

# General Specifications

Model OX400  
Low Concentration  
Zirconia Oxygen Analyzer

GS 11M10B01-01E

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% O<sub>2</sub>. 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 N<sub>2</sub>, 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 O<sub>2</sub> to 0-100 vol% O<sub>2</sub>.

**Resolution:** 0.01 ppm O<sub>2</sub>.

**Display:** 4 digit LED.

**Main display:** O<sub>2</sub> 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-□□□ ppm, 0-□□□□  
ppm, 0-□□%, 0-□□□%, □ is an 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: 550 Ω)

**Secondary:** Select from 0-1, 0-5, 0-10 V DC  
(load resistance: 10 kΩ or greater)

**Contact output:** 3 outputs,

Error, O<sub>2</sub> 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, O<sub>2</sub>  
concentration upper/lower, over range.

### Serial communication

**Comm. signal:** RS-232, one way  
**Baud rate:** 38,400 bps  
**Data (ASCII):** O<sub>2</sub> 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

CE, UKCA:	EN61010-1
CSA:	CAN/CSA-C22.2 No. 61010-1
UL:	UL Std. No. 61010-1
GB:	GB30439 Part1

## EMC

CE, UKCA:	EN 61326-1 Class A, Table 2 EN 61326-2-3, EN 61000-3-2, EN IEC 61000-3-2, EN 61000-3-3
RCM:	EN61326-1 Class A, Table 2
KC:	Korea Electromagnetic Conformity Standard

## Environmental regulation

RoHS:	EN IEC 63000
REACH:	Regulation EC 1907/2006

Waste Electrical and Electronic Equipment (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 and UK.

Installation altitude: 2000 m or less  
Category based on IEC 61010: II (Note)  
Pollution degree based on IEC 61010: 2 (Note)

Note: Installation category, called over-voltage category, specifies impulse withstand voltage. Category II is for electrical equipment.  
Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 is the normal indoor environment.

**Characteristics**

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

**Model and Suffix Codes**

[Style: S2]

Model	Suffix Code	Option Code	Description
<b>OX400</b>	.....	.....	Low Concentration Zirconia Oxygen Analyzer
Power supply (*1)	-5 -3	.....	100-120 V AC 200-240 V AC
Sampling method	-P -A -N	.....	Built-in pump With aspirator No suction device
Line connection	R T	.....	Rc 1/4 1/4 NPT
User's manual	-J -E	.....	Japanese English
Power cable (*1)	-D -F -H -Q -R -T	.....	UL/CSA cable (2 m) VDE cable (2.5 m) GB cable (2.5 m) BS cable (2 m) SAA cable (2.5 m) BSMI cable (2 m)
Option	Mounting hardware Multi selector function Filter	/P /MS /A	Panel mount Multi selector function Activated carbon filter (*2)

- \*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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**Accessories**

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

**Consumables**

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

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



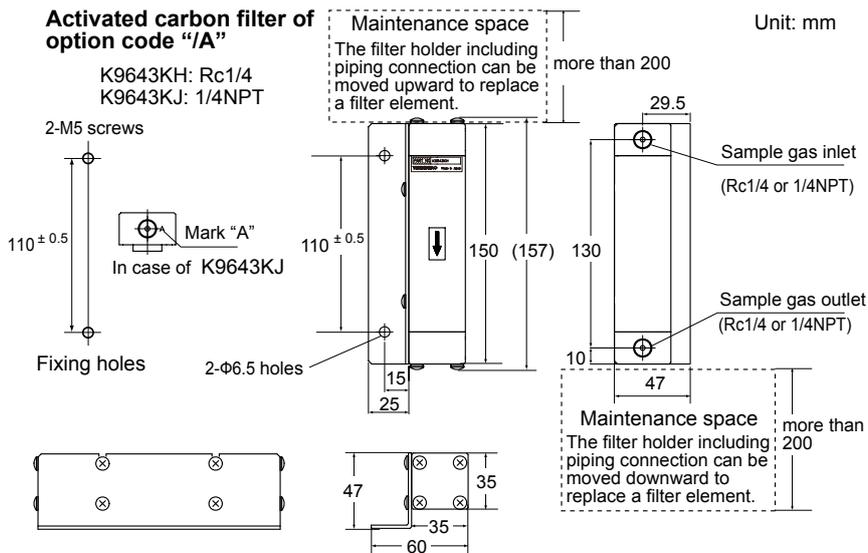


### Notes on panel mounting

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.

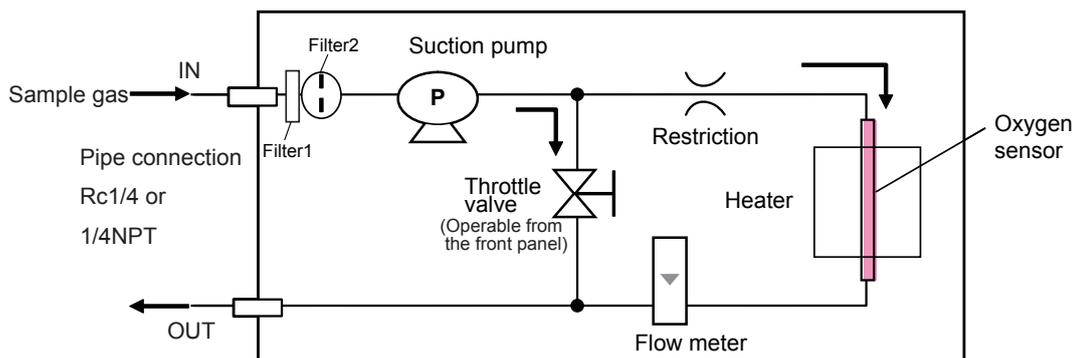
### Notes on desktop type installation

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.

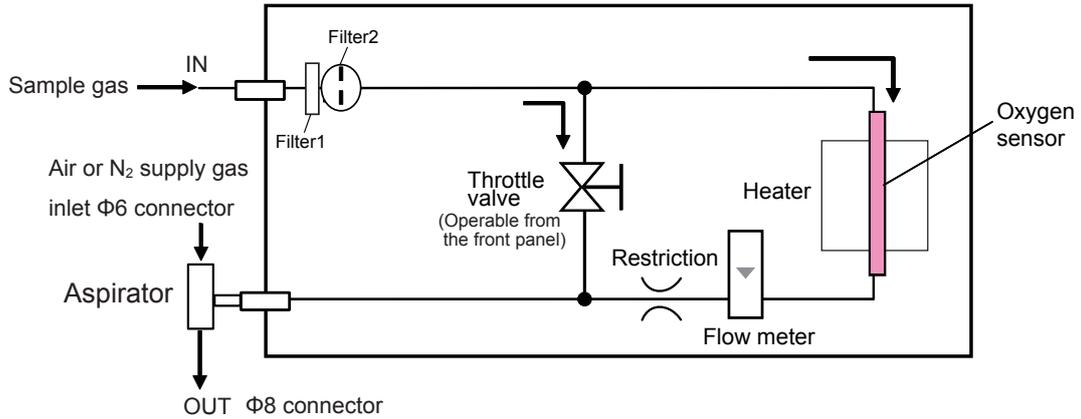


### Piping Diagram

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

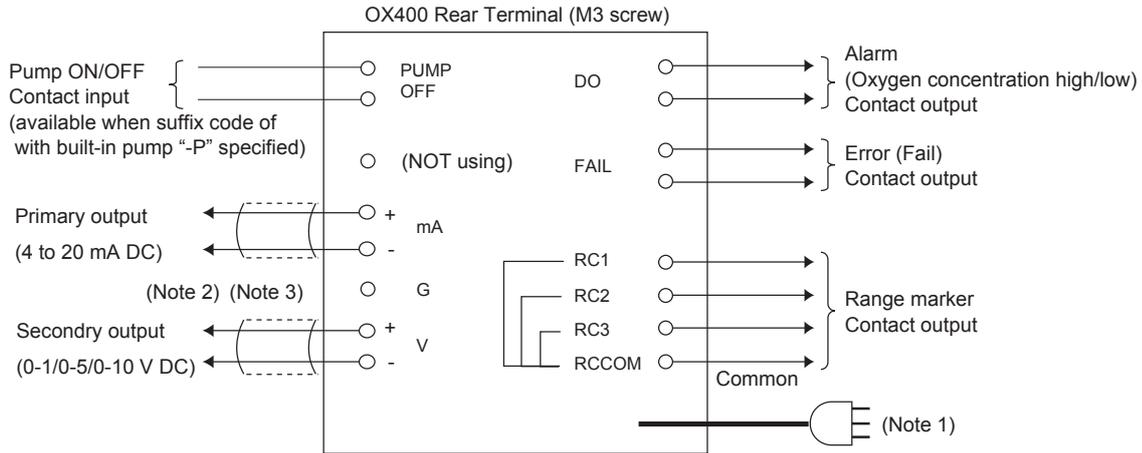


**With aspirator (Sampling method [-A])**



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

**Wiring Diagram**



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

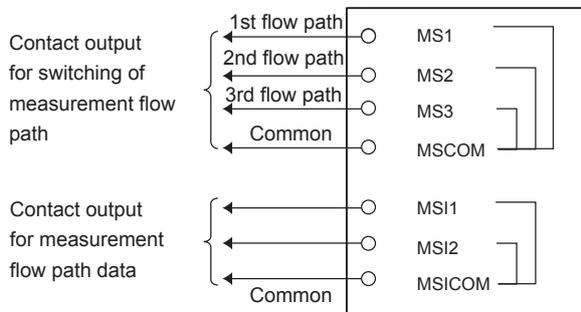
Note 2: Ground the measurement output signal line shield on the receiving side.

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 O<sub>2</sub>  vol%O<sub>2</sub>

(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/Nm<sup>3</sup>]

(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 O<sub>2</sub>  vol%O<sub>2</sub>

(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 : \_\_\_\_\_