User's Manual

Model OX102
Current limit type
Oxygen Analyzer

IM 11M10A01-03E

vigilantplant®

YOKOGAWA
Yokogawa Electric Corporation

IM 11M10A01-03E
3rd Edition

Safety Precautions

This Analyzer is a component-type stand-alone instrument 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

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.

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3rd Edition: Nov. 2007 (YK)

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)

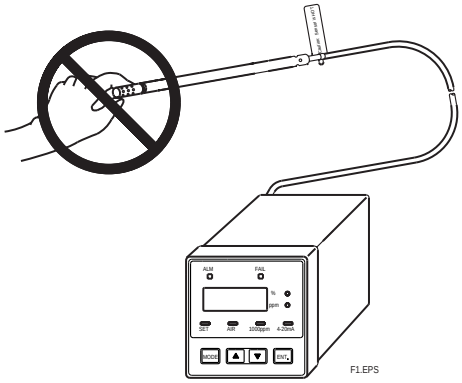
Yokogawa grants no warranties other than the express warranty set forth under the warranty provisions.

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.

WARNING

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 (100Ω 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 silicon(e) 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

Yokogawa warrants the product for the period specified in the pre-purchase quotation. Yokogawa shall perform warranty service according to its own standards. For on-site service outside of the normal service area, you may be billed for travel expenses of technical personnel, even during the warranty period.

In the event of any failure caused by the following, service (including shipment to the factory for repair where necessary) may be billed for, even during the warranty period:

- the use of software, hardware, or spare parts not supplied by Yokogawa.
- improper or insufficient maintenance by the user.
- unauthorized modification, abuse, misuse or mishandling.
- improper installation or transportation of the equipment.
- the use of unspecified power supply (voltage, frequency) or abnormal power supply.
- use under conditions not meeting the required standards, or improper maintenance of the installation site.
- force majeure events – including, but not limited to, fires, earthquakes, windstorms, lightning, riots, civil disorder, war or other hostilities, radiation contamination, or acts of God.

Yokogawa makes no warranty with respect to the fitness of this equipment for a particular user purpose. In no event shall Yokogawa be liable for direct, incidental or consequential damages.

In the event that the equipment is incorporated into other equipment, or resold, Yokogawa assumes no liability to the end user for direct, incidental or consequential damages.

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℃.
- 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 silane silicone gas.
- 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.
- 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 sections you are recommended to read when performing the corresponding tasks.

Unpacking installation	Initial setting	Daily operation	Changing settings	Maintenance troubleshooting	Section to refer to:
◎	◎	◎	◎	◎	Safety precautions
◎	◎	◎	◎	◎	Sect. 1. Overview
◎	◎			○	Sect. 2. System Configuration
◎	◎	○	◎	○	Sect. 3. Installation
◎	◎			○	Sect. 4. Wiring
◎	◎			○	Sect. 5. Component Functions
	◎	○	◎	○	Sect. 6. Operation
		◎		◎	Sect. 7. Inspection and Maintenance
				◎	Sect. 8. Troubleshooting
○				◎	App. 1. Sampling Unit
○				◎	App. 2. Calibration Gas Kits
			○	◎	CMPL (Parts List)

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Contents

1. Overview

The OX102 Current limit Oxygen Analyzer is an advanced oxygen analyzer which is capable of measuring a wide range of oxygen concentrations, from ppm level to percentage level. The OX102 is best suited to ppm-level oxygen measurement - for example, monitoring the furnace gas of nitrogen reflow furnaces and the atmosphere of semiconductor plants. This analyzer uses a compact zirconia current limiting sensor. The sensor is designed for direct insertion type installation. 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 K9424GA sampling system, to avoid contact with the solvent. Note that the OX102 cannot measure oxygen concentration if combustible or corrosive gases are present in the atmosphere to be measured.

This equipment needs to be returned to the factory for repair. Contact your Yokogawa representative.

1.1 Standard Specifications

(1) Measurement principle: Zirconia current limiting method
(2) Sampling system : Natural diffusion system
If the sampled gas may include organic solvents, use a sampling unit.
(3) Measured gas : O_2 in N_2 or mixed gases; cannot be used with silicone vapor, combustible gases and organic solvents
(4) Measuring range : 0 to 25%
(5) Output range : 0-100 ppm/0-1000 ppm/0-10000 ppm/0-25%, automatic/fixed switching mode
(6) External output : a. 4-20 mA DC automatic/manual switching mode
b. 1-5 V DC fixed (0-100 ppm/0-1000 ppm/0-10000 ppm/0-25%)
c. 4-20 mA DC identification signal for automatic switching (See below)

Output Range	0-100 ppm	0-1000 ppm	0-10000 ppm	0-25%
Range Identification Signal	4 V DC	3 V DC	2 V DC	1 V DC

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(7) Repeatability:

Measuring Range	Repeatability
20 - 100 ppm	±15 ppm O_2
100 - 1000 ppm	±25 ppm O_2
1000 - 5000 ppm	±0.3 of reading
5000 - 10000 ppm	±7.5% of reading
1 - 25%	±0.25%O_2

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(8) Alarm contact output: 2 contact outputs. contact rating 110 V AC/24 V DC, 1 A
a. Alarm output if oxygen concentration abnormal (Hi, Lo)
b. Alarm output if sensor disconnected (FAIL)
(9) Alarm setting for abnormal oxygen concentration:
a. Setting range : 1 ppm to 24.9% O_2
b. Setting conditions : High alarm (Hi) ≧ Low alarm (Lo)
(10) Indication : LED Digital indication, ranges 0-9995 ppm to 1.0-25.0%, autoswitching
(11) Display and resolution: 3 steps

Range	Display	Resolution
20 ≦ N <100 ppm	100	1 ppm
100 ≦ N <10000 ppm	9995	5 ppm
1.0 ≦ N ≦ 25%	25.0	0.1%

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(12) Unit indication lamp:
a. ppm LED turns on for O_2 measurement range 0-9995 ppm
b. % LED turns on for O_2 measurement range 1-25.0%
(13) Operation lamp:
a. Hi.ALM: turns on when the O_2 concentration exceeds the high alarm setting
b. Lo.ALM: turns on when the O_2 concentration goes below the low alarm setting
c. FAIL: turns on when self-diagnostics detect sensor disconnected
d. PASS: turns on when key lock is enabled, turns off when disabled
(14) Calibration:
a. Atmospheric air one-point calibration :
Calibration point setting range: 15 to 25% O_2
b. One-point calibration at 100 ppm :
Calibration point setting range: 80 to 120 ppm O_2
c. One-point calibration at 1000 ppm :
Calibration point setting range: 900 to 1100 ppm O_2
d. One-point calibration at 10000 ppm :
Calibration point setting range: 8500 to 9500 ppm O_2
e. Complete calibration (*) Calibration with air, 20, 100, 500, 1000, 10000 ppm in that order

Calibration Setting Range

Calibration Order	Calibration Point	Calibration Point Setting Range
1	Atmospheric air	15 - 25% O2
2	20 ppm	15 - 25 ppm O2
3	100 ppm	80 - 120 ppm O2
4	500 ppm	400 - 600 ppm O2
5	1000 ppm	900 - 1100 ppm O2
6	10000 ppm	8500 - 9500 ppm O2

(*) A calibration kit for calibrating all ranges is not available. Prepare calibration gas of specified concentration on site or contact us for factory calibration.

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(15) Fine tune mode : The measuring value can be adjusted to true analyzer value.
(16) Operating temperature : Converter: 0 to 50°C
Sensor 0 to 150°C
0 to 250°C within 50mm of sensor tip
(17) Extension cable : 4 m, 9 m, 29 m, operating temperature: 0 to 70°C
(18) Gas flow rate : 1 m/sec max.
(19) Operating pressure : 1013 ± 40 hPa abs
(20) Power supply : 100 to 240 V AC, 50/60 Hz, approx. 15 W
(21) Storage temperature : 0 to 70°C for both sensor and converter
(22) Self-diagnostic function : Detects sensor disconnection
(23) Sensor replacement : Compatibility can be achieved by entering a sensor-specific constant

1.2 Model and Suffix Codes

(1) OX102 Current limiting Type Oxygen Analyzer

Model	Suffix Code	Option Code	Description
OX102	• • • • • • • •	• • • • • • • • • •	Current limit type oxygen analyzer
Measuring Range	**-1**	• • • • • • • • • •	0-100/1000/10000 ppm/0-25%O_2
Sensor	**1**	• • • • • • • • • •	5 m (1 m sensor assembly + 4 m cable)
	2	• • • • • • • • • •	10 m (1 m sensor assembly + 9 m cable)
	3	• • • • • • • • • •	30 m (1 m sensor assembly + 29 m cable)
	N	• • • • • • • • • •	Not required
Manual	**J**	• • • • • • • • • •	Japanese
	E	• • • • • • • • • •	English
Optional Nipple *(1)		/J	Plastic nipple, 17 mm O.D. or G3/8 hole, (for measuring range 0-1000 ppm or greater)
		/S	Metal nipple (ferrule; teflon), Rc1/4, (for measuring range 0-100 ppm)

*(1) Either plastic or metal nipple should be specified according to the measuring range of the application, if required. When the OX102 is used with a sampling unit, nipple is not required.

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(2) Sample unit, calibration kit (optional)

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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(3) Optional Accessories

Part Number	Description
K9424GY	Activated carbon element (5 pieces/pack), for sampling unit
K9424JP	1000 ppm O_2 calibration gas, 1L x 6 cylinders/box
K9424JQ	10000 ppm O_2 calibration gas, 1L x 6 cylinders/box
K9424JC	Needle valve assembly, with flow adjustment
K9424JD	Needle valve assembly, without flow adjustment
K9424LA	Sensor assembly, specially designed for OX102
K9424LB	Extension cable, 4 m, specially designed for OX102
K9424LC	Extension cable, 9 m, specially designed for OX102
K9424LD	Extension cable, 29 m, specially designed for OX102
K9424DB	Metal nipple (ferrule; metal), Rc1/4, 100 to 150°C *
K9424DF	Metal nipple (ferrule; teflon), Rc1/4, For 100°C or less
L9811LA	Plastic nipple, 17 mm O.D. or G3/8 hole, for measuring range 0-1000 ppm or greater
K9424GQ	Disk filter for Sampling Unit
K9346WH	Felt filter for Sampling Unit

* The insertion length cannot be changed once a metal ferrule is tightened with a nipple. It is because the ferrule engages with the sheath of the sensor once tightened.

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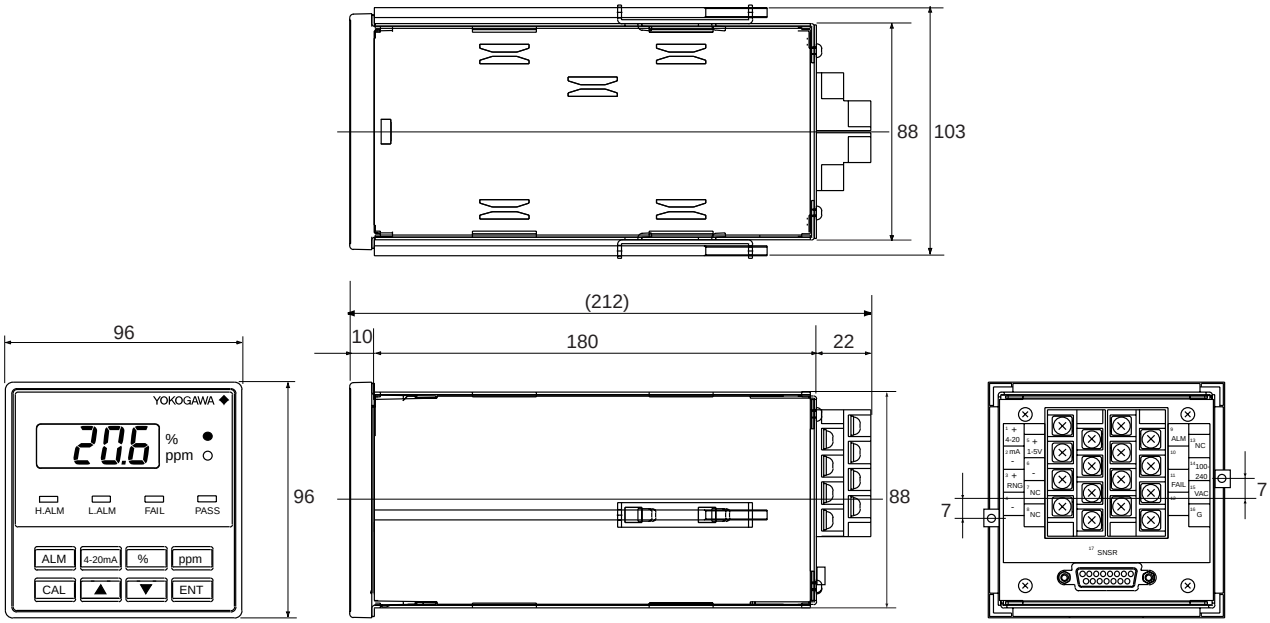
1.3 External Dimensions

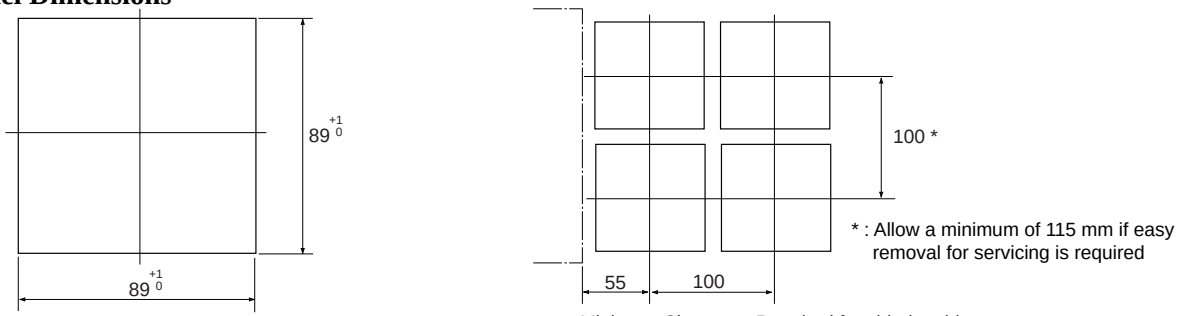
Instrument Body

Unit: mm



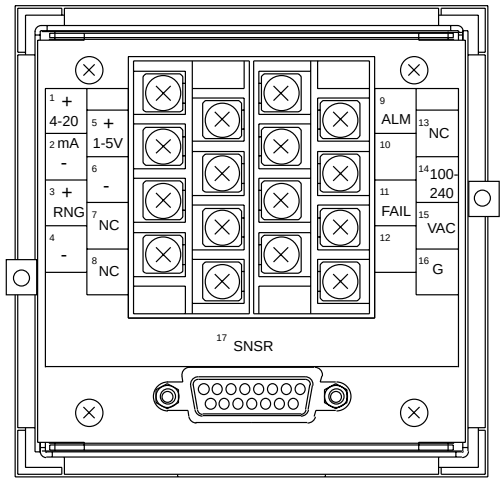
Weight : Approx. 1.2 kg

Panel Dimensions



Panel Cutout

Minimum Clearance Required for side-by-side installation of multiple analyzers



Terminal Configuration

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Figure 1.1 Converter

Unit : mm

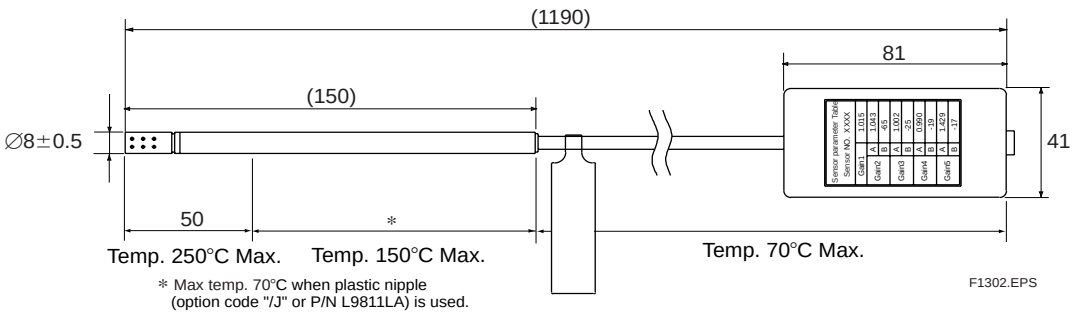
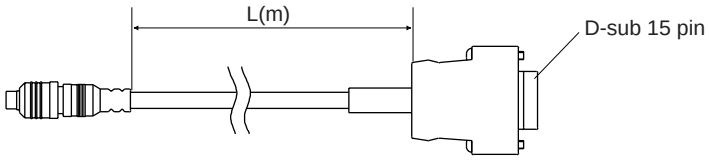


Figure 1.2 Sensor



Model and Code	L (m)
OX102-11□	4
OX102-12□	9
OX102-13□	29

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Figure 1.3 Extension cable

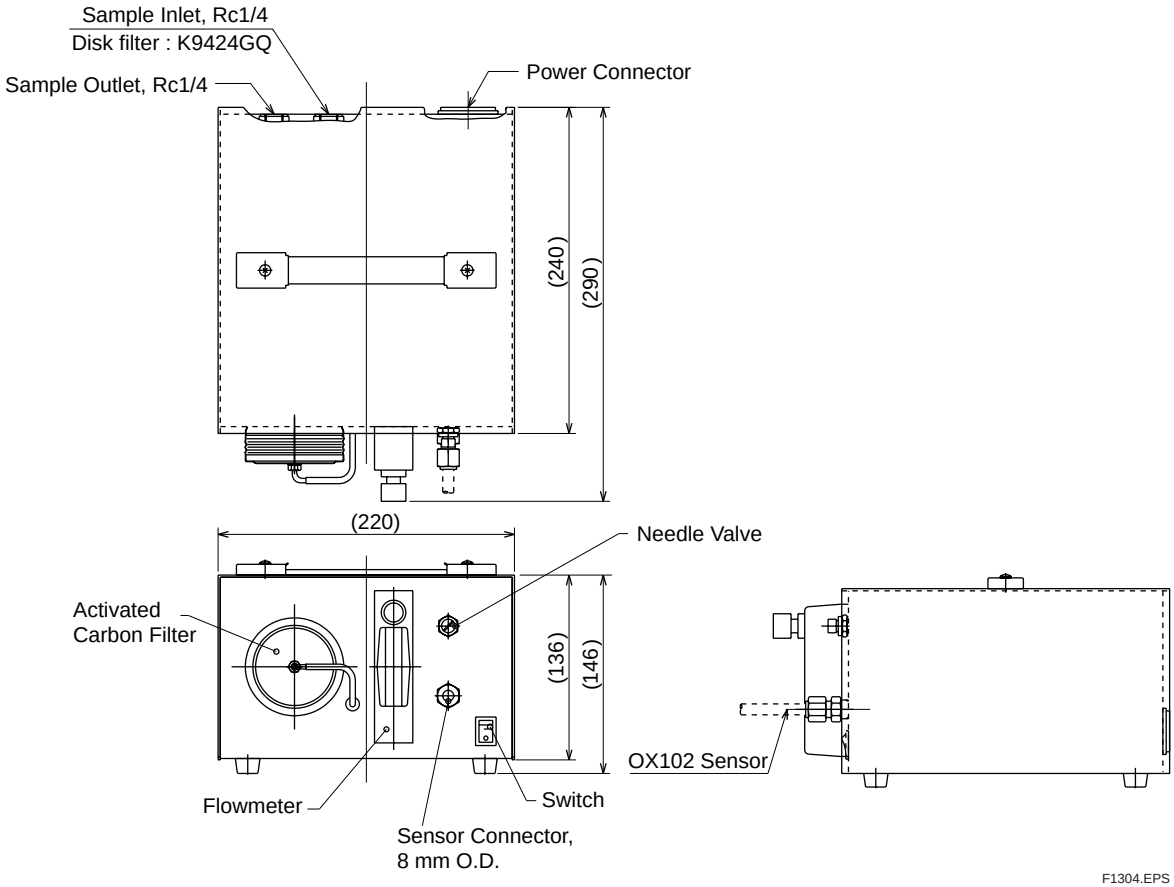
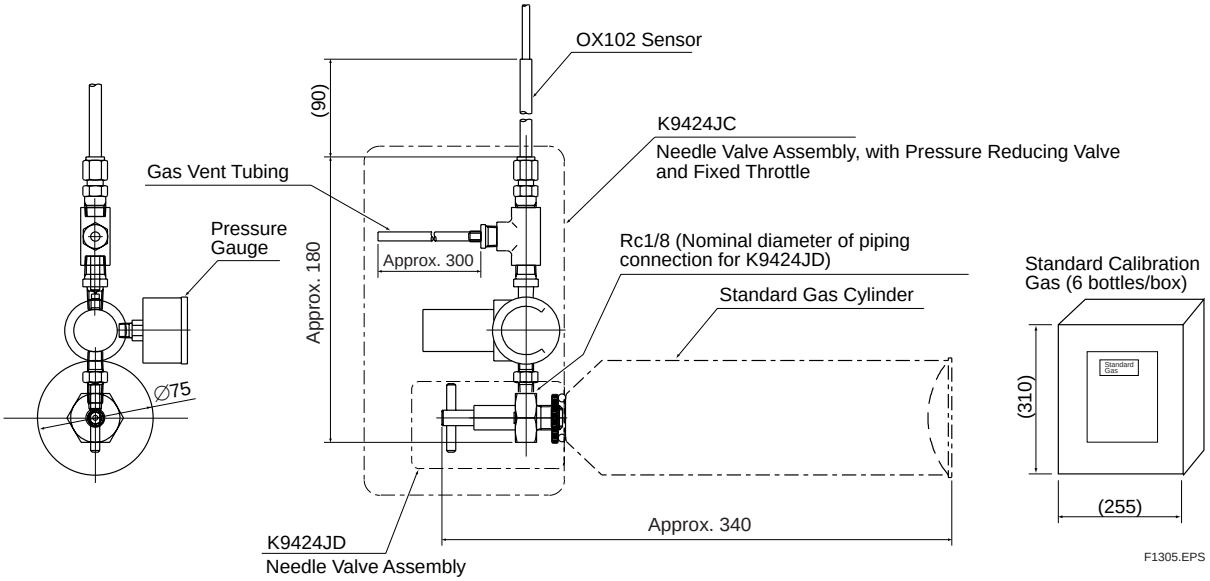


Figure 1.4 Sampling Unit (K9424GA, Optional)

Unit : mm



Part Number	Description
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 1.5 Calibration Kit (Optional)

2. System Configuration

A basic system of the OX102 oxygen analyzer comprises a sensor, extension cable and converter. The length of the extension cable is selectable - any of 4 m, 9 m and 29 m - to accommodate your application. An optional sampling unit (K9424GA) is available to filter out organic solvents, if a sample gas contains such solvents at a level between a few ppm and a few percent, such as in reflow applications. One-point calibration should be performed corresponding to the measuring range normally used. This can be conveniently achieved using the optional calibration kit (Refer to Section 1.3 figure 1.5). When all ranges are used, they all need to be calibrated. Refer to Section 1.1 (14) “Calibration”.

2.1 System Configuration 1

This basic system configuration comprises sensor, extension cable and converter.

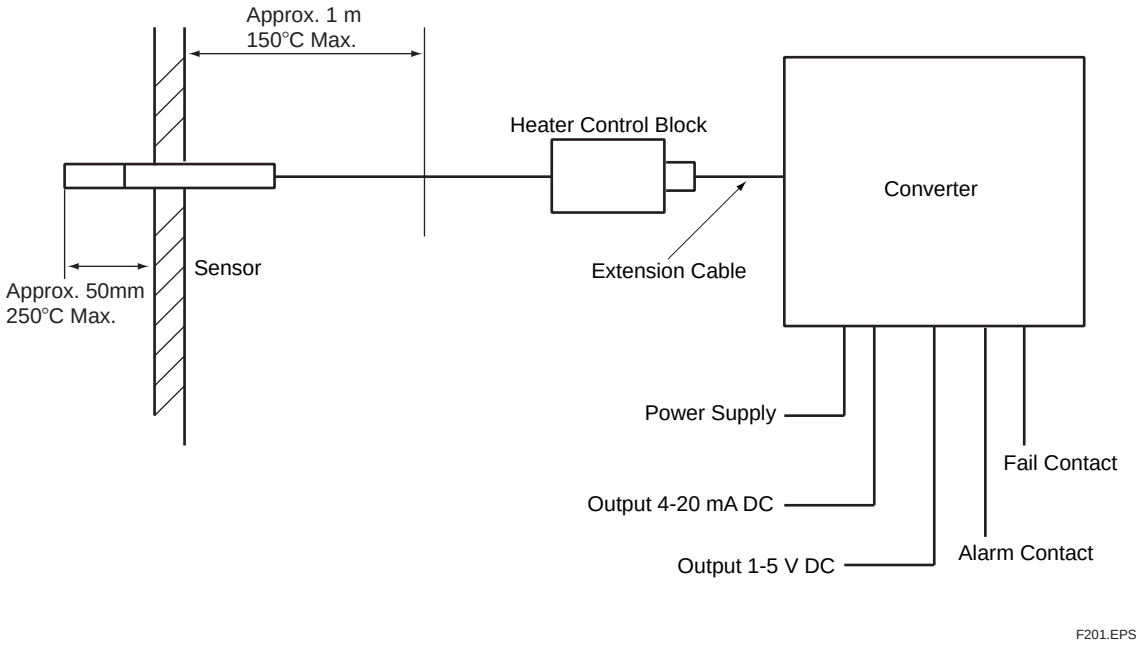

Figure 2.1 System Configuration 1

2.2 System Configuration 2

This configuration, incorporating an optional sampling unit to remove organic solvents, should be used when a sample gas contains such solvents at a level of a few ppm to a few percent.

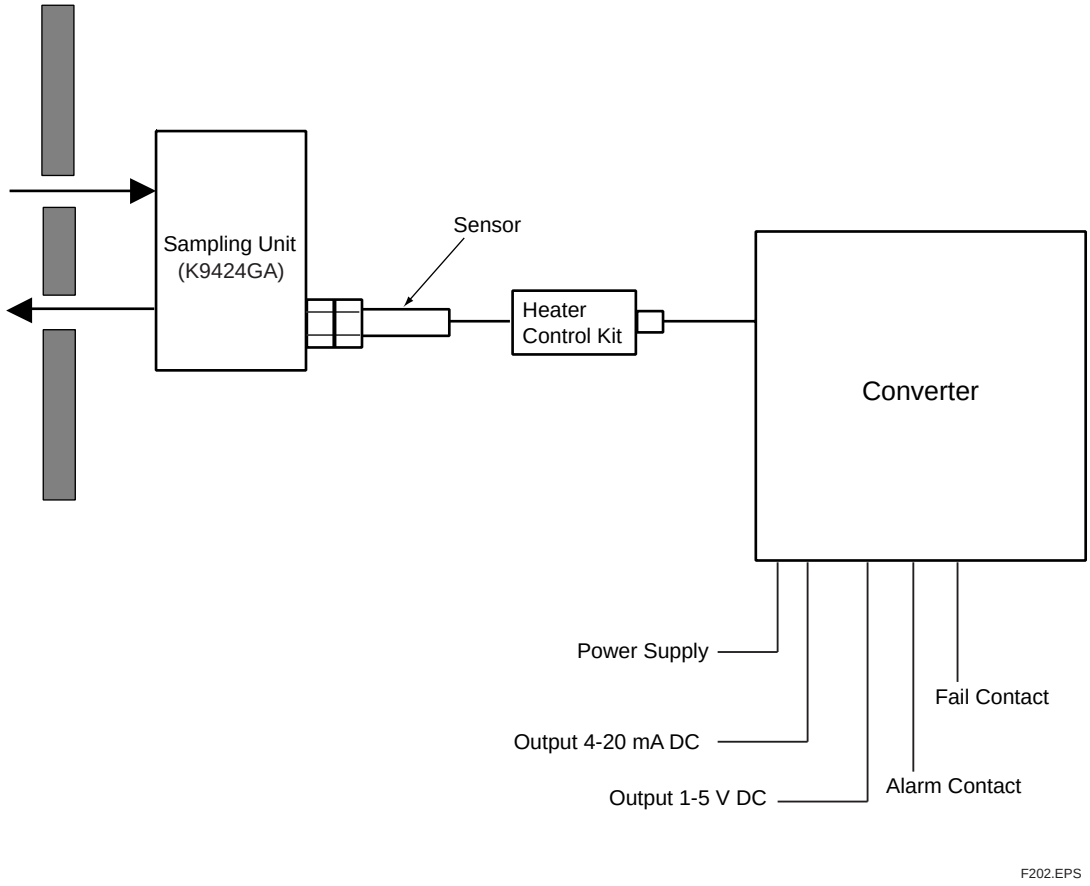

Figure 2.2 System Configuration 2

3. Installation

This chapter explains installation procedures for components of the OX102 oxygen analyzer.

3.1 Installing the Sensor

(1) Installation Site
The OX102 should be installed in a place where there is adequate space for inspection and maintenance. For calibration, the sensor should be removed from the process and installed in the calibration kit.

(2) Mounting
The sensor should be mounted and fixed horizontally and securely using an optional nipple so that it cannot vibrate. Note the following when mounting the nipple.

△ Notes

- When the measuring range used is 0-1000/10000 ppm O_2 or 0-25% O_2, or when the sensor is mounted in a location with severe vibration, a plastic nipple (L9811LA) should be used. Its connection is G3/8 screw or 17 mm O.D. hole. The maximum thickness of the mounting plate is 4 mm for a 17 mm O.D. hole.
- When the measuring range used is 0-100 ppm O_2, a metal nipple (K9424DB) should be used. Its connection is Rc1/4.
- The nipple should be securely tightened so that no leakage occurs. When mounting the sensor with a plastic nipple, use a finger-tight connection; when mounting the sensor with a metal nipple, finger tighten the connection then use a wrench to tighten it a further 1/2 turn.
- Within 50 mm of the sensor tip, it can get very hot. Do not mount the nipple in this hot area.

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.

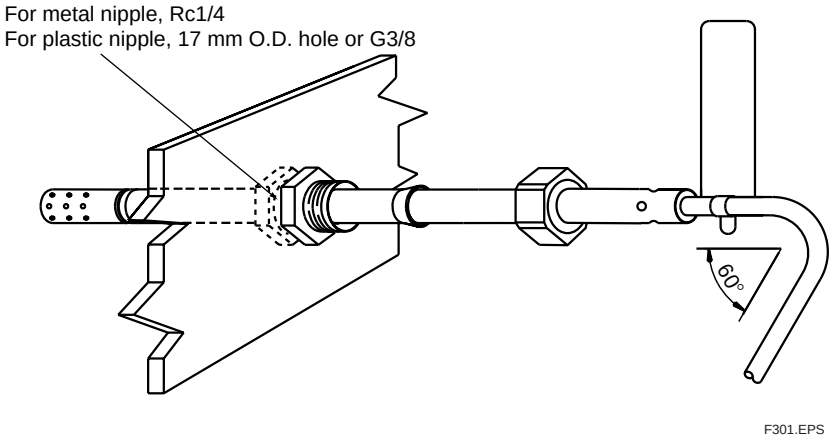

Figure 3.1 Sensor Mounting

3.2 Installing the Converter

(1) Installation Site

The converter should be installed in places where:

- Easy access to display and key operations can be achieved.
- Inspection and maintenance can be easily performed.
- Ambient temperature does not exceed 50°C and temperature fluctuations are minimal: Avoid exposure to direct sunlight or radiant heat.
- Humidity is moderate (40 to 75% RH recommended), and no corrosive gases or metal dust are present.
- Mechanical vibration should be negligible.
- No electromagnetic field should be present.
- No exposure to rain or water is allowed.

(2) Mounting

The converter is panel mounted (copperplate of 1 to 10 mm thickness) using the supplied brackets.

Procedure

- Insert the unit through the mounting hole from the front.
- Mount the converter on the panel using brackets. The brackets should be fixed to the designated position on the right and left sides of the housing by tightening the screws. See Figure 3.2.
- The converter should be upright and horizontal.
- Ensure that the converter bracket screws are tightly secured so there is no movement.

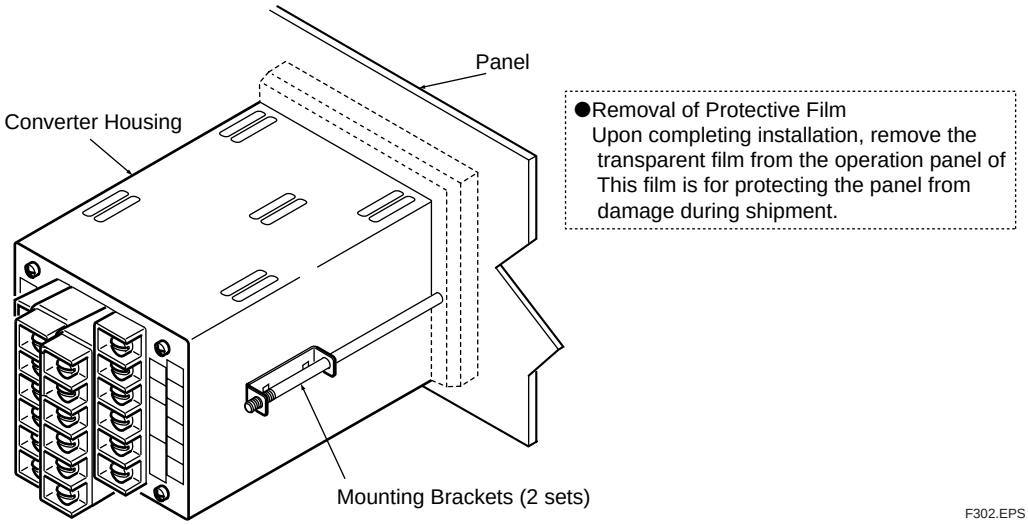

Figure 3.2 Converter Mounting

CAUTION

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

3.3 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.

△Notes

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.

△Notes

The pumps and activated charcoal filter used in this equipment have limited life, and periodic maintenance or replacement will be required. Install this equipment in an accessible location to facilitate maintenance.
Maintenance conditions vary depending on the gas conditions. Replacement intervals for the filter and activated charcoal should be determined in accordance with the operating conditions.

- Used eight hours a day, pump life will be approximately one year.
- Filter life is about 50 hours. (if measured gas contains isopropyl alcohol of concentra tion 500 ppm, and flow is 500 ml/min.)

4. Wiring

This chapter explains the procedures for wiring the converter.

4.1 Precautions

△Notes

Do not apply power to the converter or any other devices, such as alarm devices, relating to the power circuit of the converter, until all wiring has been completed.

4.2 Wiring Types

The converter requires the following wiring.

(1) Sensor (special cable)
(2) Output signal (two analog output)
• 4-20 mA DC (two-core shielded cable)
• 1-5 V DC fixed range only (two-core shielded cable)
(3) Range identification signal: automatic range switching only (two-core shielded cable)
(4) High/Low alarm contact signal (600 V rated heavy-vinyl-insulated wire, or wire of equivalent or greater capacity)
(5) Fail contact signal (600 V rated heavy-vinyl-insulated wire, or wire of equivalent or greater capacity)
(6) Power supply (600 V rated heavy-vinyl-insulated wire, or wire of equivalent or greater capacity)

4.3 Terminals for External Connections

External connections should be made from the terminals on the rear side of the converter. Be careful not to make any mistakes.

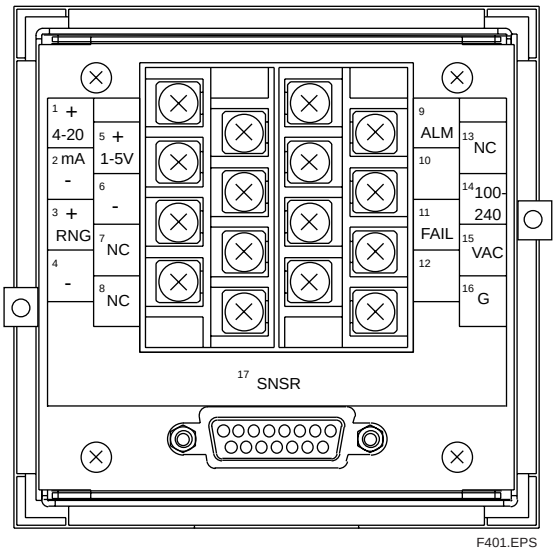

Figure 4.1 Terminal Configuration

CAUTION

- When wiring, ensure that the mains power supply is disconnected, to minimize the risk of electric shock.
- Use 600 V rated heavy-vinyl-insulated wire (JIS C3307), or wires or cables of equivalent or greater capacity for connections.
- Connect to a ground with a ground resistance of 100Ω or less.
- Use (4-mm screw) crimp-on terminals with insulating sleeves for power supply and ground terminals.
- The converter is not equipped with a power switch. Use an external two-pole power switch.
- All wiring should be attached to the installation panel, so that the connection terminals and cables are protected if the cable is pulled or jerked. Fix the extension cable from the sensor and the AC power cable at separate points.

4.4 Wiring Procedures

Follow the instructions below for wiring the converter.

(1) Sensor wiring
Sensor is connected using a special extension cable with 15P connector. Plug in the connector and tighten the screws to secure it.

(2) Signal output
There are two types for signal output: 4-20 mA DC and 1-5 V DC. The 1-5 V DC output signal is only available for a fixed range.

Use two-core shielded wires for signal output wiring. Perform the wiring as shown in Figure 4.2.

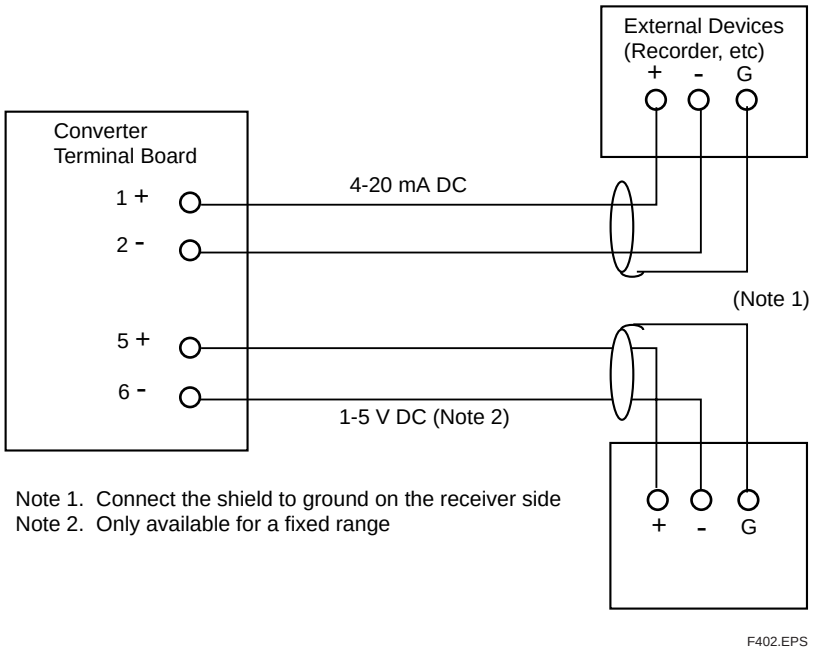

Figure 4.2 Output Signal

(3) Range Identification Signal
The range identification signals are output when automatic range switching mode is selected. See Section 1.1 (6). For these range identification signals, terminal 3 is positive and terminal 4 negative (see Figure 4.1). Use two-core shielded wires for the wiring.

(4) High/Low Alarm Contact Output
This contact output is a relay contact and closes when an alarm condition exists.

Use 600 V-rated insulated wires (JIS C3307), or wires or cables of equivalent or greater capacity, for connections as shown in Figure 4.3.

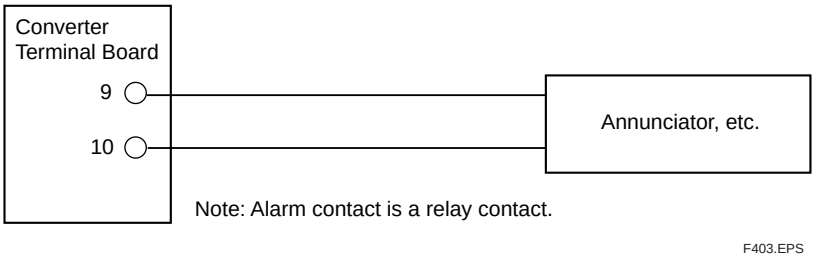

Figure 4.3 Alarm Contact Output

(5) Fail Contact Signal

This contact output is a relay contact, and closes when a failure condition exists, such as disconnection of the sensor heater, and failure or disconnection of cable between the sensor and the converter. Use 600 V-rated vinyl insulated wires (JIS C3307), or wires or cables of equivalent or greater capacity, for connections as shown in Figure 4.4.

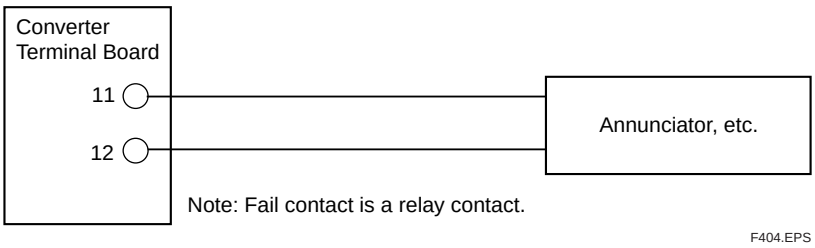

Figure 4.4 Fail Contact Output

(6) Power Supply Wiring

Use 600 V-rated vinyl insulated wires (JIS C3307), or wires or cables of equivalent or greater capacity for power supply wiring as shown in Figure 4.5.

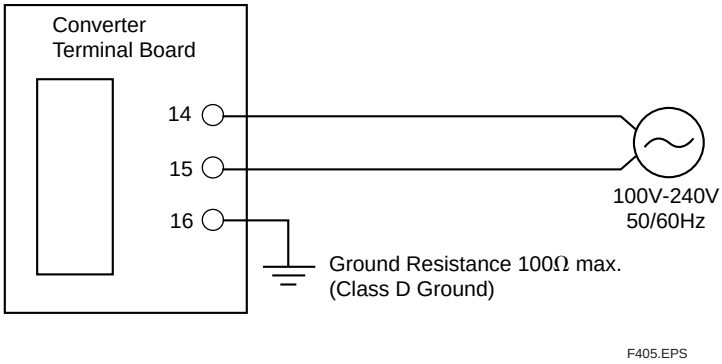

Figure 4.5 Power Supply

5. Component Functions

This chapter describes functions of main equipment of the OX102 oxygen analyzer.

5.1 Sensor

The sensor uses a zirconia current limiting system, enabling direct insertion of the sensor at elevated temperatures up to 150°C. 0 to 250°C within 50 mm of sensor tip. The sensor should be used at a measuring point pressure of 1013 ± 40 hPa abs. When replacing the sensor, enter the data in the Sensor Parameter Table (attached to the sensor control block) into the converter. This ensures sensor compatibility.

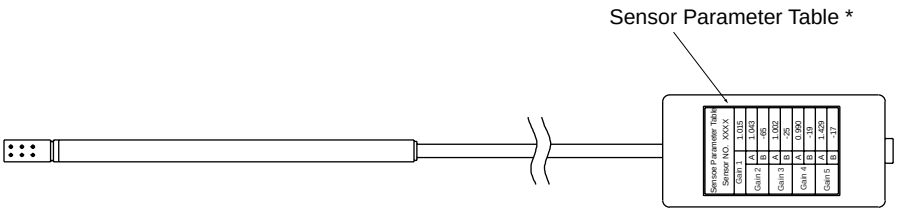

Figure 5.1 Sensor

* Sensor Parameter Table (Example)

Sensor Parameter Table Sensor No. YA-0007		
Gain 1		1.015
Gain 2	A	1.043
	B	-65
Gain 3	A	1.002
	B	-25
Gain 4	A	0.990
	B	-19
Gain 5	A	1.429
	B	-17

When replacing the sensor, enter values in the Sensor Parameter Table into the converter. See Section 6.3 (1) "Setting Sensor Parameter" for procedure.

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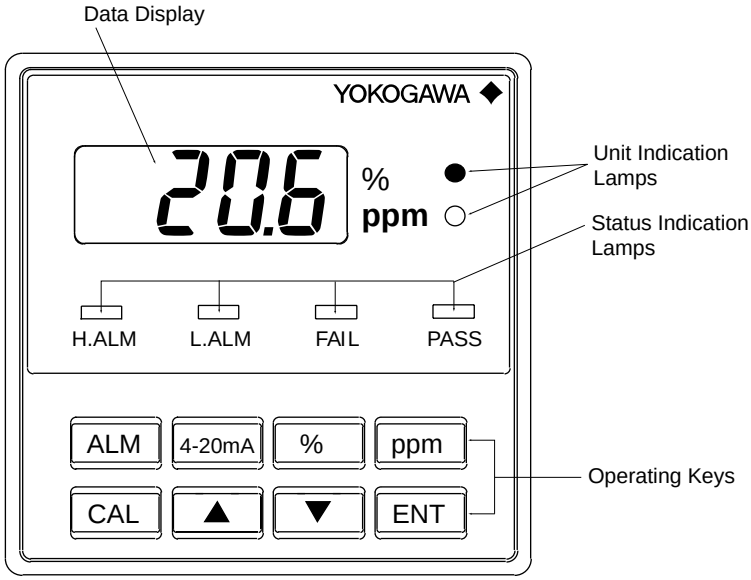
5.2 Converter

The converter provides oxygen concentration readings based on the signals from the sensor and outputs a 4-20 mA/1-5 V DC signal outside. Also the converter has various functions, including the high/low alarm contact output, easy, one-touch calibration, and self-diagnosis function.



Operating Keys :

[ALM] : Used to enter the high/low alarm setting mode

[4-20mA] : Used to configure 4-20 mA output, used together with [▲] key to enter the 1-5 V output setting mode, used together with [▼] key to enter the automatic/manual switching mode

[%] : Used for percentage indication for reading

[ppm] : Used for ppm indication for reading, used together with [CAL] key to enter the measurement mode from any other modes

[CAL] : Used for entering the calibration mode

[▲] : Used for increasing the value during data setting

[▼] : Used for decreasing the value during data setting

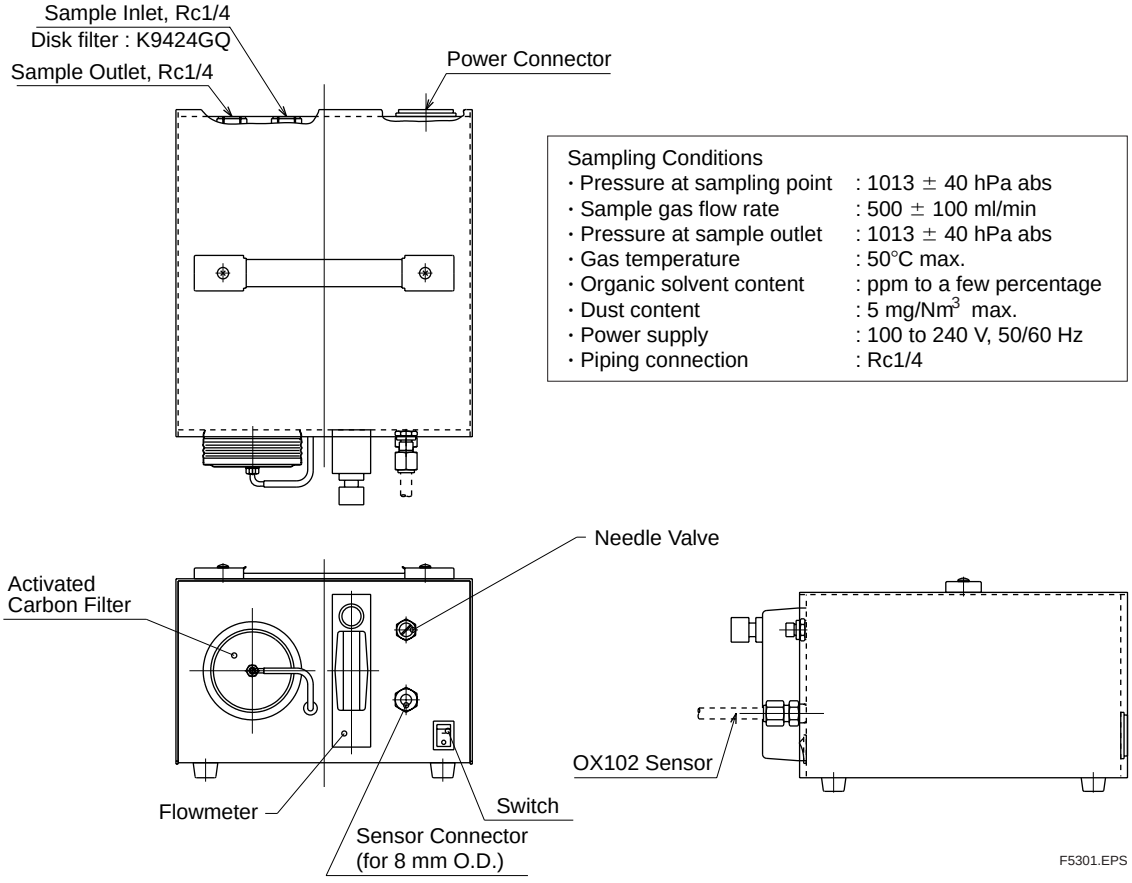
[ENT] : Used for confirming the data entry F5201.EPS

Figure 5.2 Converter

5.3 Sampling Unit (Optional)

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.



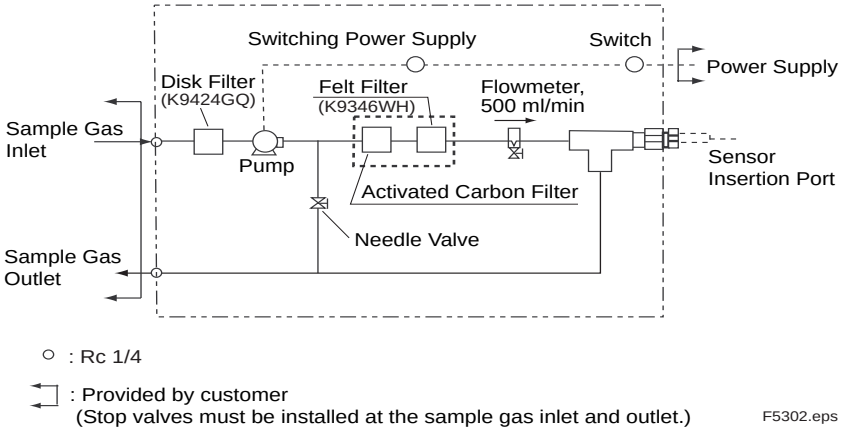
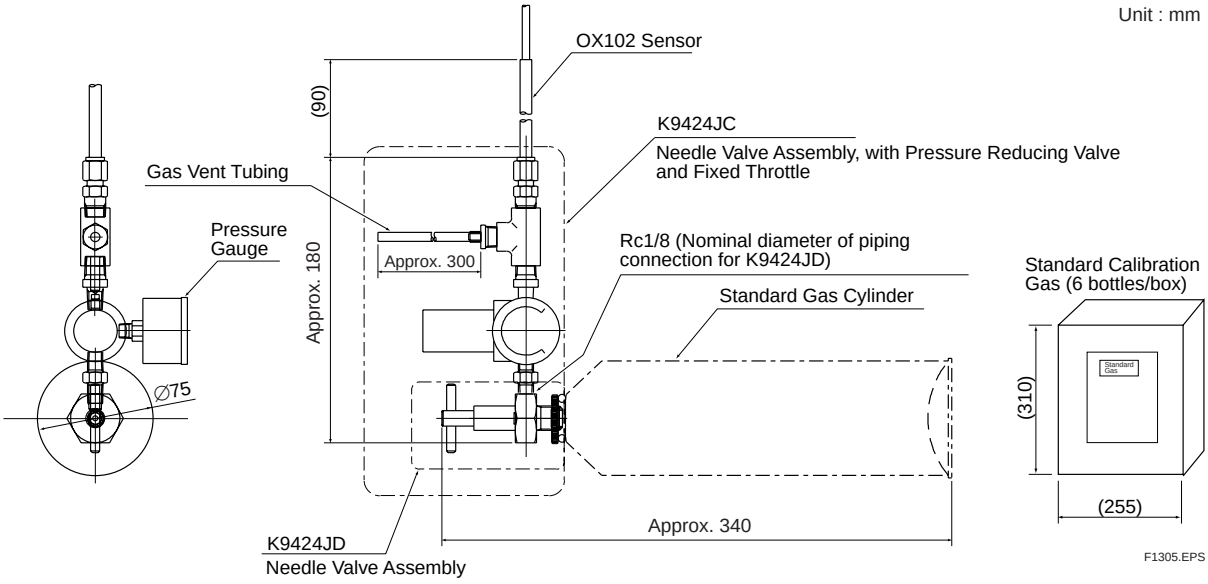


Figure 5.3 Sampling Unit

5.4 Calibration Kit (Optional)

The calibration kit for the OX102 oxygen analyzer comprises a standard gas cylinder and pressure regulating valve to supply standard gas for calibration, when necessary.



Part Number	Description
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

For a system without flow adjustment, adjust the flow rate to 500 ml/min using the needle valve (K9424JD). T1301E.EPS

Figure 5.4 Calibration Kit

CAUTION

Shelf life of gas cylinder

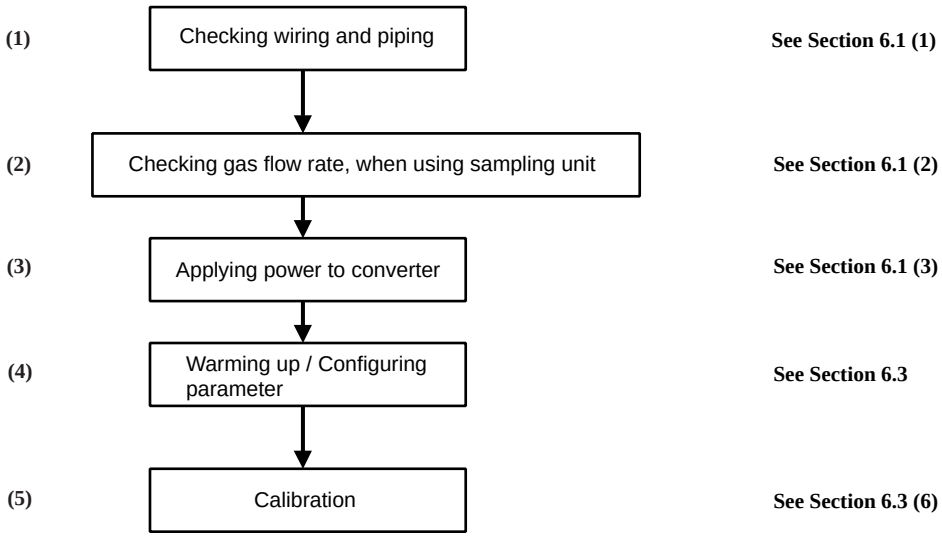
The shelf life of a calibration gas shall be one year from the manufacturing date specified on the label of the cylinder. Yokogawa shall not guarantee accuracy of the equipment, if it is calibrated with an expired calibration gas.

6. Operation

This chapter explains how to operate the OX102 oxygen analyzer.

6.1 Startup

The startup procedure is outlined in the following chart.



Note : For operating procedure of the calibration kit, see Section 6.1 (4).

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Figure 6.1 Startup

(1) Checking wiring and piping, when using the sampling unit
Ensure that wiring is made correctly in accordance with the procedures described in Chapter 4. Piping is only required when using a sampling unit. Ensure that piping is installed properly so that it is free from gas leakage.

(2) Checking gas flow rate, when using the sampling unit
Turn on the power switch of the sampling unit. Adjusting the gas flow rate should be performed with the sensor connected to the sampling unit. While opening the flow regulating valve of the flowmeter completely, adjust the front needle valve until the flowmeter reads approximately 500 ± 100 ml/min. See Figure 5.3.

(3) Applying power to the converter
Ensure that the power supply voltage conforms to the specification of the converter before applying power to the converter (see Section 1.1 (19)). Turn on power to the converter. Measurement is not available for the initial 10 minutes since it takes that time for the sensor to reach the required operating temperature. The initial converter parameters are the default settings. If necessary, change the parameters to meet your application requirements, referring to Sections 6.2 and 6.3.

Briefly after the converter is energized, it shows values at random on the display for about 5 seconds and then switches to measurement mode to indicate approximate values of the oxygen concentration at sampling point. At this stage, the readings are invalid since the sensor temperature has not reached the required operating temperature.

(4) Operating procedure for the calibration gas kit

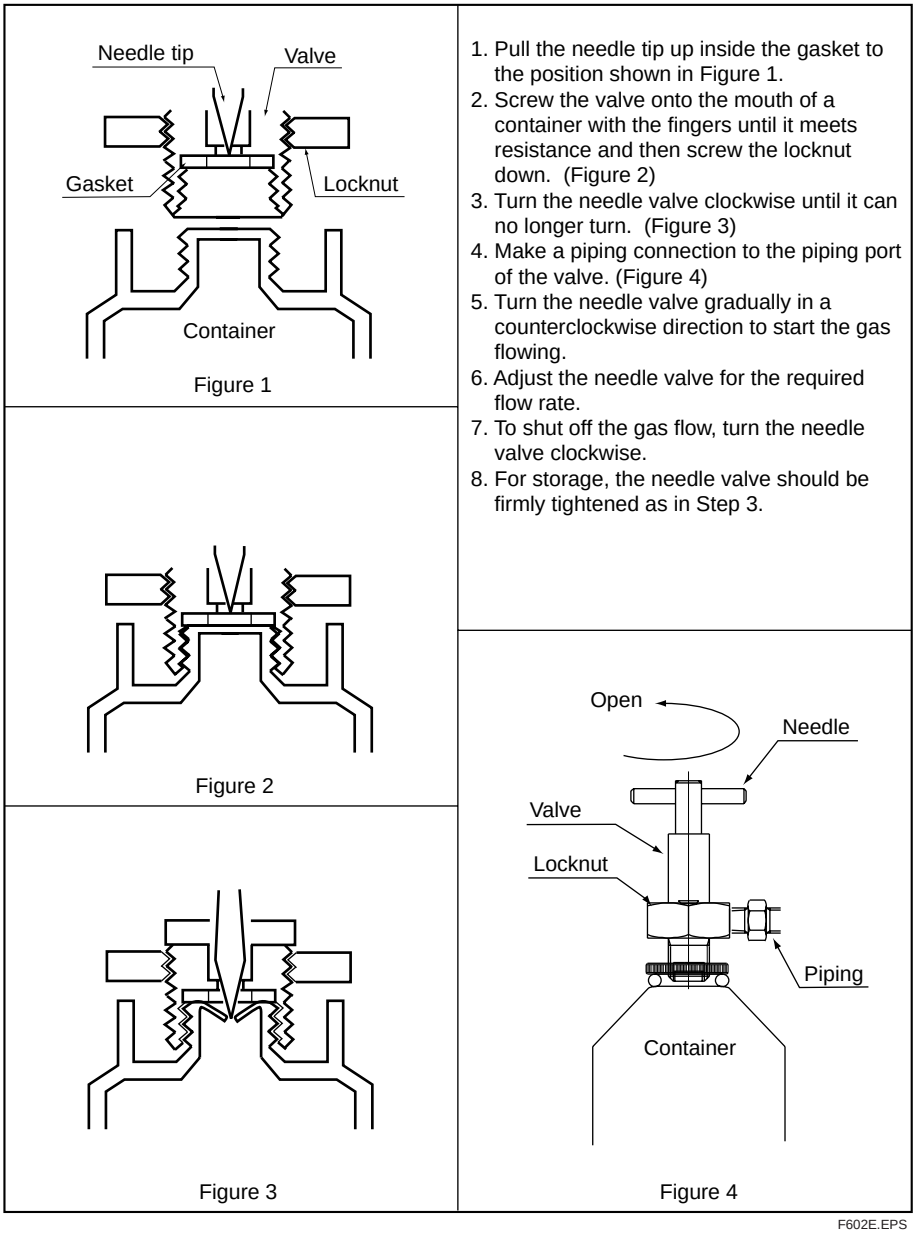

Figure 4 calibration gas kit

6.2 Operational Flow Chart

The following definitions apply in general to the notation used in the text to express and explain the operation keys and the display descriptions. Refer to Figure 5.2 for the functions of the operation keys and the indications on the converter front panel.

●Notation descriptions for the operational flow chart

(1) Display

Notation	Status	Description
20.6 % ● ppm ○ ■ H.ALM	Indicates high alarm status occurs	1. Concentration indication ON 2. % lamp ON 3. ppm lamp OFF 4. High alarm lamp ON
225 % ○ ppm ●	Normally, displays oxygen concentration reading	1. Concentration indication ON 2. % lamp OFF 3. ppm lamp ON

Note:

20.6 : Indicates flashing display, prompting you to configure

225 : Indicates continuous (non-flashing) display

% ● : A black circle indicates that the lamp is on

ppm ○ : A white circle indicates that the lamp is off

■ : A black square indicates that the high alarm lamp is on

H.ALM

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(2) Key operations

[ppm + CAL]: Indicates that keys specified should be pressed simultaneously in left-to-right order. In this case, press the [ppm] key while simultaneously pressing the [CAL] key.

●Operational Flow Chart

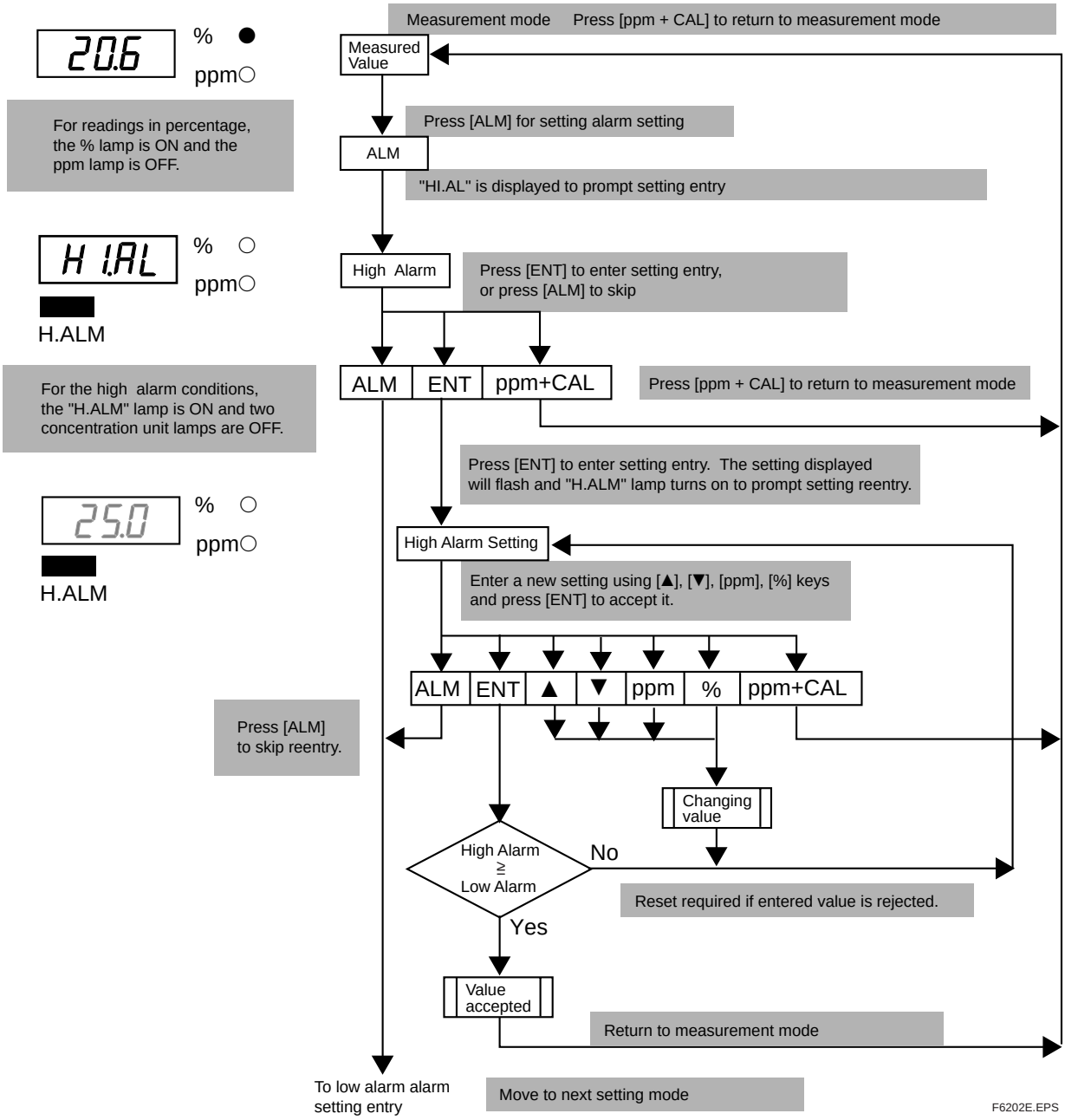
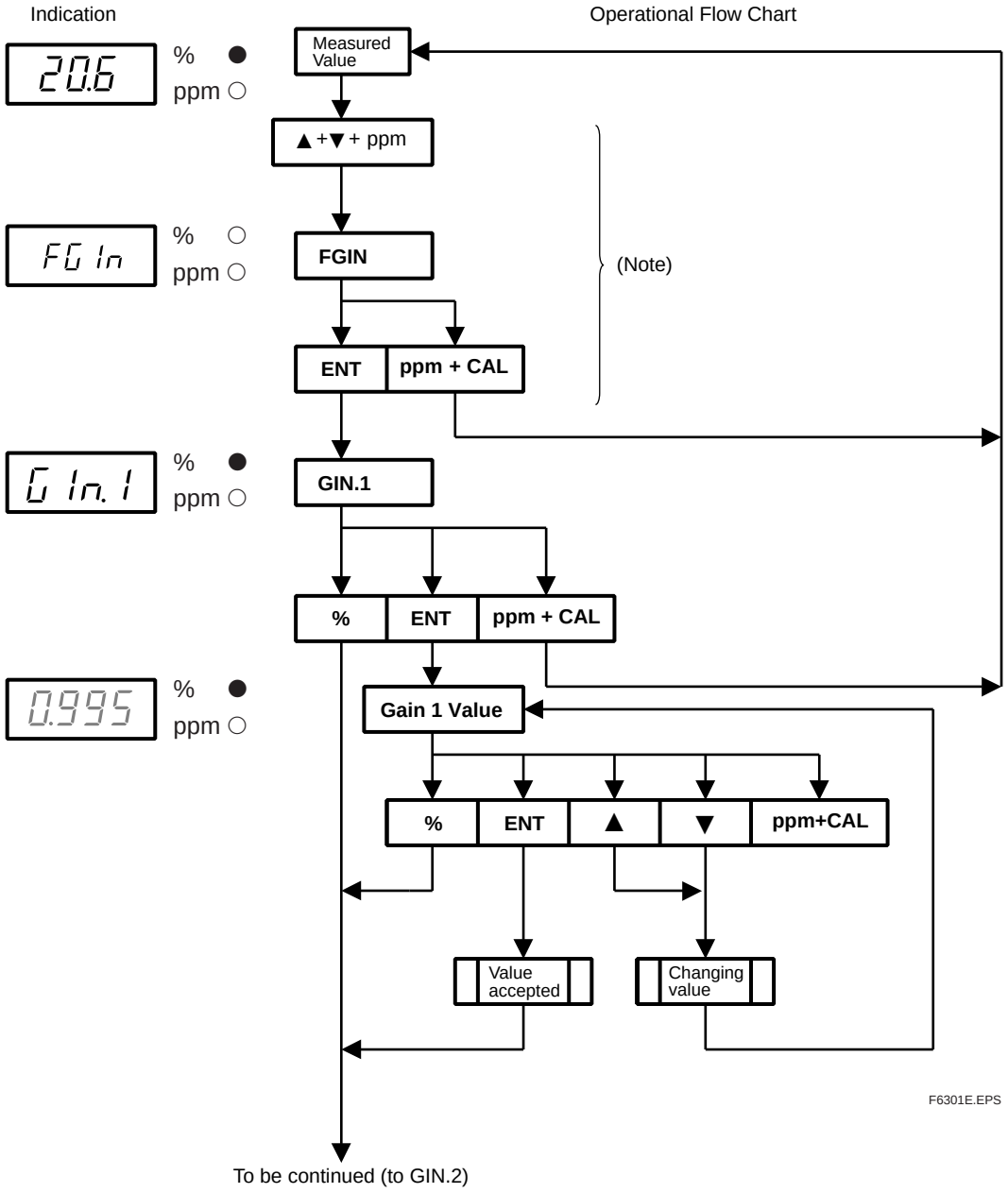


Figure 6.3 Operational Flow Chart

6.3 Configuring Data

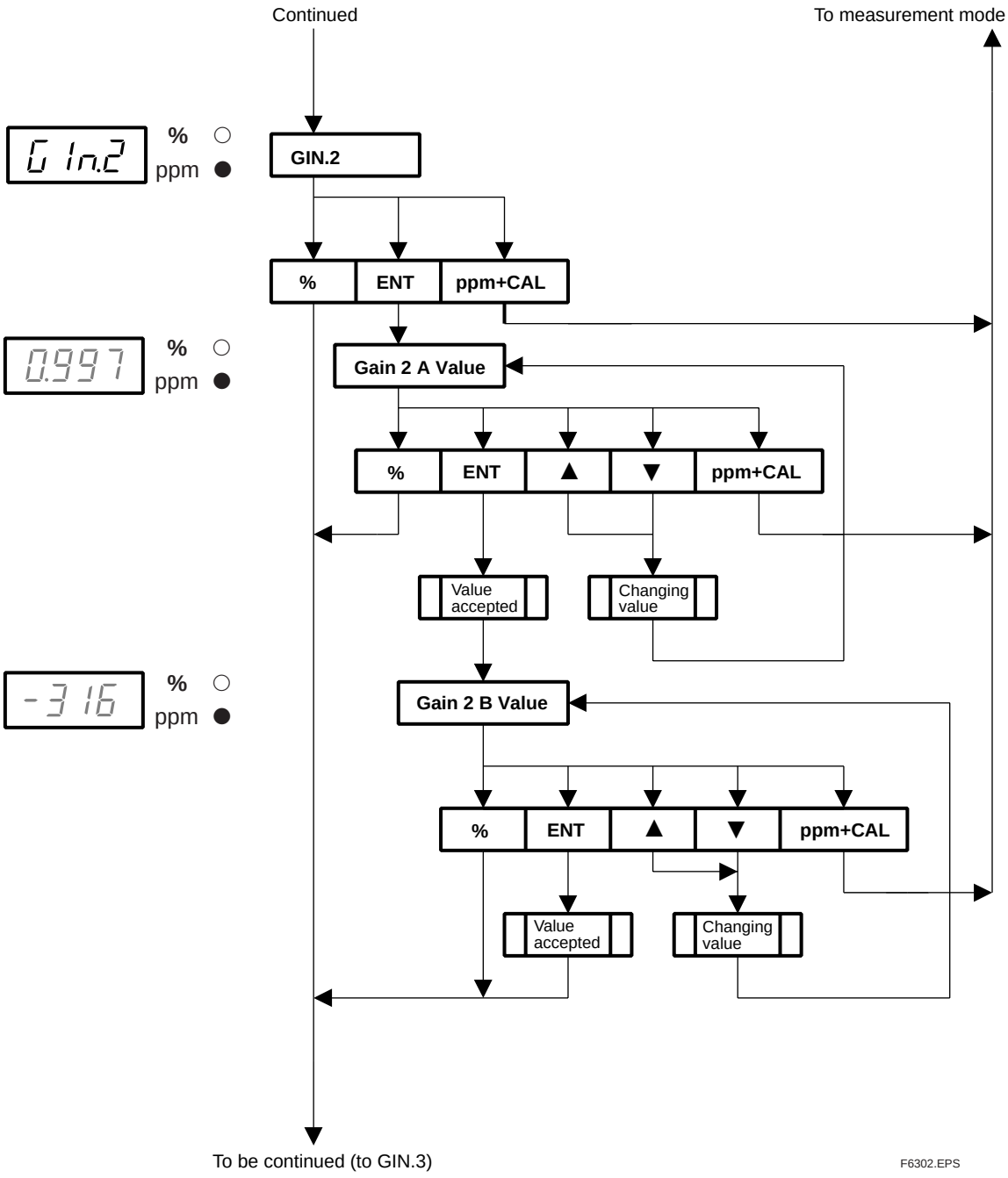
(1) Configuring the sensor parameters

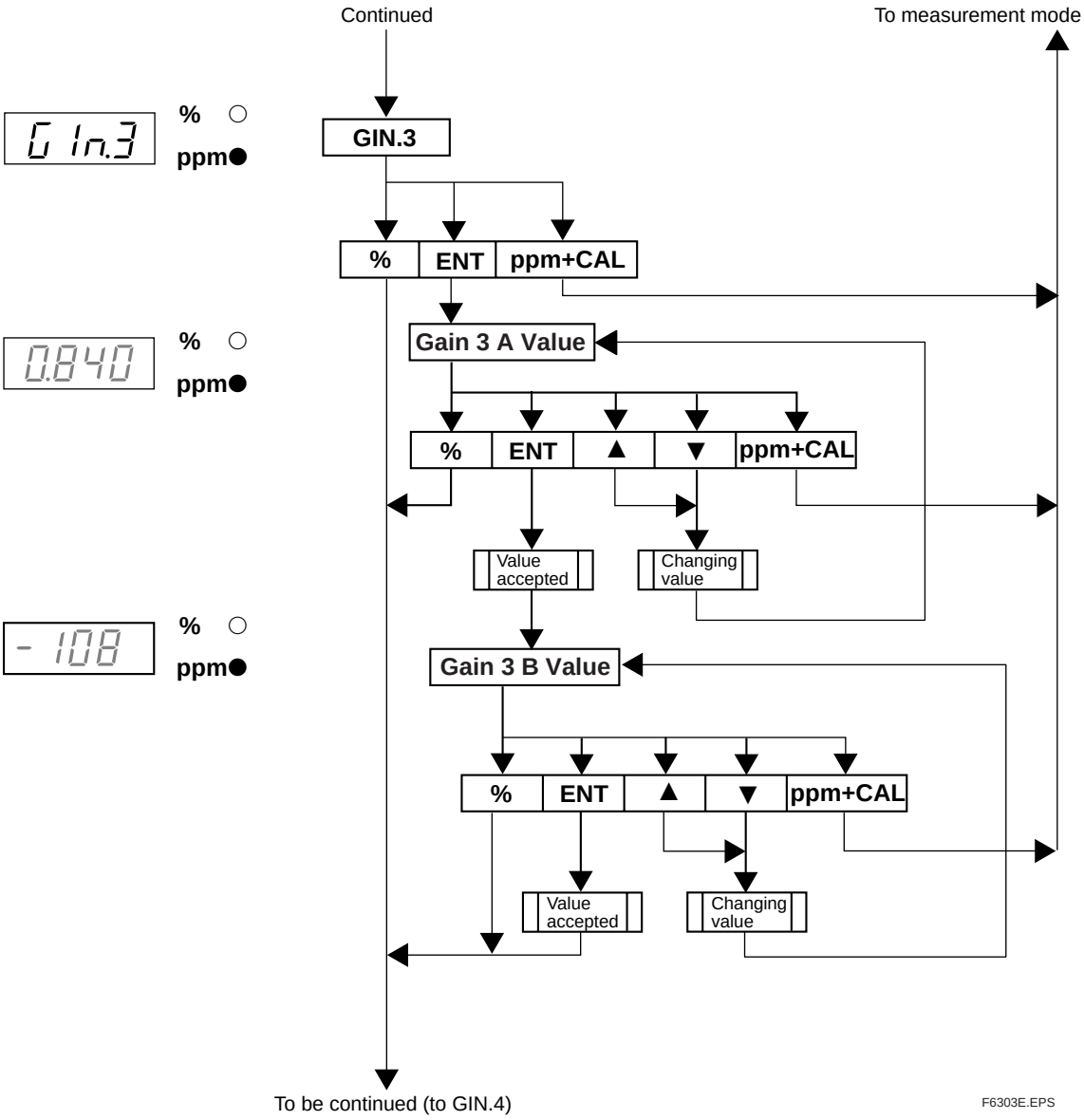
Upon replacing sensors, parameters must be configured following the chart below. Parameters to be configured are specified in the Sensor Parameter Table (Figure 5.1) attached on a new sensor.

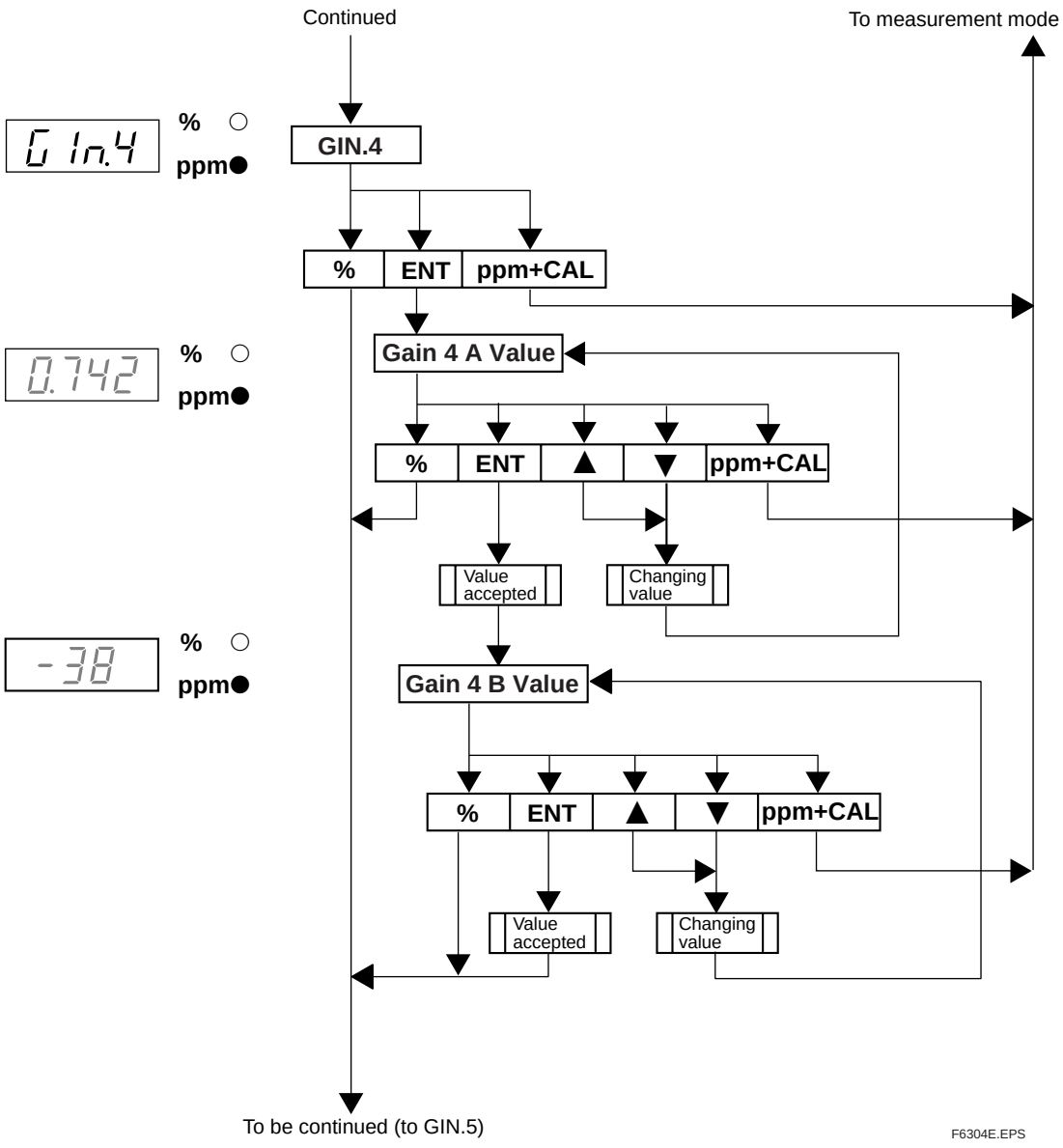


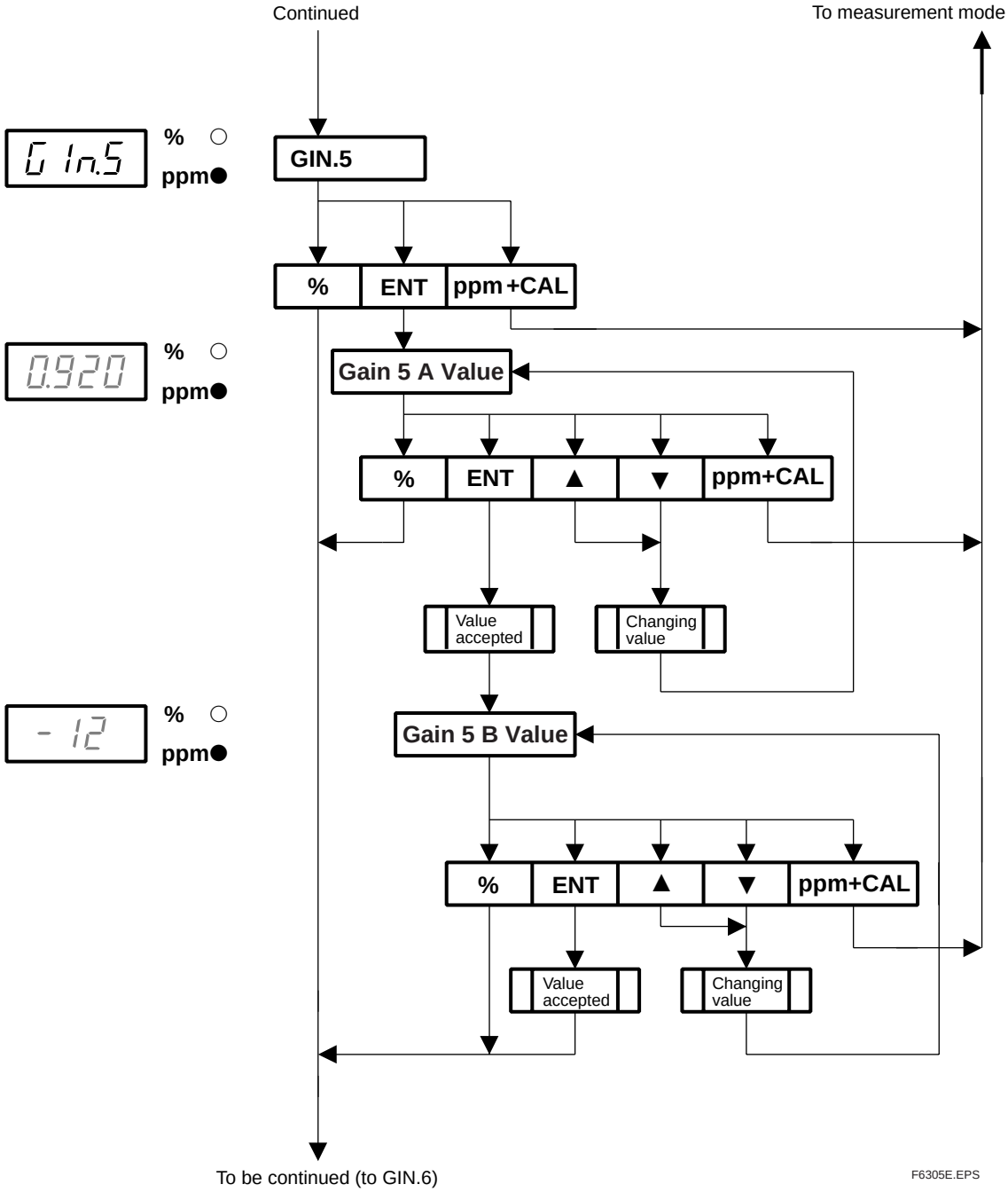
Note) To check the sensor parameter, press [▲+▼+%]. [G In.1] will appear on the display. Press [**ENT**] to confirm the parameter.

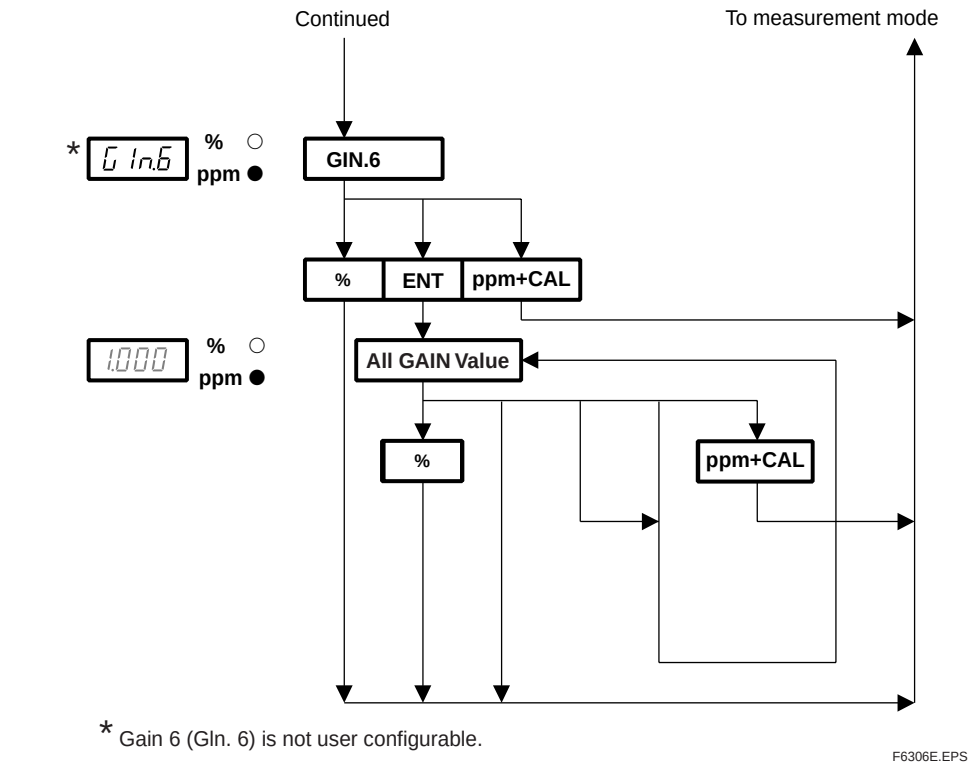
Figure 6.4 Flow Chart of Sensor Parameter Setting


Continued
To measurement mode
G In.2
% ○
ppm ●
GIN.2
% ENT ppm+CAL
0.997
% ○
ppm ●
Gain 2 A Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
-316
% ○
ppm ●
Gain 2 B Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
To be continued (to GIN.3)
F6302.EPS


Continued
To measurement mode
GIN.3
% ENT ppm+CAL
Gain 3 A Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
Gain 3 B Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
To be continued (to GIN.4)
% ○
ppm●
F6303E.EPS


Continued
To measurement mode
GIN.4
% ENT ppm+CAL
Gain 4 A Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
Gain 4 B Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
% ○
ppm●
To be continued (to GIN.5)
F6304E.EPS


Continued
To measurement mode
GIN.5
% ENT ppm +CAL
Gain 5 A Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
Gain 5 B Value
% ENT ▲ ▼ ppm+CAL
Value accepted
Changing value
% ○
ppm●
To be continued (to GIN.6)
F6305E.EPS



(2) Automatic/Manual Switching

In this mode, either automatic or manual range switching can be selected. Set either mode following the procedure shown in the flow chart below.

When the autoswitching is selected, the mode of "Configuring the 4-20 mA output signal" described in Section (3) is automatically determined.

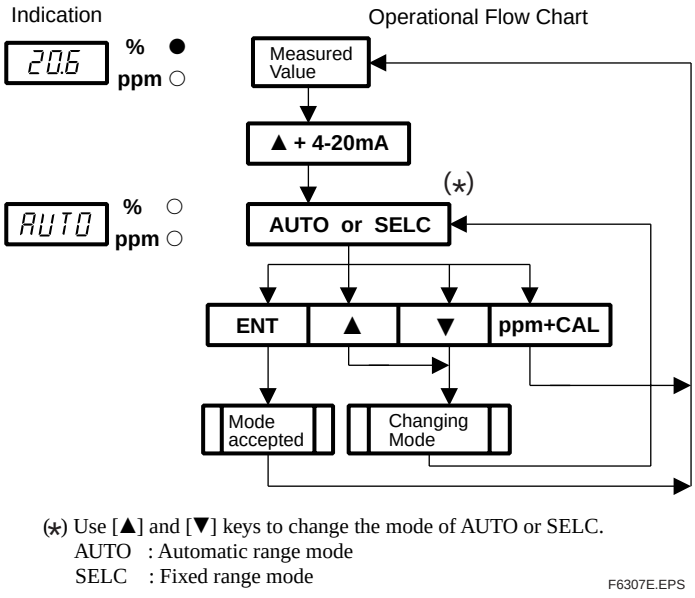
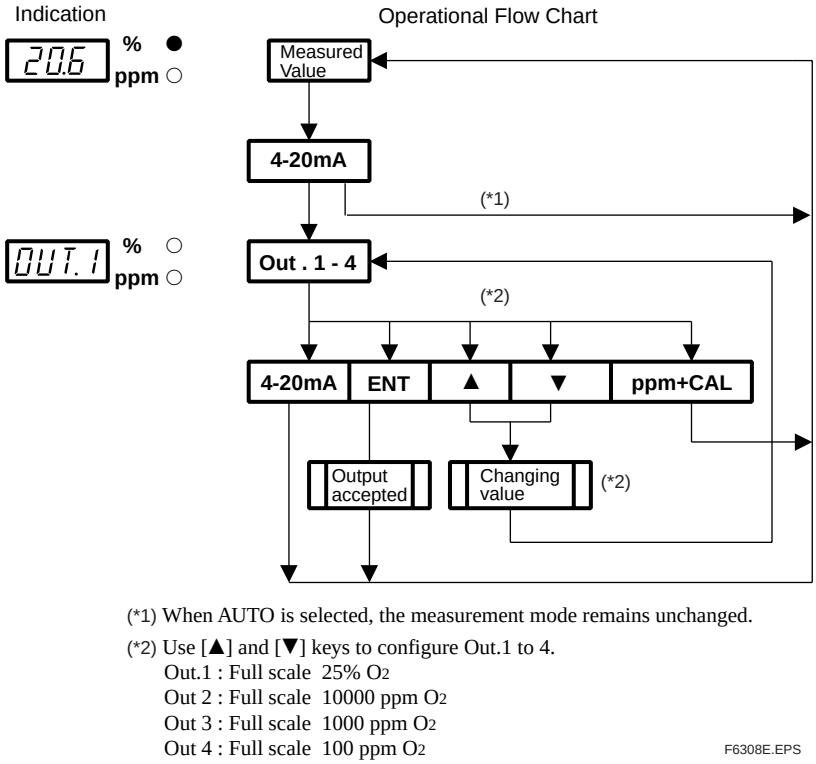


Figure 6.5 Flow Chart of Automatic/Manual Switching Setting

(3) Configuring the 4-20 mA output signal

This mode is to configure the 4-20 mA output signal for the fixed range. Configure the signals following the procedure shown in the flow chart below.

This mode is automatically determined if the automatic/manual range switching mode is set to autorange mode.



(*1) When AUTO is selected, the measurement mode remains unchanged.

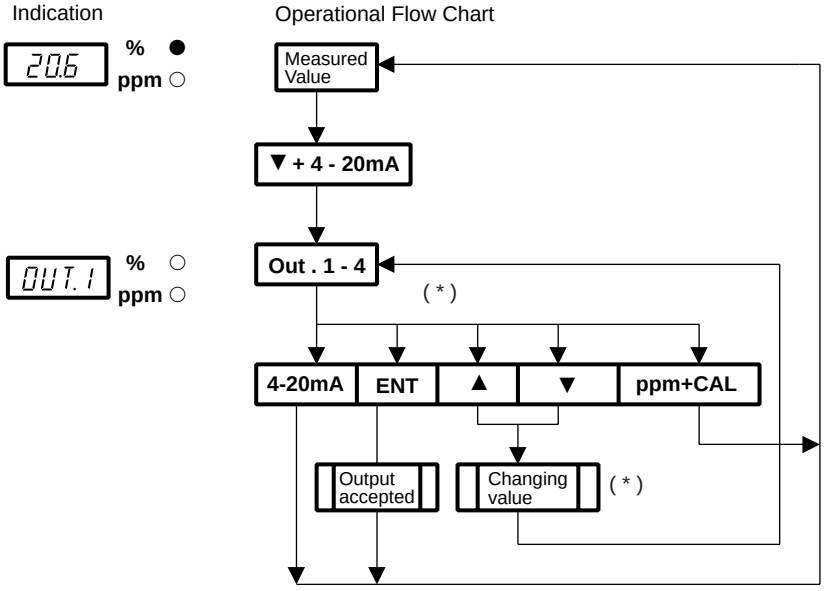
(*2) Use [▲] and [▼] keys to configure Out.1 to 4.
Out.1 : Full scale 25% O_2
Out 2 : Full scale 10000 ppm O_2
Out 3 : Full scale 1000 ppm O_2
Out 4 : Full scale 100 ppm O_2

Figure 6.6 Flow Chart of 4-20 mA Output Signal Setting

(4) Configuring the 1-5 V output signal

This mode is to configure the 1-5 V output signal to correspond to a fixed range. Configure the signals following the procedure shown in the flow chart below.

This output signal is always set to correspond to a fixed range. Therefore, even if automatic range switching is selected, this output signal should be configured for each range.

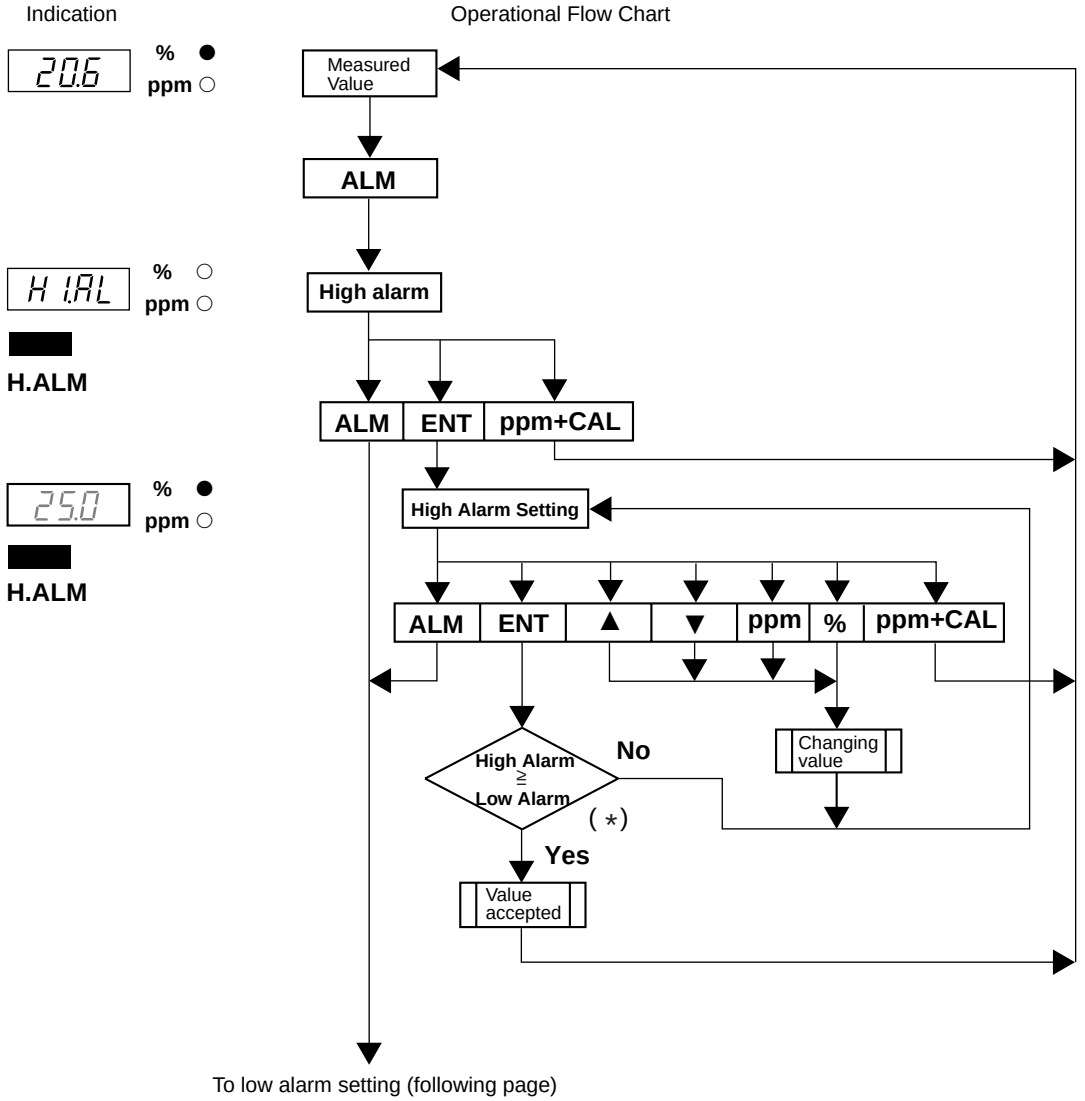


(*) Use [▲] and [▼] keys to configure Out.1 to 4.
Out.1 : Full scale 25% O_2
Out 2 : Full scale 10000 ppm O_2
Out 3 : Full scale 1000 ppm O_2
Out 4 : Full scale 100 ppm O_2

Figure 6.7 Flow Chart of 1-5 V Output Signal Setting

(5) Configuring high/low alarm contact output settings

This mode is to configure the oxygen concentration high/low alarm contact output settingsalarm. Configure settings following the procedure shown in the flow chart below. The high alarm setting should be equal or greater than the low alarm setting.



(*) If the entered high alarm setting is less than the low alarm setting, the display will show E- - - for about 3 seconds and the entered setting will flash to prompt reentry. An appropriate value should be reentered.

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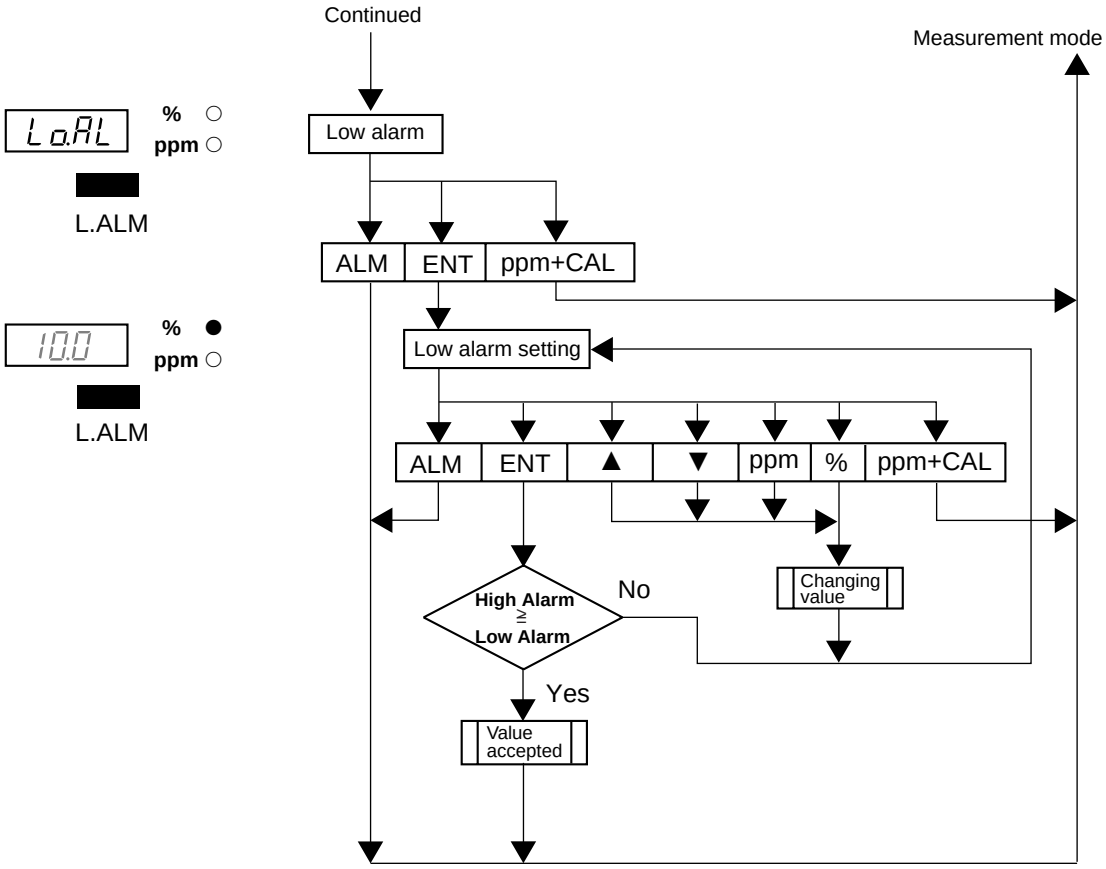
Figure 6.8 Flow Chart of High/Low Alarm Setting



(*) If the entered high alarm setting is less than the low alarm setting, the display will show **E- - -** for about 3 seconds and the entered setting will flash to prompt reentry. An appropriate value should be reentered.

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(6) Resetting the sensor parameters to the default values

This is to reset the sensor parameters (A and B values for each gain, see Section 5) to the factory default values.

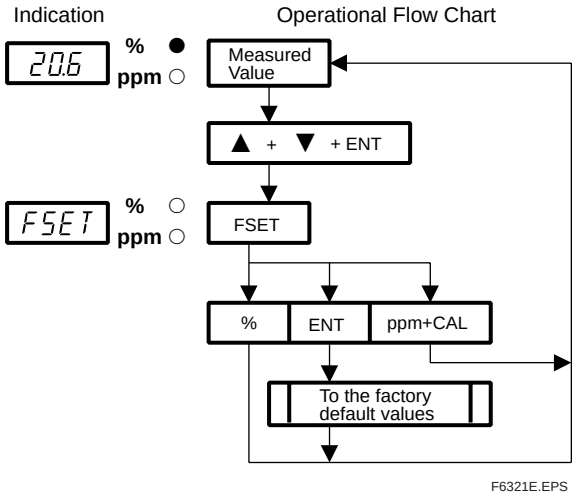

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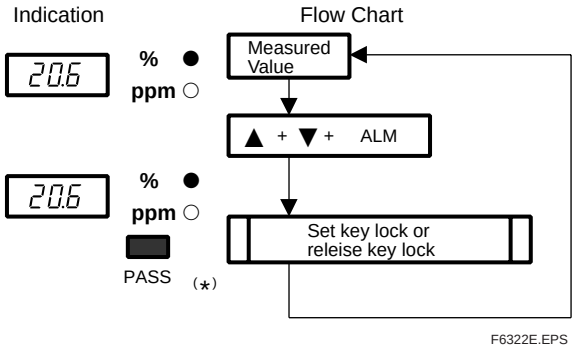
Figure 6.9 Flow Chart of Sensor Parameter Resetting

(7) Key lock

This is to lock each key operation.



(*) While the "PASS" lamp is on, the key lock mode is enabled so that key operations are not permitted.

Figure 6.10 Flow Chart of Key Lock

6.4 Calibration

(1) Calibration

This mode is to calibrate the OX102 oxygen analyzer using the calibration gases, including atmospheric air. Enter the known concentration value of a calibration gas and then analyzer apply the calibration gas to the sensor and calibrate the sensor. The calibration requires calibration gases with known concentrations (1000 ppm O_2 or 10000 ppm O_2 calibration gases) and the calibration kit.

- Before shipment, a complete calibration of the OX102 oxygen analyzer from 0-100 ppm to 0-25% was performed with standard calibration gases at the factory.
- When using the equipment right after the delivery, first check the reading of the converter with the sensor in atmospheric air. If the reading is within a deviation of ± 0.25% O_2 from 20.9%, the equipment does not need calibration and is ready for use. If the reading is out by a deviation of ± 0.25% O_2 or greater, the equipment needs one-point calibration for each range.
- Calibration is basically performed at one point for each measuring range. Perform calibration following the procedure shown in the flow chart in the following pages.
- Flow charts illustrate how to perform calibration for each range. To perform calibration only for required ranges, skip unwanted ranges by pressing the [CAL] key repeatedly until the desired range appears. For complete calibration, contact us for factory calibration.
- Quick adjustment is available that enables the analyzer to harmonize output values with actual ones. For details, see Section 6.4 (2) “Moving zero point.” This function is useful when temporary adjustment is required or when calibration gas is not available at hand.
- The sensor deteriorates progressively in service. Its life varies depending on operating conditions. If the sensor cannot be calibrated or the response becomes quite slow, the sensor should be replaced.

No.	Calibration Point	Calibration Setting Range
1	Air	Atmospheric air or 15-25% O_2
2	20 ppm	15-25 ppm O_2 gas cylinder
3	100 ppm	80-120 ppm O_2 gas cylinder
4	500 ppm	400-600 ppm O_2 gas cylinder
5	1000 ppm	900-1100 ppm O_2 gas cylinder (*1)
6	10000 ppm	8500-9500 ppm O_2 gas cylinder (*2)

*(1) Or 1000 ppm O_2 calibration gas (1L, P/N K9424JP) T6401E.EPS

*(2) Or 10000 ppm O_2 calibration gas (1L, P/N K9424JQ)

For complete calibration, contact YOKOGAWA for factory calibration.

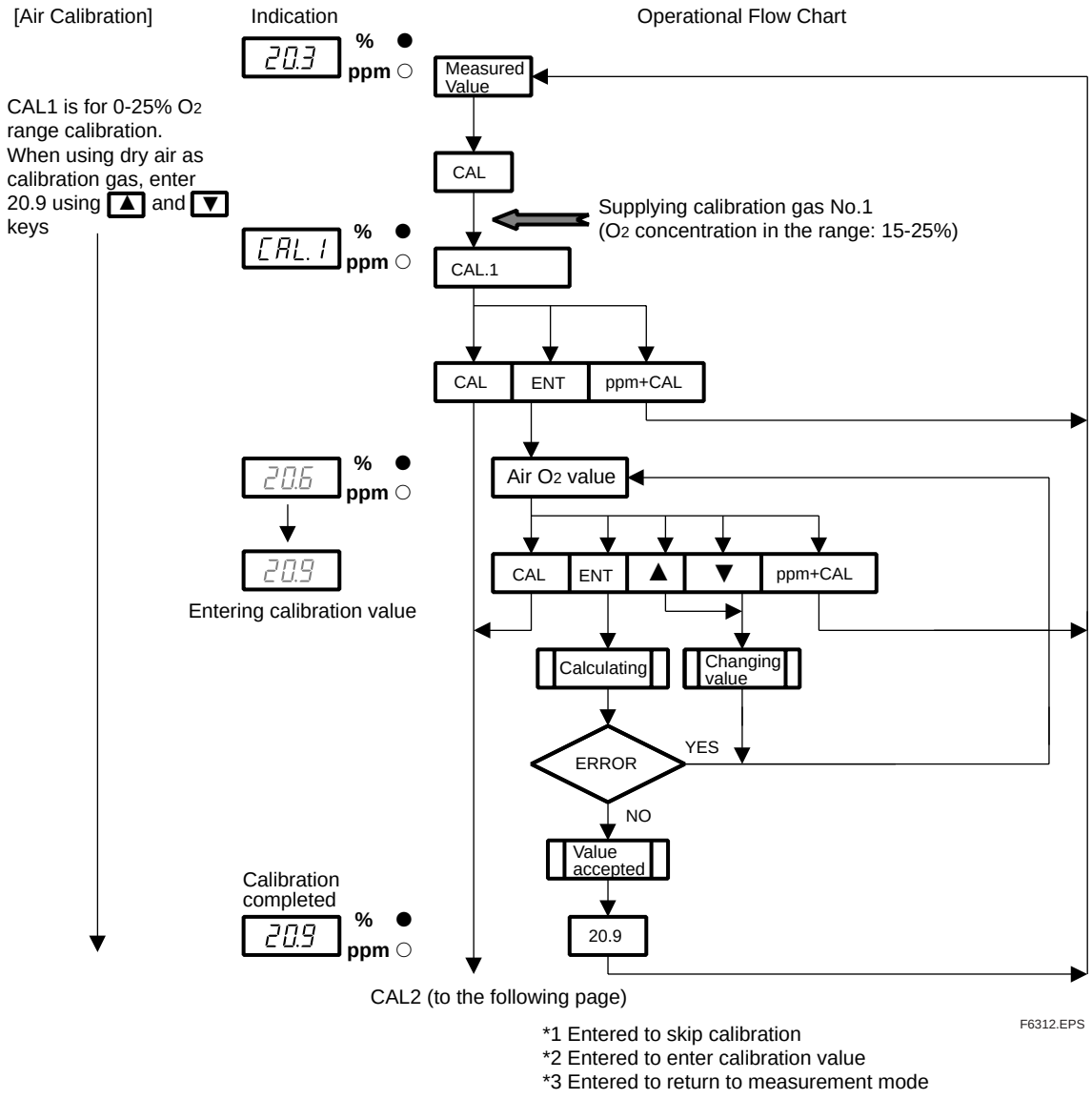
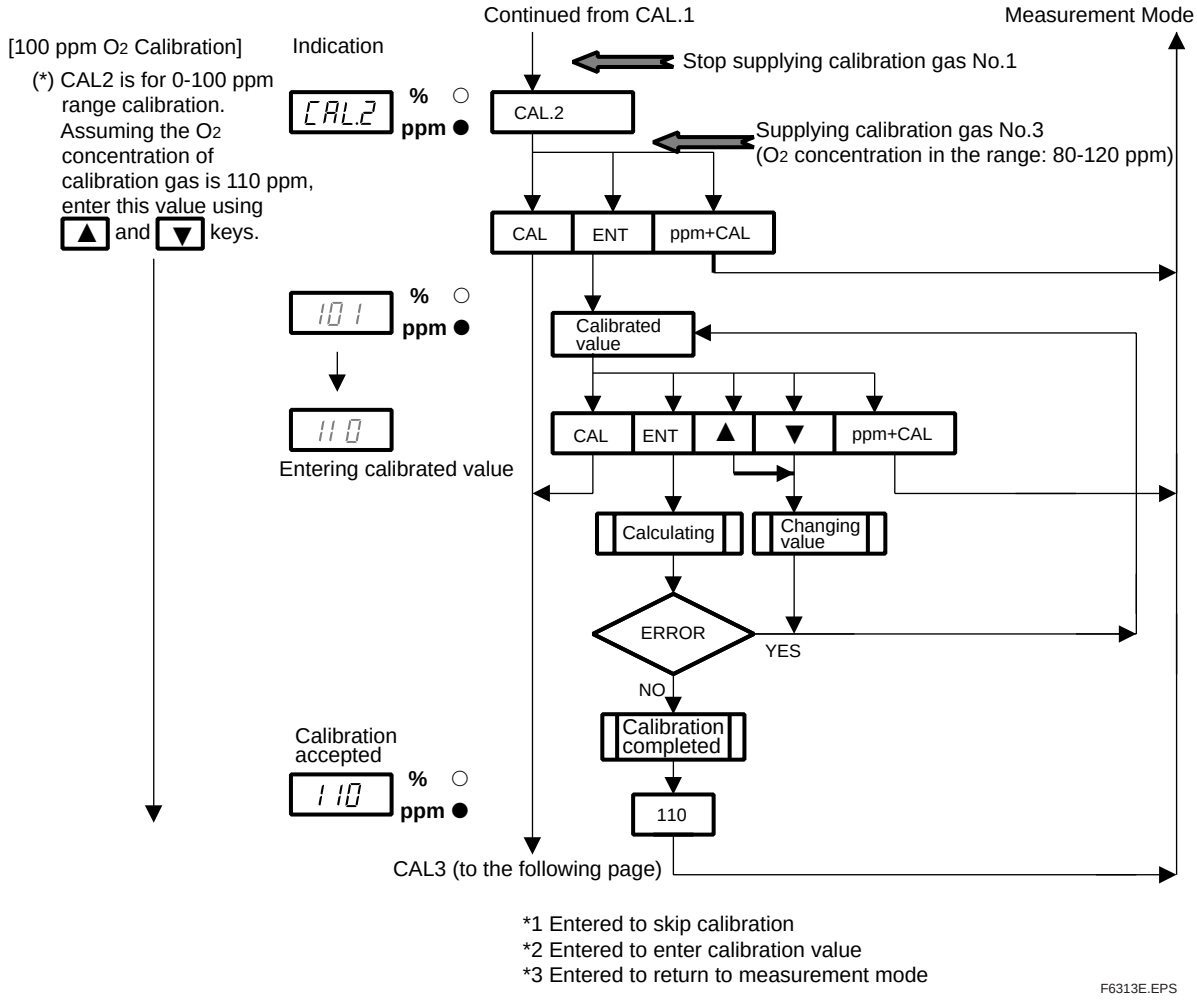
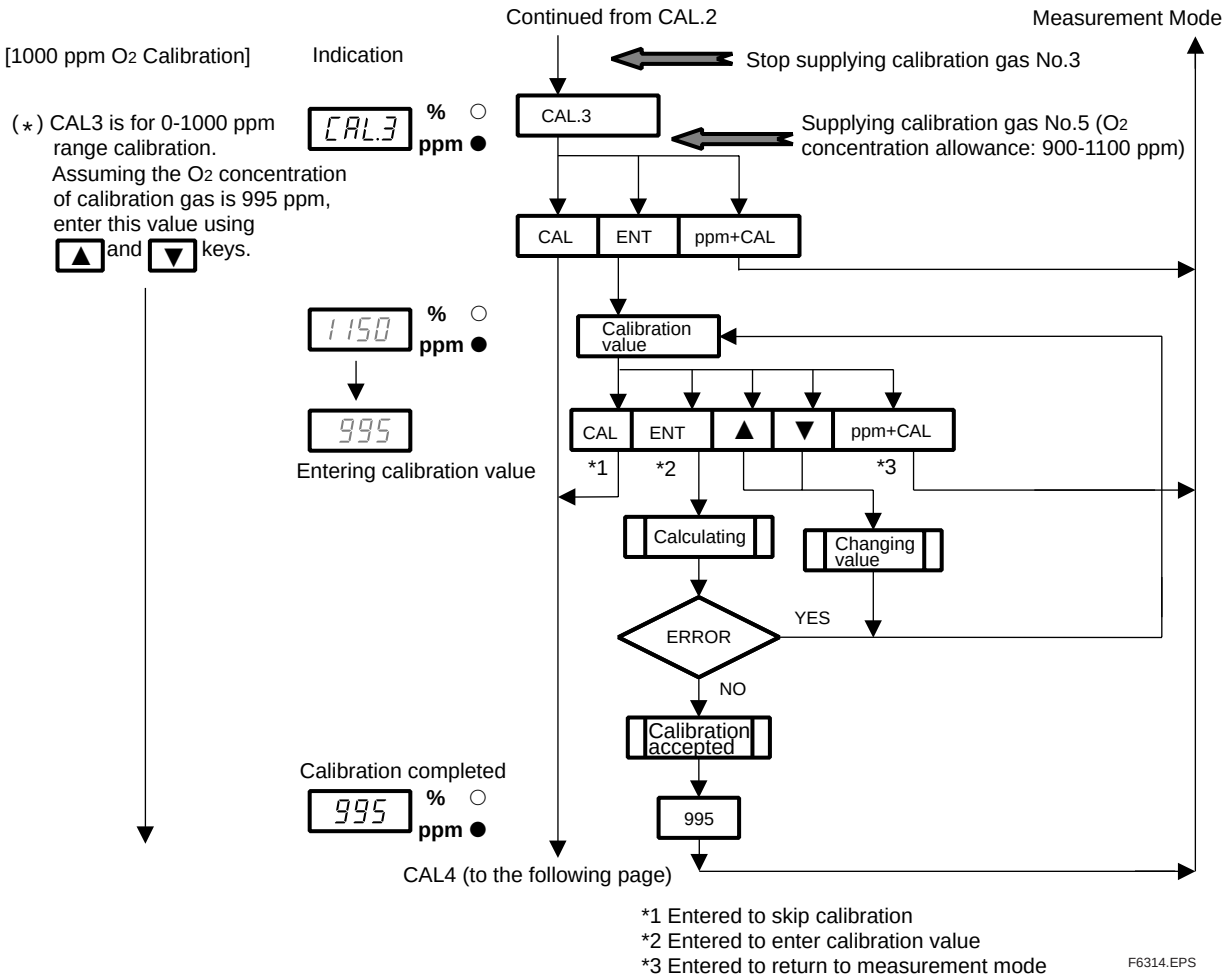
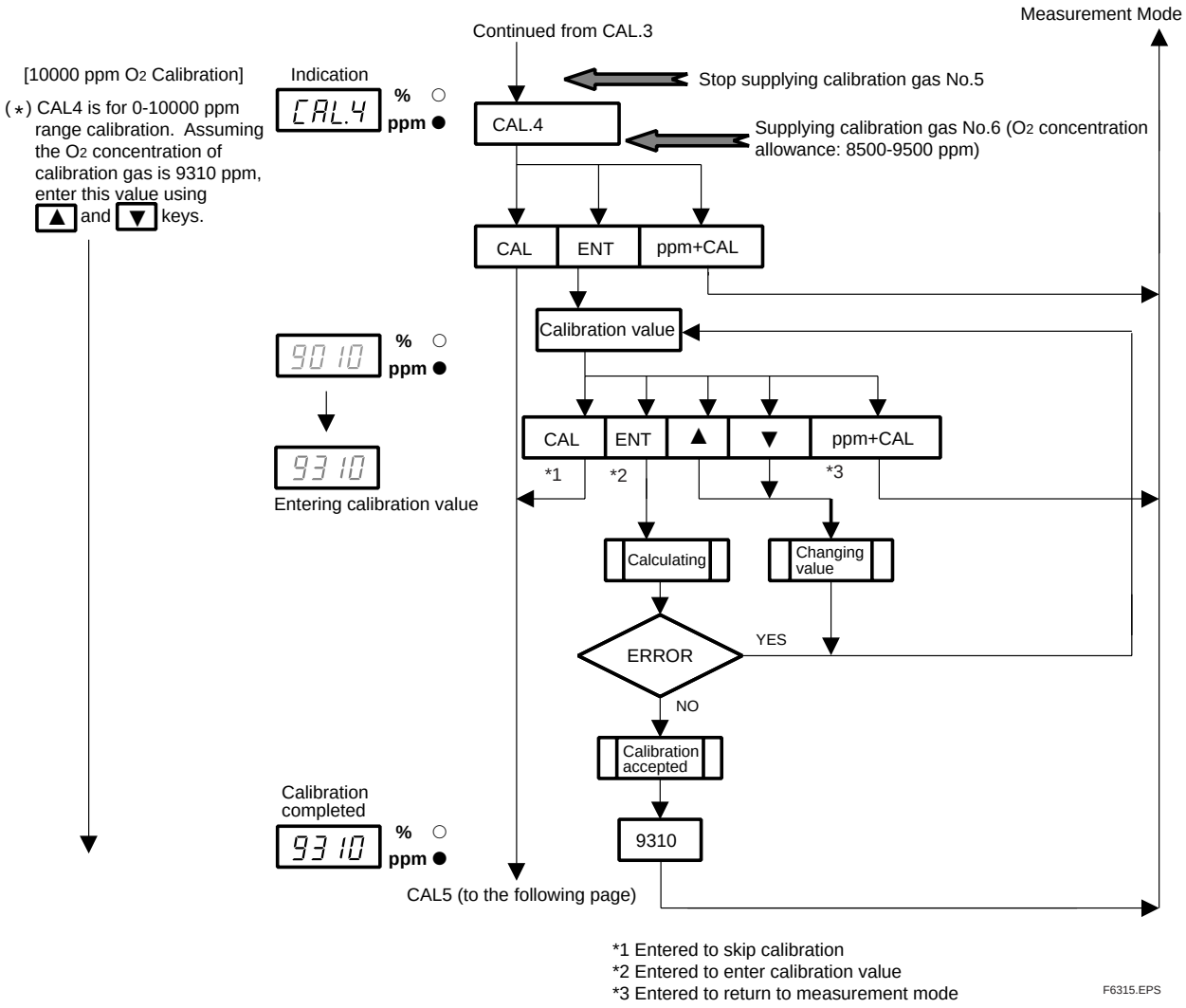


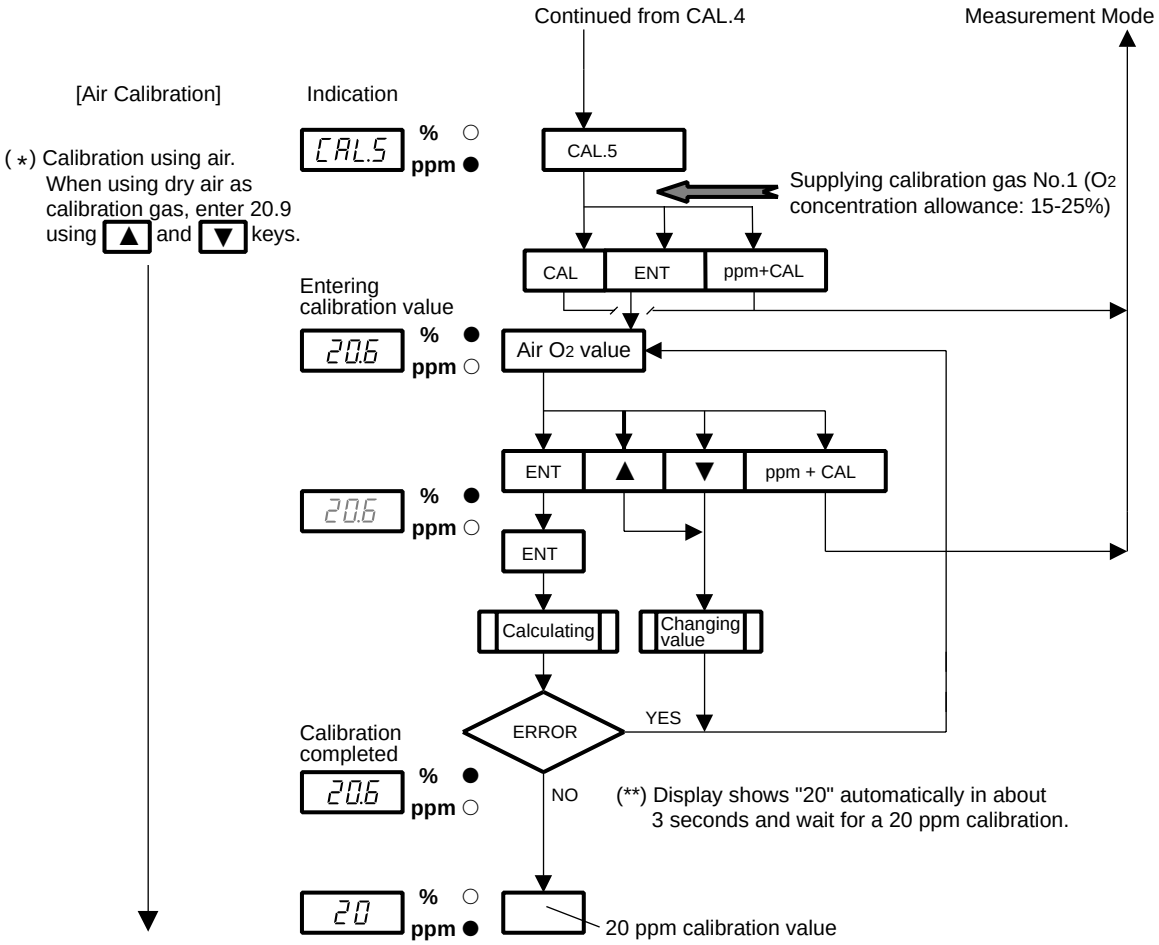
Figure 6.11 Calibration Flow


Continued from CAL.1
Measurement Mode
[100 ppm O2 Calibration]
Indication
(*) CAL2 is for 0-100 ppm range calibration. Assuming the O2 concentration of calibration gas is 110 ppm, enter this value using ▲ and ▼ keys.
Stop supplying calibration gas No.1
CAL.2
Supplying calibration gas No.3
(O2 concentration in the range: 80-120 ppm)
CAL
ENT
ppm+CAL
% ○
ppm ●
101
Calibrated value
110
Entering calibrated value
CAL
ENT
▲
▼
ppm+CAL
Calculating
Changing value
ERROR
YES
NO
Calibration completed
Calibration accepted
110
CAL3 (to the following page)
*1 Entered to skip calibration
*2 Entered to enter calibration value
*3 Entered to return to measurement mode
F6313E.EPS


Continued from CAL.2
Measurement Mode
[1000 ppm O2 Calibration]
Indication
Stop supplying calibration gas No.3
(*) CAL3 is for 0-1000 ppm range calibration. Assuming the O2 concentration of calibration gas is 995 ppm, enter this value using ▲ and ▼ keys.
CAL.3
% ○
ppm ●
Supplying calibration gas No.5 (O2 concentration allowance: 900-1100 ppm)
CAL
ENT
ppm+CAL
1150
995
Entering calibration value
Calibration value
▲
▼
*1
*2
*3
Calculating
Changing value
ERROR
YES
NO
Calibration accepted
Calibration completed
CAL4 (to the following page)
*1 Entered to skip calibration
*2 Entered to enter calibration value
*3 Entered to return to measurement mode
F6314.EPS


Measurement Mode
Continued from CAL.3
[10000 ppm O2 Calibration]
(*) CAL4 is for 0-10000 ppm range calibration. Assuming the O2 concentration of calibration gas is 9310 ppm, enter this value using ▲ and ▼ keys.
Indication
CAL.4
% ○
ppm ●
Stop supplying calibration gas No.5
CAL.4
Supplying calibration gas No.6 (O2 concentration allowance: 8500-9500 ppm)
CAL
ENT
ppm+CAL
Calibration value
9010
% ○
ppm ●
CAL
ENT
▲
▼
ppm+CAL
*1
*2
*3
9310
Entering calibration value
Calculating
Changing value
ERROR
YES
NO
Calibration accepted
9310
Calibration completed
9310
% ○
ppm ●
CAL5 (to the following page)
*1 Entered to skip calibration
*2 Entered to enter calibration value
*3 Entered to return to measurement mode
F6315.EPS

The procedure for complete calibration, requiring six types of calibration gas, is illustrated in the following flow chart.



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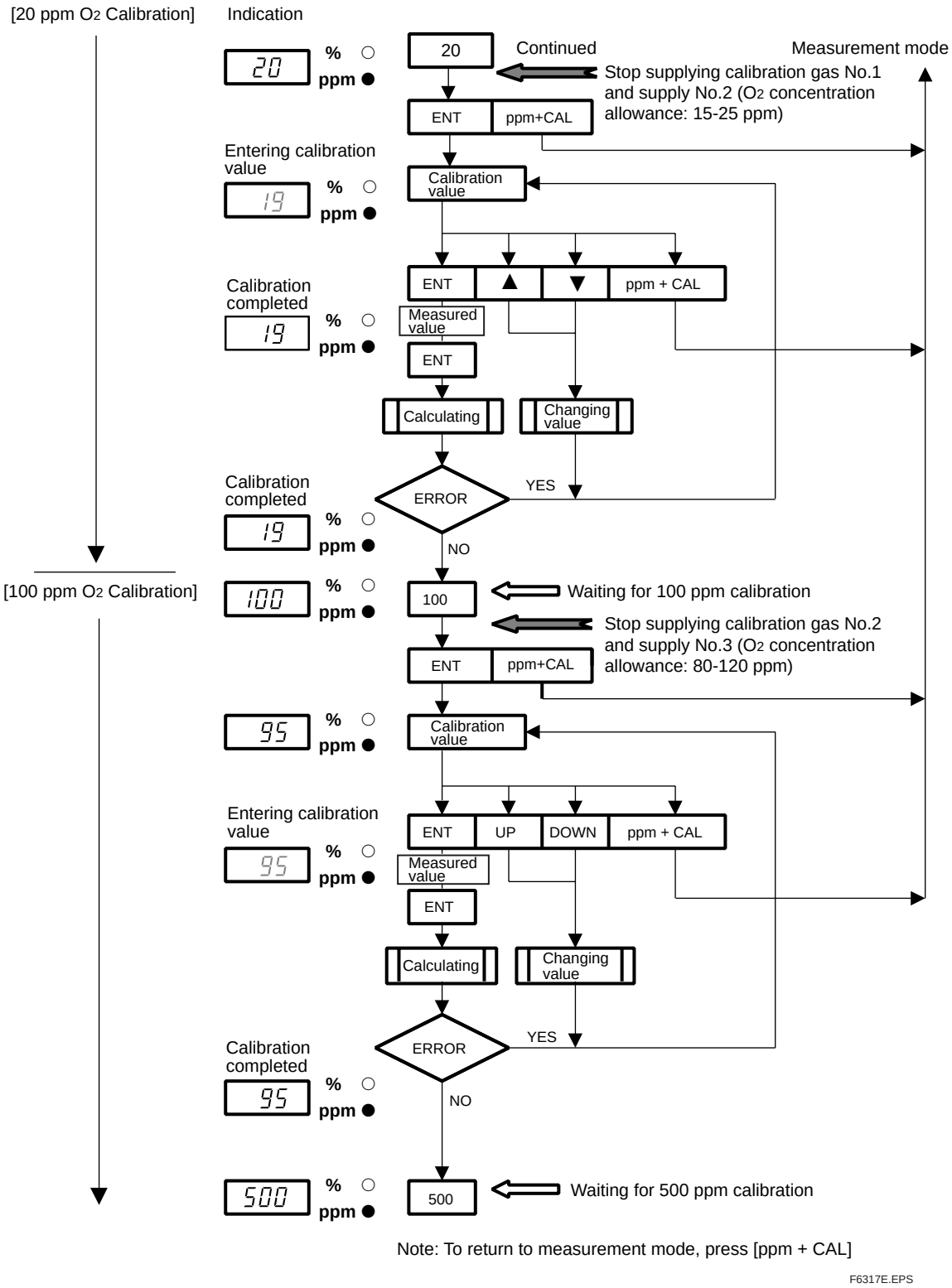
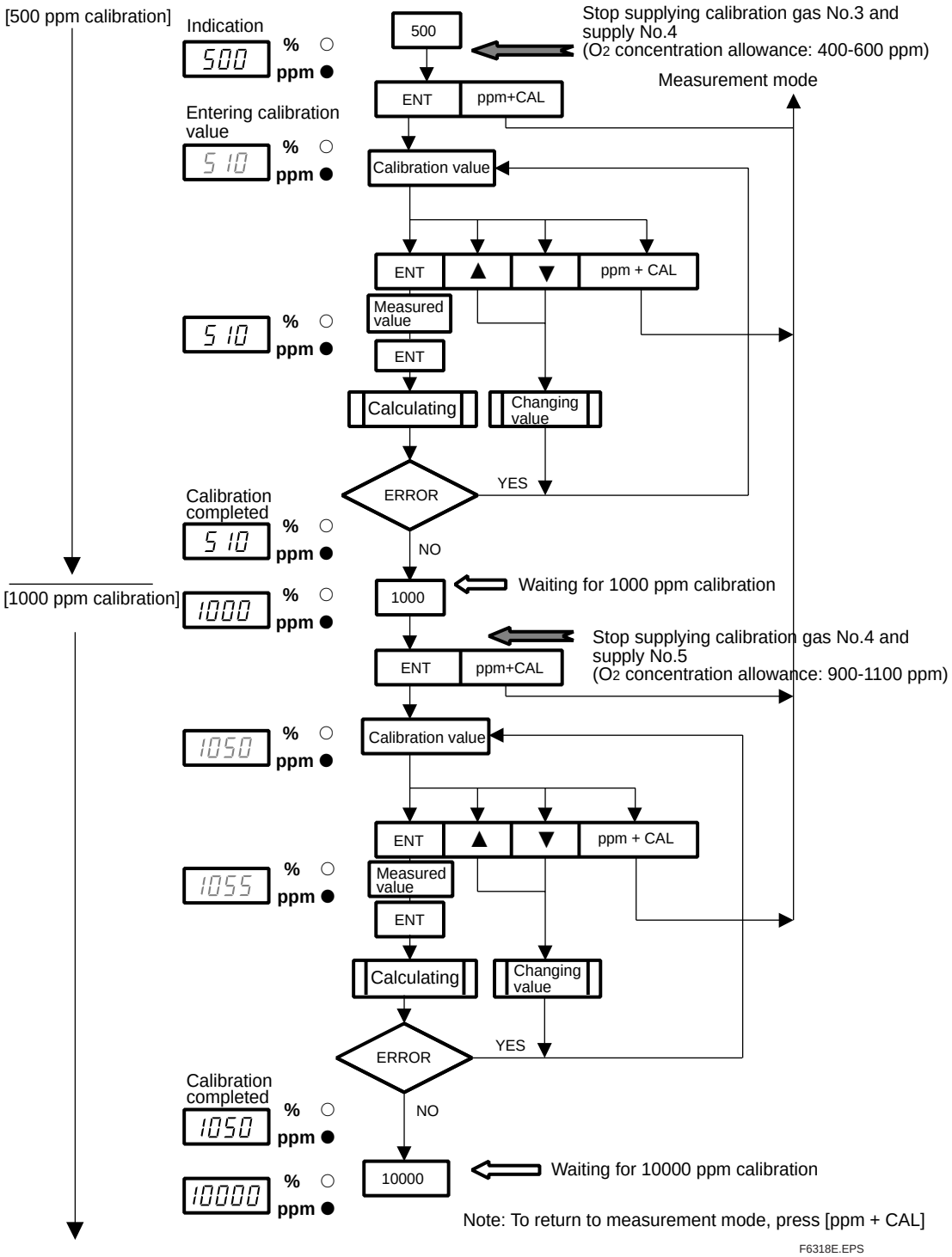
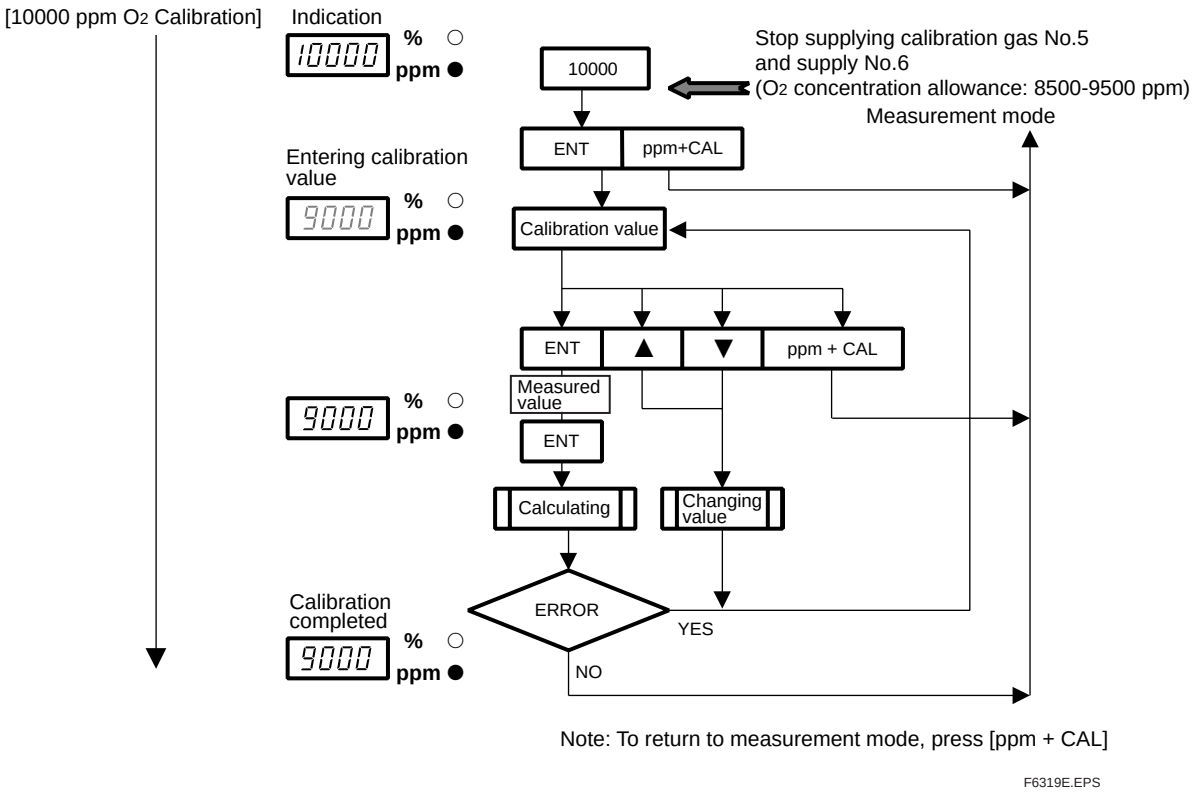


Note: To return to measurement mode, press [ppm + CAL]

F6317E.EPS


[500 ppm calibration]
Indication
500
% ○
ppm ●
500
Stop supplying calibration gas No.3 and supply No.4
(O2 concentration allowance: 400-600 ppm)
ENT
ppm+CAL
Measurement mode
Entering calibration value
510
Calibration value
ENT
▲
▼
ppm + CAL
Measured value
510
ENT
Calculating
Changing value
ERROR
YES
Calibration completed
510
NO
[1000 ppm calibration]
1000
Waiting for 1000 ppm calibration
Stop supplying calibration gas No.4 and supply No.5
(O2 concentration allowance: 900-1100 ppm)
1050
1055
10000
Note: To return to measurement mode, press [ppm + CAL]
F6318E.EPS



(2) Moving zero point

This is to translate the output function: to change value b of the characteristic function, y = ax + b. The range for moving the zero point is from -999 to +999 ppm.

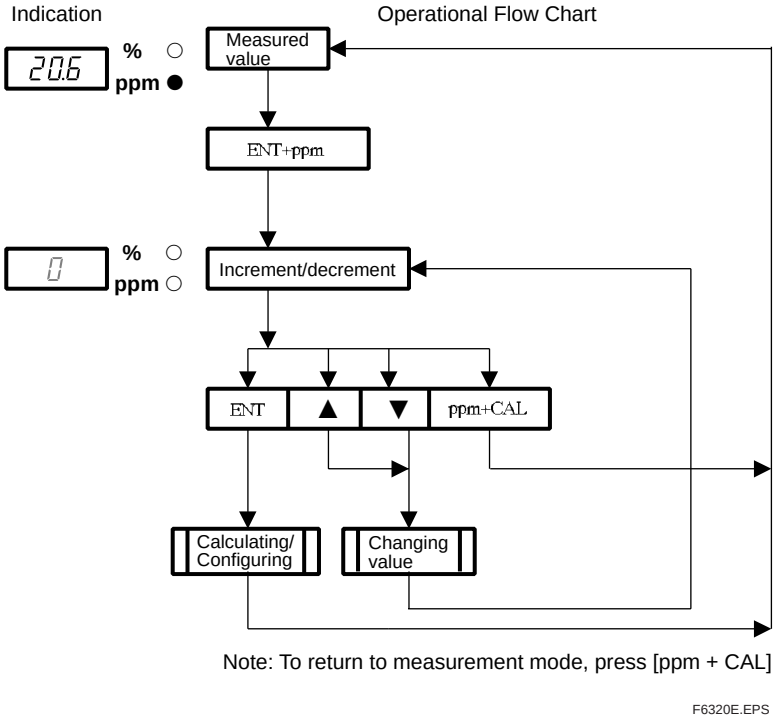


Figure 6.13 Flow Chart of Moving Zero Point

7. Inspection and Maintenance

This chapter explains inspections to ensure best performance and operations of the OX102 oxygen analyzer.

If repair is required, this equipment will need to be returned to the factory. Contact your Yokogawa representative.

7.1 Sensor

⚠ NOTE

- Do not touch the sensor head accidentally while the sensor is hot right after removing it from the process. The sensor can be as hot as 700°C. This can cause severe burns.
- The sensor contains components made from ceramics (zirconia). Physical damage by dropping or jolting can result in sensor failure.

(1) The sensor is of limited life, and its service life varies depending on operating conditions. When the sensor cannot be calibrated, it should be replaced.
(2) After replacement, the sensor parameters specified in the Sensor Parameter Table (Figure 5.1) of a new sensor must be entered following the procedure described in Section 6.3 (1) “Configuring the sensor parameters.”
(3) If the slots of the sensor head get clogged, it may cause false measurement. When clogging becomes severe enough to block the gas flow, clean the slots with a brush and subsequently by applying pressurized air (300 kPa max.) to the sensor while keeping the sensor head facing downward to prevent dust from getting into the inside of the sensor.

7.2 Converter

The fuse is mounted on a printed board inside the converter. If no display appears after applying power, the fuse needs to be replaced. Contact our service station for fuse replacement.

7.3 Sampling Unit (Optional)

The sampling unit is used to eliminate organic solvents using a built-in activated carbon filter, when the sample gas contains a small amount of organic solvents.

When this sampling unit is used with OX100 series Oxygen Analyzer, if the sampling unit is not properly maintained the life of the Oxygen Analyzer sensor will be adversely affected, drift will occur or the instrument will not calibrate.

Frequent filter maintenance is particularly important. If zero or span need frequent adjustment, check the filter first.

(1) When the sample gas contains 500 ppm of isopropyl alcohol and flows at 500 ml/min, the expected life of the activated carbon filter element is approximately 50 hours. After 50 hours service, the activated carbon filter element must be replaced. Using expired carbon filter may result in false measurement, or even sensor deterioration.

(2) Replacement interval for the disk filter (P/N K9424GQ) varies depending on dust content in the sample gas. Check the cleanness of element to determine the filter replacement cycle. The felt filter (P/N K9346WH) is for preventing the activated carbon from leaking so it requires no replacement unless abnormal conditions occur.
(3) Increasing contamination of the filter may deteriorate the flow rate of sucked sample gas. The flow rate should be checked regularly by the flowmeter of the sampling unit. If the flow rate is outside of the specified range 500 ± 100 ml/min, readjust the flow rate.

8. Troubleshooting

The table below summarizes troubles that may develop in the OX102, problem source and corrective action.

Abnormal symptom	Problem source	Corrective action
No indications	1. No power applied 2. Fuse has blown	1. Apply power 2. Replace the fuse
FAIL lamp lit	1. Sensor connector failure 2. Sensor heater is disconnected	1. Connect the sensor connector securely 2. Replace the sensor
Low value displayed High value displayed	1. Operating pressure is out of specified range 2. Improper calibration 3. Sensor failure 4. Expired activated carbon has been used	1. Use within the specified pressure range 2. Recalibration 3. Replace the sensor 4. Replace the activated carbon filter
Slow response	1. Ambient pressure around sensor is negative 2. Sensor has been clogged	1. Use within the specified pressure range 2. Clean the sensor head
Large error in measurement	1. Operating temperature is out of specified range 2. Operating pressure is out of specified range 3. Sample gas contains oxidation-reduction gas or corrosive gas 4. Sensor head touches wall 5. Expired activated carbon has been used	1. Use within the specified temperature range 2. Use within the specified pressure range 3. Specified accuracy cannot be expected in measurement 4. Reinstall the sensor following procedure as in Section 3.1 5. Replace the activated carbon filter
Occasional, large fluctuations in readings	1. Sensor failure 2. Operating pressure is out of specified range	1. Replace the sensor 2. Use within the specified pressure range
Calibration fails	1. Improper calibration gas concentration 2. Sensor failure 3. Operating pressure is out of specified range 4. Useful life of activated charcoal filter is over	1. Use proper calibration gas 2. Replace the sensor 3. Recalibrate within the specified pressure range 4. Replace activated charcoal filter
No alarm contact signal is activated1.	1. Alarm contact signal is not set 2. Alarm contact relay failure	1. Set the alarm contact signal properly 2. Contact Yokogawa

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◆ Appendix 1. Sampling Unit

K9424GA Sampling Unit for OX100/102

This sampling unit is designed for the OX100 Series Oxygen Analyzers when they are used where a sample gas contains a small amount of organic solvents (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.

△Notes

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: The expected life of the activated carbon filter is approx. 50 hours when a sample gas contains 500 ppm of isopropyl alcohol and flows at 500 ml/min.

Power supply : 100 to 240 V AC, 50/60 Hz

Piping connection : Rc1/4

Operating environment temperature range: 0 to 40°C

Life of disk filter : 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 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 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.

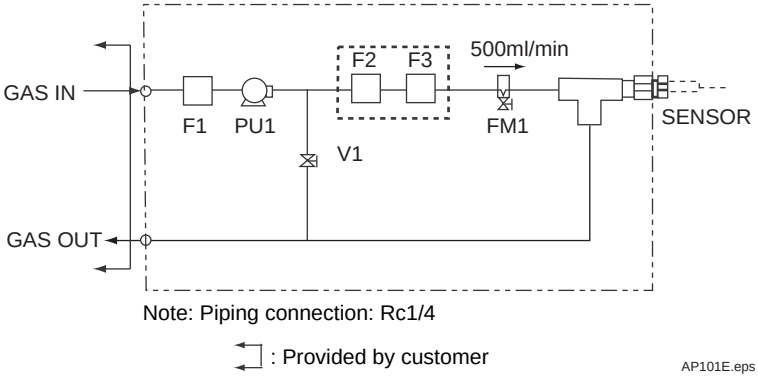

Figure 1 Piping Diagram

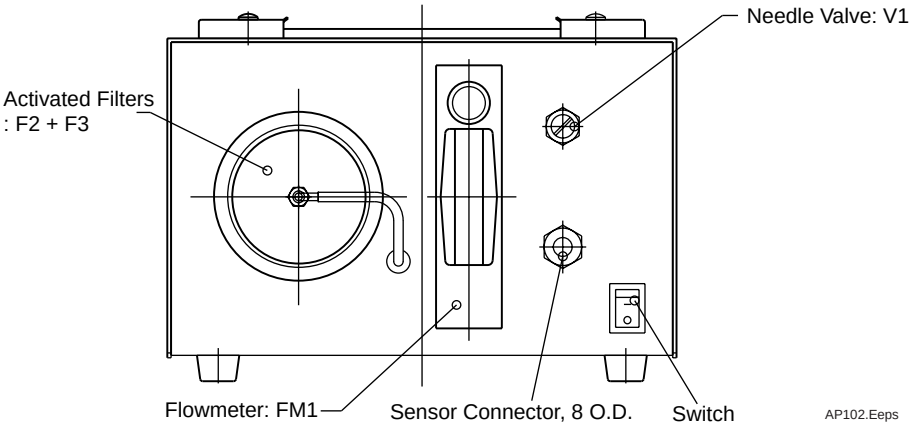

Figure 2 Sampling Unit

3. Operating Procedures

3.1 Starting operation

Before starting the operation of the sampling unit, make sure to power down the OX100 Series oxygen analyzers. 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 and 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 apply the 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 vale 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

When this sampling unit is used with OX100 serise Oxygen Analyzer, if the sampling unit is not properly maintained the life of the Oxygen Analyzer sensor will be adversely affected, drift will occur or the instrument will not calibrate.

Frequent filter maintenance is particularly important. If zero or span need frequent adjustment, check the filter first.

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 tug 1 to puff out the pack and folding 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 tug, and tighten the lid securely (Figure 3).
(5) Connect the tubing to the lid.

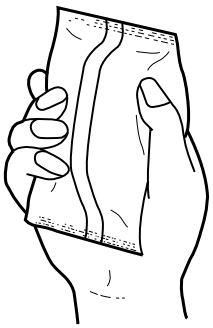

Figure 1.

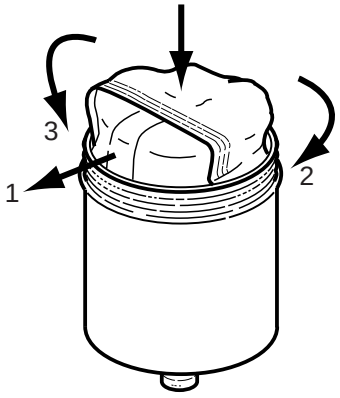

Figure 2.

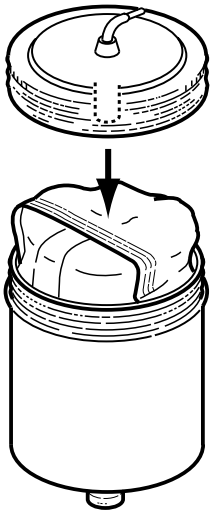

Figure 3.

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4.2 Maintenance of the disk filter attached to 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.

* When the filter becomes clogged shortly after the restoration, the filter needs to be replaced.

◆ 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-litter cylinders) and a needle valve assembly. The calibration gas is available in two types: 900 to 1100 ppm O_2 and 8500 to 9500 ppm O_2 (N_2 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 and then screw the locknut down (See Figure 2).

Figure 1

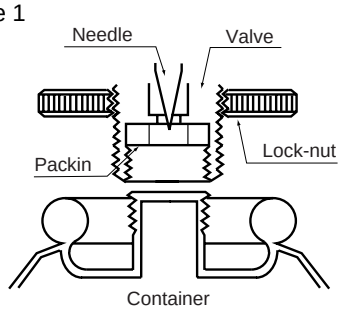
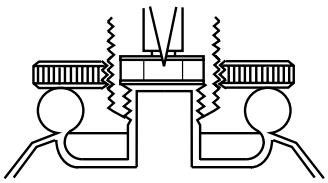


Figure 2



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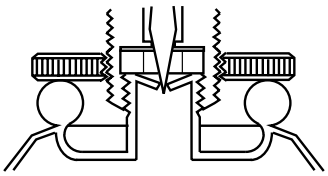
2. Supplying the calibration gas

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.

Figure 3



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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

Model OX102
Current Limit Type Oxygen Analyzer

Item	Part No. (Ms code)	Qty	Description
1	OX102-1N□	1	Converter
2	K9424LA	1	Sensor
3	——	1	Sensor Cable
	K9424LB		Cable (4m)
	K9424LC		Cable (9m)
	K9424LD		Cable (29m)

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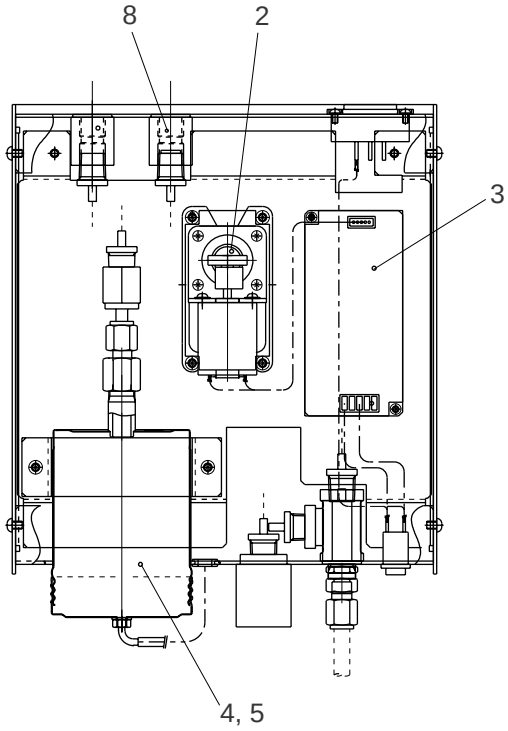
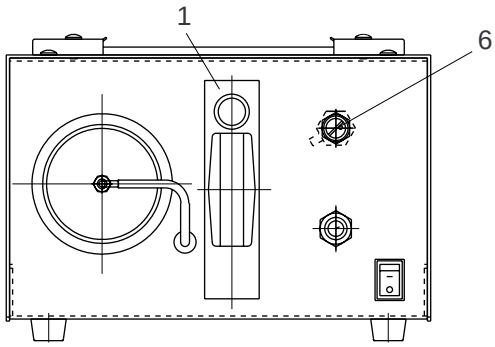
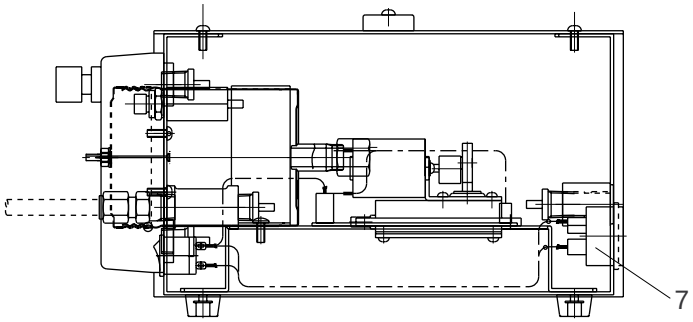
CMPL 11M10A01-03E
1st Edition : Apr. 2000 (YK)
5th Edition : Nov. 2007 (YK)

K9424GA SAMPLING UNIT





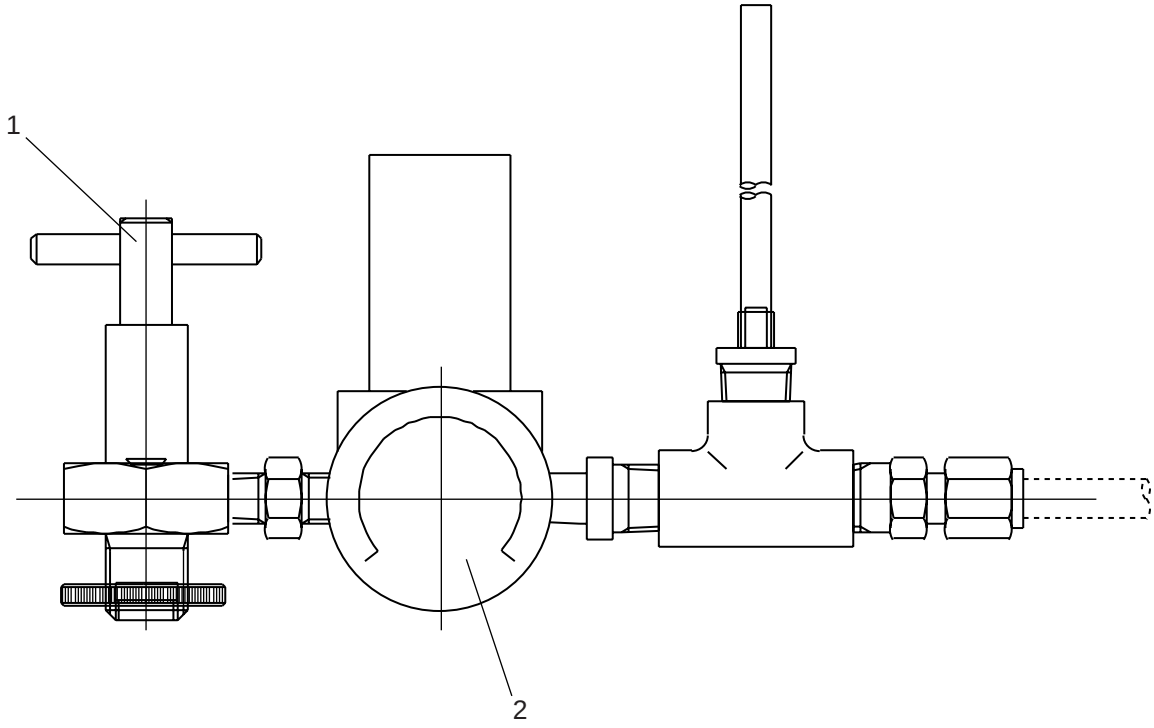


Item	Part No.	Qty	Description
1	L9866CX	1	Flow Meter
2	K9424GN	1	Pump Assy
3	K9424HE	1	Power Unit
4	K9424GZ	1	Filter Assy *1
5	K9424GY	1	Filter Element (active carbon filter: 5 packs)
6	E7050AC	1	Valve
7	A1109EF	1	Fuse
8	K9424GQ	1	Disk Filter

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

5th Edition :Nov. 2007

K9424JC NEEDLE VALVE ASSY



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

Revision Record

Manual Title : Model OX102 Current Limit type Oxygen Analyzer
Manual Number : IM 11M10A01-03E

Edition	Date	Remark (s)
1st	Dec. 2000	Newly published
2nd	Nov. 2002	Shown Belew Added caution about requirement for return of equipment to factory for repaia. 1.1 Added conditions requiring sampling unit to specification. 3.3 Added sampling unit installation environment conditions. 5.3 Added caution regarding life of sampling unit suction pump. 7. Added caution about requirement for return of equipment to factory for repair. 7.3 Added sampling unit maintenance cautions. 8. Added activated charcoal filter to items to check when troubleshooting. Appendix 1 Added cautions regarding activated chacoal filter life, operating environment temperature renge, membrane filter life, and pump life, and requirement for return of equipment to factory for repair. Appendix 4 Added cautions regarding maintenance.
3rd	Dec. 2007	Revised and Corrected all over.

User's Manual

Model OX102 Current limit type Oxygen Analyzer

Supplement

Thank you for selecting our Model OX102 Current limit type Oxygen Analyzer.
In User's Manual, IM 11M10A01-03E, 3rd 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. v, " Notes on Use,": Added the "Notes on Use in Korea."
- p. 6-5, Section 6.3, " Configuring Data," Figure 6.4: Added the description of note.
- p. 6-14, Section 6.3, " Configuring Data," Added the note of "6".
- p. A-3, Section 3.1, " Starting Operation,": Changed the description of "1".

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IM 11M10A01-03E
3rd Edition

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.

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℃.
- 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 silane silicone gas.
- 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.
- Keep this instruction manual handy for your quick reference during operation and maintenance.

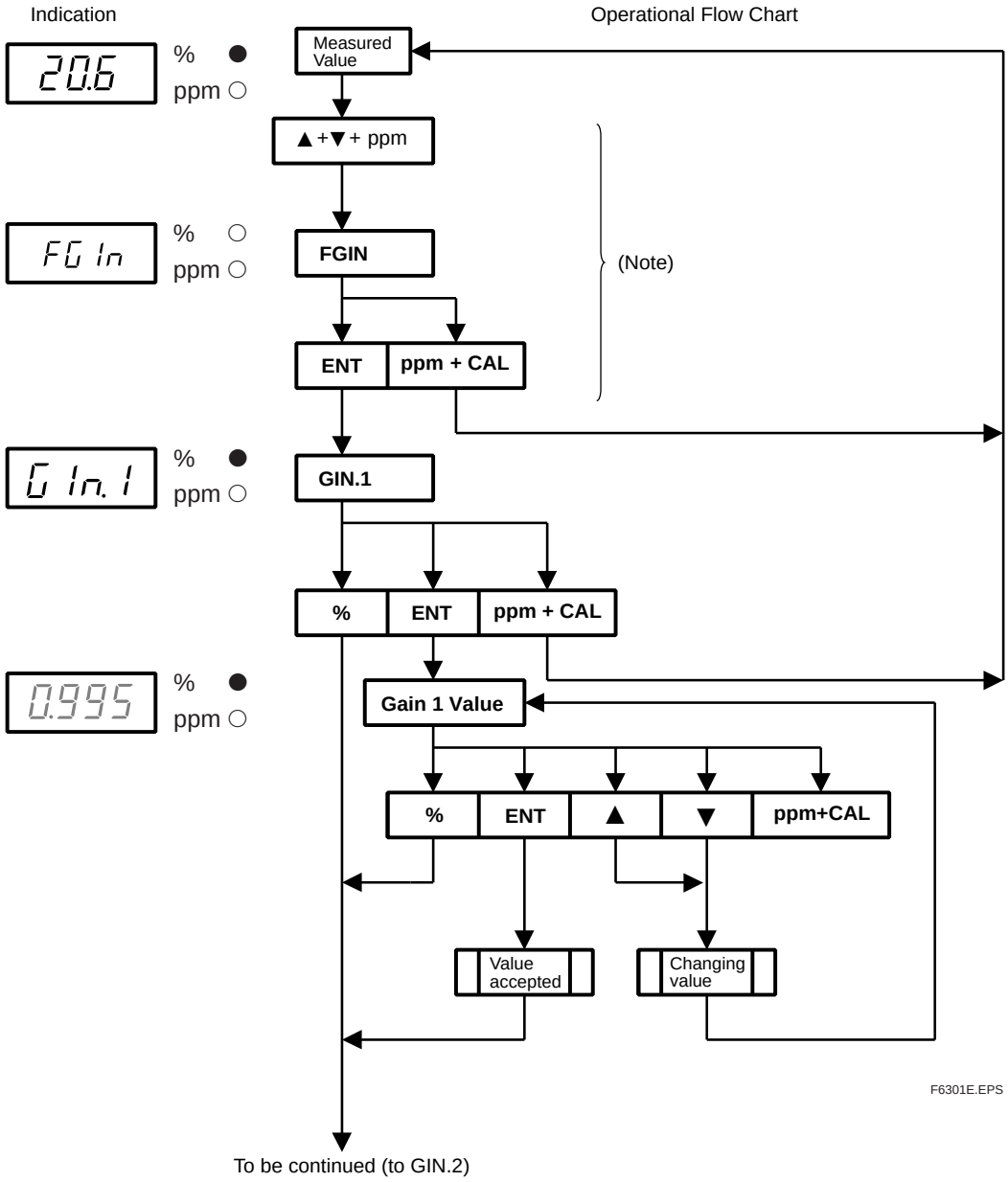
■ Notes on Use in Korea

The AC electric cable included with this product is not compliant with the safety standards in korea.
Please do not use it to connect household appliances in Korea.
It is prohibited to use an adapter connector to change the plug shape for the AC electric cable of this product.

6.3 Configuring Data

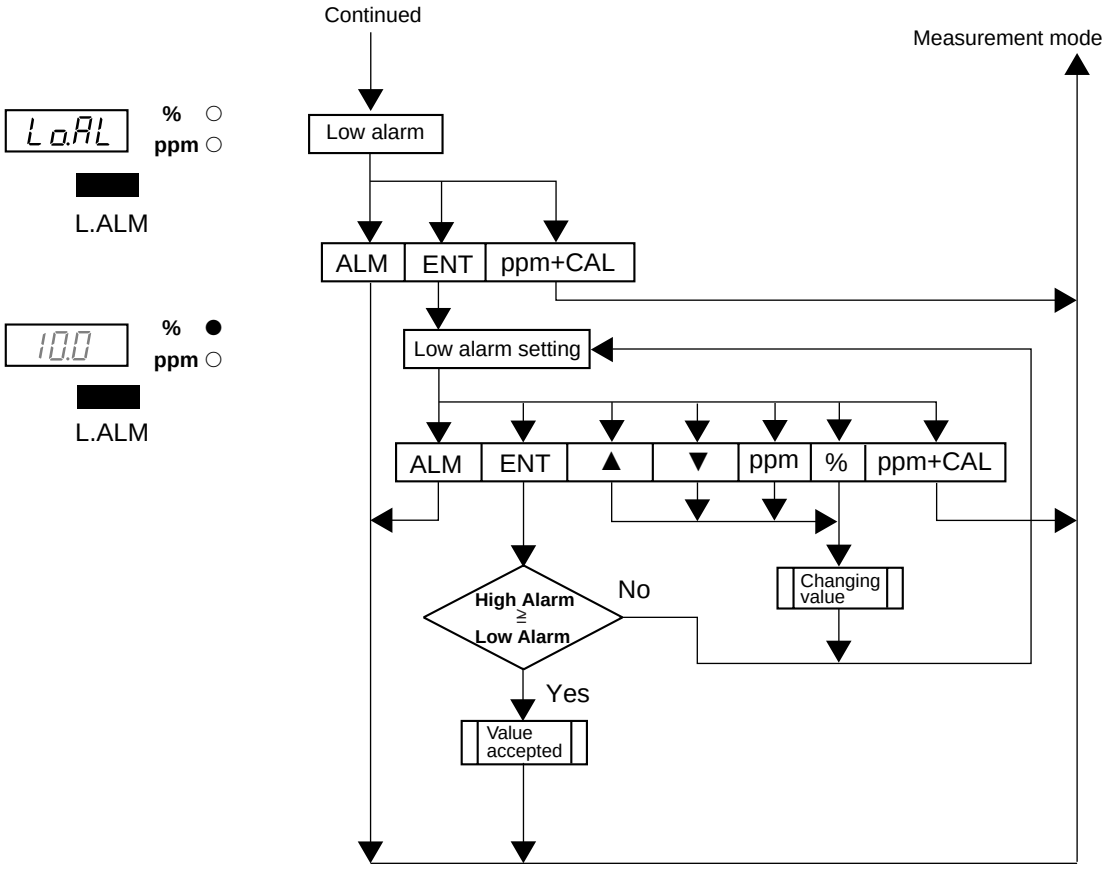
(1) Configuring the sensor parameters

Upon replacing sensors, parameters must be configured following the chart below. Parameters to be configured are specified in the Sensor Parameter Table (Figure 5.1) attached on a new sensor.



Note) After one-point calibration, if [▲+▼+ ppm] and [**ENT**] key are pressed, GIN6 value is reset to 1.00.
In this case, the calibration is required again.
To check the sensor parameter, press [▲+▼+%]. Press [**ENT**] to confirm the parameter.

Figure 6.4 Flow Chart of Sensor Parameter Setting



(*) If the entered high alarm setting is less than the low alarm setting, the display will show **E- - -** for about 3 seconds and the entered setting will flash to prompt reentry. An appropriate value should be reentered.

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(6) Resetting the sensor parameters to the default values

This is to reset the sensor parameters (A and B values for each gain, see Section 5) to the factory default values.

Note) In the case of the sensor is replaced and the parameters are changed (refer to 6.3 (1) Configuring the sensor parameters), the parameter are reset to those changed value.

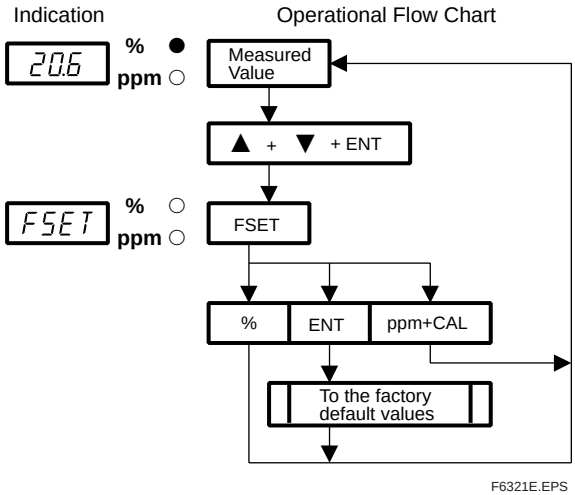

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Figure 6.9 Flow Chart of Sensor Parameter Resetting

3. Operating Procedures

3.1 Starting operation

Before starting the operation of the sampling unit, make sure to power down the OX100 Series oxygen analyzers. 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 pall out the sensor to 1-2 mm front and tightening the locknut firmly with fingers. The locknut should be finger tight only and 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 apply the 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 vale 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.