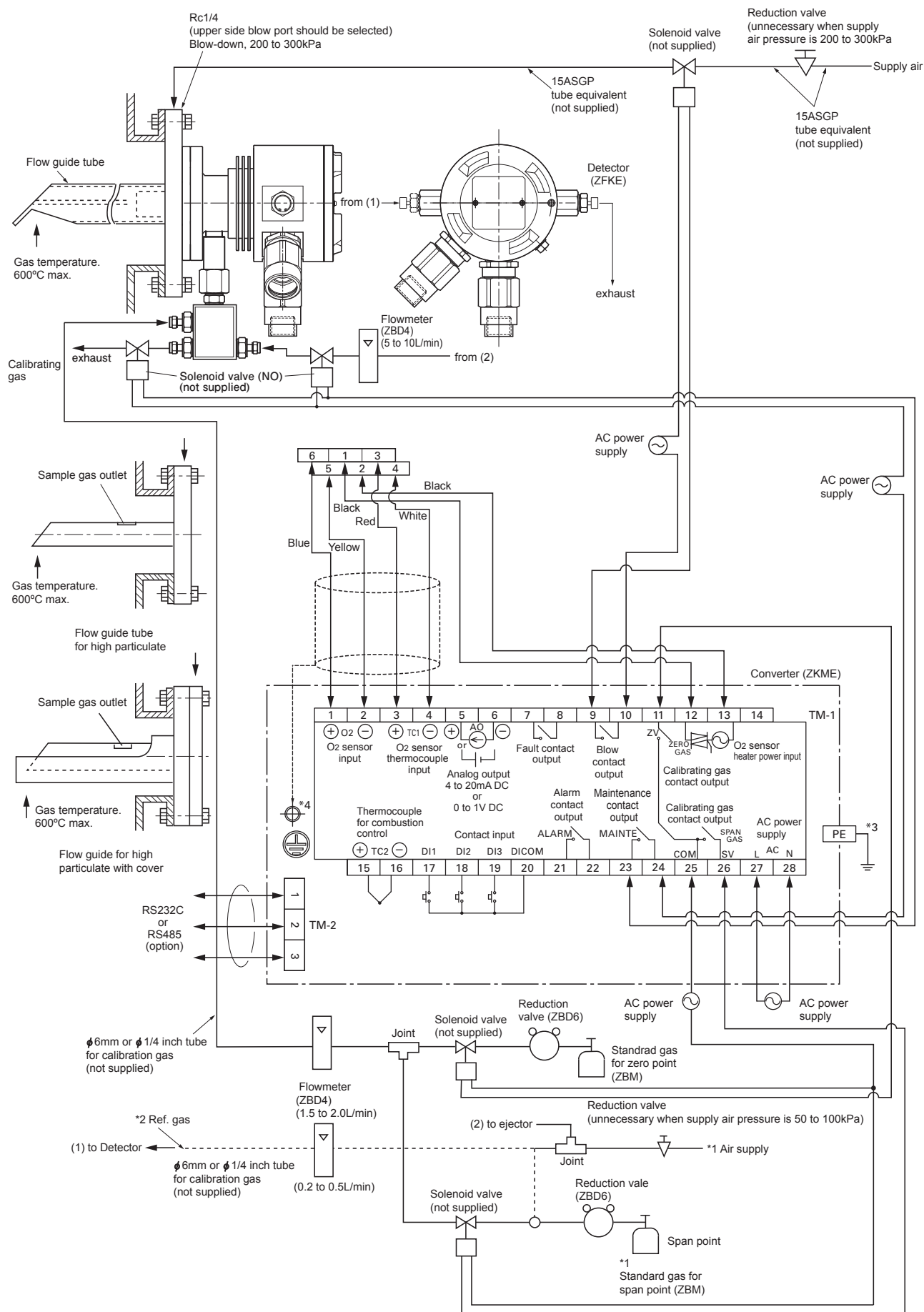
(2) Instrument quality air or bottled air is available as reference air by selecting detector with reference air inlet.

CONFIGURATION

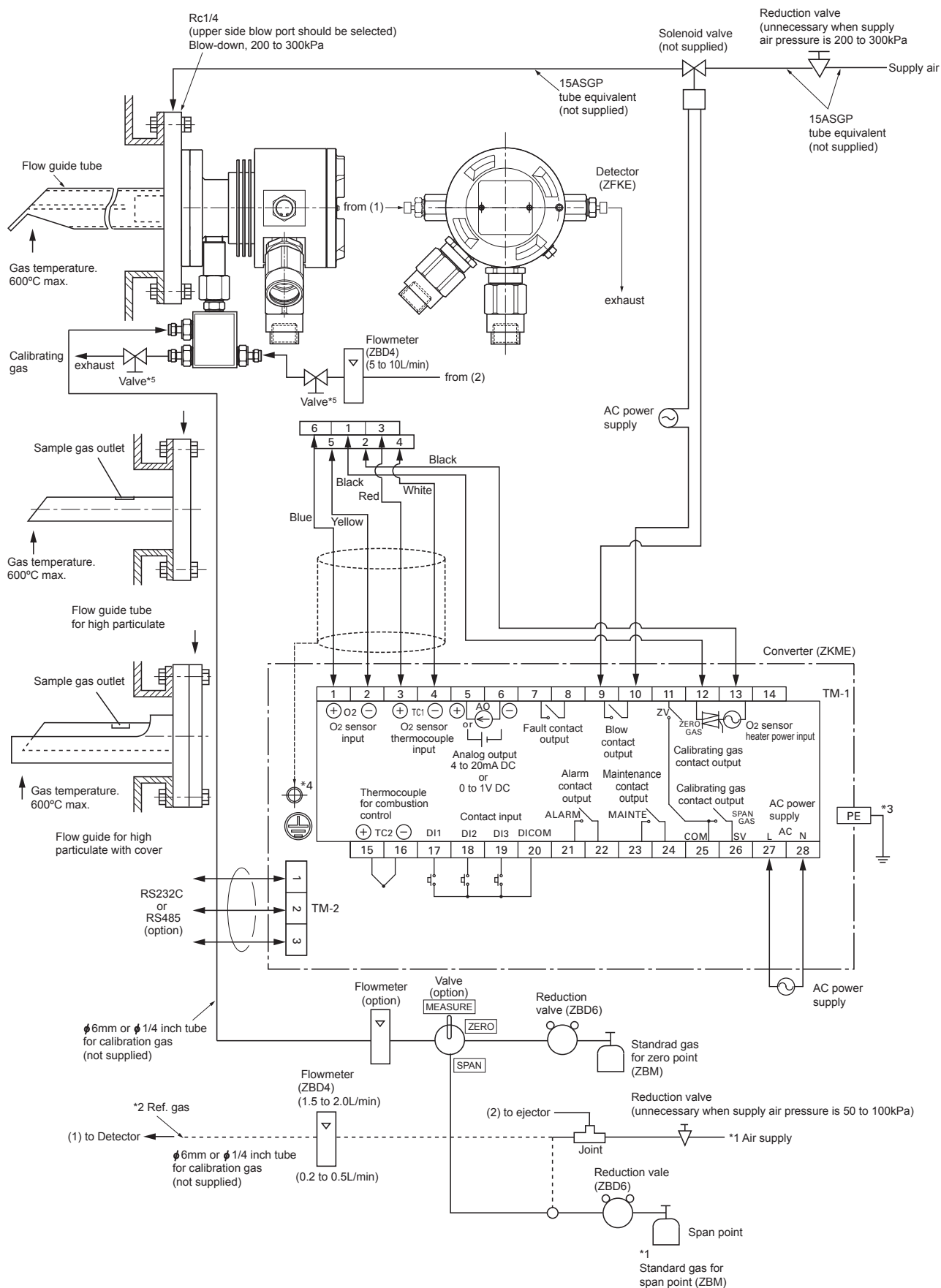
Flow guide tube system



Flow guide tube system (with ejector)



Flow guide tube system (with ejector+valve)

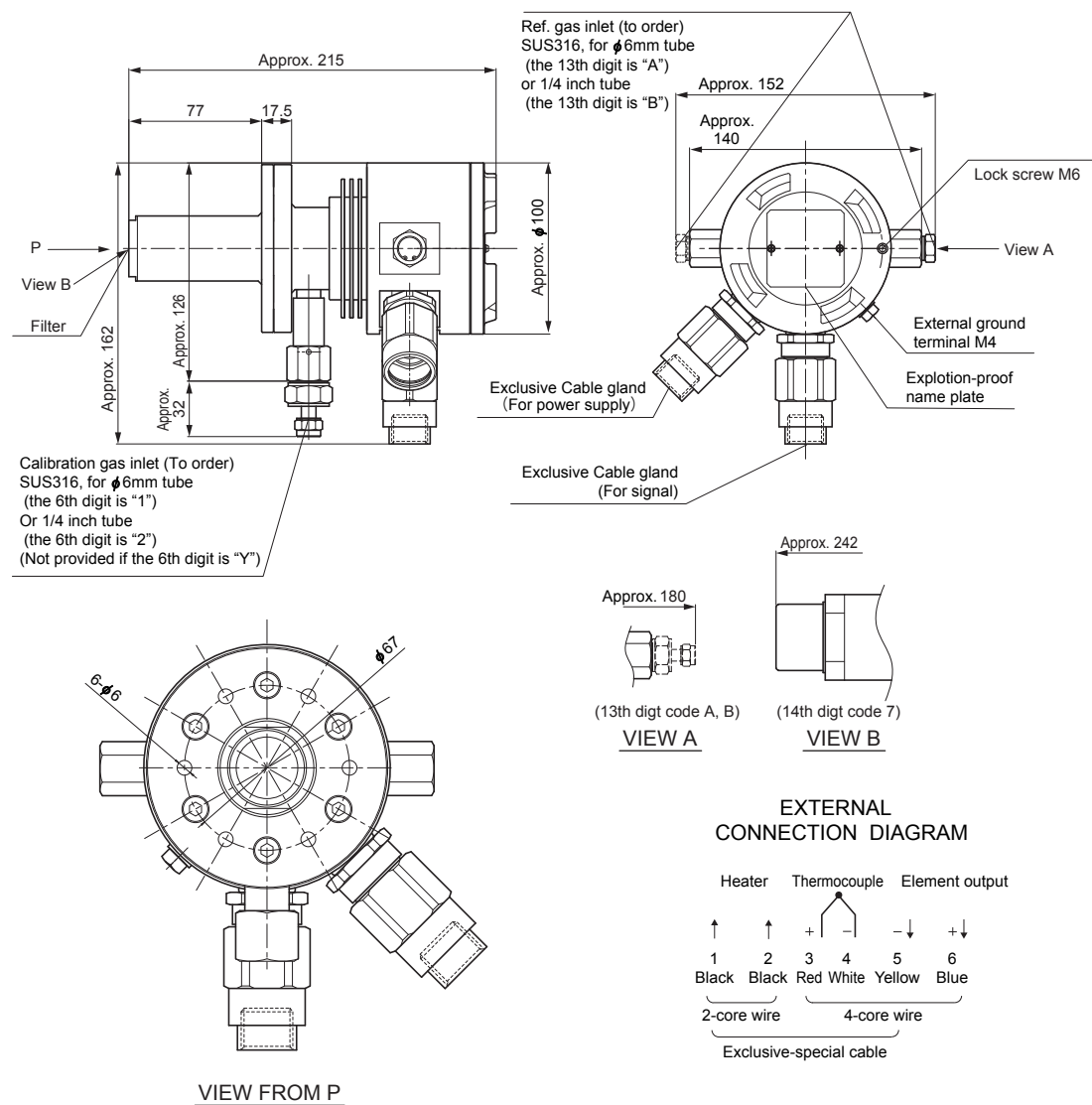


- Note: *1 Standard gas or instrumentation air can be used in place of span gas.
 *2 Instrument quality air or bottled air is available as reference gas instead of ambient air.
 *3 Protective earth.
 *4 Connect the shield of a exclusive cable with the ground terminal in the converter.
 *5 Close the valve during calibration. (Valve is out of the scope of supply)

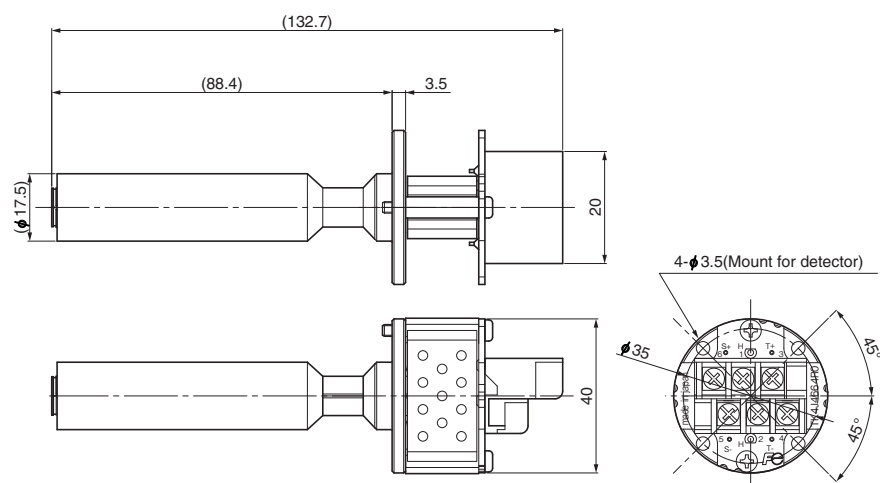
OUTLINE DIAGRAM (Unit:mm)

 Detector (ZFKER

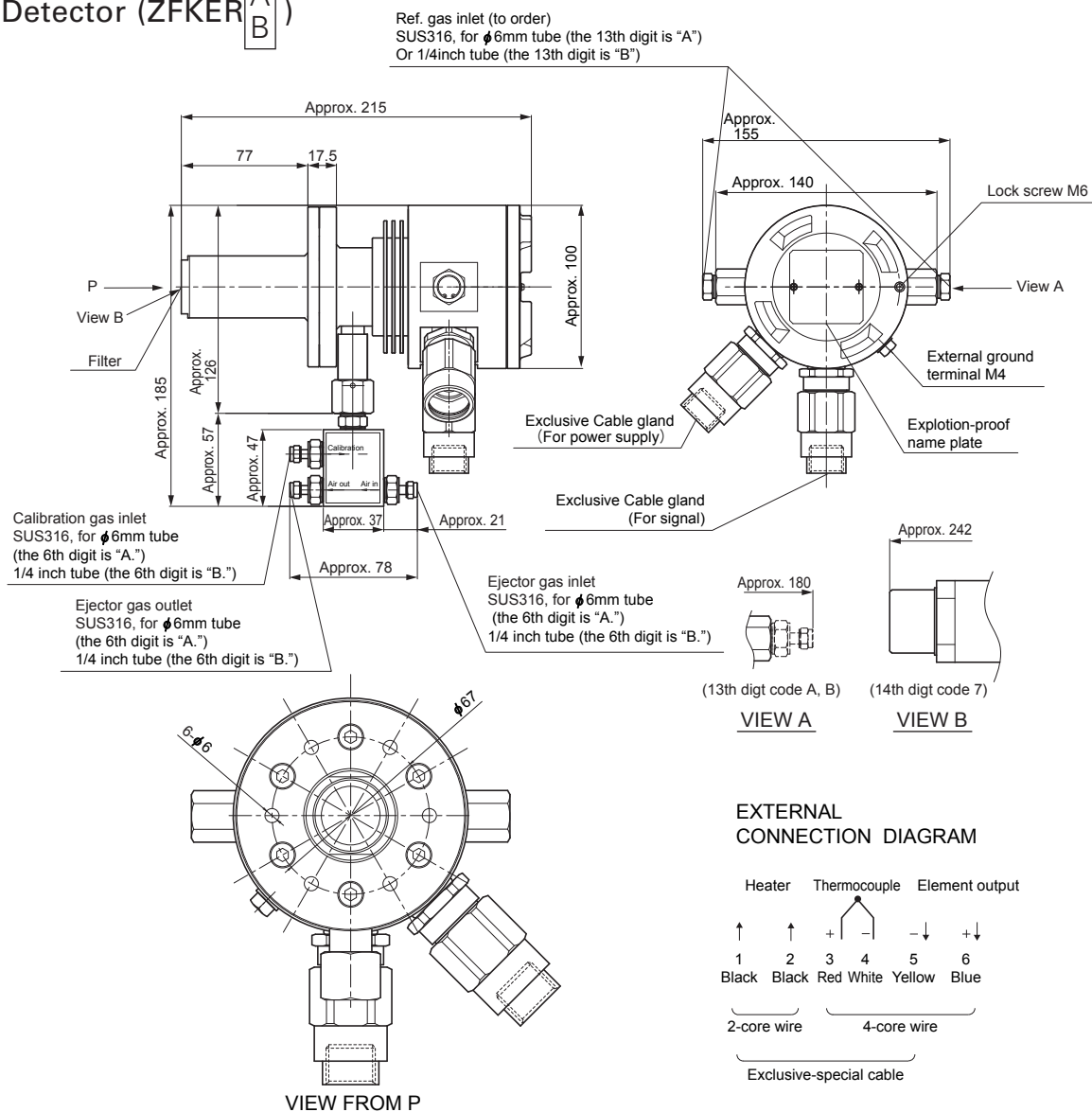
Y
1
2

)


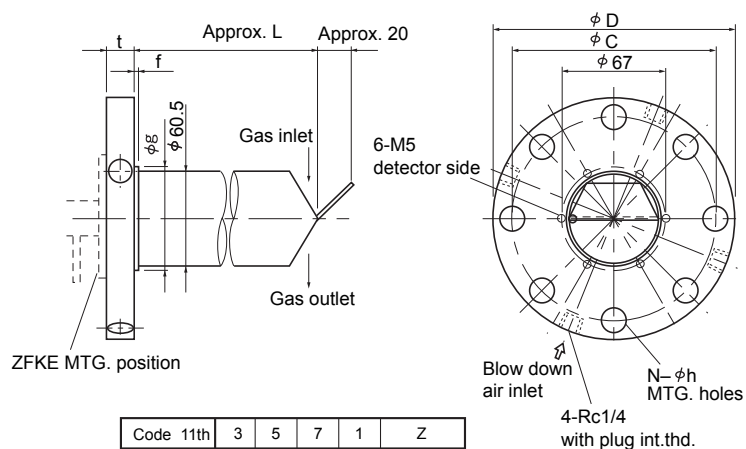
Sensor unit (ZFK8YY)



Detector (ZFKER ^A_B)



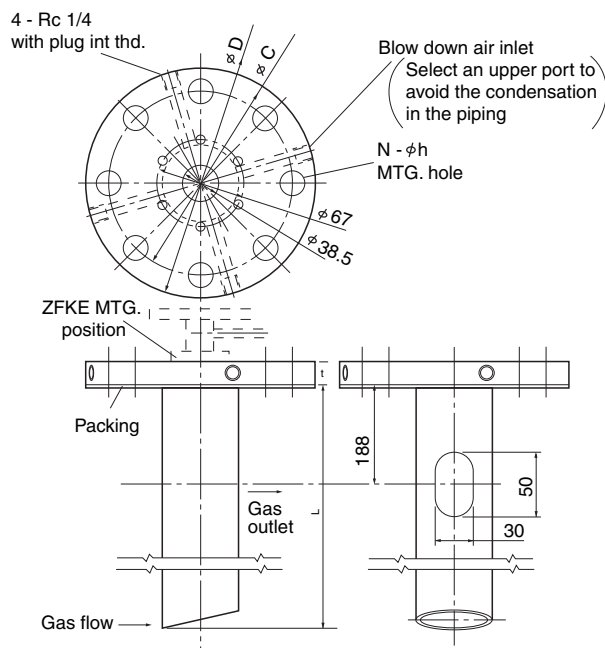
Flow guide tube (with blow-down nozzle) (ZFKE: 10th digit code. G)



Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	
Mass Approx.(kg)	3.0	3.8	4.8	5.7	L= (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

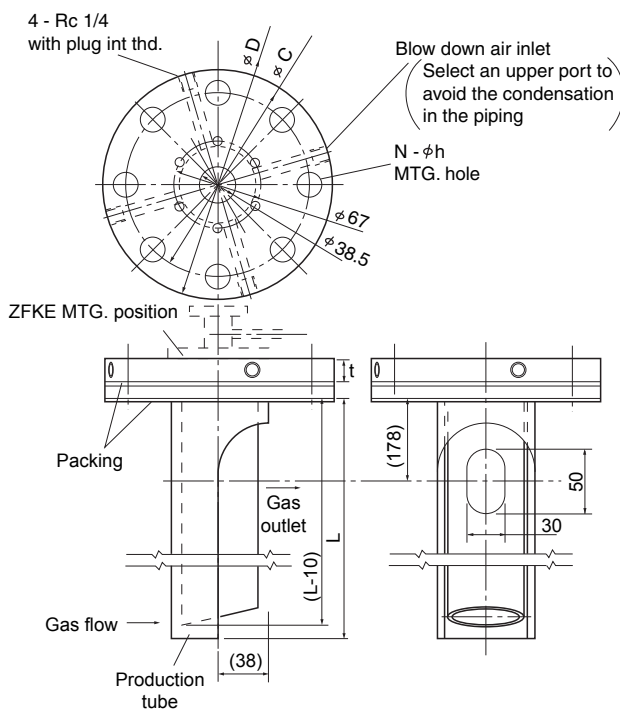
Flow guide tube (for high particulate) (ZFKE: 10th digit code. H, K, M)



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)

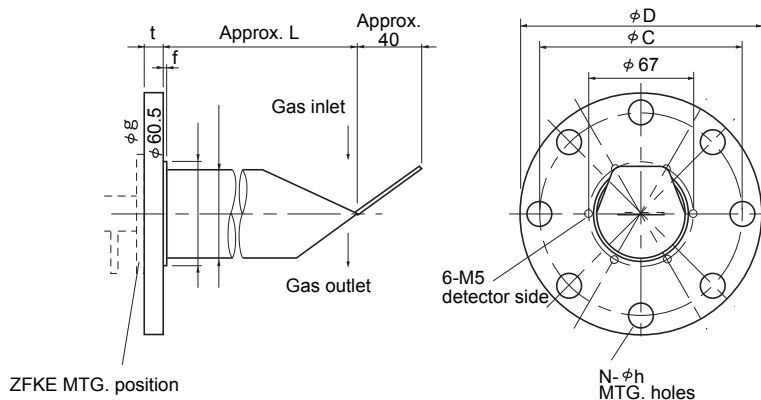
Flange size	Code 9th	D	C	t	f	g	N	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	A	175	140	18	2	116	4	19
JIS 10K 80A	B	185	150	18	2	126	8	19
JIS 10K 100A	C	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB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

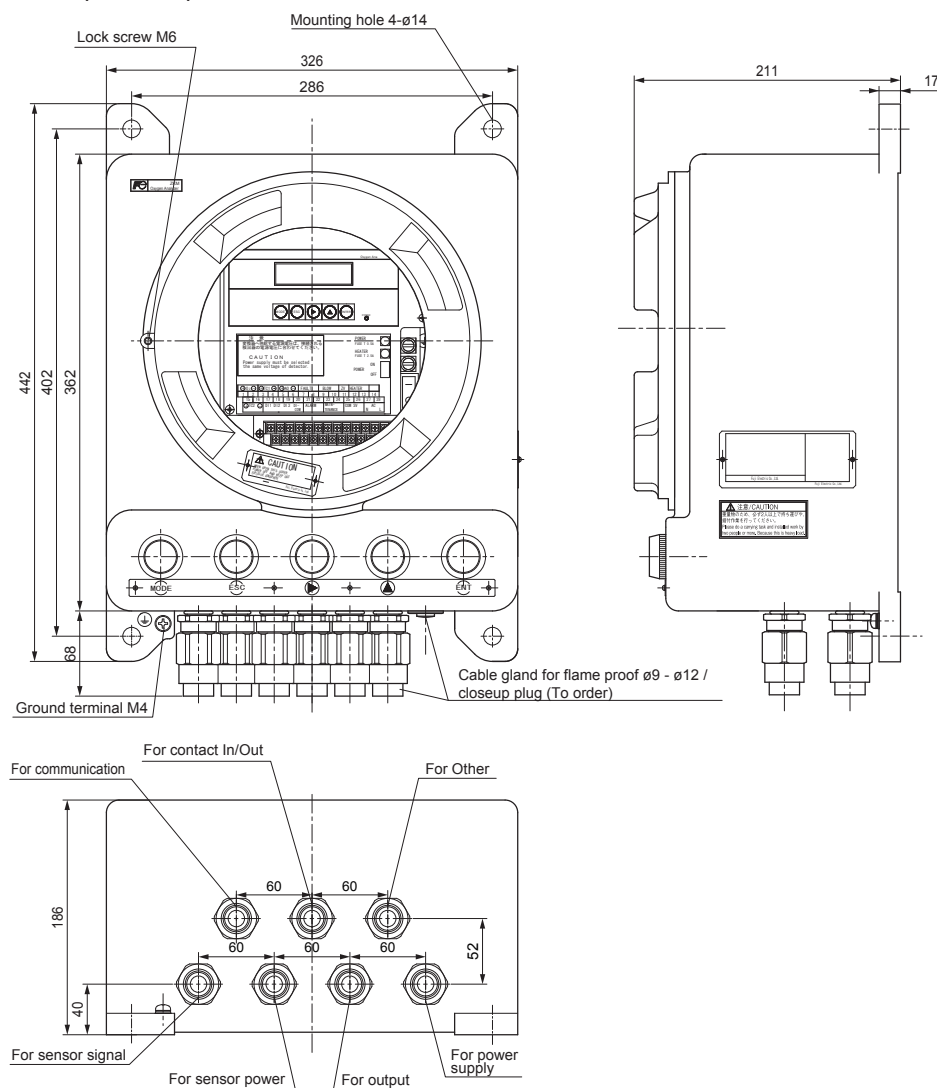


Code	11th	3	5	7	1	Z
L (m)		0.3	0.5	0.75	1.0	
MASS Approx.(kg)		3.3	4.5	6.1	7.6	

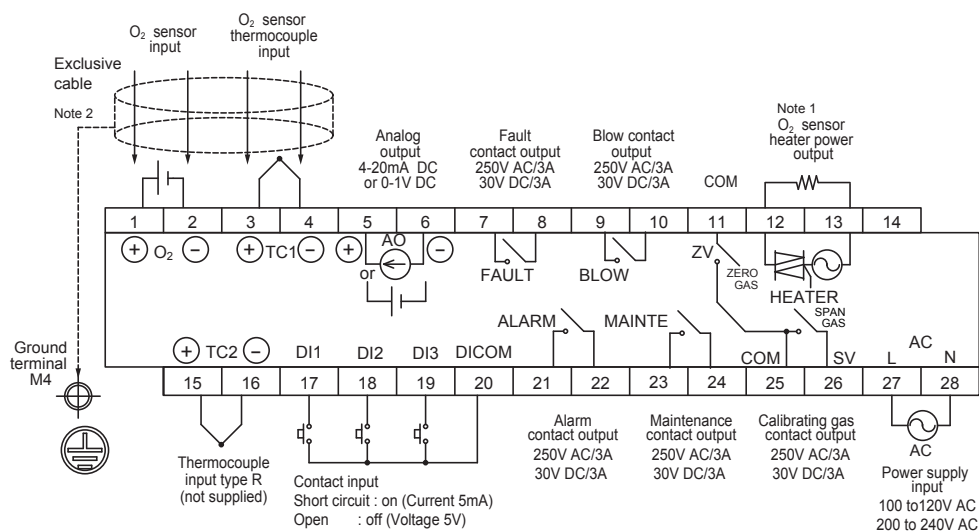
L= (to order)

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

Converter (ZKME)



EXTERNAL TERMINAL (TM1) /M3



Note 1) The heater is energized through the converter.

Note 2) Be sure to connect the shield to the ground terminal.

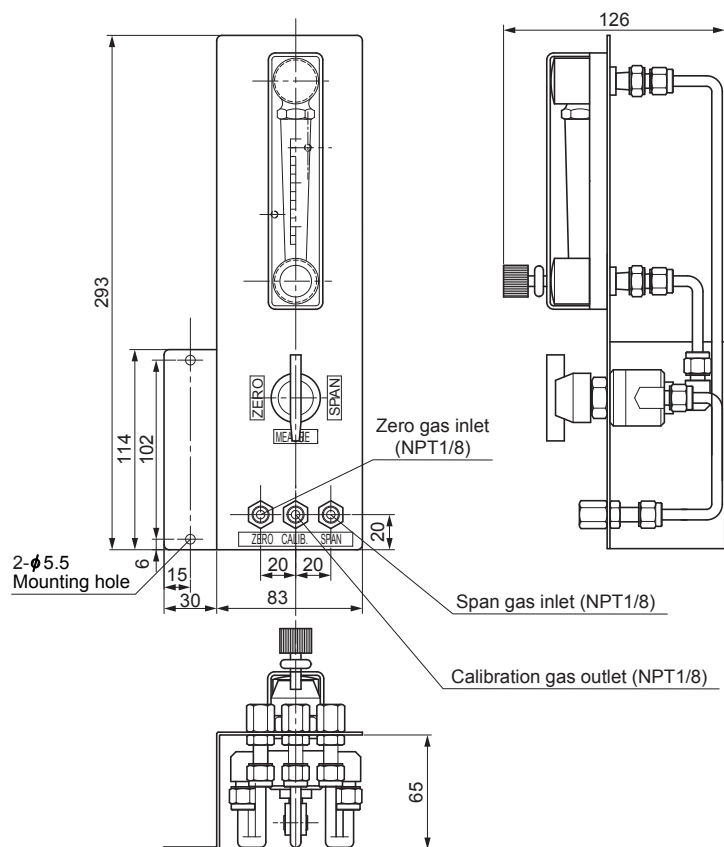
COMMUNICATION TERMINAL (TM2) /INSERTION TERMINAL

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

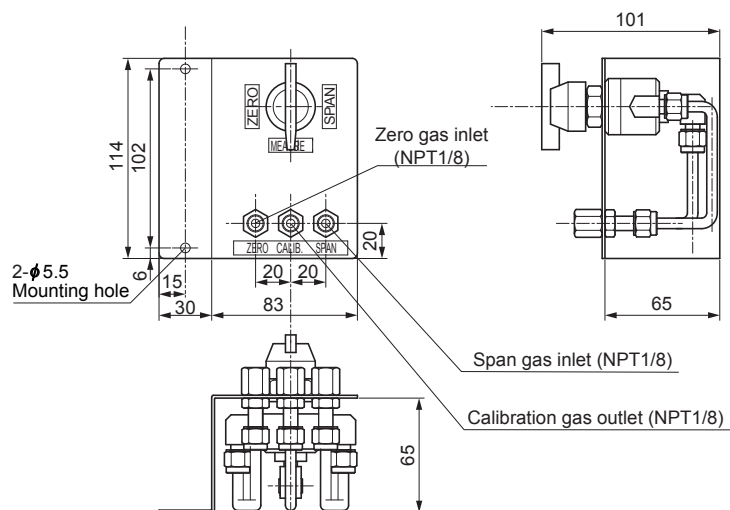
OUTLINE DIAGRAM (Unit:mm)

<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.

 Fuji Electric Co., Ltd.

Grobal Sales Section

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/>