
**User's
Manual**

**OX100
General-Purpose Oxygen Analyzer**

IM 11M10A01-01E

vigilantplant.™

Safety Precautions

This Analyzer is designed for instrument panel or rack mounting.

To ensure safe operation of this instrument, strictly observe the following safety instructions during operation, maintenance and servicing. Yokogawa will not be responsible or liable for damage caused by not following these instructions when using the instrument.

• Symbols

The following graphical symbols are used in this manual.



WARNING

Emphasizes instructions that must be observed – or electric shock and injury to, or death of, personnel could result.



CAUTION

Emphasizes instructions that must be observed – or damage to hardware, software or system crashes, could result.



NOTE

Emphasizes points that require special attention in understanding the operation and functions.

Notes on Instruction Manuals

- Please pass on the Instruction Manuals to the end user.
- Please read the manual thoroughly before using the instrument.
- This manual describes the functions of the product in detail; they do not imply any warranty that the instrument will meet the special needs of the user.
- No part of the manual may be reproduced without prior written consent from Yokogawa.
- Yokogawa reserves the right to improve the instrument and manuals at any time, without notice or obligation.
- If you have any questions about the manuals, or feel that there are mistakes or omissions, please contact our sales representative or your local distributor/agent.

Maintenance, Safety, and Product Modification

- In order to protect the system controlled by the instrument, and the instrument itself, and to ensure safe operation, observe the safety precautions described in this manual.
- If any protective or safety circuitry is required for the system used with this instrument, or for the instrument itself, prepare and install it. Do not change the internal parts or circuitry of the instrument in any way.

Disclaimers (Limitation of Liability)

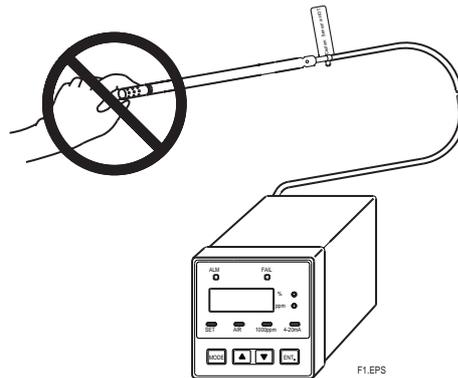
Yokogawa grants no warranties other than the express warranty set forth under the warranty provisions.

Yokogawa shall not be liable to you or any third party for any damage, including consequential or incidental damages, arising out of or in connection with the use of this equipment, defects beyond our knowledge, or any other contingency beyond our control.



High temperature, take care

When the sensor is powered on, the sensor tip gets very hot. Be careful not to touch it.



Power

Be sure to check the power supply voltage before turning on the power.

Grounding

Be sure to connect a Class D (100 Ω or less) ground before turning on the power, to minimize the possibility of shock.

Need for Grounding

Do not cut the internal or external protective ground wire, or remove the ground wire from the terminal. This creates a shock hazard.

Do not Operate without Protective Grounding and Fuse

Do not operate the instrument without protective grounding and correct fuse.

Fuse

For safety, this product is fused internally. It is recommended that you ask the local service representative to change the fuse; do not either change it yourself, or open the case to check the fuse. Turn off the power switch and disconnect the instrument from the power before changing the fuse. Do not use a fuse of different type or size, or short-circuit the fuse holder.

Environmental Restrictions

Danger: Do not use this instrument in a flammable, explosive, or steamy environment. Do not try to measure gases with traces of redox gas, corrosive gas, or organic silicone gas.

Keep Hands Out

While voltage is applied, keep hands out. Internal parts should be replaced by our service representative, or by an authorized person.

External Connections

Before wiring, to minimize the possibility of shock, disconnect power from the instrument. Also check ground connection to this instrument, to the system being measured, and to any associated external control equipment

◆ After-Sales Warranty

- Do not modify the product.
- During the warranty period, for repair under warranty carry or send the product to the local sales representative or service office. Yokogawa will replace or repair any damaged parts and return the product to you.
- Before returning a product for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.
- If we replace the product with a new one, we won't provide you with a repair report.
- Yokogawa warrants the product for the period stated in the pre-purchase quotation. Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the service area, a fee for dispatching the maintenance engineer will be charged to the customer.
- In the following cases, customer will be charged repair fee regardless of warranty period.
 - Failure of components which are out of scope of warranty stated in instruction manual.
 - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa did not supply.
 - Failure due to improper or insufficient maintenance by user.
 - Failure due to misoperation, misuse or modification which Yokogawa does not authorize.
 - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
 - Failure caused by any usage out of scope of recommended usage
 - Any damage from fire, earthquake, a storm and flood, lightning, disturbance, riot, warfare, radiation and other natural changes.
- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa will not bear responsibility when the user configures the product into systems or resells the product.
- Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair this product, please contact the nearest sales office described in this instruction manual.

Notes on Use

- Do not drop or jolt the equipment, or its accuracy may be adversely affected.
- Do not attempt to disassemble the equipment, or it may malfunction.
- As far as possible, install the equipment horizontally. The sensor should be installed securely so that it does not vibrate. Avoid installing the equipment in places where the temperature exceeds 70°C.
- Avoid installing the equipment where it would be exposed to direct sunlight, radiant heat, or the weather, and where vibration exists.
- Avoid installing the equipment in atmospheres containing corrosive gases, gas atmospheres out of measuring scope, or atmospheres where the sensor is exposed to silicone vapor.
- Keep the equipment away from noise-generating devices to minimize the possibility of malfunction, although it is designed to cope with noise.
- The sensor has a limited life, which varies depending on operating conditions. It is strongly recommended that you replace the sensor once a year from a preventive maintenance standpoint, even if sensor deterioration is not observed.
- Keep this instruction manual handy for your quick reference during operation and maintenance.

Restrictions on Use

- Do not use the equipment in atmospheres containing combustible, corrosive, or flue gases, or organic compounds.
- If it is used in silicon gas atmospheres, in flow furnaces or nitrogen reflow furnaces, the equipment must be used in the following system:
- The sampling unit, K9424GA, must be used.
- The sampling unit requires appropriate maintenance, which is determined by gas conditions. Filters and activated carbon packs should be replaced at intervals which depend on the operating conditions.
For best measurement, use new activated carbon packs. Using expired packs may result in invalid measurement results, or even sensor deterioration.
- If you have any questions, please contact your Yokogawa representative.

How to Use This Manual

The structure of this manual is as shown in the table below. This table shows which chapters you are recommended to read when performing the corresponding tasks.

Unpacking installation	Initial setting	Daily operation	Changing settings	Maintenance troubleshooting	Chapter to refer to:
○	○	○	○	○	Safety precautions
○	○	○	○	○	Chapter 1. Overview
○	○	○	○	○	Chapter 2. Installation
	○	○	○	○	Chapter 3. Operation
	○		○	○	Chapter 4. Troubleshooting
				○	Appendix 1. Sampling Unit
				○	Appendix 2. Calibration Gas Kits
				○	CMPL (Parts List)

○ : Read and completely understand before operating the equipment.

○ : Read before operating the equipment, and refer to it whenever necessary.

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1. Overview

1.1 Cautions Regarding Use



CAUTION

- (1) This is a precision instrument; be careful not to drop it.
 - (2) Do not disassemble it, as it may stop operating normally.
 - (3) As far as possible, mount horizontally. Secure the sensor so that it can't vibrate. Avoid installing in places where the temperature exceeds 70°C.
 - (4) Do not mount this instrument in a place that is exposed to direct sunlight, or to direct radiation from a furnace, boiler or the like, in a windy place, or in a location that is subject to vibration.
 - (5) Avoid mounting in a location where there may be corrosive gases, gases other than the measured gas, or organic silicon vapor.
 - (6) Where the furnace gas of a nitrogen reflow furnace contains organic solvent at a few ppm to percentage level, the sensor should be used with the optional sampling system (K9424GA), to avoid contact with the solvent.
 - (7) This instrument was designed to be resistant to electrical noise, but to avoid invalid readings it would be wise to avoid using electrically noisy devices in the vicinity.
 - (8) The sensor is a consumable. Its life depends on usage and environment, but is about one year.
 - (9) Be sure to keep this manual in a handy place when using this instrument.
-

1.2 Standard Specifications

Measured gas: Measures O₂ in N₂ or mixed gases; can't contain silicone vapor, flammable gas or organic solvent.

Measuring principle: Current-limited Zirconia sensor

Measuring range: 0 to 1000 ppm O₂, 0.1 to 25% O₂ (measuring range autoswitching)

Note: If you want an oxygen (concentration) control range of 0.2 to 0.5%, please consult with us, or your Yokogawa salesperson or representative.

Sampling method: Natural diffusion (direct input)

Linearity : ±5% of span (for 0-1000 ppm range, with O₂ being in the range 0 to 100 ppm). ±3% of span (for 0-1000 ppm range, with O₂ being in the range 100 to 1000 ppm). ±2% of span (for 0.1 to 25% range, with O₂ being in the range 100 to 1000 ppm).

Repeatability : ±5% of span (for 0-1000 ppm range, with O₂ being in the range 0 to 100 ppm). ±2% of span (for 0-1000 ppm range, with O₂ being in the range 100 to 1000 ppm). ±2% of span (for 0.1 to 25% range, with O₂ being in the range 100 to 1000 ppm).

Stability (Drift): ±2% of span per week.

Display: LED digital display

Output signal: 4-20 mA DC isolated (measuring range: 0 to 1000 ppm or 0.1 to 25%).

Contact outputs (relay) : Closed if fail, contact rating 250 V AC / 3A

Closed if alarm, contact rating 250 V AC / 3A.

Operating temperature range: Sensor 0 to 250°C (within 5 cm of tip, the rest 0 to 70°C)

Converter 0 to 50°C

Measurement gas conditions: Atmospheric pressure, temperature 0 to 70°C, gas flow up to 1 m/s, no corrosive gases like SO₂ (can't be used in atmosphere with flammable gases, corrosive gases, or silicone vapor).

Power consumption: up to 15 VA.

Power supply : 100 V AC ±10% 50/60 Hz.

Weight : Body approx. 600 g, sensor approx 150 g.

Accessories : Oxygen sensor assembly (1), nipple (1), bracket (2), extension cable (1), instruction manual (1), warranty CARD (1)

1.3 MS Code

- OX100 Current limited Zirconia Oxygen Analyzer

Model	Standard Code	Specifications
OX100	General purpose Oxygen analyzer
Application	-1 -2 -3	Oxygen analyzer (Can't use an activated carbon filter) *1 For (N ₂) reflow furnace (Specify in case of using an activated carbon filter) *1 Monitoring for deficiency of Oxygen with low alarm, Measuring range 0-25%
Measuring Range	1	0-1000 ppm/ 0-25% O ₂
Power Supply	5	100 V AC ± 10%, 50/60 Hz
Sensor	1 N	Sensor assy. cable 3m + extension 2 m No sensor assembly
Manual	J E	Japanese English

L9811LA plastic resin sensor holder is provided as standard accessory.

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*1 For measurement in the range of 1500 to 4500 ppm, use the OX102.

- Sampling unit, calibration kit

Part Number	Description
K9424GA	Sampling unit
K9424JA	Calibration kit: 1000 ppm, 6 cylinders (1L) + needle valve assembly, with flow adjustment
K9424JB	Calibration kit: 1000 ppm, 6 cylinders (1L) + needle valve assembly, without flow adjustment
K9424JR	Calibration kit: 10000 ppm, 6 cylinders (1L) + needle valve assembly, with flow adjustment
K9424JS	Calibration kit: 10000 ppm, 6 cylinders (1L) + needle valve assembly, without flow adjustment

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- Accessories

Part Number	Description
K9346WM	Activated carbon element (5 pieces/pack), for sampling unit
K9424JC	Needle valve assembly, with flow adjustment
K9424JD	Needle valve assembly, without flow adjustment
K9424JP	1000 ppm O ₂ calibration gas, 1L x 6 cylinders/box
K9424JQ	10000 ppm O ₂ calibration gas, 1L x 6 cylinders/box
K9424BA	Sensor assy. cable, 3 m for OX100 only
K9424CA	Extension cable, 2 m: for OX100 only
B9877BA	Bracket for mounting OX100, two per set.
K9424DB	Metal nipple, Rc1/4, for measuring range of 0-100 ppm
L9811LA	Plastic nipple, 17 mm O.D. or G3/8 hole, for measuring range 0-1000 ppm or greater
K9424GQ	Disk filter
K9346WH	Felt filter

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1.4 External Dimensions

Instrument Body

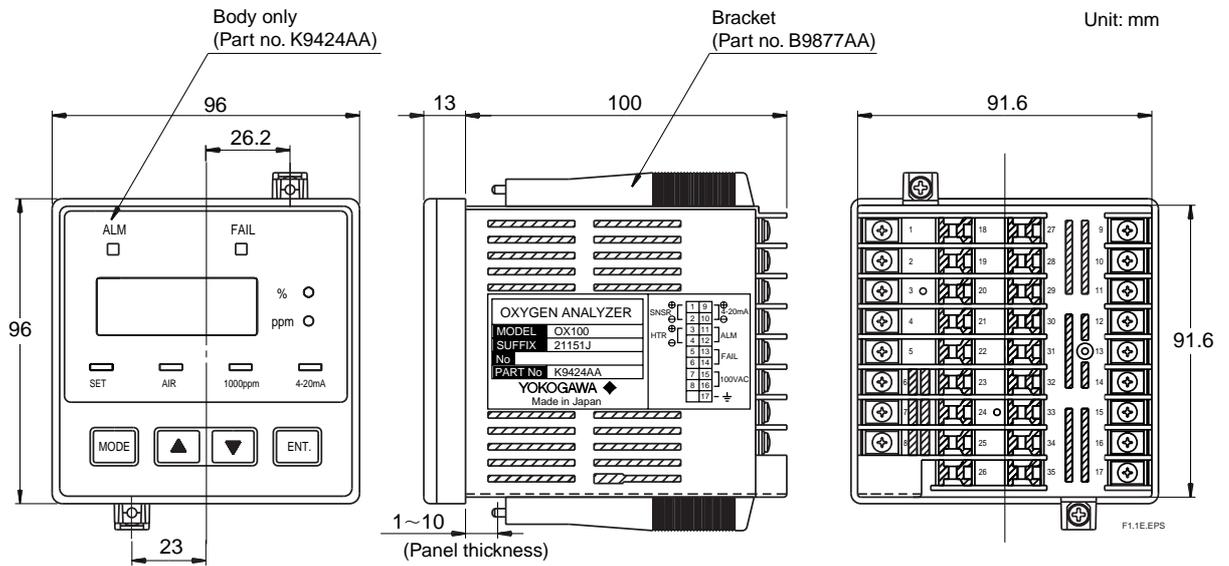
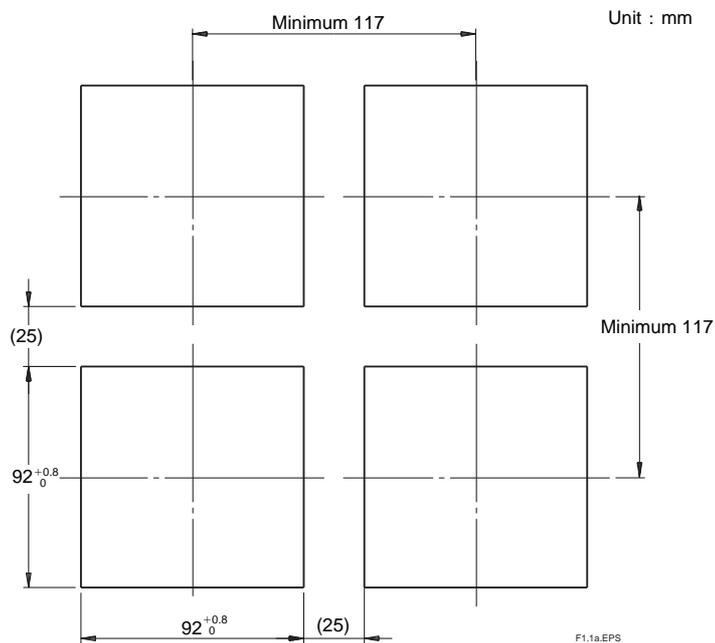


Fig. 1.1 External Dimensions of Instrument

Panel Dimensions



Sensor

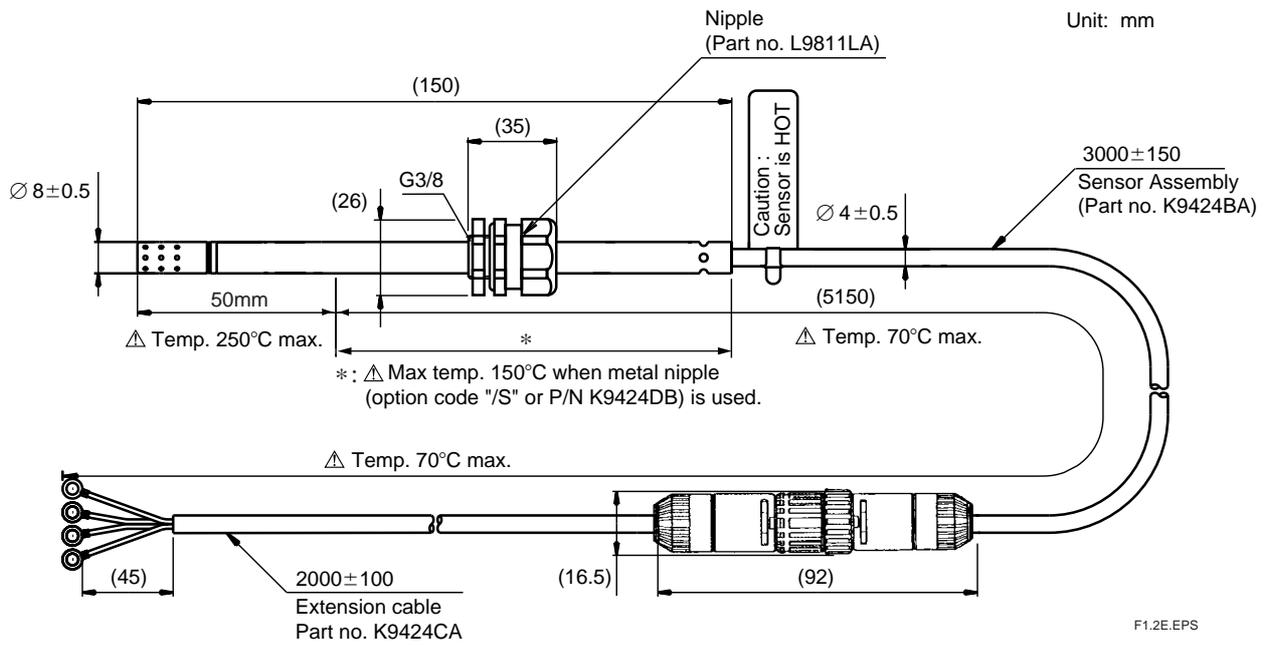


Figure 1.2 Sensor dimensions

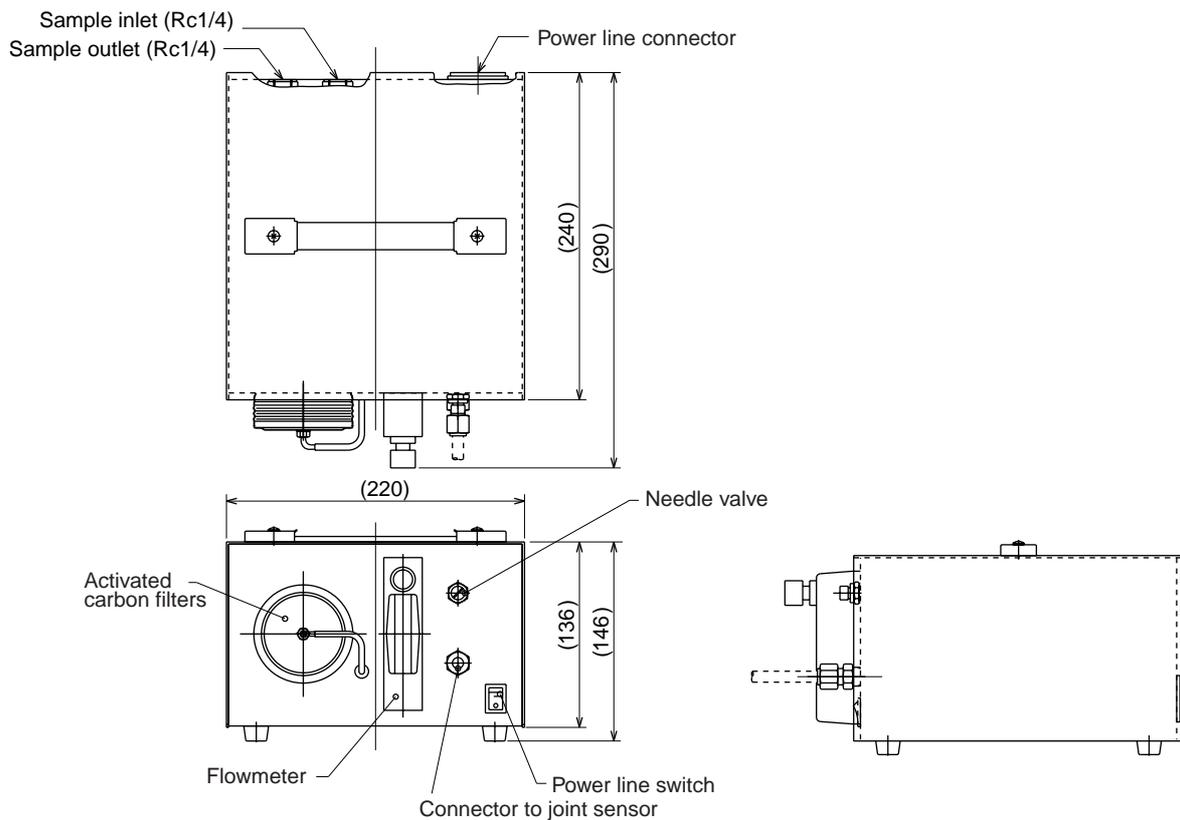
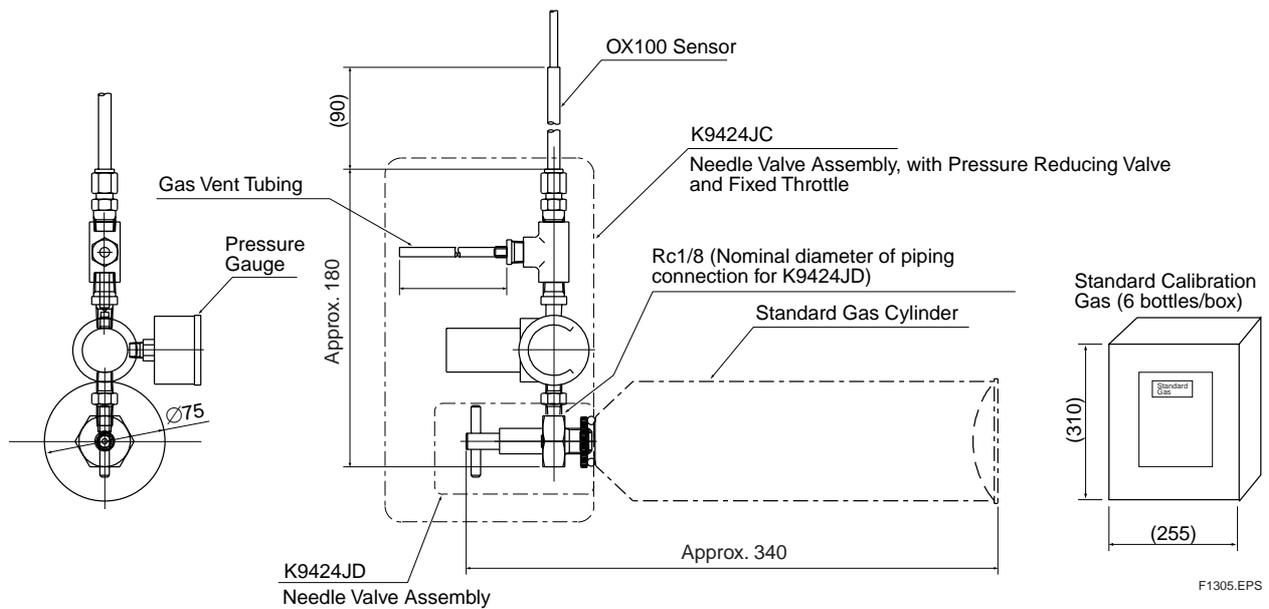


Figure 1.3 Sampling unit

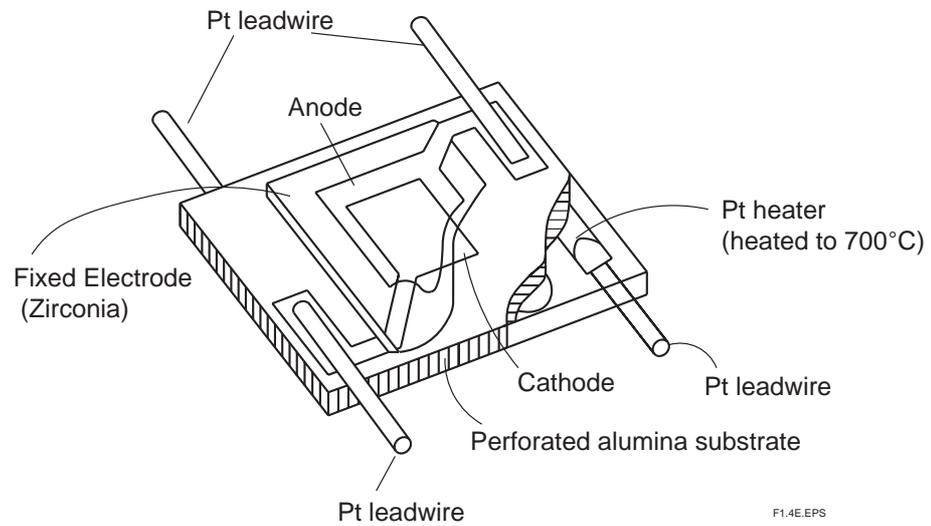


Part Number	Description
K9424GA	Sampling unit
K9424JA	Calibration kit: 1000 ppm, 6 cylinders (1L) + needle valve assembly, with flow adjustment
K9424JB	Calibration kit: 1000 ppm, 6 cylinders (1L) + needle valve assembly, without flow adjustment
K9424JR	Calibration kit: 10000 ppm, 6 cylinders (1L) + needle valve assembly, with flow adjustment
K9424JS	Calibration kit: 10000 ppm, 6 cylinders (1L) + needle valve assembly, without flow adjustment

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Figure 1.4 Calibration Kit (Optional)

1.5 Sensor Operating Principles



Current flowing in the Zirconia fixed electrolyte causes oxygen to move from the negative to positive electrode (acts as an oxygen pump). If the flow of oxygen to the negative electrode is restricted by the alumina substrate then a current saturation area is created and the same current flows regardless of the applied voltage. The current that flows is called the limiting current. When a fixed voltage is applied, the current flow is proportional to the oxygen concentration.

2. Installation

2.1 Names and Functions of Parts

2.1.1 Sensor

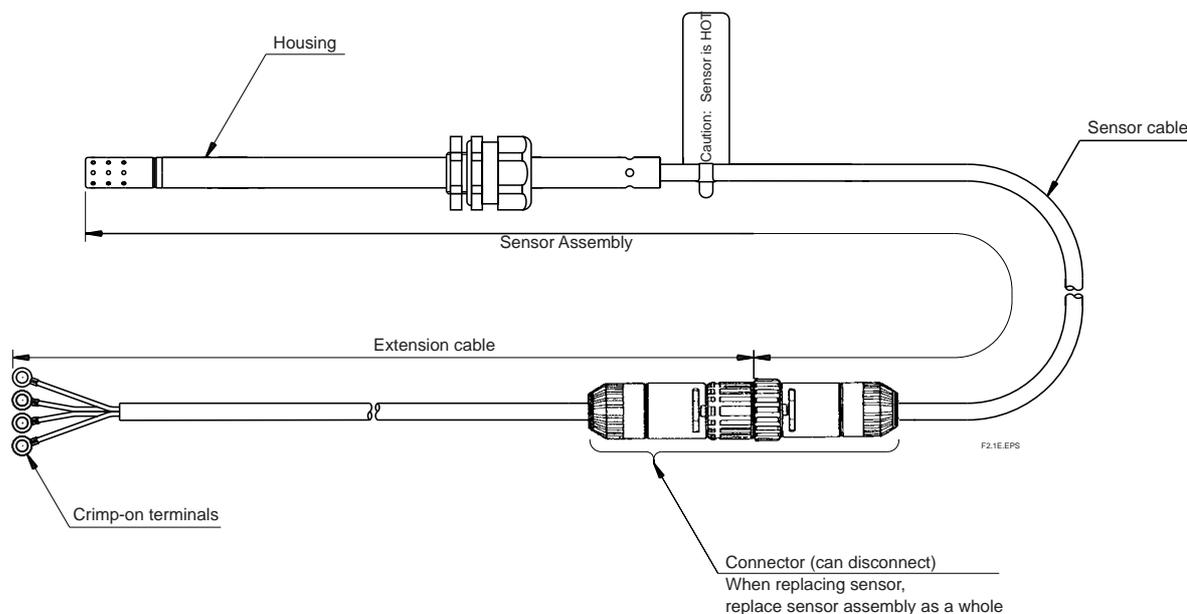


Figure 2.1 Oxygen sensor

2.1.2 Instrument Body

Display panel

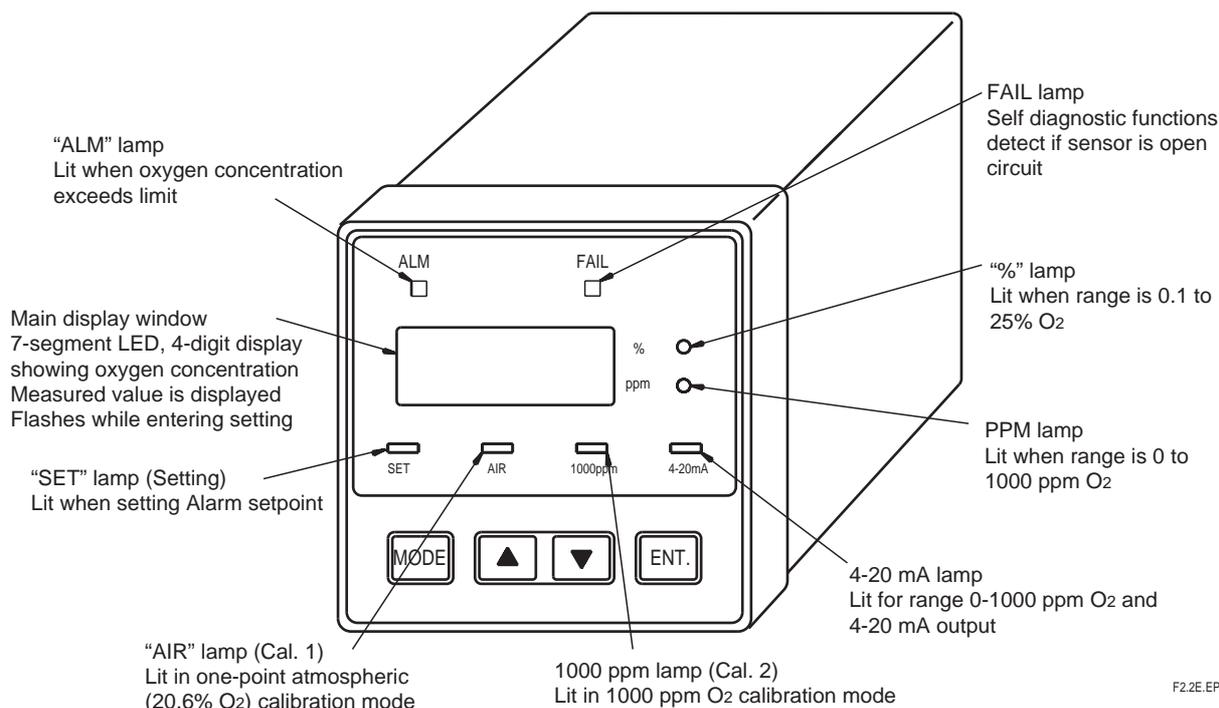


Fig. 2.2 Display panel

Terminal layout

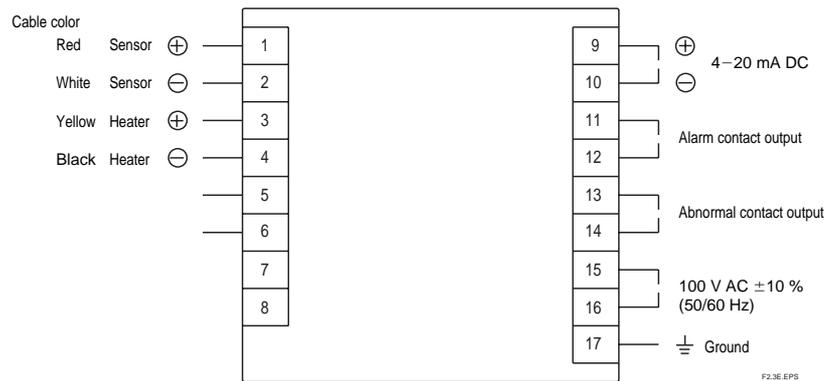


Figure 2.3 Terminal layout

Operation Key Panel

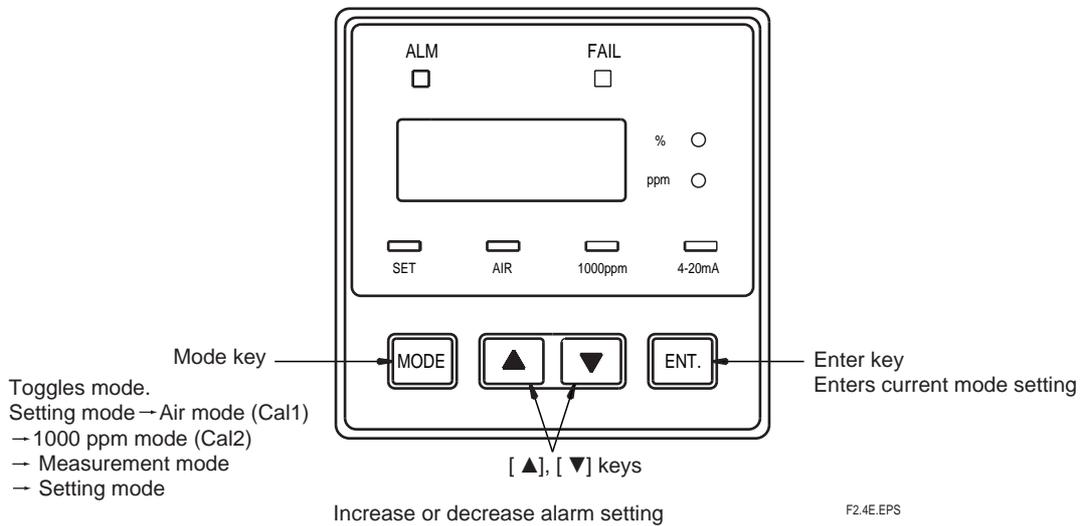


Figure 2.4 Operation Keys

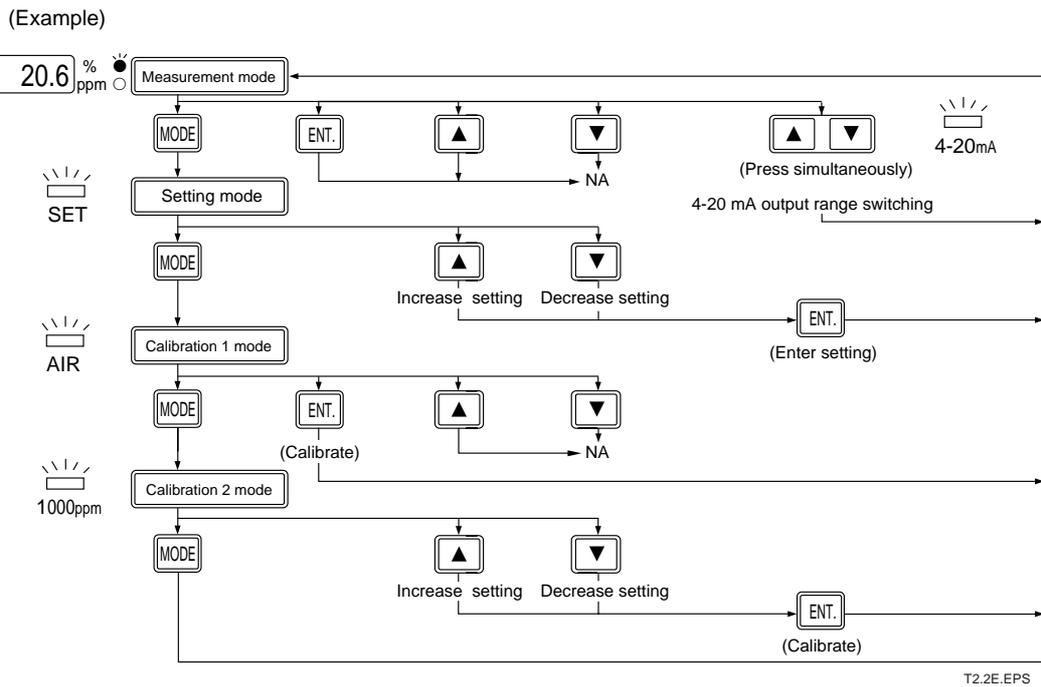
Mode Sequence

Key SW	Measurement mode (Normal measurement) Oxygen concentration is displayed on main display.	Setting mode (Alarm setting) Can set high alarm in range 0 to 25% O ₂ .	Cal1 mode Atmosphere (20.6% O ₂) Calibrate in atmosphere.	Cal2 mode (1000 ppm) Calibrate with 1000 ppm O ₂ for better accuracy at low concentrations.
[MODE]	Switch to setting mode →	Switch to Cal1 mode →	Switch to Cal2 mode →	Switch to measure
[▲]	NA	Press both to switch to 4-20 mA output range	Increase setting	NA
[▼]	NA	Decrease setting	NA	Decrease setting
[ENT.]	NA	Enters setting and switches to measure.	Starts calibration. At end, switches to measure.	Starts calibration. At end, switches to measure.

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State Transition Flow Chart

(Example)



2.2 Installation Location for the Instrument

Install in a location that meets the following requirements:



CAUTION

- (1) Instrument panel or rack
This product should be mounted on an instrument panel or in a rack.
 - (2) Well-ventilated location
To keep instrument cool, mount in a well-ventilated location
 - (3) Location with minimal vibration
Install in a location with minimal vibration.
Instrument accuracy may be affected if the installation location is subject to vibration.
 - (4) Horizontal location
As far as possible, the installation location should be horizontal.
-

Avoid locations with the following conditions:



CAUTION

- (1) In direct sunlight or near hot objects
Choose an installation location with stable temperature (around ambient 23°C).
Placing this instrument in direct sunlight or near hot objects may adversely affect accuracy.
 - (2) Location with oily smoke, warm or humid air, dust, corrosive gas
Avoid such locations.
 - (3) Near a source of electromagnetic fields
Electromagnetic fields may affect the accuracy of the instrument.
-

2.3 Installing the Instrument

CAUTION

- (1) The panel on which the instrument is mounted should be steel plate between 1 mm and 10 mm thick.
 - (2) Insert the instrument from the front of the panel.
 - (3) As shown in Fig. 2.5, mount this instrument on the panel using the supplied brackets. The brackets mount on the top and bottom of the case at the specified positions (see Fig. 1.1 External Dimensions of Instrument).
 - (4) Tighten the mounting bracket screws until they touch the panel, then tighten half a turn.
-

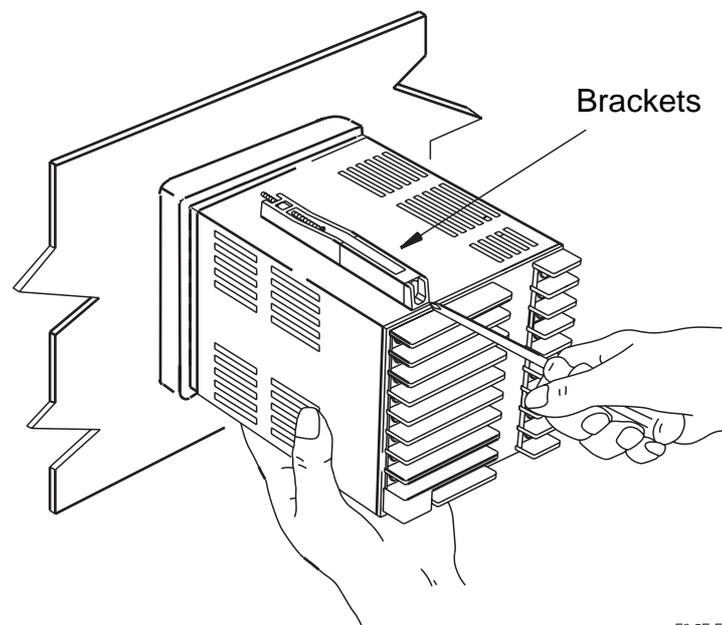


Figure 2.5 Mounting

CAUTION

Over-tightening the screws may distort the case or damage the brackets.

2.4 Wiring

Be sure to read the following sections 2.4.1 and 2.4.2 before wiring this instrument.

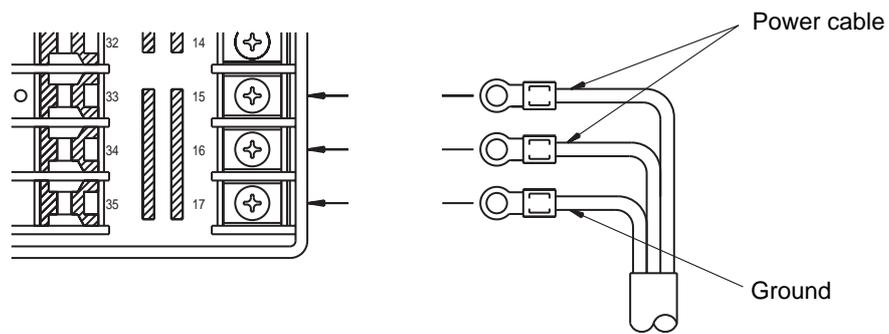
WARNING

Secure all wiring behind the panel, to protect the ends of the wires and the terminals if the cable is pulled.

2.4.1 Power Wiring

CAUTION

Connect 100 V AC power to terminals 15 and 16 on the rear terminal strip. Ground terminal 17.

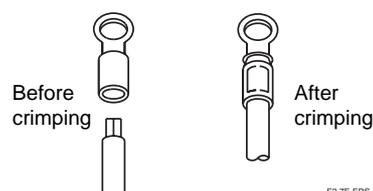


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Figure 2.6 Power wiring

WARNING

- To minimize the possibility of electrical shock, ensure that power source is off before wiring power cable.
- To minimize the possibility of fire, use 600 V rated heavy vinyl insulated cable (JIS C 3307) or similar for power wiring.
- Before applying power, connect the ground terminal to a ground connection with ground resistance of 100Ω or less.
- Use crimp-on terminals (4 mm screw) and heat-shrink insulating sleeves on power and ground wiring. (See Fig. 2.7 for illustration of crimp-on terminals).
- The power connection to this instrument should have a switch in it, for safety reasons.
- When wiring, be careful not to drop strands of wire or wire clippings into the instrument.



F2.7E.EPS

Fig. 2.7 Crimp-on terminals

2.4.2 Connecting to an External Instrument



CAUTION

This instrument provides three outputs: 4 to 20 mA DC (signal), “Alarm” contact, and “Fail” contact.

- 4 to 20 mA DC output from terminals 9, 10: corresponds to O₂ concentration display range 0 to 1000 ppm or 0.1 to 25%. Refer to Section 3.4 below for range setting.
 - Alarm contact output from terminals 11, 12: relay contact closes if concentration exceeds alarm setting.
 - Fail contact output from terminals 13, 14: relay contact closes if sensor heater element goes open circuit.
-



WARNING

- To minimize the possibility of electrical shock, ensure that power source is off before wiring power cable.
-

2.5 Installation of Sensor

CAUTION

- Use the nipple provided as an accessory, mount it horizontally and secure it so that it cannot vibrate.
- When tightening, for cap use torque of 1 to 1.5 N • m, and for other items use torque of 2 to 2.5 N • m

WARNING

- Sensor cable should be within 30 cm of sensor housing, and angle of bend (see figure below) should not be greater than 60°.
- When mounting sensor through a 17 mm hole, mounting plate should be no greater than 4 mm thick.

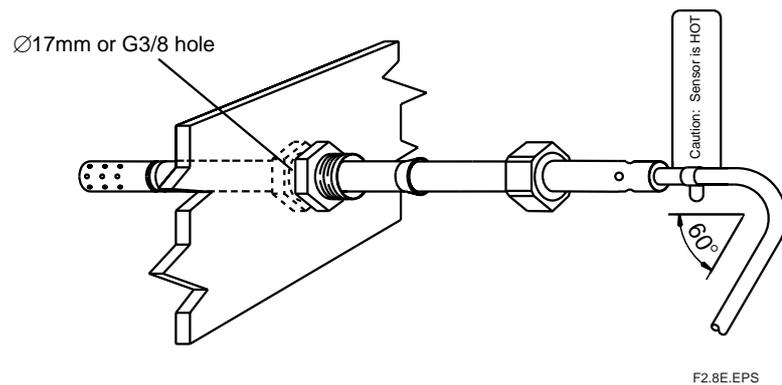


Figure 2.8 Installation of Sensor

2.6 Installing the Optional Sampling Unit (K9424GA)

The sampling unit is a desktop type and should be installed on a stand near the sampling point.

Note the following when installing the unit.

NOTE

The unit should be installed in places where:

- Ambient temperature is in the range of 0 to 40°C and temperature fluctuations are minimal.
 - Mechanical vibration is negligible.
 - Adequate space for inspection and maintenance, such as replacing filter element, is secured.
 - The unit should be securely mounted on a stand to prevent it falling.
 - No exposure to rain or water is allowed.
-

The sampling unit incorporates a suction pump, which requires power supply of 100-240 V AC

The sampling unit comprises membrane filters, suction pump, flowmeter and activated carbon filter to absorb organic solvents. When a sample gas contains organic solvents, use this sampling unit to filter out such solvents. The expected life of the activated carbon filter is approximately 50 hours when a sample gas contains 500 ppm of isopropyl alcohol and flows at 500 ml/min.

Used eight hours a day, suction pump life will be approximately one year..

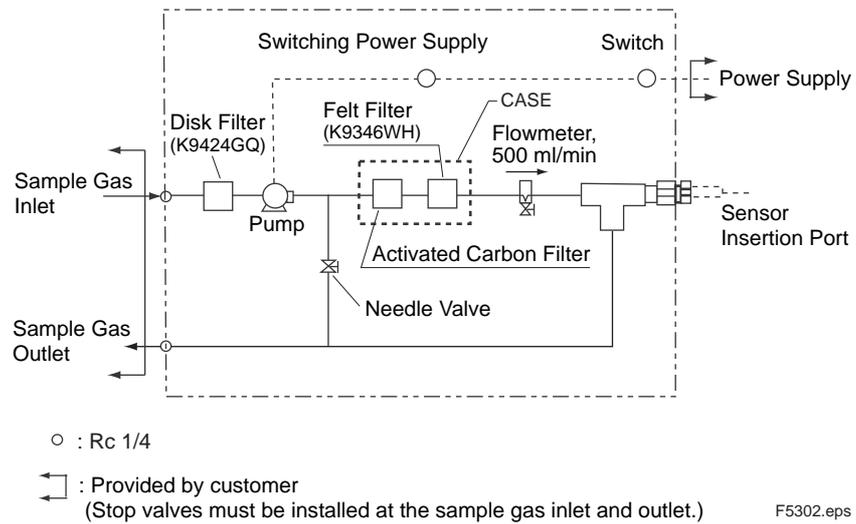
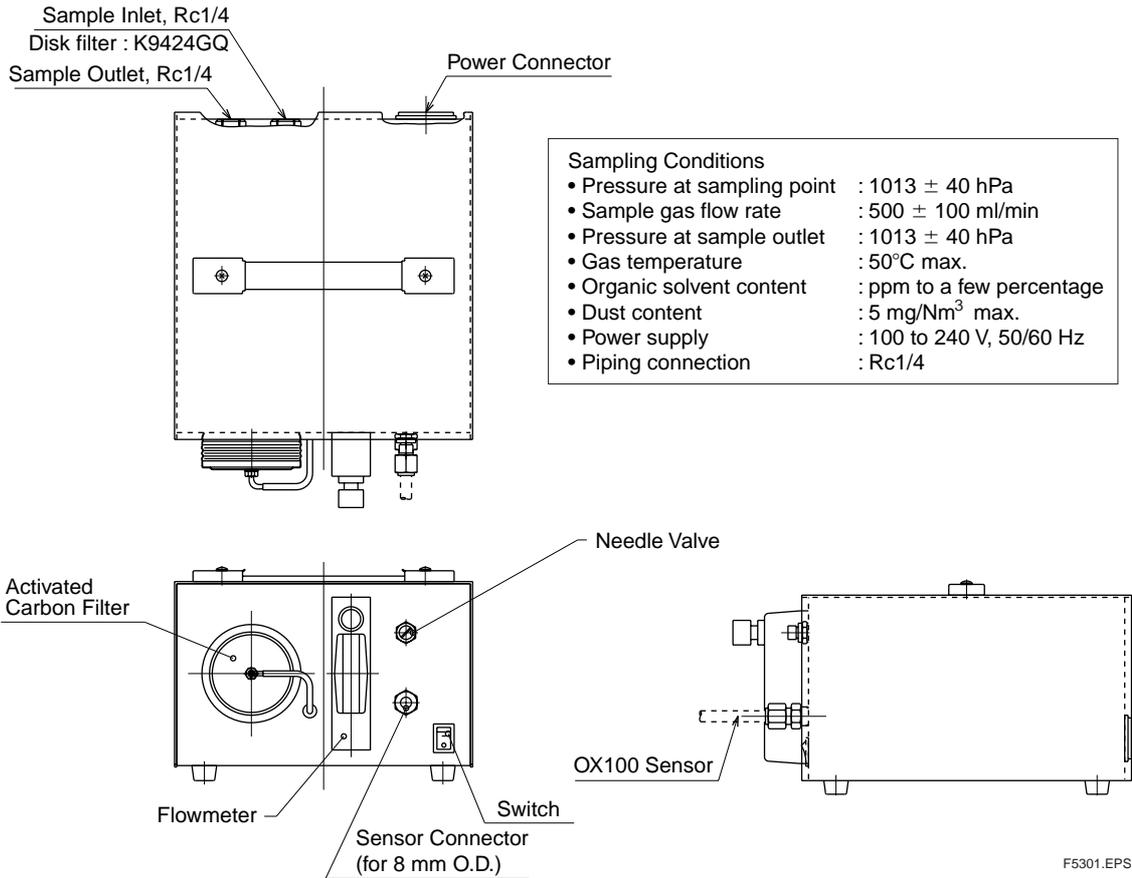
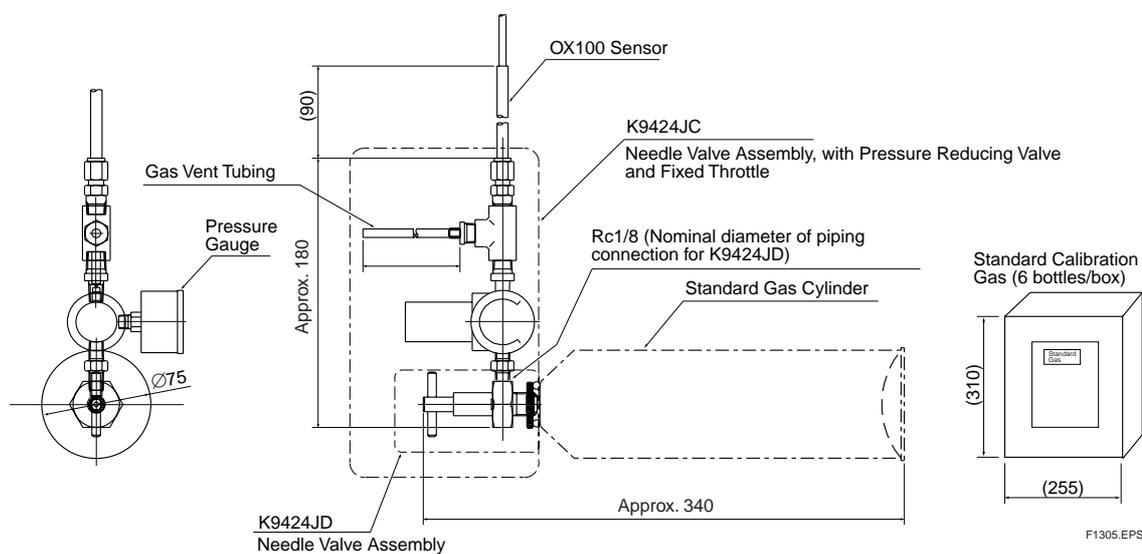


Figure 2.9 Sampling Unit (K9424GA, Optional)

2.7 Calibration Kit (Optional)

The calibration kit for the OX100 oxygen analyzer comprises a standard gas cylinder and pressure regulating valve to supply standard gas for calibration, when necessary.



Part Number	Description
K9424GA	Sampling unit
K9424JA	Calibration kit: 1000 ppm, 6 cylinders (1L) + needle valve assembly, with flow adjustment
K9424JB	Calibration kit: 1000 ppm, 6 cylinders (1L) + needle valve assembly, without flow adjustment
K9424JR	Calibration kit: 10000 ppm, 6 cylinders (1L) + needle valve assembly, with flow adjustment
K9424JS	Calibration kit: 10000 ppm, 6 cylinders (1L) + needle valve assembly, without flow adjustment

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Figure 2.10 Calibration Kit



CAUTION

Shelf life of gas cylinder

The shelf life of a calibration gas shall be one year from the manufacturing date specified on the label of the cylinder. Yokogawa shall not guarantee accuracy of the equipment, if it is calibrated with an expired calibration gas.



NOTE

Calibration gases are not available from Yokogawa. Consult with local suppliers.

3. Operation

3.1 Calibration

- As described below, calibrate the span immediately before starting a measurement.
 - (1) Before using the 0 to 1000 ppm O₂ range, perform one-point calibration with calibration gas of concentration between 700 and 1300 ppm O₂.
 - (2) Before using the 0.1 to 25% O₂ range, perform one-point calibration with atmospheric air.
 - (3) If you will be using both ppm and % ranges, be sure to calibrate the ranges in the following order: first perform one-point calibration with air, then 1000 ppm O₂ calibration.
- Before calibrating, turn on the power and allow the OX100 to warm up for at least 10 minutes then perform air cleaning.
- Before measuring on the 0 to 1000 ppm O₂ range, use standard gas of concentration 950±50 ppm O₂ for span calibration.

3.1.1 One-point Calibration in Atmospheric Air (Span Calibration)

Press the Mode key twice, and confirm that the “Air” lamp is lit.

Supply cleaning air to the sensor, and then press the ENT key. This completes 20.6% O₂ calibration, and returns the instrument to measurement status (the display indicates the O₂ concentration).



CAUTION

If calibration fails, and the ALM lamp lights for two seconds, replace the sensor (part no. K9424BA).

3.2 Alarm Setting



CAUTION

- Press the [MODE] key one time, and confirm that the “SET” lamp is lit.
 - To set 300 ppm O₂, for example, operate the [▲] [▼] keys so as to display 300 (ppm). Next press the [ENT] key to set this value, and the instrument enters measurement mode. If you press the [MODE] key by mistake, then the instrument enters calibration mode. Entering 0 (ppm) releases **Alarm Setting** .
-

3.3 Alarms and Alarm Output

If the O₂ concentration reaches the High Alarm setting entered in Section 3.2 above, then the “ALM” lamp lights, and the alarm output contact between terminals 11, 12 turns ON.

3.4 Setting 4 to 20 mA DC Output

When the 4-20 mA lamp is lit, this indicates that range is 0 to 1000 ppm O₂ and output is provided as a 4-20 mA DC output signal corresponding to 0-1000 ppm. Press the [▲] and [▼] keys simultaneously to toggle 4-20 mA lamp ON and OFF. When the lamp is OFF, the 4-20 mA DC output signal corresponds to 0.1% to 25% O₂.

4. Troubleshooting

Possible abnormal symptoms, and corresponding problem sources, are shown in the table below.

Abnormal symptom	Problem source	Corrective action
No display	<ol style="list-style-type: none"> 1. Check AC power. 2. Fuse blown. 	<ol style="list-style-type: none"> 1. Connect power. 2. Consult Yokogawa rep.
FAIL lamp lit	<ol style="list-style-type: none"> 1. Bad sensor connection. 2. Sensor heater open circuit. 	<ol style="list-style-type: none"> 1. Connect securely. 2. Replace sensor.
Low value displayed High value displayed	<ol style="list-style-type: none"> 1. Was instrument calibrated? 2. Sensor bad. 	<ol style="list-style-type: none"> 1. Recalibrate. 2. Replace sensor.
Slow response	<ol style="list-style-type: none"> 1. Negative pressure around sensor. 2. Holes in sensor clogged. 	<ol style="list-style-type: none"> 1. Use within the specified pressure range. 2. Clean probe tip.
Large errors	<ol style="list-style-type: none"> 1. Temperature out of range. 2. High pressure, or negative pressure around sensor. 3. Oxidation-reduction or high concentration of corrosive gas. 	<ol style="list-style-type: none"> 1. Measure within rated. temperature 2. Measure at near atmospheric pressure. 3. Can't measure to rated accuracy.
Display fluctuates on high side	<ol style="list-style-type: none"> 1. Sensor bad. 	<ol style="list-style-type: none"> 1. Change sensor.
Calibration 1 Can't calibrate	<ol style="list-style-type: none"> 1. CAL gas oxygen concentration too high or too low. 2. Sensor bad. 	<ol style="list-style-type: none"> 1. Use clean atmospheric air. 2. Replace sensor.
Calibration 2 Can't calibrate	<ol style="list-style-type: none"> 1. CAL gas oxygen concentration too high or too low. 2. Sensor bad. 	<ol style="list-style-type: none"> 1. Use specified (950±50 ppm O₂) calibration gas. 2. Change sensor.
Alarm doesn't work	<ol style="list-style-type: none"> 1. Check if set 2. Relay bad 	<ol style="list-style-type: none"> 1. Set again 2. Consult Yokogawa rep.

◆ Appendix 1. Sampling Unit

K9424GA Sampling Unit for OX100/102

This sampling unit is designed for the OX100 Series Oxygen Analyzers and is used where a sample gas contains a small amount of organic solvent (e.g. isopropyl alcohol), such as in reflow furnaces.

The sampling unit comprises two membrane filters to eliminate dust and mist, a suction pump to draw a sample gas, an activated carbon filter to eliminate organic solvents, and a flowmeter to monitor sample gas flow rates.



NOTE

If repair is required, the is equipment will need to be returned to the factory.

For repair or maintenance, contact your Yokogawa representative.

1. Specifications

Pressure at sampling point	: Atmospheric pressure
Pressure at sample outlet	: Atmospheric pressure
Gas temperature	: 50°C max.
Organic solvent content	: ppm to a few percentage level of isopropyl alcohol (IPA) equivalent
Dust content	: 5 mg/Nm ³ max.
Life expectancy of activated carbon:	Approx. 1L of absorbed IPA volume
Power supply	: 100 to 240 V, 50/60 Hz
Piping connection	: Rc1/4
Operating environment temperature range:	0 to 40°C
Life of membrane filetr	: When specified flow is no longer possible. Replace as early as possible.
Pump life	: Approximately one year when used eight hours a day.

Included Accessories

1. Power cord (1)
 - A1007WD (AC 100 V standard)
 - A1009WD (AC 200 V by Tokuchu special order)
2. Fuse (2)
 - A1109EF (rating 1A)
3. Instruction Manual (1)
 - K9424JY

2. Installation

The sampling unit is a desktop type and should be installed on a stand near the sampling point. Note the following when installing the unit.

NOTE

The unit should be installed in places where:

- Ambient temperature is in the range of 0 to 40 °C and temperature fluctuations are minimal.
- Mechanical vibration is negligible.
- Adequate space for inspection and maintenance, such as replacing filter element, is secured.
- The unit should be securely mounted on a stand to prevent its dropping.
- No exposure to rain or water is allowed.

Procedure:

- (1) Feed sampling tubing from the sampling point through a stop valve to the sample gas inlet, GAS IN, with care not to produce gas leakage. The piping connection of the sample gas inlet is Rc1/4. Use an appropriate joint for this connection.
- (2) Feed gas vent tubing from the sampling outlet, GAS OUT, with care not to produce gas leakage. The piping connection of the sampling gas outlet is Rc1/4. Use an appropriate joint for his connection.
- (3) Insert a power cable to the power connector of the sampling unit.

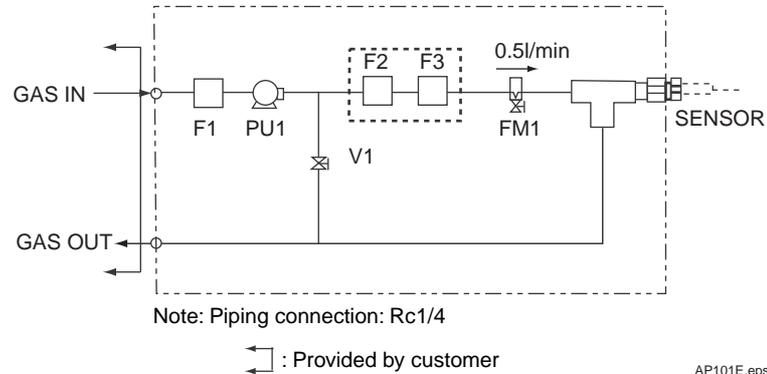


Figure1. Piping Diagram

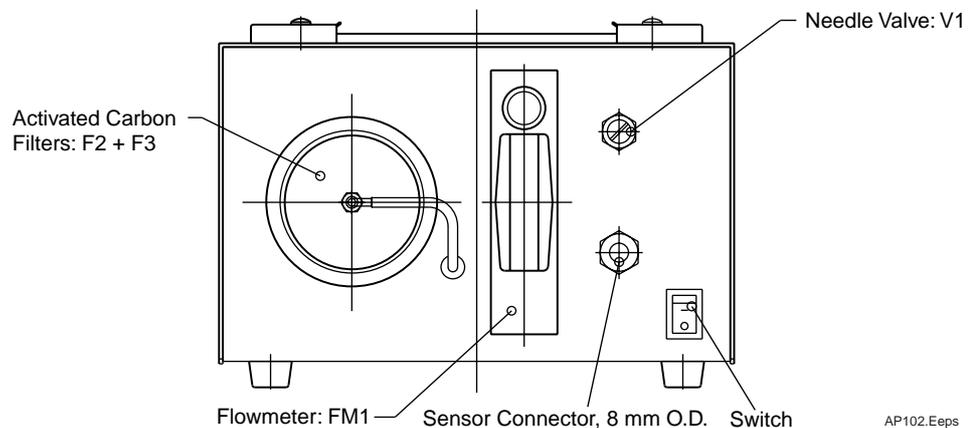


Figure2. Sampling Unit

3. Operating Procedures

3.1 Starting Operation

Before starting the operation of the sampling unit, make sure to power down the OX100 Series oxygen analyzer. Take the following steps to start operating the unit.

- (1) Mount an OX100 Series sensor to the sensor connector of the sampling unit by inserting 70 to 80 mm of the sensor and tightening the locknut firmly with fingers . The locknut should be finger tight only, do not use a wrench for tightening.
- (2) Completely open both stop valves, sampling gas intake and gas vent.
- (3) Turn off the power switch of the unit and connect to a voltage conforming to the specification.
- (4) Open the flow regulating valve of the flowmeter and the needle valve on the front completely by turning the valves counterclockwise completely.
- (5) Turn on the power switch of the unit. The suction pump starts working.
- (6) If the flowmeter reads below 0.5 l/min, close the needle valve on the front gradually by turning it clockwise until the flowmeter reads 0.5 l/min. If the flowmeter reads over 0.5 l/min, close the flow regulating valve of the flowmeter gradually by turning it clockwise until the flowmeter reads 0.5 l/min.
- (7) Turn on the power of the OX100 Series oxygen analyzers.

3.2 Stopping Operation

Take the following steps to stop operating the unit.

- (1) Remove power from the OX100 Series oxygen analyzers.
- (2) Turn off the power switch of the sampling unit.
- (3) Close both stop valves for sampling gas intake and for gas vent completely by turning the valves clockwise completely.

4. Maintenance

4.1 Replacing the Activated Carbon Pack

- (1) Remove the tubing from the case's lid.
- (2) Turn the lid counterclockwise to open it.
- (3) Remove an old filter pack.
- (4) Open a new filter pack and follow the steps below, referring to the figures, to put it into the case.
 - * Shape the pack into cylinders (Figure 1).
 - * Put it into the case by pushing it while pulling the seam(1) to puff out the pack and fold the both top corners (2) and (3) of the pack outside (Figure 2).
 - * Push the pack into the case until the top of the pack sinks under the brim. Thrust the pipe protruding from the back of the lid onto the top center, not on the seam, and tighten the lid securely (Figure 3).
- (5) Connect the tubing to the lid.

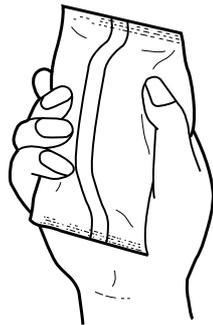


Figure 1.

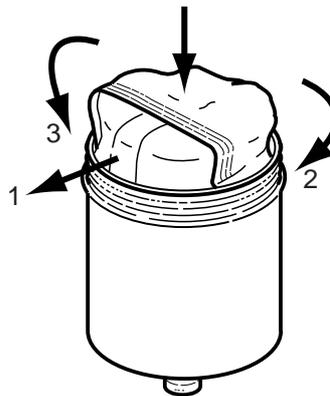


Figure 2.

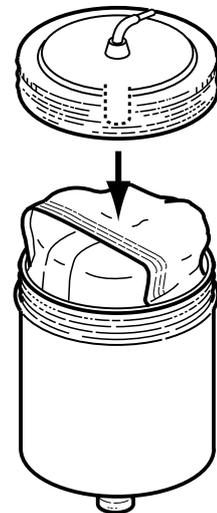


Figure 3.

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4.2 Maintenance of the Disk Filter (K9424GQ) Attached on the Gas Inlet

- (1) Disconnect the fitting from the sampling gas inlet.
- (2) Remove the filter with tweezers.
- (3) Clean the captured foreign substances out of the filter by air purges.
- (4) Replace the restored filter with its smooth surface facing to the gas inlet.
 - * If the filter becomes clogged soon after being restored, it needs to be replaced with a new one.

◆ Appendix 2. Calibration Gas Kits

K9424JA, K9424JB, K9424JR, K9424JS Calibration Gas Kits for OX100/102

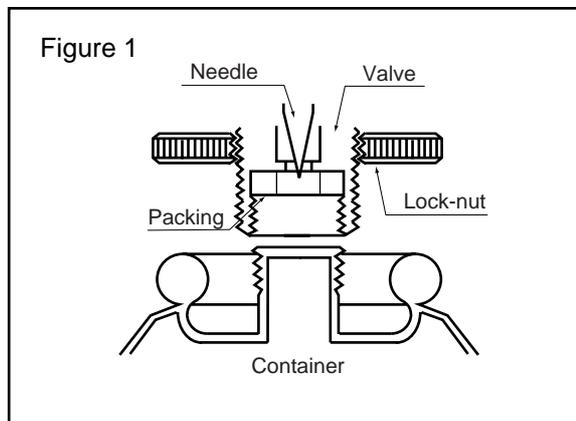
The calibration gas kits are designed for calibration of the OX100 Series Oxygen Analyzers.

The kit comprises a calibration gas (filled pressure of 0.7 MPa, 6 one-liter cylinders) and a needle valve assembly. The calibration gas is available in two types: 900 to 1100 ppm O₂ and 8500 to 9500 ppm O₂ (N₂ based). Prepare either one according to your application.

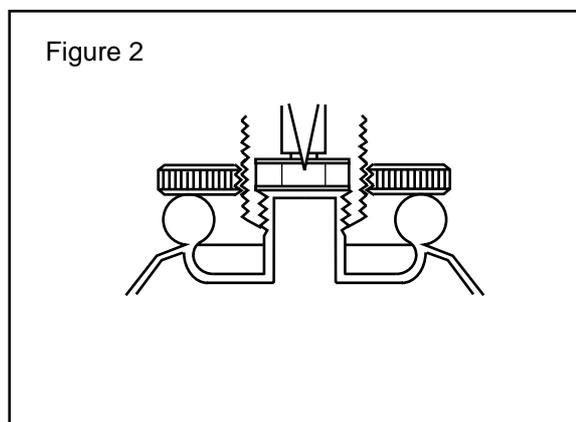
1. Connecting the Needle Valve Assembly to the Gas Cylinder

Take the following steps to connect the gas cylinder to the needle valve assembly.

- (1) Turn the handle of the needle valve counterclockwise to pull the needle tip inside the gasket to the position shown in Figure 1.
- (2) Loosen the locknut of the needle valve. Screw the valve into the mouth of the gas cylinder in a clockwise direction with fingers until it meets resistance by finger and then screw the locknut down (See Figure 2).



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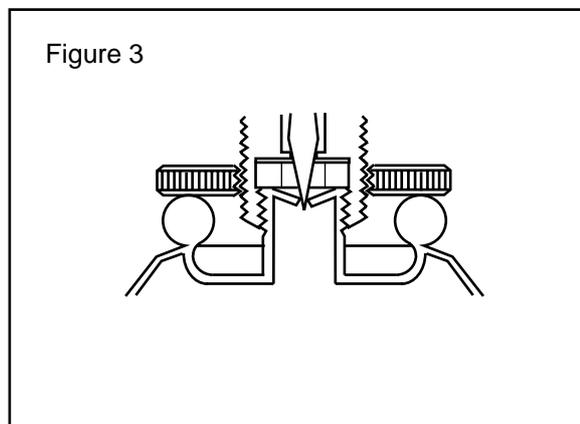


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2. Supplying the Calibration Gas

Take the following steps to supply the calibration gas.

- (1) Mount an OX100 Series sensor to the needle valve assembly by inserting 70 to 80 mm of the sensor and screwing down the locknut firmly with fingers. The locknut should be finger tight only and do not use a wrench for tightening.
- (2) Turn the pressure regulating handle of the needle valve assembly's regulator counterclockwise completely.
- (3) Turn the handle of the needle valve clockwise until it can no longer turn so that the needle tip pokes into the gas cylinder (See Figure 3).
- (4) Turn the handle of the needle valve counterclockwise to the position shown in Figure 1.
- (5) Turn the pressure regulating handle of the regulator gradually in a clockwise direction to set the pressure at approximately 0.05 MPa. This allows the calibration gas to be supplied to the sensor for calibration



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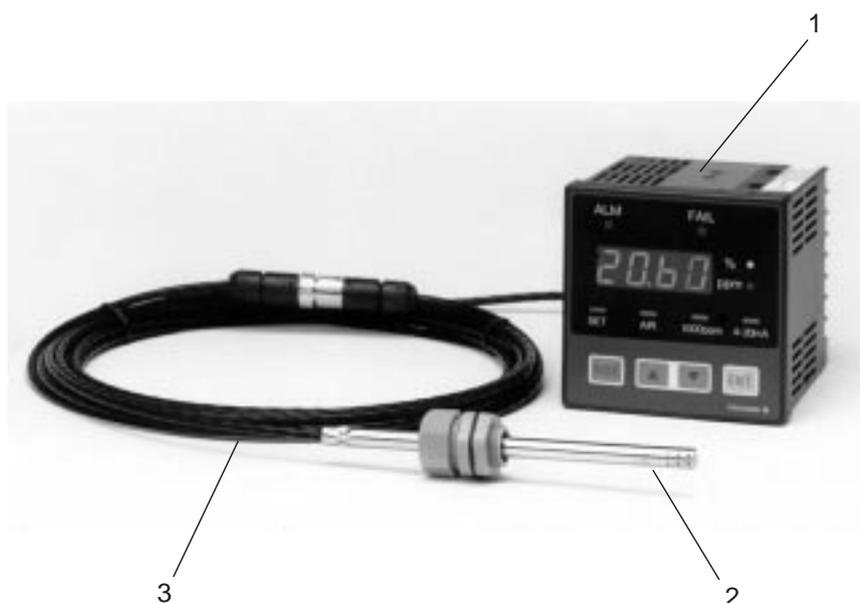
3. Stopping Supplying the Calibration Gas

Take the following steps to stop supplying the calibration gas.

- (1) Turn the handle of the needle valve clockwise until it meets resistance.
- (2) Turn the pressure regulating handle of the regulator counterclockwise completely.

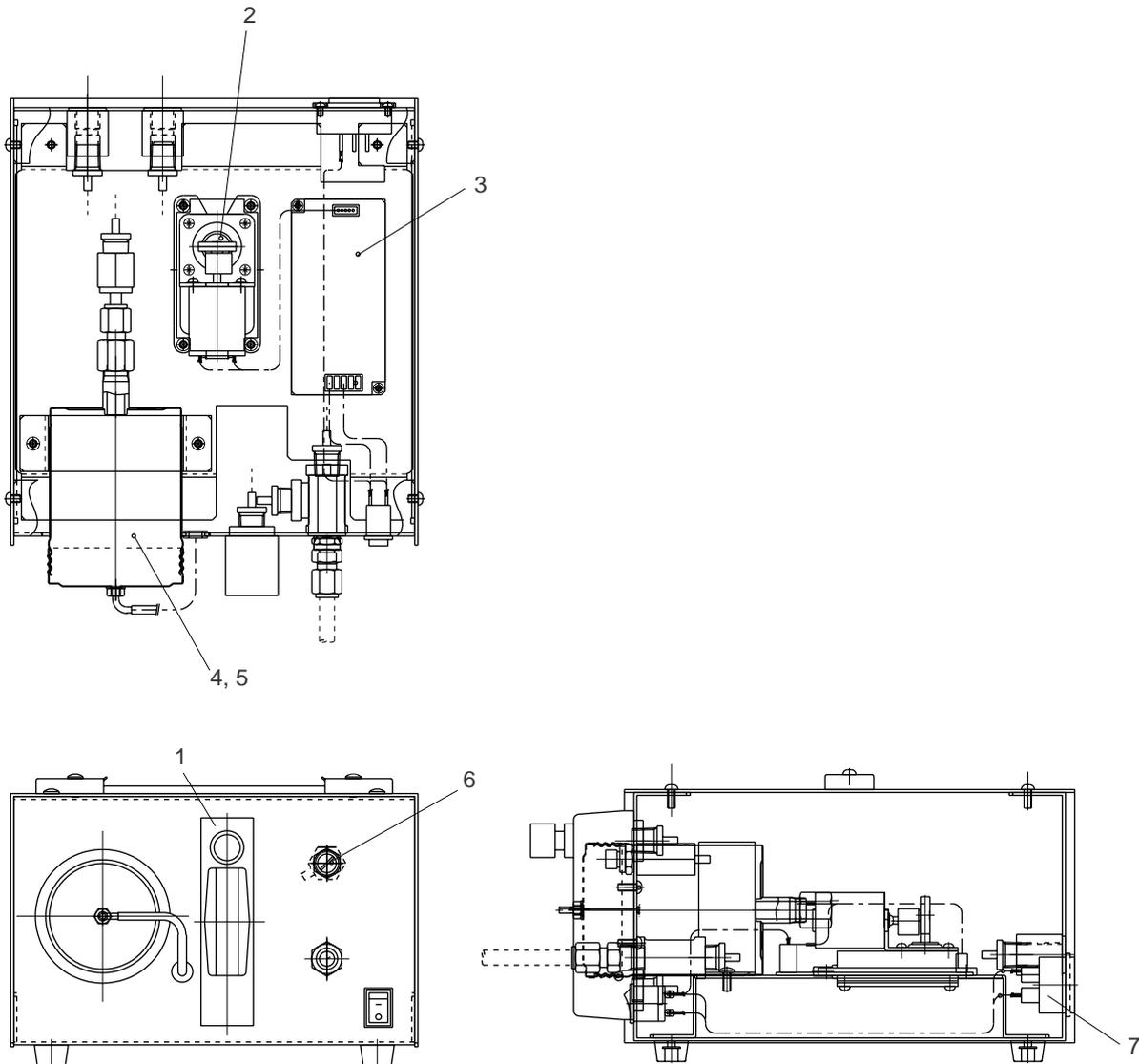
Customer Maintenance Parts List

OX100 General-purpose Oxygen Analyzer



Item	Part No. (MS code)	Qty	Description
1	OX100-□15N□ K9424AA	— 1	Converter General-purpose Oxygen Analyzer
2	K9424BA	1	Sensor
3	K9424CA	1	Cable

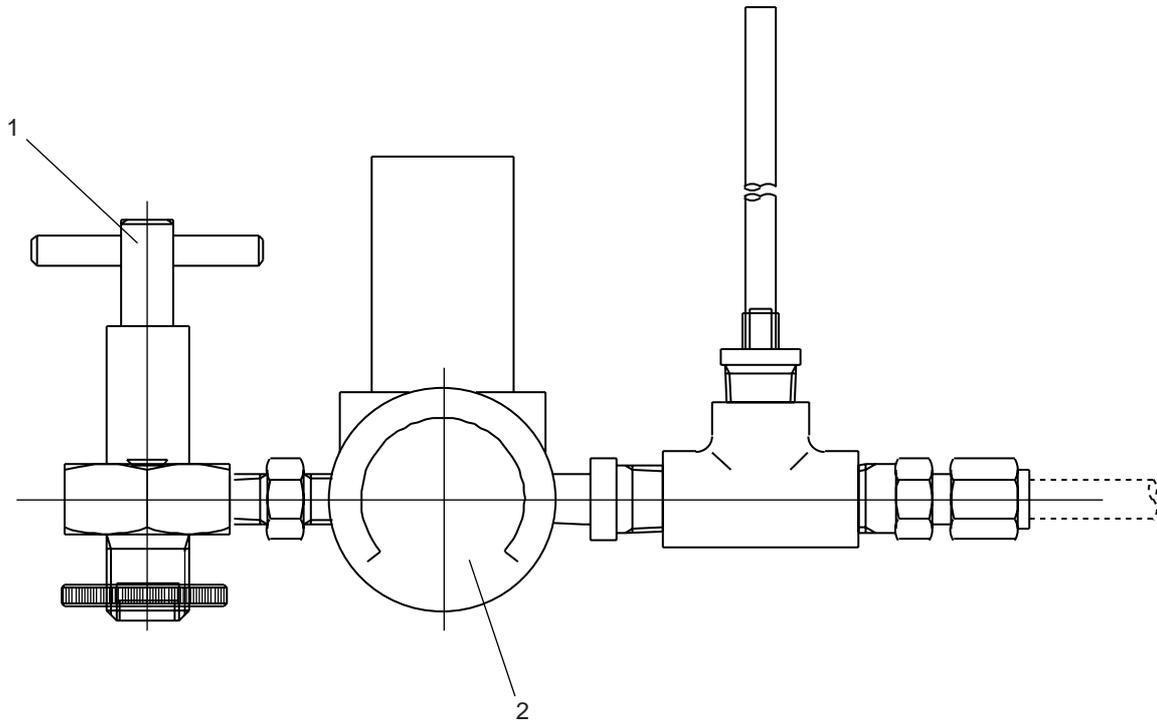
K9424GA SAMPLING UNIT



Item	Part No.	Qty	Description
1	L9866CX	1	Flow Meter
2	K9424GN	1	Pump Assy
3	K9424HE	1	Power Unit
4	K9424GZ	1	Filter Assy *1
5	K9424GY	1	Filter Element (active carbon filter: 5 packs)
6	E7050AC	1	Valve
7	A1109EF	1	Fuse

*1: Comprises a stainless steel case (including an activated carbon filter and a disk filter) and a spare activated carbon element.

K9424JC NEEDLE VALVE ASSY



Item	Part No.	Qty	Description
1	K9424JD	1	Needle Valve Assy
2	K9424HQ	1	Regulator

Revision Record

Manual Title : Model OX100 General-Purpose Oxygen Analyzer

Manual Number : IM 11M10A01-01E

Edition	Date	Remark (s)
1st	Nov. 2000	Newly published
2nd	Oct. 2005	Revised Section p. iv, "After-Sales Warranty": Fully revised. p. Vii, "How to Use This Manual": Added items to the table. p. 1-1, Section 1.1, "Cautions Regarding Use": Added an item. p. 1-2, Section 1.2, "Standard Specifications": Changed operating temperature range. p. 1-3, Added Section 1.3, "MS Code" p. 1-5, Section 1.3, "External Dimensions": Figure 1.2, Changed. p. 1-6, Section 1.3, "External Dimensions": Added Figure 1.4. pp. 2-9 and 2-10, Added Section 2.6, "Installing the Optional Sampling Unit (K9424GA)" p. 2-11, Added Section 2.7, "Calibration Kit (Optional)" Added Appendix 1, "Sampling Unit" and Appendix 2, "Calibration Gas Kits" CMPL: Revised.
3rd	Nov. 2007	CMPL: Revised.

Thank you for selecting our OX100 General-Purpose Oxygen Analyzer.

In User's Manual, IM 11M10A01-01E, 2nd Edition, supplied with the product, some corrections/additions have been made. Please replace the corresponding pages in your copy with the attached, revised pages.

Revisions

- p. iv, "After-Sales Warranty,": Deleted a part of description.
- p. 3-1, Section 3.1, "Calibration,": Changed the description of "1", and deleted of the last description.
- p. 3-2, Section 3.1.2, "When Measuring on 0 to 1000 ppm O₂ Range,": Changed the standard gas concentration of "CAUTION".
- p. 3-2, Section 4, "Troubleshooting,"Table: Changed of the calibration gas concentration.
- p. A-3, Section 3.1, "Starting Operation,": Changed the description of "1".

◆ After-Sales Warranty

- Do not modify the product.
- During the warranty period, for repair under warranty carry or send the product to the local sales representative or service office. Yokogawa will replace or repair any damaged parts and return the product to you.
- Before returning a product for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.
- If we replace the product with a new one, we won't provide you with a repair report.
- Yokogawa warrants the product for the period stated in the pre-purchase quotation. Yokogawa shall conduct defined warranty service based on its standard.
- In the following cases, customer will be charged repair fee regardless of warranty period.
 - Failure of components which are out of scope of warranty stated in instruction manual.
 - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa did not supply.
 - Failure due to improper or insufficient maintenance by user.
 - Failure due to misoperation, misuse or modification which Yokogawa does not authorize.
 - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
 - Failure caused by any usage out of scope of recommended usage
 - Any damage from fire, earthquake, a storm and flood, lightning, disturbance, riot, warfare, radiation and other natural changes.
- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa will not bear responsibility when the user configures the product into systems or resells the product.
- Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair this product, please contact the nearest sales office described in this instruction manual.

3. Operation

3.1 Calibration

- As described below, calibrate the span immediately before starting a measurement.
 - (1) Before using the 0 to 1000 ppm O₂ range, perform one-point calibration with standard gas of concentration 1000±100 ppm O₂.
 - (2) Before using the 0.1 to 25% O₂ range, perform one-point calibration with atmospheric air.
 - (3) If you will be using both ppm and % ranges, be sure to calibrate the ranges in the following order: first perform one-point calibration with air, then 1000 ppm O₂ calibration.
- Before calibrating, turn on the power and allow the OX100 to warm up for at least 10 minutes then perform air cleaning.

3.1.1 One-point Calibration in Atmospheric Air (Span Calibration)

Press the Mode key twice, and confirm that the “Air” lamp is lit.

Supply cleaning air to the sensor, and then press the ENT key. This completes 20.6% O₂ calibration, and returns the instrument to measurement status (the display indicates the O₂ concentration).



CAUTION

If calibration fails, and the ALM lamp lights for two seconds, replace the sensor (part no. K9424BA).

3.1.2 When Measuring on 0 to 1000 ppm O₂ Range

CAUTION

Before taking measurements on the 0 to 1000 ppm O₂ range, calibrate with 1000±100 ppm O₂/N₂ standard gas.

- (1) Immerse sensor in 1000±100 ppm O₂/N₂.
- (2) Press [Mode] key three times, and confirm that “1000 ppm” lamp is lit.
- (3) Press [▲] [▼] keys to set standard gas concentration.
- (4) Press [ENT] key.

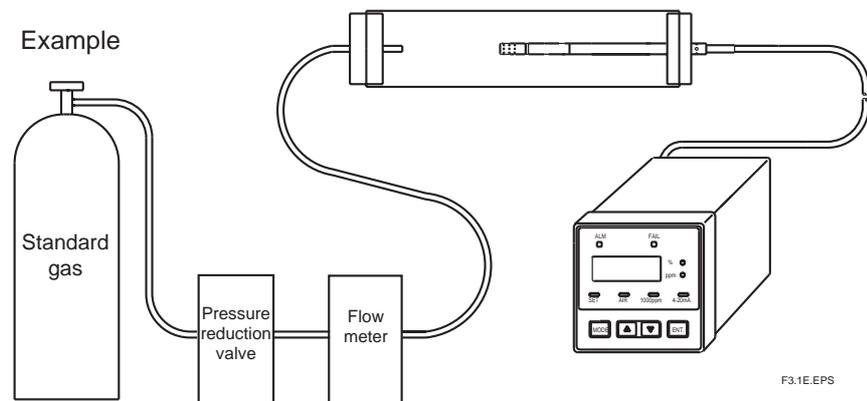
This completes span calibration, and the instrument switches to measure mode.

You can calibrate with standard gas in the range 700 to 1300 ppm O₂. If the alarm lamp lights for 2 sec. when you attempt calibration, replace the sensor (part no. K9424BA).

CAUTION

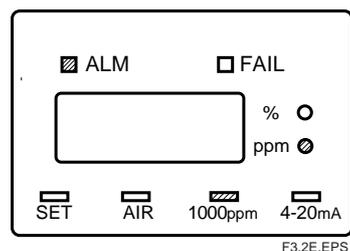
- Ideally you should use 1000±100 ppm O₂/N₂ standard gas for calibration.
- Gas flow should be between 800 and 1200 ml/min.
- Yokogawa offers a 1000 ppm O₂ calibration kit as an option (part no. K9424JA).

Example



3.1.3 Setting Error Display

(Display example for 1000 ppm calibration)



If the gas concentration is out of limits for calibration, the Alarm lamp lights for 2 sec., and the instrument displays an error code and remains in Calibration mode.

4. Troubleshooting

Possible abnormal symptoms, and corresponding problem sources, are shown in the table below.

Abnormal symptom	Problem source	Corrective action
No display	<ol style="list-style-type: none"> 1. Check AC power. 2. Fuse blown. 	<ol style="list-style-type: none"> 1. Connect power. 2. Consult Yokogawa rep.
FAIL lamp lit	<ol style="list-style-type: none"> 1. Bad sensor connection. 2. Sensor heater open circuit. 	<ol style="list-style-type: none"> 1. Connect securely. 2. Replace sensor.
Low value displayed High value displayed	<ol style="list-style-type: none"> 1. Was instrument calibrated? 2. Sensor bad. 	<ol style="list-style-type: none"> 1. Recalibrate. 2. Replace sensor.
Slow response	<ol style="list-style-type: none"> 1. Negative pressure around sensor. 2. Holes in sensor clogged. 	<ol style="list-style-type: none"> 1. Use within the specified pressure range. 2. Clean probe tip.
Large errors	<ol style="list-style-type: none"> 1. Temperature out of range. 2. High pressure, or negative pressure around sensor. 3. Oxidation-reduction or high concentration of corrosive gas. 	<ol style="list-style-type: none"> 1. Measure within rated. temperature 2. Measure at near atmospheric pressure. 3. Can't measure to rated accuracy.
Display fluctuates on high side	<ol style="list-style-type: none"> 1. Sensor bad. 	<ol style="list-style-type: none"> 1. Change sensor.
Calibration 1 Can't calibrate	<ol style="list-style-type: none"> 1. CAL gas oxygen concentration too high or too low. 2. Sensor bad. 	<ol style="list-style-type: none"> 1. Use clean atmospheric air. 2. Replace sensor.
Calibration 2 Can't calibrate	<ol style="list-style-type: none"> 1. CAL gas oxygen concentration too high or too low. 2. Sensor bad. 	<ol style="list-style-type: none"> 1. Use specified (1000±100 ppm O₂) calibration gas. 2. Change sensor.
Alarm doesn't work	<ol style="list-style-type: none"> 1. Check if set 2. Relay bad 	<ol style="list-style-type: none"> 1. Set again 2. Consult Yokogawa rep.

3. Operating Procedures

3.1 Starting Operation

Before starting the operation of the sampling unit, make sure to power down the OX100 Series oxygen analyzer. Take the following steps to start operating the unit.

- (1) Mount an OX100 Series sensor to the sensor connector of the sampling unit until it stops against the end. Then pull out the sensor to 1-2 mm front and tightening the locknut firmly with fingers. The locknut should be finger tight only, do not use a wrench for tightening.
- (2) Completely open both stop valves, sampling gas intake and gas vent.
- (3) Turn off the power switch of the unit and connect to a voltage conforming to the specification.
- (4) Open the flow regulating valve of the flowmeter and the needle valve on the front completely by turning the valves counterclockwise completely.
- (5) Turn on the power switch of the unit. The suction pump starts working.
- (6) If the flowmeter reads below 0.5 l/min, close the needle valve on the front gradually by turning it clockwise until the flowmeter reads 0.5 l/min. If the flowmeter reads over 0.5 l/min, close the flow regulating valve of the flowmeter gradually by turning it clockwise until the flowmeter reads 0.5 l/min.
- (7) Turn on the power of the OX100 Series oxygen analyzers.

3.2 Stopping Operation

Take the following steps to stop operating the unit.

- (1) Remove power from the OX100 Series oxygen analyzers.
- (2) Turn off the power switch of the sampling unit.
- (3) Close both stop valves for sampling gas intake and for gas vent completely by turning the valves clockwise completely.