Manual No.3225E R2

Operation Manual for DTF-201R Oxygen Analyzer

RX-622310-A＊＊＊＊＊

READ THE OPERATION MANUAL.

ENERGY SUPPORT CORPORATION

Cautionary items for safety

Observe the following cautionary items for safe operation of the device.

Warning

1. When connecting wiring at the terminal of the analyzer, be careful to avoid electric shock. Be sure to turn the power off before connecting wiring.
2. Connect a grounding cable to avoid electric shock.
3. Be sure to close the gas source valve before installing gas inlet and outlet pipes for the sensor or disconnecting piping for maintenance, so that gas intoxication or oxygen deficiency does not occur.
   To avoid gas intoxication and oxygen deficiency, perform a gas leak test after installing gas inlet and outlet pipes for the sensor or performing maintenance of them.

Caution

1. To avoid electric shock, check for correct power supply wiring and agreement between the supply voltage requirement of the device and the supplied voltage before turning on the power switch of the device.
2. To avoid gas intoxication and oxygen deficiency, check for correct piping at the gas inlet and outlet of the sensor and gas leakage before opening the gas source valve.
3. Keep away from the sensor and its periphery during operation and shortly after operation stop to avoid burns caused by high temperatures. If maintenance is inevitably necessary, wear heat resistant gloves or the like and be careful to avoid burns.
4. An “electric shock” warning mark shown on the right is attached near the power supply where there is a danger of electric shock. If the wiring circuit is unknown, turn the power off even when no electric shock warning mark is attached.

5. If the sample gas includes toxic contents, there is a danger of gas intoxication. Be sure to shut off the source gas valve when performing maintenance of the piping system.
6. For safe and correct use of the device, observe the cautions and handling methods described in this operation manual. If the device is operated without observing description herein, there is a danger of electric shock, gas intoxication, oxygen deficiency and burns as well as damage to the device, deterioration of functions or possible damage to the final product (system, etc.).

Guarantee

1. Term

   The term of guarantee of a single piece of equipment shall be one year since the product is delivered. However, if the equipment is built in another unit, the term of guarantee shall be that of the unit. The single unit delivery meant that the receiver, sensor unit, cable are delivered as single unit whereas the equipment built in another unit meant the equipment by combining the sampling flow or to combine to another units are delivered as built-in delivery.

2. Conditions

   The delivered product shall be exchanged or repaired free of charge if it fails or any abnormality is generated due to poor workmanship in design, manufacture or material attributable to ENERGY SUPPORT CORP. in the above-mentioned term of guarantee though it is operated properly after it is stored and installed properly after it is delivered to the client.

   The proper operating method includes the following.

   ① The installation conditions and operation conditions described in the specifications of this measuring tool and this operation manual are satisfied.

   ② The analyzer is periodically calibrated and replacement of consumable parts is made.

   ③ Periodic maintenance and inspection are made according to the operating state of the analyzer.

   However, the following cases shall be excluded from the scope of guarantee even if they occur in the above-mentioned term of guarantee.

   1) Failure generated due to operation errors (erroneous operation not described in operation manual)
   2) Failure caused by repairs, remodeling, disassembly, cleaning and so on made by other than us
   3) Failure caused by fire or act of God (including inductive lightning surge)
   4) Failure caused by improper storage (storage in a hot and humid site, etc.) or lack of maintenance (generation of fungi, etc.)

   Note) Consumable parts and consumable components are excluded from the scope of guarantee.

3. Scope

   The scope of guarantee shall be limited to the range delivered by us.

4. Indemnity

   We will not assume responsibility for any accompanying losses caused by the failure of our product (losses, lost profits and so on caused by the controlled or recorded results made under the use of our product, or losses, lost profits and so on caused by the system in which our product is installed.). Safety units or the like shall be installed under the responsibility of the client.

5. Term of supply of replacement parts or repair

   ① Repairs or replacement with alternative product will be made with charge for seven years after manufacture of the product is stopped.

   ② We may reject even charged repairs of products passing 10 years or more after delivery.

Contents

1. General items

1-1 Introduction

The DTF-201R Oxygen Analyzer has been produced thanks to the latest ceramics production technology by applying the thick-film sensor and digital signal processing technology.

This operation manual explains how to operate the DTF-201R oxygen analyzer.

Read through the operation manual and operate our product over a long time.

1-2 Precautions for operation

- Avoid installing to a site susceptible to vibration.
- Do not splash water or evaporative liquids on the receiver or sensor.
- The sample gas must be free from corrosive gases (F, HF, CL_2, HCL, SO_2, H_2S, etc.) and poisoning materials (Si, Pb, P, Zn, Sn, As, etc.). If these gases are included, the sensor life may become short.
- The sample gas must be free from flammable gases. If flammable gases are included, the oxygen concentration measurement will include an error.
- The major usage of this oxygen analyzer is for atmospheric oxygen measurement at boiler, Heating furnac
- The lower limit of operation is about 0.65 of air ratio m. If the device is operated in an environment exceeding this limit, the oxygen in the zirconia porcelain may be electrolyzed, causing deterioration of the sensor.

1-3 Outline of product

The DTF-201R oxygen analyzer features the following.

- With one calibration of the air sample point is possible.
- Compact size.(Small installation space.)
- Maintenance is easy.
- Low power consumption by the sensor.(About 13 W for normal use.)
- Short warm up time.
- No power switch.
- For the $-O_2$ range<RX-622310-AB＊＊＊>
  - The oxidation and reduction zones can be managed by a single unit.
  - For the oxidation zone, the excess oxygen concentration is displayed ($+O_2$)
  - For the reduction zone, the shortage oxygen concentration necessary to fire non-combustion gases (CO,H_2) is displayed ($-O_2$).
  - Use $-O_2$ analysis in the presence of H_2O or in the range of $CO_2+H_2O>CO+H_2$.

Operating Principles of the Zirconia Type Oxygen Analyzer

(1) Configuration and Functions (See diagram at right.)

① Heater: Heats the sensor to approximately 800℃.

② Sensing cell: Sets the oxygen concentration of the reference oxygen chamber to 100%, and measures the oxygen concentration of the gas detection chamber. (See below for detailed principles.)

③ Pumping cell: Sets the oxygen concentration of the gas detection chamber to 0%. (See below for detailed principles.)

④ Gas detection chamber: Inducts gas through the gas diffusion holes.

⑤ Reference oxygen chamber: The oxygen concentration is set at approximately 100% by the reference oxygen microcurrent.

(2) Detection characteristics resulting from high temperature heating of the sensor:

① When a gas with a different oxygen concentration is put between the electrodes, oxygen ion conductivity occurs and electromotive force is generated. (Oxygen concentration cell effect)

② When current is applied between the electrodes, oxygen ions flow in the opposite direction in proportion to the current. (Oxygen pumping effect)
The sensing cell uses characteristics ① and ② above, and the pumping cell uses characteristic ② above.

(3) Sensing Cell Principles

① Minute current flows between the electrodes of the sensing cell. When current is applied between the electrodes, the oxygen inside the gas detection chamber is transferred to the reference oxygen chamber so that the oxygen concentration in the reference oxygen chamber is approximately 100%.
Note: The quantity of oxygen transferred from the gas detection chamber to the reference oxygen chamber is extremely small, so it does not affect the oxygen concentration in the gas detection chamber.

② The electromotive force in the following equation is generated between the electrodes of the sensing cell by the difference between the oxygen concentration in the gas detection chamber and the reference oxygen chamber.
The sensing cell measures the electromotive force generated between its electrodes and sends signals to the pumping cell so that the electromotive force reaches 450 mV (oxygen concentration of 0% in the gas detection chamber).

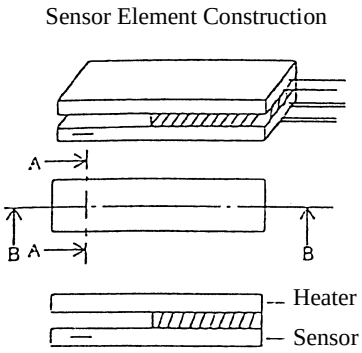
Electromotive force $E = -53.2 \times \log_{10} \frac{\text{oxygen concentration in gas detection chamber}}{\text{oxygen concentration in reference oxygen chamber (100)}}$

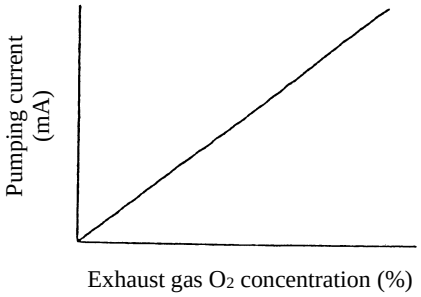
$$450 = -53.2 \times \log_{10} \frac{X}{100}$$

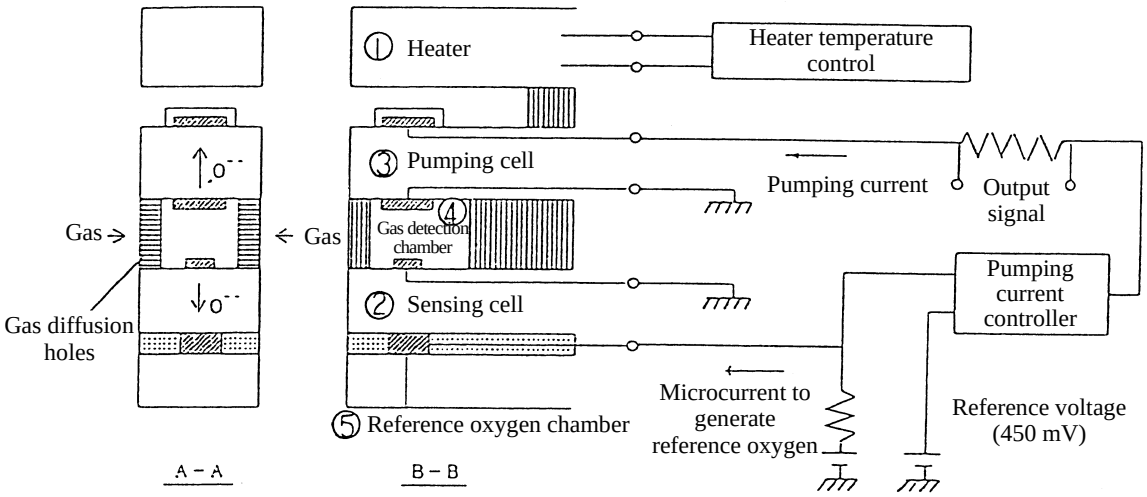
X = approx. 0.003 ppm ≒ 0%

(4) Pumping Cell Principle

The pumping cell receives the signal from the sensing cell and applies current to the electrodes so that the oxygen concentration in the gas detection chamber reaches 0%. The current applied and the oxygen concentration in the sample gas are proportional, so by measuring the current the oxygen concentration in the sample gas can be measured.







(5) Point of measurement of reduction zone

For the reduction zone, H2O in the measuring gas is electrolyzed and oxygen is added to make

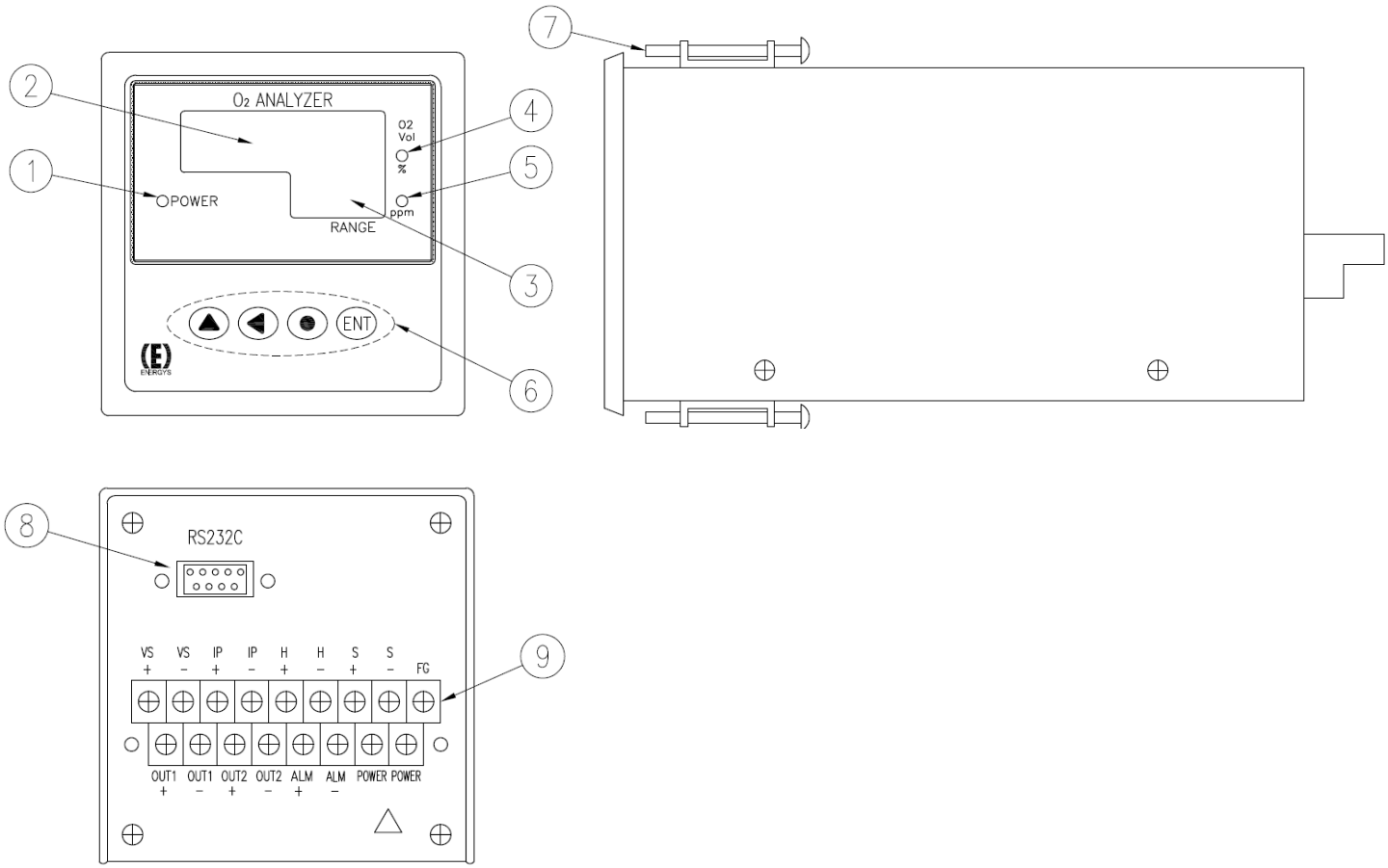
the concentration of the reduction gas (H2, CO) in the gas detection chamber to 0%.

(The direction of O2 ion and electric current is contrary to that for oxidation.)

During the process, the supplied oxygen is in proportion to the reduction gas concentration in the exhaust gas ; therefore by measuring electric current , the reduction gas concentration in the exhaust gas can be measured.

1-4 Name of each part

(1)DTF-201R receiver of oxygen analyzer



No.	Name (function)
①	POWER lamp (Lit after the power is turned on.)
②	Display 1 (5 digits, for display of concentration, data and error)
③	Display 2 (3 digits, for display of range, concentration alarm and channel)
④	% range lamp (Lit in % measurement mode.)
⑤	ppm range lamp (Lit in ppm measurement mode.)
⑥	Key (for calibration and data setting)
⑦	Installation fitting (for fixing the panel)
⑧	Connector 1 (for RS232C connection; option)
⑨	Terminal block (for connecting the sensor unit, input/output wiring)

2. Unpacking

2-1 Check of delivered product and accessories

Part name	Part No.	Q'ty	Remarks
Receiver of oxygen analyzer	RX-622310-AA＊＊＊＊	1	For the $+O_2$ range
	RX-622310-AB＊＊＊＊		For the $-O_2$ range
Installation fitting	CA-1	2	Accessory

NOTE)

＊refer to your specifications document. The probe, sensor, relay cables, and other are different depending on the specifications; check those parts off against the specifications document.

2-2 Temporary storage of product

When storing the product temporarily before installation, take care of the following points.

- Place Styrofoam around the product in the box when storing it.
- Avoid direct sunshine as a storage location.
- Store at a place with an ambient temperature from -10 to 50 ℃ with as little temperature fluctuation as possible.
- Store at a place with a low humidity and less dust.
- Store at a place free from rain water.
- Store at a place with less mechanical vibration.
- Store at a place with less corrosive or other danger gases.

3. Installation

3-1 Installation conditions

Take the following conditions into consideration for the determination of the installation site for safe and correct operation of the device, and choose the best location for installation. The analyzer must be installed indoors.

- Place with less vibration
- Place where corrosive gases (F, HF, CL_2, HCL, SO_2, H_2S, etc.) does not corrode the device or give ill effects on the maintenance personnel
- Place free from condensation caused by rapid temperature changes
- Place free from direct radiation of heat
- Place with less effect of electric noise
- Place at low humidity or less dust
- Place with ambient temperature from 0 to 50 ℃

3-2 Installation method

Cautionary items for installation

- This analyzer is a precision device. Avoid excessive impact or load during installation.
- Its terminal block and connector jut out from the panel, so they are easily damaged. Take care not to knock them during installation.

3-3 Piping and wiring method

(1) Piping methods

Piping between the probe generator (sensor) and the air selector unit (for supplying calibration gas) must be connected.

Pipes consist of the following:

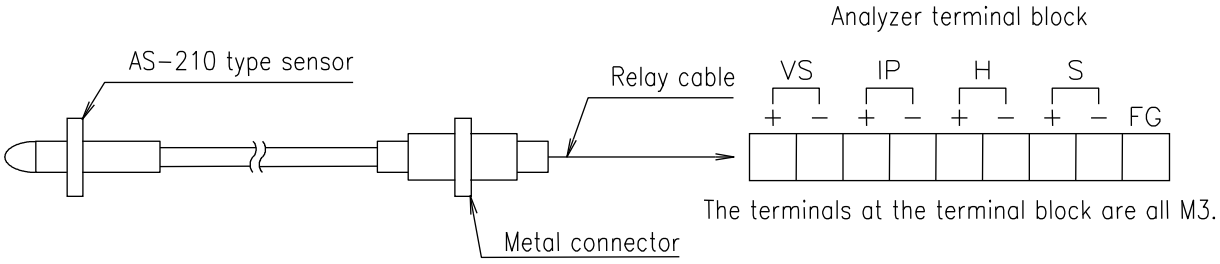
- Calibration gas pipe
- Ejector air pipe
- Purge air pipe

And others

Details differ depending on the specifications. Refer to your specifications document.

(2) Wiring methods

a) Wiring between the probe generator (sensor) and analyzer

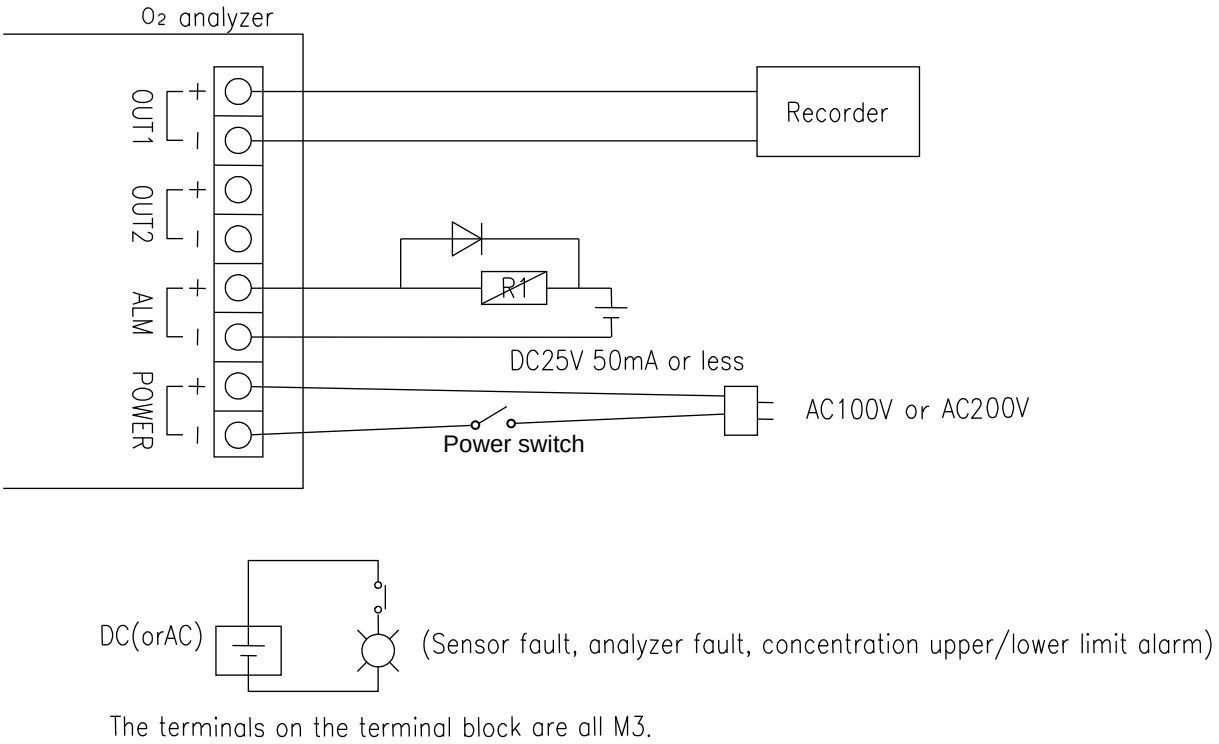


Connect the sensor and analyzer with the special relay cable.

Metal connector pin no.	Relay cable mark band no.	Analyzer terminal signal name	Description
1	1	Vs^+	Sensing cell output voltage
2	2	Vs^-	
3	3	Ip^+	Pumping cell output current
4	4	Ip^-	
5	5	H^+	Heater voltage (Four-terminal wiring)
6	6	H^-	
7	7	S^+	
8	8	S^-	
-	E	FG	Terminal for grounding

Match the mark band no. of the relay cable with the analyzer terminal signal name.

b) Wiring between the analyzer and instrument room



The terminals on the terminal block are all M3.

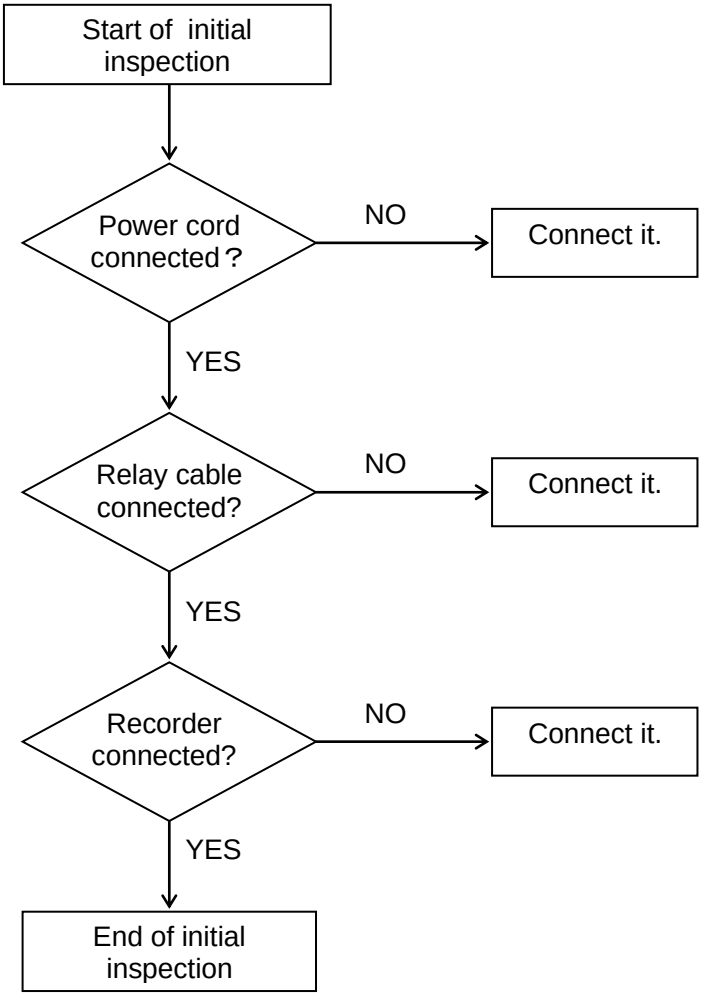
CAUTION

- Install the power source outside as the receiver has no power switch.
- For the OUT1 terminal, 4-20mA only.
- For the OUT2 terminal, select from 0-1VDC, 0-5V, 0-10V.
- The ALM terminal is an open collector type contact. (ON when abnormal) (Factory setting)
- Since the OUT1, OUT2, and ALM terminals share a common grounding wire inside the oxygen analyzer, be sure to ground it externally to one point and not two points.
- The FG terminal is connected to the grounding wire of the switching power source circuit of the case and inside the oxygen analyzer. When the power source has excessive line noise, connect a class D grounding to the FG terminal.

4. Operation

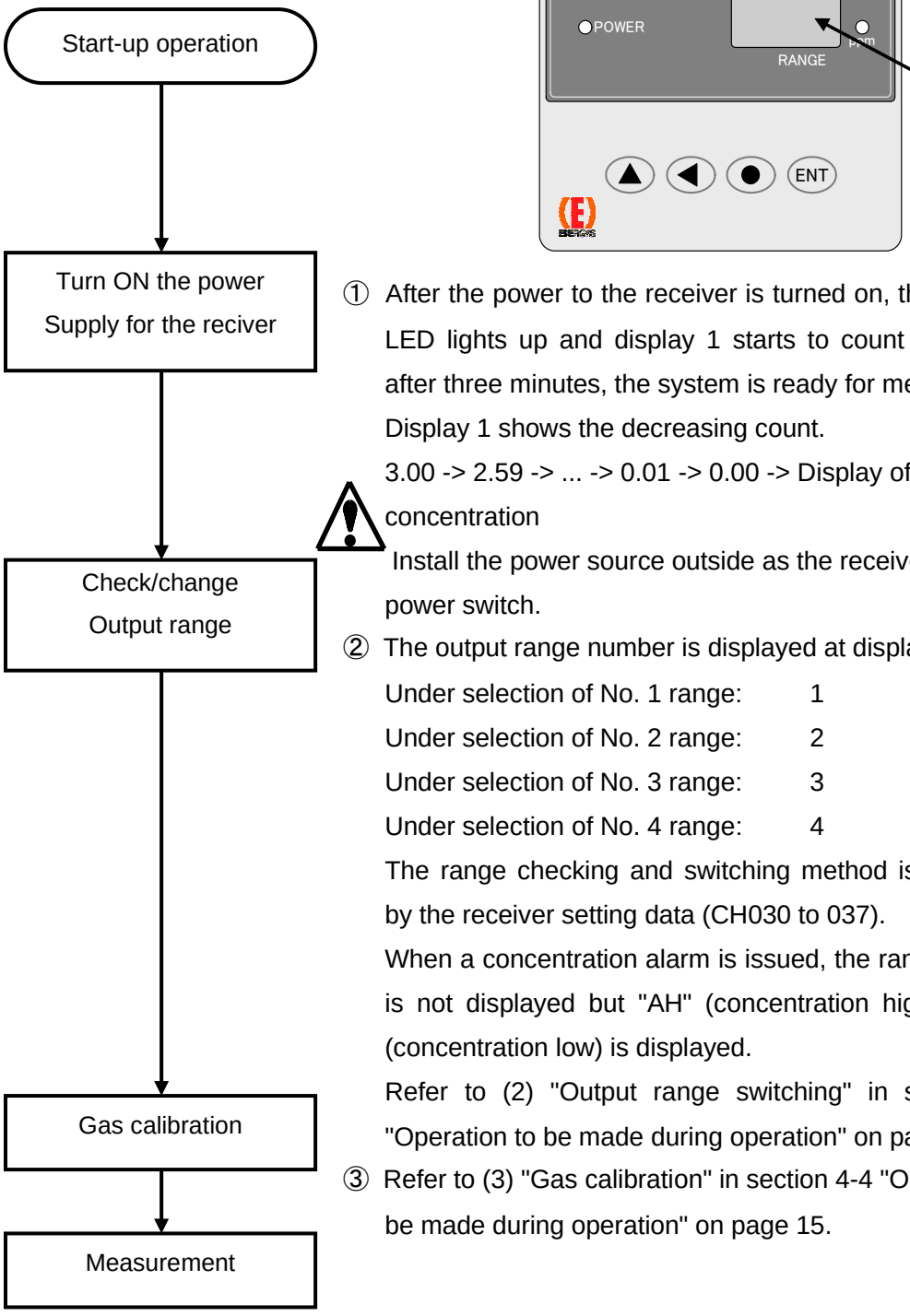
4-1 Preparation for operation

Before turning ON the analyzer, check the following once again.



4-2 Starting

The basic starting operation is described below.



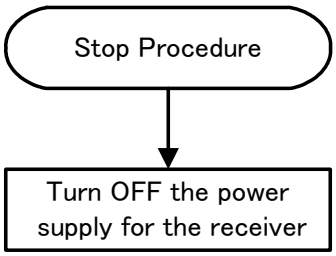
① After the power to the receiver is turned on, the POWER LED lights up and display 1 starts to count down and, after three minutes, the system is ready for measurement. Display 1 shows the decreasing count.
3.00 -> 2.59 -> ... -> 0.01 -> 0.00 -> Display of concentration

Install the power source outside as the receiver has no power switch.

② The output range number is displayed at display 2.
Under selection of No. 1 range: 1
Under selection of No. 2 range: 2
Under selection of No. 3 range: 3
Under selection of No. 4 range: 4
The range checking and switching method is controlled by the receiver setting data (CH030 to 037).
When a concentration alarm is issued, the range number is not displayed but "AH" (concentration high) or "AL" (concentration low) is displayed.
Refer to (2) "Output range switching" in section 4-4 "Operation to be made during operation" on page 14.

③ Refer to (3) "Gas calibration" in section 4-4 "Operation to be made during operation" on page 15.

4-3 Stopping



The power supply to the receiver is turned off.

Install the power source outside as the receiver has no power switch.

Do not turn the power off for a short-period stop (within one week).

To stop for a long time, wait until the sample gas becomes the air atmosphere before turning the power off so that the suction pump being turned OFF or sample gas does not flow out by shutting the source valve.

4-4 Operation to be made during operation

(1) Key operation method

Key operation is necessary to change the range during start-up or when performing gas calibration. This is a very important operation. Read without fail.

As the oxygen analyzer output may change by key operation, be sure to make key operation after performing the control exclusion when output signal of the oxygen analyzer

Description of key

◀ key ⋯ Press the key to change from the oxygen concentration display mode to the data setting mode, or to shift the digit place in the setting data to the left. The digit place which can be changed blinks.

▲ key ⋯ Press the key to change the setting CH or setting data value.

● key ⋯ Press the key in the following cases.

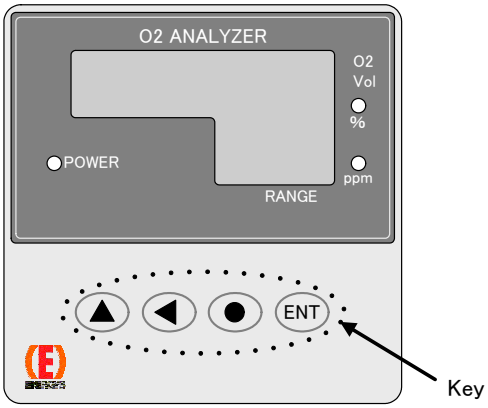
To place a decimal point at the blinking digit place.

To change the plus/minus sign of the setting data.

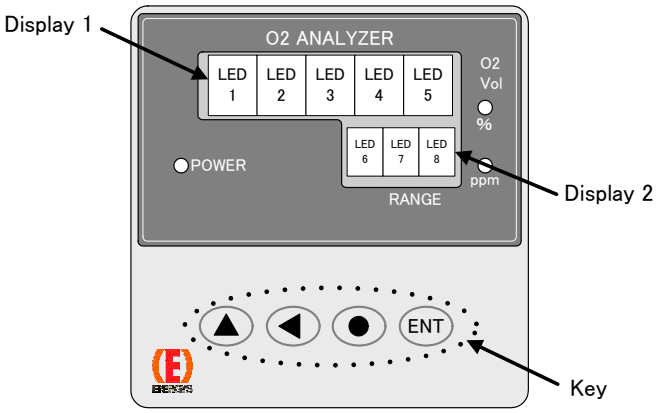
To return from the data setting mode to the oxygen concentration display mode.

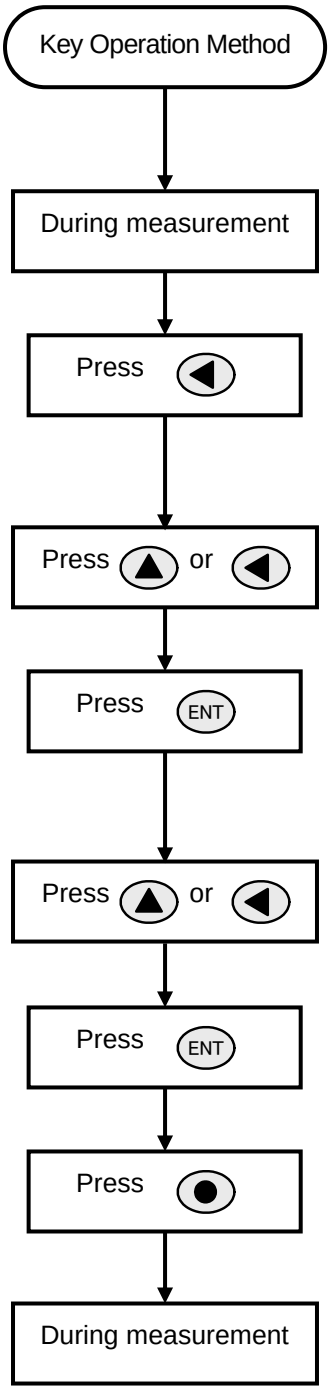
To clear an error upon occurrence of an error.

ENT key ⋯ Press the key to store data in the memory of the receiver after the setting CH or setting data value has been changed.



Description of key operation





Display 1 shows the oxygen concentration.
Display 2 shows the range or a concentration alarm display.

① First, press the ◀ key.
Display 2 shows the CH number and LED8 blinks.
Display 1 shows data.

② Press ▲ or ◀ to display the desired CH number on the display 2.

③ Press ENT .
LED5 of display 1 blinks.
Display 2 remains showing the CH number.

④ Press ▲ or ◀ to change the data shown at display 1.

⑤ Press ENT to store the data in the memory of the receiver.

⑥ Press ● to return to the oxygen concentration display screen.

Key operation is complete.
Operation steps ① through ⑥ can be used for range change, gas calibration and so on.
A list of system data in each CH is shown on the next page.

System data list

CH No.	Description	Setting data	Initial data
000	Display selection	0: No display (— — — —) 1: Oxygen concentration	1
001	Sensor output VS monitor (mV)	—	Monitor value
002	Sensor output IP1 monitor (mA)	—	
003	Sensor output IP2 monitor (μA)	—	
004	Sensor output VP monitor (V)	—	
005	Sensor heater voltage monitor (V)	—	
006	Sensor heater current monitor (A)	—	
007	Sensor heater current monitor (A)	—	
008 to 015	Data for setting and checking by manufacturer		
016	Primary delay time (sec)	0 to 99	0
017 to 019	Data for setting and checking by manufacturer		
020	Output range switching	1: No. 1 range 2: No. 2 range 3: No. 3 range 4: No. 4 range	1
021 to 022	Data for setting and checking by manufacturer		
023	Output hold setting	0: No hold 1: Arbitrary value 2: Value 5 seconds prior to occurrence of error	1
024	Output hold value setting (%FS)	0 to 100	0
025	Data for setting and checking by manufacturer		
026	Auto range setting	0: Not used 1: Used	0
027	OUT1 output adjustment	This CH is used for zero and span adjustment of output.	—
028	OUT2 output adjustment		—
029	—	—	—

CH No.	Description	Setting data	Initial data
030	Output range No. 1 span value	1 to 99999 * Check the unit of the output range at CH034 through 037.	25
031	Output range No. 2 span value		10
032	Output range No. 3 span value		5
033	Output range No. 4 span value		0
034	Output range No. 1 unit	0: Not used 1: ppm 2: %	2
035	Output range No. 2 unit		2
036	Output range No. 3 unit		2
037	Output range No. 4 unit		0
038	—	—	—
039	—	—	—
040 to 119	Data for setting and checking by manufacturer		
120	Zero gas concentration (%)	0.00 to 99.90	See inspection data
121	Span gas concentration (%)		
122	-Span gas concentration (%)	-99.90 to 99.90	
123	Air point concentration	0.00 to 99.90	
124 to 142	Data for setting and checking by manufacturer		
143	Linearization table	Specific values for each sensor	See inspection data
144 to 179	Data for setting and checking by manufacturer		
180	Calibration point selection	5: Zero point 6: Span point 7: -Span point 8: Air point	8
181	Calibration start	0: OFF 1: Calibration start	0
182 to 189	Data for setting and checking by manufacturer		
190	Heater control mode	0: Heater off 1: Constant voltage control 2: Constant resistance control 1 3: Constant resistance control 2	Data for setting by manufacturer
191	Heater voltage setting value (V)	5.00 to 11.00	10.50 (Cannot be changed)
192	Heater resistance at room temperature (Ω)	Value characteristic to sensor	See inspection data
193 to 199	Data for setting and checking by manufacturer		

CH No.	Description	Setting data	Initial data
200	Contact output ALM content setting	0: No contact output 1: Analyzer error 4: READY 5: Upper concentration limit alarm 6: Lower concentration limit alarm	1
201 to 203	Data for setting and checking by manufacturer		
204	Contact output ALM operation setting	0: NO 1: NC	0
205 to 219	Data for setting and checking by manufacturer		
220	Upper concentration alarm setting	0.0 to 9999.0	25
221	Lower concentration alarm setting	0.0 to 9999.0	0
222	Upper concentration alarm unit	0: Not used 1: ppm 2: %	0
223	Lower concentration alarm unit		0
224 to 309	Data for setting and checking by manufacturer		
310	Password for data setting modification	0: Data protected 201: Data modification enabled	201

Cautionary items for data setting modification

Do not change CH190 through 192 because otherwise the heater voltage supplied to the sensor is changed to cause breakage of the sensor.

But, when the sensor is replaced, it is necessary to enter CH192. (refer to section 4-4(4).)

(2) Output range switch(Range selection by key operation)

Output range 1 through 4 can be changed at CH020. Enter "1" to select range 1, enter "2" to select range 2, or enter a number corresponding to the range number. When the high or low concentration alarm is not displayed at display 2, the currently selected range is shown at display 2.

Check the output range setting according to the procedure described at (6 Output range setting in section 4-6 "Application operations" on page 19.

(3) Gas calibration

This analyzer can be used with air 1 point calibration. It doesn't need to carry out calibration ②,③,④,⑤ standardly.

① Air 1 point calibration

(a) Send the Air to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication.

(b) Input 0 to CH276 to set the calibration mode to air 1 point calibration.

(c) Input the Air point concentration to CH123. 20.6% is inputted when the atmosphere air is used 20.9% when the instrument air is used for calibration.

(d) Input 8 to CH180 to set the calibration point to air point.

(e) Input 1 to CH181 to start calibration.

This procedure performs calibration. As long as the setting data is not changed, steps (b) ,(c)and (d) are not required.

② Air, Zero 2 point calibration

This analyzer doesn't need to carry out zero point calibration standardly. How to zero point (0.0%O2point) calibration is shown in the following for the reference.

(a) Input 1 to CH276 to set the calibration mode to air and zero 2 point calibration.

(b) Send the Air to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication. Air point is calibrated in a method to show in (c)-(e) of ①.

(c) Input 0.0 to CH120 for zero gas concentration. Zero gas is to use 10%CO2/N2 gas or 100%N2 gas.

Combustibility gas such as CO and H2 isn't to be contained in zero gas.

(d) Send the zero gas to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication.

(e) Input 5 to CH180 to set calibration point to zero point.

(f) Input 1 to CH181 to start calibration.

This procedure performs calibration. As long as the setting data is not changed, steps (a)and (c) are not required.

③ Air, Span 2 point calibration

(a) Input 2 to CH276 to set the calibration mode to air and span 2 point calibration.

(b) Send the Air to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication. Air point is calibrated in a method to show in (c)-(e) of ①.

(c) Input to CH121 for span gas concentration. The concentration of span gas is to use the gas of the 90% in F.S. range.

(d) Send the span gas to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication.

(e) Input 6 to CH180 to set calibration point to span point.

(f) Input 1 to CH181 to start calibration.

This procedure performs calibration. As long as the setting data is not changed, steps (a)and (c) are not required. Input the concentration after the change by the operation of (c) when you change the concentration of span gas.

④ Air, Zero, Span 3 point calibration

(a) Input 3 to CH276 to set the calibration mode to air, zero and span 3 point calibration.

(b) Send the Air to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication. Air point is calibrated in a method to show in (c)-(e) of ①.

(c) Input 0.0 to CH120 for zero gas concentration. Zero gas is to use 10%CO2/N2 gas or 100%N2 gas.

Combustibility gas such as CO and H2 isn't to be contained in zero gas.

(d) Send the zero gas to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication. Zero point is calibrated in a method to show in (e),(f) of ②.

(e) Input to CH121 for span gas concentration. The concentration of span gas is touse the gas of the 90% in F.S. range.

(f) Send the span gas to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication. Span point is calibrated in a method to show in (e),(f) of ③.

This procedure performs calibration. As long as the setting data is not changed, steps (a), (c) and (e) are not required. Input the concentration after the change by the operation of (c) when you change the concentration of span gas.

⑤ Air, －Span 2 point calibration (Only for the $-O_2$ range)

(a) Input 2 to CH276 to set the calibration mode to air and span 2 point calibration.

(b) Send the Air to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication. Air point is calibrated in a method to show in (c)-(e) of ①.

(c) Input to CH122 for span gas concentration. The recommended span gas to refer to the following notes.

(d) Send the span gas to the Probe transmitter (sensor unit) at 1-3L/min ,and it stabilizes indication.

(e) Input 7 to CH180 to set calibration point to －span point.

(f) Input 1 to CH181 to start calibration.

This procedure performs calibration. As long as the setting data is not changed, steps (a)and (c) are not required. Input the concentration after the change by the operation of (c) when you change the concentration of span gas.

CAUTION

・When the flow of calibration gas, be sure to bubbling water.
・Recommended calibration gas concentration of －span point
CO＝9%, H_2＝7%, CO_2＝7%/N_2 Bal
calibration gas ＝– (CO+H_2/2)= –((9+7)/2)= –8
・In view of the bubbling water, －span gas concentration is －7.8%.
⇒Input －7.8 to CH122
・Be careful when exhaust the calibration gas.

(4) Setting of linearization table and heater resistance at room temperature

When changing the sensor, the linearization table (CH143) and the room temperature heater resistance (CH192) must be entered. Refer to the test data of the sensor for linearization table and the room temperature heater resistance.

(5) Concentration alarm setting

Set the high concentration alarm at CH220 and set the unit of the setting at CH222.

Set the low concentration alarm at CH221 and set the unit of the setting at CH223.

As a setting of the unit, enter "0" when the unit is not used, enter "1" for ppm, or "2" for %.

4-5 Operation to be made upon occurrence of an error

When an error occurs, display 1 shows the error code or concentration display does not show a correct value. In such a case, take a remedy referring to section 5-2 "Troubleshooting" on page 22. After removing the error, press the ● key or reset the power supply to return to the measuring state by turning the supply power to the receiver OFF(power reset).

4-6 Application operations

(1) Primary delay time setting

A primary delay time can be set to the concentration output signal using the CH016 data (unit: second). The setting range is 0 to 99 seconds.

(2) Output hold setting

The concentration output signal holding pattern upon an error occurring to the sensor or receiver can be set at CH023. The relationship between the entered data and the holding pattern is described in the table below.

Entered data	Holding pattern
0	No output hold upon sensor or receiver error
1	The output is held at the value set at CH024 upon a sensor or receiver error.
2	The output is held at the value five seconds prior to the occurrence of the error upon a sensor or receiver error.

(3) Output hold value setting

In a warming-up interval (when the receiver counts down) or with "1" set at CH023, the concentration output signal is held to the CH024 data (unit: FS) when an error occurs to the sensor or receiver. The setting range is 0 to 100% FS. For example, if you want to 4 to 20 mA output of OUT 2 to hold at 12 V, set FS to 50%.

(4) OUT1 (current) output adjustment

① Connect an ammeter or the like which can check the output, to the OUT1+, OUT 1- terminal at the terminal block of the receiver.

② Call up CH027. Display 1 shows "cAL 1."

③ Press the ENT key. Display 1 shows "0." Each time the ● key is pressed, display 1 shows "0" and "100" alternately.

When "0" is shown, the output zero point can be adjusted, and when "100" is shown, the output span point can be adjusted, in the following procedure.

④ When display 1 shows "0" or "100," press the ▲ key to roughly adjust the output, or press the ◀ key to finely adjust the output. Make adjustment while observing the output at the ammeter or the like.

⑤ After finishing adjustment of the zero point and span point at step 4, press the ENT key to return to the CH setting mode.

(5) OUT2 (voltage) output adjustment

① Connect a voltmeter or the like which can check the output, to the OUT2+, 2- terminal at the terminal block of the receiver.

② Call up CH028. Display 1 shows "cAL 2."

③ Press the ENT key. Display 1 shows "0." Each time the ● key is pressed, display 1 shows "0" and "100" alternately.

When "0" is shown, the output zero point can be adjusted, and when "100" is shown, the output span point can be adjusted, in the following procedure.

④ When display 1 shows "0" or "100," press the ▲ key to roughly adjust the output, or press the ◀ key to finely adjust the output. Make adjustment while observing the output at the voltmeter or the like.

⑤ After finishing adjustment of the zero point and span point at step 4, press the ENT key to return to the CH setting mode.

(6) Output range setting

Up to four output ranges can be set with CH030 to 033 for the range span value and with CH034 to 037 for the unit.

Output range No. 1: CH030 for range span value setting and CH034 for unit setting
Output range No. 2: CH031 for range span value setting and CH035 for unit setting
Output range No. 3: CH032 for range span value setting and CH036 for unit setting
Output range No. 4: CH033 for range span value setting and CH037 for unit setting

Enter "0" for the unit setting when the unit is not used, or enter "1" for ppm, or "2" for %.

－ Example －

To set output range No. 1 at 0 to 10 ppm, enter "10" to CH030 and enter "1" to CH035.

After the output range setting has been changed, calibration using the calibration gas corresponding to the range become necessary.

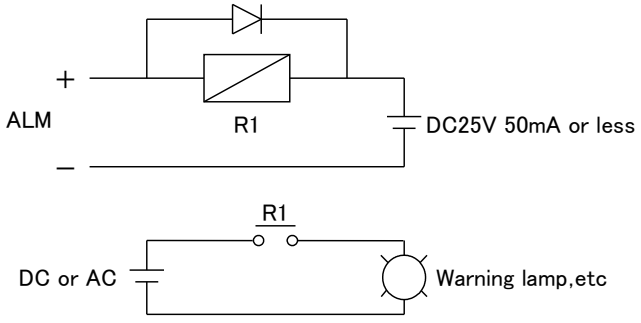
(7) Contact output setting

Set the contact output content at CH200, and set the contact output mode setting at CH204.

Enter "0" for normally open (NO) mode setting, or enter "1" for normally closed (NC) mode setting. Refer to the table below for the contact mode according to the contact output content and NO/NC setting.

Input data of CH 200	Contact output content		Contact output mode, input data of CH 204	
			0 (NO)	1 (NC)
0	No contact output		OFF	ON
1 (Factory setting)	Analyzer error	During warming-up or measurement	OFF (Factory setting)	ON
		Upon analyzer error	ON (Factory setting)	OFF
4	READY	During warming-up	ON	OFF
		After warming-up	OFF	ON
5	Upper concentration limit alarm	During warming-up	OFF	ON
		Upon concentration higher than setting	ON	OFF
		Upon concentration lower than setting	OFF	ON
6	Low concentration limit alarm	During warming-up	OFF	ON
		Upon concentration higher than setting	OFF	ON
		Upon concentration lower than setting	ON	OFF

Example of wiring circuit to ALM.



(8) RS232C Communication function setting

The measurement status, error codes, range and measurement values can be transmitted.

The formats include condition = measurement status (6 bytes), E = error code (2 bytes), RANGE = range No. (1 byte), ppm = measured value (maximum 11 bytes), CR + LF. The communication specifications (bit rate, data length, parity check, stop bit, etc.) are set by ENERGY SUPPORT CORP..

(9) Data protection password setting

Enter "0" to CH310 to protect the setting data against changes. Enter "201" to CH310 to allow data changes.

5. Maintenance

The maintenance and inspection procedures described herein are important for maintenance of correct functions and accurate measurement. Be familiar with the description of items and methods and perform without fail.

Sensor replacement cautions

- To prevent gas intoxication or oxygen deficiency, before you replace the sensor, always stop the supply of sample gas.
- There is a danger of getting burned, so before you replace the sensor, turn off the power and allow the analyzer to cool down first. If you must work while the analyzer is still hot, wear heat resistant gloves and work carefully to avoid burns.

5-1 Daily and periodic inspection

Gas calibration	Interval	At least once in each month (Periodic calibration according to the operation condition is recommended.)
	Method	Perform gas calibration according to (3) in section 4-4.
Inspection of Sensor	Interval	1 month
	Method	The amount of drift toward the last time calibration value is confirmed. (When it exceeds ±2%F.S./month, it thinks with the deterioration tendency of the sensor.)
Sensor replacement	Interval	2 years
	Method	Replace when replacement of the sensor unit is necessary (refer to section 5-2 "Troubleshooting.") See the manual of sensor for the replacement method.

5-2 Troubleshooting

Phenomenon	Cause	Countermeasure	Remarks
Unable to change data.	0 is input for CH310.	Input 201 for CH310.	
	Receiver problem	Request repair by ENERGY SUPPORT CORP.	
Analyzer output, display value does not change.	Analyzer error occurring	Turn power OFF, then ON again after 10 seconds. Or push ◉ key to reset.	Take ountermeasures in accordance with error code.
	Receiver problem	Request repair by ENERGY SUPPORT CORP.	
Analyzer output, display value error	Sample gas flow rate is outside range.	Readjust sample gas flow rate.	Adjustment to specified flow rate
	Sample gas pipe leak	Check for leaks, tighten sample gas pipe joints.	
	Pipe leak inside analyzer	Tighten joints, etc.	
	Gas calibration error	Perform gas calibration	
	Sensor deterioration	Replace the sensor	
Analyzer output, display value is zero	Sample gas flow rate is outside range	Readjust sample gas flow rate	Adjustment to specified flow rate
	Flammable gas included in sample gas	Eliminate flammable gas from sample gas	
	Sensor deterioration	Replace the sensor	
Analyzer output and display value do not match	Output adjustment is inaccurate	Perform output adjustment for CH027, 028	
	Output range is different.	Change output range (CH020, 026, 207). Check output range setting (CH030 - 037) and reset.	
	Receiver problem	Request repair by ENERGY SUPPORT CORP.	
Slow response	Residual air effect inside sampling pipe, analyzer	N_2 purge of sampling pipe, pipes inside analyzer	
	Sample gas flow rate is insufficient.	Readjust sample gas flow rate	Adjustment to specified flow rate
	Blockage of sample gas pipe	Clean pipe or install new pipe	
	Primary delay time setting value is too large (CH016)	Check CH016 data, set it to 0 sec	
	Sensor deterioration	Replace the sensor	

Error Code	Description	Possible cause	Action
E-01 E-02 E-03	Abnormality in ROM, RAM, and/or EEPROM	Receiver abnormality, or temporary malfunction due to external noise	Turn off the power and then, after 10 seconds, turn it back on.
E-04	Heater current excessively high	Sensor heater abnormality Heater wiring error Receiver abnormality	Press the DOT ⦿ key, or turn off the power and then, after 10 seconds, turn it back on. To clear the error display, press the DOT ⦿ key after the cause of the error has been eliminated (e.g. after a sensor has been replaced). Check the heater resistance (normally about 3 Ω). Check the heater voltage (normally about 10.5V).
E-05	Heater current excessively low		
E-06	Heater voltage excessively high		
E-07	Heater voltage excessively low		
E-20	Heater temperature not high enough		
E-08	VS voltage excessively high	Sensor heater abnormality Heater wiring error Receiver abnormality	Press the DOT ⦿ key, or turn off the power and then, after 10 seconds, turn it back on. To clear the error display, press the DOT ⦿ key after the cause of the error has been eliminated (e.g. after a sensor has been replaced). Check the VS voltage (normally about 450 mV). Check the IP current （normally ±10mA）. Check the VP voltage (normally ±5V).
E-09	VS voltage excessively low		
E-10	IP current excessively high		
E-11	IP current excessively low		
E-12	VP voltage excessively high		
E-13	VP voltage excessively low		
E-14	Heater terminals (S+, S-) not closed	Defective contact in wiring between S+ and S-	Press the DOT ⦿ key to clear the error display. Check the wiring and return to normal condition.
E-21	Data out of the specified range	Data entry error	Press the DOT ⦿ key to clear the error display. Enter data within the specified range.
E-35 ～48	Calibration error	Sensor abnormality Calibration gas concentration setting error	Press the DOT ⦿ key to clear the error display. Make sure that the standard gas concentration setting value is correct and that the calibration gas flow rate is normal. Then perform the calibration again. Check the IP current with N2 (normally ± 0.5mA). Check the following value. (IPAir－IPN2／21＝ka) （normally 0.1～0.5）
E-60	All output ranges are “Not used”.	Range entry error	Press the DOT ⦿ key to clear the error display. Change any one of the output ranges (No.1～4) into other than “Not used”.
E-63	“Not used” range is selected.	Range entry error or range selection error	Press the DOT ⦿ key to clear the error display. Select a range other than “Not used”.

⚠ **The O_2 analyzer needs to be sent to the maker for repair if all the actions listed above should fail.**

6. Reference data

6-1 Standard specification

Model	DTF-201R		
Measurement principle	Zirconia limiting current method		
Measuring range	RX-622310-AA＊＊＊＊：0～5，0～10，0～25%O2		
	RX-622310-AB＊＊＊＊：-3～5，-6～10，-15～25%O2		
Output	DC4 - 20 mA (non-insulated output, load resistance 600 Ω or less)		
	DC0 - 1 V (non-insulated output, load resistance 100 KΩ or above)		
Repeatability	±0.5% FS (0 to 10 % range)		
Linearity	±1% FS (0 to 10 % range)		
Response time	10 sec. or less (90% response for calibration gas switching)		
Warming-up time	Approx.3 min		
Ambient temperature	0 - 50℃		
Humidity	90% RH or less		
Power supply	AC85 – 132V 50/60Hz		
	AC170 – 264V 50/60Hz		
Conditions of Sample gas	O2	%	-15～25
	CO2	%	0～20
	H2	%	CO+H2：15% or less
	CO	%	H2O＞CO+H2　Besides, the thing which doesn't have combustible gas. It is heated when it has condensation.
	H2O	%	
	SOx	ppm	500 or less
	NOx	ppm	500 or less
	HCl	ppm	1 or less
	NH3	ppm	1 or less
	HF	ppm	1 or less
	Cl2	ppm	1 or less
	Others		
	N2	%	Bal.

※Please check the nameplate exact supply voltage

The contents of this manual are subject to change without notice for improvement.

ENERGY SUPPORT

For inquiries regarding product handling, please contact us or our distributors.
Inquiry form URL：https://www.energys.co.jp/english/inq/all.php
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