In-Situ
Zirconia Oxygen Analyzers
Detector: ZFK8, ZFKE  Converter: ZKMA, ZKMB, ZKME

Ideal for Combustion Control

☑ User-replaceable zirconia element
☑ No gas sampling required
☑ Enhanced safety design
☑ Response speed from 4 to 7 seconds
☑ Dust- and water-proof, and/or flameproof enclosure
☑ Key operation available on front cover (ZKMA and ZKME)
☑ HART communication
High Safety Level
- Upon detecting a break of the thermocouple for heater control in the sensor unit, the analyzer stops the power supply to the detector.
- The power supply to the detector can also be stopped by contact input in an emergency.
- The key lock function prevents operational errors.

Easily Replaceable Zirconia Element

Operating Principle

Fast Sampling with No Gas Sampling Devices

Ejector for High-Temperature Gas

Applications
- Waste incinerator
- Boiler combustion control
## System diagram

- **Blow-down air inlet**
- **Ejector** *Non-compliant with CE marking*
- **Detector ZFK8**
- **Transmitter ZKMA**
- **Calibration gas inlet**
- **Dedicated cable**
- **Power supply**
- **Contact input 3 points**

## Ordering code

### Detector

<table>
<thead>
<tr>
<th>Code</th>
<th>ZFK8R</th>
<th>5</th>
<th>-</th>
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<td>Code</td>
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<tr>
<td>6</td>
<td>Pipe adapter for calibration gas inlet</td>
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<td>Heat-retaining cover</td>
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<td>Instruction manual</td>
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### Converter

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<th>Y</th>
<th>R</th>
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<td>13</td>
<td>Thermocouple for combustion efficiency display</td>
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<td>14</td>
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<tr>
<td>15</td>
<td>Type K thermocouple</td>
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<td>1</td>
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</tbody>
</table>

### Ejector

- **ZTA**
  - 111
  - 1

### Replacement detector element

- **Power supply**: AC100 to 120V, ZFK8Y15-0Y0Y-YY, AC200 to 240V, ZFK8Y35-0Y0Y-YY

## Notes
1. On the version with the combustion efficiency display, the rich mode indicator is available.
2. If you order the version without combustion efficiency display (9th code Y, 2, 3, or 6), select "Y" in the 16th digit.
3. If you order the version with auto calibration (9th code 3, 5, 6, or 7), select "Y" in the 11th digit.
4. A thermocouple is to be prepared by the customer.
5. If you order the version with combustion efficiency display (9th code 1, 4, 5, or 7), select "R" or "K" in the 16th digit.
6. For connection between detector and converter, use a rainproof flexible conduit.
Flameproof version for Explosive Atmospheres

Converter ZKME

<table>
<thead>
<tr>
<th>TIIS</th>
<th>NEPSI</th>
</tr>
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<tbody>
<tr>
<td>Ex d IIB T6</td>
<td>Ex d IIC T6 Gb</td>
</tr>
<tr>
<td>Detector ZFKE</td>
<td>Ex d IIB T4</td>
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■ Ordering code

**Detector**

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<th>Description</th>
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<th>Code</th>
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<tbody>
<tr>
<td>6</td>
<td>Pipe adapter for calibration gas inlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None (G3/8 internal screw)</td>
<td>Y</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For ø6mm tube</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>For ø1/4 inch tube</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ejector with pipe adapter for ø6mm tube</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Ejector with pipe adapter for ø1/4 inch tube</td>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Power supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 to 120 V AC 50/60 Hz</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>200 to 240 V AC 50/60 Hz</td>
<td>2</td>
<td>7</td>
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<td></td>
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<tr>
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**Converter**

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<th>Note</th>
<th>Code</th>
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<tr>
<td>5</td>
<td>Output signal</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>4 to 20mA DC</td>
<td>B</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>0 to 1V DC</td>
<td>E</td>
<td>7</td>
</tr>
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<td>3</td>
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<td></td>
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<tr>
<td></td>
<td>None</td>
<td>Y</td>
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<td>RS-485</td>
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**Replacement detector element**

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Code symbols</th>
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<tbody>
<tr>
<td>AC100 to 120V</td>
<td>ZFK8YY15-0Y0YY0YY</td>
</tr>
<tr>
<td>AC200 to 240V</td>
<td>ZFK8YY35-0Y0YY0YY</td>
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</table>

**Dedicated cable**

<table>
<thead>
<tr>
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<th>Description</th>
<th>Note</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>Connectable device</td>
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</tr>
<tr>
<td></td>
<td>ZKME</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For type R thermocouple</td>
<td>R</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Cable length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 m</td>
<td>YA</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>10 m</td>
<td>YB</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>15 m</td>
<td>YC</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>20 m</td>
<td>YD</td>
<td>16</td>
</tr>
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<td>30 m</td>
<td>YE</td>
<td>17</td>
</tr>
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<td>40 m</td>
<td>YF</td>
<td>18</td>
</tr>
<tr>
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<td>50 m</td>
<td>YG</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>60 m</td>
<td>YH</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>70 m</td>
<td>YJ</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>80 m</td>
<td>YK</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>90 m</td>
<td>YL</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>100 m</td>
<td>YM</td>
<td>24</td>
</tr>
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</table>

**Optional functions**

- None
- Combustion efficiency display function
- Blowndown
- Auto calibration
- Combustion efficiency indication + Blowndown
- Combustion efficiency indication + Auto calibration
- Combustion efficiency indication + Blowndown + Auto calibration
- Blowdown + Auto calibration

**Instruction manual language**

- Japanese
- English
- Chinese

**Number of cable glands**

- Standard

**Ex standard**

- NEPSI
- TIIS

**Cable end treatment**

- None
- One side (detector side)
- Both sides
### Specifications

#### General
- **Measuring object**: Oxygen in non-combustible gas
- **Principle**: Zirconia oxygen sensor
- **Range**: 0...2...50 vol%
  - User-configurable two ranges
- **Repeatability**: ≤ ±0.5% FS
- **Linearity**: ≤ ±2% FS
- **Zero/span drift**: ≤ ±2% FS per month
- **Response time**: 4–7 seconds (from the calibration gas inlet)
- **Analog output**: 4–20 mA DC or 0–1 V DC, isolated
- **Power supply voltage**: 100–120 V AC or 200–240 V AC

#### Detector

<table>
<thead>
<tr>
<th>Detector</th>
<th>ZFK8</th>
<th>ZFKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas temperature</td>
<td>With flow guide tube: -10...600°C</td>
<td>-10...600°C</td>
</tr>
<tr>
<td>With ejector: For general use</td>
<td>-10...800°C</td>
<td></td>
</tr>
<tr>
<td>For high temperature</td>
<td>-10...1500°C</td>
<td></td>
</tr>
<tr>
<td>Gas pressure</td>
<td>-3...3 kPa</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Alumina, quartz paper, SS 316</td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP66, flameproof</td>
<td></td>
</tr>
<tr>
<td>Weight (excl. flow guide tube)</td>
<td>1.6 kg</td>
<td>3 kg</td>
</tr>
</tbody>
</table>

#### Converter
- **Display**: 4-digit, with backlight
- **Contact output**: 6 relay contacts
- **Contact input**: 3 volt-free contacts
- **Communication**: HART or RS-485 (Modbus)
- **Output hold**: During calibration and during blowdown
- **Other functions**: Thermocouple break detection, key lock, sensor diagnosis
- **Options**: Combustion efficiency display, blowdown, auto calibration, Flowmeter, selector valve
- **Enclosure**: ZKMA: IP66, ZKMB: IP67, ZKME: IP65 and flameproof

#### Flow guide tube
- **For ZFK8**
- **Types**: Standard, Corrosion resistant, With blowdown nozzle, Dust tolerant, Dust tolerant and with cover
- **For ZFKE**
- **Types**: Corrosion resistant, With blowdown nozzle, Dust tolerant, Dust tolerant and with cover
- **Length**: 300, 500, 700, or 1000 mm
- **Flange size**: JIS 5K 65A, JIS 5K 80A (for dust tolerant version)
- **See the 9th to 11th digits of ordering codes**

### Detector Selection Guide

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

#### ZFK8

<table>
<thead>
<tr>
<th>Application</th>
<th>Gas conditions</th>
<th>Detector</th>
<th>Converter</th>
<th>Ejector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers</td>
<td>Gas, oil</td>
<td>≤ 600°C</td>
<td>5–20 m/s</td>
<td>≤ 0.2 g/Nm³</td>
</tr>
<tr>
<td>Coal</td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>SS 304</td>
<td>With blowdown nozzle</td>
</tr>
<tr>
<td></td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>SS 316</td>
<td>For corrosive gas</td>
</tr>
<tr>
<td>Refuse incinerators</td>
<td>≤ 600°C</td>
<td>5–20 m/s</td>
<td>≤ 1 g/Nm³</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>SS 316</td>
<td>For corrosive gas</td>
</tr>
<tr>
<td></td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>SS 316</td>
<td>For corrosive gas</td>
</tr>
<tr>
<td>Heating furnaces</td>
<td>≤ 800°C</td>
<td>≤ 1 m/s</td>
<td>≤ 1 g/Nm³</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>≤ 1500°C</td>
<td>≤ 1 m/s</td>
<td>≤ 1 g/Nm³</td>
<td>Low</td>
</tr>
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<td></td>
<td>≤ 1500°C</td>
<td>≤ 1 m/s</td>
<td>≤ 1 g/Nm³</td>
<td>Low</td>
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</table>

#### ZFKE

<table>
<thead>
<tr>
<th>Application</th>
<th>Gas conditions</th>
<th>Detector</th>
<th>Converter</th>
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<tbody>
<tr>
<td>Boilers</td>
<td>Gas, oil</td>
<td>≤ 600°C</td>
<td>5–20 m/s</td>
</tr>
<tr>
<td>Coal</td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>For corrosive gas</td>
</tr>
<tr>
<td></td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>With blowdown nozzle</td>
</tr>
<tr>
<td>Refuse incinerators</td>
<td>≤ 600°C</td>
<td>5–20 m/s</td>
<td>≤ 1 g/Nm³</td>
</tr>
<tr>
<td></td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>For corrosive gas</td>
</tr>
<tr>
<td></td>
<td>≤ 10 g/Nm³</td>
<td>Low</td>
<td>With blowdown nozzle</td>
</tr>
<tr>
<td></td>
<td>≤ 25 g/Nm³</td>
<td>Low</td>
<td>For high particulate</td>
</tr>
<tr>
<td></td>
<td>≤ 25 g/Nm³</td>
<td>High</td>
<td>For high particulate, with cover</td>
</tr>
</tbody>
</table>

Notes:
1) Dust volumes listed above are approximate value.
2) If the oxygen concentration of ambient air fluctuates, select a detector with a pipe adapter for reference gas inlet (13th code A or B).
3) Consult us for specifications not listed above.
### Dimensions (in mm)

#### Converter (ZKMA) < IP66>

- **Dimensions (in mm)**: 2.5, 7.1, 100, 142, 224, 82, 51, 170, 205, 270
- **Valve (optional)**: 
- **Flowmeter (optional)**: 
- **Support (option)**: 
- **Spring washer, washer, nut (option)**: 
- **U bolt (option)**: 
- **SUS316, for 5/8-12 mm tube**:
- **Exclusive Cable gland**:
- **Temp. Proof cover**: 
- **Ground wire Screw: M4**:
- **Spring washer, washer, nut (option)**:
- **U bolt (option)**:
- **SUS316, for 5/8-12 mm tube**:

#### Converter (ZKMB) < IP67>

- **Dimensions (in mm)**: 230, 80, 8.5, 97, 130, 8.5, 4, 8.5, 130, 332
- **Valve (optional)**: 
- **Flowmeter (optional)**: 
- **Support (option)**: 
- **Spring washer, washer, nut (option)**: 
- **U bolt (option)**: 
- **SUS316, for 5/8-12 mm tube**:
- **Exclusive Cable gland**: 
- **Temp. Proof cover**: 
- **Ground wire Screw: M4**:
- **Spring washer, washer, nut (option)**:
- **U bolt (option)**:
- **SUS316, for 5/8-12 mm tube**:

#### Detector (ZFK8)

- **Dimensions (in mm)**: 67, 60, 6.65, 90
- **Valve (optional)**: 
- **Flowmeter (optional)**: 
- **Support (option)**: 
- **Spring washer, washer, nut (option)**: 
- **U bolt (option)**: 
- **SUS316, for 5/8-12 mm tube**:
- **Exclusive Cable gland**: 
- **Temp. Proof cover**: 
- **Ground wire Screw: M4**:
- **Spring washer, washer, nut (option)**:
- **U bolt (option)**:
- **SUS316, for 5/8-12 mm tube**:

#### Flow guide tube for ZFK8 (Flange size JIS 5K 65A) 9th code:5, 10th code:A

- **Dimensions (in mm)**: 10, Approx. L, Approx. 20, 155
- **Gas inlet**: 
- **Gas outlet**: 
- **Oxygen detector**: 
- **Code 11th**: 3, 5, 7, 1, Z
- **Length (in mm)**: 67, 60, 6.65, 90, 58.5
- **Mass (approx.)**: 2.7, 3.3, 4.1, 4.9

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**Notes**:
- **Ref. Air inlet (to order)**: SUS316, for 5/8-4 tube or 1/4 inch tube
- **Calibration gas inlet (To order)**: SUS316, for 5/8-4 tube or 1/4 inch tube
- **Cable gland (option)**
- **Cable gland (option)**
- **Waterproof connector for connection to detector**
- **Waterproof connector for connection to detector**
- **Earth terminal (M4)**
- **Earth terminal (M4)**
- **Exclusive Cable gland**
- **Exclusive Cable gland**
- **Screw: M4**
- **Screw: M4**
- **U bolt (option)**
- **U bolt (option)**
- **Support (option)**
- **Support (option)**
- **Spring washer, washer, nut (option)**
- **Spring washer, washer, nut (option)**
- **Flowmeter (option)**
- **Flowmeter (option)**
- **Valve**: 
- **Valve**: 
- **Flowmeter (option)**
- **Flowmeter (option)**
- **Valve**: 
- **Valve**: 
- **Flowmeter (option)**
- **Flowmeter (option)**
- **E-TESC Zirconia Oxygen Analyzer**
- **ZKM Oxygen Analyzer**
**Converter (ZKME)**

- **Ground terminal M4**
- **Mounting holes 4-φ14**
- **Lock screw M6**
- **Exclusive Cable gland (For power supply)**
- **Exclusive Cable gland (For signal)**
- **Approx. 215**
- **Filter**
- **Ref. gas inlet (to order)**
- **SUS316, for ø6mm tube**
- **(the 13th digit is “A”)**
- **Or 1/4 inch tube**
- **(the 13th digit is “B”)**
- **External ground terminal M4**
- **Explosion-proof name plate**
- **Lock screw M6**
- **View A**
- **View B**
- **Approx. 185**
- **Approx. 57**
- **Approx. 47**
- **Approx. 37**
- **Approx. 21**
- **Approx. 78**
- **Cable gland for flame proof ø9 - ø12 / closeup plug (To order)**
- **Mounting hole 4-φ14**
- **For communication**
- **For contact In/Out**
- **For Other**
- **For sensor signal**
- **For sensor power**
- **For output**

**Detector (ZFKER)**

- **Calibration gas inlet (To order)**
- **SUS316, for ø6mm tube**
- **(the 6th digit is “A”)**
- **Or 1/4 inch tube**
- **(the 6th digit is “B”)**
- **(Not provided if the 6th digit is “Y”)**
- **Ejector gas inlet**
- **SUS316, for ø6mm tube**
- **(the 6th digit is “A”)**
- **Or 1/4 inch tube**
- **(the 6th digit is “B”)**
- **Ejector gas outlet**
- **SUS316, for ø6mm tube**
- **(the 6th digit is “A”)**
- **Or 1/4 inch tube**
- **(the 6th digit is “B”)**
- **Approx. 155**
- **Ref. gas inlet (to order)**
- **SUS316, for ø6mm tube**
- **(the 13th digit is “A”)**
- **Or 1/4 inch tube**
- **(the 13th digit is “B”)**
- **External ground terminal M4**
- **Explosion-proof name plate**
- **View A**
- **View B**
- **Approx. 110**
- **Approx. 95**
- **Approx. 65**
- **Approx. 7**
- **Approx. 47**
- **Approx. 37**
- **Approx. 21**
- **Approx. 60**
- **Lock screw M6**
- **Detector side**
- **PFKE MTG. position**

**Flow guide tube for ZFKE (Flange size JIS 5K 65A) 9th code: 7, 10th code: F**

<table>
<thead>
<tr>
<th>Code</th>
<th>11th</th>
<th>9th</th>
<th>7th</th>
<th>1st</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>3.3</td>
<td>4.5</td>
<td>6.1</td>
<td>7.6</td>
<td>(to order)</td>
</tr>
<tr>
<td>MASS</td>
<td>0.3</td>
<td>0.5</td>
<td>0.7</td>
<td>1.0</td>
<td>(to order)</td>
</tr>
</tbody>
</table>

**Dimensions**

- **L**: 67 mm
- **D**: 65 mm
- **6-M5 MTG. holes**
- **PFKE MTG. position**
- **Gas inlet**
- **Gas outlet**
- **6-M5 detector side**
Ejector (ZTA) for ZFK8

**Viewed from P direction**

- **Ejector air inlet** (Rc1/4)
- **Ejector air outlet** (Rc1/4)
- **Blow down air inlet** (Rc1/4)
- **Detector** (ZFK8) (JIS 10K65ARF)

**L [mm]**
- 500
- 750
- 1000
- 1500

**Approx. L**
- 190

**4-M16 bolt**
- P

**P 140** (Units: 10K65ARF)

**P 42.7**

**P 30**

**105**

**25**

**217**

**270**

**40**

**60**

**80**

**90**

**500**

**750**

**1000**

**1500**

**Viewed from P direction**

**Ejector air inlet** (Rc1/4)

**Ejector air outlet** (Rc1/4)

**Blow down air inlet** (Rc1/4)

**Detector** (ZFK8)

**4-M16 bolt**

**P**

**10**

**25**

**30**

**40**

**50**

**60**

**75**

**105**

**217**

**270**

**40**

**60**

**80**

**90**

**35**

**500**

**750**

**1000**

**1500**


**Wiring diagram**

**O2 sensor input**

**O2 sensor heater input**

**Analog output**
- 4–20 mA DC or 0–1 V DC or HART

**Fault output**
- Contact output 250 V AC/3 A 30 V DC/3 A

**Blow output**
- Contact output 250 V AC/3 A 30 V DC/3 A

**Contacts**
- 250 V AC/3 A 30 V DC/3 A

**Calibrating gas output**
- Contact output 250 V AC/3 A 30 V DC/3 A

**Power supply input**
- 100 to 120 V AC 200 to 240 V AC

**Thermocouple input**
- Type R (not supplied)

**Ground terminal M4**

**Dedicated cable**

**RS485 communication (option) terminal**

1 2 3 4 5 6 7 8 9 10 11 12 13 14

**O2 sensor**

**TC2**

**D11**

**D12**

**D13**

**ALARM**

**MAINT**

**D401**

**COM**

**SV**

**N**

**AC**

**L**

**GND**

**TRX-**

**TRX+**

**Note 1)** The heater uses the same power source as the converter.

**Note 2)** Connect the shield of the dedicated cable to the ground terminal inside the converter.

**Note 3)** HART communication (option) uses the 4–20 mA analog output line.