The OX400 is a highly accurate and reliable low-concentration zirconia oxygen analyzer that is capable of measuring a wide range of concentrations, from 0-10 ppm up to 0-100 vol% O₂. This is the latest oxygen analyzer from Yokogawa, and its development was based on the company's long experience and strong track record with this technology.

A proprietary new thin-film deposition technology was used in the zirconia sensor that creates a molecular bond between the zirconia element and the platinum layer. This prevents separation, enables a reduction in sensor size and ensures a high-speed response and long life.

The OX400 can be used to control and monitor various semiconductor applications, and to control environment, air leakage into inert gas, and other processes.

**Features**

**Long life and high-speed response**

- Thanks to the use of Yokogawa’s proprietary new thin-film deposition technology, the sensor has three times the lifespan of those used in our earlier products.
- A cylindrical sensor design facilitates the replacement of measurement gases, thereby helping to assure a high-speed response.

**High performance and high reliability**

- Superior repeatability and linearity even at low oxygen concentrations
- Either pump or aspirator sampling can be selected, depending on the application.
- CE, CSA, etc. certification.

**Built-in functions and a variety of self-diagnosis functions**

- Comes with multi selector, auto range, partial range, and pump on/off functions
- A variety of self-diagnosis functions are provided that detect malfunctions such as heater temperature error, temperature sensor burnout, and sensor resistance value error.

**Superior maintainability**

- The sensor can be replaced on-site.
- Compact and lightweight for easy installation.

**Applications**

- Oxygen concentration control in semiconductor-related diffusion and drying furnaces and in LCD manufacturing processes
- Oxygen concentration control in solder pot flow and re-flow furnaces, and glove boxes used in electronics manufacturing, and in gas production processes
- Oxygen concentration measurements to prevent dust explosions during powder transfer
Standard Specifications

Measurement object
: Oxygen concentrations in inert gases containing no flammable gas, silica, corrosive gas, or liquid (including water vapor).

Measurement system: Zirconia system

Sampling method
: Pump, aspirator, or no suction device.
For the sampling gas pressure in each sampling method, refer to the sampling gas conditions.

Pump and aspirator suction flow rate
: Approx. 1.0 l/min.

Aspirator suction conditions
: Air or N₂, supply pressure 65 to 100 kPaG, total discharge flow 10 l/min max. (when gas inlet and outlet are at ambient atmospheric pressure).

Sample gas conditions
Flow rate
: 200 ± 25 ml/min (only applies to sensor).
Temperature
: 0-50°C (non-condensing).
Humidity
: Non-condensing.
Pressure
: Pump and aspirator: 0-300 PaG
No suction device: 40 kPaG max.

Measurement range
: 0-10 ppm O₂ to 0-100 vol% O₂
Resolution
: 0.01 ppm O₂
Display
: 4 digit LED.
Main display: O₂ concentration (auto switching).
Sub display: Parameter or alarm/error number
Unit
: %, ppm.

Output range
Auto: 0-10 ppm, 0-100 ppm, 0-1000 ppm, 0-1%, 0-10%, 0-100% (default)
Other: 0-∞ ppm, 0-∞00 ppm, 0-∞000 ppm, 0-∞%, 0-∞0%, 0-∞00% 
| Class | Variation | For each integer from 2 to 9.
Fixed: Set to 0-10 ppm, 0-100 ppm, 0-1000 ppm, 0-1%, 0-10%, or 0-100%.
Partial: Lower value or upper value of range can be set.

Note: Span (upper value-lower value) is 20% FS or more of above fixed range.
Example: 200-400 ppm when fixed range is 0-1000 ppm, 20-40 ppm when fixed range is 0-100 ppm.

Analog output
: 2 outputs,
Primary: 4 to 20 mA DC (maximum load resistance: 550Ω)
Secondary: Select from 0-1, 0-5, 0-10 V DC (load resistance: 10 kΩ or greater)

Contact output
: 3 outputs,
Error, O₂ concentration alarm contact, range marker contact
Multi selector (optional): Contact output for switching of measurement flow path, contact output for measurement flow path data. Note: For detailed information, see the external dimensions.

Contact output specifications
General: Relay
Nominal contact capacity: 2 A 30V DC, 2 A 240 V AC (120 V AC for 100 V power supply) for resistive load
Maximum power: 60 W, 480 VA
Maximum voltage: 30 V DC, 264 V AC (132 V AC for 100 V power supply)
Maximum current: 2 A DC/AC

Contact input
Voltage-free contact, 1 point: Remote switching for sample gas suction pump ON/OFF
Input signal
Open signal: 100 kΩ or more
Close signal: 200 Ω or less

Self-diagnostics
Error (failure): Sensor unit error, heater temperature error, temperature sensor disconnection, device temperature error, CPU error, fan stop.
Alarm (warning): Heater unstable, sensor defect, electromotive force abnormal, asymmetry voltage error, calibration error, sensor resistance error, O₂ concentration upper/lower, over range.

Serial communication
Comm. signal: RS-232, one way
Baud rate: 38,400 bps
Data (ASCII): O₂ concentration, unit, alarm/error

Calibration methods:
(1) 3 point: 10 ppm, 1000 ppm, air
(2) 2 point: zero and span calibration may be set freely
(3) 1 point
(4) Air calibration

Warm-up time: Within 20 min

Power supply:
Power supply: 100 - 120 V AC/200 - 240 V AC, 50/60 Hz
Acceptable range: 100 to 120 V AC ±10% 200 to 240 V AC ±10%, 50/60 Hz

Power consumption: 100 to 120 V AC, 200 VA max.
200 to 240 V AC, 400 VA max.

Dimension:
: 213 (W) x 132 (H) x approx. 375 (D) mm

Weight:
: Approx. 5 kg

Finish:
: Polyester coating

Line connection
Gas inlet: Rc1/4 or 1/4NPT female
Gas outlet: Rc1/4 or 1/4NPT female

Electrical connection
External output terminals: M3 screw
Contact input/output terminals: M3 screw
Serial communication: D-sub 9 pin connector
Ground: within power cord connector

Environment and operational conditions
Installation conditions: Indoors, panel or wall mounting, non explosion area
Ambient temperature: 0 to 40°C, non-condensing
Ambient humidity: 5 to 85% RH
Storage temperature: -5 to 50°C
### Safety, EMC and RoHS conformity standards

Safety: EN61010-1  
UL Std. No. 61010-1  
CAN/CSA-C22.2 No. 61010-1  

EMC:  
EN 61326-1 Class A, Table 2  
EN 61000-3-2  
EN 61000-3-3  

EMC Regulatory Arrangement in Australia and New Zealand (RCM) EN61326-1 Class A  

RoHS: EN 50581

### Information of the WEEE Directive

This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive does not apply. The WEEE Directive is only valid in the EU.

### Installation altitude: 2000 m or less

### Model and Suffix Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OX400</td>
<td></td>
<td></td>
<td>Low Concentration Zirconia Oxygen Analyzer</td>
</tr>
</tbody>
</table>

#### Power supply

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>-5</em></td>
<td>-5</td>
<td>100-120 V AC</td>
</tr>
<tr>
<td><em>-3</em></td>
<td>-3</td>
<td>200-240 V AC</td>
</tr>
</tbody>
</table>

#### Sampling method

<table>
<thead>
<tr>
<th>Sampling method</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>-P</em></td>
<td>-P</td>
<td>Built-in pump</td>
</tr>
<tr>
<td><em>-A</em></td>
<td>-A</td>
<td>With aspirator</td>
</tr>
<tr>
<td><em>-N</em></td>
<td>-N</td>
<td>No suction device</td>
</tr>
</tbody>
</table>

#### Line connection

<table>
<thead>
<tr>
<th>Line connection</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>-J</td>
<td>Japanese</td>
</tr>
<tr>
<td>T</td>
<td>-E</td>
<td>English</td>
</tr>
</tbody>
</table>

#### User’s manual

<table>
<thead>
<tr>
<th>User’s manual</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>-J</em></td>
<td>-D</td>
<td>UL/CSA cable (2 m)</td>
</tr>
<tr>
<td><em>-E</em></td>
<td>-F</td>
<td>VDE cable (2.5 m)</td>
</tr>
<tr>
<td><em>-J</em></td>
<td>-H</td>
<td>GB cable (2.5 m)</td>
</tr>
<tr>
<td><em>-E</em></td>
<td>-Q</td>
<td>BS cable (2 m)</td>
</tr>
<tr>
<td><em>-J</em></td>
<td>-R</td>
<td>SAA cable (2.5 m)</td>
</tr>
<tr>
<td><em>-E</em></td>
<td>-T</td>
<td>BSMI cable (2 m)</td>
</tr>
</tbody>
</table>

#### Power cable

<table>
<thead>
<tr>
<th>Power cable (*1)</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>-D</em></td>
<td>-P</td>
<td>UL/CSA cable (2 m)</td>
</tr>
<tr>
<td><em>-F</em></td>
<td>-A</td>
<td>VDE cable (2.5 m)</td>
</tr>
<tr>
<td><em>-H</em></td>
<td>-N</td>
<td>GB cable (2.5 m)</td>
</tr>
<tr>
<td><em>-Q</em></td>
<td>-P</td>
<td>BS cable (2 m)</td>
</tr>
<tr>
<td><em>-R</em></td>
<td>-E</td>
<td>SAA cable (2.5 m)</td>
</tr>
<tr>
<td><em>-T</em></td>
<td>-T</td>
<td>BSMI cable (2 m)</td>
</tr>
</tbody>
</table>

### Option, Mounting hardware, Multi selector function, Filter

<table>
<thead>
<tr>
<th>Option</th>
<th>Mounting hardware</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P</em></td>
<td>Panel mount</td>
<td>Multi selector function</td>
</tr>
<tr>
<td>/MS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/A</td>
<td>Activated carbon filter (*2)</td>
<td></td>
</tr>
</tbody>
</table>

*1: Power cable of two-pole with earthing plug is attached. Suffix code “-D” and “-T” of power cable can not be specified when “-3” of power supply is specified. Power cable of “-D” can be used in Japan, because another cable doesn’t conform to PSE marking. Power cable of “-F” can be used in Korea, because another cable doesn’t conform to KC marking. Power cable of “-T” can be used in Taiwan, because another cable doesn’t conform to BSMI marking.

*2: When “R” of line connection is specified, K9643KH filter (Rc1/4) is attached, when “T” of line connection is specified, K9643KJ filter (1/4NPT) is attached. “A” is specified when it is used for flow furnace or reflow furnace.

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**Characteristics**

- **Repeatability**: ±1% FS (Hereafter, either 10, 100, 1000 ppm, 1%, 10%, or 100% O₂ is FS)
- **Linearity**: ±2% FS  
  ±3% FS (0-100 ppm or less)
- **Response time**:  
  90% response: within 10 sec (0-1% or more)  
  within 30 sec (less than 0-1%)
- **Drift**: ±2% FS / week
### Accessories

<table>
<thead>
<tr>
<th>Item</th>
<th>Part no. and rating</th>
<th>Qt'y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuse</td>
<td>A1113EF: Time-lag T3.15 conformed to IEC60127</td>
<td>1</td>
</tr>
<tr>
<td>User’s manual</td>
<td>IM 11M10B01-01, -01E</td>
<td>1</td>
</tr>
<tr>
<td>Aspirator kit</td>
<td>K9643KA (Rc1/4), K9643KB (1/4NPT)</td>
<td>Optional</td>
</tr>
<tr>
<td>Panel mount kit</td>
<td>K9643KC</td>
<td>Optional</td>
</tr>
<tr>
<td>Activated carbon filter</td>
<td>K9643KH (Rc1/4), K9643KJ (1/4NPT)</td>
<td>Optional</td>
</tr>
</tbody>
</table>

### Consumables

<table>
<thead>
<tr>
<th>Item</th>
<th>Part no. and rating</th>
<th>Qt'y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated carbon filter element kit (15 times replacement)</td>
<td>K9643KK</td>
<td>1</td>
</tr>
<tr>
<td>Filter kit (5 times replacement)</td>
<td>K9643KL</td>
<td>1</td>
</tr>
<tr>
<td>Sensor assembly (including O-ring)</td>
<td>K9643KG</td>
<td>1</td>
</tr>
<tr>
<td>Snap ring (retainer)</td>
<td>Y9011EV</td>
<td>1 (*)</td>
</tr>
<tr>
<td>Plate</td>
<td>K9213FB</td>
<td>1</td>
</tr>
<tr>
<td>Filter</td>
<td>K9643FB</td>
<td>1</td>
</tr>
<tr>
<td>Snap ring plier</td>
<td>K9643ZE</td>
<td>1</td>
</tr>
</tbody>
</table>

(*) Qt'y of 10 pieces or more can be purchased.
External Dimensions

Panel mount type with built-in pump or no suction device (OX400-□-□-□-M/P)

Panel mount type with aspirator (OX400-□-□-□-M/P)

Note: Pump ON/OFF switch; when no suction device [□-□] is specified for the sampling method, this switch is not installed.

For the notes on panel mounting, see page 6.
Desktop type with built-in pump or no suction device (OX400-□-□-□-□-M)

For the notes on panel mounting, see page 6.

Note: Pump ON/OFF switch; when no suction device [-N] is specified for the sampling method, this switch is not installed.

Desktop type with aspirator (OX400-□-□-□-□-M)

For the notes on panel mounting, see page 6.
Notes on panel mounting
1. Make sure the bottom supports do not block the ventilation outlet on the bottom panel of the measuring instrument.
2. Maintain at least 100 mm of free space around the measuring instrument in order to ensure adequate ventilation.
3. Make sure the panel is at least 2 mm thick.

Notes on desktop type installation
Hot air is discharged from the air outlet on the rear panel of the OX400. Maintain at least 100 mm of free space around the OX400 to ensure adequate ventilation.

Activated carbon filter of option code “/A”
K9643KH: Rc1/4
K9643KJ: 1/4NPT

Maintenance space
The filter holder including piping connection can be moved upward to replace a filter element.

Maintenance space
The filter holder including piping connection can be moved downward to replace a filter element.

Sample gas outlet
(Rc1/4 or 1/4NPT)

Sample gas outlet
(Rc1/4 or 1/4NPT)

Maintenance space
The filter holder including piping connection can be moved upward to replace a filter element.

Maintenance space
The filter holder including piping connection can be moved downward to replace a filter element.

Unit: mm
29.5
10
47

Fixing holes
2-Φ6.5 holes

Piping Diagram

Built-in pump (Sampling method [-P])

P
Heater

Sample gas
IN

Flow meter

Suction pump

Restriction

Oxygen sensor

Pipe connection
Rc1/4 or 1/4NPT

IN

OUT

Sample gas

Filter1

Filter2

Throttle valve
(Operable from the front panel)
With aspirator (Sampling method [-A])

Sample gas

Air or N₂ supply gas

inlet Φ6 connector

Aspirator

OUT Φ8 connector

Oxygen sensor

Throttle valve

(Filter2)

Filter1

Heater

Restriction

Flow meter

Note: If no suction device [-N] is specified, the aspirator is removed from this diagram.

Wiring Diagram

OX400 Rear Terminal (M3 screw)

PUMP OFF

DO

FAIL

Alarm

(Oxygen concentration high/low)

Contact output

Error (Fail)

Contact output

Range marker

Contact output

Power cord (two-pole plug with earthing contact)

Primary output

(4 to 20 mA DC)

Secondary output

(0-1/0-5/0-10 V DC)

mA

G

V

Note 1: Use the earthing contact of power cord to ground to earth. Use the supplied power cord only.

Note 2: Ground the measurement output signal line shield on the receiving side. The G-terminal is connected to a ground pin. Use this if the line shield cannot be grounded on the receiving side. Be very careful not to ground the line at two points.

Note 3: The signal output and contact input cable must be no longer than 30 m for CE marking. RS232 cable must be no longer than 3 m.

The following terminals are added for the multi-selector “/MS” option. The customer needs to supply a switching device and carry out the necessary wiring.
Specifications Inquiry Sheet for OX400 Low Concentration Zirconia Oxygen Analyzer

Please place checkmarks (✓) in the pertinent boxes and filling in the blanks.

1. General information
Name of your company: ________________________________
Name of inquirer: _____________________ Dept. or sect.: ________ (telephone: ____________ )
Name of plant: _____________________________________
Measuring point: ______________________________________
Purpose of use: □ Indication □ Record □ Alarm □ Control
Power supply: ___________________ V AC_______ Hz

2. Process conditions
(1) Measuring gas components: ______________________________
(2) Oxygen concentration: _________ to _________ , normally _________ □ ppm O₂ □ vol%O₂
(3) Temperature: _________ to _________ , normally _________ [°C]
(4) Pressure: _________ to _________ , normally _________ [Pa]
(5) Gas flow: _________ to _________ , normally _________ [ml/min]
(6) Dust: No dust □ Dust type ______________ Size to ________ [μm] Quantity ____________ [g/Nm³]
(7) Other remarks: __________________________________

3. Installation environment
(1) Ambient temperature: _________ to _________ [°C]
(2) Vibration: No vibration □ Vibration____________________
(3) Installation: □ Desktop □ Built-in □ Others____________________
(4) Sampling method: □ Pump □ Aspirator □ No suction device____________________

4. Specification requirements
(1) Measuring range: _________ to _________ , normally _________ □ ppm O₂ □ vol%O₂
(2) Output signal: 4-20 mA DC □ 0-1 V □ 0-5 V □ 0-10 V DC
(3) Multi selector function (switching of measurement flow path): □ Without □ With
(4) Other remarks : ________________________________