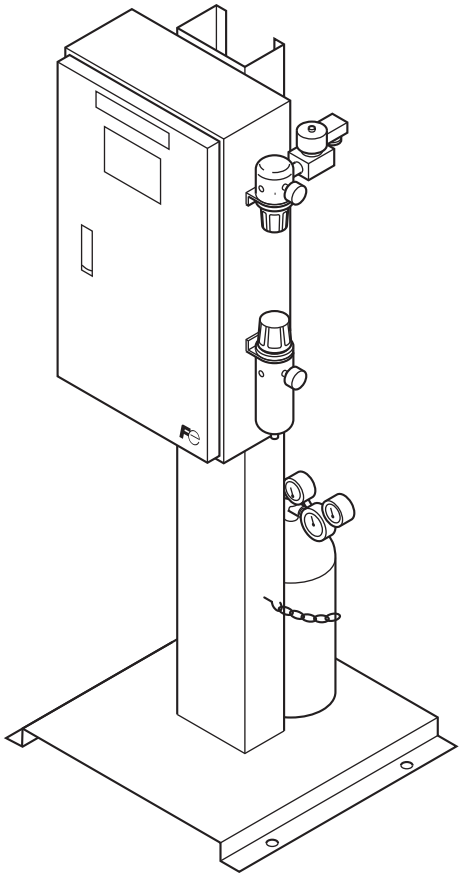
Instruction Manual

# DIRECT INSERTION TYPE ZIRCONIA OXYGEN ANALYZER

**Type: ZSB**



Fuji Electric Co., Ltd.

INZ-TN2ZSBa-E

# PREFACE

We are grateful for your purchase of Fuji Direct Insertion Type Zirconia Oxygen Analyzer (ZSB).

- First read this instruction manual carefully until an adequate understanding is acquired, and then proceed to installation, operation and maintenance of the analyzer. Wrong handling may cause an accident or injury.
- The specifications of this analyzer will be changed without prior notice for further product improvement.
- Modification of this analyzer is strictly prohibited unless a written approval is obtained from the manufacturer. Fuji will not bear any responsibility for a trouble caused by such a modification.
- This instruction manual shall be stored by the person who actually uses the analyzer.
- After reading the manual, be sure to store it at a place easier to access.
- This instruction manual should be delivered to the end user without fail.

| | |
|---|---|
| Manufacturer: | Fuji Electric Co., Ltd. |
| Type: | Described in the nameplate put on the main body |
| Date of manufacture: | Described in the nameplate put on the main body |
| Product nationality: | Japan |

- Related instruction manual
  Direct insertion type zirconia oxygen analyzer detector (Type: ZFK8)····· INZ-TN5ZFK8-E
  Direct insertion type zirconia oxygen analyzer converter (Type: ZKM) ····· INZ-TN1ZKM-E



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**Request**

- It is prohibited to transfer part or all of this manual without Fuji's permission in written format.
- Description in this manual will be changed without prior notice for further improvement.

# CAUTION ON SAFETY

**First of all, read this "Caution on Safety" carefully, and then use the gas extractor in the correct way.**

- Be sure to observe the instructions shown below, because they describe important information on safety. Those safety precautions are ranked in 3 levels, "DANGER", "CAUTION" and "PROHIBITION".

| | |
|---|---|
| **DANGER** | Wrong handling may cause a dangerous situation, in which there is a risk of death or heavy injury. |
| **CAUTION** | Wrong handling may invite a dangerous situation, in which there is a possibility of medium-level trouble or slight injury or only physical damage is predictable. |

- Even an undesirable action described in " **CAUTION** " may lead to a grave result depending on situation. Be sure to observe DANGER and CAUTION because they are both important for ensuring safety.

| **Caution on installation and transport of gas analyzer** | |
|---|---|
| **DANGER** | • This unit is not explosion-proof type. Do not use it in a place with explosive gases to prevent explosion, fire or other serious accidents. |
| **CAUTION** | • This unit should be installed in a place which conforms to the conditions noted in the instruction manual. Otherwise, it may cause electric shocks, fire or malfunction of the unit.<br>• During installation work, care should be taken to keep the unit free from entry of cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.<br>• For installation, observe the rule on it given in the instruction manual and select a place where the weight of gas analyzer can be endured.<br>Installation at an unsuited place may cause turnover or fall and there is a risk of injury.<br>• For lifting the gas analyzer, be sure to wear protective gloves. Bare hands may invite an injury.<br>• Before transport, fix the casing so that it will not open. Otherwise, the casing may be separated and fall to cause an injury.<br>• The gas analyzer is heavy. It should be transported carefully by two or more persons if manually required. Otherwise, body may be damaged or injured. |

**Caution on piping**

**DANGER**

- If leaked gas contains oxygen at a high concentration, there is a risk of fire.
- Connect pipes correctly referring to the instruction manual. Wrong piping may cause gas leakage.

**Caution on wiring**

**CAUTION**

- The unit must be earthed as specified. Otherwise, it may cause electric shocks, malfunction, etc.
- Be sure to use a power supply of correct rating. Connection of power supply of incorrect rating may cause fire.
- Wiring work must be performed with the main power set to OFF to prevent electric shocks.
- Use wiring materials that match the rating of the unit. Use of wiring materials out of rating may cause fire.

**Cautions on use**

**CAUTION**

- During operation, avoid opening the casing and touching the internal parts. Otherwise, you may suffer a burn or shock hazard.
- Avoid touching the detector with bare hand during operation. Otherwise, you may suffer a burn because the detector may have reached a high temperature (about 800°C).
- During operation, avoid removing and placing the detector on or near a combustible material. Otherwise, fire may occur.

**Caution on maintenance and check**

## ⚠ CAUTION

- Before maintenance and check, be sure to turn off the main power supply and wait until the detector is cooled adequately. Otherwise, you may suffer a burn.
- Before removing the detector from the flue for maintenance and check, make sure the furnace is stopped. Otherwise, you may suffer a burn.
- Before working, take off a wrist watch, finger ring or the like metallic accessories. And never touch the instrument with a wet hand. Otherwise, you will have a shock hazard.
- If the fuse is blown, eliminate the cause, and then replace it with the one of the same capacity and type as before. Otherwise, shock hazard or fault may be caused.

**Others**

## ⚠ CAUTION

- If the cause of any fault cannot be determined despite reference to the instruction manual, be sure to contact your dealer or Fuji's technician in charge of adjustment. If the instrument is disassembled carelessly, you may have a shock hazard or injury.
- Do not use a replacement part other than specified by the instrument maker. Otherwise, adequate performance will not be provided. Besides, an accident or fault may be caused.
- Replacement parts such as a maintenance part should be disposed of as incombustibles.

# CONTENTS

# 1. GENERAL DESCRIPTION

This manual describes the installation, operation, and the maintenance of the zirconia oxygen analyzer. Read it carefully before using the analyzer. Refer to the instruction manual of the zirconia oxygen detector, type ZFK, for the handling of the detector used in combination with the analyzer.

## 1.1 Direct insertion type zirconia oxygen analyzer

The zirconia oxygen analyzer consists of a direct insertion type oxygen detector (type: ZFK) and a zirconia oxygen analyzer main unit.

The analyzer intended for the measurement of oxygen concentration in exhaust gas is used for combustion control.

**Caution**

Power voltage for the converter must conform to that for the detector to be connected. Don't use any power voltage different from the power specifications of the detector. Otherwise it may result in damage to the detector.

100/120V AC 50/60Hz for ZFK8R□1

200/240V AC 50/60Hz for ZFK8R□3

## 1.2 Check of delivered components

Check the appearance of the analyzer and the number of accessories to make sure that there is no damage or shortage of parts.

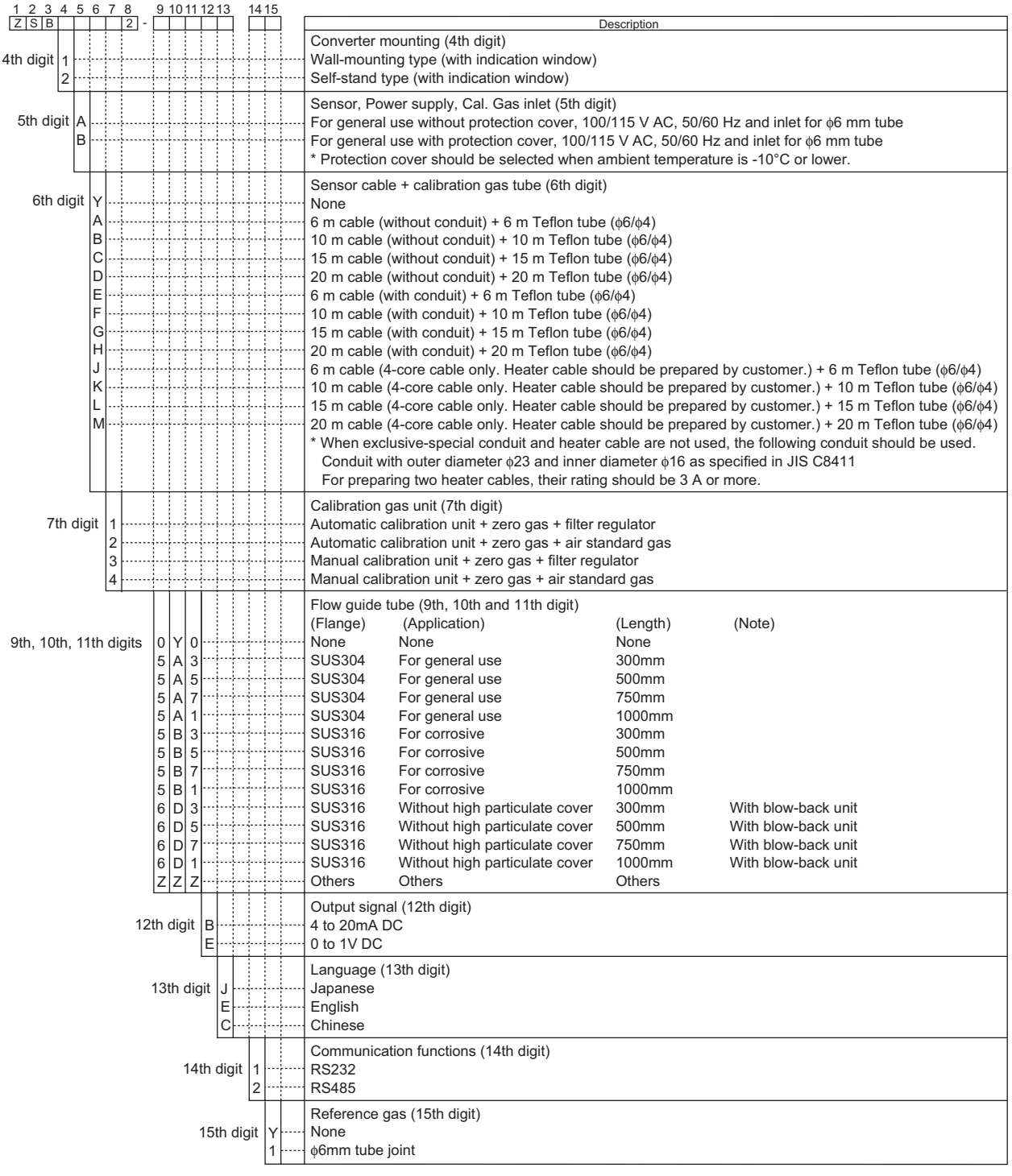
Delivered item (standard)

Zirconia oxygen analyzer: 1 set
Instruction manual: 1 copy
Standard accessories: 1 set

- · O-ring (for detector): 1
- · Ceramic filter (for detector): 1
- · Fuse (2.5A, 0.5A): 2 each
- · Joint (for standard gas connection): 1 set
- · Polyethylene tube (for standard gas connection): 1
- · Toaron tube (for standard gas connection): 1
- · Flow guide tube accessories (bolt, nut, spring washer: 4 each): 1 set

## 1.3 Check of the type of delivered components

Check the model name on the rating plate to make sure that the delivered components are what you ordered.



| 1 2 3 4 5 6 7 8 - 9 10 11 12 13 14 15 | | Description |
|---|---|---|
| Z S B | | |
| | | Converter mounting (4th digit) |
| 4th digit | 1 | Wall-mounting type (with indication window) |
| | 2 | Self-stand type (with indication window) |
| | | Sensor, Power supply, Cal. Gas inlet (5th digit) |
| 5th digit | A | For general use without protection cover, 100/115 V AC, 50/60 Hz and inlet for ϕ6 mm tube |
| | B | For general use with protection cover, 100/115 V AC, 50/60 Hz and inlet for ϕ6 mm tube |
| | | * Protection cover should be selected when ambient temperature is -10°C or lower. |
| | | Sensor cable + calibration gas tube (6th digit) |
| 6th digit | Y | None |
| | A | 6 m cable (without conduit) + 6 m Teflon tube (ϕ6/ϕ4) |
| | B | 10 m cable (without conduit) + 10 m Teflon tube (ϕ6/ϕ4) |
| | C | 15 m cable (without conduit) + 15 m Teflon tube (ϕ6/ϕ4) |
| | D | 20 m cable (without conduit) + 20 m Teflon tube (ϕ6/ϕ4) |
| | E | 6 m cable (with conduit) + 6 m Teflon tube (ϕ6/ϕ4) |
| | F | 10 m cable (with conduit) + 10 m Teflon tube (ϕ6/ϕ4) |
| | G | 15 m cable (with conduit) + 15 m Teflon tube (ϕ6/ϕ4) |
| | H | 20 m cable (with conduit) + 20 m Teflon tube (ϕ6/ϕ4) |
| | J | 6 m cable (4-core cable only. Heater cable should be prepared by customer.) + 6 m Teflon tube (ϕ6/ϕ4) |
| | K | 10 m cable (4-core cable only. Heater cable should be prepared by customer.) + 10 m Teflon tube (ϕ6/ϕ4) |
| | L | 15 m cable (4-core cable only. Heater cable should be prepared by customer.) + 15 m Teflon tube (ϕ6/ϕ4) |
| | M | 20 m cable (4-core cable only. Heater cable should be prepared by customer.) + 20 m Teflon tube (ϕ6/ϕ4) |
| | | * When exclusive-special conduit and heater cable are not used, the following conduit should be used. Conduit with outer diameter ϕ23 and inner diameter ϕ16 as specified in JIS C8411 For preparing two heater cables, their rating should be 3 A or more. |
| | | Calibration gas unit (7th digit) |
| 7th digit | 1 | Automatic calibration unit + zero gas + filter regulator |
| | 2 | Automatic calibration unit + zero gas + air standard gas |
| | 3 | Manual calibration unit + zero gas + filter regulator |
| | 4 | Manual calibration unit + zero gas + air standard gas |

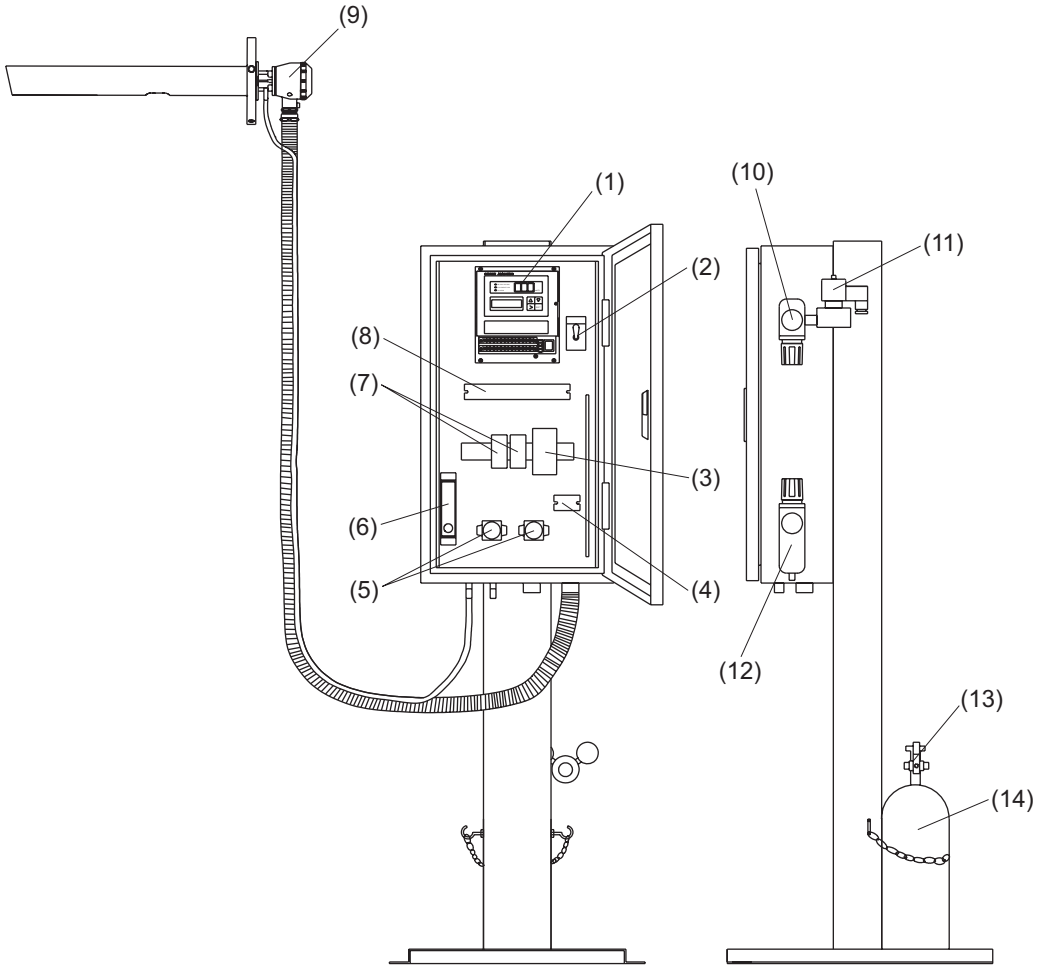
Flow guide tube (9th, 10th and 11th digit)

| 9th, 10th, 11th digits | (Flange) | (Application) | (Length) | (Note) |
|---|---|---|---|---|
| 0 Y 0 | None | None | None | |
| 5 A 3 | SUS304 | For general use | 300mm | |
| 5 A 5 | SUS304 | For general use | 500mm | |
| 5 A 7 | SUS304 | For general use | 750mm | |
| 5 A 1 | SUS304 | For general use | 1000mm | |
| 5 B 3 | SUS316 | For corrosive | 300mm | |
| 5 B 5 | SUS316 | For corrosive | 500mm | |
| 5 B 7 | SUS316 | For corrosive | 750mm | |
| 5 B 1 | SUS316 | For corrosive | 1000mm | |
| 6 D 3 | SUS316 | Without high particulate cover | 300mm | With blow-back unit |
| 6 D 5 | SUS316 | Without high particulate cover | 500mm | With blow-back unit |
| 6 D 7 | SUS316 | Without high particulate cover | 750mm | With blow-back unit |
| 6 D 1 | SUS316 | Without high particulate cover | 1000mm | With blow-back unit |
| Z Z Z | Others | Others | Others | |

| | | |
|---|---|---|
| | | Output signal (12th digit) |
| 12th digit | B | 4 to 20mA DC |
| | E | 0 to 1V DC |
| | | Language (13th digit) |
| 13th digit | J | Japanese |
| | E | English |
| | C | Chinese |
| | | Communication functions (14th digit) |
| 14th digit | 1 | RS232 |
| | 2 | RS485 |
| | | Reference gas (15th digit) |
| 15th digit | Y | None |
| | 1 | ϕ6mm tube joint |

# 2. NAME AND FUNCTION OF EACH PART

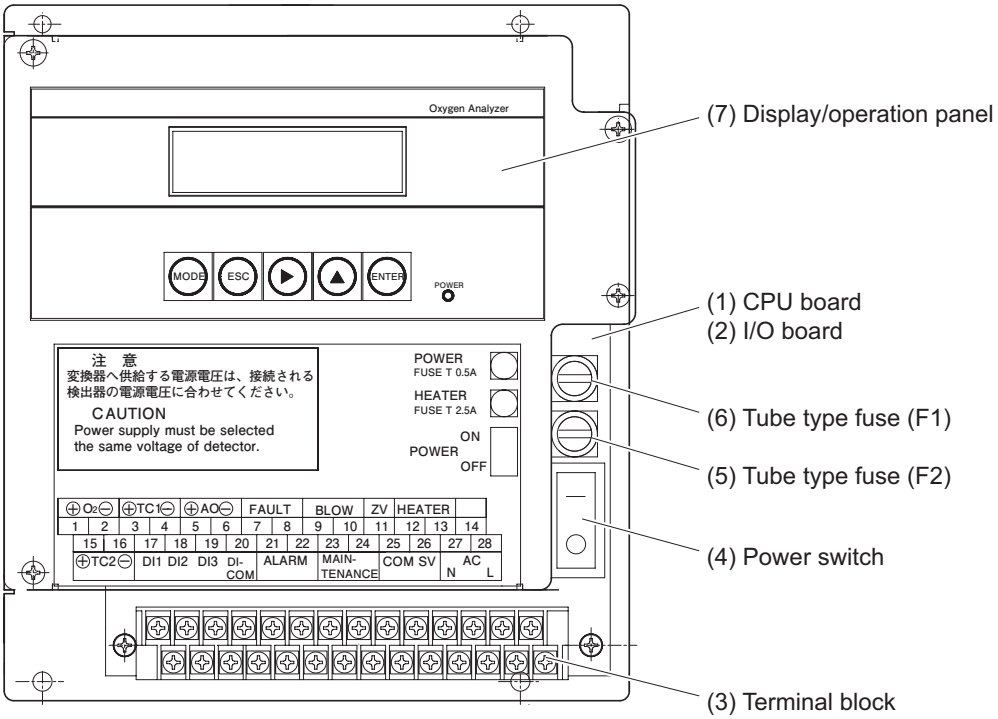
## 2.1 Name of major parts of the analyzer




Name of major parts of stand type analyzer

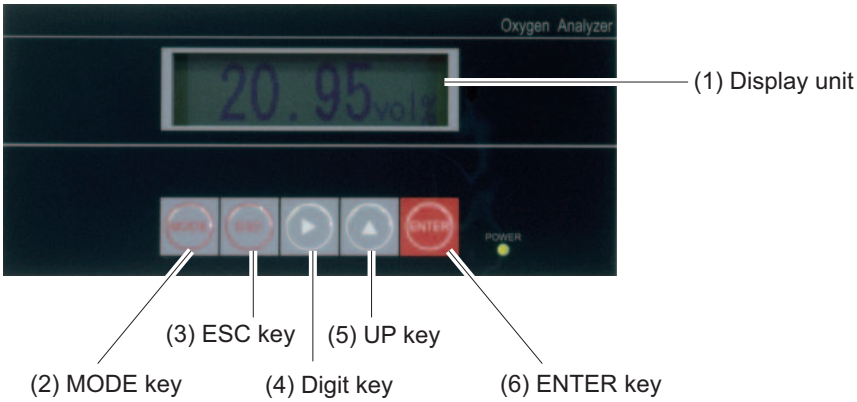
(1) Converter
(2) Toggle switch (Maintenance select switch)
(3) Auto breaker
(4) Relay block terminal
(5) Port valve
(6) Flow meter
(7) Relay
(8) External terminal block
(9) Zirconia oxygen detector (ZFK8)
    * Refer to the instruction manual of the zirconia oxygen detector (ZFK8) for the handling of the detector.
(10) Regulator
(11) Port valve
(12) Filter regulator
(13) Pressure controller
(14) Standard gas (3.4L)

## 2.2 Name and function of converter




| No. | Name | Explanation |
|---|---|---|
| (1) | CPU board | The liquid crystal display and the memory circuit are installed. |
| (2) | I/O board | The input/output circuit and the power circuit are installed. |
| (3) | Terminal block | Terminal block for various input/output signals. |
| (4) | Power switch | Turns ON/OFF this converter. ( ー : OFF, ○ : ON) |
| (5) | Tube type fuse (F2) | Fuse for the heater. (250 V T 2.5 A) |
| (6) | Tube type fuse (F1) | Fuse for the main unit (250 V T 0.5 A) |
| (7) | Display/operation panel | Displays or operates the concentration value or setting values. |

## 2.3 Description on display/operation panel




| No. | Name | Explanation |
|---|---|---|
| (1) | Display unit | Displays the concentration value and setting values. |
| (2) | MODE key | Used to switch measurement display and mode display. |
| (3) | ESC key | Used to return to the previous screen or exit the setting. |
| (4) | Digit key | Used to change the setting values. |
| (5) | Up key | |
| (6) | ENTER key | Used to determine the setting values. |

# 3. INSTALLATION

**⚠ CAUTION**

- Install the analyzer securely and safely, paying attention not to let it fall.

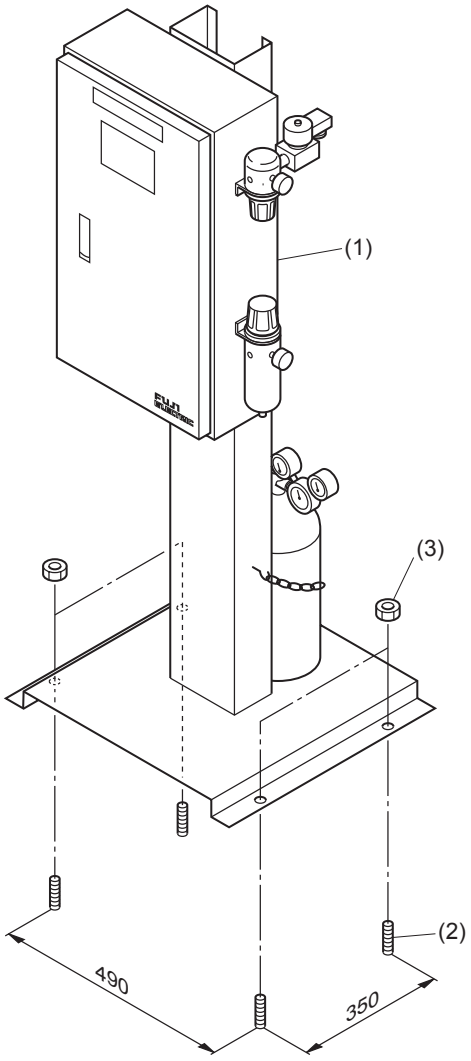
## 3.1 Installation site

Install the analyzer in a place that satisfies the following conditions.

(1) Space for periodic inspection and wiring work is available.
(2) Vibration, dust, dirt, and humidity are minimal.
(3) Not directly affected by radiation heat from heating furnace, etc. (converter)
(4) The atmosphere is non-corrosive.
(5) Away from electrical devices that may cause noise trouble (such as motor and transformer), and equipment that may cause electromagnetic or electrostatic induction trouble
(6) Ambient temperature is -10 to +50°C, and ambient humidity is 95%RH or lower. (converter)

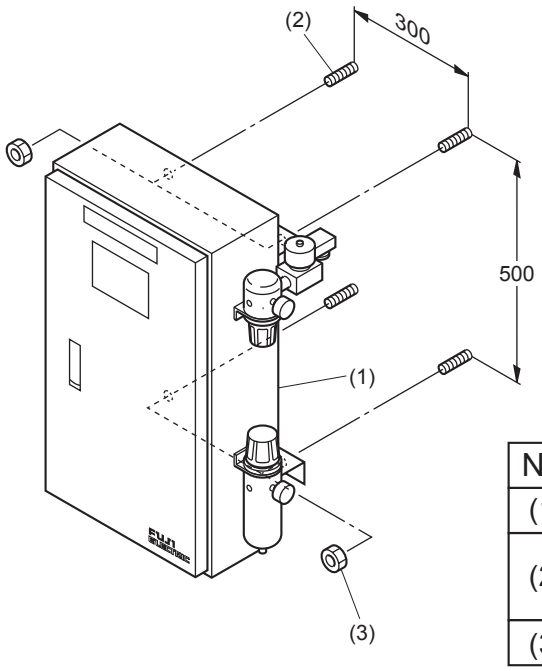
## 3.2 How to install the analyzer

### 3.2.1 Stand type




| No. | Name | Q'ty |
|---|---|---|
| (1) | Stand type converter | 1 |
| (2) | Anchor bolt (option)<br>M12 × 160 × 50 | 4 |
| (3) | M12 nut | 4 |

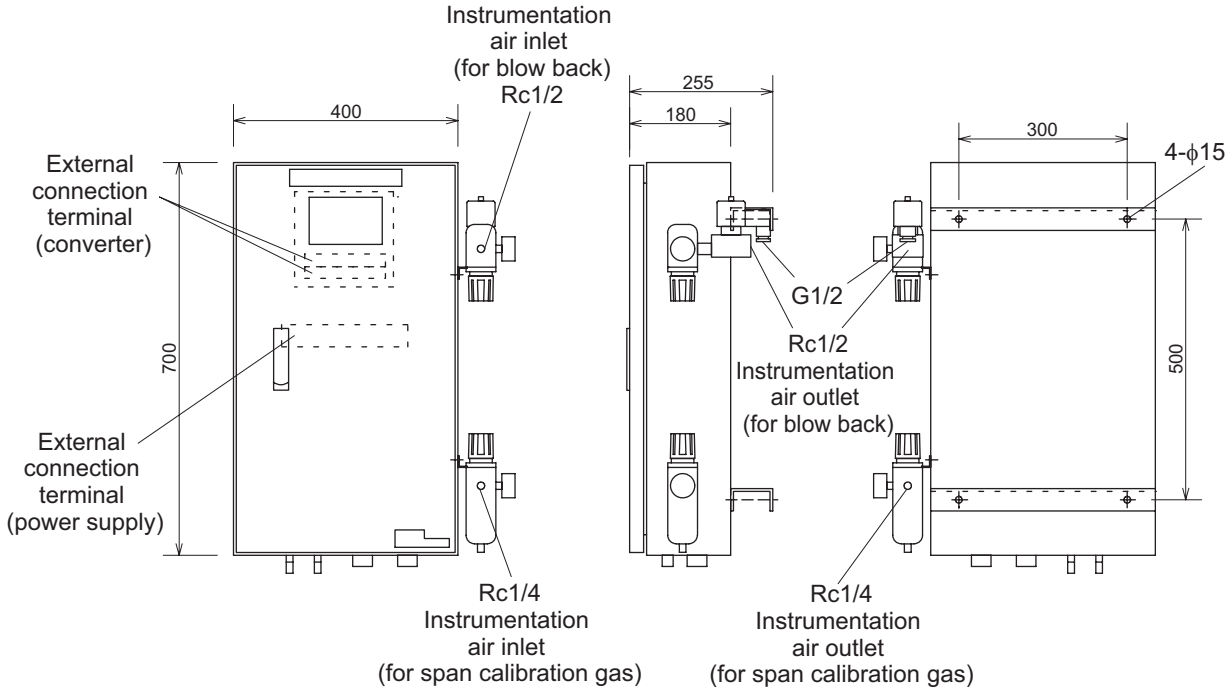
### 3.2.2 Wall mount type



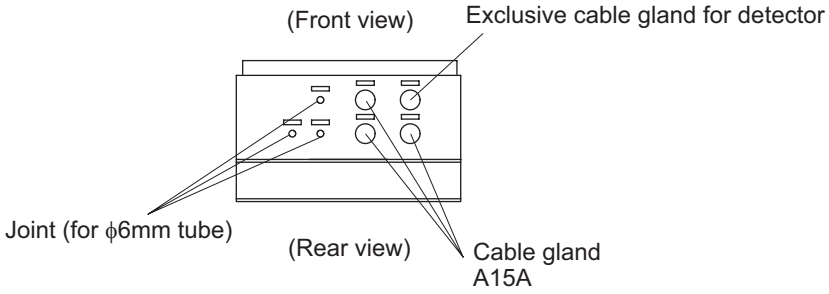

| No. | Name | Q'ty |
|---|---|---|
| (1) | Wall-mount converter | 1 |
| (2) | Anchor bolt (option)<br>M12 × 160 × 50 | 4 |
| (3) | M12 nut | 4 |

## 3.3 Outline drawing of converter

### Wall-mount type

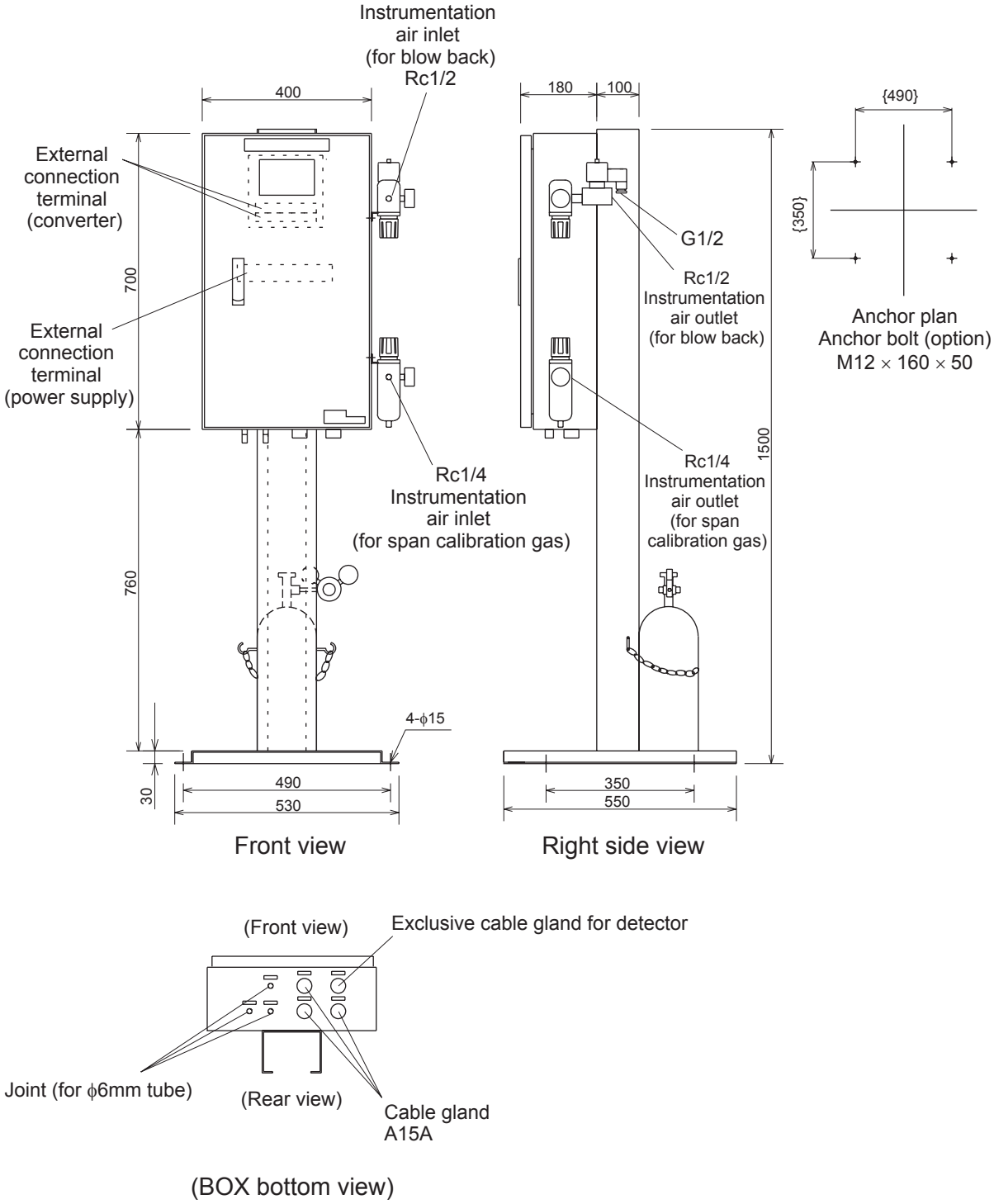



Front view Right side view Rear view




(BOX bottom view)

## Stand type


Instrumentation
air inlet
(for blow back)
Rc1/2
400
180
100
{490}
External
connection
terminal
(converter)
700
External
connection
terminal
(power supply)
G1/2
Rc1/2
Instrumentation
air outlet
(for blow back)
{350}
Anchor plan
Anchor bolt (option)
M12 × 160 × 50
Rc1/4
Instrumentation
air inlet
(for span calibration gas)
Rc1/4
Instrumentation
air outlet
(for span
calibration gas)
1500
760
4-ϕ15
30
490
530
350
550
Front view
Right side view
(Front view)
Exclusive cable gland for detector
Joint (for ϕ6mm tube)
(Rear view)
Cable gland
A15A
(BOX bottom view)

# 4. WIRING AND PIPING

**⚠ CAUTION**

⚠ : Wiring work must be carried out with all power supplies turned off.
Otherwise electric shock may result.

⏚ : Be sure to ground the Converter. (Class D grounding)

## 4.1 Before wiring

(1) Power voltage for the converter must conform to that for the detector to be connected.

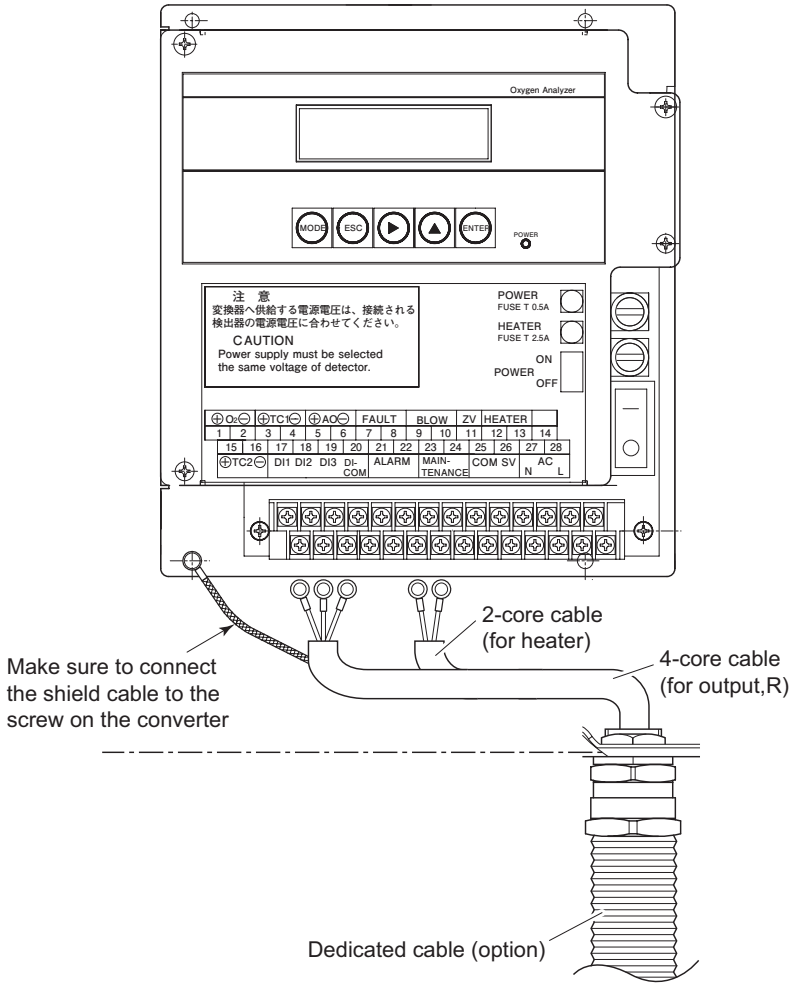
(2) Power supply wiring

- Use 1.25sq 600V vinyl insulated cable (JISC3307) or equivalent as power supply cable.

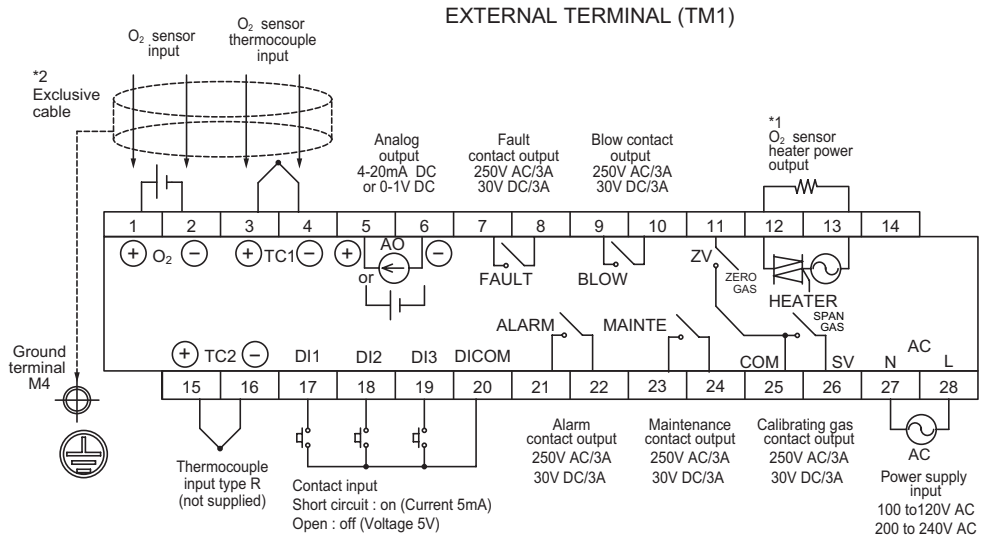
(3) Provide adequate protection of the dedicated cable (6 cores in total), which connects the detector to converter, using wire protection tube, etc. Separate these cables from the power cable (noise prevention).

(4) Keep the wire for output signals as far as possible (more than 30cm) from the power line and heavy current lines to prevent induced noise. Also, wherever possible use a shielded cable and earth one point of the shield.

Note) For connection of wiring to the external terminals, use of solderless terminal with insulating sleeve is recommended. (for M3 screw)



## 4.2 Wiring to each terminal

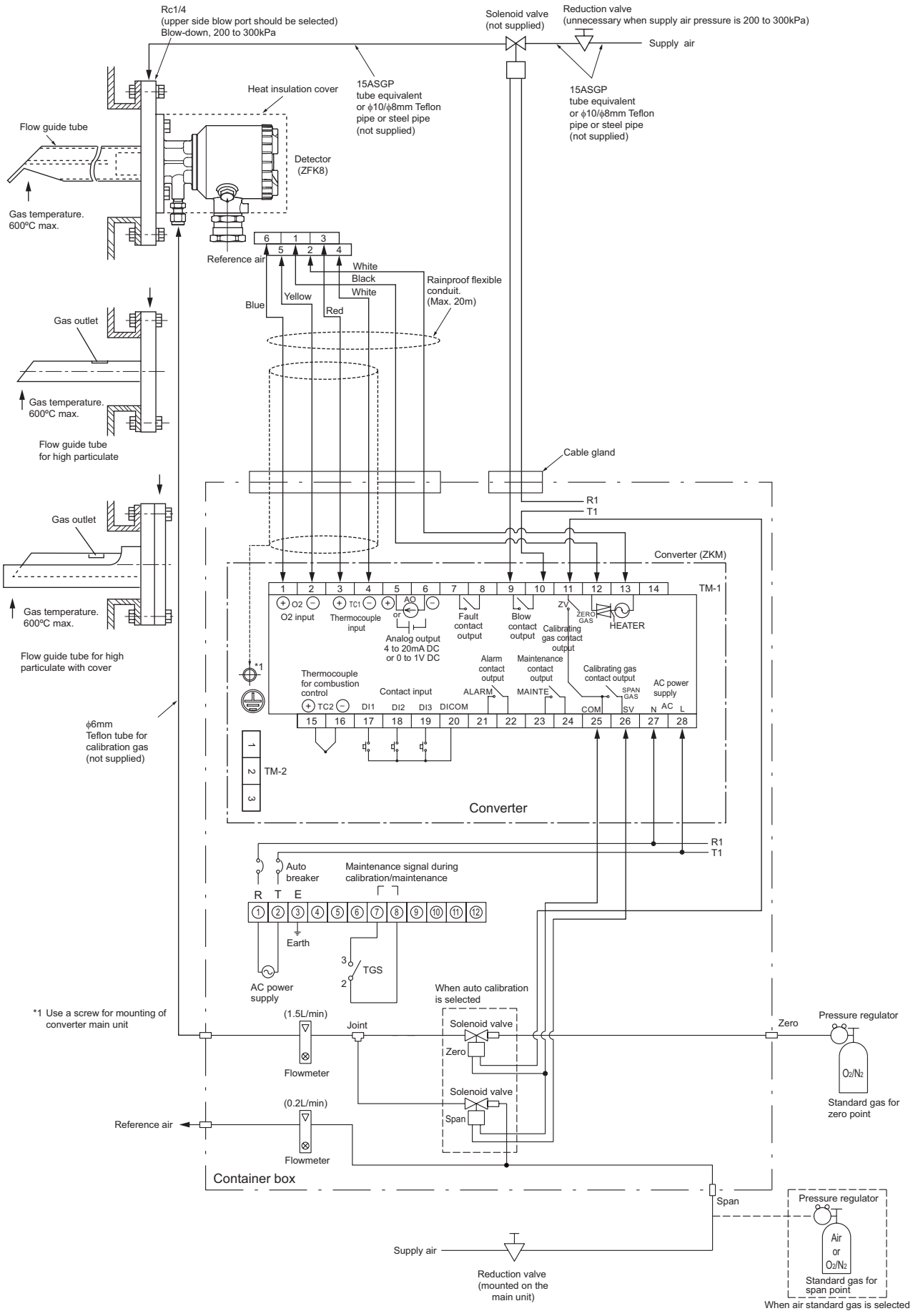



COMMUNICATION TERMINAL (TM2) /INSERTION TERMINAL

| | Terminal number | | | Remarks |
|---|---|---|---|---|
| | 1 | 2 | 3 | |
| RS232C | TXD | RXD | GND | Standard |
| RS485 | TRX+ | TRX– | GND | Option |

Note 1) The heater power supply is the same as the converter power supply.
Note 2) Be sure to connect the shield of the cable to the ground in the main body.

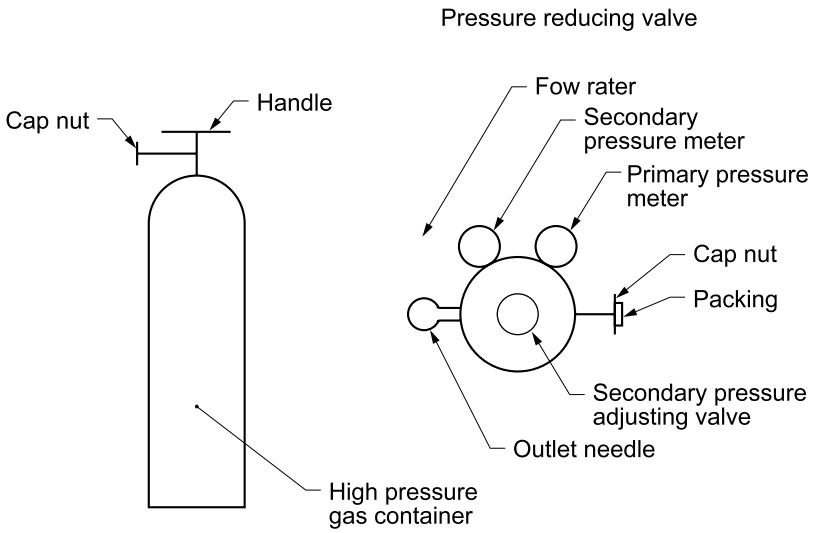
## 4.3 Wiring and piping diagram



## 4.4 Handling of standard gas

**(1) Handling**

1) Make sure the handle is closed on the high pressure gas container, then detach the cap nut.
2) Attach the high pressure gas container using the cap nut with packing of the pressure reducing valve.
3) Make sure the secondary pressure adjusting valve is turned fully counterclockwise (pressure not applied) and the outlet needle is turned fully clockwise (closed), then open the handle.
4) Turn the secondary pressure adjusting valve clockwise and set to the normal value of 20 to 30 kPa, then open the outlet needle slowly to allow the gas to flow.



# 5. OPERATION

## 5.1 Preparation for operation

(1) Wiring check (Refer to “4.2”, “4.3”)

⇩

(2) Confirmation of the power supply specifications (Please check the main power supply and the power supply voltage specification of the detector.)

⇩

(3) Power ON.
Open the front flap. Turn “ON (–)” the power switch. (Refer to “2.2”)

| OXYGEN ANALYZER<br>VER ∗.∗∗ YY/MM |
|---|

The message shown left appears on the LCD screen.

| WARM-UP<br>HEATER 234 °C |
|---|

After about 6 seconds, the display is automatically switched to the warming-up screen.

⇩

(4) Warmup (After 10 minutes from power ON, accurate measurement data may be obtained.)

⇩

(5) Parameter setting, key operation outline
Move to each Menu with reference to the paragraph “5.2 Key operation flow diagram (outline), and set a necessary parameter. Refer to the paragraph “5.3 Initial parameter value table”.
If you need to change a parameter, refer to the “Chapter 8”.

⇩

(6) Calibration
At the first operation, perform manual calibration after warmup using a standard gas.
Refer to chapter 7 for calibration procedures.

⇩

(7) Auto calibration (option)
Automatic calibration may be performed at specified time intervals.
Refer to “8.2.2” for automatic calibration settings.

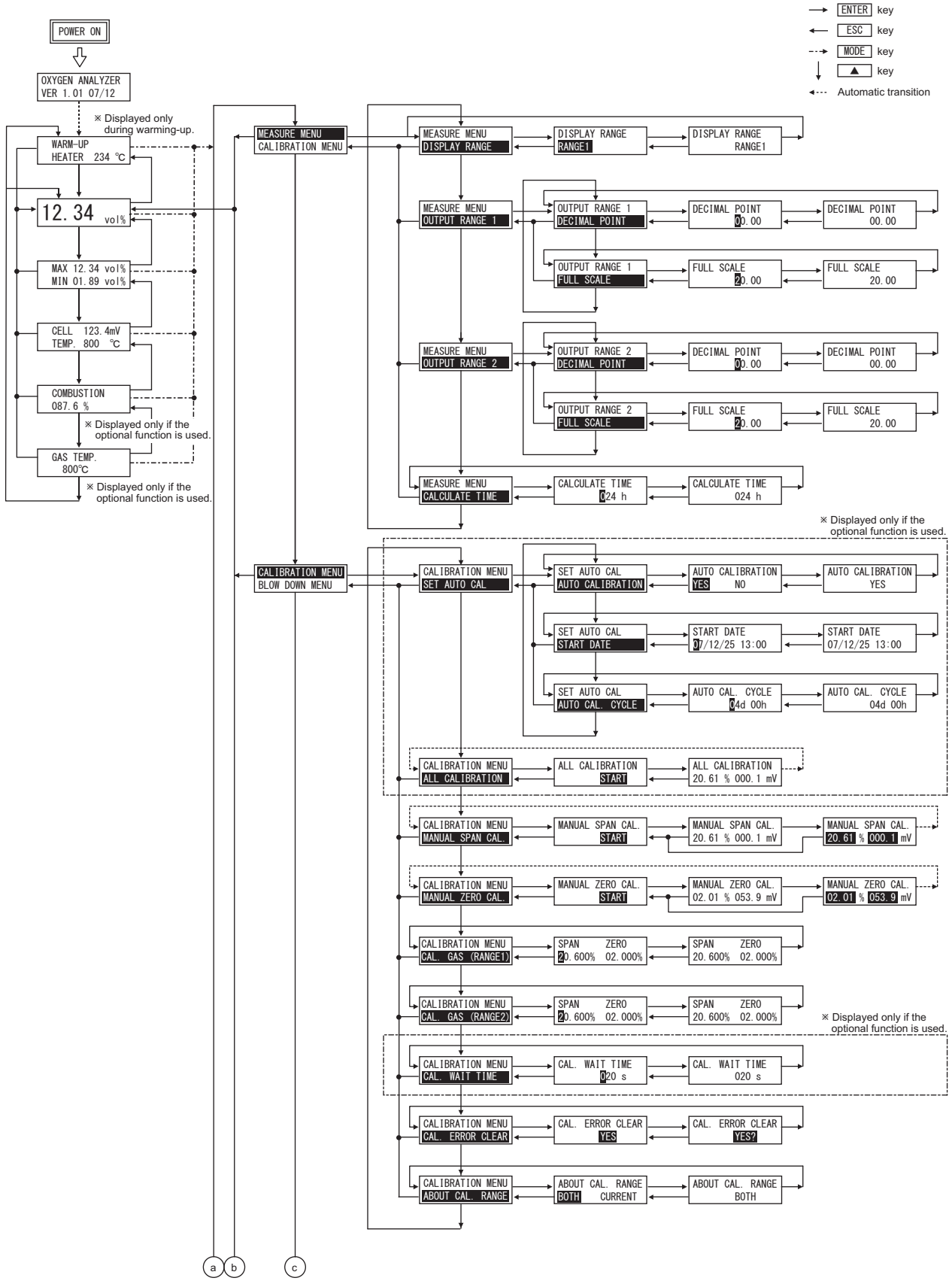
⇩

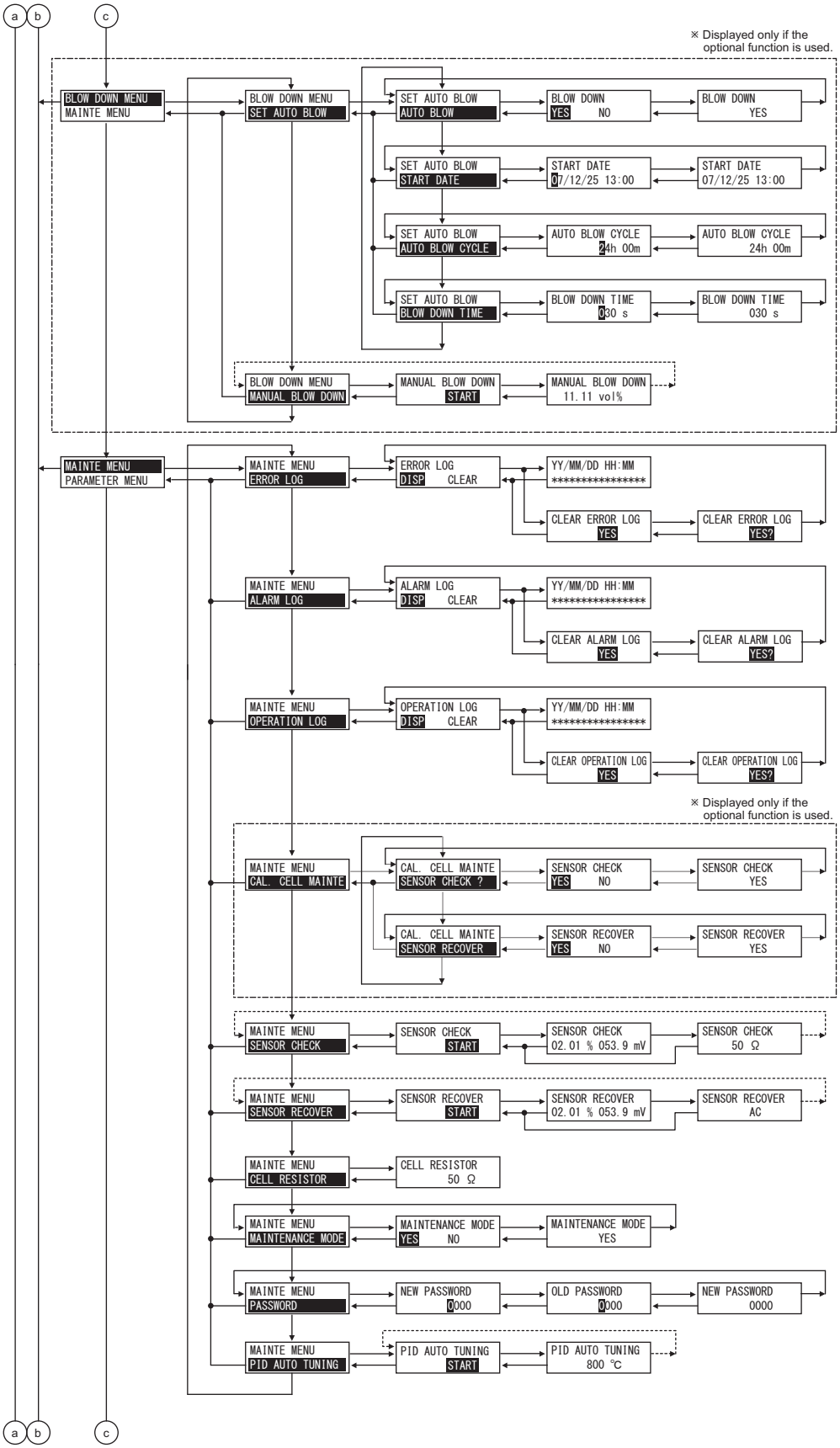
(8) Blowdown (option)
A flow guide tube blowdown function prevents the flow guide tube from clogging due to dust in the gas stream.
Refer to “8.3” for operation procedures.

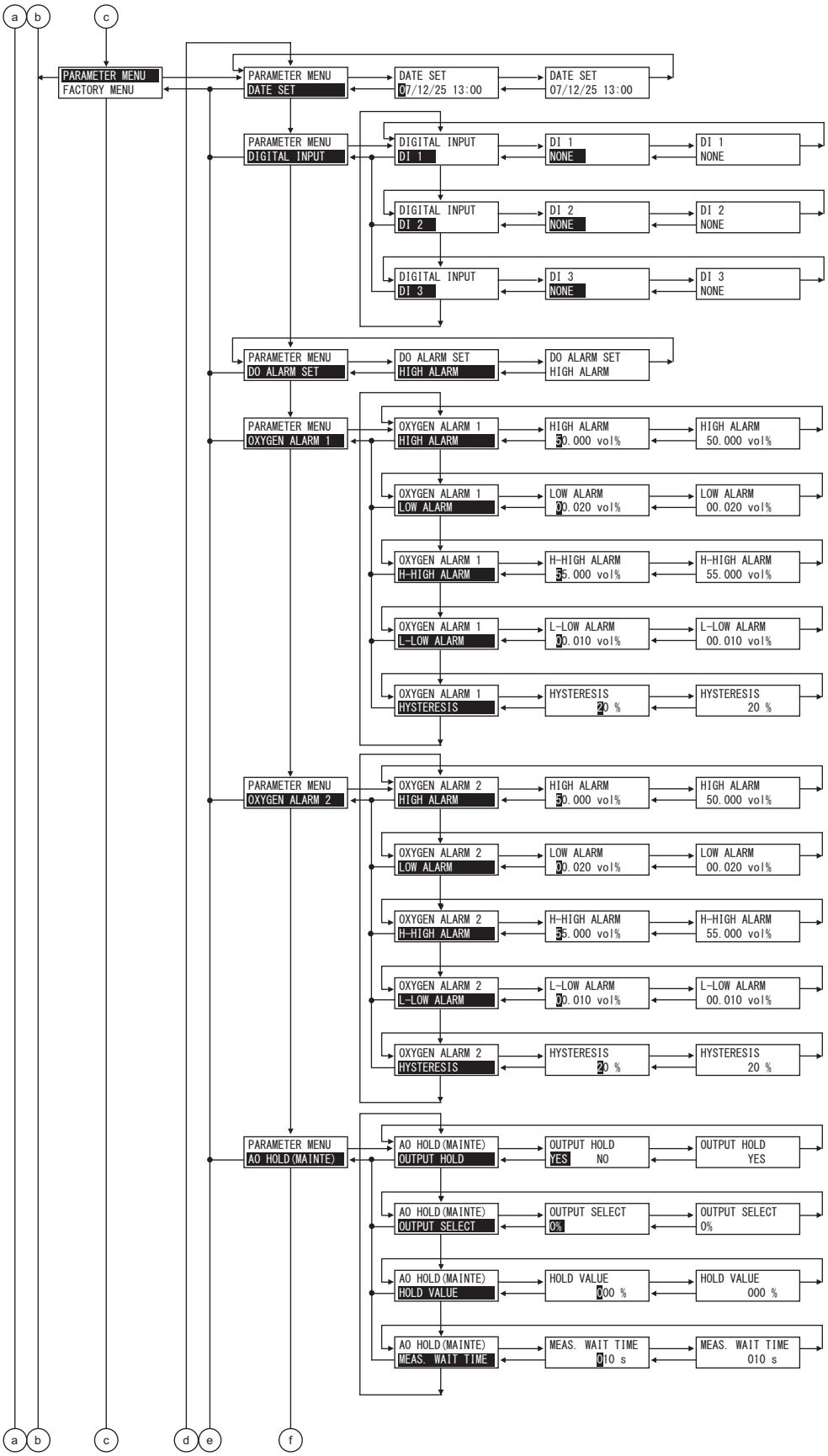
⇩

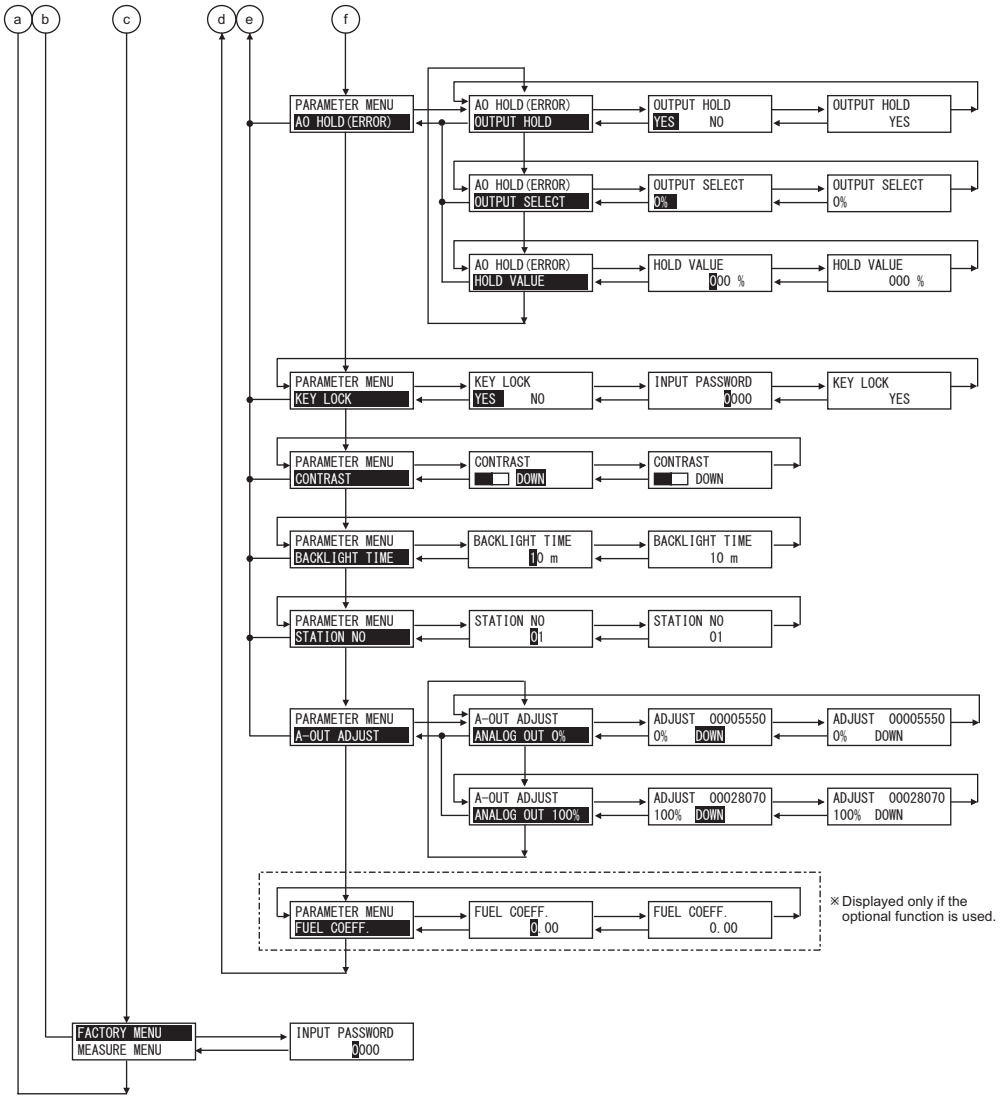
Operation

## 5.2 Key operation flow diagram (outline)




a
b
c
※ Displayed only if the optional function is used.
BLOW DOWN MENU
MAINTE MENU
BLOW DOWN MENU
SET AUTO BLOW
SET AUTO BLOW
AUTO BLOW
BLOW DOWN
YES NO
BLOW DOWN
YES
SET AUTO BLOW
START DATE
START DATE
07/12/25 13:00
START DATE
07/12/25 13:00
SET AUTO BLOW
AUTO BLOW CYCLE
AUTO BLOW CYCLE
24h 00m
AUTO BLOW CYCLE
24h 00m
SET AUTO BLOW
BLOW DOWN TIME
BLOW DOWN TIME
030 s
BLOW DOWN TIME
030 s
BLOW DOWN MENU
MANUAL BLOW DOWN
MANUAL BLOW DOWN
START
MANUAL BLOW DOWN
11.11 vol%
MAINTE MENU
PARAMETER MENU
MAINTE MENU
ERROR LOG
ERROR LOG
DISP CLEAR
YY/MM/DD HH:MM
**********
CLEAR ERROR LOG
YES
CLEAR ERROR LOG
YES?
MAINTE MENU
ALARM LOG
ALARM LOG
DISP CLEAR
YY/MM/DD HH:MM
**********
CLEAR ALARM LOG
YES
CLEAR ALARM LOG
YES?
MAINTE MENU
OPERATION LOG
OPERATION LOG
DISP CLEAR
YY/MM/DD HH:MM
**********
CLEAR OPERATION LOG
YES
CLEAR OPERATION LOG
YES?
※ Displayed only if the optional function is used.
MAINTE MENU
CAL. CELL MAINTE
CAL. CELL MAINTE
SENSOR CHECK ?
SENSOR CHECK
YES NO
SENSOR CHECK
YES
CAL. CELL MAINTE
SENSOR RECOVER
SENSOR RECOVER
YES NO
SENSOR RECOVER
YES
MAINTE MENU
SENSOR CHECK
SENSOR CHECK
START
SENSOR CHECK
02.01 % 053.9 mV
SENSOR CHECK
50 Ω
MAINTE MENU
SENSOR RECOVER
SENSOR RECOVER
START
SENSOR RECOVER
02.01 % 053.9 mV
SENSOR RECOVER
AC
MAINTE MENU
CELL RESISTOR
CELL RESISTOR
50 Ω
MAINTE MENU
MAINTENANCE MODE
MAINTENANCE MODE
YES NO
MAINTENANCE MODE
YES
MAINTE MENU
PASSWORD
NEW PASSWORD
0000
OLD PASSWORD
0000
NEW PASSWORD
0000
MAINTE MENU
PID AUTO TUNING
PID AUTO TUNING
START
PID AUTO TUNING
800 ℃
a
b
c


a
b
c
PARAMETER MENU
FACTORY MENU
PARAMETER MENU
DATE SET
DATE SET
07/12/25 13:00
DATE SET
07/12/25 13:00
PARAMETER MENU
DIGITAL INPUT
DIGITAL INPUT
DI 1
DI 1
NONE
DI 1
NONE
DIGITAL INPUT
DI 2
DI 2
NONE
DI 2
NONE
DIGITAL INPUT
DI 3
DI 3
NONE
DI 3
NONE
PARAMETER MENU
DO ALARM SET
DO ALARM SET
HIGH ALARM
DO ALARM SET
HIGH ALARM
PARAMETER MENU
OXYGEN ALARM 1
OXYGEN ALARM 1
HIGH ALARM
HIGH ALARM
50.000 vol%
HIGH ALARM
50.000 vol%
OXYGEN ALARM 1
LOW ALARM
LOW ALARM
00.020 vol%
LOW ALARM
00.020 vol%
OXYGEN ALARM 1
H-HIGH ALARM
H-HIGH ALARM
55.000 vol%
H-HIGH ALARM
55.000 vol%
OXYGEN ALARM 1
L-LOW ALARM
L-LOW ALARM
00.010 vol%
L-LOW ALARM
00.010 vol%
OXYGEN ALARM 1
HYSTERESIS
HYSTERESIS
20 %
HYSTERESIS
20 %
PARAMETER MENU
OXYGEN ALARM 2
OXYGEN ALARM 2
HIGH ALARM
HIGH ALARM
50.000 vol%
HIGH ALARM
50.000 vol%
OXYGEN ALARM 2
LOW ALARM
LOW ALARM
00.020 vol%
LOW ALARM
00.020 vol%
OXYGEN ALARM 2
H-HIGH ALARM
H-HIGH ALARM
55.000 vol%
H-HIGH ALARM
55.000 vol%
OXYGEN ALARM 2
L-LOW ALARM
L-LOW ALARM
00.010 vol%
L-LOW ALARM
00.010 vol%
OXYGEN ALARM 2
HYSTERESIS
HYSTERESIS
20 %
HYSTERESIS
20 %
PARAMETER MENU
AO HOLD(MAINTE)
AO HOLD(MAINTE)
OUTPUT HOLD
OUTPUT HOLD
YES NO
OUTPUT HOLD
YES
AO HOLD(MAINTE)
OUTPUT SELECT
OUTPUT SELECT
0%
OUTPUT SELECT
0%
AO HOLD(MAINTE)
HOLD VALUE
HOLD VALUE
000 %
HOLD VALUE
000 %
AO HOLD(MAINTE)
MEAS. WAIT TIME
MEAS. WAIT TIME
010 s
MEAS. WAIT TIME
010 s
a
b
c
d
e
f


a
b
c
d
e
f
PARAMETER MENU
AO HOLD(ERROR)
AO HOLD(ERROR)
OUTPUT HOLD
OUTPUT HOLD
YES NO
OUTPUT HOLD
YES
AO HOLD(ERROR)
OUTPUT SELECT
OUTPUT SELECT
0%
OUTPUT SELECT
0%
AO HOLD(ERROR)
HOLD VALUE
HOLD VALUE
000 %
HOLD VALUE
000 %
PARAMETER MENU
KEY LOCK
KEY LOCK
YES NO
INPUT PASSWORD
0000
KEY LOCK
YES
PARAMETER MENU
CONTRAST
CONTRAST
DOWN
CONTRAST
DOWN
PARAMETER MENU
BACKLIGHT TIME
BACKLIGHT TIME
10 m
BACKLIGHT TIME
10 m
PARAMETER MENU
STATION NO
STATION NO
01
STATION NO
01
PARAMETER MENU
A-OUT ADJUST
A-OUT ADJUST
ANALOG OUT 0%
ADJUST 00005550
0% DOWN
ADJUST 00005550
0% DOWN
A-OUT ADJUST
ANALOG OUT 100%
ADJUST 00028070
100% DOWN
ADJUST 00028070
100% DOWN
PARAMETER MENU
FUEL COEFF.
FUEL COEFF.
0.00
FUEL COEFF.
0.00
※Displayed only if the optional function is used.
FACTORY MENU
MEASURE MENU
INPUT PASSWORD
0000

## 5.3 Initial parameter value table

### 5.3.1 Parameters related to measurement

| Parameter setting | Displayed message | Range | Initial value | Reference paragraph |
|---|---|---|---|---|
| Display range | OUTPUT RANGE<br>RANGE1 RANGE2 | Range1 or Range2 | Range-1 | 8.1.1 |
| Decimal point position (Range1 / Range2) | DECIMAL POINT<br>00.00 | [00.00]<br>[0.000] | [00.00] | 8.1.2 |
| Full scale (Range1 / Range2) | FULL SCALE<br>25.00 | 2 to 50 in 1 vol% steps | 25.00 vol% | 8.1.3 |
| Calculation time of maximum and minimum values | CALCULATE TIME<br>024 h | 0 to 240 hour in 1-hour steps | 24 hour | 8.1.4 |

### 5.3.2 Parameters related to calibration

| Parameter setting | Displayed message | Range | Initial value | Reference paragraph |
|---|---|---|---|---|
| Auto calibration function (Displayed if the option is provided.) | AUTO CALIBRATION<br>YES NO | YES or NO | Invalid<br>(Auto calibration function: Invalid) | 8.2.2 |
| Date and time for starting automatic calibration (Displayed if the option is provided.) | START DATE<br>99/01/01 00:00 | Date and time in the future in the calendar | 99/01/01 00:00 | 8.2.2 |
| Automatic calibration cycle time (Displayed if the option is provided.) | AUTO CAL. CYCLE<br>07d 00h | 00d 00h to 99d23h<br>(h: 00 to 23) | 07d 00h | 8.2.2 |
| Calibration gas concentration-1<br>calibration gas concentration-2 | SPAN ZERO<br>20.600% 02.000% | Span:<br>00.010 to 50.000 vol%<br>Zero:<br>00.010 to 25.000 vol%<br>in 0.001 vol% steps | Span:<br>20.600 vol%<br>Zero:<br>02.000 vol% | 8.1.7 |
| Calibration wait time | CAL. WAIT TIME<br>030 s | 10 to 300 sec.<br>in 1 sec. steps | 60 sec. | 8.1.8 |
| Calibration range setting | ABBOUT CAL. RANGE<br>BOTH CURRENT | Set calibration range<br>Current or both range | BOTH | 8.1.6 |

### 5.3.3 Parameters related to blowdown (displayed if the option is provided)

| Parameter setting | Displayed message | Range | Initial value | Reference paragraph |
|---|---|---|---|---|
| Automatic blowdown function | BLOW DOWN<br>YES NO | YES or NO | NO<br>(The automatic blowdown function is invalid.) | 8.3.3 |
| Date and time for starting automatic blowdown | START DATE<br>99/01/01 00:00 | Date and time in the future in the calendar | 99/01/01 00:00 | 8.3.3 |
| Automatic blowdown cycle time | AUTO BLOW CYCLE<br>24h 00m | 00h 00m to 99h 59m<br>(m: 00 to 59) | 24h 00m | 8.3.3 |
| Blowdown time | BLOW DOWN TIME<br>030 s | 0 to 999 sec. in 1 sec. steps | 30 sec. | 8.3.3 |

### 5.3.4 Parameters related to maintenance

| Parameter setting | Displayed message | Range | Initial value | Reference paragraph |
|---|---|---|---|---|
| Sensor check function for automatic calibration | SENSOR CHECK<br>YES NO | YES or NO | NO<br>(Sensor check function for calibration is invalid.) | 9.1.6 |
| Sensor recovery function for automatic calibration | SENSOR RECOVER<br>YES NO | YES or NO | NO<br>(Sensor recovery function for calibration is invalid.) | 9.1.7 |

### 5.3.5 Other parameters

| Parameter setting | Displayed message | Range | Initial value | Reference paragraph |
|---|---|---|---|---|
| Current date and time | DATE SET<br>00/00/01 00:00 | Date and time in the calendar | (00/01/01 00:00) | 9.2.1 |
| Contact inputs 1 to 3 | DI 1<br>NONE | DI1 to DI3<br>[NONE]<br>[BLOW DOWN ON]<br>[HEATER OFF]<br>[PROHIBIT CAL.]<br>[REMOTE CAL.]<br>[REMOTE HOLD]<br>[CALCULATE REST]<br>[OUTPUT RANGE] | DI1<br>[NONE]<br>DI2<br>[NONE]<br>DI3<br>[NONE] | 9.2.2 |
| Alarm contact output | DO ALARM SET<br>ALARM NONE | [ALARM NONE]<br>[HIGH ALARM]<br>[LOW ALARM]<br>[H-HIGH ALARM]<br>[L-LOW ALARM]<br>[H/L ALARM]<br>[HH/LL ALARM] | [ALARM NONE] | 9.2.3 |
| Upper limit of oxygen concentration<br>(Range-1<br>Range-2) | HIGH ALARM<br>50.000 vol% | 0.001 to 55.000 vol% in 0.001 vol% steps | 50.000 vol% | 9.2.4 |
| Lower limit of oxygen concentration<br>(Range-1<br>Range-2) | LOW ALARM<br>00.020 vol% | 0.001 to 55.000 vol% in 0.001 vol% steps | 00.020 vol% | 9.2.5 |
| Upper 2 limit of oxygen concentration<br>(Range-1<br>Range-2) | H-HIGH ALARM<br>55.000 vol% | 0.001 to 55.000 vol% in 0.001 vol% steps | 55.000 vol% | 9.2.6 |
| Lower 2 limit of oxygen concentration<br>(Range-1<br>Range-2) | L-LOW ALARM<br>00.010 vol% | 0.001 to 55.000 vol% in 0.001 vol% steps | 00.010 vol% | 9.2.7 |
| Hysteresis<br>(Oxygen concentration alarm)<br>(Range-1<br>Range-2) | HYSTERESIS<br>10 % | 0 to 20 % in 1 % steps | 10 % | 9.2.8 |
| Analog output hold function<br>(Maintenance hold<br>Error hold) | OUTPUT HOLD<br>YES NO | YES or NO | NO<br>(Analog output hold function is invalid.) | 9.2.9<br>9.2.13 |
| Output value of analog output hold<br>(Maintenance hold<br>Error hold) | OUTPUT SELECT<br>0% | [0 %] (4 mA/0V)<br>[100 %] (20 mA/1V)<br>[Last output value]<br>[Setting value] | [0 %](4 mA/0V) | 9.2.10<br>9.2.14 |
| Setting the value of analog output hold<br>(Maintenance hold<br>Error hold) | HOLD VALUE<br>000 % | 0 to 100 % in 1 % steps | 0 % | 9.2.11<br>9.2.15 |

| Parameter setting | Displayed message | Range | Initial value | Reference paragraph |
|---|---|---|---|---|
| Measurement recovery time | MEAS. WAIT TIME<br>010 s | 0 to 300 sec. in 1 sec. steps | 10 sec. | 9.2.12 |
| Key lock function | KEY LOCK<br>YES NO | YES or NO | No<br>(Key lock function is invalid.) | 9.2.16 |
| Adjustment of brightness | CONTRAST<br>▬▬ DOWN | (0 to 100 %) | 50 % | 9.2.17 |
| Automatic OFF time | BACKLIGHT TIME<br>10 m | 0 to 99 min. in 1 min. steps | 10 min. | 9.2.18 |

# 6. PERATION START AND SHUTDOWN

## 6.1 Starting

After correct wiring and piping has been completed, turn the power switch in the converter ON, and measuring operation will begin.
Note: 10 min. of warm-up time is necessary after power ON.

Caution of before starting

(1) Furnace operation should only be started after 10 min. or more of warm-up time has elapsed.

(2) When a detector is to be installed in a furnace already in operation, take care to blow out harmful gas from the furnace and then install the fully warmed up detector quickly.

## 6.2 Stopping operation

**(1) When a process (furnace etc.) is to be shutdown for a short time i.e. a week or so**

It is strongly recommended to keep the detector in operation to avoid possible deterioration of platinum electrodes in the detector and destruction of the wet sensor element (depending on the condition in furnace and/or ambient conditions) due to power ON-OFF.

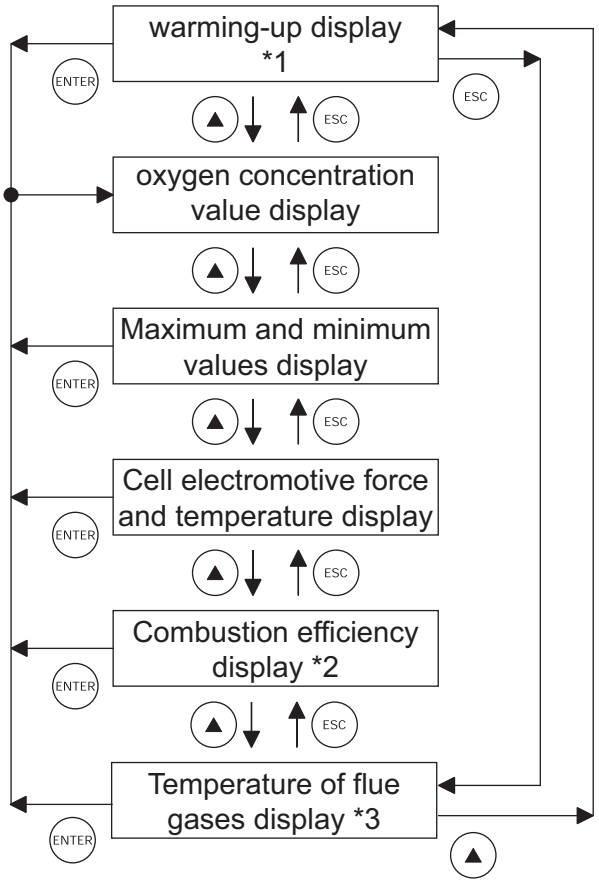
In case of the detector with an ejector (option), shutdown the air source.

**(2) When a process (furnace etc.) is to be shutdown for a long time**

Turn OFF the power switch of the instrument after gas in the furnace has been replaced completely by ambient air.

## 6.3 Actions during operation

While the instrument is operating, the following displays can be changed.




*1: Displayed only during warm-up.
Analog output during warm-up is output at 4 mA/0 V constantly.

*2: This optional screen is displayed only if the option is selected.
Combustion efficiency is calculated using the oxygen concentration, temperature of flue gases, and fuel coefficient in this function.

*3: This optional screen is displayed only if the option is selected.
Temperature of flue gases is displayed, which is detected by the temperature sensor (R-type thermocouple) of the auxiliary input.

## 6.4 Check the contents of display

The condition of the unit is displayed on the left of the LCD with three words. The maximum of three items are displayed on one display. If there are four or more items, "▼" is displayed at the bottom of the screen. Scroll the screen with the (▶) key to display the fourth and subsequent items.

The unit displays the following three pieces of information:

- (1) Condition information ("6.4.1"), (2) Error information ("6.4.2"), (3) Alarm information ("6.4.3")

### 6.4.1 Check of condition information

| Display message | State | Remarks |
|---|---|---|
| WUP | Warm-up | Appears during warm-up |
| CAL | Auto calibration | Appears during auto calibration |
| S | Span calibration | Displayed together with "CAL" or "RIC" during span calibration. |
| Z | Zero calibration | Displayed together with "CAL" or "RIC" during zero calibration. |
| SCK | Sensor check | Displayed during sensor check. |
| SRC | Sensor recovery | Displayed during sensor recovery. |
| BLW | Automatic blowdown | Displayed during automatic blowdown. |
| RIC | Rich mode | Combustion efficiency option<br>Displayed when electromotive force is 200mV but no more than 260mV |
| KYL | Key Lock | Displayed during key lock |
| RHO | Remote heater is off. | Displayed while remote heater is off. |
| RCP | Remote calibration is prohibited. | Displayed while remote calibration is prohibited. |
| RAH | Remote analog output hold | Displayed during remote analog output hold. |
| RCL | Remote calibration | Displayed during remote calibration. |
| RBL | Remote blowdown | Displayed during remote blowdown. |

### 6.4.2 Checking the error information

| Display message | Status | Remarks |
|---|---|---|
| Er1 | Fault of heater temperature | Appears when control temperature of the heater exceeds the set range.<br>The heater control is stopped. |
| Er2 | Disconnection detection | Appears when disconnection is detected at the sensor, or thermocouples for temperature control or combustion control.<br>The heater control is stopped. |
| Er3 | Sensor error | Appears when the A/D value is saturated. |
| Er4 | Span calibration error | Appears when the span calibration is abnormal.<br>(The calibration gas is unstable. / The calibration factor setting is inappropriate.) |
| Er5 | Zero calibration error | Appears when the zero calibration is abnormal.<br>(The calibration gas is unstable. / The calibration factor setting is inappropriate.) |

### 6.4.3 Checking the alarm information

| Display message | Status | Remarks |
|---|---|---|
| ALM | Oxygen concentration error | Appears when the oxygen concentration exceeds any of specified HH / High / Lower / LL limit values.<br>(Refer to “9.2.4” to “9.2.8”) |
| H | High limit error | Appears together with ALM. |
| L | Lower limit error | Appears together with ALM. |
| HH | HH limit error | Appears together with ALM. |
| LL | LL limit error | Appears together with ALM. |

You can select one of the following seven alarms to output to the alarm contact (Numbers of contacts of the external terminal block: (21), (22)) when an oxygen concentration error occurs.

(1) [Not used] : No alarm is output to the contact output.

(2) [High limit alarm] : Alarm contact is output when an high limit alarm occurs.

(3) [Lower limit alarm] : Alarm contact is output when a lower limit alarm occurs.

(4) [HH limit alarm] : Alarm contact is output when an HH limit alarm occurs.

(5) [LL limit alarm] : Alarm contact is output when a LL limit alarm occurs.

(6) [High/lower limit alarm] : Alarm contact is output when an high or lower limit alarm occurs.

(7) [HH / LL limit alarm] : Alarm contact is output when an HH or LL limit alarm occurs.

## 6.5 Oxygen detector standard output voltage

| $O_2$ concentration (%) | Output value (mV) | $O_2$ concentration (%) | Output value (mV) | $O_2$ concentration (%) | Output value (mV) |
|---|---|---|---|---|---|
| 0.01 | 176.38 | 5.0 | 32.73 | 25.0 | -4.475 |
| 0.1 | 123.15 | 10.0 | 16.71 | 30.0 | -8.689 |
| 0.5 | 85.95 | 15.0 | 7.333 | 40.0 | -15.34 |
| 1.0 | 69.93 | 20.0 | 0.683 | 50.0 | -20.50 |
| 1.5 | 60.56 | 20.6 | 0 | – | – |
| 2.0 | 53.91 | 21.0 | -0.445 | – | – |

# 7. CALIBRATION

In order to maintain good accuracy, proper calibration using calibration gas is necessary. The following 4 methods of calibration are provided.

(1) Manual calibration (“8.2”), (2) Auto calibration (option) (“8.2.2”),
(3) Remote calibration (“8.2.3”), (4) All calibration (option) (“8.2.4”)

## 7.1 Preparation

- Check of piping and wiring
  Perform wiring and piping correctly referring to Item “4.3”. At this time, the main plug of standard gas should be left open. Since high pressure is present at piping connections, use blind-nut type joints and take special care with regard to air-tightness. Calibration gas flow should be 1.5 ± 0.5 L/min.
- Setting of calibration gas concentration
  Referring to “8.1.7 Calibration gas setting” set the oxygen concentration in standard gas cylinder to be used.
- Setting of calibration range
  Set the range for calibration according to “8.1.6 Operation setting screen of calibration range.”

# 8. SETTING AND OPERATING OF PARAMETER

## 8.1 Measured menu

### 8.1.1 Display range setting screen

Description

- You can set the display range of oxygen concentration value using this function.
- Settable range: Select one of the following
  (1) "Range 1": Displayed in the range set in the range setting 1.
  (2) "Range 2": Displayed in the range set in the range setting 2.

| Procedure | Operation (example) | Setting the display range to "Range 1" | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key.<br>The display range setting screen appears. | MEASURE MENU<br>OUTPUT RANGE |
| (2) | ▶<br>ENTER | Use the ▶ key to select the range-1.<br>Press the ENTER key to set the value. | OUTPUT RANGE<br>RANGE1 RANGE2 |
| (3) | ENTER | Press the ENTER key. | OUTPUT RANGE<br>RANGE1 |
| (4) | | When it is fixed, the display returns to the screen on the right. | MEASURE MENU<br>OUTPUT RANGE |

Note

- If "Range setting" is set in the contact input setting, you cannot change the display range on this screen.

### 8.1.2 Decimal point position setting screen

Description

- You can set the decimal point position of full scale for oxygen concentration display using this function.
- Settable range: Select one of the following.
  (1) "00.00": Displayed with two-digit integer and two decimal places.
  (2) "0.000": Displayed with one-digit integer and three decimal places.

| Procedure | Operation (example) | Setting the display of two-digit integer and two decimal places (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | MEASURE MENU<br>OUTPUT RANGE |
| (2) | ENTER | Press the ENTER key.<br>The decimal point position setting screen appears. | OUTPUT RANGE<br>DECIMAL POINT |
| (3) | ▲<br>ENTER | Use the ▲ key to select the two-digit integer and two decimal places.<br>Press the ENTER key to set the value. | DECIMAL POINT<br>00.00 |
| (4) | ENTER | Press the ENTER key. | DECIMAL POINT<br>00.00 |
| (5) | | When it is fixed, the display returns to the screen on the right. | OUTPUT RANGE<br>DECIMAL POINT |

Note

- If changing "0.000" to "00.00," "25.00" is set as the full scale value.
- If changing "00.00" to "0.000," "5.000" is set as the full scale value.

### 8.1.3 Full scale setting screen

Description

- You can set the full scale value for display of oxygen concentration value using this function.
- Settable range: If the decimal point position is set to "00.00": 02.00 to 50.00 vol%
  If the decimal point position is set to "0.000": 2.000 to 9.000 vol%

| Procedure | Operation (example) | Setting the full scale value to 20.00% (Range-1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | MEASURE MENU<br>OUTPUT RANGE |
| (2) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The full scale setting screen appears. | OUTPUT RANGE<br>FULL SCALE |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the full scale value.<br>Press the ENTER key to set the value. | FULL SCALE<br>20.00 |
| (4) | ENTER | Press the ENTER key. | FULL SCALE<br>20.00 |
| (5) | | The display returns to the screen on the right. | OUTPUT RANGE<br>FULL SCALE |

### 8.1.4 Setting the screen for calculation time of maximum and minimum values

Description

- You can set the calculation time of maximum and minimum values of oxygen concentration value using this function.
- Settable range: 0 to 240h

| Procedure | Operation (example) | Setting the calculation time of maximum and minimum values to 24 hours | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key.<br>The screen for calculation time of maximum and minimum values setting screen appears. | MEASURE MENU<br>CALCULATE TIME |
| (2) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the calculation time of maximum and minimum values.<br>Press the ENTER key to set the value. | CALCULATE TIME<br>024 h |
| (3) | ENTER | Press the ENTER key. | CALCULATE TIME<br>024 h |
| (4) | | When it is fixed, the display returns to the screen on the right. | MEASURE MENU<br>CALCULATE TIME |

### 8.1.5 Calibration error clear

Description

- You can clear the errors occurred during calibration using this function.
  If an error occurs during calibration, an error display (Er4, Er5) and abnormal contact output (close) continues until the next calibration is properly completed.
- Clear the error display on the measurement screen and open the abnormal contact output.
- Error log information is not cleared.

| Procedure | Operation (example) | Clearing a calibration error | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key.<br>The calibration error clear appears. | CALIBRATION MENU<br>CAL. ERROR CLEAR |
| (2) | ENTER | Press the ENTER key.<br>(The calibration error is not cleared yet.) | CAL. ERROR CLEAR<br>YES |
| (3) | ENTER | Press the ENTER key.<br>(Calibration error cleared.) | CAL. ERROR CLEAR<br>YES? |
| (4) | | The display returns to the screen on the right. | CALIBRATION MENU<br>CAL. ERROR CLEAR |

### 8.1.6 Operation setting screen of calibration range

Description

- During calibration, you can select single or common range for the calibration factor using this function.
- Settable range: Select one of the following.
  (1) "Range interlock": Performs calibration of the range that is currently displayed and sets the calibration factors of the other ranges to the same value as above.
  (2) "Display range": Performs calibration of the range that is currently displayed.

| Procedure | Operation (example) | Setting the calibration range to range interlock | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key.<br>The operation setting screen of calibration range appears. | CALIBRATION MENU<br>CURRENT |
| (2) | ▶<br>ENTER | Use the ▶ key to select the range interlock.<br>Press the ENTER key to set the value. | ABOUT CAL. RANGE<br>BOTH CURRENT |
| (3) | ENTER | Press the ENTER key. | ABOUT CAL. RANG<br>BOTH |
| (4) | | When it is fixed, the display returns to the screen on the right. | CALIBRATION MENU<br>CURRENT |

### 8.1.7 Calibration gas setting

Description

- Set calibration gas concentration (span/zero calibration gas concentrations).
  Use the calibration gas concentration 1 for the range 1, and the calibration gas concentration 2 for the range 2.
- Use normal air (atmosphere) as a span calibration gas and set its concentration to 20.600% $O_2/N_2$.
- Settable range: Span calibration gas 00.010 to 50.000 %$O_2/N_2$
  Zero calibration gas 00.010 to 25.000 %$O_2/N_2$

| Procedure | Operation (example) | Setting the span/zero calibration gas concentrations (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | CALIBRATION MENU<br>CAL. GAS |
| (2) | | The set content is displayed now. | SPAN ZERO<br>20.600% 02.000% |
| (3) | (▲) (▶)<br>(ENTER) | Use the (▲) and (▶) key to change the calibration gas concentrations.<br>Press the (ENTER) key to set the value. | SPAN ZERO<br>20.600% 02.000% |
| (4) | (ENTER) | The set content is displayed.<br>Press the (ENTER) key. | SPAN ZERO<br>20.600% 02.000% |
| (5) | | The display returns to the screen on the right. | CALIBRATION MENU<br>CAL. GAS |

Note

- You cannot change the setting value during automatic calibration or remote calibration.
- Set with span calibration gas concentrations ≧ zero calibration gas concentrations.

### 8.1.8 Calibration waiting setting (option)

Description

- Set the waiting time from supply of calibration gas to start of calibration.
  (Set the time so that the calibration gas becomes stable before the calibration.)
- Settable range: 10 to 300sec.

| Procedure | Operation (example) | Setting the waiting time to start of calibration to 20 seconds | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | CALIBRATION MENU<br>CAL. WAIT TIME |
| (2) | ▲ ▶ ENTER | The set content is displayed now.<br>Use the ▲ and ▶ key to change the wait time.<br>Press the ENTER key to set the value. | CAL. WAIT TIME<br>020 S |
| (3) | ENTER | Press the ENTER key. | CAL. WAIT TIME<br>020 S |
| (4) | | The display returns to the screen on the right. | CALIBRATION MENU<br>CAL. WAIT TIME |

Caution

- You cannot change the setting value during automatic calibration or remote calibration.

## 8.2 Manual calibration

### 8.2.1 Manual span/zero calibration

Description

- Span/zero is calibrated once by key operation.
- Calibration must be made in the order of span and zero.
- Perform calibration after a calibration gas is supplied to the detector and the output signal of the detector becomes stable.
- The operator shall perform open and close operations, or adjust the flow rate of calibration gas.
- During calibration, if the analog output hold function (maintenance hold) is enabled, the analog output signal is held at the set value. Even after the calibration, the hold is maintained during the set time as a measurement recovery time.

| Procedure | Operation (example) | Executes span calibration and zero calibration. | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key, the manual span calibration screen appears.<br>If supplying calibration gas manually (without the auto-calibration function)<br>The operator shall open the span gas valve manually and adjust the flow rate to 1.5 ± 0.5 L/min. | CALIBRATION MENU<br>MANUAL SPAN CAL. |
| (2) | (ENTER) | Press the (ENTER) key to perform manual span calibration. | MANUAL SPAN CAL.<br>START |
| (3) | | Oxygen concentration value and cell electromotive force are displayed.<br>Wait until the oxygen concentration is stabilized. | MANUAL SPAN CAL.<br>20.61 % 000.1 mV |
| (4) | (ENTER) | Press the (ENTER) key to determine the span calibration factor.<br>During the process, the oxygen concentration value and cell electromotive force are highlighted. | MANUAL SPAN CAL.<br>20.61 % 000.1 mV |
| (5) | | After the calibration is completed, the display returns to the screen on the right. | MANUAL SPAN CAL.<br>START |
| (6) | | If the operator opened the span gas valve manually, close the valve. | |
| (7) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key, the manual zero calibration screen appears.<br>If supplying calibration gas manually (without the auto-calibration function)<br>The operator shall open the span gas valve manually and adjust the flow rate to 1.5 ± 0.5 L/min. | CALIBRATION MENU<br>MANUAL ZERO CAL. |
| (8) | (ENTER) | Press the (ENTER) key to perform manual zero calibration. | MANUAL ZERO CAL.<br>START |

| | | | |
|---|---|---|---|
| (9) | | Oxygen concentration value and cell electromotive force are displayed.<br>Wait until the oxygen concentration is stabilized. | MANUAL ZERO CAL.<br>2.01 % 053.9 mV |
| (10) | ENTER | Press the ENTER key to determine the zero calibration factor.<br>During the process, the oxygen concentration value and cell electromotive force are highlighted. | MANUAL ZERO CAL.<br>2.01 % 053.9 mV |
| (11) | | After the calibration is completed, the display returns to the screen on the right. | CALIBRATION MENU<br>MANUAL ZERO CAL. |
| (12) | | The operator shall close the zero gas valve manually. | |

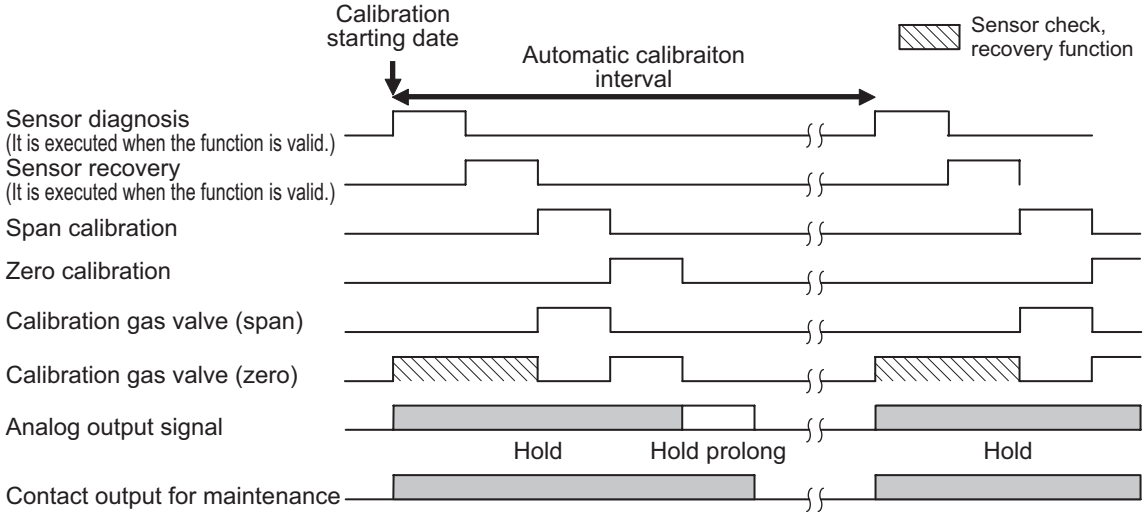
**How to interrupt**

- Press the ESC key to interrupt the operation.
- After the interruption, be sure to close the valves of span gas and zero gas.

### 8.2.2 Auto calibration (option)

Description

- Calibration is performed at time intervals set in advance.
- Feed the standard gas for automatic calibration with span gas and zero gas by driving the solenoid valve which is connected to the calibration gas contact output (ZU/SV) on the terminal block. It is necessary to set "8.1.7 Calibration gas setting".
- The word "CAL" is displayed on the left of the measurement screen during automatic calibration.
- If the output signal hold is set, the output signal is held to the set value during calibration.
- To perform sensor maintenance (sensor check, sensor recovery), "9.1.6 Sensor check setting for automatic calibration (option)" and "9.1.7 Sensor recovery setting for automatic calibration (option)" are required.
- Refer to Sections 4.2 and 4.3 for the wiring of solenoid valves.




| Procedure | Operation (example) | Setting the automatic calibration so that it is performed every four days from 13:00, 08/02/25 | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | CALIBRATION MENU<br>SET AUTO CAL |
| (2) | ENTER | Press the ENTER key.<br>The auto calibration valid/invalid setting screen appears. | SET AUTO CAL<br>AUTO CALIBRATION |
| (3) | ▶<br>ENTER | Use the ▶ key to select the auto calibration valid (YES).<br>Press the ENTER key to set the value. | AUTO CALIBRATION<br>YES NO |
| (4) | ENTER | Press the ENTER key to set the value. | AUTO CALIBRATION<br>YES |
| (5) | | The screen on the right appears. | SET AUTO CAL<br>AUTO CALIBRATION |

| | | | |
|---|---|---|---|
| (6) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The date and time for starting automatic calibration screen appears. | SET AUTO CAL<br>START DATE |
| (7) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the auto calibration starting date and time screen.<br>(Set the date and time of the future.)<br>Press the ENTER key to set the value. | START DATE<br>08/02/25 13:00 |
| (8) | ENTER | Press the ENTER key. | START DATE<br>08/02/25 13:00 |
| (9) | | The screen on the right appears. | SET AUTO CAL<br>START DATE |
| (10) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The cycle time setting of automatic calibration screen appears. | SET AUTO CAL<br>AUTO CAL. CYCLE |
| (11) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the auto calibration cycle time.<br>Press the ENTER key to set the value. | AUTO CAL. CYCLE<br>04d 00h |
| (12) | ENTER | Press the ENTER key. | AUTO CAL. CYCLE<br>04d 00h |
| (13) | | The display returns to the screen on the right. | SET AUTO CAL<br>AUTO CAL. CYCLE |

### How to interrupt

- Press the ESC key to interrupt the operation.

### Caution

Automatic calibration is not performed under the following conditions.

- Warming-up is being performed.
- Contact of “Prohibition of calibration” is being input.
- Contact of “Heater off” is being input.

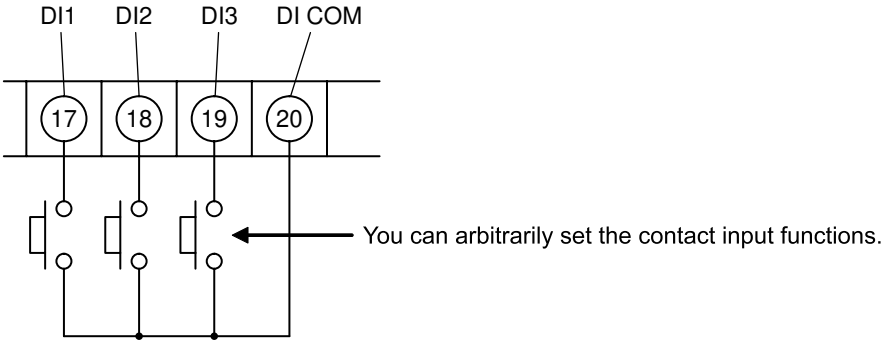
### 8.2.3 Remote calibration

You can perform all calibration by the contact input of the external terminal block.
To perform remote calibration, install piping and wiring for the standard gas cylinder and the solenoid valve according to Section 4.

(1) Set one of the contact inputs DI 1 to 3 to "Remote calibration" in accordance with the following operation procedure.

(2) Close the contact set to the "Remote contact" for one second or more (depending on the settings of (17) to (19) and (20) of the terminal block).

(3) Remote calibration is started. The word "RCL" is displayed on the left of the display panel, which disappears when the calibration is completed.




You can arbitrarily set the contact inputs (17), (18), (19) and (20) of the external terminal block (see "9.2.2 Contact input setting").
Piping and wiring for the standard gas cylinder and the solenoid valve shall be installed.

Description

- You can perform all calibration by the contact input using this function.
- The solenoid valve is driven by contact signal from the terminal block to feed the standard gas for automatic calibration with span gas and zero gas.
- Refer to Sections 4.2 and 4.3 for the wiring of solenoid valves.

| Procedure | Operation (example) | Executes remote calibration. | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. The contact input setting screen appears. | PARAMETER MENU<br>DIGITAL INPUT |
| (2) | ▲<br>ENTER | Press the ▲ key several times and select one of DI 1 to DI 3.<br>Press the ENTER key. | DIGITAL INPUT<br>DI ∗ |
| (3) | ENTER | Press the ENTER key.<br>Contact is set. | DI 1<br>NONE |
| (4) | ▲<br>ENTER | Press the ▲ key several times and select "REMOTE CAL.".<br>Press the ENTER key to set the value. | DI 1<br>REMOTE CAL. |

| | | | |
|---|---|---|---|
| (5) | ENTER | Press the ENTER key. | DI 1<br>REMOTE CAL. |
| (6) | ESC | The screen on the right appears.<br>Press the ESC key several times and return to the measurement screen. | DIGITAL INPUT<br>DI 1 |
| (7) | | Close the contact set to the "REMOTE CAL."<br>Remote calibration is performed. | 12.34 Vol% |

**How to interrupt**

- Press the ESC key to interrupt the operation.

**Caution**

Automatic calibration is not performed under the following conditions.

- Warming-up is being performed.
- Contact of "Remote blow" is being input.
- Contact of "Prohibition of calibration" is being input.
- Contact of "Heater off" is being input.

### 8.2.4 All calibration (option)

Description

- Perform sensor maintenance [sensor check (setting), sensor recovery (setting)], span and zero calibration once for each sequentially by key operation.
- Feed the standard gas for automatic calibration with span gas and zero gas by driving the solenoid valve which is connected to the calibration gas contact output (ZU/SV) on the terminal block.
- If the output signal hold is set, the output signal is held to the set value during calibration. After the calibration, the hold is maintained until the time set in the measurement waiting time elapses.
- To perform sensor maintenance (sensor check, sensor recovery), "9.1.6 Sensor check setting for automatic calibration (option)" and "9.1.7 Sensor recovery setting for automatic calibration (option)" are required.
  Note that the sensor recovery is performed if it is determined to be required at the sensor check.
- Refer to Sections 4.2 and 4.3 for the wiring of solenoid valves.

| Procedure | Operation (example) | Executes all calibration. | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key, the all calibration performing screen appears. | CALIBRATION MENU<br>ALL CALIBRATION |
| (2) | ENTER | Press the ENTER key to perform all calibration. | ALL CALIBRATION<br>START |
| (3) | | The value of the concentration of oxygen and the cell electromotive force are displayed while executing the all calibration. | ALL CALIBRATION<br>20.61 % 000.1 mV |
| (4) | | After the all calibration is completed, the display returns to the screen on the right. | CALIBRATION MENU<br>ALL CALIBRATION |

How to interrupt

- Press the ESC key to interrupt the operation.

## 8.3 BLOWDOWN (OPTION)

In order to prevent the flow guide tube from being clogged with dust contained in gas being measured, dust deposits in the flow guide tube is removed by blowing compressed air such as instrumentation air, etc. Use the blowdown function by one of the following three methods.

- (1) Manual blowdown ("8.3.2"), (2) Automatic blowdown ("8.3.3"),
  (3) Remote blowdown ("8.3.4")

### 8.3.1 Preparation for blowdown

- Wiring/piping check
  Perform wiring and piping correctly referring to Item. 4.3. Since high pressure is applied to the piping, be sure to use blind-nut type joints at connections. Special care should be taken with regard to air-tightness.
- Setting of blowdown time
  Referring to "8.3.3 Automatic blowdown", set blowdown time.

### 8.3.2 Manual blowdown

Description

- You can perform blowdown operation once by key operation using this function.

| Procedure | Operation (example) | Performing manual blowdown | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key, the manual blowdown performing screen enters. | BLOW DOWN MENU<br>MANUAL BLOW DOWN |
| (2) | (ENTER) | Press the (ENTER) key to perform manual blowdown. | MANUAL BLOW DOWN<br>ENTRY |
| (3) | | While executing the screen on the right appears. | MANUAL BLOW DOWN<br>11.11 vol% |
| (4) | | After the calibration is completed, the display returns to the screen on the right. | BLOW DOWN MENU<br>MANUAL BLOW DOWN |

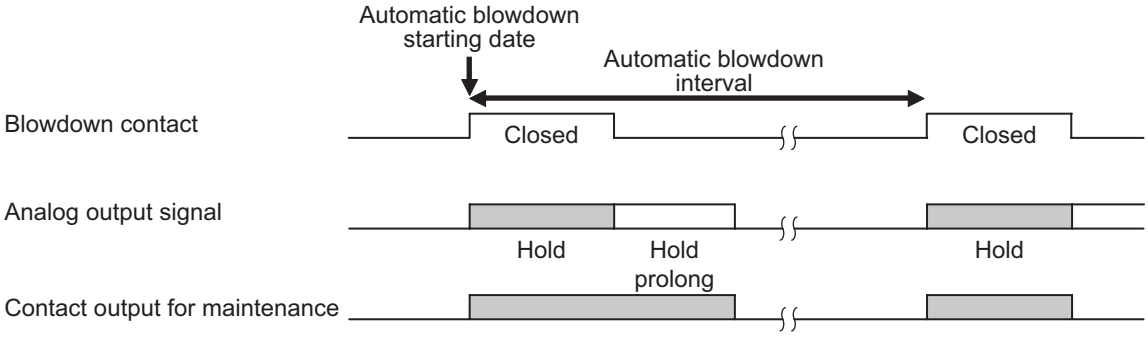
How to interrupt

- Press the (ESC) key to interrupt the operation.

### 8.3.3 Automatic blowdown

Description

- Blowdown operation is performed at time intervals set in advance.
- Remove dust by blowing instrumentation air, etc. into the flow guide tube with blowdown nozzle by driving the solenoid valve which is connected to the blow contact output (BLOW) on the terminal block .
- The word “BLW” is displayed on the left of the measurement screen during automatic blowdown.
- When output signal is set in hold mode during blowdown operation, it is held at a value prior to the start of blowdown operation. The holding time is extended to the time designated for the next measurement even after the blowdown operation of end.




| Procedure | Operation (example) | Setting the blowdown so that it is performed for 30 seconds every 24 hours from 13:00, 08/02/25 | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | BLOW DOWN MENU<br>SET AUTO BLOW |
| (2) | ENTER | Press the ENTER key.<br>The auto blowdown valid/invalid setting screen appears. | SET AUTO BLOW<br>AUTO BLOW |
| (3) | ▶<br>ENTER | Use the ▶ key to select the auto blowdown valid (YES).<br>Press the ENTER key to set the value. | BLOW DOWN<br>YES NO |
| (4) | ENTER | Press the ENTER key. | BLOW DOWN<br>YES |
| (5) | | The screen on the right appears. | SET AUTO BLOW<br>AUTO BLOW |
| (6) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The date and time setting of automatic blowdown screen appears. | SET AUTO BLOW<br>START DATE |

| | | | |
|---|---|---|---|
| (7) | ▲ ▶ | Use the ▲ and ▶ key to set the auto blowdown starting date and time.<br>(Set the date and time of the future.) | START DATE<br>08/02/25 13:00 |
| | ENTER | Press the ENTER key to set the value. | |
| (8) | ENTER | Press the ENTER key. | START DATE<br>08/02/25 13:00 |
| (9) | | The screen on the right appears. | SET AUTO BLOW<br>START DATE |
| (10) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The auto setting blowdown interval screen appears. | SET AUTO BLOW<br>AUTO BLOW CYCLE |
| (11) | ▲ ▶ | Use the ▲ and ▶ key to set the auto blowdown interval. | AUTO BLOW CYCLE<br>24h 00m |
| | ENTER | Press the ENTER key to set the value. | |
| (12) | ENTER | Press the ENTER key. | AUTO BLOW CYCLE<br>24h 00m |
| (13) | | The screen on the right appears. | SET AUTO BLOW<br>AUTO BLOW CYCLE |
| (14) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The setting blowdown time screen appears. | SET AUTO BLOW<br>BLOW DOWN TIME |
| (15) | ▲ ▶ | Use the ▲ and ▶ key to set the blowdown time.<br>(Common with the manual blowdown.) | BLOW DOWN TIME<br>030 S |
| | ENTER | Press the ENTER key to set the value. | |
| (16) | ENTER | Press the ENTER key. | BLOW DOWN TIME<br>030 S |
| (17) | | The display returns to the screen on the right. | SET AUTO BLOW<br>BLOW DOWN TIME |

### How to interrupt

- Press the ESC key to interrupt the operation.

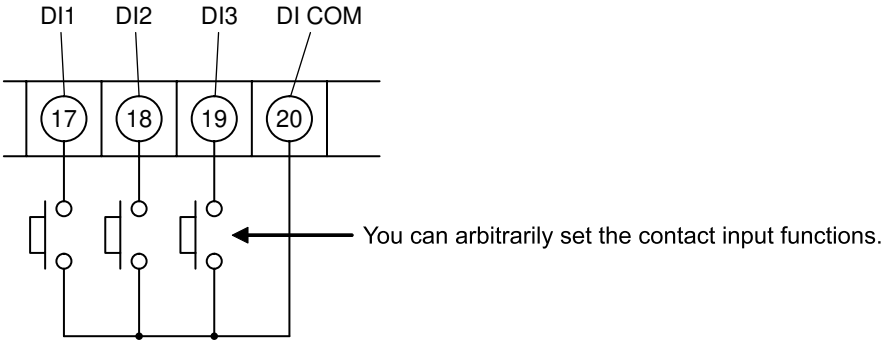
### 8.3.4 Remote blowdown

You can perform blowdown by the contact input of the external terminal block.
To perform remote blowdown, install piping and wiring for the supply air and the solenoid valve according to Section 4.

(1) Set one of the contact inputs DI 1 to 3 to "Blowdown ON" in accordance with the following operation procedure.

(2) Close the contact set to the "Blowdown ON" for one second or more (depending on the settings of (17) to (19) and (20) of the terminal block).

(3) Blowdown is started. The word "RBL" is displayed on the left of the display panel, which disappears when the blowdown is completed.




You can arbitrarily set the contact inputs (17) to (19) and (20) of the terminal block (see "9.2.2 Contact input setting").
Piping and wiring for the supply air and the solenoid valve shall be installed.

**Description**

- You can perform blowdown by the contact input using this function.
- Feed the supply air for automatic blowdown by driving the solenoid valve which is connected to the blow contact output (BLOW) on the terminal block.
- Refer to Sections 4.2 and 4.3 for the wiring of solenoid valves.

| Procedure | Operation (example) | Performing remote blowdown | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key.<br>The contact input setting screen appears. | PARAMETER MENU<br>DIGITAL INPUT |
| (2) | (▲)<br>(ENTER) | Press the (▲) key several times and select one of DI 1 to DI 3.<br>Press the (ENTER) key. | DIGITAL INPUT<br>DI 1 |
| (3) | (ENTER) | Press the (ENTER) key.<br>Contact is set. | DI 1<br>NONE |
| (4) | (▲)<br>(ENTER) | Press the (▲) key several times and select "BLOW DOWN ON".<br>Press the (ENTER) key to set the value. | DI 1<br>BLOW DOWN ON |

| | | | |
|---|---|---|---|
| (5) | ENTER | Press the ENTER key. | DI 1<br>BLOW DOWN ON |
| (6) | ESC | The screen on the right appears.<br>Press the ESC key several times and return to the measurement screen. | DIGITAL INPUT<br>DI 1 |
| (7) | | Close the contact set to the “Blowdown ON.”<br>Blowdown is performed. | 12.34 Vol% |

How to interrupt

- Press the ESC key to interrupt the operation.

# 9. Maintenance menu

## 9.1 Error log display

Description

- You can display an error log on the screen using this function.
- A latest piece of error information is displayed first.
  The maximum of 12 pieces of error information are saved.
  Press the (▲) key to display the older pieces of error information.
  The latest piece of error information is displayed next to the oldest piece of error information.
- The oldest piece of error information is overwritten by a new one.

| Procedure | Operation (example) | Displaying an error log on the screen | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>ERROR LOG |
| (2) | (▶) | Use the (▶) key to select the error log screen. | ERROR LOG<br>DISP CLEAR |
| (3) | (ENTER) | Press the (ENTER) key, the latest error log appears. | YY/MM/DD HH:MM<br>********** |
| (4) | (▲) | Press the (▲) key to display the previous piece of error log information. | YY/MM/DD HH:MM<br>********** |
| (5) | (ESC) | Press the (ESC) key, the display returns to the screen on the right. | ERROR LOG<br>DISP CLEAR |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>ERROR LOG |

Error history

| Display message | Status |
|---|---|
| Sensorline Error | Sensor line disconnection of the zirconia oxygen analyzer was detected. |
| TC-line Error | Temperature control line disconnection of the zirconia oxygen analyzer was detected. |
| Sub temp. Error | Line disconnection of the thermocouple for combustion control was detected. |
| Warm-up Error | Warming-up was not completed within the warming-up monitoring time (45 minutes).<br>• Warming-up is properly completed if the heater temperature of the zirconia oxygen analyzer becomes the control temperature (800°C) ± 1°C and stable for one minute. |
| Cell temp. Error | Heater temperature exceeds the specified range (800°C ± 70°C) |
| Span gas Error | • The concentration of the calibration span gas being supplied is not stable.<br>(In a discrimination treatment of stability, the error of ± 0.2% or more compared to the value in the previous treatment continues.) |
| Zero gas Error | • The concentration of the calibration zero gas being supplied is not stable.<br>(In a discrimination treatment of stability, the error of ± 0.2% or more compared to the value in the previous treatment continues.) |
| Span cal. Error | Span calibration failed. (Calibration factor could not be determined.) |
| Zero cal. Error | Zero calibration failed. (Calibration factor could not be determined.) |
| Sensor Error | An error was detected in the A/D conversion of oxygen concentration value of the zirconia oxygen analyzer. (260 mV or more, –50 mV or less) |
| A/D data Error | An error was detected in the A/D conversion of oxygen concentration value of the zirconia oxygen analyzer. (260 mV or more, –50 mV or less) |

### 9.1.1 Clearing error logs

Description

- You can clear all error logs saved using this function.

| Procedure | Operation (example) | Clearing all error logs saved | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>ERROR LOG |
| (2) | (▶) | Use the (▶) key to select the error log clear screen. | ERROR LOG<br>DISP CLEAR |
| (3) | (ENTER) | Press the (ENTER) key to clearing error logs.<br>(However, it has not been deleted yet.) | CLEAR ERROR LOG<br>YES |
| (4) | (ENTER) | The screen is displayed again to check. Press the (ENTER) key to clear all the error logs. | CLEAR ERROR LOG<br>YES? |
| (5) | | After the processing is completed, the display changes to the menu screen. | ERROR LOG<br>DISP CLEAR |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>ERROR LOG |

### 9.1.2 Alarm log display

Description

- You can display alarm logs on the screen using this function.
- A latest piece of alarm information is displayed first.
  The maximum of 12 pieces of alarm information are saved.
  Press the (▲) key to display the older pieces of alarm information.
  The latest piece of alarm information is displayed next to the oldest piece of alarm information.
- The oldest piece of alarm information is overwritten by a new one.

| Procedure | Operation (example) | Displaying alarm logs on the screen | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>ALARM LOG |
| (2) | (▶) | Use the (▶) key to select the alarm log display screen. | ALARM LOG<br>DISP CLEAR |
| (3) | (ENTER) | Press the (ENTER) key, the latest alarm log appears. | YY/MM/DD HH:MM<br>********** |
| (4) | (▲) | Press the (▲) key to display the previous piece of alarm log information. | YY/MM/DD HH:MM<br>********** |
| (5) | (ESC) | Press the (ESC) key, the display returns to the screen on the right. | ALARM LOG<br>DISP CLEAR |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>ALARM LOG |

Alarm log

| Display message | Status |
|---|---|
| High alarm | Oxygen concentration value exceeded a specified upper limit. |
| Low alarm | Oxygen concentration value exceeded a specified lower limit. |
| Hi-High alarm | Oxygen concentration value exceeded a specified upper 2 limit. |
| Low-Low alarm | Oxygen concentration value exceeded a specified lower 2 limit. |

### 9.1.3 Clearing alarm logs

Description

- You can clear all alarm logs using this function.

| Procedure | Operation (example) | Clearing all alarm logs saved | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>ALARM LOG |
| (2) | (▶) | Use the (▶) key to select the alarm log clear screen. | ALARM LOG<br>DISP CLEAR |
| (3) | (ENTER) | Press the (ENTER) key to perform clearing alarm logs.<br>(However, it has not been deleted yet.) | CLEAR ALARM LOG<br>YES |
| (4) | (ENTER) | The screen is displayed again to check. Press the (ENTER) key to clear all the alarm logs. | CLEAR ALARM LOG<br>YES? |
| (5) | | After the processing is completed, the display changes to the menu screen. | ALARM LOG<br>DISP CLEAR |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>ALARM LOG |

### 9.1.4 Operation log display

Description

- You can display operation logs on the screen using this function.
- A latest piece of operation information is displayed first.
  The maximum of 12 pieces of operation information are saved.
  Press the (▲) key to display the older pieces of operation information.
  The latest piece of operation information is displayed next to the oldest piece of operation information.
- The oldest piece of operation information is overwritten by a new one.

| Procedure | Operation (example) | Displaying operation logs on the screen | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>OPERATION LOG |
| (2) | (▶) | Use the (▶) key to select the operation log display screen. | OPERATION LOG<br>DISP CLEAR |
| (3) | (ENTER) | Press the (ENTER) key, the latest operation log appears. | YY/MM/DD HH:MM<br>********** |
| (4) | (▲) | Press the (▲) key to display the previous piece of operation log information. | YY/MM/DD HH:MM<br>********** |
| (5) | (ESC) | Press the (ESC) key, the display returns to the screen on the right. | OPERATION LOG<br>DISP CLEAR |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>OPERATION LOG |

Operation log

| Display message | Status |
|---|---|
| Auto cal. | Automatic calibration was performed. |
| All calibration | All calibration was performed. |
| Manual span cal. | Manual span calibration was performed. |
| Manual zero cal. | Manual zero calibration was performed. |
| M sensor check | Manual sensor check was performed. |
| M sensor recover | Manual sensor recovery was performed. |
| Auto blow down | Automatic blowdown was performed. |
| Manual blow down | Manual blowdown was performed. |
| Prohibit cal. | Calibration was prohibited by contact input. |
| Heater off | Heater was turned off by contact input. |
| Cancel Auto cal. | Automatic calibration was forcibly canceled. |
| Cancel all cal. | All calibration was forcibly canceled. |
| Cancel span cal. | Manual span calibration was forcibly canceled. |
| Cancel zero cal. | Manual zero calibration was forcibly canceled. |
| Cancel zr-check | Manual sensor check was forcibly canceled. |
| Cancel zr-recover | Manual sensor recovery was forcibly canceled. |
| Cancel A-blow | Automatic blowdown was forcibly canceled. |
| Cancel M-blow | Manual blowdown was forcibly canceled. |
| Remote blow down | Blowdown was performed by contact input. |
| Remote cal. | Calibration was performed by contact input. |
| Remote Aout hold | Analog output hold was performed by contact input. |
| Remote reset | Calculations of maximum and minimum of oxygen concentration values were reset by contact input. |
| Cancel R-cal. | Remote calibration was forcibly canceled. |

### 9.1.5 Clearing operation logs

Description

- You can clear all operation logs saved using this function.

| Procedure | Operation (example) | Clearing all operation logs saved | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | MAINTE MENU<br>OPERATION LOG |
| (2) | ▶ | Use the ▶ key to select the operation log clear screen. | OPERATION LOG<br>DISP CLEAR |
| (3) | ENTER | Press the ENTER key to perform clearing operation logs. (However, it has not been deleted yet.) | CLEAR OPERAT. LOG<br>YES |
| (4) | ENTER | The screen is displayed again to check. Press the ENTER key to clear all the operation logs. | CLEAR OPERAT. LOG<br>YES? |
| (5) | | After the processing is completed, the display changes to the menu screen. | OPERATION LOG<br>DISP CLEAR |
| (6) | ESC | Press the ESC key again to return to the screen on the right. | MAINTE MENU<br>OPERATION LOG |

### 9.1.6 Sensor check setting for automatic calibration (option)

Description

- You can set if a sensor check is performed for calibration using this function.

| Procedure | Operation (example) | Performing setting so that a sensor check is performed for calibration | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>CAL. CELL MAINTE |
| (2) | (ENTER) | Press the (ENTER) key.<br>The sensor check setting for calibration screen appears. | CAL. CELL MAINTE<br>SENSOR CHECK |
| (3) | (▶)<br>(ENTER) | Use the (▶) key to select the sensor check valid (YES).<br>Press the (ENTER) key to set the value. | SENSOR CHECK<br>YES NO |
| (4) | (ENTER) | Press the (ENTER) key. | SENSOR CHECK<br>YES |
| (5) | | The display returns to the screen on the right. | CAL. CELL MAINTE<br>SENSOR CHECK |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>CAL. CELL MAINTE |

### 9.1.7 Sensor recovery setting for automatic calibration (option)

Description

- You can set if a sensor recovery is performed for calibration using this function.
  Note that the sensor recovery is performed only if it is determined to be required at the sensor check.
- This function is performed only if valid is selected in the sensor check setting for calibration.

| Procedure | Operation (example) | Performing setting so that sensor recovery is performed for calibration | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | (ENTER) | Display the screen on the right in accordance with the key operation summary and press the (ENTER) key. | MAINTE MENU<br>CAL. CELL MAINTE |
| (2) | (▲) | Use the (▲) key to select the sensor recovery setting screen for calibration. | CAL. CELL MAINTE<br>SENSOR RECOVER |
| (3) | (▶) | Use the (▶) key to select the sensor recovery valid (YES). | SENSOR RECOVER<br>YES NO |
| (4) | (ENTER) | Press the (ENTER) key to set the value. | SENSOR RECOVER<br>YES |
| (5) | | After the setting is completed, the display returns to the screen on the right. | CAL. CELL MAINTE<br>SENSOR RECOVER |
| (6) | (ESC) | Press the (ESC) key again to return to the screen on the right. | MAINTE MENU<br>CAL. CELL MAINTE |

### 9.1.8 Performing a manual sensor check

Description

- Supply zero calibration gas to the detector in order to calculate the internal impedance R of the sensor.
- If the internal impedance R is more than 100 Ω, perform a reset operation of the sensor.

| Procedure | Operation (example) | Performing a sensor check on the screen | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key, the manual sensor check performing screen appears. | MAINTE MENU<br>SENSOR CHECK |
| (2) | ENTER | Press the ENTER key to perform manual sensor check.<br>If supplying calibration gas manually (without the auto-calibration function)<br>The operator shall open the zero gas valve manually and adjust the flow rate to 1.5 ± 0.5 L/min.<br><br>If your detector has the auto-calibration function, you can activate the external solenoid valve using the contact output signal at the terminal block. | SENSOR CHECK<br>START |
| (3) | | Oxygen concentration value and cell electromotive force are displayed.<br>Wait until the oxygen concentration is stabilized. | SENSOR CHECK<br>2.01 % 053.9 mV |
| (4) | ENTER | Press the ENTER key to perform sensor check process.<br>During the process, the sensor impedance is displayed. | SENSOR CHECK<br>50 Ω |
| (5) | | After the calibration is completed, the display returns to the screen on the right. | SENSOR CHECK<br>START |
| (6) | | If the operator opened the zero gas valve manually, close the valve. | |

How to interrupt

- Press the ESC key to interrupt the operation.
- After the interruption, be sure to close the valves of zero gas.

### 9.1.9 Performing manual sensor recovery

Description

- Apply an alternating current to the sensor if the internal impedance R > 100 Ω in a sensor diagnosis. If R ≤ 100 Ω, this process cannot be performed.

| Procedure | Operation (example) | Performing sensor recovery on the screen | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key, the manual sensor recovery performing screen appears. | MAINTE MENU<br>SENSOR RECOVER |
| (2) | ENTER | Press the ENTER key to perform manual sensor recovery.<br>If supplying calibration gas manually (without the auto-calibration function)<br>The operator shall open the span gas valve manually and adjust the flow rate to 1.5 ± 0.5 L/min.<br><br>If your detector has the auto-calibration function, you can activate the external solenoid valve using the contact output signal at the terminal block. | SENSOR RECOVER<br>START |
| (3) | | Oxygen concentration value and cell electromotive force are displayed.<br>Wait until the oxygen concentration is stabilized. | SENSOR RECOVER<br>2.01 % 053.9 mV |
| (4) | ENTER | Press the ENTER key to determine the span calibration factor.<br>During the process, the treating method is displayed. | SENSOR RECOVER<br>AC |
| (5) | | After the calibration is completed, the display returns to the screen on the right. | SENSOR RECOVER<br>START |
| (6) | | If the operator opened the span gas valve manually, close the valve. | |

How to interrupt

- Press the ESC key to interrupt the operation.
- After the interruption, be sure to close the valves of zero gas.

### 9.1.10 Cell internal resistance display

Description

- You can display the latest cell internal resistance of the zirconia oxygen analyzer in a sensor check, using this function.

| Procedure | Operation (example) | Displaying an internal resistance of the zirconia oxygen analyzer | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | MAINTE MENU<br>CELL RESISTOR |
| (2) | ESC | Press the ESC key. | CELL RESISTOR<br>50 Ω |
| (3) | | The display returns to the screen on the right. | MAINTE MENU<br>CELL RESISTOR |

### 9.1.11 Maintenance mode setting

Description

- You can set the maintenance mode to valid or invalid with this function.
- If the maintenance mode is set to valid, the analog output signal is held at the set value (see "9.2.10 Hold value setting.") and the contact output for maintenance of the external contact is on. The data portion of the measurement screen flickers.

| Procedure | Operation (example) | Setting the current date and time to 13:00, 08/02/25 | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key, the maintenance mode setting screen appears. | MAINTE MENU<br>MAINTENANCE MODE |
| (2) | ▶<br>ENTER | Use the ▶ key to select the maintenance mode valid (YES).<br>Press the ENTER key to set the value. | MAINTENANCE MODE<br>YES NO |
| (3) | ENTER | Press the ENTER key. | MAINTENANCE MODE<br>YES |
| (4) | | The display returns to the screen on the right. | MAINTE MENU<br>MAINTENANCE MODE |

Note

- If an error occurs while the maintenance mode is enabled, error handling is prioritized.
- If the analog output hold function (error hold) is enabled, the analog output signal is held at the value set at the hold value setting (error hold).
- The data portion of the measurement screen flickers and is highlighted.

## 9.2 Parameter menu

### 9.2.1 Current date and time setting

Description

- You can set a current date and time for the unit using this function.
- Settable range: date and time in the future in the calendar

| Procedure | Operation (example) | Setting the current date and time to 13:00, 08/02/25 | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>DATE SET |
| (2) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the date and time.<br>Press the ENTER key to set the value. | DATE SET<br>08/02/25 13:00 |
| (3) | ENTER | Press the ENTER key. | DATE SET<br>08/02/25 13:00 |
| (4) | | The display returns to the screen on the right. | PARAMETER MENU<br>DATE SET |

### 9.2.2 Contact input setting

Description

- You can set the functions for the contact inputs 1 to 3 using this function.
- Settable range: Select one of the following

(1) [NONE] : Performs no treatment by contact input.

(2) [BLOW DOWN ON] : Performs blowdown by contact input.
(Switch OFF to ON to perform blowdown.)

(3) [HEATER OFF] : Turn off the heater by contact input.
(OFF／ON：Heater ON／Heater OFF)

(4) [PROHIBIT CAL.] : Sets if calibration is prohibited or valid by contact input.
(OFF/ON: Calibration is valid/prohibited.)

(5) [REMOTE CAL.] : Performs all calibration by contact input.
(Switch OFF to ON to perform calibration.)

(6) [REMOTE HOLD] : Holds the AO by contact input.
(OFF/ON: not held/held)

(7) [CALCULATE REST] : Resets maximum and minimum calculations of $O_2$ by contact input.
(Switch OFF to ON to perform calibration.)

(8) [OUTPUT RANGE] : Switches the range by contact input.
(OFF／ON: Range-1/Range-2)

Note) The functions other than "NONE" cannot be set for multiple contacts.

| Procedure | Operation (example) | Setting the blowdown function for the contact input 1 | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>DIGITAL INPUT |
| (2) | ▲<br>ENTER | Use the ▲ key to select the contact input 1 setting screen.<br>Press the ENTER key to set the value.<br>(Also follow this procedure for the contact inputs 2 and 3.) | DIGITAL INPUT<br>DI 1 |
| (3) | ▲ | Use the ▲ key to select the function for contact input 1. | DI 1<br>NONE |
| (4) | ENTER | The item selected is highlighted.<br>Press the ENTER key to set the value. | DI 1<br>BLOW DOWN ON |
| (5) | ENTER | Press the ENTER key. | DI 1<br>BLOW DOWN ON |
| (6) | | The display returns to the screen on the right. | DIGITAL INPUT<br>DI 1 |

### 9.2.3 Selection of alarm contact output

Description

- You can set the alarm conditions for alarm contact output using this function.
- Settable range: Select one of the following.

(1) [ALARM NONE] : Alarm contact output is not performed.

(2) [HIGH ALARM] : Alarm contact output is performed when an high limit alarm occurs.

(3) [LOW ALARM] : Alarm contact output is performed when an lower limit alarm occurs.

(4) HH ALARM] : Alarm contact output is performed when an HH limit alarm occurs.

(5) [LL ALARM] : Alarm contact output is performed when an LL limit alarm occurs.

(6) [H/L ALARM] : Alarm contact output is performed when an high or lower limit alarm occurs.

(7) [HH/LL ALARM] : Alarm contact output is performed when an HH or LL limit alarm occurs.

| Procedure | Operation (example) | Setting the lower limit alarm function for alarm contact output | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>DO ALARM SET |
| (2) | | The selection of alarm contact output setting screen appears. | DO ALARM SET<br>ALARM NONE |
| (3) | ▲<br>ENTER | Use the ▲ key to select the low alarm.<br>Press the ENTER key to set the value. | DO ALARM SET<br>LOW ALARM |
| (4) | ENTER | Press the ENTER key. | DO ALARM SET<br>LOW ALARM |
| (5) | | The display returns to the screen on the right. | PARAMETER MENU<br>DO ALARM SET |

### 9.2.4 High limit setting of oxygen concentration

Description

- You can set the high limit of oxygen concentration using this function.
  Use the oxygen concentration 1 for the range 1, and the oxygen concentration alarm 2 for the range 2.
- Settable range: 0.001 to 55.000 vol%

| Procedure | Operation (example) | Setting the high limit of oxygen concentration to "50.000 vol%" (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>OXYGEN ALARM 1 |
| (2) | ▲<br>ENTER | Use the ▲ key to select the oxygen concentration high limit value setting screen.<br>Press the ENTER key to set the value. | OXYGEN ALARM 1<br>HIGH ALARM |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the oxygen concentration upper limit value.<br>Press the ENTER key to set the value. | HIGH ALARM<br>50.000 vol% |
| (4) | ENTER | Press the ENTER key. | HIGH ALARM<br>50.000 vol% |
| (5) | ESC | Press the ESC key. | OXYGEN ALARM 1<br>HIGH ALARM |
| (6) | | The display returns to the screen on the right. | PARAMETER MENU<br>OXYGEN ALARM 1 |

Note

- A setting error occurs if the following condition is not satisfied:
  "HH limit of oxygen concentration" ≧ "high limit of oxygen concentration" ≧ "Lower limit of oxygen concentration" ≧ "LL limit of oxygen concentration"

### 9.2.5 Lower limit setting of oxygen concentration

Description

- You can set the lower limit of oxygen concentration using this function.
  Use the oxygen concentration 1 for the range 1, and the oxygen concentration alarm 2 for the range 2.
- Settable range: 0.001 to 55.000 vol%

| Procedure | Operation (example) | Setting the lower limit of oxygen concentration to "00.020 vol%" (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>OXYGEN ALARM 1 |
| (2) | ▲<br>ENTER | Use the ▲ key to select the oxygen concentration lower limit value setting screen.<br>Press the ENTER key to set the value. | OXYGEN ALARM 1<br>LOW ALARM |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the oxygen concentration lower limit value.<br>Press the ENTER key to set the value. | LOW ALARM<br>00.020 vol% |
| (4) | ENTER | Press the ENTER key. | LOW ALARM<br>00.020 vol% |
| (5) | ESC | Press the ESC key. | OXYGEN ALARM 1<br>LOW ALARM |
| (6) | | The display returns to the screen on the right. | PARAMETER MENU<br>OXYGEN ALARM 1 |

Note

- A setting error occurs if the following condition is not satisfied:
  "HH limit of oxygen concentration" ≧ "high limit of oxygen concentration" ≧ "Lower limit of oxygen concentration" ≧ "LL limit of oxygen concentration"

### 9.2.6 HH limit setting of oxygen concentration

Description

- You can set the HH limit of oxygen concentration using this function.
  Use the oxygen concentration 1 for the range 1, and the oxygen concentration alarm 2 for the range 2.
- Settable range: 0.001 to 55.000 vol%

| Procedure | Operation (example) | Setting the HH limit of oxygen concentration to "55.000 vol%" (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>OXYGEN ALARM 1 |
| (2) | ▲<br>ENTER | Use the ▲ key to select the oxygen concentration HH limit value setting screen.<br>Press the ENTER key to set the value. | OXYGEN ALARM 1<br>H-HIGH ALARM |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the oxygen concentration HH limit value.<br>Press the ENTER key to set the value. | H-HIGH ALARM<br>55.000 vol% |
| (4) | ENTER | Press the ENTER key. | H-HIGH ALARM<br>55.000 vol% |
| (5) | ESC | Press the ESC key. | OXYGEN ALARM 1<br>H-HIGH ALARM |
| (6) | | The display returns to the screen on the right. | PARAMETER MENU<br>OXYGEN ALARM 1 |

Note

- A setting error occurs if the following condition is not satisfied:
  "HH limit of oxygen concentration" ≧ "High limit of oxygen concentration" ≧ "Lower limit of oxygen concentration" ≧ "LL2 limit of oxygen concentration"

### 9.2.7 LL limit setting of oxygen concentration

**Description**

- You can set the LL limit of oxygen concentration using this function.
  Use the oxygen concentration 1 for the range 1, and the oxygen concentration alarm 2 for the range 2.
- Settable range: 0.001 to 55.000 vol%

| Procedure | Operation (example) | Setting the lower 2 limit of oxygen concentration to "00.010 vol%" (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>OXYGEN ALARM 1 |
| (2) | ▲<br>ENTER | Use the ▲ key to select the oxygen concentration LL limit value setting screen.<br>Press the ENTER key to set the value. | OXYGEN ALARM 1<br>L-LOW ALARM |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the oxygen concentration LL limit value.<br>Press the ENTER key to set the value. | L-LOW ALARM<br>00.010 vol% |
| (4) | ENTER | Press the ENTER key. | L-LOW ALARM<br>00.010 vol% |
| (5) | ESC | Press the ESC key. | OXYGEN ALARM 1<br>L-LOW ALARM |
| (6) | | The display returns to the screen on the right. | PARAMETER MENU<br>OXYGEN ALARM 1 |

**Note**

- A setting error occurs if the following condition is not satisfied:
  "HH limit of oxygen concentration" ≧ "High limit of oxygen concentration" ≧ "Lower limit of oxygen concentration" ≧ "LL limit of oxygen concentration"

### 9.2.8 Hysteresis Setting

Description

- You can set the hysteresis for alarm condition of oxygen concentration.
  Use the oxygen concentration 1 for the range 1, and the oxygen concentration alarm 2 for the range 2.
  Perform the setting using the percentage (%) of the range compared to the full scale.
- Settable range: 0 to 20 %

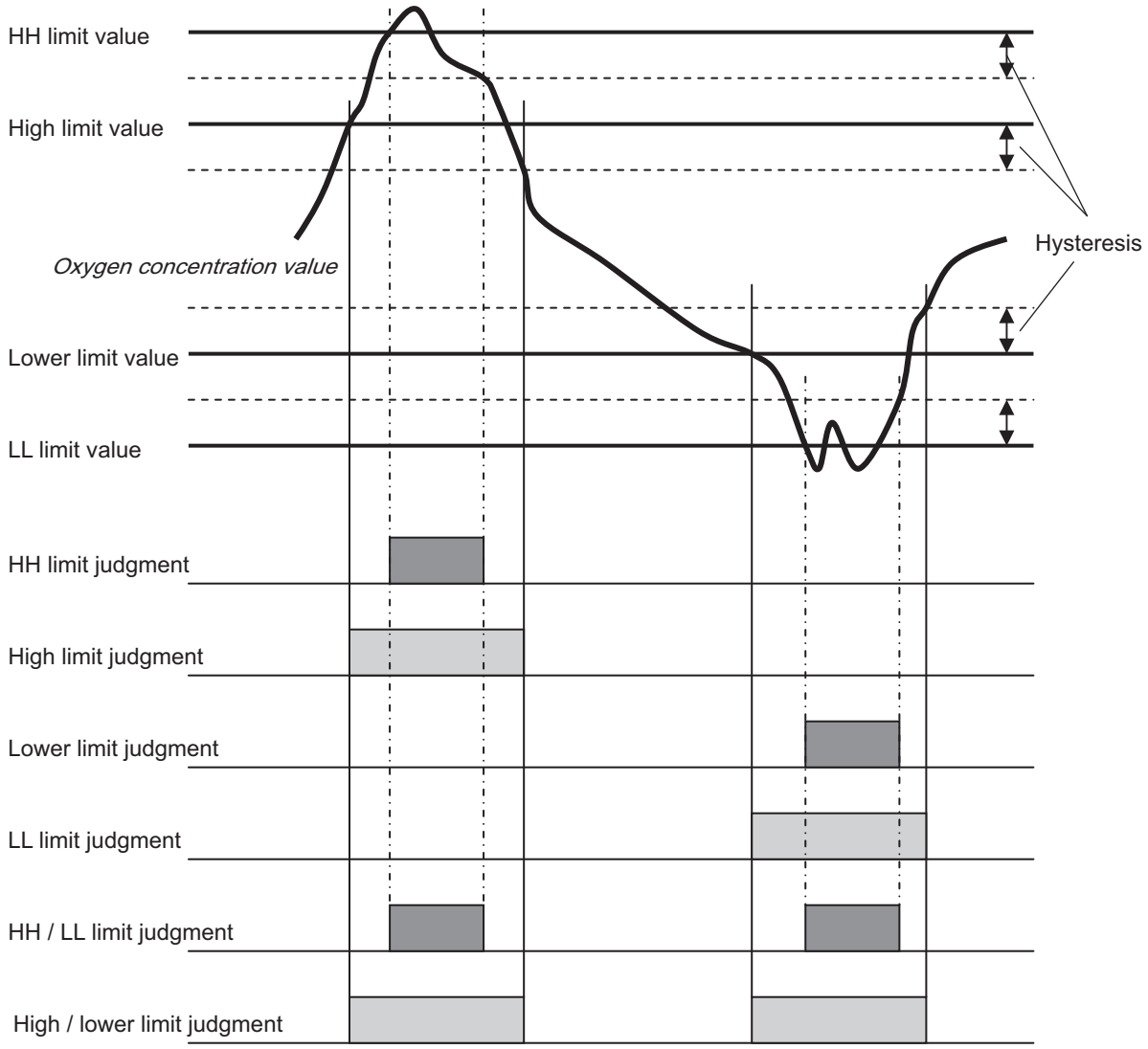
| Procedure | Operation (example) | Setting the hysteresis for alarm condition of oxygen concentration to “20%” (Range 1) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>OXYGEN ALARM 1 |
| (2) | ▲<br>ENTER | Use the ▲ key to select the hysteresis setting screen.<br>Press the ENTER key to set the value. | OXYGEN ALARM 1<br>HYSTERESIS |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the hysteresis.<br>Press the ENTER key to set the value. | HYSTERESIS<br>20 % |
| (4) | ENTER | Press the ENTER key. | HYSTERESIS<br>20 % |
| (5) | ESC | Press the ESC key. | OXYGEN ALARM 1<br>HYSTERESIS |
| (6) | | The display returns to the screen on the right. | PARAMETER MENU<br>OXYGEN ALARM 1 |

Hysteresis:

If the value fluctuates around the condition value, there is a possibility that alarms occur frequently. When determining alarms, set a hysteresis width for the condition in order to prevent chattering.

For alarm check, set the percentage (%) of the range compared to the full scale as hysteresis width (see the figure below).

This is common among “HH limit value,” “High limit value,” “Lower limit value,” and “LL limit value.”



### 9.2.9 Hold treatment setting (maintenance hold)

Description

- You can set if the analog output hold function is valid or invalid using this function.
- If the analog output hold function is valid, the value set for the analog output (see "9.2.10 Hold value setting (maintenance hold)") is held at the value set for analog output when the following treatment is performed.
  - ・Calibration (Auto, All, Manual, Remote)
  - ・Blowdown (Auto, Manual, Remote)
  - ・Sensor diagnosis, Sensor recoverable, PID auto tuning
  - ・While the maintenance mode is set to "Valid."

| Procedure | Operation (example) / Key operation | Setting the analog output hold function to valid / Description | Displayed message (LCD) |
|---|---|---|---|
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (MAINTE) |
| (2) | ENTER | Press the ENTER key.<br>The analog output hold setting screen appears. | AO HOLD (MAINTE)<br>OUTPUT HOLD |
| (3) | ▶<br>ENTER | Use the ▶ key to select the output hold valid (YES).<br>Press the ENTER key to set the value. | OUTPUT HOLD<br>YES NO |
| (4) | ENTER | Press the ENTER key. | OUTPUT HOLD<br>YES |
| (5) | | The display returns to the screen on the right. | AO HOLD (MAINTE)<br>OUTPUT HOLD |

Note

- If an error occurs while the analog output hold function (error hold) is set to "Valid," error hold processing is prioritized.
- Analog output signal during warming up is held at 0% (4 mA/0 V).

### 9.2.10 Hold value setting (maintenance hold)

Description

- Using this function, you can set (select) the output value of analog output signal when the analog output hold function (maintenance hold) is enabled.
- If the maintenance mode is set to "Valid," analog output signal is held at the value set in this procedure.
- Settable range: Select one of the following.
  - (1) [0%] : Held at 0% (4 mA/0 V)..
  - (2) [100%] : Held at 100% (20 mA/1 V).
  - (3) [Last value] : Held at the value immediately before the value for analog hold.
  - (4) [Setting value] : Held at the value set as the "9.2.11 Setting of hold setting value (maintenance hold)".

| Procedure | Operation (example) | Setting the output value of analog output hold to "0%" | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (MAINTE) |
| (2) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The analog output hold value setting screen appears. | AO HOLD (MAINTE)<br>OUTPUT SELECT |
| (3) | ▲<br>ENTER | Use the ▲ key to select the hold value.<br>Press the ENTER key to set the value. | OUTPUT SELECT<br>0% |
| (4) | ENTER | Press the ENTER key. | OUTPUT SELECT<br>0% |
| (5) | | The display returns to the screen on the right. | AO HOLD (MAINTE)<br>OUTPUT SELECT |

### 9.2.11 Setting of hold setting value (maintenance hold)

Description

- Using this function, you can set the output value of analog output signal to an arbitrary value when the analog output hold function (maintenance hold) is enabled.
- This function is enabled if "Setting value" is set at "9.2.10 Hold value setting (maintenance hold)."
- Set the output value of analog output signal as a percentage (%) of the full-scale value of the display range. 0% is equivalent to 0 vol% (4 mA/0 V) and 100 % is to the full-scale value (20 mA/1 V).
- Settable range: 0 to 100 %

| Procedure | Operation (example) | Setting the output value of analog output hold to "000%" | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (MAINTE) |
| (2) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The hold setting value setting screen appears. | AO HOLD (MAINTE)<br>HOLD VALUE |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the hold value.<br>Press the ENTER key to set the value. | HOLD VALUE<br>000 % |
| (4) | ENTER | Press the ENTER key. | HOLD VALUE<br>000 % |
| (5) | | The display returns to the screen on the right. | AO HOLD (MAINTE)<br>HOLD VALUE |

### 9.2.12 Setting of measurement recovery time (maintenance hold)

Description

- Using this function, you can set the time between hold condition (such as a calibration processing) and returning to the measurement condition (extension of hold) when the analog output hold function (maintenance hold) is enabled.
- Settable range: 0 to 300 sec.

| Procedure | Operation (example) | Setting the time for extension of hold to "10 seconds" | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (MAINTE) |
| (2) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The measurement recovery time setting screen appears. | AO HOLD (MAINTE)<br>MEAS. WAIT TIME |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the measurement recovery time.<br>Press the ENTER key to set the value. | MEAS. WAIT TIME<br>010 S |
| (4) | ENTER | Press the ENTER key. | MEAS. WAIT TIME<br>010 S |
| (5) | | The display returns to the screen on the right. | AO HOLD (MAINTE)<br>MEAS. WAIT TIME |

### 9.2.13 Hold treatment setting (error hold)

Description

- Using this function, you can set whether the analog output hold function is valid or invalid when an error occurs.
- If the analog output hold function (error hold) is set to valid, analog output signal is held at the set value (see "9.2.14 Hold value setting (error hold)") if an error occurs.

| Procedure | Operation (example) | Setting the analog output hold function to valid | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (ERROR) |
| (2) | ENTER | Press the ENTER key.<br>The analog output hold setting screen appears. | AO HOLD (ERROR)<br>OUTPUT HOLD |
| (3) | ▶<br>ENTER | Use the ▶ key to select the output hold valid (YES).<br>Press the ENTER key to set the value. | OUTPUT HOLD<br>YES NO |
| (4) | ENTER | Press the ENTER key. | OUTPUT HOLD<br>YES |
| (5) | | The display returns to the screen on the right. | AO HOLD (ERROR)<br>OUTPUT HOLD |

Note

- If an error occurs while the analog output hold function (error hold) is set to "Valid," error hold processing is prioritized.
- Analog output signal during warming up is held at 0% (4 mA/0 V).

### 9.2.14 Hold value setting (error hold)

Description

- Using this function, you can set (select) the output value of analog output signal when the analog output hold function (error hold) is enabled.
- If the maintenance mode is set to "Valid," analog output signal is held at the value set in this procedure.
- Settable range: Select one of the following.
  - (1) [0%] : Held at 0% (4 mA/0 V).
  - (2) [100%] : Held at 100% (20 mA/1 V).
  - (3) [Last value] : Held at the value immediately before the value for analog hold.
  - (4) [Setting value] : Held at the value set as the "9.2.15 Setting of hold setting value (error hold)".

| Procedure | Operation (example) | Setting the output value of analog output hold to "0%" | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (ERROR) |
| (2) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The analog output hold value setting screen appears. | AO HOLD (ERROR)<br>OUTPUT SELECT |
| (3) | ▲<br>ENTER | Use the ▲ key to select the hold value.<br>Press the ENTER key to set the value. | OUTPUT SELECT<br>0% |
| (4) | ENTER | Press the ENTER key. | OUTPUT SELECT<br>0% |
| (5) | | The display returns to the screen on the right. | AO HOLD (ERROR)<br>OUTPUT SELECT |

### 9.2.15 Setting of hold setting value (error hold)

Description

- Using this function, you can set the output value of analog output signal to an arbitrary value when the analog output hold function (error hold) is enabled.
- This function is enabled if "Setting value" is set at "9.2.14 Hold value setting (error hold)."
- Set the output value of analog output signal as a percentage (%) of the full-scale value of the display range. 0% is equivalent to 0 vol% (4 mA/0 V) and 100 % is to the full-scale value (20 mA/1 V).
- Settable range: 0 to 100 %

| Procedure | Operation (example) | Setting the output value of analog output hold to "000%" | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>AO HOLD (ERROR) |
| (2) | ▲<br>ENTER | Press the ▲ key to display the screen on the right and press the ENTER key.<br>The hold setting value setting screen appears. | AO HOLD (ERROR)<br>HOLD VALUE |
| (3) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the hold value.<br>Press the ENTER key to set the value. | HOLD VALUE<br>000 % |
| (4) | ENTER | Press the ENTER key. | HOLD VALUE<br>000 % |
| (5) | | The display returns to the screen on the right. | AO HOLD (ERROR)<br>HOLD VALUE |

### 9.2.16 Setting of key lock

Description

- Authorized person can set if the key lock is valid or invalid using this function.
  You need a "password" to make a setting if the key lock is valid or invalid.
- If the key lock is valid, you cannot make settings and manual operation (manual calibration, manual broke down, etc.). However, you can see the screen transition and set values.

| Procedure | Operation (example) | Setting the key lock to valid (Password is assumed to be "0123"). | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>KEY LOCK |
| (2) | ▶ | Use the ▶ key to select the key lock valid (YES) or invalid (No). | KEY LOCK<br>YES NO |
| (3) | ENTER | Press the ENTER key. | INPUT PASSWORD<br>0000 |
| (4) | ▲ ▶ | Use the ▲ key and the ▶ key to input the password. | INPUT PASSWORD<br>0123 |
| (5) | ENTER | Press the ENTER key. | KEY LOCK<br>YES |
| (6) | ENTER | Press the ENTER key to return to the screen on the right. | PARAMETER MENU<br>KEY LOCK |

### 9.2.17 LCD brightness adjustment

Description

- You can adjust the brightness of the screen (LCD) using this function.
- Settable range: 0 to 100 %

| Procedure | Operation (example) | Setting the brightness of the screen (LCD) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>CONTRAST |
| (2) | ▶<br>▲<br>ENTER | The LCD brightness adjustment screen appears.<br>Switch between "DOWN" and "UP" with the ▶ key.<br>Use the ▲ key to adjust the brightness.<br>Use the both key to adjust the brightness that sees easily.<br>Press the ENTER key to set the value. | CONTRAST<br>DOWN |
| (3) | ENTER | Press the ENTER key. | CONTRAST<br>DOWN |
| (4) | | The display returns to the screen on the right. | PARAMETER MENU<br>CONTRAST |

### 9.2.18 Setting of automatic OFF time

Description

- You can set the time for automatically turning off the backlight of the LCD (screen) using this function.
  When the time set for turning off the backlight elapses after the last operation, the backlight is turned off.
  (Press any key to turn on the backlight.)
  If 00 seconds is set, the backlight is not turned off.
- Settable range: 0 to 99 min.

| Procedure | Operation (example) | Setting the time for automatically turning off the backlight to 10 minutes | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>BACKLIGHT TIME |
| (2) | ▲ ▶<br>ENTER | Use the ▲ and ▶ key to set the automatic OFF time.<br>Press the ENTER key to set the value. | BACKLIGHT TIME<br>10 m |
| (3) | ENTER | Press the ENTER key. | BACKLIGHT TIME<br>10 m |
| (4) | | The display returns to the screen on the right. | PARAMETER MENU<br>BACKLIGHT TIME |

### 9.2.19 Adjustment screen for analog output 0%

Description

- You can adjust the analog output 0% using this function.

| Procedure | Operation (example) | Adjusting the analog output 0% (4 mA) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | | Connect the ammeter to the analog output terminals (5) – (6). | |
| (2) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>A-OUT ADJUST |
| (3) | ENTER | Press the ENTER key.<br>The analog output 0% adjustment screen appears. | A-OUT ADJUST<br>ANALOG OUT 0% |
| (4) | ▶ ▲ | Adjust the analog output with the ▶ and ▲ keys.<br>Switch between "DOWN" and "UP" with the ▶ key.<br>Adjust the value to 4 mA with the ▲ key, checking the analog output with the ammeter. | ADUST ******<br>0% DOWN |
| | ENTER | Press the ENTER key to set the value. | |
| (5) | | The display returns to the screen on the right. | A-OUT ADJUST<br>ANALOG OUT 0% |
| (6) | | Remove the ammeter connected to the analog output terminals (5) – (6). | |

### 9.2.20 Adjustment screen for analog output 100%

Description

- You can adjust the analog output 100% using this function.

| Procedure | Operation (example) | Adjusting the analog output 100% (20 mA) | |
|---|---|---|---|
| | Key operation | Description | Displayed message (LCD) |
| (1) | | Connect the ammeter to the analog output terminals (5) – (6). | |
| (2) | ENTER | Display the screen on the right in accordance with the key operation summary and press the ENTER key. | PARAMETER MENU<br>A-OUT ADJUST |
| (3) | ENTER | Press the ENTER key.<br>The analog output adjustment screen appears. | A-OUT ADJUST<br>ANALOG OUT 0% |
| (4) | ▲<br>ENTER | Press the ▲ key.<br>Press the ENTER key.<br>The analog output 100% adjustment screen appears. | A-OUT ADJUST<br>ANALOG OUT 100% |
| (5) | ▶ ▲<br><br><br><br>ENTER | Adjust the analog output with the ▶ and ▲ keys.<br>Switch between "DOWN" and "UP" with the ▶ key.<br>Adjust the value to 20 mA with the ▲ key, checking the analog output with the ammeter.<br>Press the ENTER key to set the value. | ADUST ******<br>100% DOWN |
| (6) | | The display returns to the screen on the right. | A-OUT ADJUST<br>ANALOG OUT 0% |
| (7) | | Remove the ammeter connected to the analog output terminals (5) – (6). | |

# 10. MAINTENANCE AND CHECK

## 10.1 Checking

Please regularly maintenance, check, and use it always good condition.
Perform maintenance and check once every year or 2, or at time of furnace check.

| | Items for check | Recommended interval, method of checking, remedy for abnormalities, etc. |
|---|---|---|
| Daily inspection | Span, zero calibration | Calibrate once every week ((Refer to Chapter 7. “CALIBRATION”) |
| | Deterioration of packings and O-rings | If deteriorated, replace with new ones. |
| | Check for loose cable ground | Retighten |
| | Check the remain pressure in the calibration gas cylinder | Check the amount using primary pressure. |
| Periodic inspection | Clogging or corrosion of flow guide tubes | Remove the flow guide tube from the furnace wall, remove the detector and wash the flow guide tube with water. |
| | Clogging or corrosion of ejector type sampling prove | Remove the ejector from the furnace wall, disassemble the prove and wash it with water. |
| | Clogging of air outlet of ejectors | Remove the ejector from the furnace wall and clean the air outlet located in the heat insulation layer of the furnace wall. |

## 10.2 Consumable parts

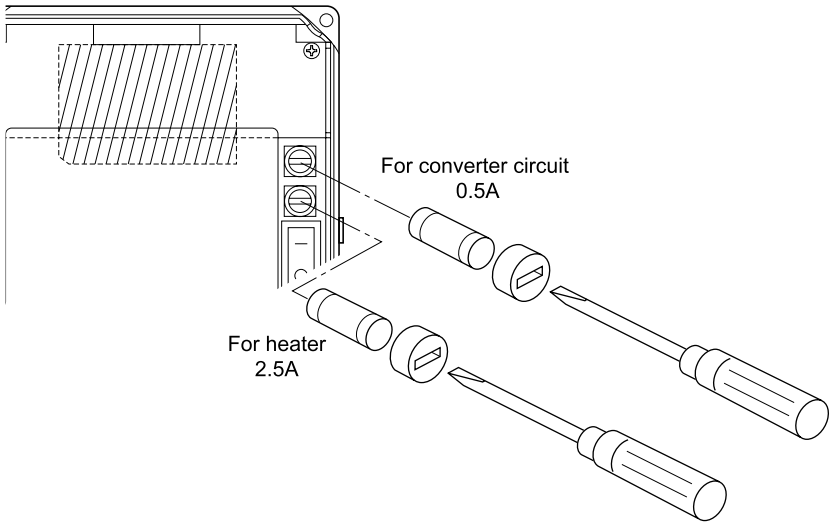
| No. | Product name | Part number for order (Code to order) |
|---|---|---|
| 1 | Ceramic filter | *ZZPZFK4-TK750201P1 |
| 2 | O-ring for detector | *ZZPZFK4-8552836 |

## 10.3 Spare parts

| No. | Product name | Code to order |
|---|---|---|
| 3 | Replacement detector | Depends on type designation. See “11.2 Code symbols” |
| 4 | Flow guide tube | *ZZP-TK□ See [INZ-TN5ZFK8-E] for details. |

## 10.4 Replacement of fuse

If a fuse blows, turn off the power switch, and replace the fuse after investigating the cause.
Open the front door and you can see the two fuses. The upper fuse is for protection of the converter circuit and the lower one is for protection of the heater. Take care that these fuses are different each other in the rated current.
To replace the fuse, insert a flathead screwdriver or coin into the fuse cap and turn it to the left while pressing it in order to remove the cap and replace the fuse.
Put the cap on the fuse and turn it to the right to fix it.




**The specifications of the fuse**

| | Specifications |
|---|---|
| For converter circuit | Φ5×20 mm 0.5 A<br>(Example: 0213, 0.5 A, manufactured by Littelfuse) |
| For heater | Φ5×20 mm 2.5 A<br>(Example: 0213, 2.5 A, manufactured by Littelfuse) |

Note: Use time-lag fuses.

## 10.5 Troubleshooting

| Symptoms | Probable causes | Checking methods (normal value) | Remedy |
|---|---|---|---|
| No display | Converter fuse blown out | Check the fuse and supply voltage specification. | Replace fuse Check Power supply voltage |
| Indication does not change or slow response | Filter and/or flow guide tube clogged | Visual check of filter and flow guide tube for contamination or clogging. Check for loosen and gas leaks at piping connections and mounting place of detector. | Clean or replace filter Tighten pipe connections |
| | Detector element deterioration | Change over between zero and span gas and check if 5 minutes or longer is needed for 90% response. | Replace detector element |
| | Decrease in flow velocity of exhaust gas | Check response to process gas after shutting down calibration gas. Move the direction (mounting position) of "arrow" of the flow guide slightly. | Increase process gas Flow into the flow guide tube. |
| Temperature alarm continues for more than 10 min. after power switched ON | Break of wiring<br>Wrong wiring<br>Source voltage is too low. | Ohmic check of wiring<br>Wiring check<br>Check of supply voltage specification | Replacement<br>Correct wiring<br>Check supply voltage |
| | Break of thermocouples | Ohmic check | Replace detector element |
| | Blown heater fuse | Ohmic check of fuse | Replace fuse |
| | Break in detector heater | Check heater resistance 50 to 55Ω for 115V, 200 to 250Ω for 220V (Excluding wiring resistance) | Replace detector element |
| Automatic calibration is not possible | Difference between calibration gas concentration and its setting | Check the set value for calibration gas concentration. | Set proper value (Refer to "8.1.7") |
| | Wrong parameters setting | Check automatic calibration intervals. | • Set proper parameters |
| | The calibration is prohibited in the contact input of the external terminal block. | Check if the calibration is not prohibited in the contact input of the external terminal block. | • Set proper parameters<br>• Correct wiring |
| | The heater is set to off at the contact input of the external terminal block. | Check if the heater is set to off at the contact input of the external terminal block. | • Set proper parameters<br>• Correct wiring |
| Zero and/or span alarm | Difference between calibration gas concentration and its setting or misconnection between zero and span gas | Check the set value for calibration gas concentration. | • Set proper value |
| | | Check piping. | • Correct wiring |
| Indication too high or too low | Loose flange and its surroundings Deteriorated O-rings | Check for gas leaks in detector and mounting part of flow guide tube flange. | • Tighten mounting screws<br>• Replace detector element |
| | | Check for leaks from the outside. | • Seal |
| | Detector is faulty. | Check for gas leaks at calibration gas inlet. Check detector element voltage (mV) for higher or lower than other detector when flowing zero gas. (See "6.5 Oxygen detector standard output voltage") | • Tighten connectors<br>• Replace detector element |
| | Abnormal detector element temperature | Refer to check items for detector temperature alarm described above. | • Replace detector element |
| | Indication difference between dry and wet base measurement | Oxygen concentration is higher in dry base. | • Normal |

| Symptoms | Probable causes | Checking methods (normal value) | Remedy |
|---|---|---|---|
| Disconnection detection error | Break of thermocouples<br>Break of detector element<br>Wrong wiring | Ohmic check of wiring<br>Wiring check | • Replace the defective parts.<br>• Correct wiring<br>• Turn on/off the power supply. |
| Range cannot be switched. | "Range setting" is set in the contact input setting. | Check if "Range setting" is set in the contact input setting. | Cancel "Range setting" in the contact input setting. |

# 11. SPECIFICATIONS

## 11.1 Specifications

### General Specifications

- **Measuring object** : Oxygen in noncombustible gas
- **Measuring method** : Directly insert type zirconia system
- **Measuring range** : 0 to 2 ··· setting range at option 2 in 50 vol% $O_2$ (in 1 vol% $O_2$ steps)
- **Repeatability** : Within ±0.5%FS
- **Linearity** : Within ±2%FS
- **Response time** : Within 4 to 7 sec, for 90% (from calibration gas inlet)
- **Warmup time** : More than 10 min
- **Analog output** : 4 to 20mA DC (allowable load resistance 500Ω or less) or
  0 to 1V DC (output resistance 100Ω or more)
- **Power supply** : Rated voltage;
  100 to 120V AC (operating voltage 90 to 132V AC)
  200 to 240V AC (operating voltage 190 to 264V AC)
  Rated frequency; 50/60Hz
- **Power consumption** : Maximum 240VA (Detector: approx. 200VA, Converter: approx. 40VA)
  Normal 70VA (Detector: approx. 50VA, Converter: approx. 20VA)

### Detector Specifications (ZFK)

- **Measured gas temperature:**
  Flow guide tube system; −20 to +600ºC(for general-use, corrosive gas)
  Ejector system; −20 to +1500ºC (for high-temperature gas)
  −20 to +800ºC (for general-use)
- **Measured gas pressure:**
  −3 to +3kPa
- **Flow guide tube** : ・With or without blowdown nozzle
  Flange; JIA5K 65A FF
  Insertion length; 0.3, 0.5, 0.75, 1m
  ・For high particulate gas (with blowdown nozzle)
  With or without cover
  Flange; JIS5K 80A FF
  Insertion length; 0.3, 0.5, 0.75, 1m
- **Ejector** : Probe for guiding measured gas to detector
  Flange; JIS10K 65A RF
  Insertion length; 0.5, 0.75, 1, 1.5m (according to customer's specification)
- **Operating temperature** :
  −10 to +60ºC for Primary detecting element −5 to +100ºC for detector
  125ºC or less at detector flange surface with power applied
- **Storage temperature** : Detector: −20 to +70ºC
  Ejector: −10 to +100ºC
- **Structure** : Dust/rain-proof structure(IEC IP66 equivalent, except the filter part at the tip)
  Use a heat insulation cover in cold climates (as specified)
- **Filter** : Alumina (filtering accuracy 50μm) and quartz paper

- **Main materials of gas-contacting parts:**
  Detector; Zirconia, SCS14 (SUS316 equivalent), platinum, SUS304
  Flow guide tube; SUS304 or SUS316
  Ejector (general use); SUS316, SUS304
  Ejector; (for high temperature) SiC, SUS316, SUS304
- **Calibration gas inlet :** ϕ6mm tube join, ϕ1/4-inch tube join, or ball valve (as specified)
- **Reference air inlet (option):**
  ϕ6mm tube join or ϕ1/4-inch tube join (as specified)

  It is used when reference oxygen gas concentration changes
- **Detector mounting :** Horizontal plane ±45º, ambient air should be clean.
- **Outer dimensions :** (L × max. dia.) 210mm × 100mm (detector)
- **Mass (approx.) {weight}:**
  Detector; 1.6kg
  Ejector; 15kg (insertion length 1m)
  Flow guide tube (general-use, 1m); 5kg
- **Finish color :** Silver and SUS metallic color
- **Ejector air inlet flow rate:**
  5 to 10 L/min
- **Calibration gas flow :** 1.5 to 2 L/min
- **Blowdown air inlet pressure:**
  200 to 300kPa
- **Ejector exhaust gas processing:**
  Returned to furnace and flue
- **Heater temperature drop alarm output (ejector):**
  Alarm output when below 100 ºC Mechanical thermostat N.O. (1a) contact, 200V AC, 2A

## Converter specification (ZKM)

- **Concentration value indication:**
  Digital indication in 4 digits
- **Contact output signal:**
  (1) Contact specification; 6 points, 1a 250V AC/3A or 30V DC/3A
  (2) Contact function;
  - Under maintenance
  - Under blowdown Note3)
  - Span calibration gas valve
  - Zero calibration gas valve
  - Instrument anomalies Note1)
  - Alarm Note2)

  Note1) The following Instrument errors (1) Thermocouples break (2) Sensor break (3) Temperature fault (4) Calibration fault (5) Zero/span fault (6) Output error the contact ON
  Note2) Alarm selects just one as mentioned below (1) High (2) Low (3) H/L (4) HH (5) LL, it turns ON while operating.
  Note3) Under blow down, it is available in case of option, and it turns ON while operating.

- **Contact input signal:**
  (1) Contact specification; 3points (the following option)
  ON; 0V (10mA or less), OFF; 5V

  (2) Contact function;
  - External hold
  - Calculation reset
  - Heater OFF
  - Blow down (option)
  - Inhibition of calibration
  - Calibration start
  - Range change
- **Calibration method:** (a) Manual calibration with key operation
  (b) Auto. calibration (option)
  Calibration cycle; 00 day 00 hour to 99 days 23 hours
  (c) All calibration
- **Calibration gas :**
  - Settable range
    Zero gas; 0.010 to 25.00% $O_2$
    Span gas: 0.010 to 50.00% $O_2$
  - Recommended calibration gas concentration
    Zero gas; 0.25 to 2.0% $O_2$
    Span gas; 20.6 to 21.0% $O_2$ (oxygen concentration in the air)
- **Blowdown (optein) :** A function for blowing out dust with compressed air that has deposited in the flow guide tube. Blowdown can be performed only for a predetermined time and at predetermined intervals.
  Blowdown cycle; 00 hour 00 minute to 99 hours 59 minutes
  Blowdown time; 0 minute 00 second to 0 minutes 999 seconds
- **Output signal hold :** Output signal is held during manual/auto calibration, blowdown, sensor recovery processing, warm-up, PID auto tuning, and while maintenance mode setting is "available". The hold function can also be released.
- **Communication function:**
  RS232C (MODBUS) standard specification
  RS485 (MODBUS) (option)
- **Combustion efficiency display (option):**
  When you select this display, "rich mode display" will be simultaneously displayed. This function calculates and displays combustion efficiency from oxygen concentration and measured gas temperature.
  Thermocouple (R) is required for temperature measurement.
- **Operating temperature:**
  −20 to +55ºC
- **Operating humidity :** 95% RH or less, non condensing
- **Storage temperature :** −30 to +70ºC
- **Storage humidity :** 95% RH or less, non condensing
- **Outer dimensions (H × W × D):**
  182 × 163.5 × 70.6mm (Bench type)
- **Mass {weight} :** Approx. 2kg (excluding cable and detector)
- **Mounting method :** Mounted flush on panel

## 11.2 Code symbols

<Replacement Detector element>

| Power supply | Code symbols |
|---|---|
| 100 to 120V AC | ZFK8YY15-0Y0YY-0YY |
| 200 to 240V AC | ZFK8YY35-0Y0YY-0YY |

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