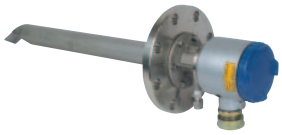
IN-SITU ZIRCONIA OXYGEN ANALYZER

DATA SHEET ZFK8, ZKM, ZTA

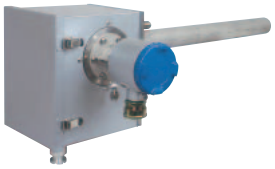
This oxygen analyzer is used to continuously measure oxygen concentration in combustion exhaust gas of industrial boilers or furnaces, and is ideally suited for combustion management and control.

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.



General-use detector (ZFK8)



High-temperature detector (ZTA)

<IP66> Converter (ZKM1)

<IP67> Converter (ZKM2)

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.

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% O_2
(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: More than 10 min

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

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 (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 +306mmH_2O)

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 (according to customer's specification)

Operating temperature:
−10 to +60°C for Primary detecting element
−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 valbe (as specified)

Reference air inlet (option):
ϕ6mm tube join or ϕ1/4-inch tube join (as specified)

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

Outer dimensions: (L × max. dia.) 210mm × 100mm (detector)

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 Mechanical 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) 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:
(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% 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 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. 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)

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TZ734575. The applicable standards used to demonstrate compliance are :

EN 55011 : 1992 CLASSA Conducted and Radiated emissions

EN 50082-1 : 1992 Radiated immunity, ESD and FBT

CODE SYMBOLS

(Detector)

4 5 6 7 8	9 10 11 12 13	14 15 16	Description
ZFK 8 R		5 - 1	
1			Cal. gas inlet For ϕ6mm tube (SUS)
2			For ϕ1/4 inch tube (SUS)
3			Ball valve
1			Power supply 100 to 120VAC 50/60Hz
3			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		With
	Y		Reference air inlet Non
	A		For ϕ6mm tube (SUS)
	B		For ϕ1/4 inch tube (SUS)
		1	Filter spec. Standard
		J	Instruction manual language Japanese
		E	English
		C	Chinese
		1	Specification name plate Standard (100 to 120V AC 50/60Hz)
		2	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)

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

Note4) 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 K R	1 -		
		Connectable devices	
K		For ZKM	
		Types	
R		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 (Note5)	6m
BB		10m (Note5)	10m
CC		15m (Note5)	15m
DD		20m (Note5)	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	
	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:

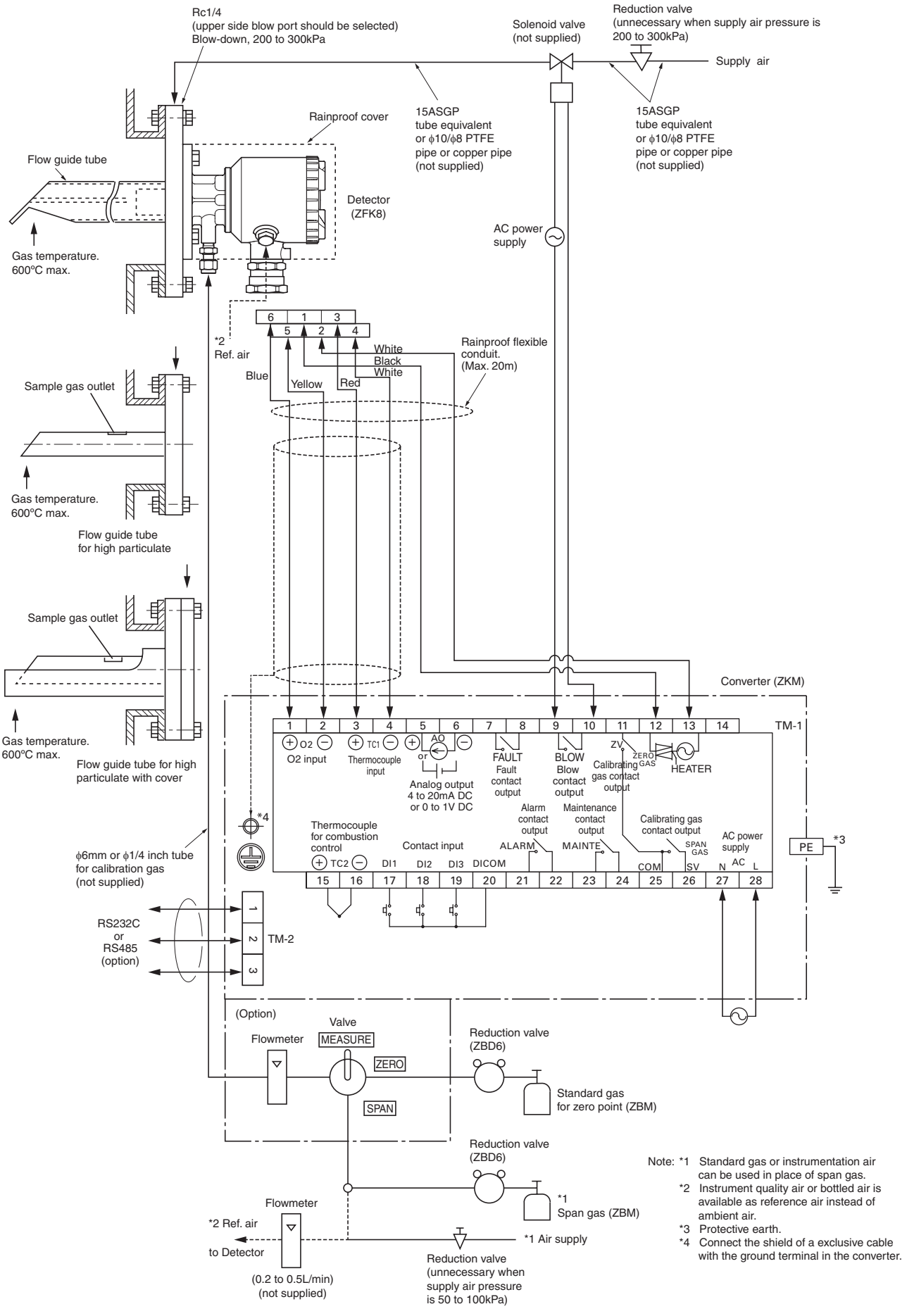
(1) Standard gas for calibration
Type ZBM□NSH4-01 (up to 5% O_2 range)
Type ZBM□NSJ4-01 (over 5% O_2 range)
(2) Reduction valve for standard gas (type ZBD61003)
(3) Flowmeter
Type; ZBD42203, 0.2 to 2L/min (for calibrating gas)
Type; ZBD42403, 1 to 10L/min (for ejector)

CAUTIONS

- If combustible gas (CO, H_2 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.

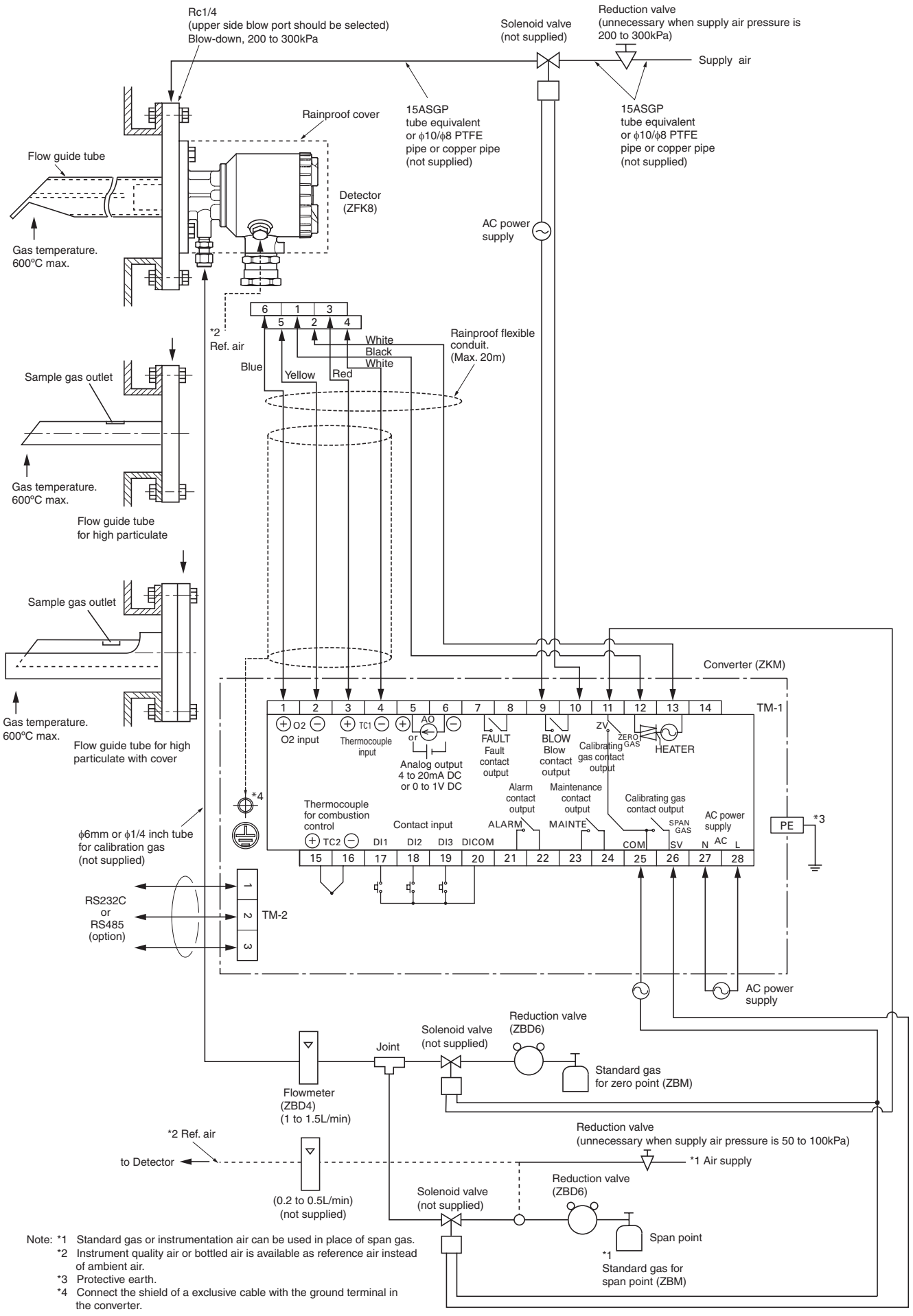
CONFIGURATION

Flow guide tube system (with valve)



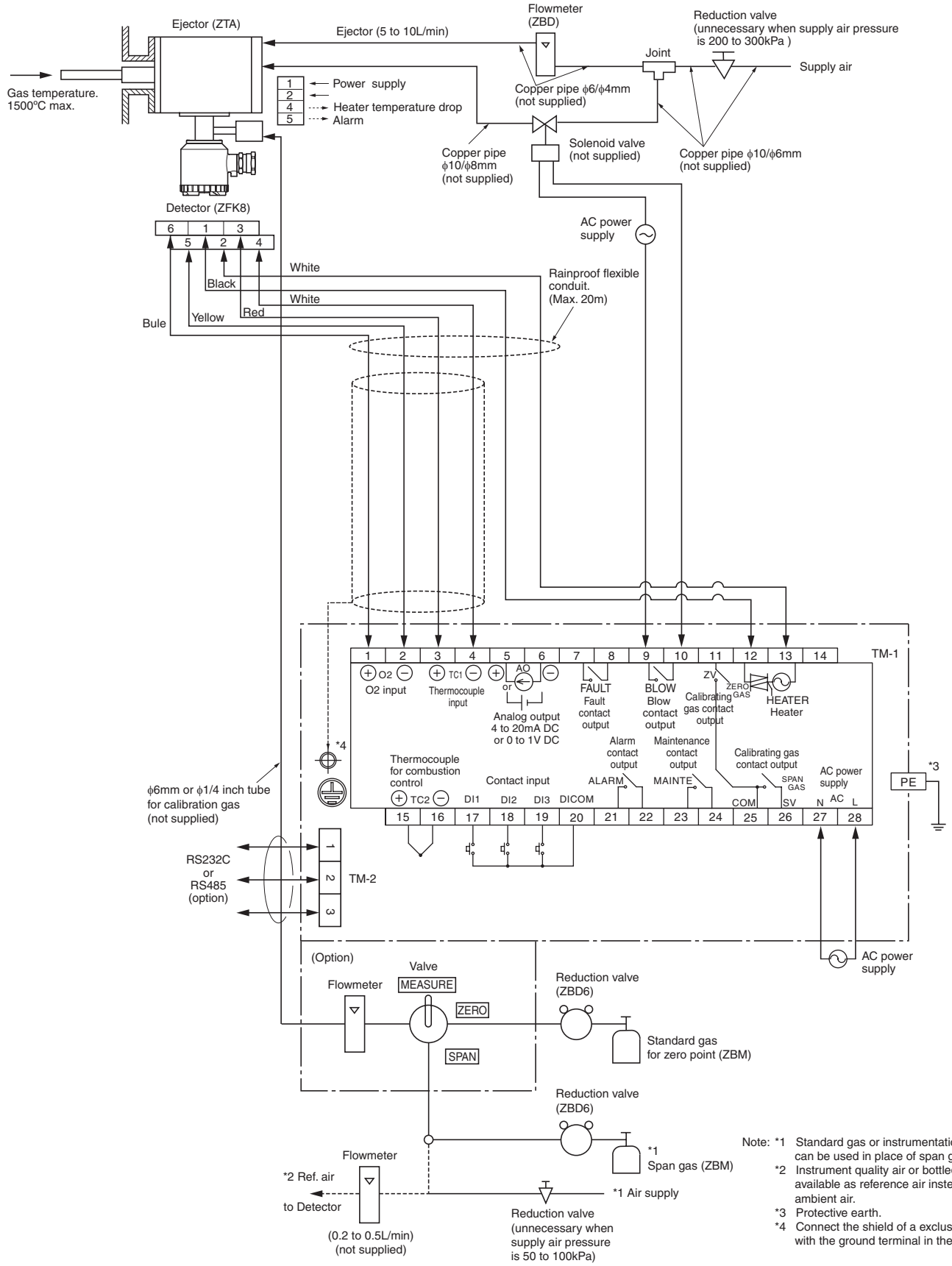
Note: *1 Standard gas or instrumentation air can be used in place of span gas.
*2 Instrument quality air or bottled air is available as reference air instead of ambient air.
*3 Protective earth.
*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

Flow guide tube system



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 air instead of ambient air.
*3 Protective earth.
*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

Ejector system (with valve)



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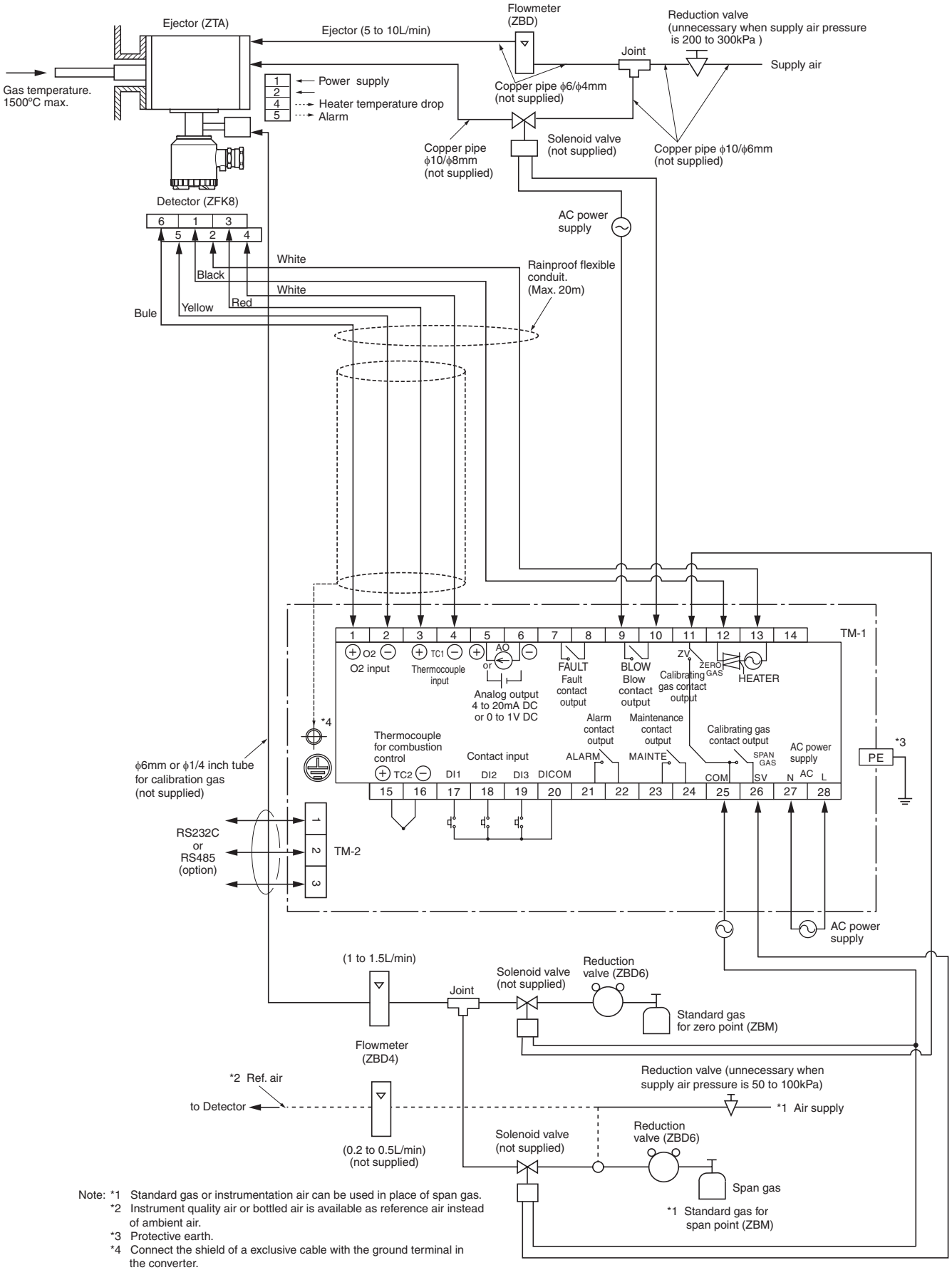
*2 Instrument quality air or bottled air is available as reference air instead of ambient air.
*3 Protective earth.
*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

Ejector 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 air instead of ambient air.
*3 Protective earth.
*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

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.

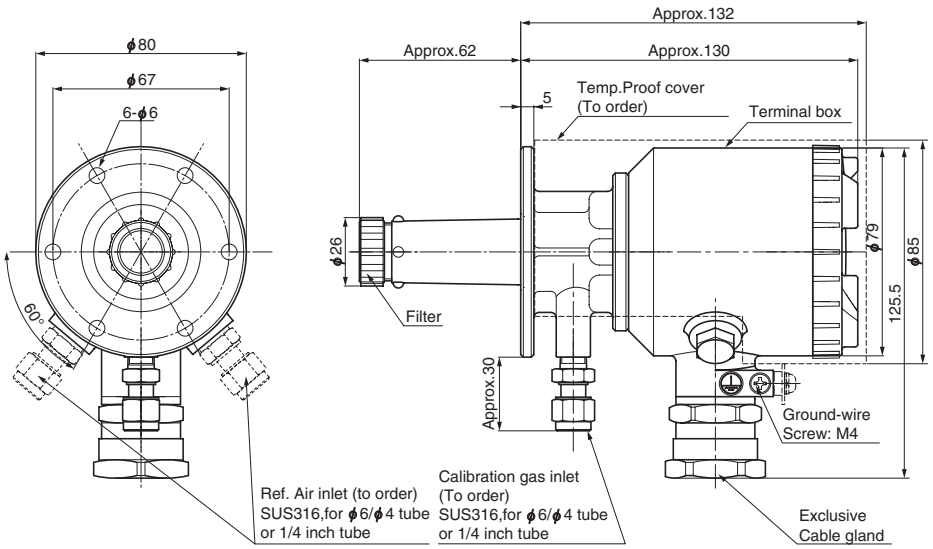
Measured gas						Device configuration		
Application	Temperature	Gas Flow	DUST	Protection cover	Note	Detector type	Converter type	Ejector type
General-use (boiler)	600°C or less	5 to 20m/s	Less than 0.2g/Nm^3	—	Fuel; gas, oil	ZFK8R□□5-□A5□□-1□	ZKM	—
			Less than 10g/Nm^3	—	Fuel: coal with blow down	ZFK8R□□5-□C5□□-1□	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.

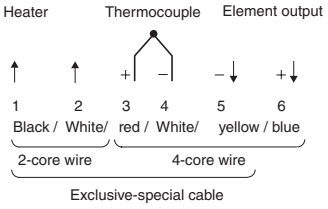
(2) Instrument quality air or bottled air is available as reference air by selecting detector with reference air inlet.

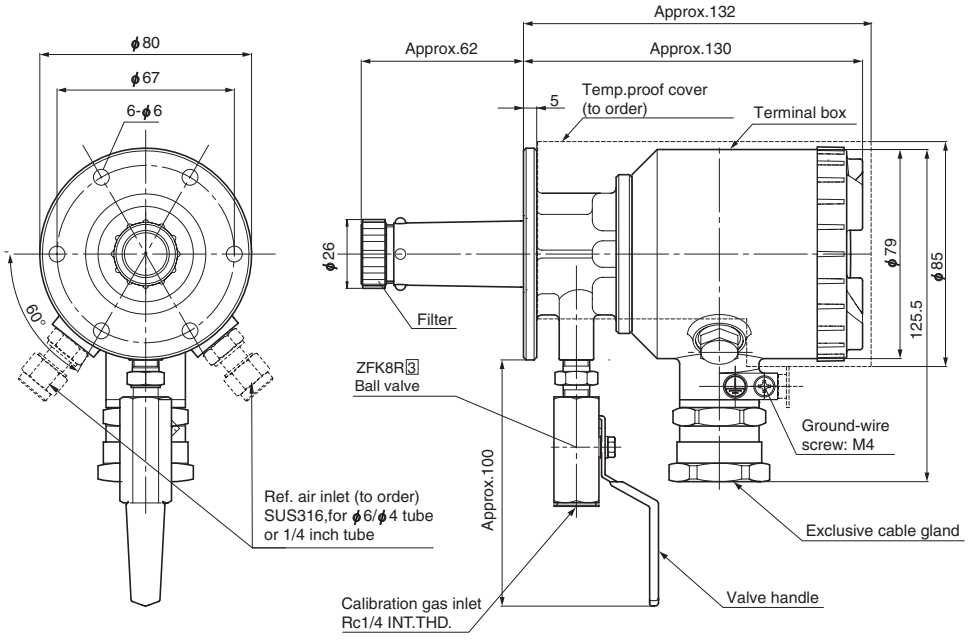
OUTLINE DIAGRAM (Unit:mm)

Detector (ZFK8)

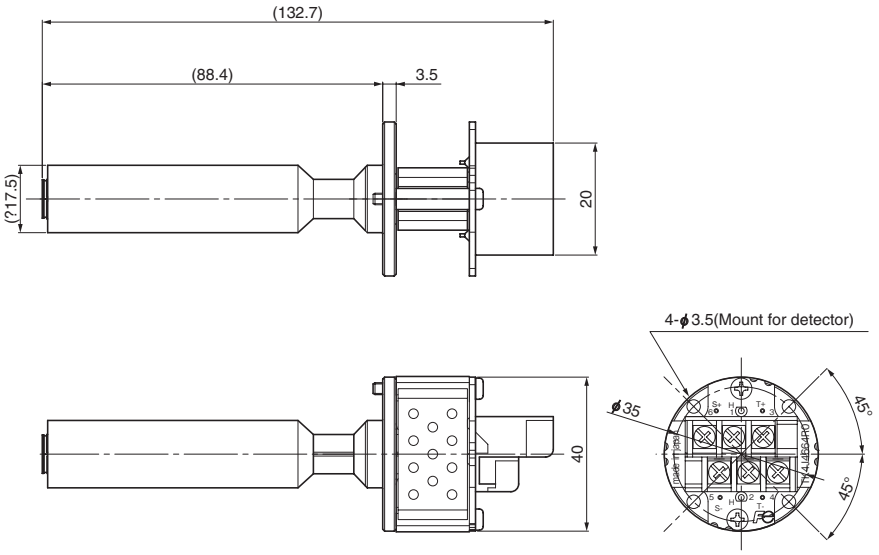


EXTERNAL CONNECTION DIAGRAM

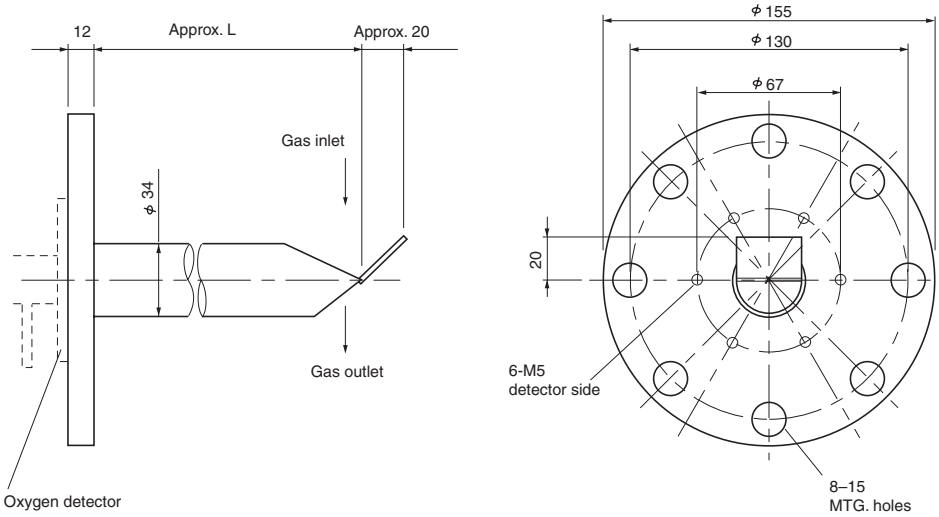




Sensor unit (ZFK8YY)



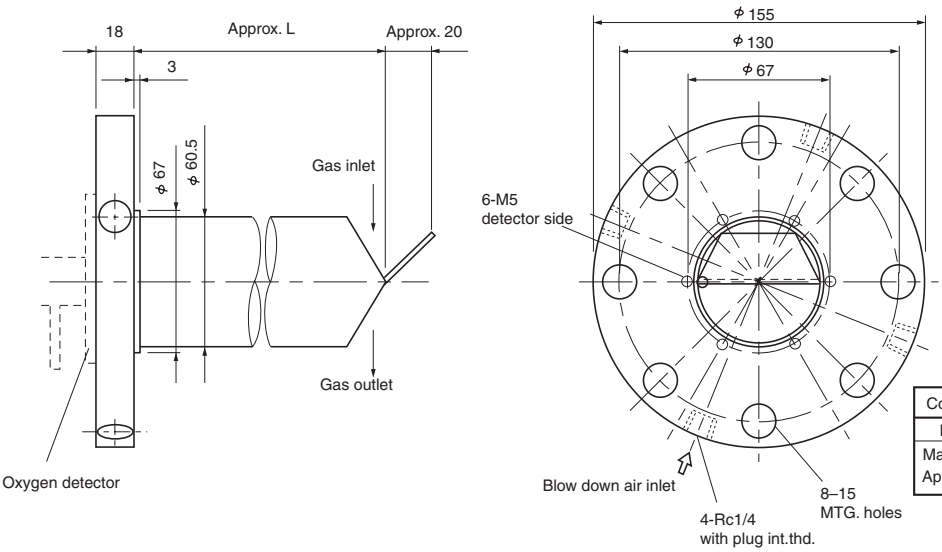
Flow guide tube



Z F K 8 R □ □ 5 - 5 A [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	

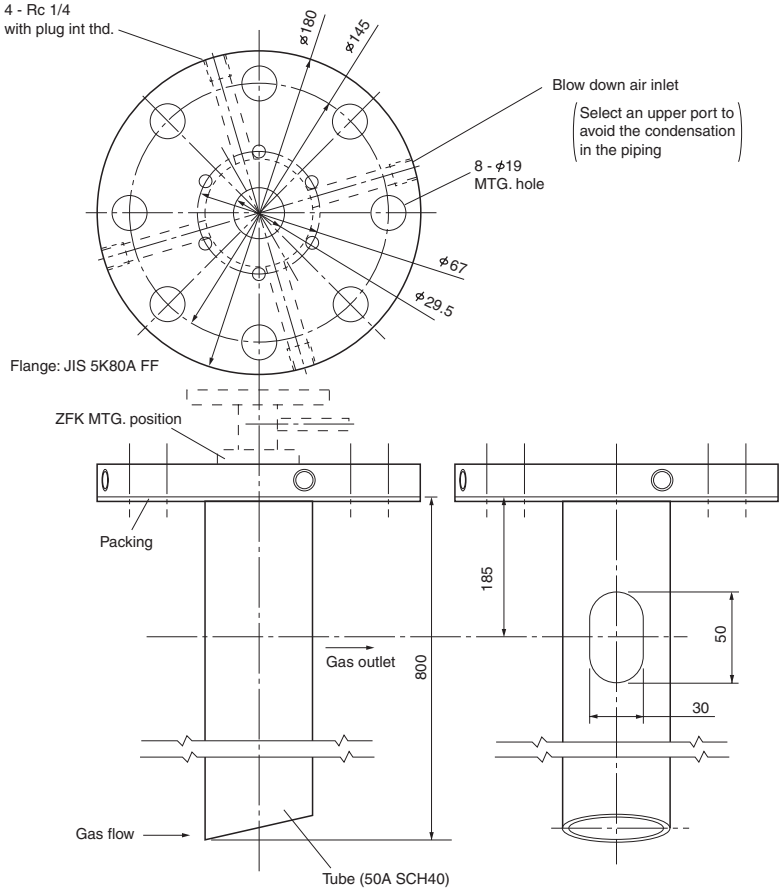
Flow guide tube (with blow-down nozzle)



Z F K 8 R □ □ 5 - 5 C [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	

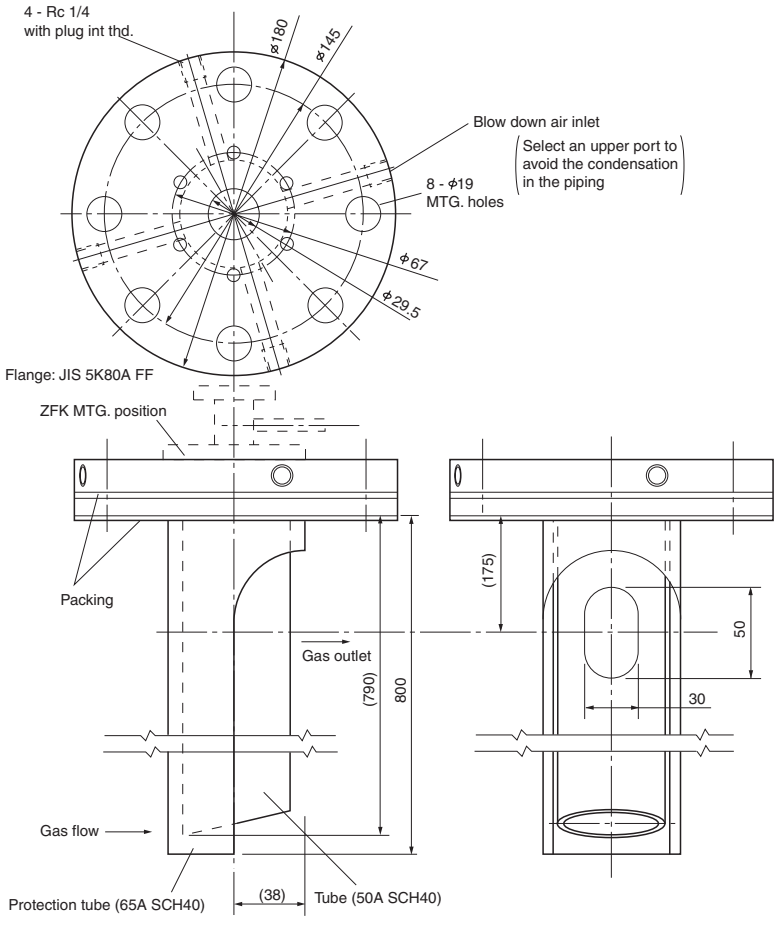
Flow guide tube (for high particulate)



Z F K 8 R□□5 - 6 D 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)	4.5	5.6	7.0	8.3	

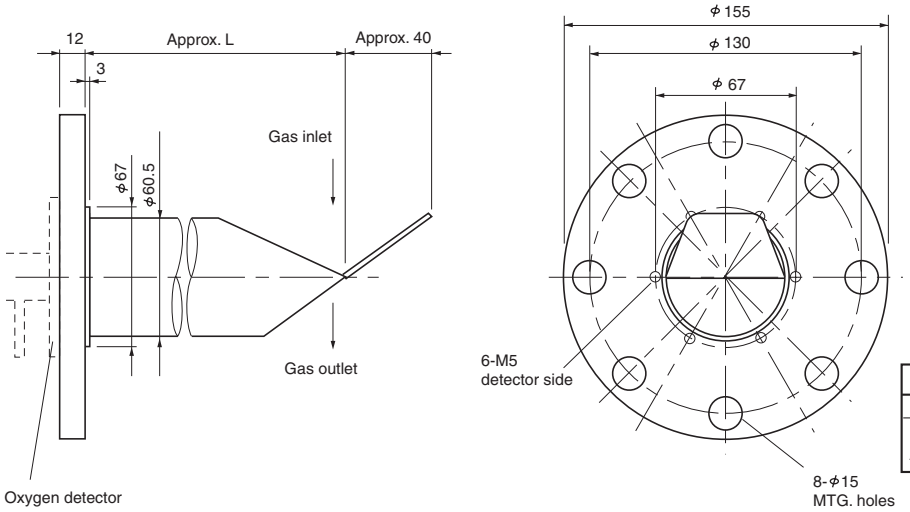
Flow guide tube (for high particulate with cover)



Z F K 8 R□□5 - 6 E 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)	7.1	9.0	11.4	13.6	

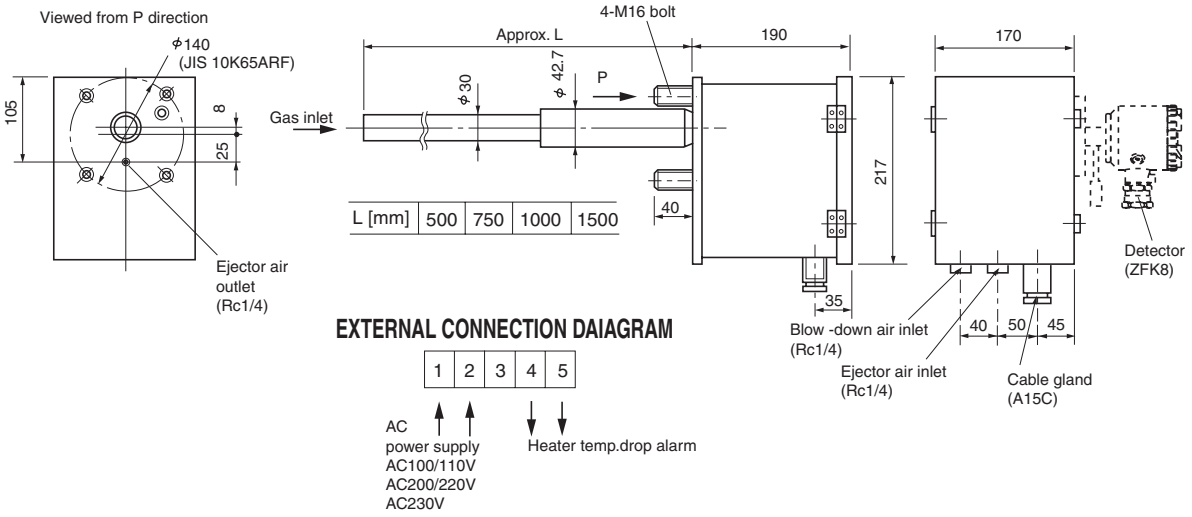
Flow guide tube (for corrosive gas)



Z F K 8 R□□5 - 5 B 3 □
5
7
1

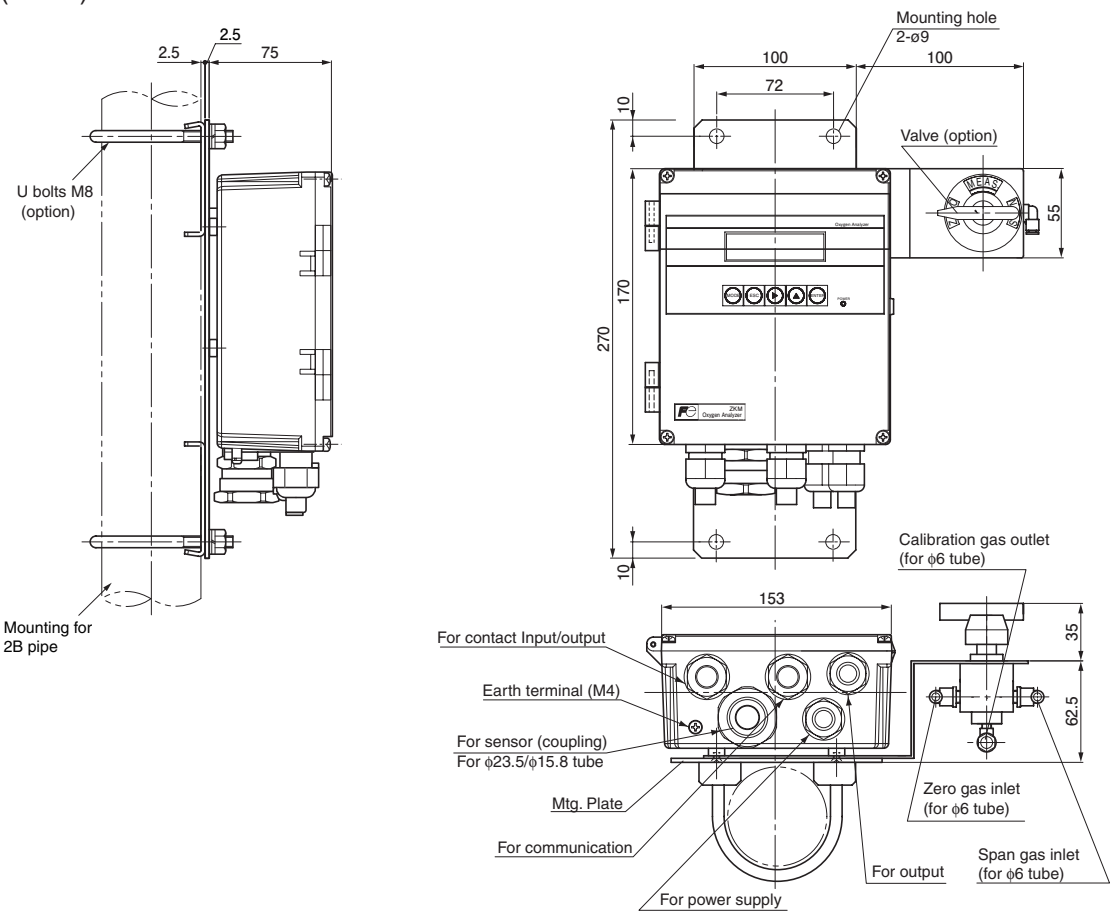
Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	L= (to order)
MASS Approx.(kg)	3.3	4.5	6.1	7.6	

Ejector (ZTA)



EXTERNAL CONNECTION DAIAGRAM

Converter (ZKM1)
<IP66>



Converter (ZKM2)
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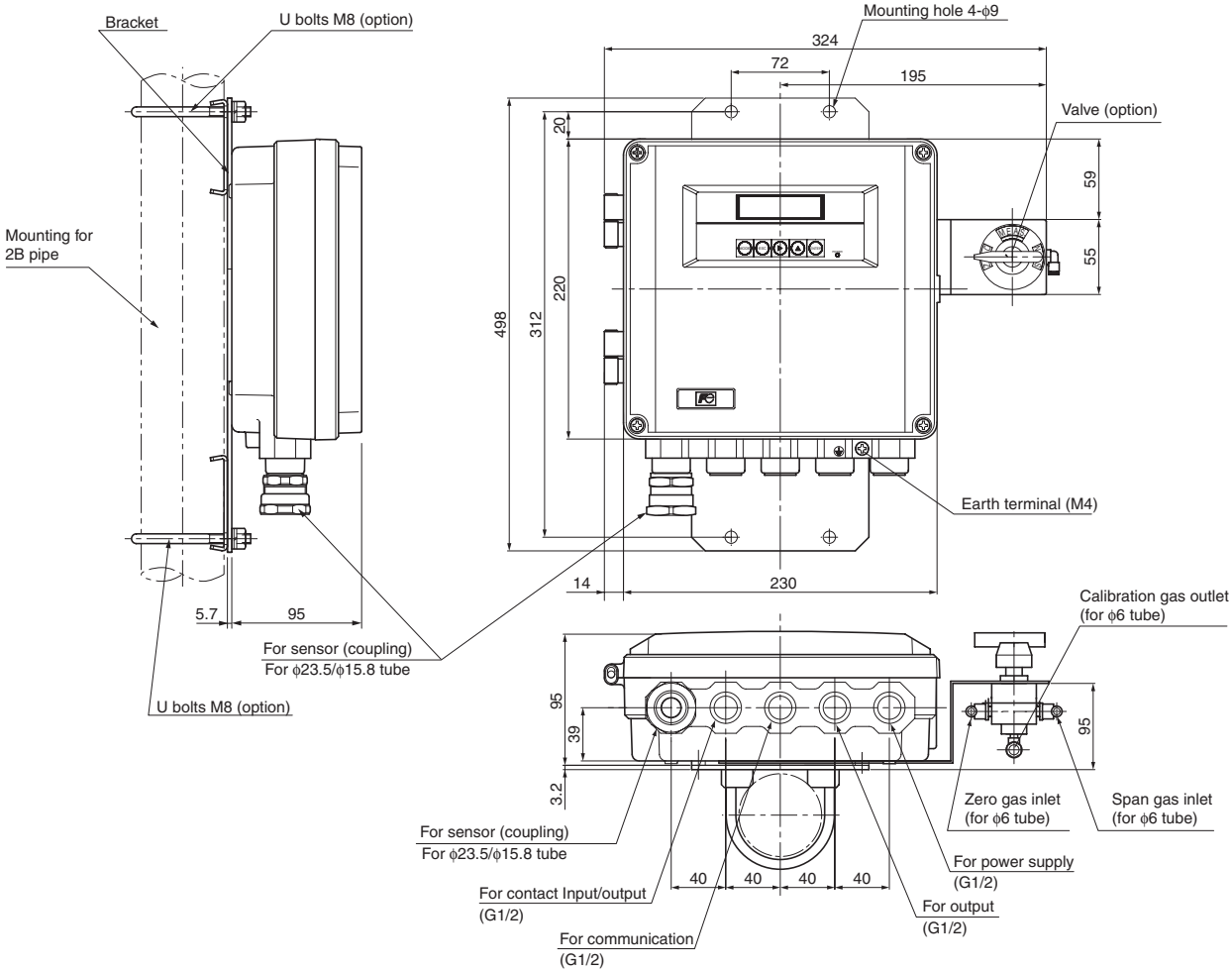

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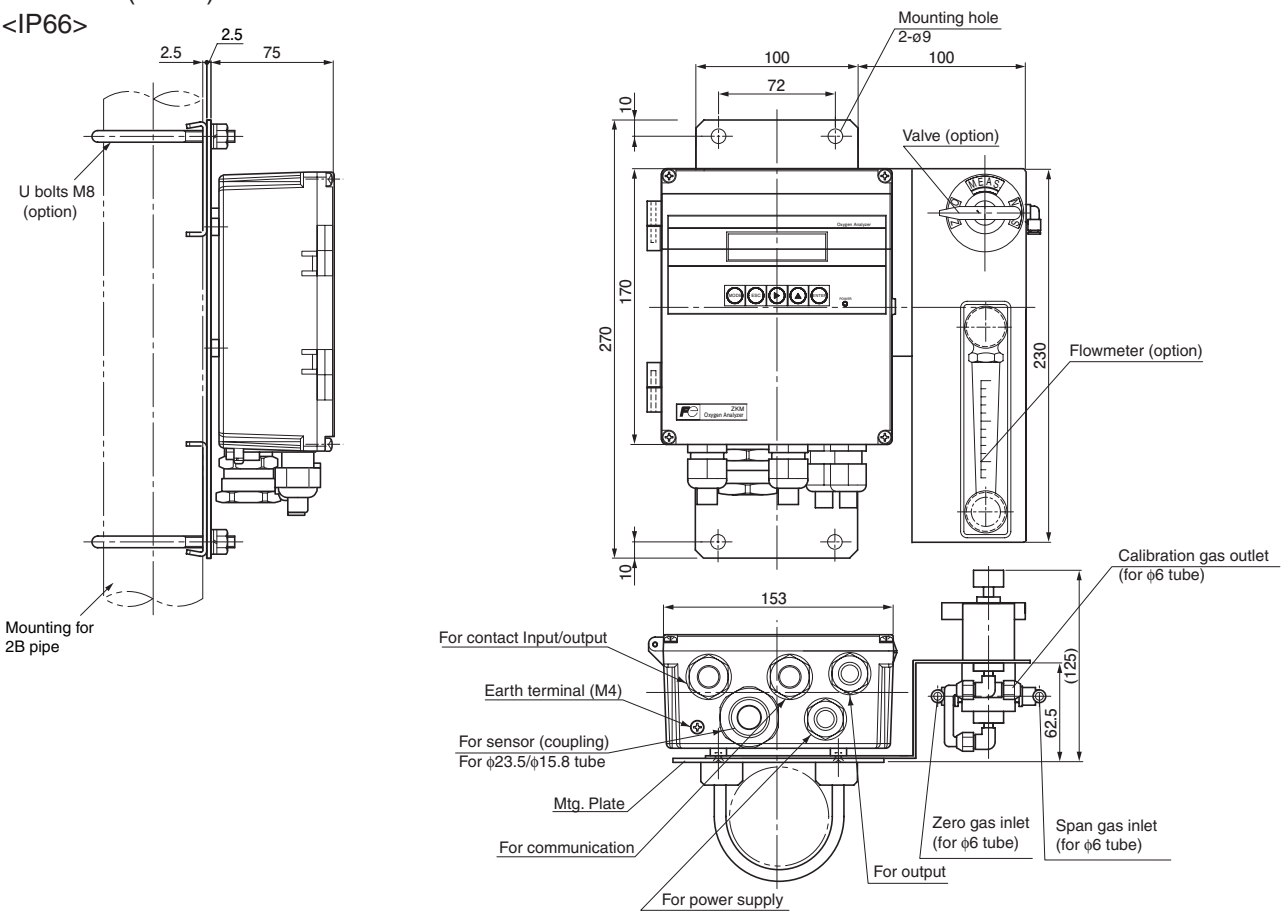

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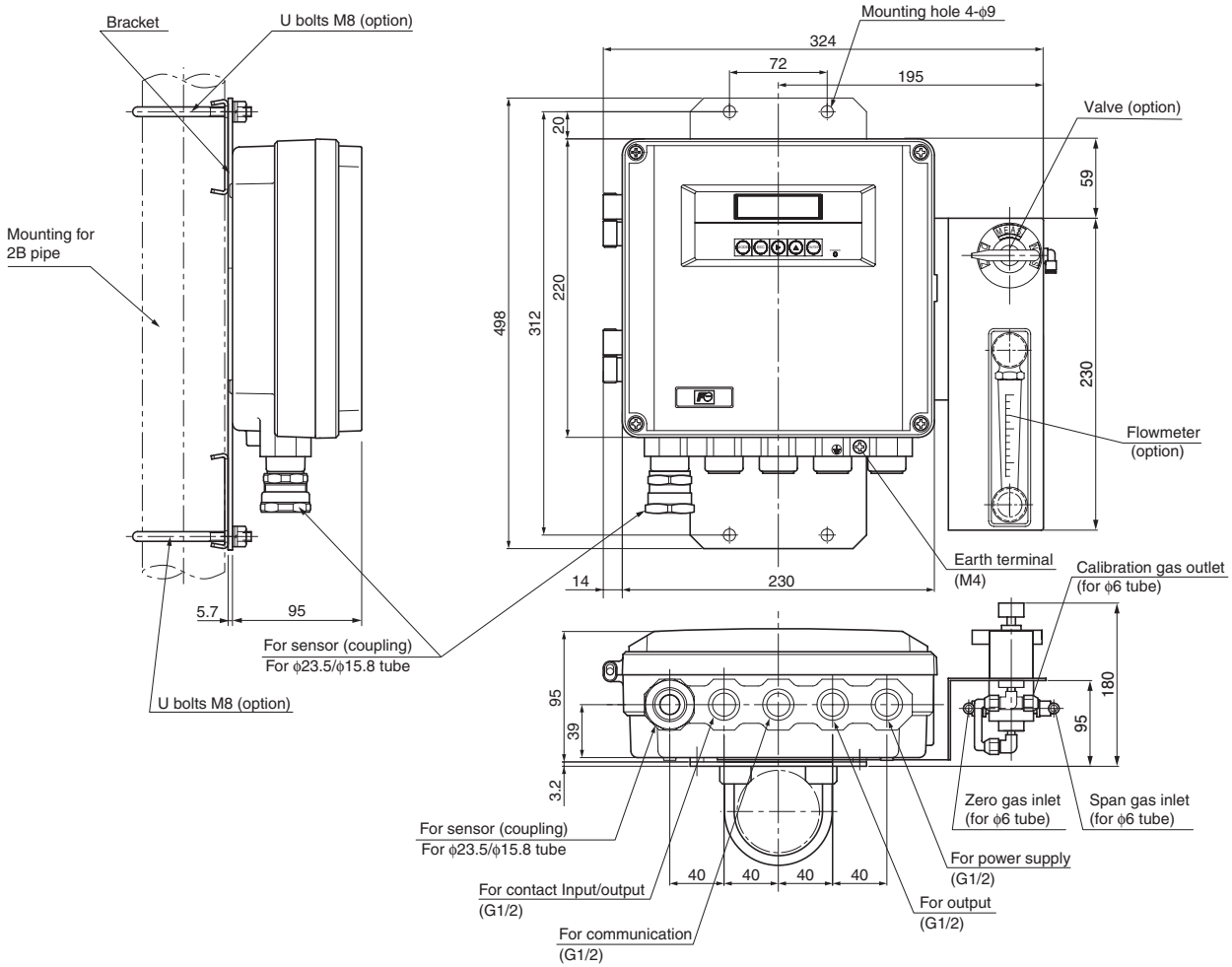
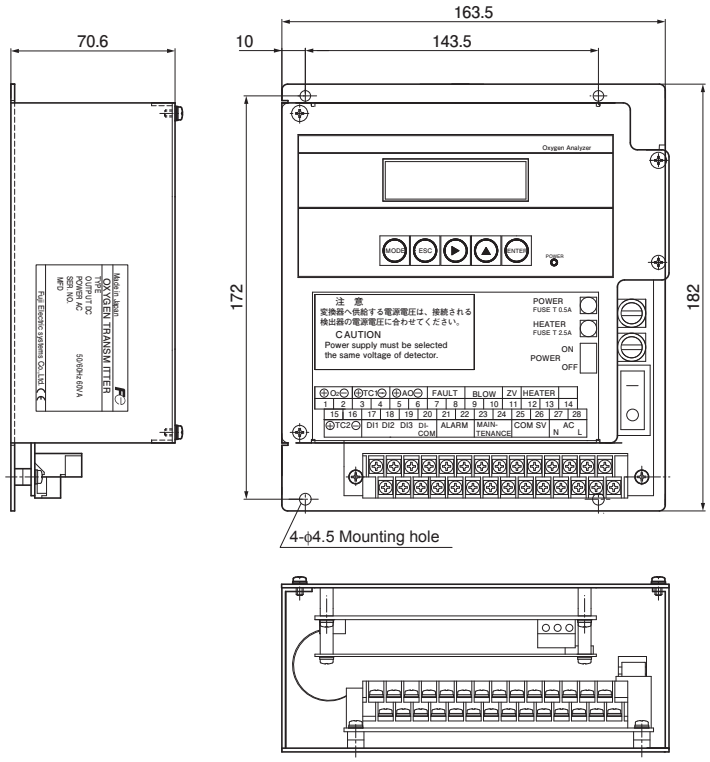
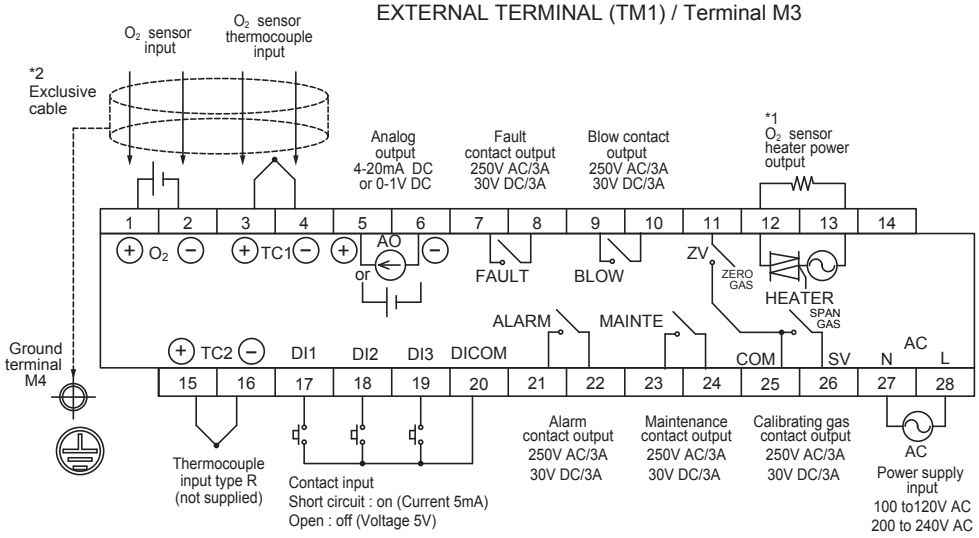


Converter (ZKM3)
<Bench type>



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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