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.

SPECIFICATIONS

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<th>General Specifications</th>
</tr>
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<tbody>
<tr>
<td>Measuring object:</td>
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<td>Measuring range:</td>
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<td>Response time:</td>
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<td>Warmup time:</td>
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<td>Analog output:</td>
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<td>Power supply:</td>
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<tr>
<td>Power consumption:</td>
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<tr>
<td></td>
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</tbody>
</table>
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 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:
- ø6mm tube join, ø1/4-inch tube join, or ball valve (as specified)

Reference air inlet (option):
- ø6mm tube join or ø1/4-inch tube join (as specified)

Detector mounting:
- Horizontal plane ±45º, 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

Heat temperature drop alarm output (ejector):
- Alarm output when below 100°C Mechanical thermostat

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: 3 points (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
   - Calibration gas inlet:
     - 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:
- 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

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

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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)”

EN61000-3-3: 2008
Electrical equipment for measurement, control and laboratory use. EMS requirements.

ZFK, ZKM
### Code Symbols

#### (Detector)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZFK8</td>
<td>Cal. gas inlet&lt;br&gt;For φ6mm tube (SUS)&lt;br&gt;For Ø1/4 inch tube (SUS)&lt;br&gt;Ball valve</td>
</tr>
</tbody>
</table>

#### Power supply
- 100 to 120VAC 50/60Hz
- 200 to 240VAC 50/60Hz

#### Flow guide tube
- Flange application length<br>- None<br>- SUS304 general use 300mm<br>- SUS304 general use 500mm<br>- SUS304 general use 750mm<br>- SUS304 general use 1000mm<br>- SUS316 for corrosive gas 300mm<br>- SUS316 for corrosive gas 500mm<br>- SUS316 for corrosive gas 750mm<br>- SUS316 for corrosive gas 1000mm<br>- SUS316 with blowdown nozzle 300mm<br>- SUS316 with blowdown nozzle 500mm<br>- SUS316 with blowdown nozzle 750mm<br>- SUS316 with blowdown nozzle 1000mm<br>- SUS316 for high particulate 300mm<br>- SUS316 for high particulate 500mm<br>- SUS316 for high particulate 750mm<br>- SUS316 for high particulate 1000mm<br>- SUS316 for high particulate with cover 300mm<br>- SUS316 for high particulate with cover 500mm<br>- SUS316 for high particulate with cover 750mm<br>- SUS316 for high particulate with cover 1000mm<br>- Others

#### Protection cover
- Without<br>- With

#### Reference air inlet
- For φ6mm tube (SUS)<br>- For Ø1/4 inch tube (SUS)

#### Instruction manual language
- Japanese<br>- English<br>- Chinese

#### Specification name plate
- Standard (100 to 120V AC 50/60Hz)<br>- Standard (200 to 240V AC 50/60Hz)

#### Connectable devices

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8</td>
<td>Connectable devices&lt;br&gt;For ZKM</td>
</tr>
</tbody>
</table>

#### Power supply Code symbols

- 100 to 120V AC: ZFK8YY15-0YYY0YY YYY |
- 200 to 240V AC: ZFK8YY35-0YYY0YY YYY

### (Converter)

#### Description

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1 2 3 | Construction<br>- IP66<br>- IP67<br>Mounting type<br>- 4 to 20mA DC<br>- 0 to 1V DC<br>- Other<br>Communication function<br>- RS-232C<br>- RS-485<br>Mounting bracket<br>- None (Specify "None" when the bench type is selected)<br>- Pipe mounting<br>Optional Functions<br>- None<br>- Combustion efficiency display function<br>- Blowdown<br>- Auto calibration<br>- Combustion efficiency indication + Blowdown<br>- Auto calibration<br>- Combustion efficiency indication + Auto calibration<br>- Blowdown + Auto calibration<br>- Combustion efficiency indication + Blowdown + Auto calibration<br>Display language<br>- Japanese<br>- English<br>- Chinese<br>Option<br>- None (Specify "None" when the bench type or the auto calibration is selected)<br>- With valve<br>- With valve + flowmeter

#### Conduit length

<table>
<thead>
<tr>
<th>Code</th>
<th>Conduit length</th>
<th>Cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>6m</td>
<td>6m</td>
</tr>
<tr>
<td>B1</td>
<td>10m</td>
<td>10m</td>
</tr>
<tr>
<td>CC</td>
<td>15m</td>
<td>15m</td>
</tr>
<tr>
<td>DD</td>
<td>20m</td>
<td>20m</td>
</tr>
</tbody>
</table>

#### Cable end treatment

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
</table>
| 0    | None<br>1 | One side (detector side)<br>2 | Both sides

#### Note:
- For connection between detector and converter, the conduit to be used should be rainproof flexible type.
(Ejector)

<table>
<thead>
<tr>
<th>Description</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Measured gas temperature</td>
<td>100V/115V AC 50/60Hz</td>
</tr>
<tr>
<td>2. For high temperatures (+150°C max.)</td>
<td>200V/220V AC 50/60Hz</td>
</tr>
<tr>
<td>3. General-use (+800°C max.)</td>
<td>230VAC 50/60Hz</td>
</tr>
<tr>
<td>4. Insertion length [mm]</td>
<td></td>
</tr>
<tr>
<td>B: 600</td>
<td></td>
</tr>
<tr>
<td>C: 750</td>
<td></td>
</tr>
<tr>
<td>D: 1000</td>
<td></td>
</tr>
<tr>
<td>E: 1500</td>
<td></td>
</tr>
</tbody>
</table>

**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, rainproof 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 ZBMNSH4-01 (up to 5% O2 range)
Type ZBMNSJ4-01 (over 5% O2 range)

**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.

<table>
<thead>
<tr>
<th>Application</th>
<th>Temperature</th>
<th>Gas Flow</th>
<th>DUST</th>
<th>Protection cover</th>
<th>Note</th>
<th>Detector type</th>
<th>Converter type</th>
<th>Ejector type</th>
</tr>
</thead>
<tbody>
<tr>
<td>General-use (boiler)</td>
<td>600°C or less</td>
<td>5 to 20m/s</td>
<td>Less than 0.2g/Nm²</td>
<td>—</td>
<td>Fuel; gas, oil</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 10g/Nm²</td>
<td>—</td>
<td>Fuel; coal with blow down</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For corrosive gas (refuse incinerator)</td>
<td>600°C or less</td>
<td>5 to 20m/s</td>
<td>Less than 1g/Nm²</td>
<td>—</td>
<td>Included low moisture</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 10g/Nm²</td>
<td>—</td>
<td>Included low moisture with blow down</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 25g/Nm²</td>
<td>no</td>
<td>Included low moisture with blow down</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 25g/Nm²</td>
<td>yes</td>
<td>Included high moisture with blow down</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General-use (boiler)</td>
<td>800°C or less</td>
<td>Less than 1m/s</td>
<td>Less than 1g/Nm²</td>
<td>—</td>
<td>SUS316 tube with blow down</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1500°C or less</td>
<td>Less than 1m/s</td>
<td>Less than 1g/Nm²</td>
<td>—</td>
<td>SIC tube with blow down</td>
<td>ZFKBR0R-0Y01-0 ZKM —</td>
<td></td>
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</tr>
</tbody>
</table>

**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.

**Note**
(1) Instrument quality air or bottled air is available as reference air by selecting detector with reference air inlet.
Flow guide tube system (with valve)

- Gas temperature: 600°C max.
- Sample gas outlet
- Flow guide tube for high particulate
- Flow guide tube system (with valve) - Rc1/4 (upper side blow port should be selected)
  Blown down, 200 to 300kPa
- Blown-down: 200 to 300kPa
- Supply air
- Reduction valve (unnecessary when supply air pressure is 200 to 300kPa)
- Ref. air to Detector
- AC power supply
- RS232C or RS485 (option)

- 15ASGP tube equivalent or Ø10/Ø8 PTFE pipe or copper pipe (not supplied)
- Solenoid valve (not supplied)
- Reduction valve (unnecessary when supply air pressure is 200 to 300kPa)

- 6mm or Ø1/4 inch tube for calibration gas (not supplied)
- Protective earth.
- Connect the shield of an exclusive cable with the ground terminal in the converter.

- 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 an exclusive cable with the ground terminal in the converter.

- Flow guide tube for high particulate with cover
- Sample gas outlet
- Gas temperature: 600°C max.
- Flow guide tube
- Reducer valve (unnecessary when supply air pressure is 200 to 300kPa)
- Standard gas for zero point (ZBM)
- Reduction valve (ZBD6)
- Calibration gas contact output
- Maintenance contact output
- Fault contact output
- Alarm contact output
- Thermocouple for combustion control
- O2 input
- Thermocouple input
- Analog output 4 to 20mA DC or 0 to 1V DC
- Fault output
- Blow gas output
- Calibrating gas output
- Span gas (ZBM)
- Span gas (ZBD6)
- Span gas (ZBM)
- Reference air
- Ref. air to Detector
- Flowmeter
- Flowmeter
- Valve
- Reduction valve (ZBD6)
- Reduction valve (ZBD6)
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- Reduction valve (ZBD6)
- Reduction valve (ZBD6)
- Reduction valve (ZBD6)
- Reduction valve (ZBD6)
- Reduction valve (ZBD6)}
Gas temperature.
1500ºC max.

Ejector (ZTA) Ejector (5 to 10L/min)

Copper pipe 6/4mm (not supplied)

I 6mm (not supplied)

Copper pipe 10/6mm (not supplied)

10/6mm (not supplied)

Copper pipe 10/8mm (not supplied)

Flowmeter (ZBD)

Alarm

Solenoid valve (not supplied)

Copper pipe 10/6mm (not supplied)

Supply air

AC power supply

Fault contact output

CALIBRATING GAS

HEATER

DI1 DI2 DI3 DICOM

15 16 17 18 19 20 21 22 23 24 25 26 27 28

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 an exclusive cable with the ground terminal in the converter.

*2 Ref. air to Detector

Reduction valve (unnecessary when supply air pressure is 200 to 300kPa)

Reduction valve (unnecessary when supply air pressure is 50 to 100kPa)

Span gas

Air supply

Standard gas for span point (ZBM)

Standard gas for zero point (ZBM)

Not supplied

AC power supply

Rainproof flexible conduit. (Max. 20m)

AC power supply

White

Bule

Red

Yellow

Supply air

Reduction valve (unnecessary when supply air pressure is 200 to 300kPa)

*3 Protective earth.

*4 Connect the shield of an exclusive cable with the ground terminal in the converter.
OUTLINE DIAGRAM (Unit:mm)

Detector (ZFK8)

EXTERNAL CONNECTION DIAGRAM

- Heater
- Thermocouple
- Element output

1. Black
2. White
3. Red
4. White
5. Yellow
6. Blue

Electrical connections:
- 2-core wire
- 4-core wire

Additional connections:
- Calibration gas inlet
- Ref. Air inlet (to order)

Materials:
- SUS316, for 1/4 inch tube

Approximate Dimensions:
- Approx. 62
- Approx. 132
- Approx. 130

Notes:
- Ball valve (ZFK8R)
- Filter
- Ground-wire screw: M4
- Valve handle
- Temp. Proof cover
- Exclusive cable gland
- Exclusive Special cable
Flow guide tube (for high particulate)

4 - Rc 1/4 with plug int thd.

Flange: JIS SK8A FF

ZFK MTG. position

Packing

Gas flow

Protection tube (65A SCH40) Tube (50A SCH40)

ZFK8R - B - 6 D

ZFK8R - B - 6 E

Flow guide tube (for high particulate with cover)

4 - Rc 1/4 with plug int thd.

Flange: JIS SK8A FF

ZFK MTG. position

Packing

Gas flow

Protection tube (65A SCH40) Tube (50A SCH40)

ZFK8R - B - 6 D

ZFK8R - B - 6 E

<table>
<thead>
<tr>
<th>ZFK8R</th>
<th>B</th>
<th>-</th>
<th>D</th>
<th>Code 11th</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>1</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L (m)</td>
<td>0.3</td>
<td>0.5</td>
<td>0.75</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mass</td>
<td>4.5</td>
<td>5.6</td>
<td>7.0</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approx.(kg)</td>
<td>0.3</td>
<td>0.5</td>
<td>0.75</td>
<td>1.0</td>
<td></td>
</tr>
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</table>

ZFK8R

<table>
<thead>
<tr>
<th>ZFK8R</th>
<th>B</th>
<th>-</th>
<th>E</th>
<th>Code 11th</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>1</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L (m)</td>
<td>0.3</td>
<td>0.5</td>
<td>0.75</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mass</td>
<td>7.1</td>
<td>9.0</td>
<td>11.4</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approx.(kg)</td>
<td>7.1</td>
<td>9.0</td>
<td>11.4</td>
<td>13.6</td>
<td></td>
</tr>
</tbody>
</table>
Flow guide tube (for corrosive gas)

Oxygen detector

Gas inlet

Gas outlet

6-M5 detector side

8-Φ15 MTG. holes

L [mm] 500 750 1000 1500
P 190 4-M16 bolt 270
40

Ejector (ZTA)

Gas inlet

Ejector air outlet (Rc1/4)

Viewed from P direction

L [mm] 500 750 1000 1500

AC power supply
AC100/110V
AC200/220V
AC230V

Heater temp. drop alarm

Blow-down air inlet (Rc1/4)

Ejector air inlet (Rc1/4)

Cable gland (A15C)

Detector (ZFK5)

EXTERNAL CONNECTION DIAGRAM

1 2 3 4 5

Acrylic jacket inserted (to order)

Code 11th

L (m) 0.3 0.5 0.75 1.0

MASS

Approx. (kg) 3.3 4.5 6.1 7.6

L = (to order)
Converter (ZKM3)

<bench type>

EXTERNAL TERMINAL (TM1) / Terminal M3

COMMUNICATION TERMINAL (TM2) / INSERTION TERMINAL

Caution on Safety

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

**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 isoraltating 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**

<table>
<thead>
<tr>
<th>General Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring object:</strong> Oxygen in noncombustible gas</td>
</tr>
<tr>
<td><strong>Measuring method:</strong> Directly insert type zirconia system</td>
</tr>
<tr>
<td><strong>Measuring range:</strong> 0 to 2 ... 0 to 50 vol% O2</td>
</tr>
<tr>
<td>2 ranges available in 1 vol% O2 steps</td>
</tr>
<tr>
<td><strong>Repeatability:</strong> Within ±0.5%FS</td>
</tr>
<tr>
<td><strong>Linearity:</strong> Within ±2%FS</td>
</tr>
<tr>
<td><strong>Response time:</strong> Within 4 to 7 sec, for 90% (from calibration gas inlet)</td>
</tr>
<tr>
<td><strong>Warmup time:</strong> approx. 10 min</td>
</tr>
<tr>
<td><strong>Analog output:</strong> 4 to 20mA DC (allowable load resistance less than 500Q) or 0 to 1V DC (output resistance more than 100Q)</td>
</tr>
<tr>
<td><strong>Power supply:</strong> 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</td>
</tr>
<tr>
<td><strong>Power consumption:</strong> Maximum 240VA (Detector: approx. 200VA, Converter: approx. 40VA) Normal 70VA (Detector: approx. 50VA, Converter: approx. 20VA)</td>
</tr>
</tbody>
</table>
**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}

---

**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:**
(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:**
- Range settings
  - Zero gas; 0.010 to 25.000% O₂
  - Span gas; 0.010 to 50.000% 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:**
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

Table 2

<table>
<thead>
<tr>
<th></th>
<th>Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIIS</td>
<td>Exd IIB T6</td>
</tr>
<tr>
<td>NEPSI</td>
<td>EExd IIC T6 Ex ii2G</td>
</tr>
</tbody>
</table>

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
### CODE SYMBOLS

#### (Detector)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cal. gas inlet</td>
<td>Non (G3/8 female screw)</td>
<td>For φ6mm tube</td>
<td>Ejector for φ6mm tube</td>
</tr>
<tr>
<td>1</td>
<td>For 1/4 inch tube</td>
<td>2</td>
<td>Ejector for φ4/1 inch tube</td>
</tr>
<tr>
<td>Power supply</td>
<td>100 to 120V AC</td>
<td>200 to 240V AC</td>
<td></td>
</tr>
</tbody>
</table>

##### Flow guide tube

- None
- Flange size
- JIS 5K 65A
- JIS 5K 80A
- JIS 5K 100A
- JIS 10K 65A
- JIS 10K 80A
- JIS 10K 100A
- ANSI 150LB 2B
- ANSI 150LB 3B
- ANSI 150LB 4B
- DIN DN50 PN10
- DIN DN100 PN10

##### Reference gas inlet

- Non (G1/4 inch female screw)
- For φ6mm tube

#### (Converter)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal</td>
<td>0 to 1V DC</td>
<td>Communication function</td>
<td>RS-232C</td>
</tr>
<tr>
<td>1</td>
<td>RS-485</td>
<td>2</td>
<td>Optional Functions</td>
</tr>
<tr>
<td>3</td>
<td>None</td>
<td>4</td>
<td>Blowdown</td>
</tr>
<tr>
<td>5</td>
<td>Auto calibration</td>
<td>6</td>
<td>Auto calibration</td>
</tr>
<tr>
<td>7</td>
<td>Combustion efficiency indication and Blowdown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

##### Instruction manual language

- Japanese
- English
- Chinese

##### Mounting Option

- Without valve
- With valve + flowmeter

##### Specification name plate

- Standard
- Number of Cable Gland
  - With valve
- 1
  - 3
  - 4
- 2
  - 5
  - 6
  - 7

##### Ex Standard

- NEPSI
- TII

#### (Exclusive-special cable)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectable devices</td>
<td>For ZKME</td>
</tr>
<tr>
<td>Types</td>
<td>For R thermocouple</td>
</tr>
<tr>
<td>Cable length</td>
<td></td>
</tr>
</tbody>
</table>

#### (Replacement Detector element)

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Code symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 to 120V AC</td>
<td>ZFK8YY15-0YYY-0YY</td>
</tr>
<tr>
<td>200 to 240V AC</td>
<td>ZFK8YY35-0YYY-0YY</td>
</tr>
</tbody>
</table>

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

Detector: Detector main unit × 1, Viton Packing × 1, thermo seal × 1, mounting screw (M6mm × 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□SH4-01 (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) Opener
   Type: ZZP＊TK7N9329P2 (for detector; ZKFE)
   Type: ZZP＊TK7N9329P1 (for converter; ZKME)

CAUTIONS

- If combustible gas (CO, Hz 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 foreign 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.

<table>
<thead>
<tr>
<th>Application</th>
<th>Temperature</th>
<th>Gas Flow</th>
<th>DUST</th>
<th>Note</th>
<th>Detector type</th>
<th>Device configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>General-use (boiler)</td>
<td>600°C or less</td>
<td>5 to 20m/s</td>
<td>Less than 0.2g/Nm³</td>
<td>Fuel: gas, oil</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less than 10g/Nm³</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fuel: coal with blow down</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td>For corrosive gas (refuse incinerator)</td>
<td>600°C or less</td>
<td>5 to 20m/s</td>
<td>Less than 1g/Nm³</td>
<td>Included low moisture</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less than 10g/Nm³</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Included low moisture with blow down</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less than 25g/Nm³</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Included low moisture with blow down</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less than 25g/Nm³</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Included high moisture with blow down</td>
<td>ZFKER□□□□□□□□</td>
<td>ZKME</td>
</tr>
</tbody>
</table>

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

Gas temperature. 600°C max.

Sample gas outlet

Gas temperature. 600°C max.

Flow guide tube for high particulate

Sample gas outlet

Gas temperature. 600°C max.

Flow guide tube for high particulate with cover

6mm or 9/16 inch tube for calibration gas (not supplied)

RS232C or RS485 (option)

Rct14 (upper side blow port should be selected)
Blow-down. 200 to 300 kPa

Detector (ZFKE)

Exhaust

AC power supply

Reduction valve (unnecessary when supply air pressure is 200 to 300 kPa)

15ASGP tube equivalent (not supplied)

15ASGP tube equivalent (not supplied)

Converter (ZKME)

TM-1

Calibrating gas contact output

O2 sensor input

O2 sensor thermocouple input

Fault contact output

Blow contact output

Alarm contact output

Maintenace contact output

COM

AC power supply

AC power supply

Reduction valve (ZBD6)

Standard gas for span point (ZBM)

*1 Air supply

*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 an exclusive cable with the ground terminal in the converter.
Flow guide tube system (with valve)

1. Flow guide tube
2. Gas temperature, 600°C max.
3. Sample gas outlet
4. Flow guide tube for high particulate
5. Sample gas outlet
6. Flow guide tube for high particulate with cover
7. 8mm or 1/4 inch tube for calibration gas (not supplied)
8. **2** Ref. gas
9. (1) to Detector
10. 6mm or 1/4 inch tube for calibration gas (not supplied)

**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 an exclusive cable with the ground terminal in the converter.
Flow guide tube system (with ejector)

- **Rc1/4** (upper side blow port should be selected)
- Blow-down: 200 to 300kPa

**Flow guide tube**

1. **Calibrating gas**
2. **Sample gas outlet**
3. **Flow guide tube for high particulate**

**Gas temperature. 600°C max.**

**Reduction valve** (unnecessary when supply air pressure is 200 to 300kPa)

**15ASIGP tube equivalent (not supplied)**

**Solenoid valve** (not supplied)

**Detector (ZFKE)**

**AC power supply**

**Converter (ZKME)**

**AC power supply**

**Reduction valve** (unnecessary when supply air pressure is 50 to 100kPa)

**1 Air supply**

**Span point**

**Standard gas for span point (ZBM)**

**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.
Flow guide tube system (with ejector + valve)

Rc1/4 (upper side blow port should be selected)
Blow-down, 200 to 300 kPa

Gas temperature: 60°C max.

Exhaust

Sample gas outlet

Gas temperature: 60°C max.

Flow guide tube for high particulate

RS232C or RS485 (option)

6mm or #1/4 inch tube for calibration gas
(not supplied)

6mm or #1/4 inch tube for calibration gas
(not supplied)

(1) to Detector

② Ref. gas

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.
OUTLINE DIAGRAM (Unit:mm)

Detector (ZFKER)

Sensor unit (ZFK8YY)
Flow guide tube (with blow-down nozzle) (ZFKE: 10th digit code. G)
Flow guide tube (for high particulate) (ZFKE: 10th digit code. H, K, M)

<table>
<thead>
<tr>
<th>Code 11th</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>1</th>
<th>Z</th>
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<tbody>
<tr>
<td>L (m)</td>
<td>0.3</td>
<td>0.5</td>
<td>0.75</td>
<td>1.0</td>
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<tr>
<td>Mass</td>
<td>4.5</td>
<td>5.6</td>
<td>7.0</td>
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Flow guide tube (for high particulate with cover) (ZFKE: 10th digit code. J, L, N)
Flow guide tube (ZFKE: 10th digit code. F)

<table>
<thead>
<tr>
<th>Code</th>
<th>11th</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>1</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (m)</td>
<td>0.3</td>
<td>0.5</td>
<td>0.75</td>
<td>1.0</td>
<td>L=</td>
<td>to order</td>
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<tr>
<td>MASS Approx (kg)</td>
<td>3.3</td>
<td>4.5</td>
<td>6.1</td>
<td>7.6</td>
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Coverter (ZKME)

Flange size

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<tr>
<th>Code</th>
<th>D</th>
<th>C</th>
<th>t</th>
<th>f</th>
<th>ε</th>
<th>N</th>
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<tr>
<td>JS 5K 65A</td>
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<td>130</td>
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<td>JS 5K 80A</td>
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EXTERNAL TERMINAL (TM1) / M3

COMMUNICATION TERMINAL (TM2) / INSERTION TERMINAL

<table>
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<tr>
<th>Terminal number</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>RXD</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
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RS232C Standard
RS485 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.

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http://www.fujielectric.com/products/instruments/

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