Fuji Electric

IN-SITU ZIRCONIA OXYGEN ANALYZER FOR HAZARDOUS LOCATION

DATA SHEET

ZFKE, ZKME

This oxygen analyzer can continuously measure oxygen concentration in noncombustible exhaust gas of industrial boilers or furnaces, and is suited to combustion management and control.
The analyzer system is comprised of the detector and converter coupled together as a complete system. The detector includes the flow guide tube and the sensor. The flow guide tube inserted into the stack draws the process gas into the sensor.
The converter has the sensor diagnosis function and the sensor recovery function, which ensure the long-term use and the stability of the sensor.

Detector (ZFKE)

Converter (ZKME)

FEATURES

1. No gas sampling devices required
   Insertion type sensor delivers quick response.
2. Easy maintenance
   Modular design allows easy replacement of sensor, flow guide tube, and filter.
3. Reliability and long-term stability
   The converter diagnoses the sensor deterioration caused by components in sample gas, and electrically restores the sensor.
4. Improved safety
   The converter cuts off the power supply for the detector when detecting a burnout of thermocouple for heater control. The converter also cuts off the power supply at emergency, in response to an external contact input. These functions along with the key lock function are provided as standard to ensure improved safety.
5. Easy operation
   A user can operate the converter or make various settings on an interactive basis. Display language is available in English, Chinese, or Japanese.

SPECIFICATIONS

General Specifications

Measuring object: Oxygen in noncombustible gas

Measuring method:
Insertion type zirconia sensor

Measuring range: 0 to 2 ··· 0 to 50 vol% O_2
2 ranges available in 1 vol% O_2 steps

Repeatability: Within ±0.5%FS

Linearity: Within ±2%FS

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

Warmup time: approx. 30 min
20 min when using the ejector

Analog output: 4 to 20mA DC (allowable load resistance ≤ 500Ω) or 0 to 1V DC (output resistance ≥ 100Ω), linear, isolated

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:
Startup: 240VA (Detector: approx. 200VA, Converter: approx. 40VA)
During operation: 70VA (Detector: approx. 50VA, Converter: approx. 20VA

Detector (ZFKE)

Measured gas temperature:
−10 to +600°C

Measured gas pressure:
−3 to +3kPa

Flow guide tube: See Code Symbol for application, flange size, and material.
Insertion length: 0.3, 0.5, 0.75, or 1 m

Ejector (option): an aspirator used to draw the measured gas into the detector

Ambient temperature:
Detector: -10 to +60°C
Flange surface: ≤ 125°C during the power is supplied

Storage temperature:
−20 to +70°C

IP rating: Equivalent to IP66 excluding the filter

Ex-proof certification:

TIIS	Ex d IIB T4
NEPSI	Ex d IIC T4 Gb

Filter: SS316 (filtering accuracy 60μm)

Main materials of gas-contacting parts:
Detector; Zirconia, SS316, platinum
Flow guide tube; SS316

Pipe adapter for calibration gas inlet:
for 6 mm tube or 1/4 inch tube (as selected in the 6th code)

Pipe adapter for reference gas inlet (option):
for 6 mm tube or 1/4 inch tube (as selected in the 13th code)

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

Dimensions: (L × max. dia.) 215mm × 162mm

Weight: Detector; 3.0kg
Flow guide tube (for corrosive gas, 1m); 6kg

Finish color: Case: Silver and SS 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

Converter (ZKME)

Concentration value indication:
Digital indication in 4 digits

Contact output:
6 points, SPST-NO,
250 V AC, 3A or 30 V DC, 3A
Functions;
- Under maintenance
- Error[*1]
- Alarm[*2]
- Zero calibration gas
- Span calibration gas
- Blowdown[*3]

Notes
1. The contact is closed upon: open circuit of thermocouple line, open circuit of O2 sensor line, temperature overrange, calibration error, zero/span error, output error.
2. The contact is closed upon the alarm you selected among: H, L, HL, HH, LL.
3. The contact is closed during blowdown. This function is available only on the version with blowdown nozzle.

Contact input:
3 points
ON; 0V (10mA or less), OFF; 5V
Functions;
- External hold
- Calculation reset
- Heater OFF
- Blow down (option)
- Inhibition of calibration
- Calibration start
- Range change

Calibration method:
(a) Manual calibration with key operation
(b) Auto. calibration (option)
Calibration cycle; 00 day 00 hour to 99 days 23 hours
(c) Batch calibration

Calibration gas:
- Setting range
  Zero gas; 0.010 to 25.00% O_2
  Span gas: 0.010 to 50.00% O_2
- Recommended calibration gas concentration
  Zero gas; 0.25 to 2.0% O_2
  Span gas; 20.6 to 21.0% O_2
  (oxygen concentration in the air)

Blowdown: (option) A function for blowing out dust that has accumulated 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:

The converter holds the output signal during: calibration, blowdown, sensor recovery, sensor diagnosis, PID auto-tuning, and during the maintenance mode is set to "yes". You can cancel the output hold function during warm-up.

Selector valve and flowmeter (option):

The selector valve allows you to switch between the zero gas and the span gas when you carry out a calibration. The flowmeter is used for regulating the flow rate of the calibration gas.

Communication (option):

RS-485 (MODBUS)

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.

Ambient temperature:

–20 to +55°C

Ambient humidity:

95% RH or less, non condensing

Storage temperature:

–30 to +70°C

Storage humidity: 95% RH or less, non condensing

IP rating: Equivalent to IP65

Ex-proof certification:

TIIS	Ex d IIB T6
NEPSI	Ex d IIC T6 Gb

Case material: Aluminum

Dimensions (H x W x D):

470 × 326 × 211mm

Weight: Approx.22kg (excluding cable and detector)

Finish color: Case: silver
Cover: blue

Installation: Panel mounting

CODE SYMBOLS

Detector

ZFKE R _ _ 5 - _ _ _ Y _ - _ _ 1 _

Digit	Description	Note	Code
6	**Pipe adapter for calibration gas inlet**		
	None (G3/8 internal screw)		Y
	For ø6mm tube		1
	For ø1/4 inch tube		2
	Ejector with pipe adapter for ø6mm tube		A
	Ejector with pipe adapter for ø1/4 inch tube		B
7	**Power supply**		
	100 to 120 V AC 50/60 Hz		1
	200 to 240 V AC 50/60 Hz		3
8	**Revision No.**		5
9	**Flow guide tube**		
	<Flange size>		
	None		0
	JIS 5K 65A		7
	JIS 5K 80A		8
	JIS 5K100A		9
	JIS 10K 65A		A
	JIS 10K 80A		B
	JIS 10K 100A		C
	ANSI 150LB 2B		D
	ANSI 150LB 3B		E
	ANSI 150LB 4B		F
	DIN DN50 PN10		G
	DIN DN80 PN10		H
10	**<Application / material>**		
	None		Y
	For corrosive gas / SS316		F
	With blow-down nozzle / SS316		G
	For high particulate / SS316		H
	For high particulate with cover / SS316		J
	For high particulate / SS310S		K
	For high particulate with cover / SS310S		L
	For high particulate / titanium		M
	For high particulate with cover / titanium		N
11	**<Length>**		
	None		0
	300mm		3
	500 mm		5
	750 mm		7
	1000 mm		1
13	**Pipe adapter for reference gas inlet**		
	None (G1/8 internal screw)		Y
	For ø6mm tube (SS)		A
	For ø1/4 inch tube (SS)		B
14	**Filter**		
	Standard		5
	For high particulate		7
15	**Instruction manual language**		
	Japanese		J
	English		E
	Chinese		C
16	**Specification name plate**		
	Standard		1
17	**Ex. standard**		
	NEPSI		N
	TIIS		T

Converter

ZKME _ _ 1 1 - _ _ _ 1 _ - _

Digit	Description	Note	Code
5	**Output signal**		
	4 to 20mA DC		B
	0 to 1V DC		E
6	**Communication**		
	None		Y
	RS-485		2
9	**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
10	**Instruction manual language**		
	Japanese		J
	English		E
	Chinese		C
11	**Option**		
	None		Y
	With valve		1
	With valve + flowmeter		2
12	**Specification name plate**		
	Standard		1
13	**Number of cable glands**		
	3		3
	4		4
	5		5
	6		6
	7		7
14	**Ex standard**		
	NEPSI		N
	TIIS		T

Note1) On the versions with combustion efficiency display, the rich mode indicator is available as well.

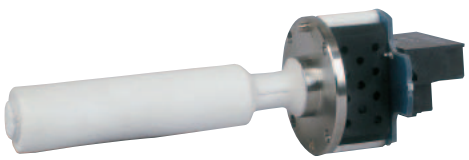
Dedicated cable

ZRZ E R _ _ 1 - _

Digit	Description	Note	Code
4	**Connectable device**		
	ZKME		E
5	**Type**		
	For type R thermocouple		R
6	**Cable length**		
7	6 m		YA
	10 m		YB
	15 m		YC
	20 m		YD
	30 m		YE
	40 m		YF
	50 m		YG
	60 m		YH
	70 m		YJ
	80 m		YK
	90 m		YL
	100 m		YM
9	**Cable end treatment**		
	None		0
	One side (detector side)		1
	Both sides		2

Replacement detector element

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



SCOPE OF DELIVERY

Detector: Detector × 1, viton packing × 1, thermo seal × 1, mounting screw (M5 × 25) × 6, flow guide tube (as specified) × 1, wrench × 1, instruction manual × 1

Converter: Converter × 1, mounting screw (M12 × 50) × 4, selector valve (option) × 1, flowmeter (option) × 1, 500mA T fuse × 2, 2.5A T fuse × 2, wrench × 1, instruction manual × 1

Ejector (option): joined with the detector

Items to be prepared separately:

(1) Standard gas for calibration
  Type ZBM□NSH4-01 (up to 5% O_2 range)
  Type ZBM□NSJ4-01 (over 5% O_2 range)

(2) Pressure regulator 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) Opener
  Type; ZZP*TK7N9329P2 (for detector; ZFKE)
  Type; ZZP*TK7N9329P1 (for converter; ZKME)

IMPORTANT INFORMATION

- Combustible gases such as CO and H_2 in the measured gas cause measurement error.
- Corrosive gases, for example, Si vapor, alkaline metal, P, and Pb, may shorten the life of the sensor.
- If the gas temperature reaches 300°C or above, remote the detector flange from the furnace wall so that the surface temperature of the flange will not go higher than 125°C. Mount the flow guide tube in such a direction that less gas flows into the detector.
- When the dust contained in the process gas is high, install the flow guide tube inclined downward, and in such a direction that less gas flows into the detector.
- If you use the analyzer in a waste incinerator, do not use the automatic blowdown because it causes corrosion of the flow guide tube due to drain water. Carry out blowdown manually after the furnace is stopped and the change in readings is decreased.

DETECTOR SELECTION GUIDE

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

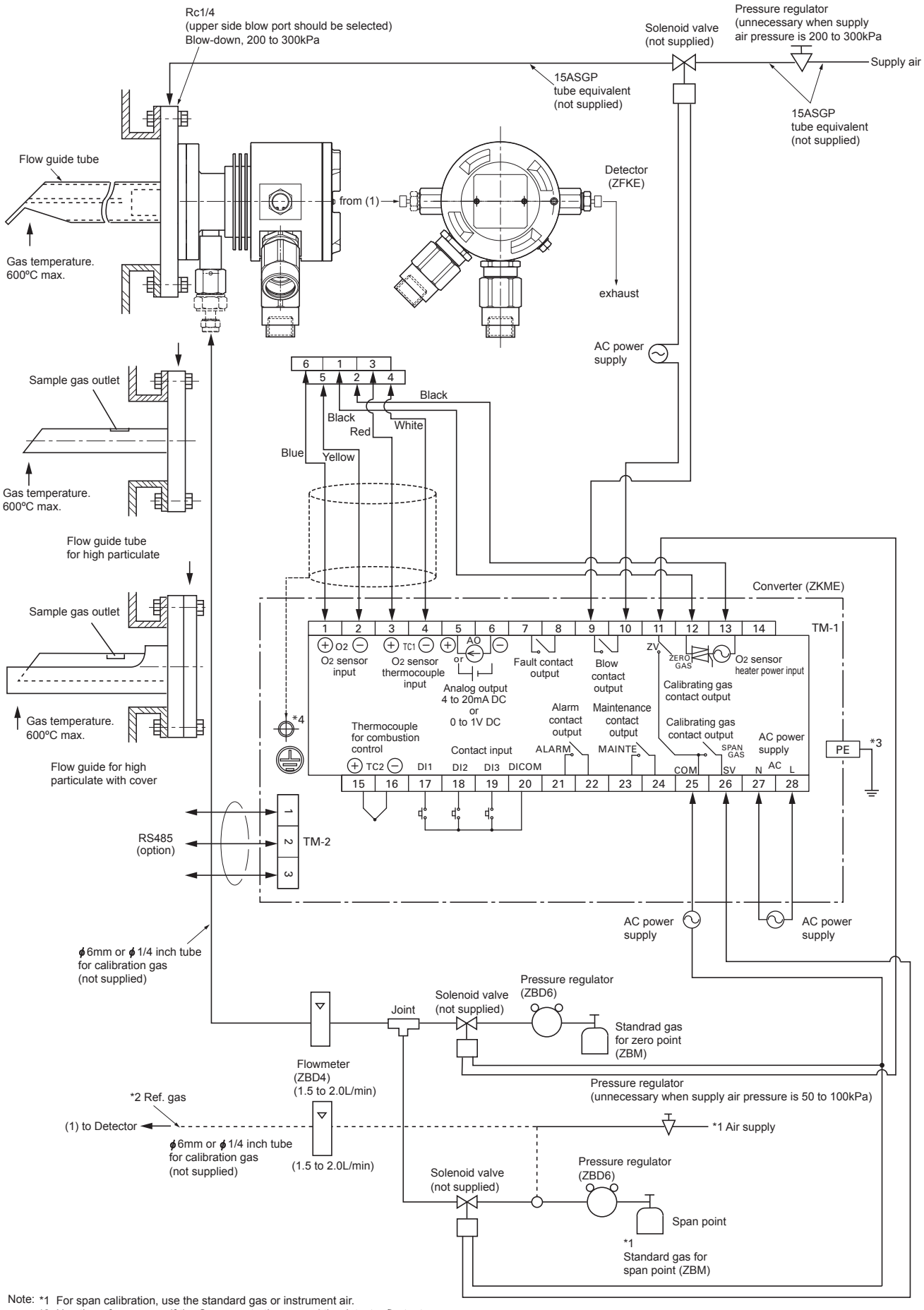
Application		Gas conditions				Detector		Converter
		Temp.	Flow rate	Dust	Moisture	Flow guide tube	10th code	
Boilers	Gas, oil	≤ 600 °C	5–20 m/s	< 0.2 g/Nm^3	Low	For corrosive gas	F	ZKME
	Coal			< 10 g/Nm^3	Low	With blowdown nozzle	G	
Refuse incinerators		≤ 600 °C	5–20 m/s	< 1 g/Nm^3	Low	For corrosive gas	F	
				< 10 g/Nm^3	Low	With blowdown nozzle	G	
				< 25 g/Nm^3	Low	For high particulate	H K M	
				< 25 g/Nm^3	High	For high particulate, with cover	J L N	

Notes

- Dust volumes listed above are approximate value.
- If the oxygen concentration of ambient air fluctuates, select a detector with a pipe adapter for reference gas inlet (13th code A or B).
- Consult us for specifications not listed above.

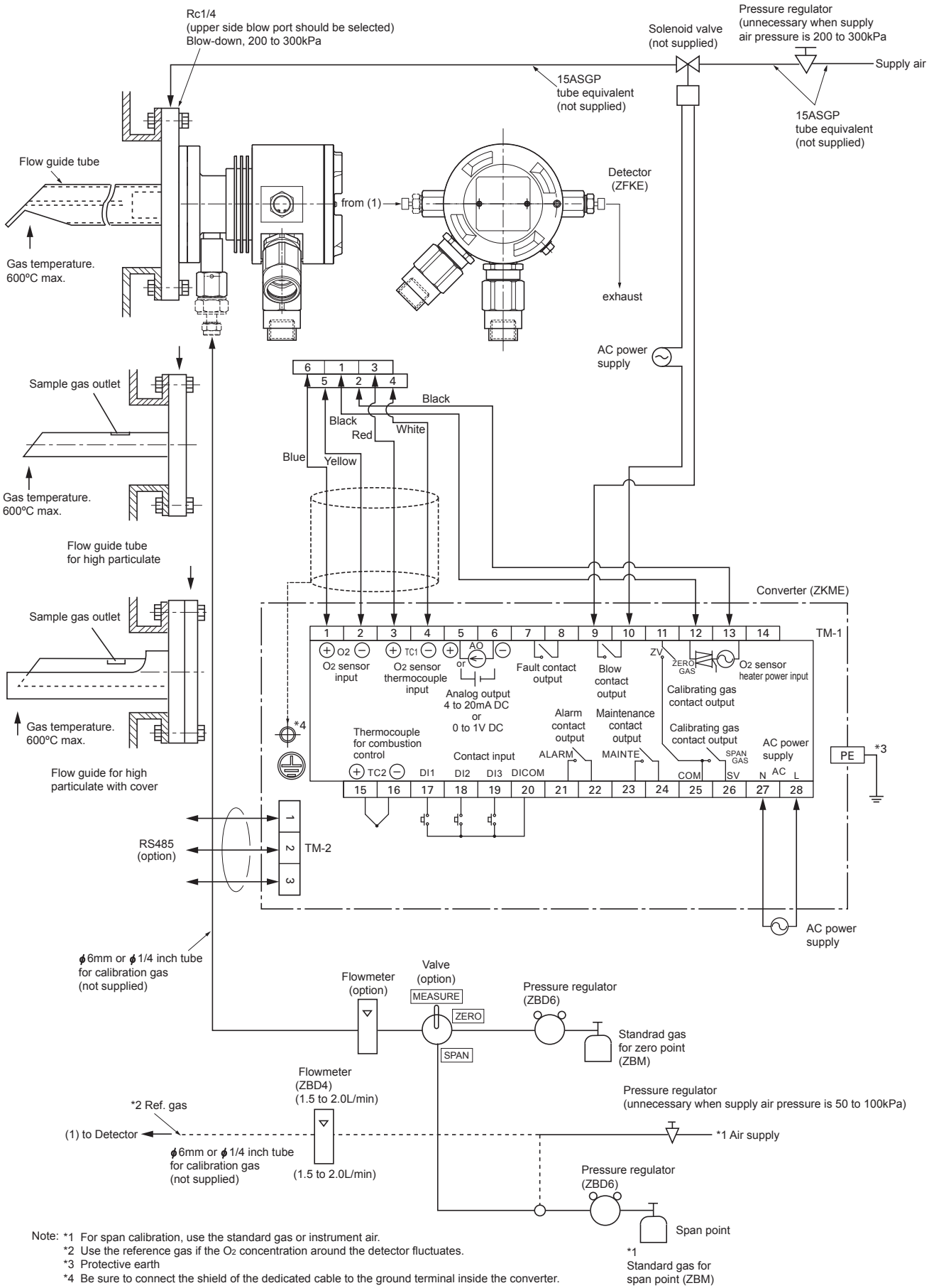
CONFIGURATION

Flow guide tube system



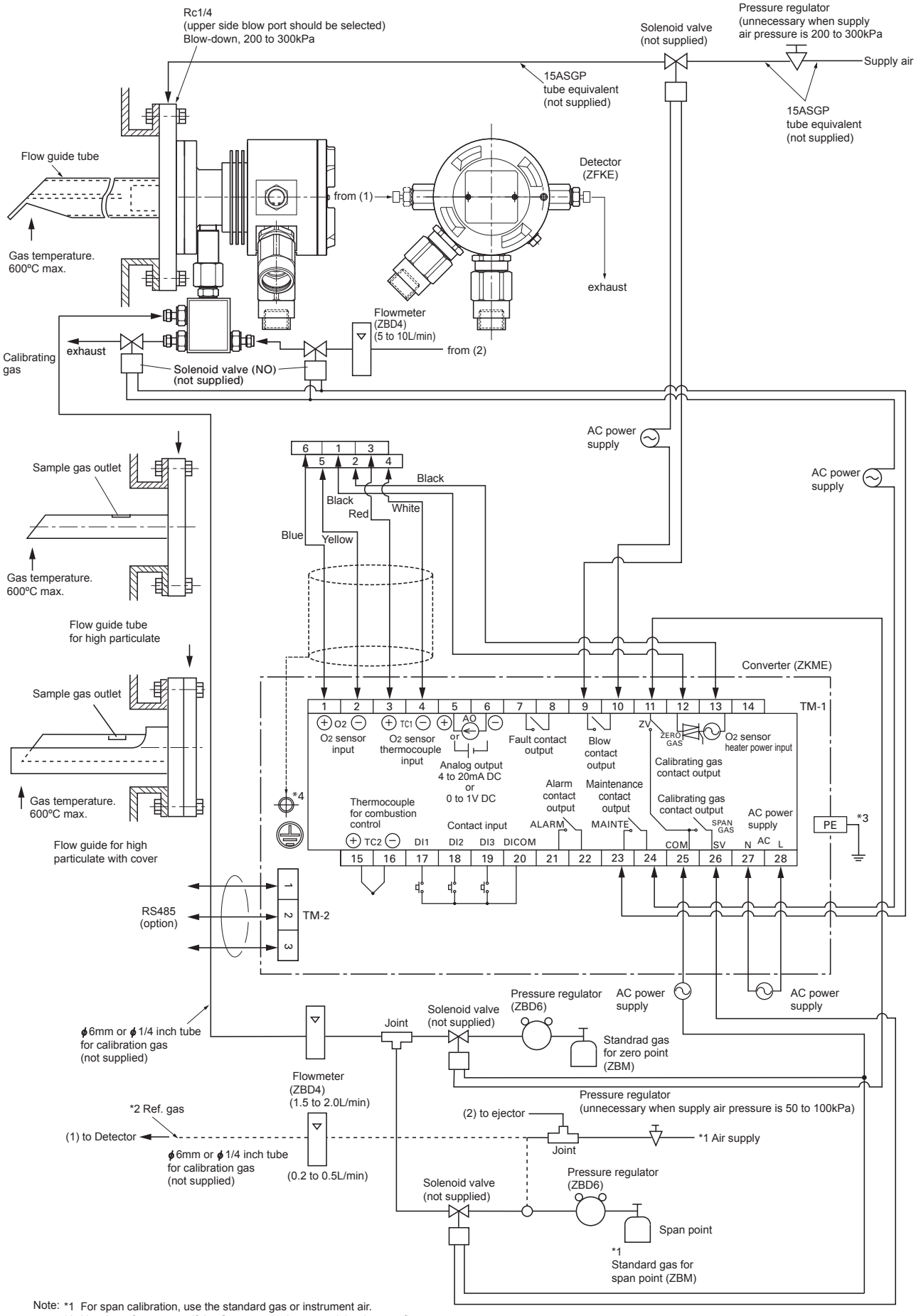
Note: *1 For span calibration, use the standard gas or instrument air.
*2 Use the reference gas if the O_2 concentration around the detector fluctuates.
*3 Protective earth
*4 Be sure to connect the shield of the dedicated cable to the ground terminal inside the converter.

Flow guide tube system (with valve)



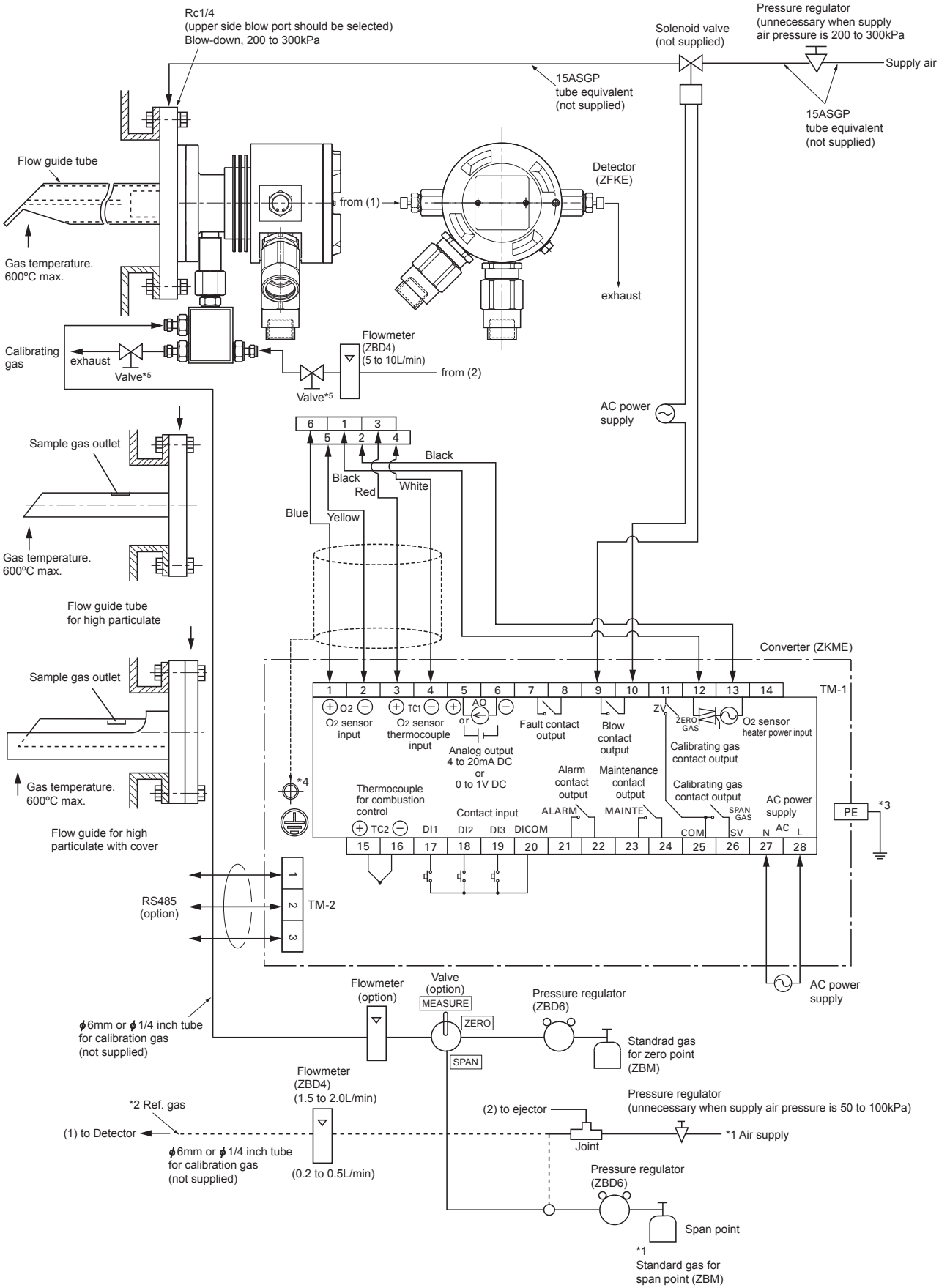
Note: *1 For span calibration, use the standard gas or instrument air.
*2 Use the reference gas if the O_2 concentration around the detector fluctuates.
*3 Protective earth
*4 Be sure to connect the shield of the dedicated cable to the ground terminal inside the converter.

Flow guide tube system (with ejector)



Note: *1 For span calibration, use the standard gas or instrument air.
*2 Use the reference gas if the O_2 concentration around the detector fluctuates.
*3 Protective earth
*4 Be sure to connect the shield of the dedicated cable to the ground terminal inside the converter.

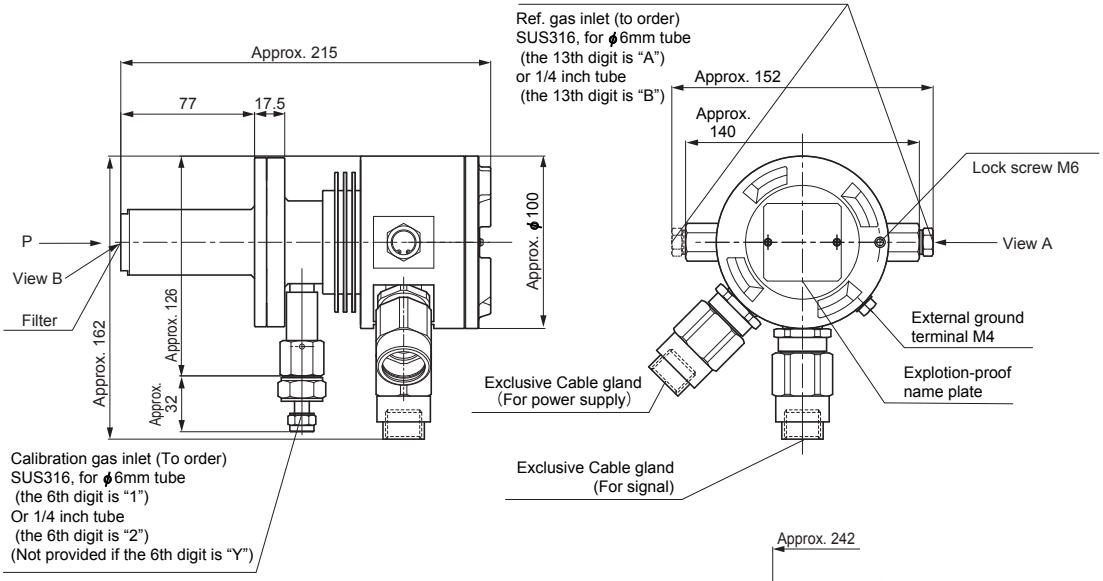
Flow guide tube system (with ejector+valve)

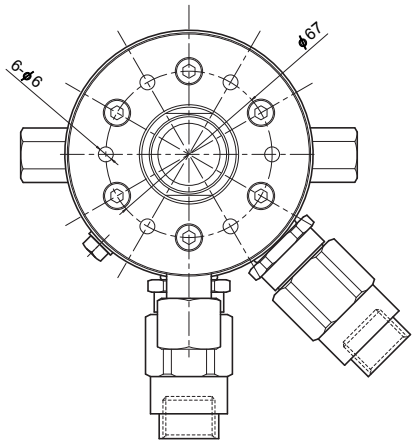


Note: *1 For span calibration, use the standard gas or instrument air.
*2 Use the reference gas if the O2 concentration around the detector fluctuates.
*3 Protective earth
*4 Be sure to connect the shield of the dedicated cable to the ground terminal inside the converter.
*5 Close the valve during calibration. (Valve is out of the scope of supply)

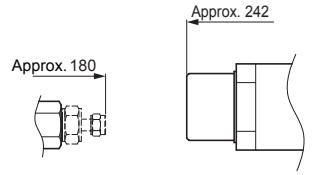
OUTLINE DIAGRAM (Unit:mm)

Detector (ZFKER[Y/1/2])



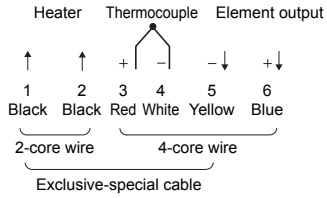


VIEW FROM P

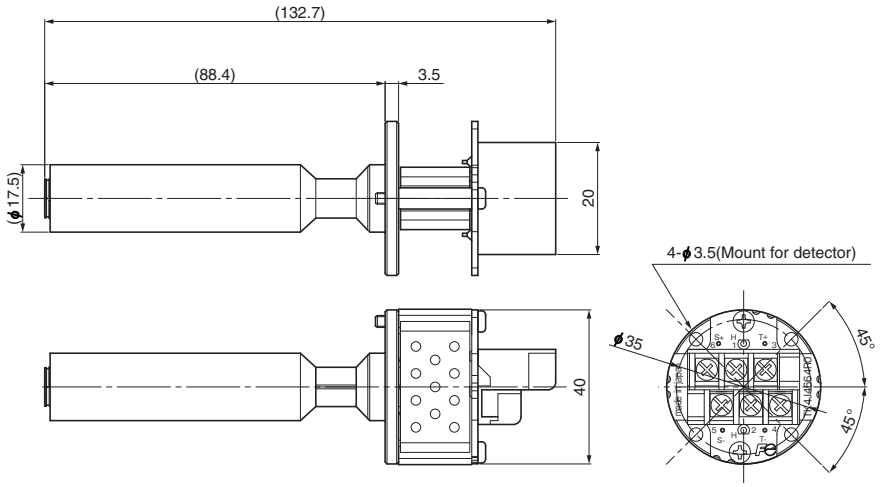


VIEW A VIEW B

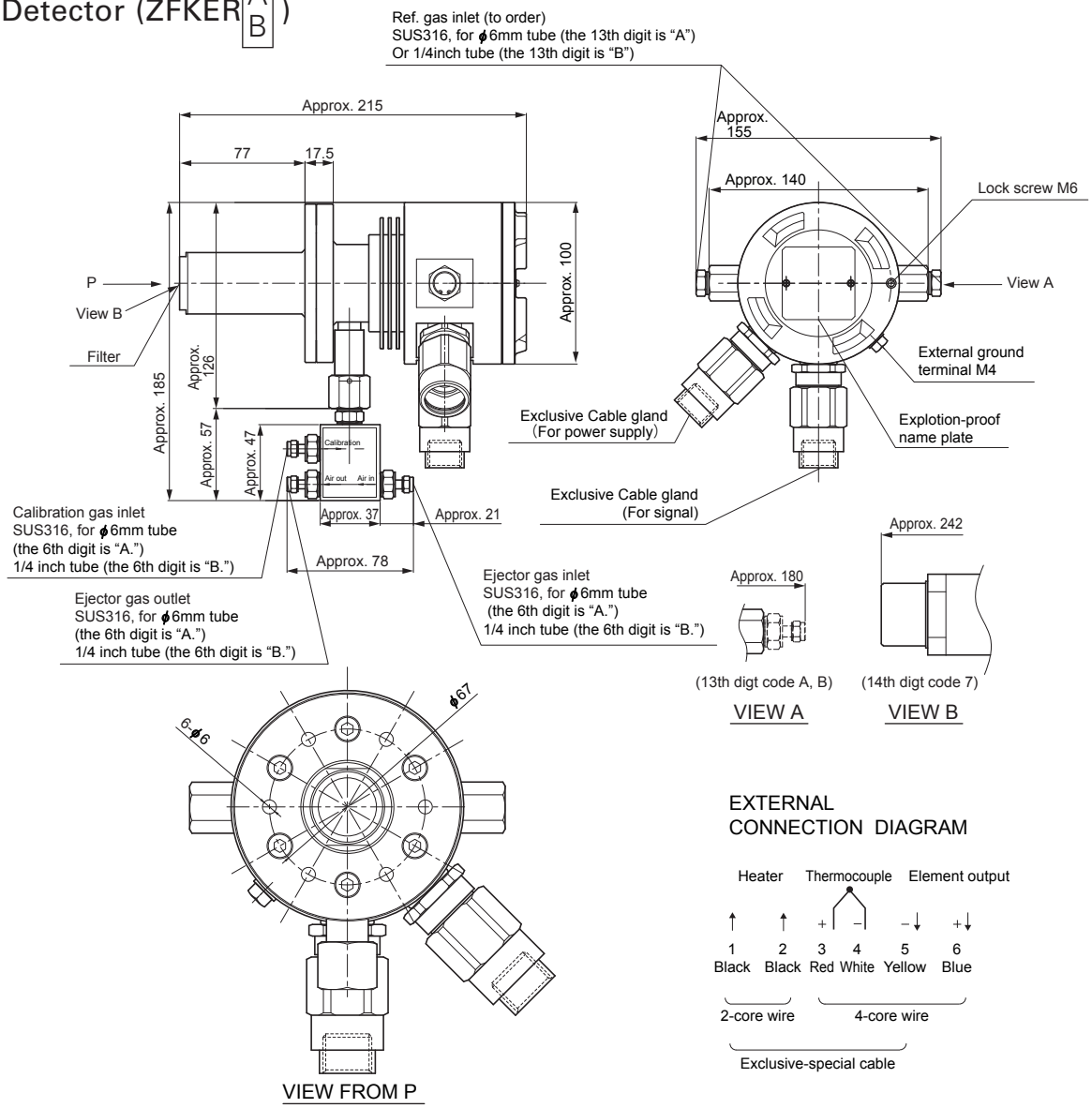
EXTERNAL CONNECTION DIAGRAM



Sensor unit (ZFK8YY)

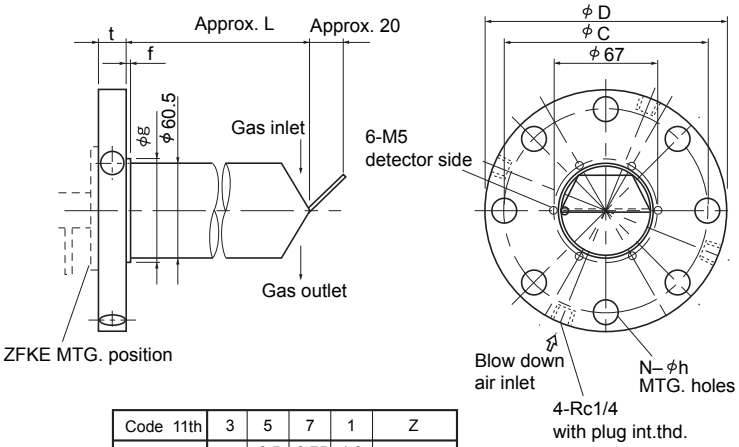


Detector (ZFKER[A/B])



EXTERNAL CONNECTION DIAGRAM

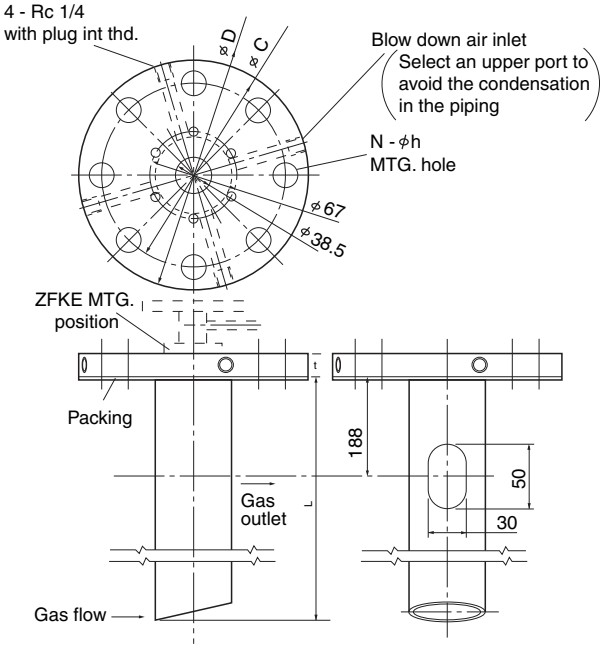
Flow guide tube (with blow-down nozzle) (ZFKE: 10th digit code. G)



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

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

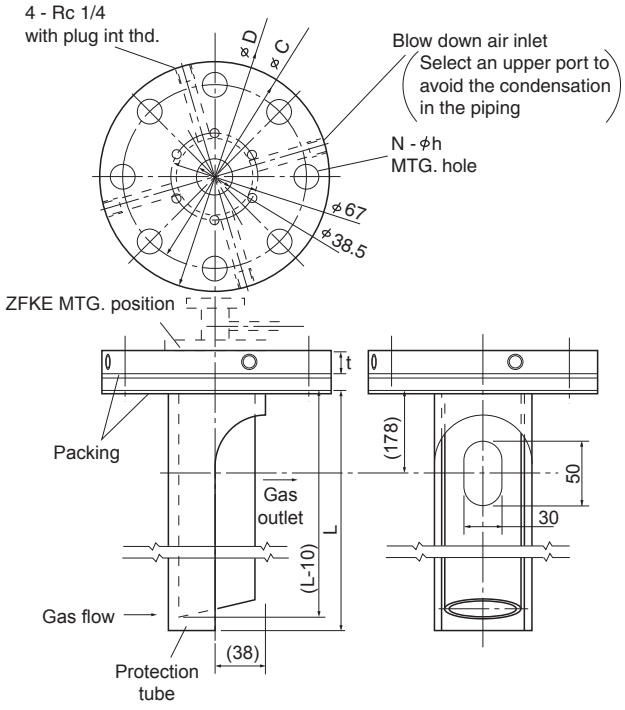
Flow guide tube (for high particulate) (ZFKE: 10th dight code. H, K, M)



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

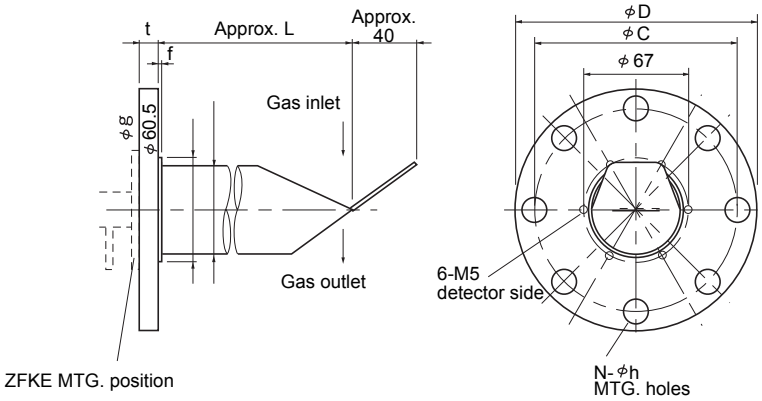
Flange size	Code 9th	D	C	t	f	g	N	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	A	175	140	18	2	116	4	19
JIS 10K 80A	B	185	150	18	2	126	8	19
JIS 10K 100A	C	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB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



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

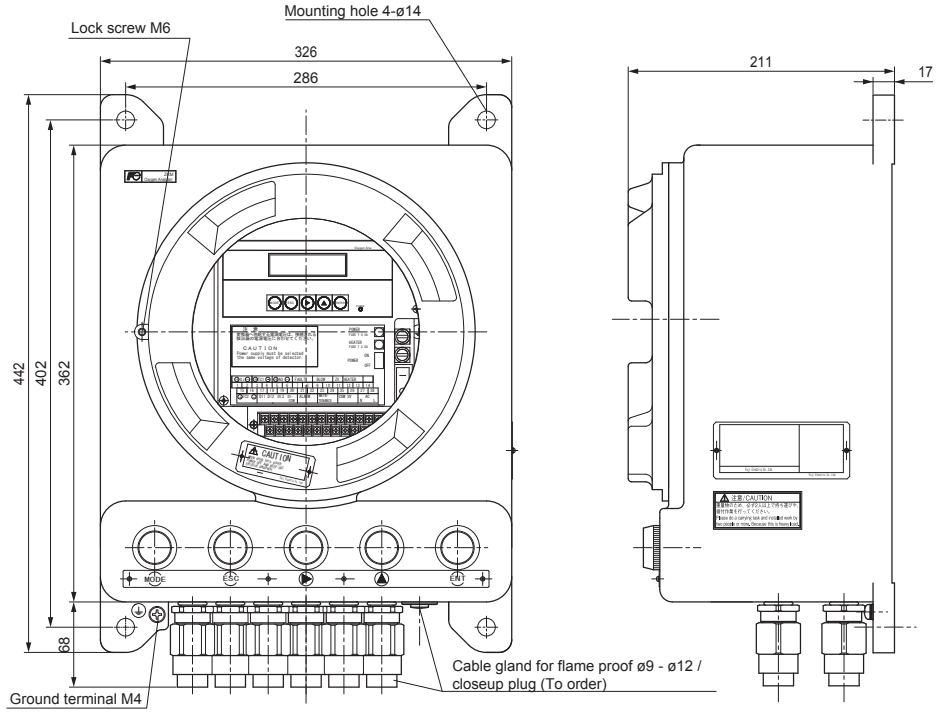
Flow guide tube (ZFKE: 10th dight code. F)

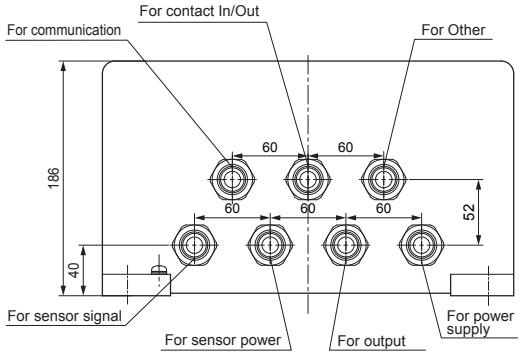


Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	L= (to order)
MASS Approx.(kg)	3.3	4.5	6.1	7.6	

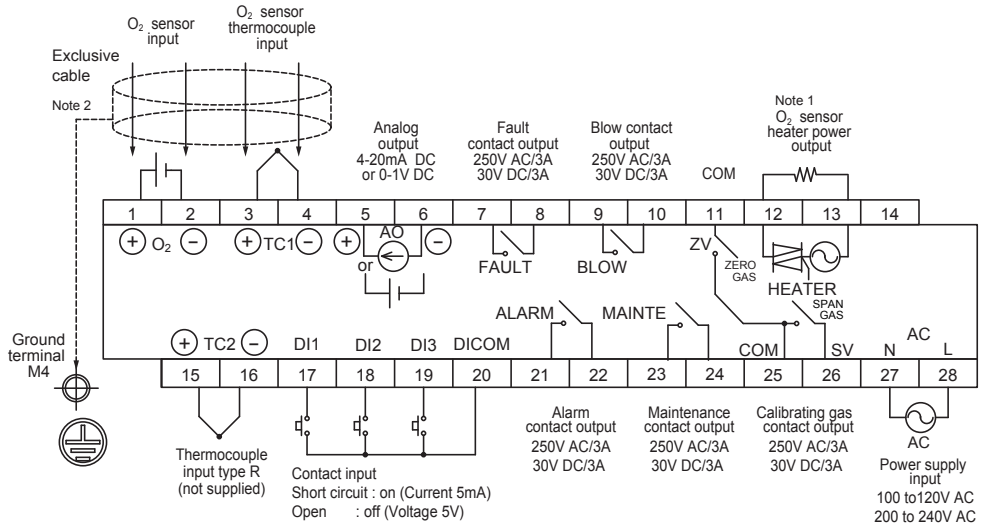
Flange size	Code 9th	D	C	t	f	g	N	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	A	175	140	18	2	116	4	19
JIS 10K 80A	B	185	150	18	2	126	8	19
JIS 10K 100A	C	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB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



Note 1) The heater is energized through the converter.
Note 2) Be sure to connect the shield to the ground terminal.

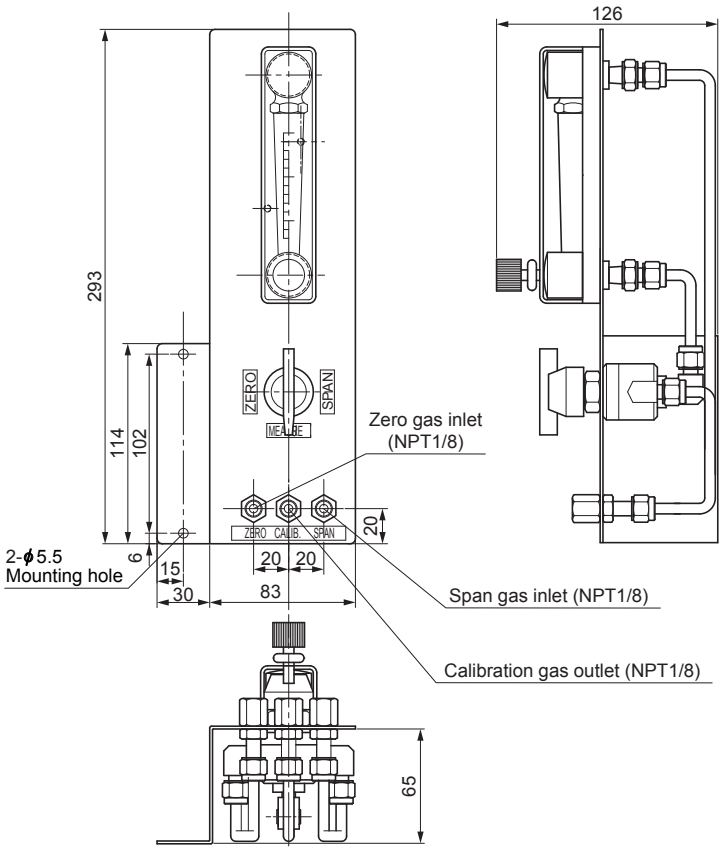
RS-485 communication terminal (TM2, option) / Euro-style terminals

1	2	3
GND	TRX–	TRX+

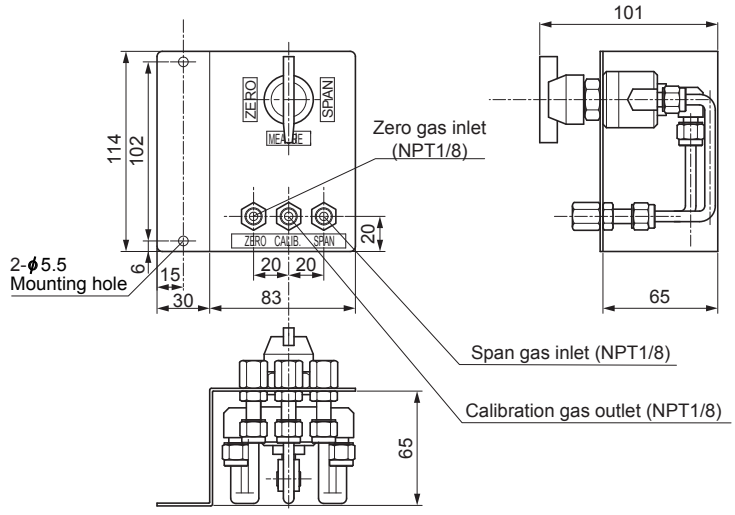
OUTLINE DIAGRAM (Unit:mm)

<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.

Fuji Electric Co., Ltd.

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