e-Front runners

Fuji Instrumentation & Control

Fuji Electric's Direct Insertion Type

Zirconia Oxygen Gas Analyzers

<ZIRCOMAT-P/ZIRCOMAT-C>

Top class performance zirconia oxygen analyzer

〈ZIRCOMAT-C〉

〈ZIRCOMAT-P〉

〈Detctor〉

- No sampling device is required
- Compact and light weight design (because of separate flow guide tube design)
- Instrument equipped with indicator and transmitting function.
- Alarm and control functions available
- Economical cost
- Easy maintenance

Fuji Electric Systems Co., Ltd.

ECNO:336

Accurate O_2 Measurement is Essential for Energy Saving !

The oxygen analyzer consists of a compact zirconia detector that can be inserted directly in wall of the flowing sample gas. The detector measures the oxygen content in the flowing sample gas and transmits the signal to the converter. The converter will then trigger the ON-OFF alarm based on the preset oxygen concentration and give control signal to other devices. Fuji Electric's oxygen analyzer has a unique construction that eliminates the necessity of aspirating sampling gas or injecting air. And make it extremely suitable for monitoring and controlling combustion system like, heater boiler, kiln, melting furnace, low oxygen warehouse and food packing machine.

Excess air coefficient and energy loss ratio

Excess Air Coefficient	Exhaust Oxygen O_2 (%)	Energy Loss Ratio from Exhaust Gas (%)
1.1	1.9	9.4
1.2	3.5	10.3
1.3	4.8	11.1
1.4	6.0	12.0
1.6	7.9	13.7

(In the case of heavy oil combustion at exhaust gas temperature of 250°C and atmospheric temperature of 20°C)

Calculation of cost saving with improved combustion efficiency

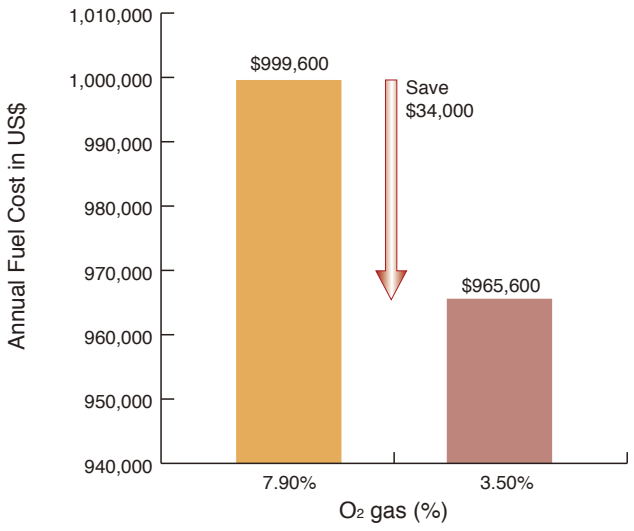
(The data may varies based on the construction and performance of the boilers)

Item	Case 1	Case 2
Evaporation rate from boiler	10 ton/hr	2 ton/hr
Annual operating hours	2,000hrs (8 hours × 250 day)	
Evaporation multiplier factor for boiler	12	
Improved value of excessive air coefficient	1.6 → 1.2 (O_2 gas from 7.9% → 3.5%)	
Kerosene price	US$ 0.6/kg (US$ 0.47/ℓ, SG 0.45)	
Kerosene consumption rate	10,000kg/hr ÷ 12 = 833kg/hr	2,000kg/hr ÷ 12 = 167kg/hr
Annual saving through the improved combustion efficiency	833kg/hr x US$ 0.6/kg x (13.7 – 10.3) % x 2,000hrs = US$ 34, 000	167kg/hr x US$ 0.6/kg x (13.7 – 10.3) % x 2,000hrs = US$ 6,800

Note: The data shown in the above table are calculated on an assumption of improvement of energy loss = full reduction ratio, therefore the combustion efficiency of the boiler must be taken into account for calculating fuel reduction rate accurately. Fuel reduction ratio will therefore be least several percent higher in actuality.

Case 1

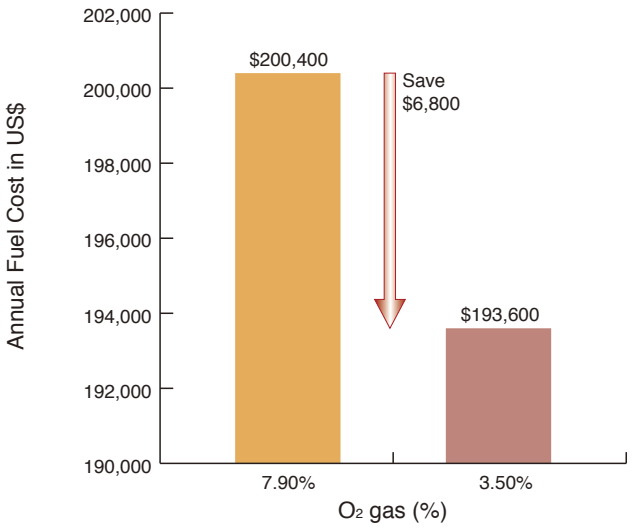
Package boirer of 10 ton/hr



Annual saving of US $ 34,000

Case 2

Package boiler of 2 ton/hr



Annual saving of US $ 6,800

Production rate of NOx can be reduced by lower O_2 combustion. And reducing the amount of combustion air can reduce the power cost.

Advantages:

1 No sampling device is required

The instrument requires no gas aspirating pump or ejector for normal measurements therefore it can be operated easily. It can be used very conveniently like traditional thermocouple.

2 Compact and light weight design (becouse of separate flow guide tube design)

The detector and converter weigh about 1.6kg and 3.5kg respectively.

3 Instrument equipped with indicator and transmitting function.

The converter is equipped with an indicator that permits direct readout of the oxygen concentration, transmitting output function or RS485 communication.

4 Alarm and control functions available

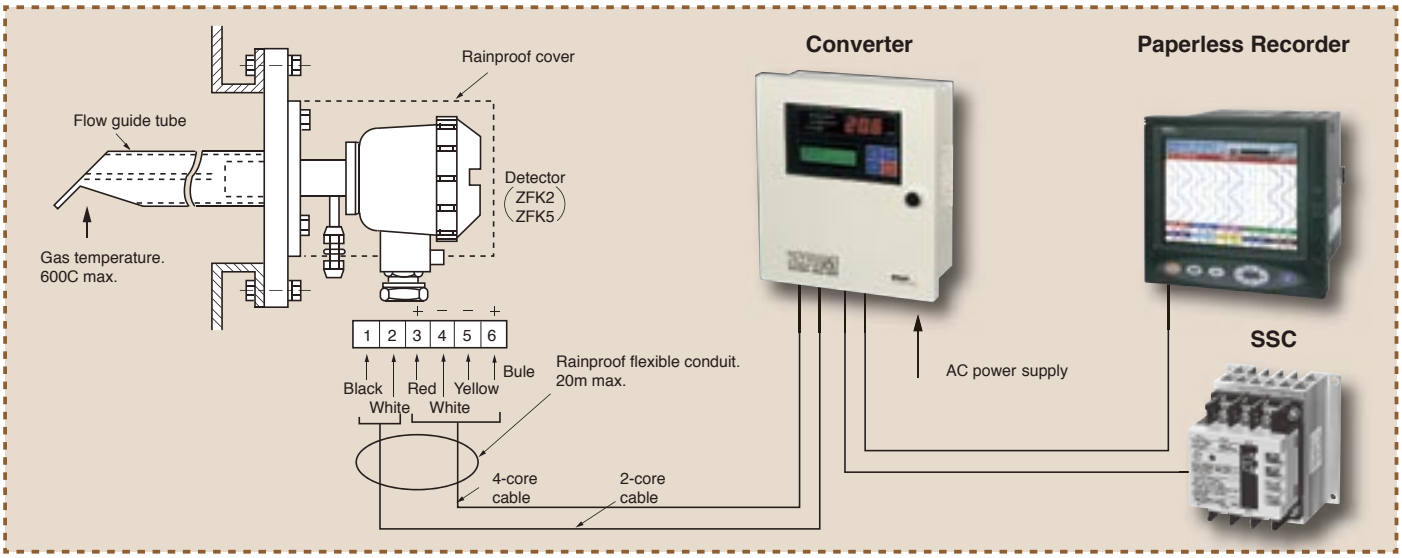
Though it is compact and lightweight in design, the converter consists of an oxygen concentration setting mechanism as well as alarm setting and control circuits that can transmit control signals.

5 Economical cost

Comparing Zircomat-C with other conventional oxygen analyzers, it is much more economical in cost.

6 Easy maintenance

Zircomat assures easier maintenance comparing to other conventional oxygen analyzers because the detector only can be removed and replaced.
It can be also used under severe site conditions for a long time.



Specification

Type		ZIRCOMAT-P	ZIRCOMAT-C
Measuring range		0 to 2 ~ 50%	0 to 5, 15, 25%
Repeatability		±0.5% FS	±1.0% FS
Linearity		±2.0% FS	
Response time		Less than 7 seconds	
Power supply		100, 115, 220 or 230V AC, 50/60Hz	
Power consumption		15 + 50A	
Warm up time		15 minutes	
Detector	Model code	ZFK	
	Type	Direct insertion type zirconia detector	
	Application Gas temperature	–20 to +600°C/1590°C	–20 to +600°C
	Sample gas pressure	–3 to +3 kPa (–306 to +306mmH_2O)	
	Ambient temperature	–20 to +60°C	
	Structure	IEC IP55	
	Weight	1.6Kg	
Converter	Model code	ZRM (Zircomat-P)	ZRY (Zircomat-C)
	Output signal	4 to 20mA or 0 to 1V DC	4 to 20 mA
	Indication oxygen concentration	3 digit LED	
	Indication operation/setting	16 digit 2 line LCD	None
	Mode display	03 x LED	None
	Mounting	Panel or Pipe mounting	Panel mounting
	Structure	IEC IP53	IEC IP65
	Weight	3.5kg	4.5kg
	Optional function	RS-485 communication	NA
		Auto calibration	NA
		Blow down system	NA
		Combustion efficiency display	NA

Standard air ratio by Energy Economy Law in Japan for conservation of energy

Based on Article 4, Clause 1 of the Japanese law regarding rational use of energy (Law No. 49 published in 1979), judging standard for enterprisers at factories (Notification No. 467 of the Ministry of Commerce and Industry, dated October 1979) has been amended on Junuary 10, 2003 (Notification No. 4 of the Ministry of Economy, Trade and Industry) to specify standard air ratio.

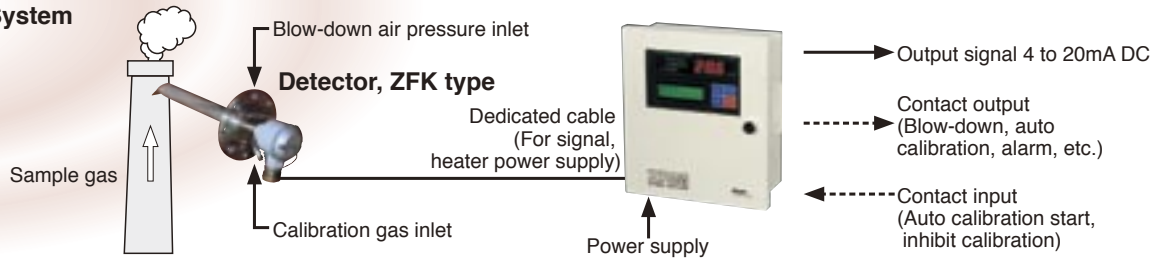
1. Boilers

Classification		Load Ratio (%)	Standard air ratio				
			Solid Fuel		Liquid Fuel	Gaseous Fuel	Blast Furnace gas
			Fixed bed	Fluidized bed			
For electrical enterprise		75 to 100	–	–	1.05 to 1.2	1.05 to 1.1	1.2
Others	Evaporation rate exceeding 30 ton/hr	50 to 100	1.3 to 1.45	1.2 to 1.45	1.1 to 1.25	1.1 to 1.2	1.2 to 1.3
	Evaporation rate from 10 to 30 ton/hr	50 to 100	1.3 to 1.45	1.2 to 1.45	1.15 to 1.3	1.15 to 1.3	–
	Evaporation rate from 5 to 10 ton/hr	50 to 100	–	–	1.2 to 1.3	1.2 to 1.3	–
	Evaporation rate not exceeding 5 ton/hr	50 to 100	–	–	1.2 to 1.3	1.2 to 1.3	–

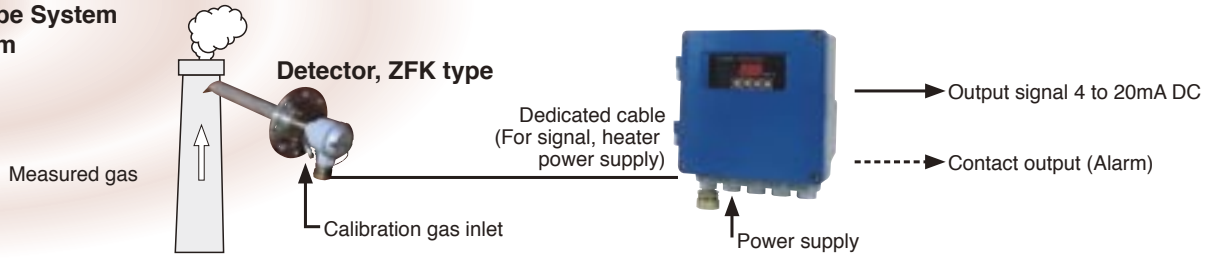
2. Industrial Furnaces

Classification	Standard air ratio			
	Gaseous fuel		Liquid fuel	
	Continuous	Intermittent	Continuous	Intermittent
Metal melting furnace	1.25	1.35	1.3	1.4
Continuous steel heating furnace	1.2	–	1.25	–
Metal heating furnace not continuous steel heating type	1.25	1.35	1.25	1.35
Metal thermal treatment furnace	1.2	1.25	1.25	1.3
Oil heating furnace	1.2	–	1.25	–
Pyrolytic furnace and modification furnace	1.2	–	1.25	–
Cement kiln	1.3	–	1.3	–
Alumina Kiln and lime kiln	1.3	1.35	1.3	1.35
Dry kiln	1.25	1.45	1.3	1.5

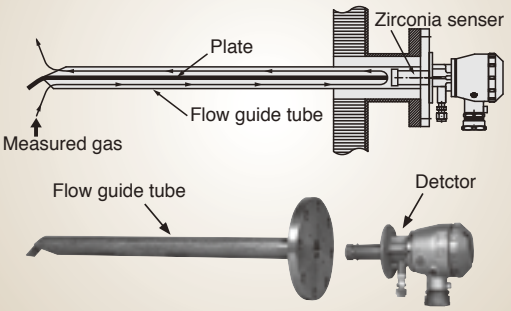
ZRM-type System Diagram



ZRY-type System Diagram



A Flow guide tube skillfully utilizing the flow of the measured gas assures fast respones.



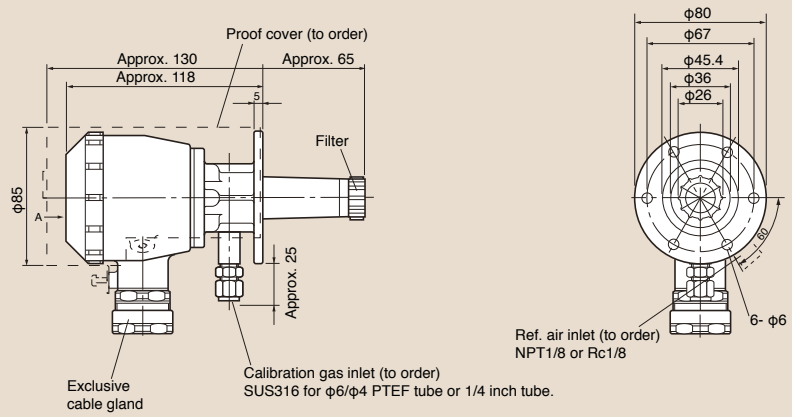
Detectors applicable for various fields

Standard type

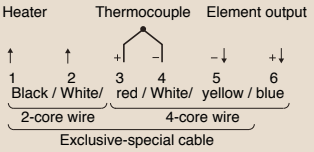
800 to 1500°C:
with ejector

OUTLINE DIAGRAM (Unit:mm)

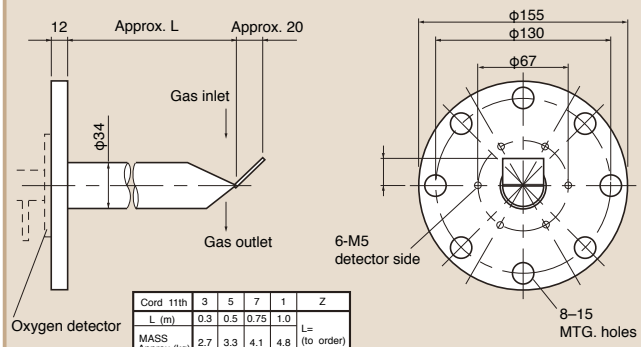
Detector (ZFK2)



EXTERNAL CONNECTION DIAGRAM

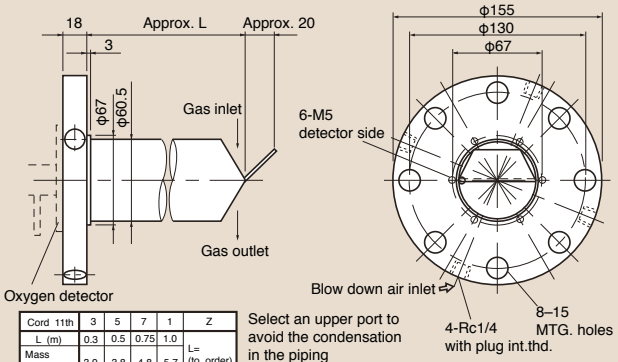


Flow guide tube



Cord 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	

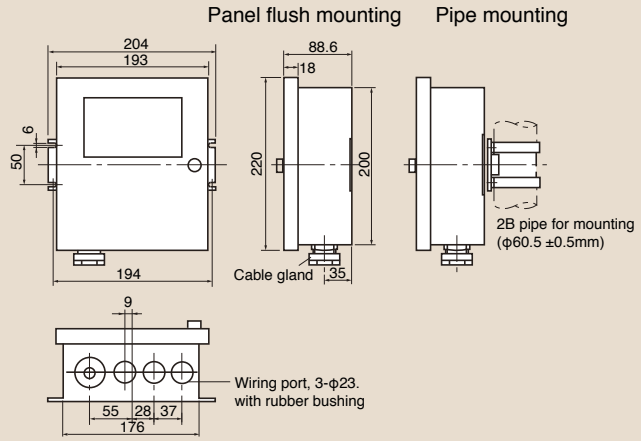
Flow guide tube (with blow-down nozzle)



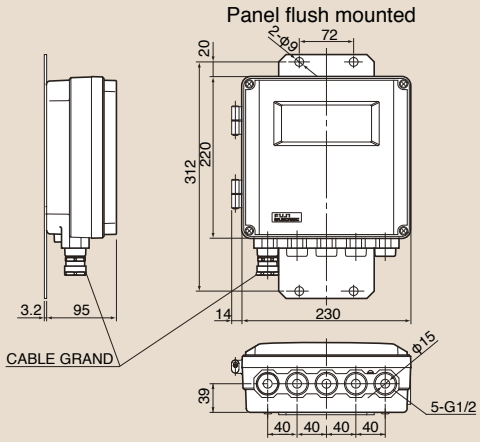
Cord 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	L= (to order)
Mass Approx.(kg)	3.0	3.8	4.8	5.7	

Select an upper port to avoid the condensation in the piping

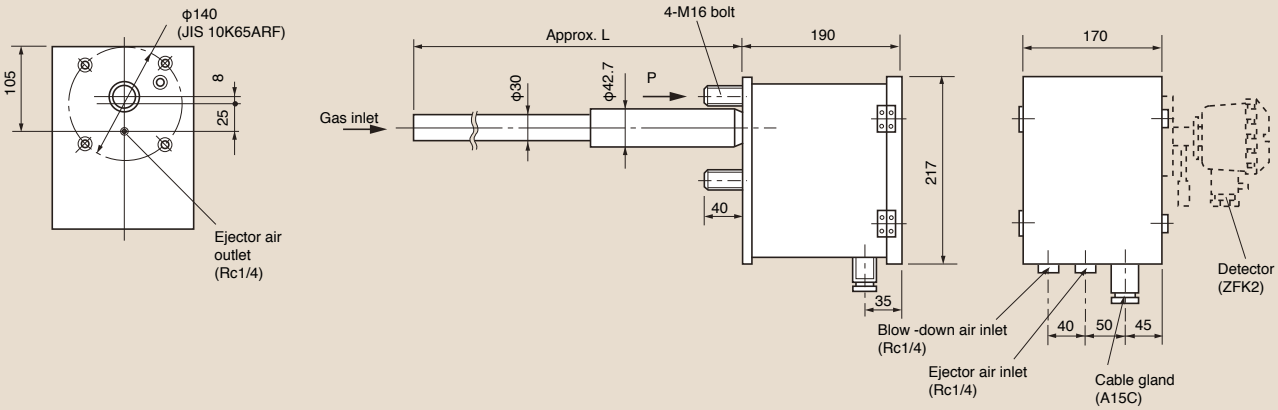
Converter (ZRM)



Converter (ZRY)



Ejector (ZTA)



CODE SYMBOLS

(Detector)

ZFK 4 5 6 7 8 9 10 11 12 13 14 4

	Description
	Application
2	General use
5	For corrosive gas (refuse incinerator)
	Kinds
R	Standard
	Cal. gas inlet
1	For ø6mm tube
2	For ø1/4 inch tube
	Power supply
1	100/115VAC 50/60Hz
3	200/220VAC 50/60Hz
5	230VAC 50/60Hz (CE-marking approved)
	Flow guide tube

	flange	application	length
0 Y 0		None	
5 A 3	SUS304	general use	300mm
5 A 5	SUS304	general use	500mm
5 A 7	SUS304	general use	750mm
5 A 1	SUS304	general use	1000mm
5 B 3	SUS316	for corrosive gas	300mm
5 B 5	SUS316	for corrosive gas	500mm
5 B 7	SUS316	for corrosive gas	750mm
5 B 1	SUS316	for corrosive gas	1000mm
5 C 3	SUS316	with blow-down nozzle	300mm
5 C 5	SUS316	with blow-down nozzle	500mm
5 C 7	SUS316	with blow-down nozzle	750mm
5 C 1	SUS316	with blow-down nozzle	1000mm
6 D 3	SUS316	for high particulate	300mm
6 D 5	SUS316	for high particulate	500mm
6 D 7	SUS316	for high particulate	750mm
6 D 1	SUS316	for high particulate	1000mm
6 E 3	SUS316	for high particulate with cover	300mm
6 E 5	SUS316	for high particulate with cover	500mm
6 E 7	SUS316	for high particulate with cover	750mm
6 E 1	SUS316	for high particulate with cover	1000mm
Z Z Z		Others	

	Description
	Protection cover
Y	Without
A	With
	Reference air inlet
Y	Non
A	Rc1/8
B	NPT1/8
	Non-standard spec.
Z	Other non-standard items

(Ejector)

Z T A 1 1 2 3 4 5 6 7 8 1

	Description
	Measured gas temperature
1	For high temperatures (+1590C max.)
2	General-use (+800C 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

(Converter) ZIRCOMAT-C

Z R Y 1 Y 1 1 - 1 R 0 1 2 3 4 5 6 7 8 9 10 11 12

	Description
	Output signal and fault output
B	4 to 20mA DC, close contact
C	4 to 20mA DC, open contact
	Power supply
1	90 to 230V AC 50/60Hz (CE marking approved)
	Mounting method
1	Panel mounting
	Instruction manual
Y	NO
E	YES (English)

(Converter) ZIRCOMAT-P

Z R M 1 1 1 - 1 2 3 4 5 6 7 8 9

	Description
	Output signal
B	4 to 20mA DC
E	0 to 1V DC
	Optional functions
Y	None
A	Serial communication (RS-485)
B	Combustion efficiency display
C	Transmission function + Combustion efficiency display
	Power supply
1	90 to 220V AC 50/60Hz
5	230VAC 50/60Hz (CE marking approved)
	Mounting method
1	Panel mounting
2	Pipe mounting

Note: Specify the detector type. (ZFK 2 or 5, R-type or K-type thermo-couple)

(Exclusive-special cable)

Z R Z 1 - 1 2 3 4 5 6 7 8 9

	Description
	Connectable devices
M	For ZRM
P	For ZRY
	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	6m
BB	10m	10m
CC	15m	15m
DD	20m	20m

	Description
	Cable end treatment
0	None
1	One side (detector side)
2	Both sides

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

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