

IN-SITU ZIRCONIA OXYGEN ANALYZER

DATA SHEET

ZFK8, ZKM, ZTA

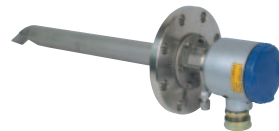
This oxygen analyzer is used to continuously measure oxygen concentration in combustion exhaust gas of industrial boilers or furnaces, and is ideally suited for combustion management and control.

The analyzer system is comprised of the detector and converter coupled together as a complete system. Detector setting configuration includes the detector 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 (ZKM) is comprised of the signal processor, input/output and communications, display and system controls.

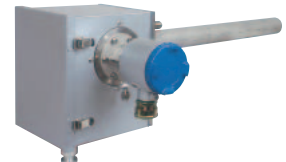
The converter is equipped with advanced functionality such as performing the sensor diagnostics and sensor recovery function, so the detector can be used within long term stability.

FEATURES

- 1. Gas sampling device is unnecessary**
For quick response, insert the detector directly into the flue 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 concentration of the measurement gas, the power 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.



General-use detector (ZFK8)



High-temperature detector (ZTA)



<IP66>
Converter (ZKM1)



<IP67>
Converter (ZKM2)

SPECIFICATIONS

General Specifications

Measuring object: Oxygen in noncombustible gas

Measuring method:

Directly insert type zirconia system

Measuring range: 0 to 2 ... setting range at option 2 in 50 vol% O₂
(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: More than 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)
Typical 70VA (Detector: approx. 50VA, Converter: approx. 20VA)

Detector Specifications (ZFK)

Measured gas temperature:

Flow guide tube system; -20 to +600°C
(for general-use, corrosive gas)
Ejector system; -20 to +1500°C (for
high-temperature gas)
-20 to +800°C (for general-use)

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

Ejector (general-use):

Probe for guiding measured gas to
detector
Flange; JIS10K 65A RF
Insertion length; 0.5, 0.75, 1, 1.5m (ac-
cording to customer's specification)

Operating temperature:

-10 to +60°C for Primary detecting ele-
ment
-5 to +100°C for ejector section
125°C or less at detector flange surface
with power applied

Storage temperature:

Sensing element: -20 to +70°C
Ejector: -10 to +100°C

Structure:

Dust/rain-proof structure(IEC IP66
equivalent)

Filter:

Alumina(filtering accuracy 50µm) and
quartz paper

Main materials of gas-contacting parts:

Detector; Zirconia, SUS316, platinum
Flow guide tube; SUS304 or SUS316
Ejector (general use); SUS316, SUS304
Ejector; (for high temperature) SiC,
SUS316, SUS304

Calibration gas inlet:

φ6mm tube join, φ1/4-inch tube join, or
ball valve (as specified)

Reference air 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.) 210mm × 100mm (de-
tector)

Mass (approx.) {weight}:

Detector; 1.6kg
Ejector; 15kg (insertion length 1m)
Flow guide tube (general-use, 1m); 5kg

Finish color:

Silver and SUS metallic color

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}

Ejector exhaust gas processing:

Into furnace, returned to flue

Heater temperature drop alarm output (ejector):

Alarm output when below 100°C Me-
chanical thermostat

N.O. (1a) contact, 200V AC, 2A

Converter specification (ZKM)

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 calibration gas valve
- Zero calibration gas valve
- 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 operation
- (b) Auto. calibration (option)
Calibration cycle; 00 day 00 hour to
99 days 23 hours
- (c) All calibration

Calibration gas:

- Available range settings
Zero gas; 0.010 to 25.00% O₂
Span gas; 0.010 to 50.00% O₂
- Recommended calibration gas concen-
tration
Zero gas; 0.25 to 2.0% O₂
Span gas; 20.6 to 21.0% O₂
(oxygen concentration in the air)

Blowdown:

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.

(option)

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, process-
ing 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. Mounted on the side of the converter.

Communication function:

RS232C (MODBUS) standard specification
RS485 (MODBUS) (option)

Combustion efficiency display (option):

When you select this display, "rich mode display" will be simultaneously displayed. 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 IP66 or IP67 of IEC)

Material: Aluminum case

Outer dimensions (H x W x D):

170 X 159 X 70mm (IP66, Bench type)

220 X 230 X 95mm (IP67)

182 X 163.5 X 70.6mm (Bench type)

Mass {weight}: IP66: Approx. 2kg (excluding cable and detector)

IP67: Approx. 4.5kg (excluding cable and detector)

Finish color: IP66: Case: Silver

Cover: Pantone Cool Gray 1C-F

IP67: Munsell 6PB 3.5/10.5 (blue)

Cover: Silver (case)

Mounting method: Mounted flush on panel or on pipe

Electrical Safety:

Overvoltage category
; II power supply input
; I relay interfaces
(IEC1010-1)
External overcurrent protective device
; 10A
Equipment interfaces are safety separated (SELV)

EC Directive Compliance

The product conforms to the requirements of the Low Voltage Directive 2006/95/EC and EMC directive 89/336/EEC (as amended by Directive 92/31/EEC), both as amended by Directive 93/68/EEC.

It conforms to following standards for product safety and electromagnetic compatibility:

EN61010-1 : 2010, EN62311: 2008
Safety requirements for electrical equipment for measurement, control and laboratory use.
"Installation Category II"
"Pollution Degree 2"
"Altitude up to 2187 yard (2,000 m)"
EN61326-1 : 2006, EN61326-2-3: 2006
EN61000-3-2 : 2006, A1: 2009, A2: 2009
EN61000-3-3 : 2008
Electrical equipment for measurement, control and laboratory use. EMS requirements.



ZFK, ZKM

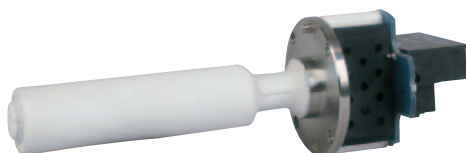
CODE SYMBOLS

(Detector)

ZFK				9 10 11 12 13				14 15 16				Description	
4	5	6	7	9	10	11	12	14	15	16			
8	R		5							1	Cal. gas inlet		
										1	For φ6mm tube (SUS)		
										2	For φ1/4 inch tube (SUS)		
										3	Ball valve		
										1	Power supply		
										3	100 to 120VAC 50/60Hz		
											200 to 240VAC 50/60Hz CE		
											Flow guide tube		
											flange	application	length
											0Y0	None	
											5A3	SUS304 general use	300mm
											5A5	SUS304 general use	500mm
											5A7	SUS304 general use	750mm
											5A1	SUS304 general use	1000mm
											5B3	SUS316 for corrosive gas	300mm
											5B5	SUS316 for corrosive gas	500mm
											5B7	SUS316 for corrosive gas	750mm
											5B1	SUS316 for corrosive gas	1000mm
											5C3	SUS316 with blow-down nozzle	300mm
											5C5	SUS316 with blow-down nozzle	500mm
											5C7	SUS316 with blow-down nozzle	750mm
											5C1	SUS316 with blow-down nozzle	1000mm
											6D3	SUS316 for high particulate	300mm
											6D5	SUS316 for high particulate	500mm
											6D7	SUS316 for high particulate	750mm
											6D1	SUS316 for high particulate	1000mm
											6E3	SUS316 for high particulate with cover	300mm
											6E5	SUS316 for high particulate with cover	500mm
											6E7	SUS316 for high particulate with cover	750mm
											6E1	SUS316 for high particulate with cover	1000mm
											ZZZ	Others	
											Y	Protection cover	Without
											A	Protection cover	With
											Y	Reference air inlet	Non
											A	Reference air inlet	For φ6mm tube (SUS)
											B	Reference air inlet	For φ1/4 inch tube (SUS)
											1	Filter spec.	Standard
											J	Instruction manual language	Japanese
											E	Instruction manual language	English
											C	Instruction manual language	Chinese
											1	Specification name plate	Standard (100 to 120V AC 50/60Hz)
											2	Specification name plate	Standard (200 to 240V AC 50/60Hz)

(Replacement Detector element)

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



(Converter)

ZKM												Description	
1	2	3	4	5	6	7	8	9	10	11	12		
Z	K	M									1	Construction	
											1	IP66	
											2	IP67	
											3	Bench type	
								B				Output signal	
								E				4 to 20mA DC	
								Z				0 to 1V DC	
												Other	
								1				Communication function	
								2				RS-232C	
												RS-485	
								Y				Mounting bracket	
								1				None (Specify "None" when the bench type is selected)	
								2				Mounting on panel surface	
												Pipe mounting	
								Y				Optional Functions	
								1				None	
								2				Combustion efficiency display function Note4)	
								3				Blowdown	
								4				Auto calibration	
								5				Combustion efficiency indication + Blowdown Note4)	
								6				Combustion efficiency indication + Auto calibration Note4)	
								7				Blowdown + Auto calibration	
												Combustion efficiency indication + Blowdown + Auto calibration Note4)	
								J				Display language	
								E				Japanese	
								C				English	
												Chinese	
								Y				Option	
								1				None (Specify "None" when the bench type or the auto calibration is selected)	
								2				With valve	
												With valve + flowmeter	

Note4) When you select this display, rich mode will be a simultaneous display.

(Exclusive-special cable)

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

Note5) For connection between detector and converter, the conduit to be used should be rainproof flexible type.

(Ejector)

1 2 3 4 5 6 7 8								Description	
Z	T	A	1				1		
								1	Measured gas temperature
								1	For high temperatures (+1500°C max.)
								2	General-use (+800°C max.)
								Insertion length [mm]	
								B	500
								C	750
								D	1000
								E	1500
								Power supply	
								1	100V/115V AC 50/60Hz
								3	200V/220V AC 50/60Hz
								5	230VAC 50/60Hz

SCOPE OF DELIVERY

Detector: Detector main unit × 1, Viton O ring × 1, mounting screw (M5mm × 16) × 6, thermal sticker × 1, flow guide tube (as specified) × 1, ceramic filter × 1, rain-proof cover (as specified) × 1, Instruction manual × 1

Converter: Converter main unit × 1, mounting bracket set, (as specified) × 1
Accessories (AC250V 500mA T fuse × 2, AC250V 2.5A T fuse × 2), Instruction manual × 1

Ejector: Ejector main unit × 1, insertion tube × 1, M16mm nut, and washer × 4, packing × 1

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)

Type; ZBD42403, 1 to 10L/min (for ejector)

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 tube 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.

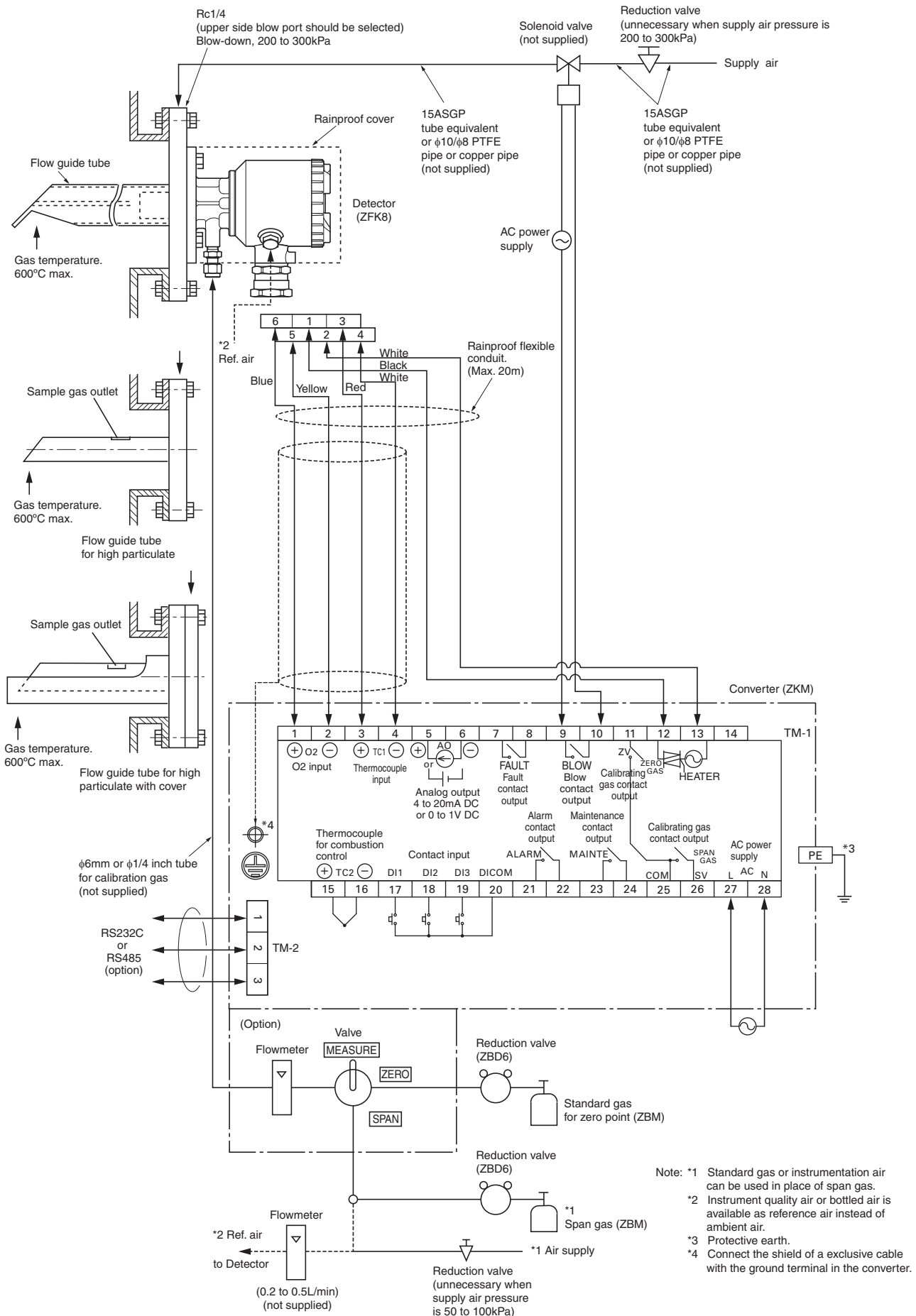
Measured gas						Device configuration		
Application	Temperature	Gas Flow	DUST	Protection cover	Note	Detector type	Converter type	Ejector type
General-use (boiler)	600°C or less	5 to 20m/s	Less than 0.2g/Nm ³	—	Fuel; gas, oil	ZFK8R□□5-□A5□□-1□	ZKM	—
			Less than 10g/Nm ³	—	Fuel: coal with blow down	ZFK8R□□5-□C5□□-1□	ZKM	—
For corrosive gas (refuse incinerator)	600°C or less	5 to 20m/s	Less than 1g/Nm ³	—	Included low moisture	ZFK8R□□5-□B5□□-2□	ZKM	—
			Less than 10g/Nm ³	—	Included low moisture with blow down	ZFK8R□□5-□C5□□-2□	ZKM	—
			Less than 25g/Nm ³	no	Included low moisture with blow down	ZFK8R□□5-□D6□□-2□	ZKM	—
			Less than 25g/Nm ³	yes	Included high moisture with blow down	ZFK8R□□5-□E6□□-2□	ZKM	—
General-use (boiler)	800°C or less	Less than 1m/s	Less than 1g/Nm ³	—	SUS316 tube with blow down	ZFK8R□□5-0Y0□□-1□	ZKM	ZTA2
	1500°C or less	Less than 1m/s	Less than 1g/Nm ³	—	SIC tube with blow down	ZFK8R□□5-0Y0□□-1□	ZKM	ZTA1

Note (1) Dust volume is approximate value.

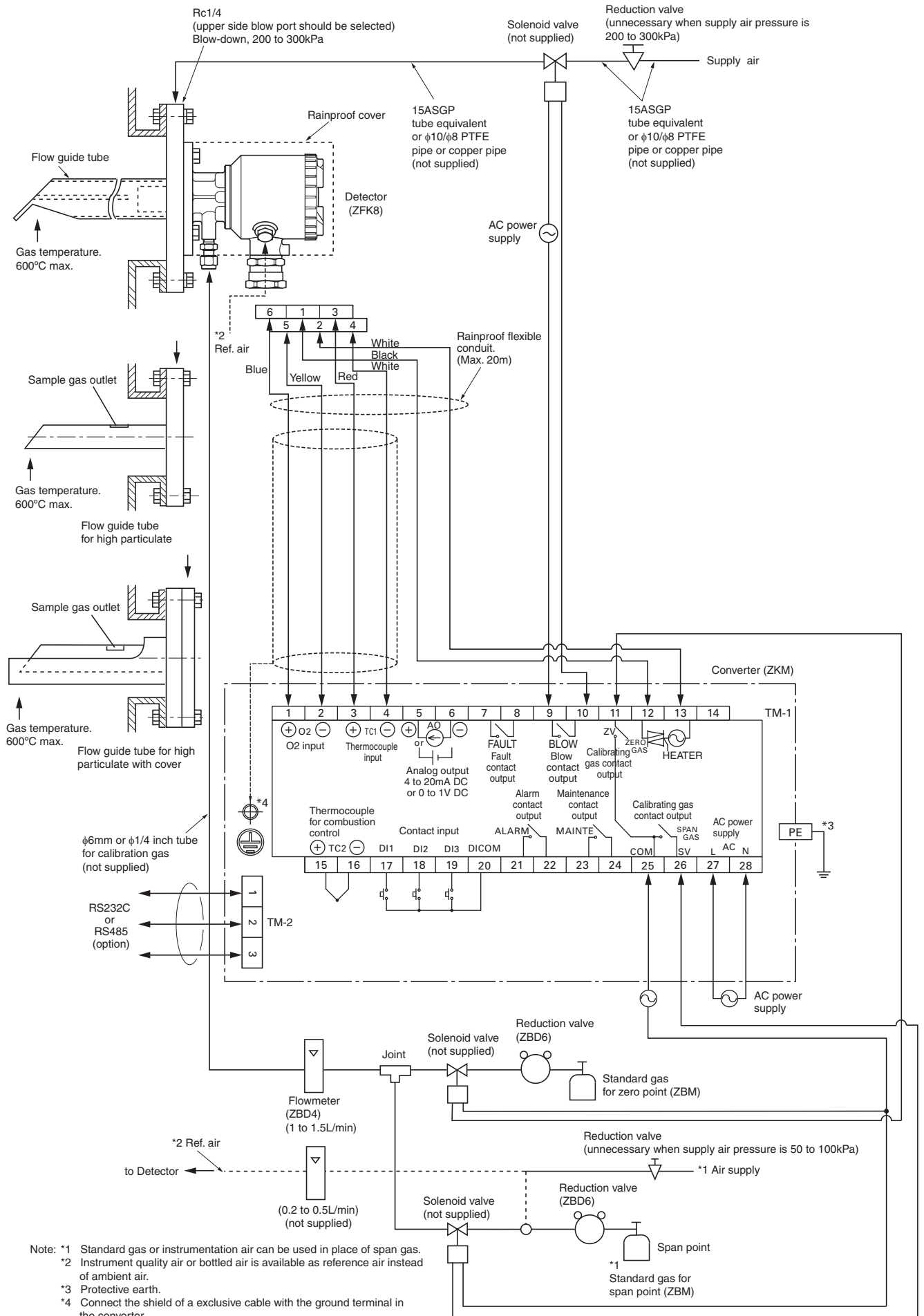
(2) Instrument quality air or bottled air is available as reference air by selecting detector with reference air inlet.

CONFIGURATION

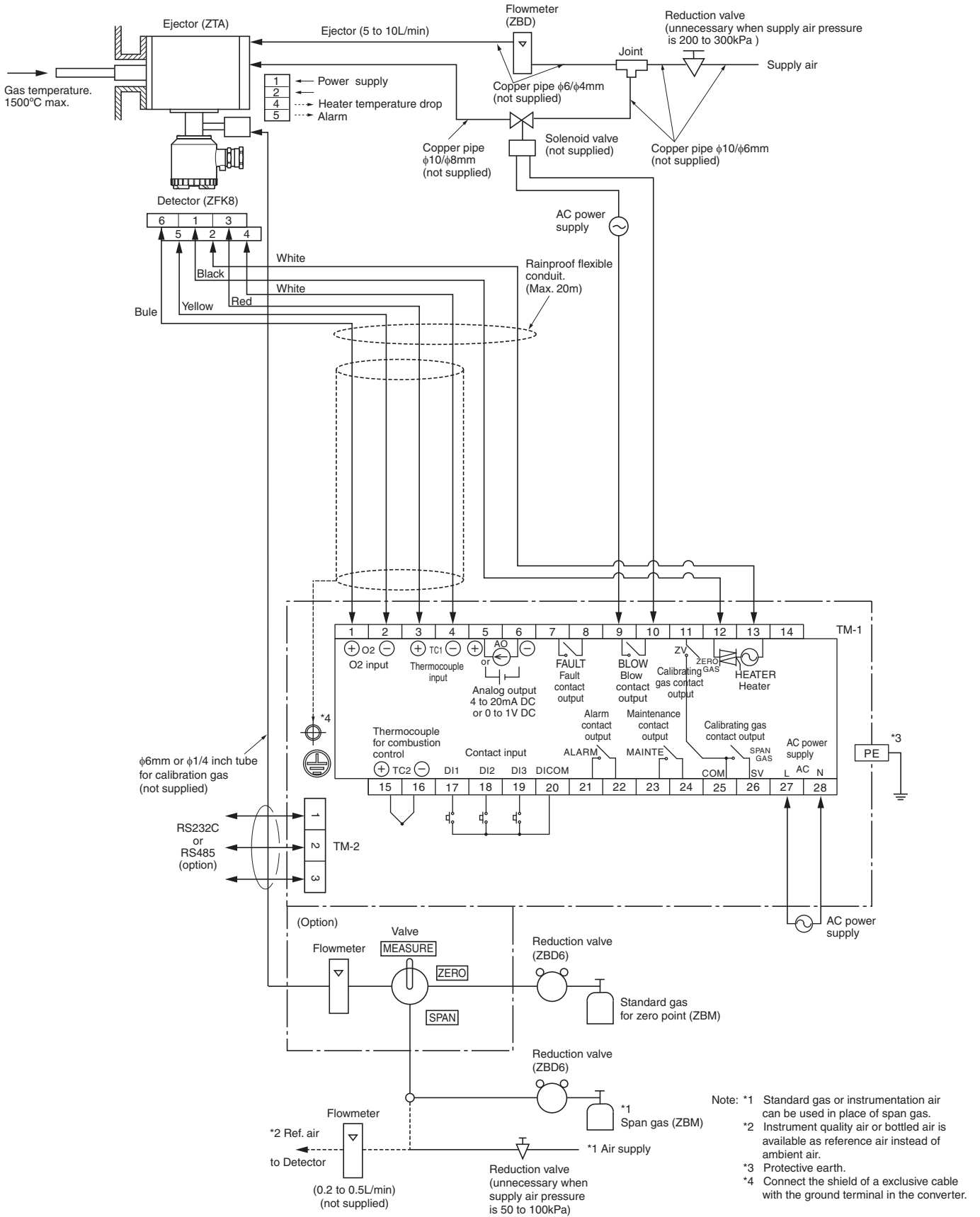
Flow guide tube system (with valve)



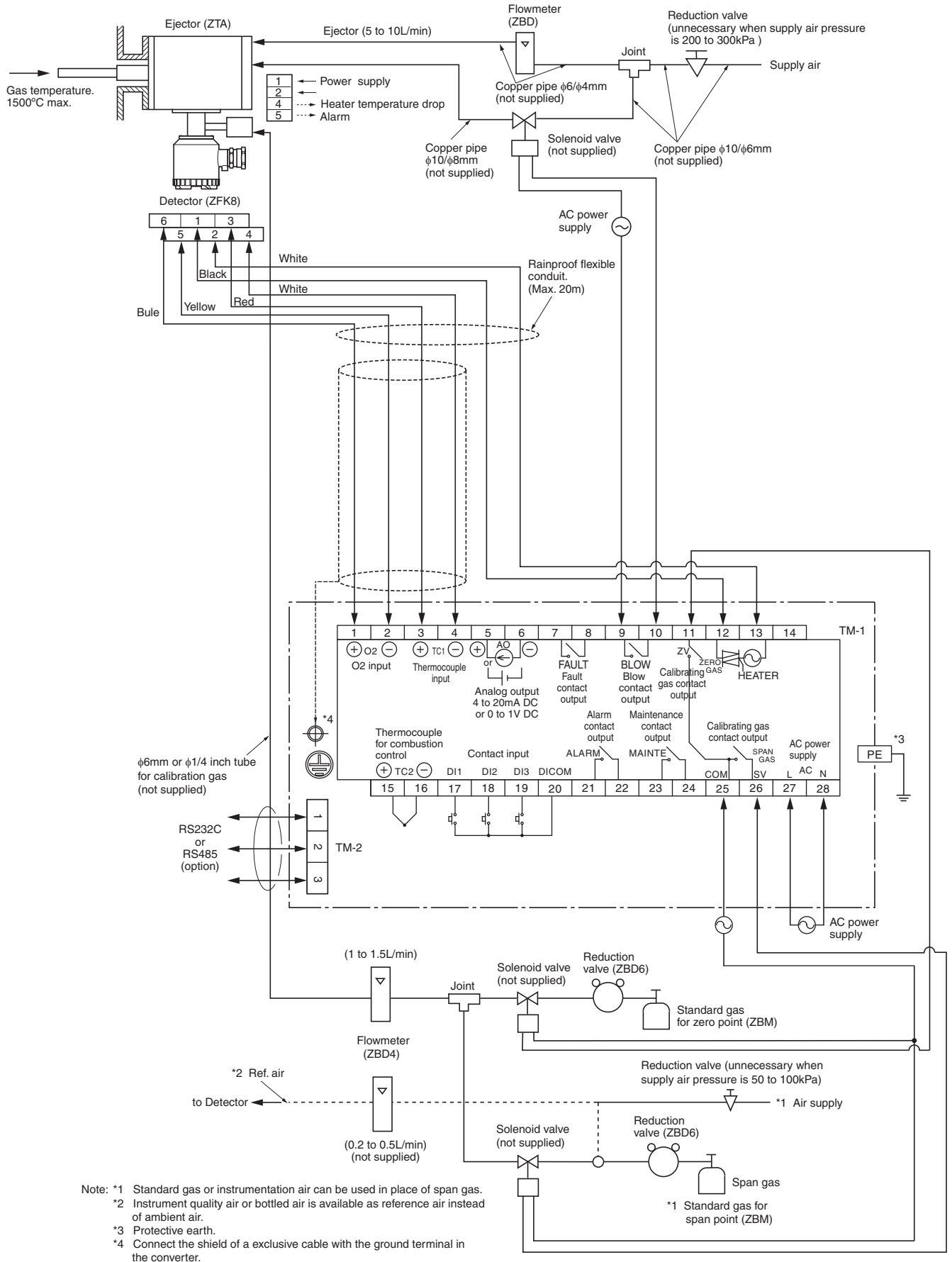
Flow guide tube system



Ejector system (with valve)

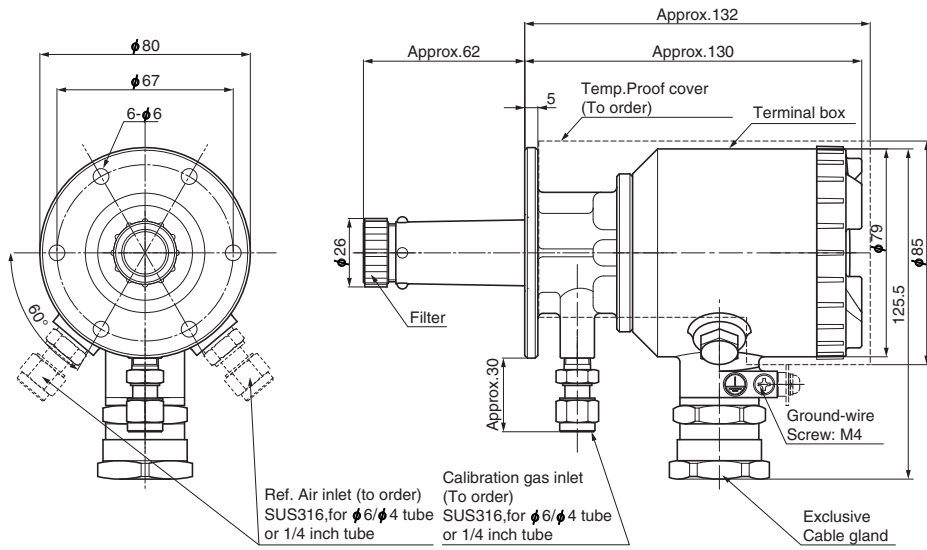


Ejector system

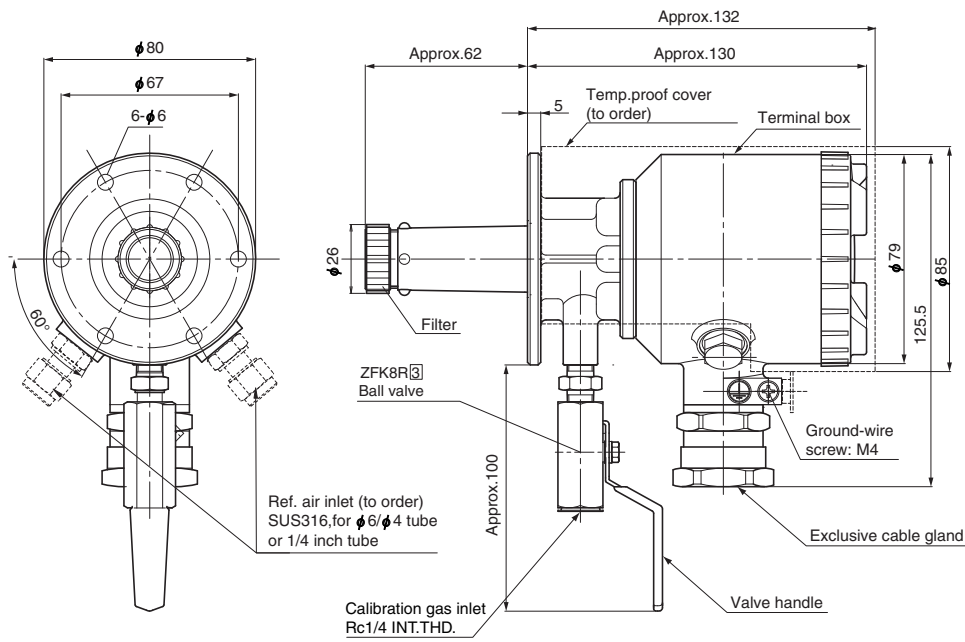
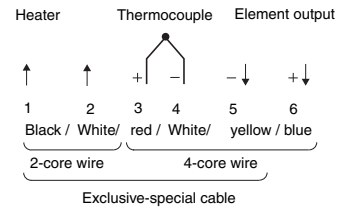


OUTLINE DIAGRAM (Unit:mm)

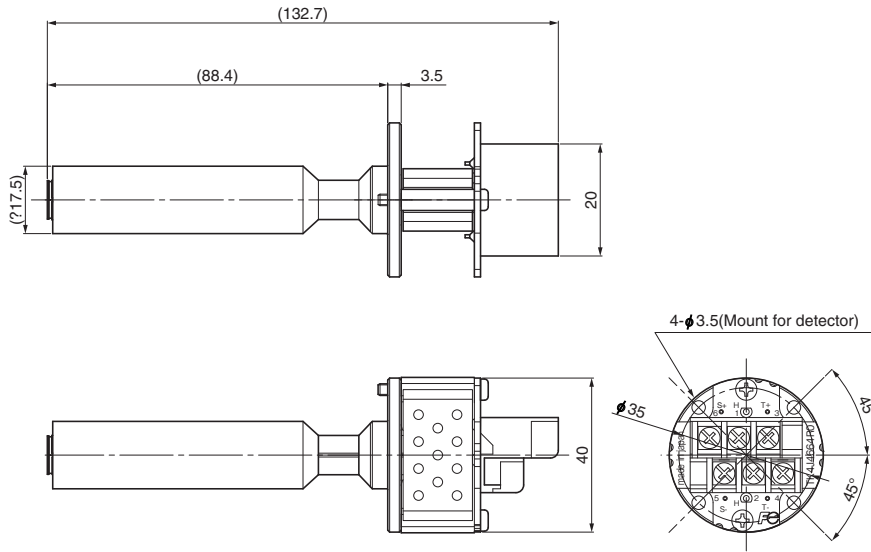
Detector (ZFK8)



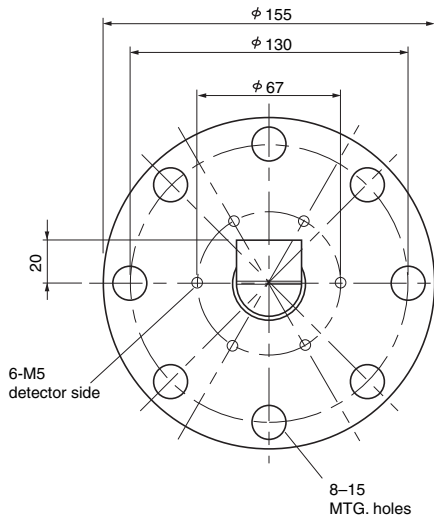
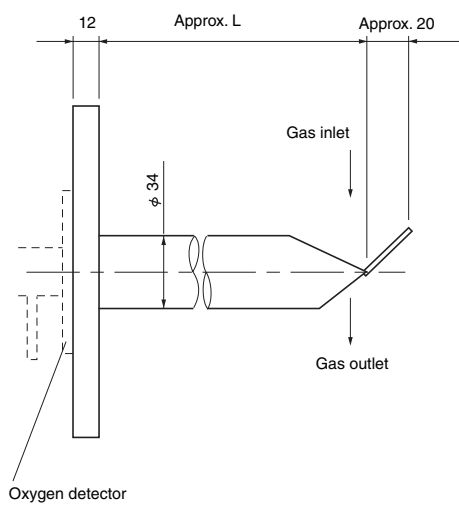
EXTERNAL CONNECTION DIAGRAM



Sensor unit (ZFK8YY)



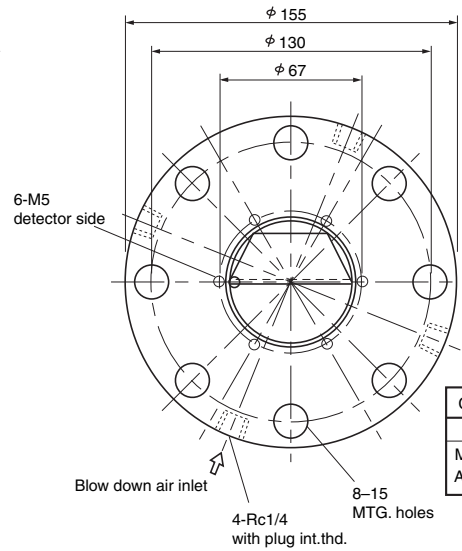
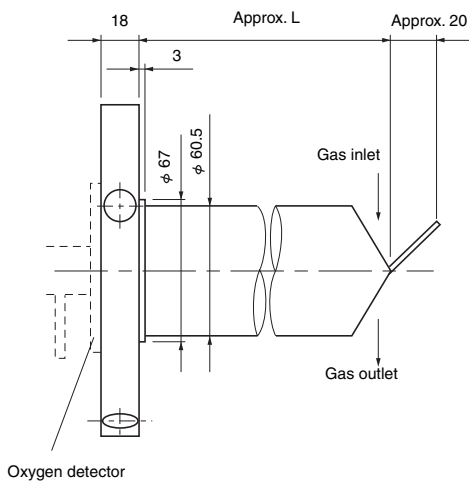
Flow guide tube



ZFK8R□□5-5A□□
3
5
7
1

Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	L= (to order)
MASS Approx.(kg)	2.7	3.3	4.1	4.8	

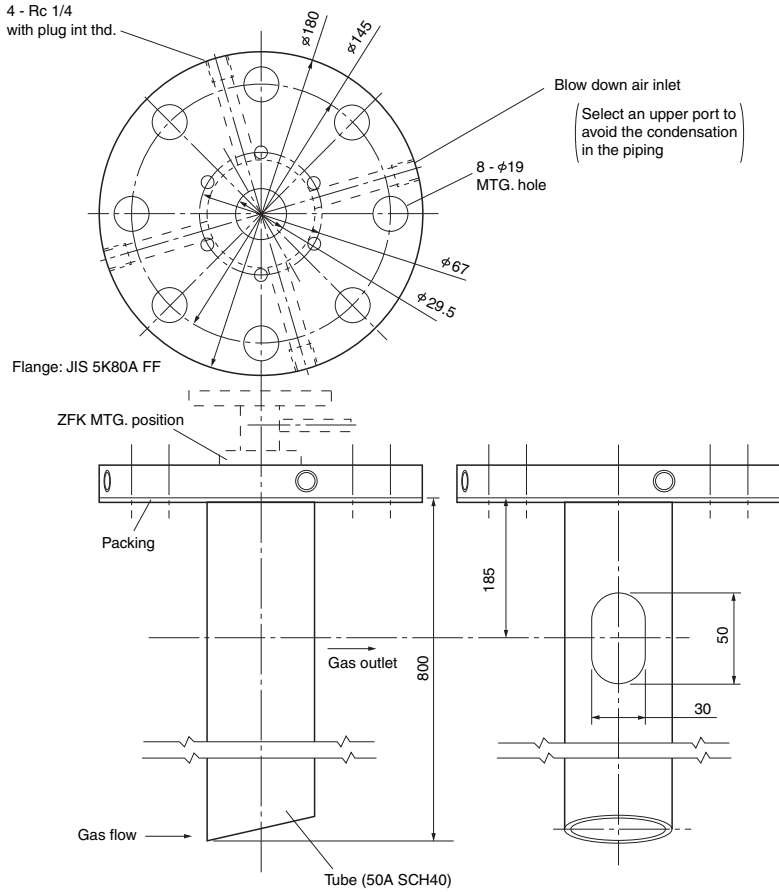
Flow guide tube (with blow-down nozzle)



ZFK8R□□5-5C□□
3
5
7
1

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	

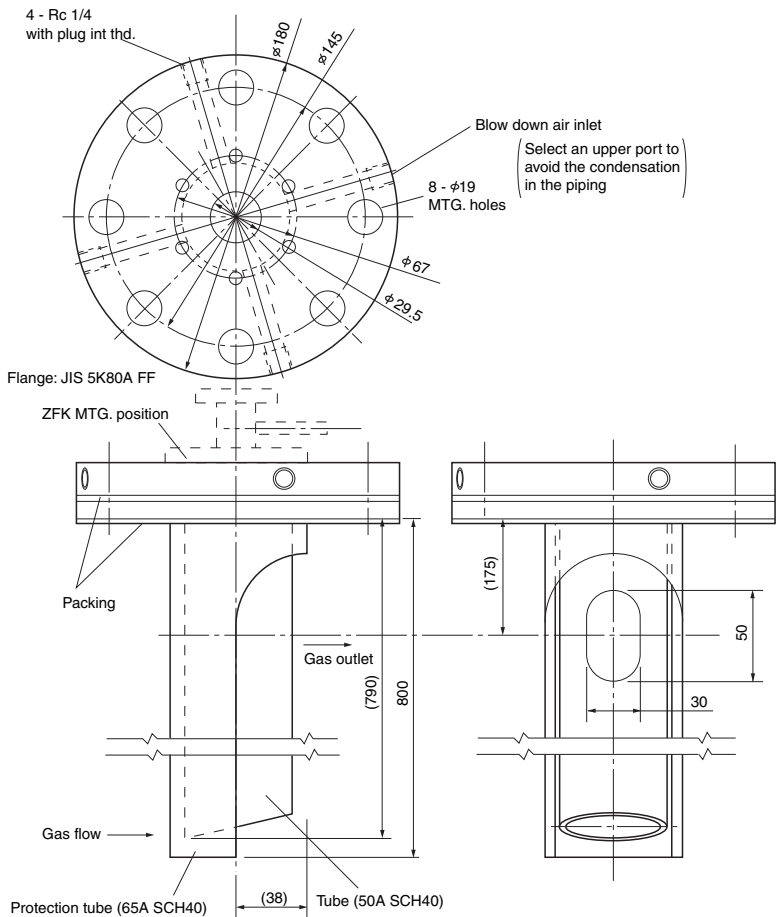
Flow guide tube (for high particulate)



Z F K 8 R □ □ 5 - 6 D $\begin{matrix} 3 \\ 5 \\ 7 \\ 1 \end{matrix}$ □

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	

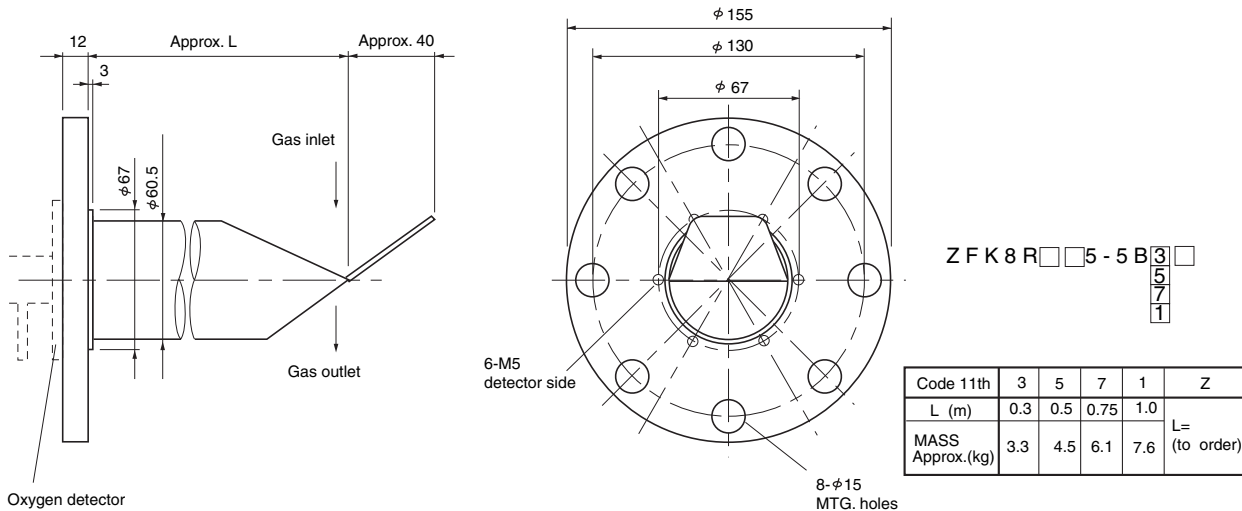
Flow guide tube (for high particulate with cover)



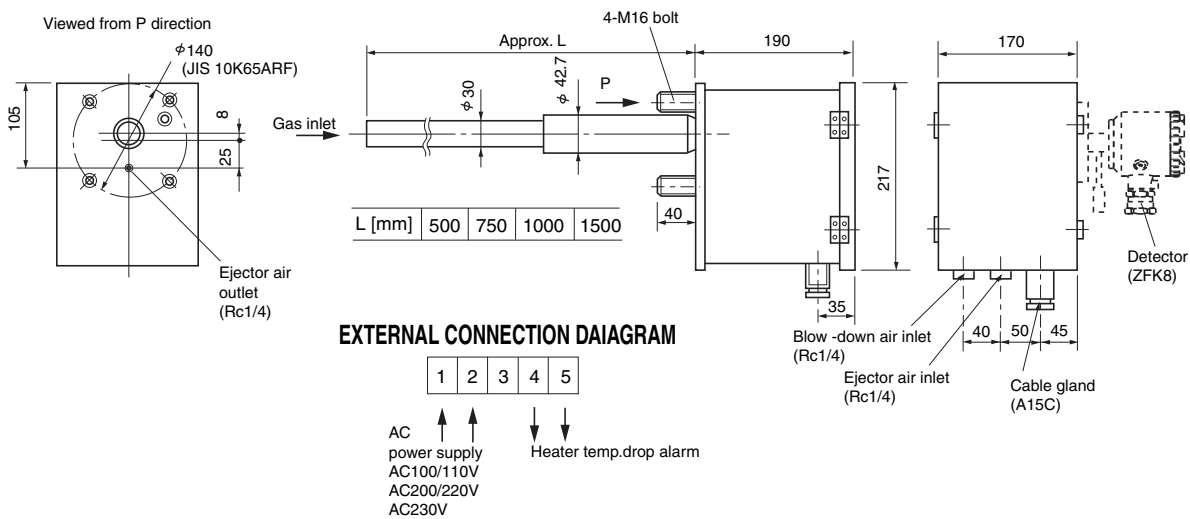
Z F K 8 R □ □ 5 - 6 E $\begin{matrix} 3 \\ 5 \\ 7 \\ 1 \end{matrix}$ □

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 (for corrosive gas)

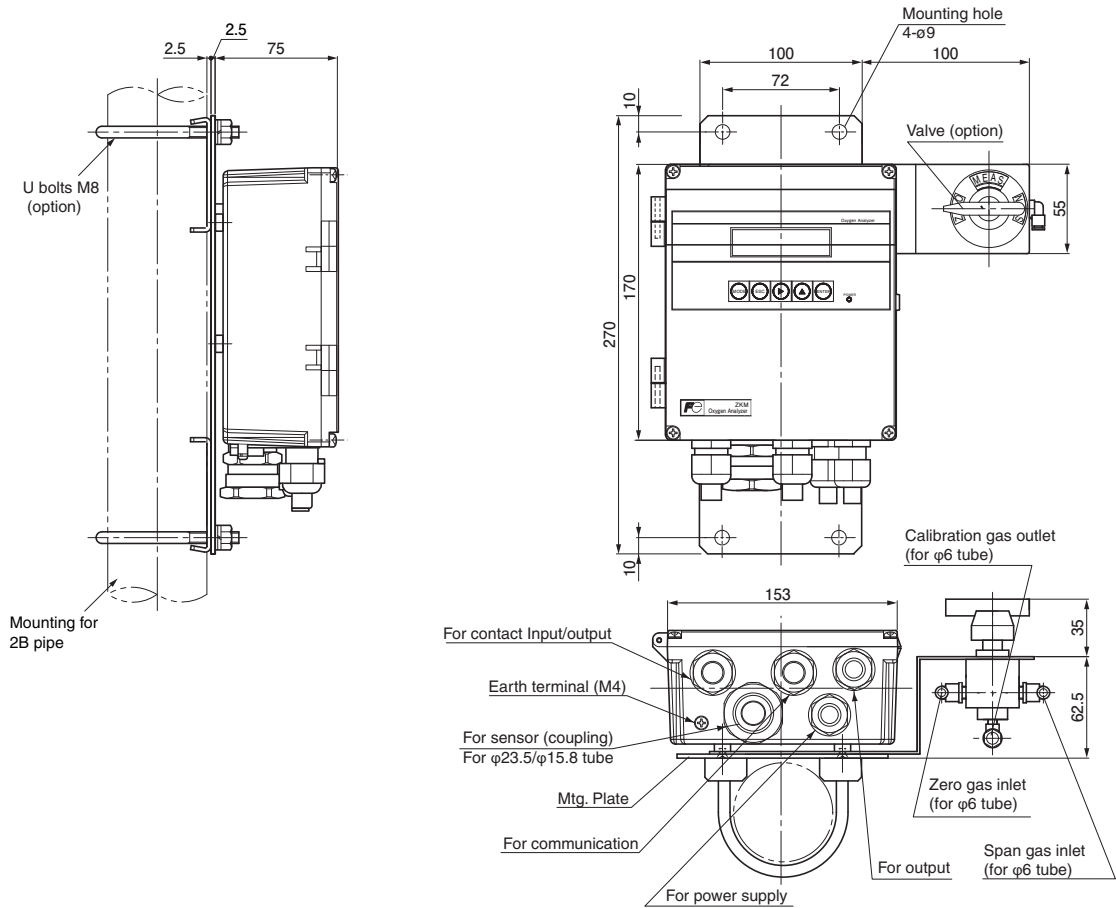


Ejector (ZTA)



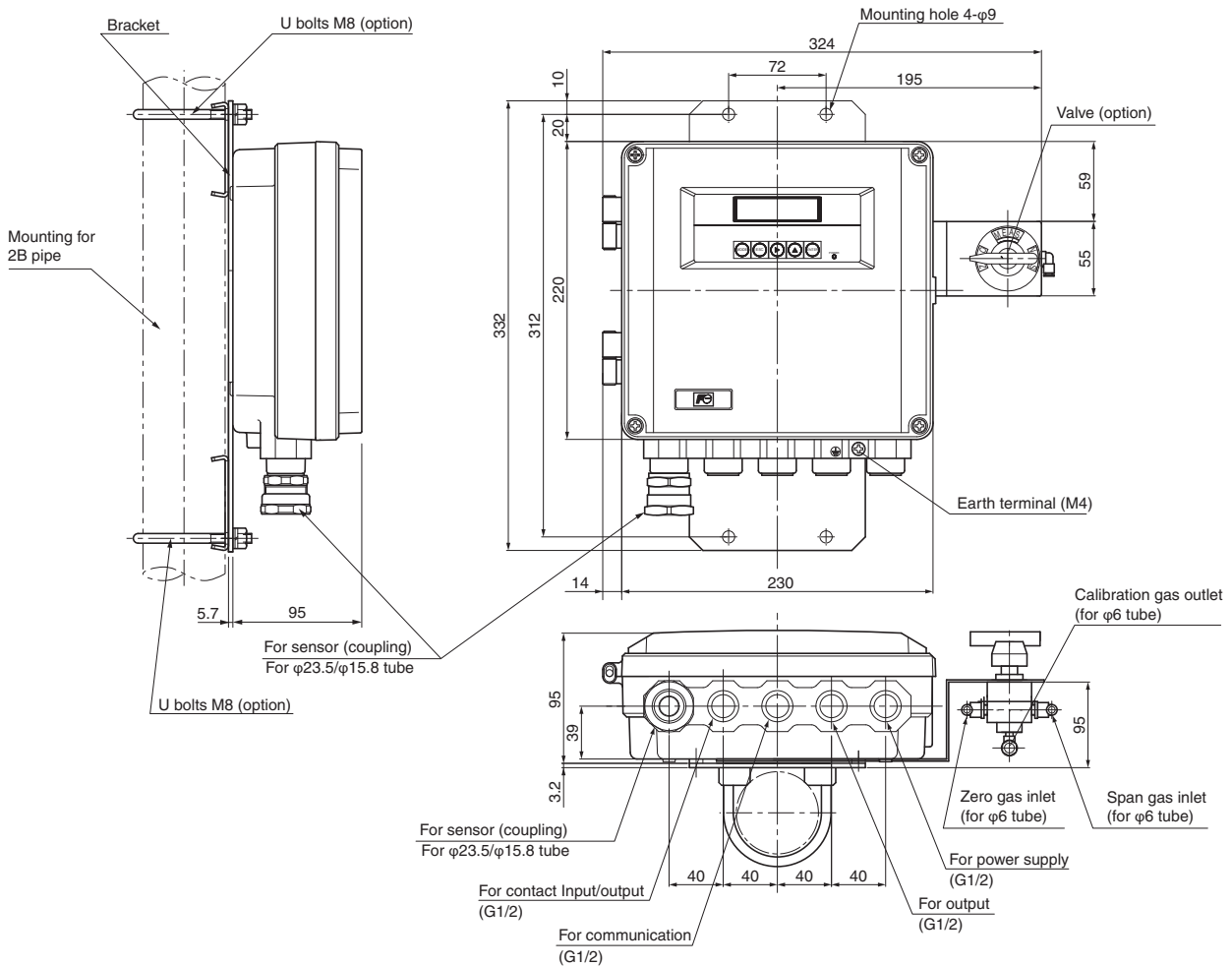
Converter (ZKM1)

<IP66>



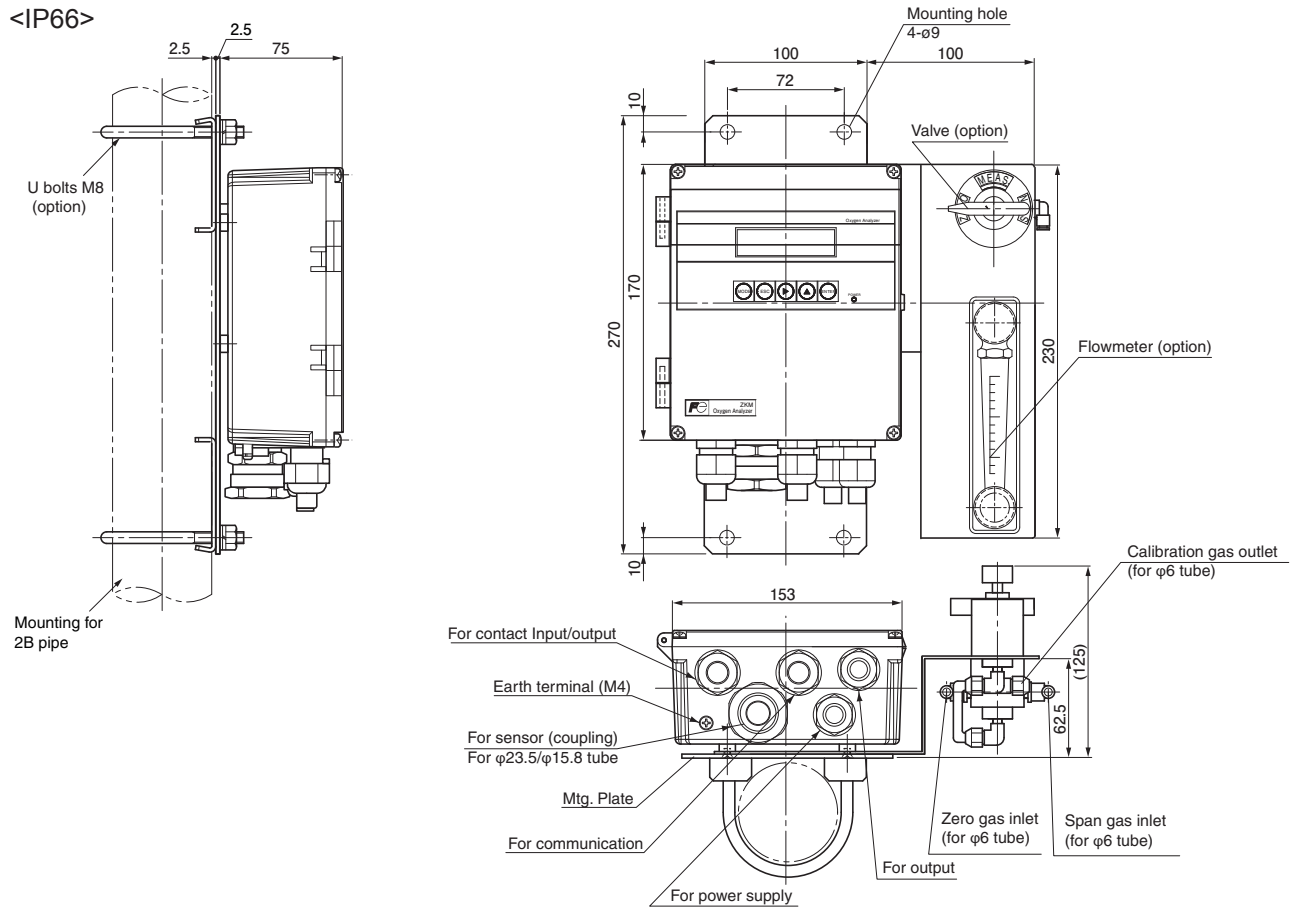
Converter (ZKM2)

<IP67>



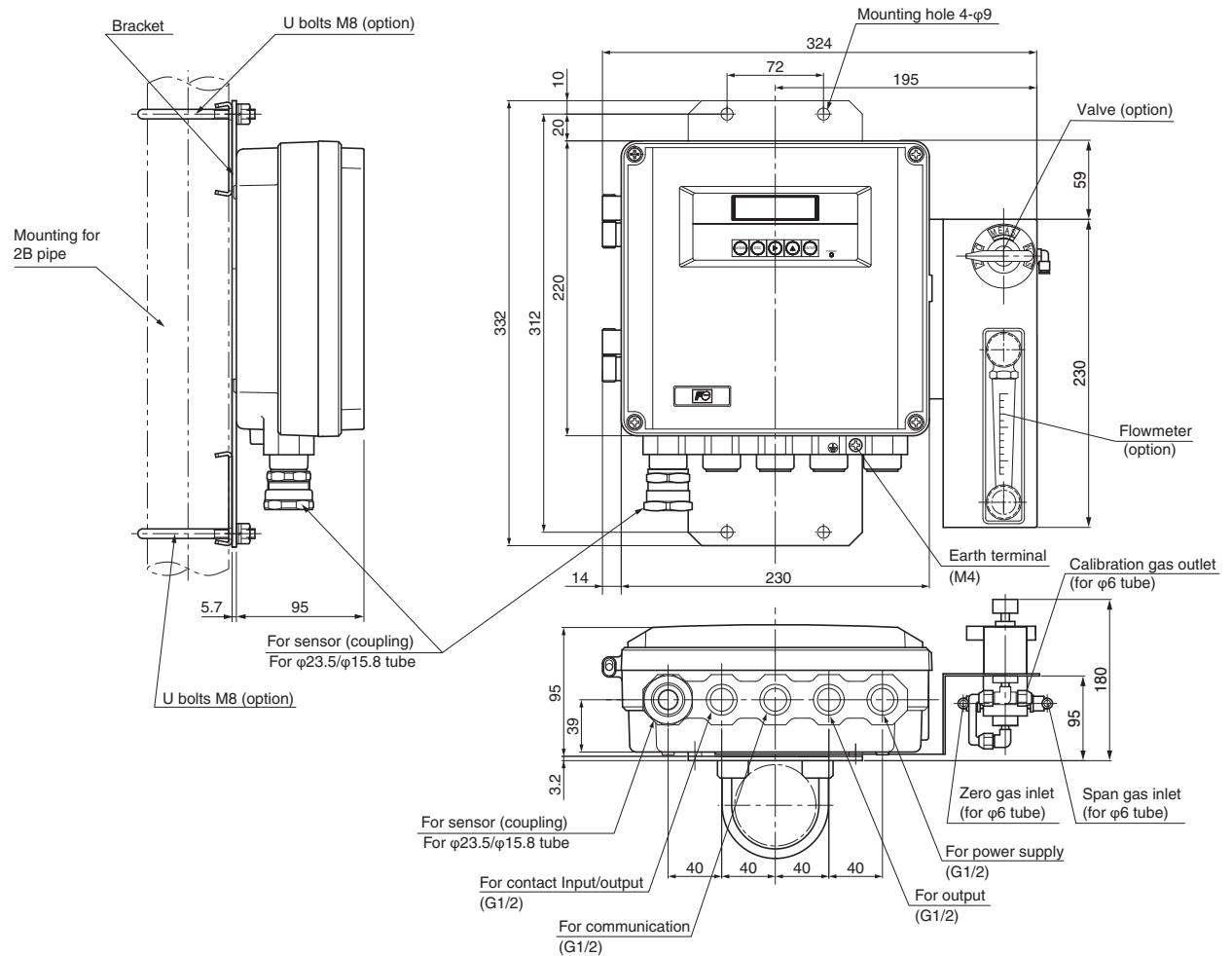
Converter (ZKM1)

<IP66>

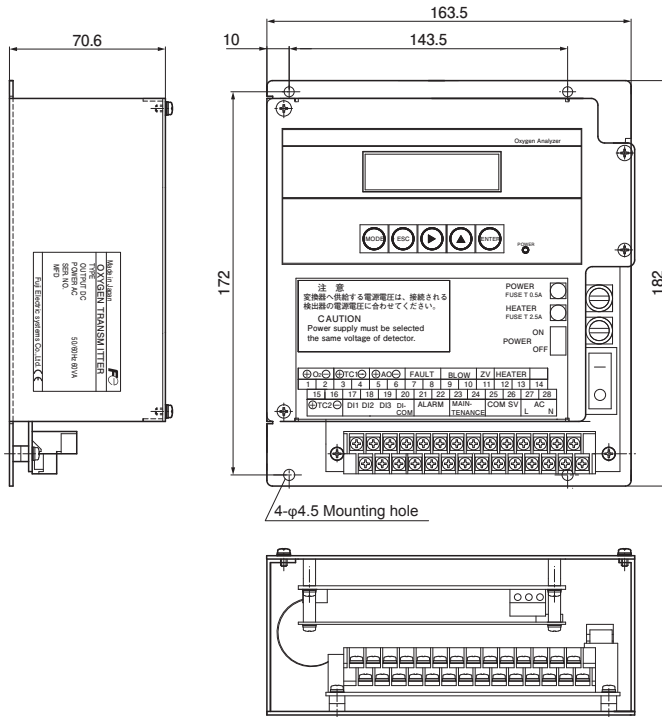


Converter (ZKM2)

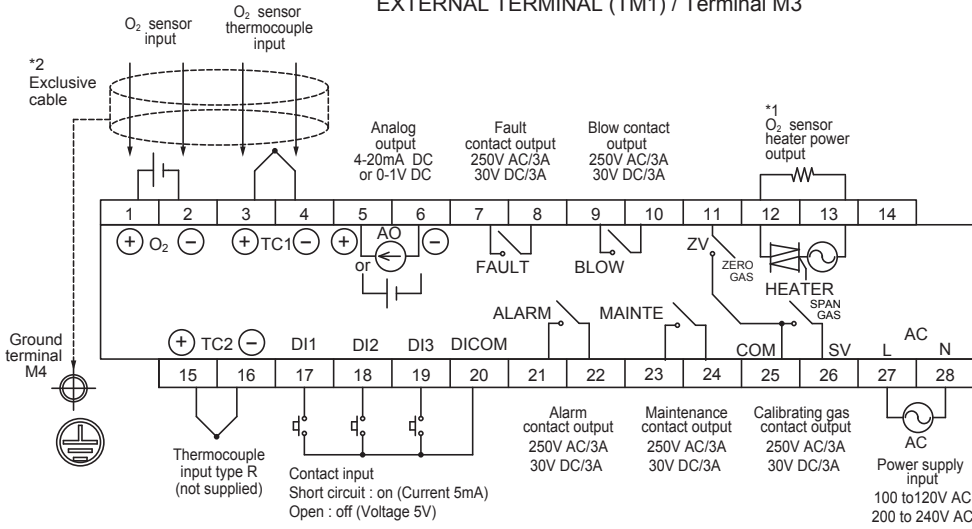
<IP67>



Converter (ZKM3)
<Bench type>



EXTERNAL TERMINAL (TM1) / Terminal M3



COMMUNICATION TERMINAL (TM2) / INSERTION TERMINAL

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

- Note 1) The heater power supply is the same as the converter power supply.
 Note 2) Be sure to connect the shield of the cable to the ground in the main body.

⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.



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