Instruction Manual

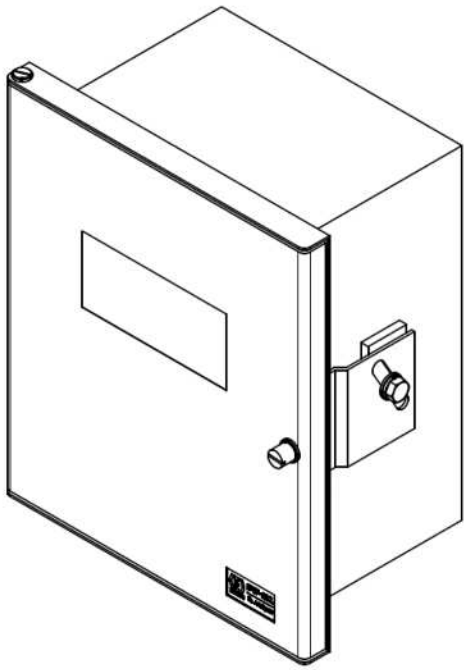
DTF-102 Receiver

Type：DTF-102

No.-3243E R2

【Product】

・DTF-102 Receiver ：KX-621038-XXXXXX



ENERGY SUPPORT

Preface

This manual is written for those who handle DTF-102 type receiver. Be sure to read this manual before using the product to ensure proper and safe operation of the product.
In particular, be sure to read "For Your Safety" and use the product correctly. And keep it in a place where anyone using this product can view it at any time.
The contents of this manual are subject to change without notice for improvement.
Please refer to the latest instruction manual when using.
If you find any unclear points, errors, omissions, etc. regarding the contents of this manual, please contact us or our distributors.

Product Applications

Consult with us in advance regarding use for the following purposes.

- Radiation-related equipment
- Nuclear applications
- Medical use
- Uses that have a large impact on important property or rights
- Other uses related to life and body

Scope of Liability and Warranty

[Warranty Period]

1 year after delivery

*If a separate warranty period is stipulated in a document such as a delivery specification, the contract shall take precedence.

[Warranty Conditions]

During the warranty period, if a failure occurs due to our responsibility, we will provide a substitute or replacement part or repair the delivered product free of charge.
However, the following cases are not covered by the warranty.

*If a separate warranty period is stipulated in a document such as a delivery specification, the contract shall take precedence.

- When used in environments other than those specified in this manual
- Failure to follow the instructions in this manual or use in a manner other than that described in this manual
- In case of failure due to incorrect operation
- If the product is repaired, processed, remodeled, or disassembled by anyone other than us or someone authorized by us
- When used in combination with parts other than our company
- In the event of a disaster beyond our responsibility, such as a natural disaster
- In case of damage, breakage, or failure due to dropping or transportation after purchase
- Failure due to corrosion, rust, etc. Deterioration of appearance.
- Consumable parts

[Warranty Scope]

The scope of warranty is limited to our products.

Regardless of the warranty period, our company does not take any responsibility for the following.

Indirect damage due to failure of our products or unforeseen defects by our company (Loss of profit, opportunity loss, compensation for damage or failure to products other than those supplied by us, compensation for other operations, compensation for accidents, etc.).

About This Instruction Manual

- Deliver this manual to the final user.
- The contents of this manual are subject to change without notice for improvement.
- Unauthorized reproduction or duplication of part or all of the contents of this manual is strictly prohibited.
- If you find any unclear points, errors, omissions, etc. regarding the contents of this manual, please contact us or our distributors.

About Related document

Related documents are below.

- TF-10 Type Probe Transmitter Instruction Manual No.-3071-*
- TF-III Type Probe Transmitter Instruction Manual No.-3064-*, 3144-*, 3231-*, 3223-*
- TF-IV Type Probe Transmitter Instruction Manual No.-3066-*, 3068-*

Description in This Manual

Note

- This interprets the necessary points for correct operation and notifies the important points for handling the product.

Refer

- This indicates the part where to refer for information.

Tip

- This indicates reference information.

Notation of the Figure

The figures in this manual may be emphasized, simplified, or partially omitted for convenience of explanation. Pictures such as screens may differ from the actual display. In addition, the contents described may be "display examples".

Trademarks

Company names and brand names are either registered trademarks or trademarks of the respective companies. (R), (TM) symbols may be omitted in this manual.

Original language

This is the English translation of an original Japanese document.

Disposal of the Product

When disposing of the product, comply with local regulations.

For Your Safety

Warning messages given here are for safe and correct use of the product and for prevention of harm or damage. These are important safety note, so be sure to read it carefully before use and be sure to observe it.

The meanings of the symbols are as follows.

⚠ DANGER	This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This is to be limited to the most extreme situations.
⚠ WARNING	This indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

When deciding on the "Installation Location"	
⚠ DANGER	**Explosion or Fire** ● This product is not explosion-proof. Do not use in an explosive gas atmosphere. ● When using a standard gas cylinder, install or store the standard gas cylinder in a location with an ambient temperature of 40°C or less and out of direct sunlight.
⚠ CAUTION	**Injury, Malfunction or Damage** ● Install in a location that satisfies the installation location conditions described in "Table 3-1 Installation location".

When "Installing" or "Transporting"	
⚠ CAUTION	**Fall, Damage or Injury** ● Installation work correctly according to the instruction manual. ● Tighten screws with the appropriate tightening torque. Insufficient tightening may cause damage or drop. Also, if it is tightened too much, it may not be possible to remove it.

When "Wiring"	
⚠ WARNING	**Fire, Electric shocks, Malfunction** ● Wiring work should be done by a person with appropriate technical training and experience. ● Use the power supply at the rated voltage. ● Be sure to turn OFF the main power supply before performing wiring connection work or wiring check. ● Connect grounding. ● Do not apply an excessive load to the cables and cord, such as bending and stretching them repeatedly, putting a heavy thing on them. ● Use appropriate wiring material according to the rating of the device.

When "Starting measurement" or "Maintenance work"

⚠ WARNING	**Fire, Electric shocks, Malfunction** ● Be sure to turn OFF the main power supply before performing wiring connection work or wiring check. ● Before turning ON the power, make sure that the power wiring is properly connected. ● If the fuse blows, check the cause and replace it with one of the same capacity and type. Also, when replacing the fuse, be sure to turn OFF the main power supply before starting work. ● Be sure to use parts specified by our company for replacement parts and consumables.

Other

⚠ CAUTION	**Fire, Electric shocks, Injury or Damage** ● In the event of a failure that cannot be determined by looking at the instruction manual, be sure to contact our company or the agency where you purchased the product, and request repairs if necessary.

Product Handling Information

If this product is used in a manner not specified by us, it may impair the protective functions and performance provided by this product. It is strictly prohibited to modify the product by the customer. Observe the following precautions.

General

- Use in a manner not specified in this manual may impair the protection provided by this product.
- Do not disassemble the parts other than those specified in this manual.
- Do not modify by the customer.
- Do not use accessories other than this product.
- Even if the temperature is within the range of the ambient temperature specification of this product, the life of the product may be shortened if it is used in a constantly high ambient temperature environment.
- This product is intended for industrial environments. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Precautions during construction

- Install the product in a location where the required space can be secured. If space is not secured, daily inspections and maintenance will not be possible, leading to equipment stoppages and product damage.

Notes on settings

- When using the product for the first time or after replacing the sensor, always setting the sensor parameters to receiver. The parameter settings to be used, see the inspection report.

Type：DTF-102

Product Name：DTF-102 Receiver

Table of Contents

1 Overview

1.1 About This Product

This product is a control device that drives and controls the oxygen sensor in an oxygen analyzer that uses a limiting current type zirconia oxygen sensor, and is responsible for concentration calculation and output. It is used in combination with our oxygen sensor (transmitter).
Since the oxygen sensor of this analyzer does not require pretreatment of the measurement gas, it is smaller and has a faster response speed than conventional sampling-type devices equipped with a pretreatment device.
In addition, since calibration can be performed using only "instrumentation air" using compressed air, which is commonly found in factories and ships, there is the advantage of not needing to install or manage standard gas cylinders.

1.2 Products and Accessories

When you receive the product, open the package and check for any shipping damage.
Also, make sure that the delivered items and accessories are correct.

Table 1-1 Supply Parts List (one set)

Name	No.	Q'ty	Remarks
Receiver	KX-621038-XXXXXX	1	

If Receiver is delivered in a unit case or mounted on an independent panel, refer to the supply parts list of the delivery specifications.

Table 1-2 Option Parts List

Name	No.	Q'ty	Remarks
Stand mounting bracket	KS-224193	1	For detail, see "3.3.3 Stand Mount".

1.3 Temporary Storage

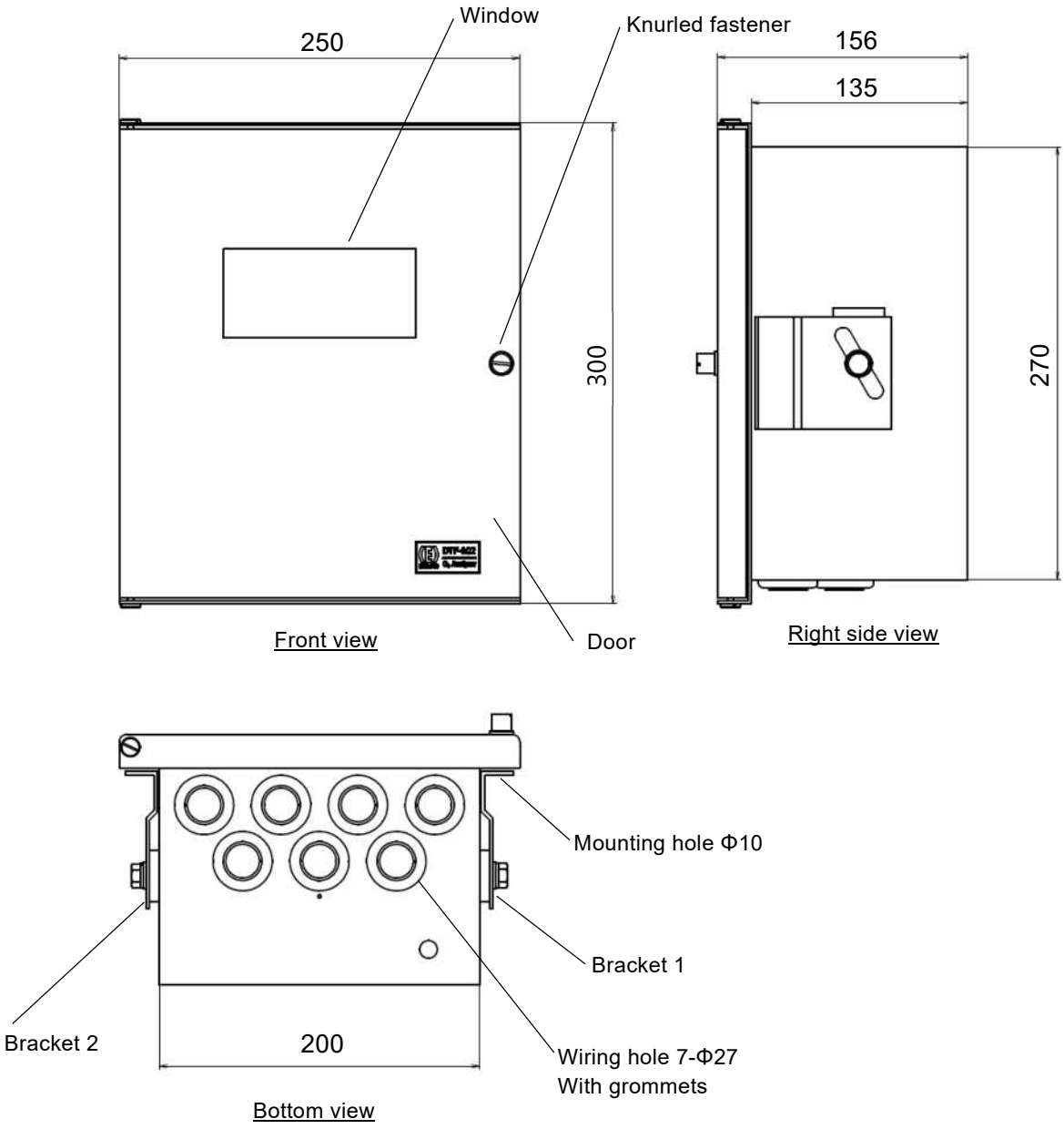
When storing the product temporarily prior to installation, observe the following conditions.

- Away from direct sunlight.
- The ambient temperature is between -10℃ and 50℃, with little variation in temperature.
- There is little humidity and dust.
- The location is not exposed to rainfall.
- There is little mechanical vibration.
- There are no corrosive gases or dangerous gases.

2 Part Names

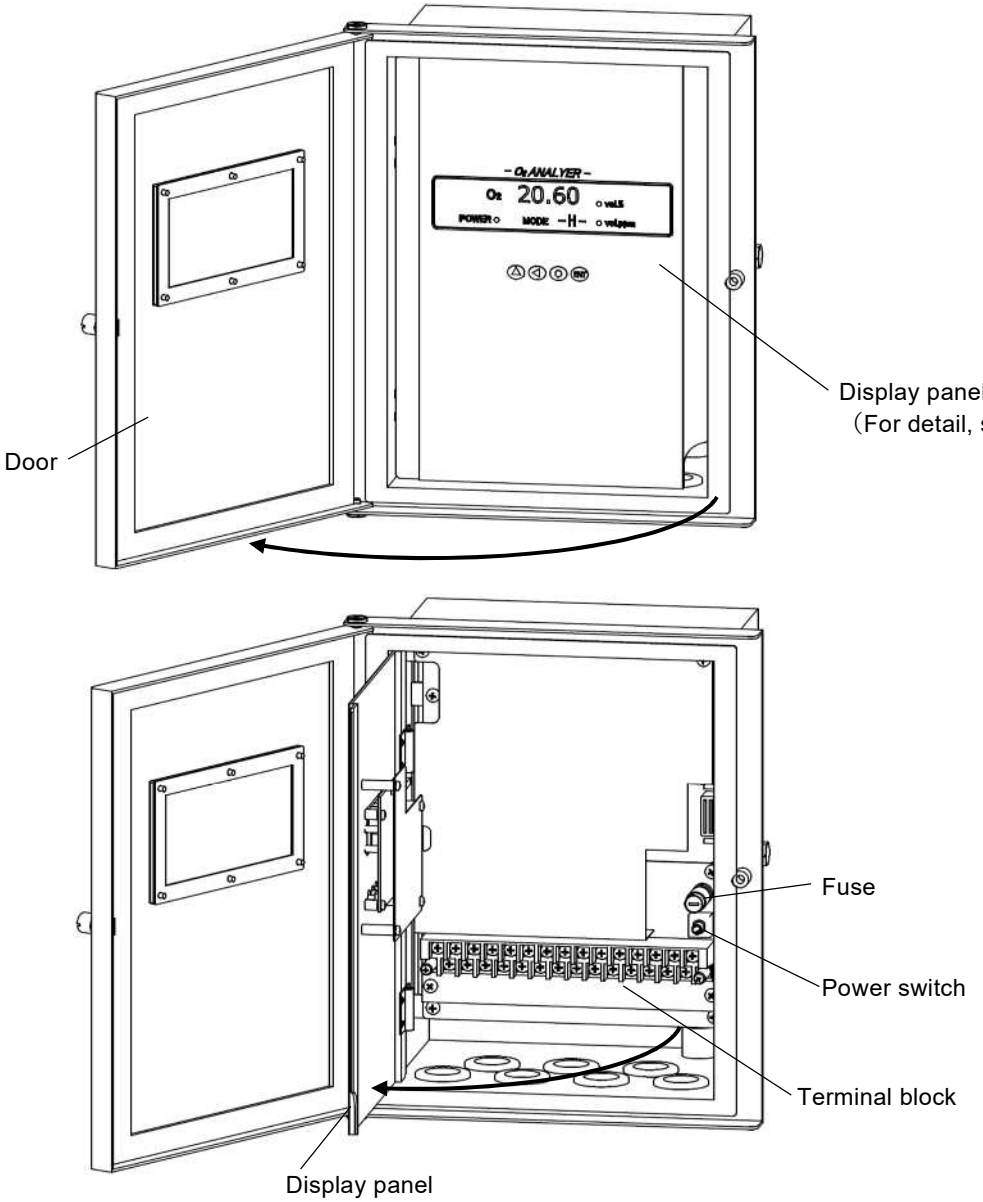
2.1 Receiver

【Dimensions】

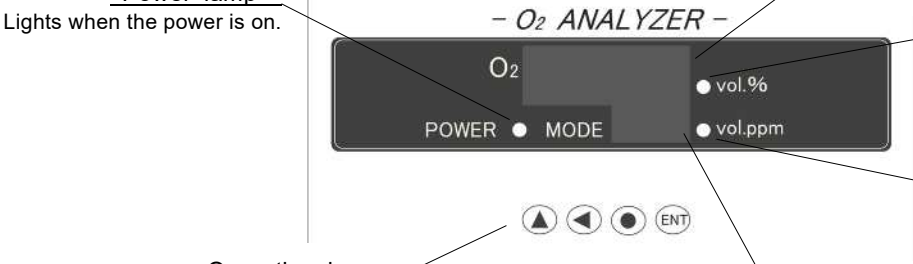


*Dimensional tolerances without individual tolerance indications are according to JEM 1459.

【Inside】



【Display Panel】



Display 1
"Oxygen concentration", "Setting data", "Error code" and "Countdown" are displayed.

Power lamp
Lights when the power is on.

% lamp
Lights when the concentration unit is %.

ppm lamp
Lights when the concentration unit is ppm.

Operation key
Used for setting sensor parameters, changing/checking various settings, and releasing errors.

Display 2
"Output range", "CH No.", "States of Analyzer", "Concentration upper limit alarm", "Concentration lower limit alarm" are displayed.

3 Installation

This product is a device that controls Oxygen Sensor and calculates and outputs concentration.
In order to measure the oxygen concentration, connect our company's zirconia Oxygen Sensor and use it by constructing piping related parts. A typical system configuration example is shown below.

3.1 System Configuration Example

Note

- Confirm the delivery specifications for scope of delivery and actual system configuration.

3.1.1 System Configuration Example 1

This system is an example of using "TF-10 Probe Transmitter" as an oxygen sensor to measure the oxygen concentration in flue gas from a boiler, etc. Manually operated valves such as needle valve and ball valve are used for calibration gas lines. At the time of calibration, after manually operating the valve to supply the calibration gas, calibration is executed by key operation on the receiver.
Use instrument air or atmospheric gas for calibration. （Calibration using standard gas cylinders such as zero gas and span gas is not required.）

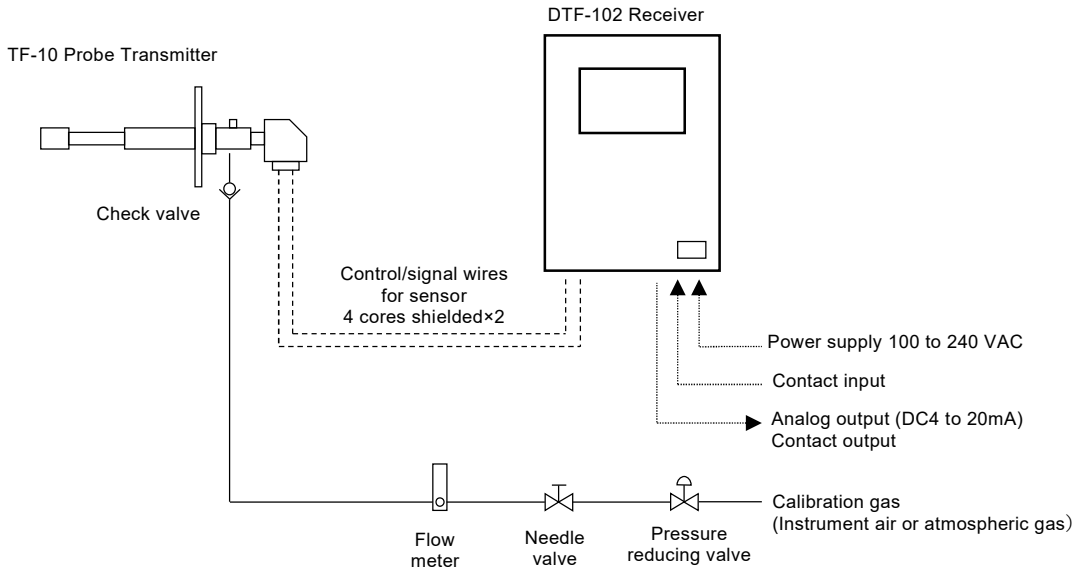


Fig. 3-1 System Configuration Example 1

3.1.2 System Configuration Example 2

This system is an example of using "TF-10 Probe Transmitter" as an oxygen sensor to measure the oxygen concentration in flue gas from a boiler, etc. A solenoid valve is installed in the calibration gas line, and the contact output of the receiver is used to open and close the solenoid valve. Calibration can be performed by methods such as "receiver key operation", "contact input", and "receiver internal timer". Use instrument air or atmospheric gas for calibration. （Calibration using standard gas cylinders such as zero gas and span gas is not required.）

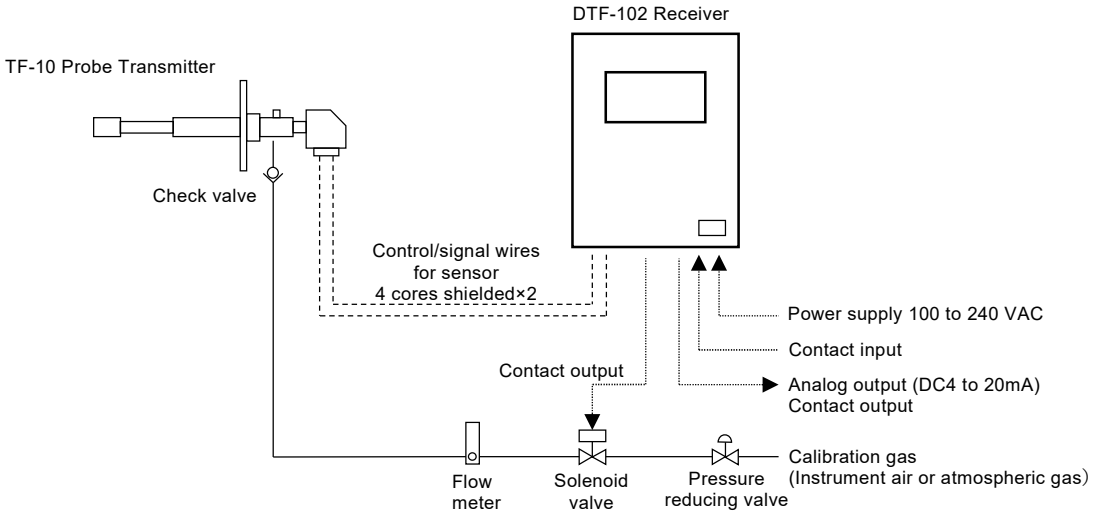


Fig. 3-2 System Configuration Example 2

3.1.3 System Configuration Example 3

This system uses a TF-III type probe transmitter as an oxygen sensor, to measure the oxygen concentration in high-temperature flue gas in a heating furnace. In addition to calibration gas piping, ejector air piping and purge air piping are used. Since the calibration gas and purge air are operated by opening and closing the solenoid valve using the contact output of the receiver, calibration and purge can be performed by methods such as "receiver key operation", "contact input", and "receiver internal timer". Use instrument air gas for calibration. （Calibration using standard gas cylinders such as zero gas and span gas is not required.） The TF-III type probe transmitter uses a separate power supply and temperature control device for heating and keeping warm in order to prevent dew condensation in the sampling section.

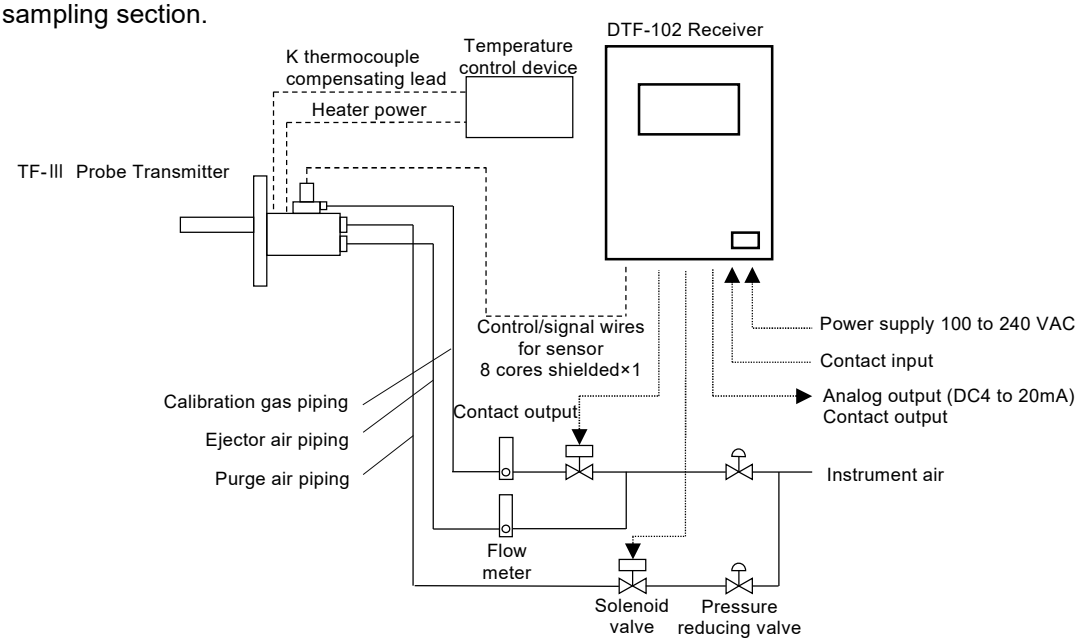


Fig. 3-3 System Configuration Example 3

3.2 Place Conditions for Installation

When deciding on the "Installation Location"	
⚠ DANGER	**Explosion or Fire** ● This product is not explosion-proof. Do not use in an explosive gas atmosphere. ● When using a standard gas cylinder, install or store the standard gas cylinder in a location with an ambient temperature of 40°C or less and out of direct sunlight.
⚠ CAUTION	**Injury, Malfunction or Damage** ● Install in a location that satisfies the installation location conditions described in "Table 3-1 Installation location".

Note

- Even if the temperature is within the range of the ambient temperature specification of this product, the life of the product may be shortened if it is used in a constantly high ambient temperature environment.
- Install the product in a location where the required space can be secured. If space is not secured, daily inspections and maintenance will not be possible, leading to equipment stoppages and product damage.
- This product is intended for industrial environments. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

For safe, correct use of your oxygen analyzer, install the analyzer in a location with the following conditions to provide the best possible installation conditions.

- Not caused condensation by sudden temperature fluctuations.
- Not directly exposed to much radiated heat.
- Not significantly affected by electromagnetic fields.
- Not exposed to much moisture and/or dust.
- Little voltage fluctuation.
- Little power frequency fluctuation.
- Meeting the following conditions "Table 3-1 Installation Conditions":

Table 3-1 Installation Conditions

Item	Spec.
Installation location	Indoor
Ambient temperature	-10˚C to +50˚C
Ambient humidity	90％RH or less (Not condensation)
Environmental protection	No waterproof structure

For the installation location conditions of the oxygen sensor (transmitter), check the instruction manual of the oxygen sensor (transmitter) to be used.

3.3 Installing the Receiver

When "Installing" or "Transporting"	
⚠ CAUTION	**Fall, Damage or Injury** ● Installation work correctly according to the instruction manual. ● Tighten screws with the appropriate tightening torque. Insufficient tightening may cause damage or drop. Also, if it is tightened too much, it may not be possible to remove it.

3.3.1 Panel Mount

Fit the receiver into the panel cutout.
Attach Bracket 1 and Bracket 2 in the direction shown in Fig. 3-5 to hold the panel down.

Panel thickness range：1.6~3.2 mm

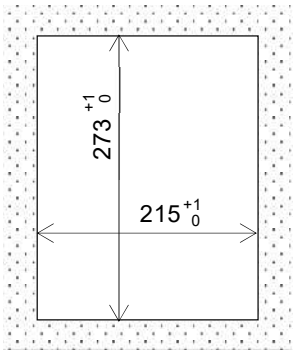


Fig. 3-4 Panel Cutout Dimensions

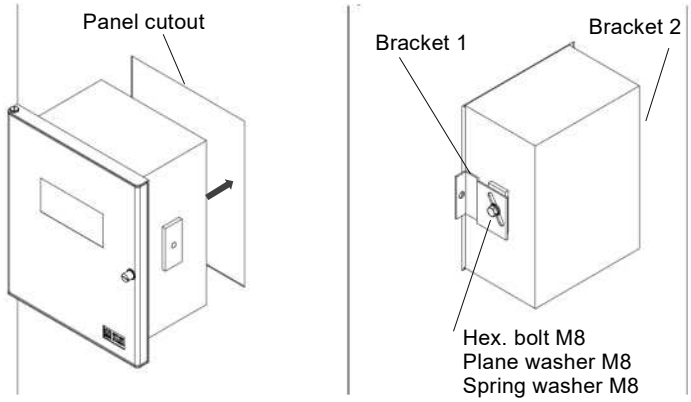


Fig. 3-5 Panel Mount

3.3.2 Wall Mount

Attach Bracket 1 and Bracket 2 in the direction shown in Fig. 3-6, fix them to the structure on the rear side of the receiver.
*Bolts for mounting to the rear side structure are not supply.
Prepare by yourself.

Note

- Install on a structure with sufficient strength to support the receiver.
  Receiver weight：Approx. 6.5 kg

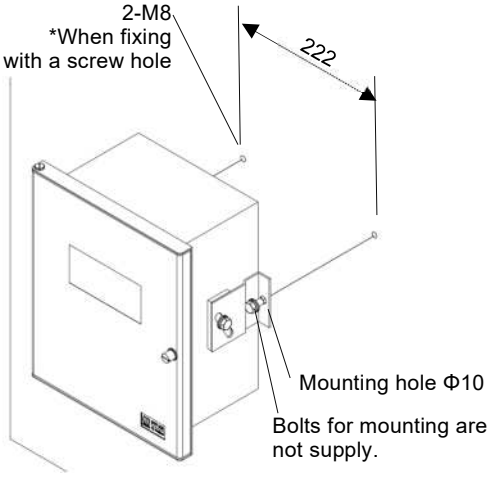


Fig. 3-6 Wall Mount

3.3.3 Stand Mount

An optional stand mounting bracket is required to mount the receiver on a 50A pole.
Attach Bracket 1 and Bracket 2 in the direction shown in Fig. 3-7.
And attach to the pole with the Stand Mounting Brackets 1 and 2.

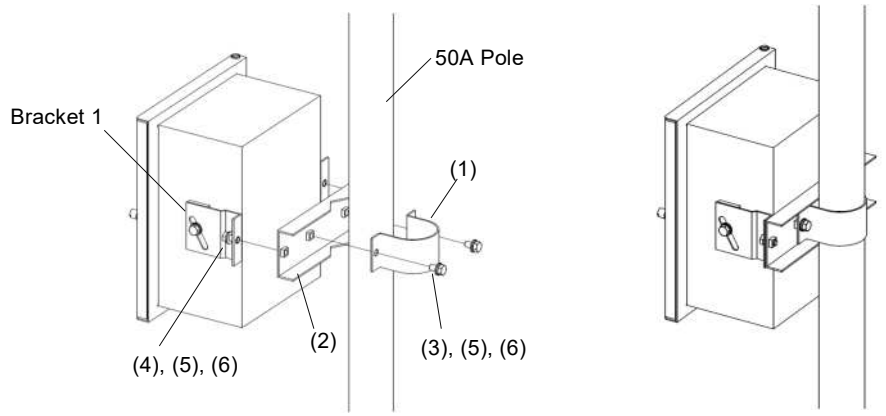


Fig. 3-7 Stand Mount

Stand Mounting Bracket (Option Parts)

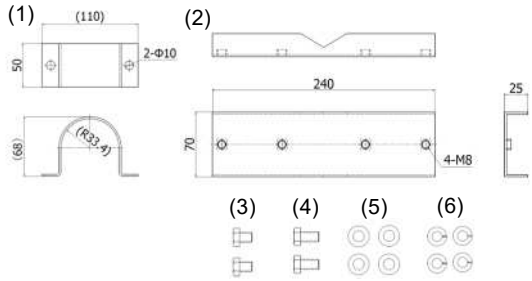


Fig. 3-8 Stand Mounting Bracket

Table 3-2 Parts List of Stand Mounting Bracket

Symbol	Parts Name	Q'ty	Remarks
(1)	Stand mounting bracket 1	1	
(2)	Stand mounting bracket 2	1	
(3)	Hex. bolt	2	M8 L = 10
(4)	Hex. bolt	2	M8 L = 15
(5)	Plane washer	4	M8
(6)	Spring washer	4	M8

3.4 Connecting Wires

When "Wiring"

WARNING

Fire, Electric shocks, Malfunction

- Wiring work should be done by a person with appropriate technical training and experience.
- Use the power supply at the rated voltage.
- Be sure to turn OFF the main power supply before performing wiring connection work or wiring check.
- Connect grounding.
- Do not apply an excessive load to the cables and cord, such as bending and stretching them repeatedly, putting a heavy thing on them.
- Use appropriate wiring material according to the rating of the device.

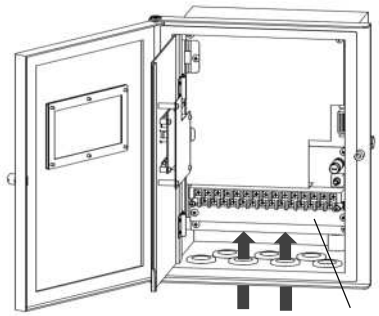
3.4.1 Connecting to Terminal Block

Pass wires through the wiring hole on the bottom of the receiver.
Connect to the terminal block by referring to "Fig. 3-9 Terminal Block Arrangement Diagram" and "Table 3-3 Terminal Block Compatibility".

-Terminal size：M4
-Applicable crimp terminal outer diameter：Max.8.5 mm

Note

- The wiring port is a Φ27 hole with a grommet. Implement the dust-proof and water-proof treatment after wiring by yourself.



IN1	IN2	VS+	IP+	H+	S+	OUT+	RY1	RY2	RY3	RY4A	RY4B		POWER	POWER
COM	IN3	VS-	IP-	H-	S-	OUT-	RY1	RY2	RY3	RY4A	RY4B		E	

Fig. 3-9 Terminal Block Arrangement Diagram

Table 3-3 Terminal Block Compatibility

Item	Symbol	Contents	Item	Symbol	Contents
Contact Input	IN1	Input No-voltage contact Operating current 5 mA （DC 24 V is applied)	Analog Output	OUT+	DC 4-20 mA Isolated output Load resistance 550Ω or less
	IN2				
	IN3			OUT-	
	COM	Common for contact input			
Sensor Control / Signal	VS+	Sensing voltage	Contact Output	RY1	No-voltage relay contact Contact capacity AC 250 V 1A Resistive load DC 30 V 1A Resistive load
	VS-			RY2	
	IP+	Sensing current		RY3	
	IP-			RY4A	
	H+	Heater voltage application		RY4B	
	H-		Power	POWER	100-240 VAC ±10% max.50 VA
	S+	Heater voltage measurement		POWER	
	S-		Grounding	E	Grounding terminal

3.4.2 Wiring Connection Example

Fig. 3-10 shows a wiring connection example.

Note

- Wire according to the delivery specifications or the customer's usage.

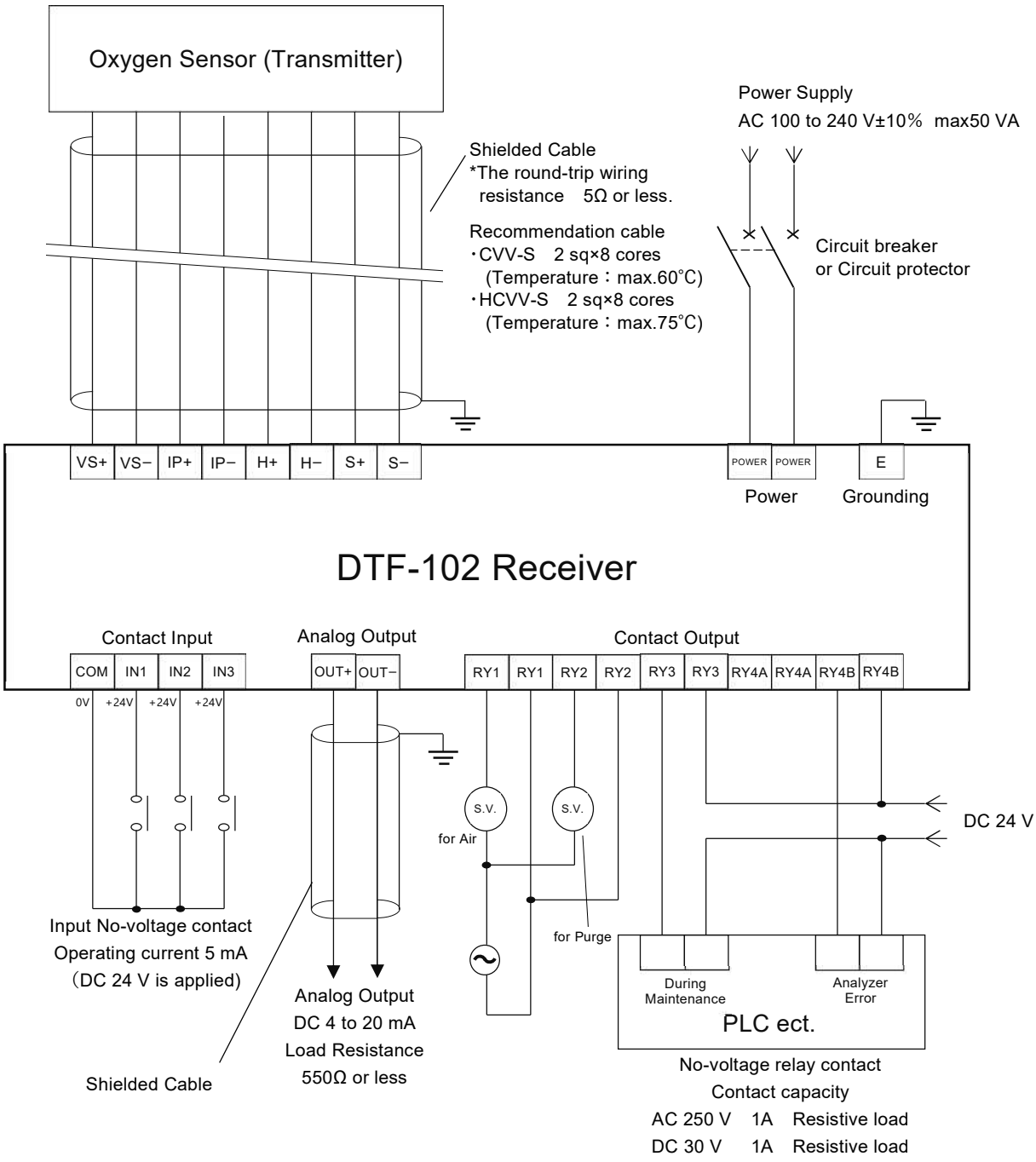


Fig. 3-10 Wiring Connection Example

3.4.3 Wiring Method When Replacing from DTF-101 Receiver

DTF-101 receiver and DTF-102 receiver differ in the number of contact input/output points and the content corresponding to each terminal symbol. When replacing DTF-101 with this product(DTF-102), connect the wiring referring to the following.

【Power line / Analog output line】

There is no change. Connect to terminals with the same terminal symbol as the DTF-101 receiver.

【Contact input line / Contact output line】

Use "3.4.4 Wiring Confirmation Sheet When Replacing from DTF-101 Receiver" to connect contact input and contact output wiring. Here are the steps:

1. Check the input/output settings of the existing receiver

Check the contact input and contact output details from t product number (CAT NO.) of DTF-101 receiver. The product number is indicated on the rating plate of the receiver. (The rating plate is pasted on the inside of the door.)

2. Check the input/output you are actually using

Check the terminal symbols that are actually wired to the terminal block of the DTF-101 receiver. Enter the input/output items in the columns of "Used contact input items" and "Used contact output items" only for the terminals that are wired. Even if contact input/output is set, there is no need to wire the replacement receiver (DTF-102) because the terminals that are not actually wired are not used.

3. Check the input/output settings of the DTF-102 receiver

Check the contact input and contact output contents from the replacement receiver (DTF-102) product number (CAT NO.). Described in the "DTF-102 contact input setting" and "DTF-102 contact output setting" columns.

4. Relocate the wiring to the corresponding terminal on the DTF-102 receiver

Move the wiring to the terminals of the DTF-102 receiver that have the same items as the "contact input items in use" and "contact output items in use".

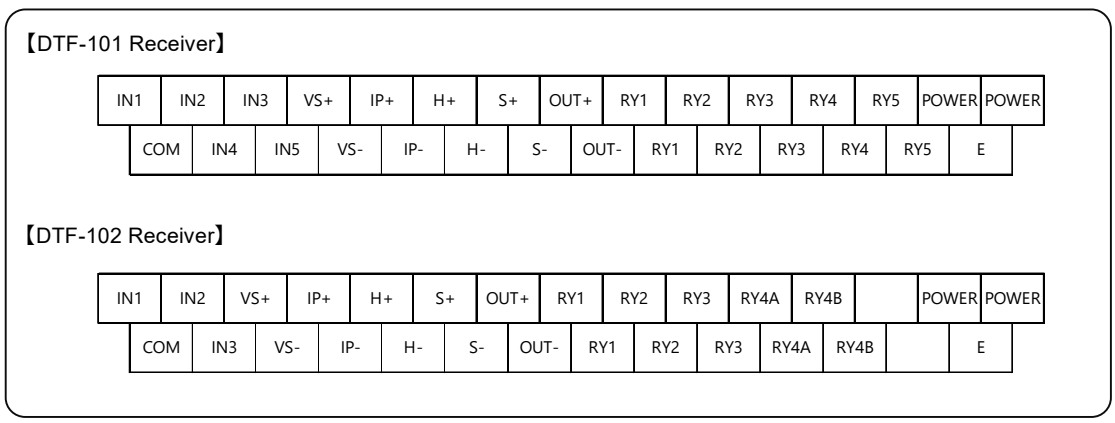


Fig. 3-11 Terminal block arrangement diagram of DTF-101 receiver and DTF-102 receiver Wiring Connection Example

3.4.4 Wiring Confirmation Sheet When Replacing from DTF-101 Receiver

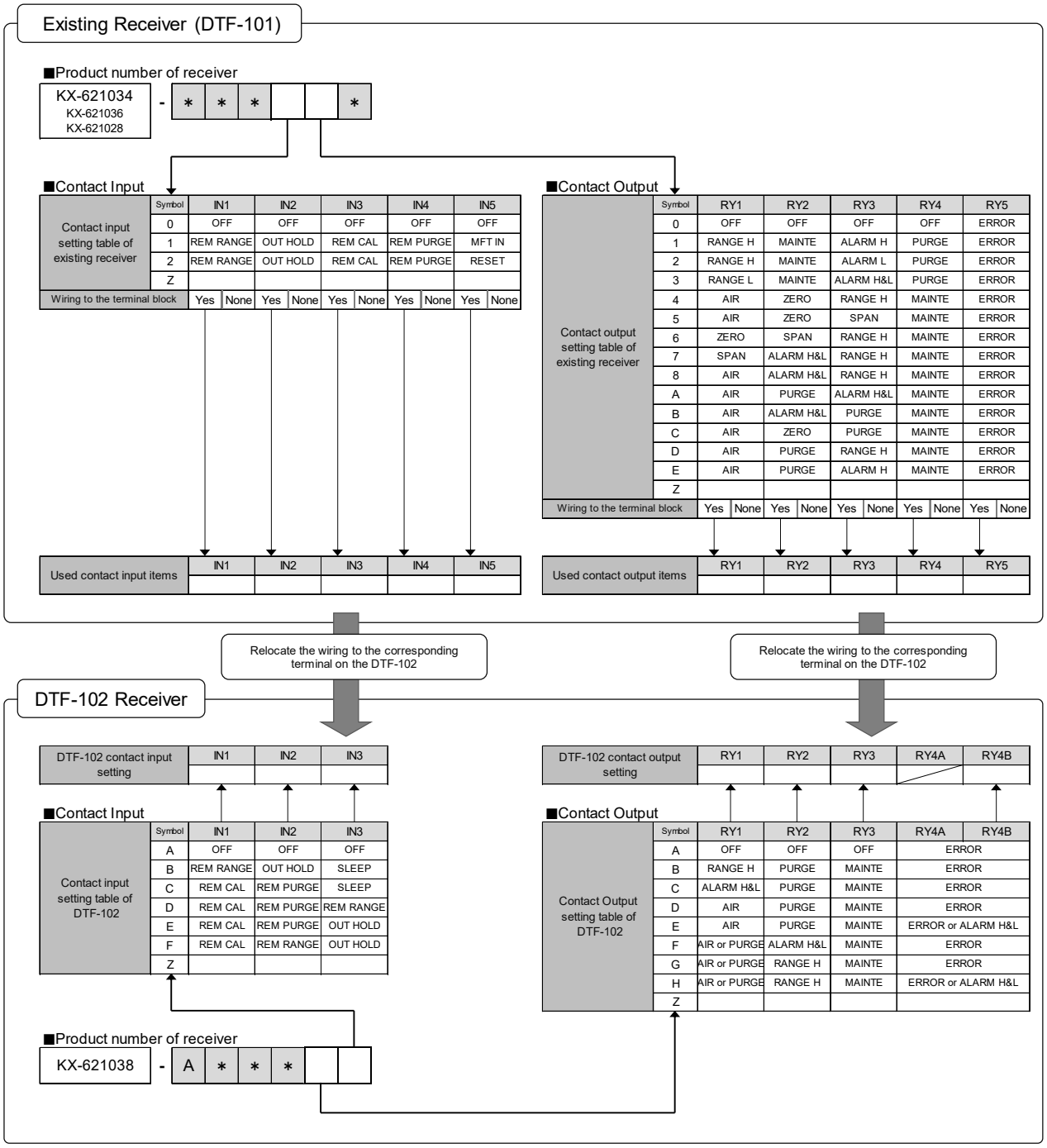


Fig. 3-12 Wiring Confirmation Sheet When Replacing from DTF-101 Receiver

- "MFT IN" of DTF-101 receiver corresponds to "SLEEP" of DTF-102 receiver.
- "RESET" of the DTF-101 receiver is not supported by the DTF-102 type receiver.
- If "Z" is used in the product number, check the contact input/output items in the delivery specifications.
- If the same solenoid valve is driven using the contact output of "AIR" and "Purge" in the existing equipment, With the DTF-102 receiver, it is possible to aggregate into one contact output by using "AIR or PUREG".
- If you are using the contact output of "ERROR" and "ALARM H&L" in the existing equipment, by using "ERROR or ALARM H&L" on the DTF-102 receiver, it is possible to aggregate into one contact output.

【Wiring confirmation sheet　usage example 1 】

◇Usage example conditions

- Product No. of existing receiver　: KX-621034-A3D180
- Wiring location of existing receiver　: IN3、RY1、RY4、RY5
- Product No. of DTF-102 receiver　: KX-621038-ACFADC

Existing Receiver (DTF-101)

■Product number of receiver

KX-621034 / KX-621036 / KX-621028 - A 3 D 1 8 0

■Contact Input

Contact input setting table of existing receiver	Symbol	IN1	IN2	IN3	IN4	IN5
	0	OFF	OFF	OFF	OFF	OFF
	(1)	REM RANGE	OUT HOLD	REM CAL	REM PURGE	MFT IN
	2	REM RANGE	OUT HOLD	REM CAL	REM PURGE	RESET
	Z					
Wiring to the terminal block		Yes (None)	Yes (None)	(Yes) None	Yes (None)	Yes (None)

■Contact Output

Contact output setting table of existing receiver	Symbol	RY1	RY2	RY3	RY4	RY5
	0	OFF	OFF	OFF	OFF	ERROR
	1	RANGE H	MAINTE	ALARM H	PURGE	ERROR
	2	RANGE H	MAINTE	ALARM L	PURGE	ERROR
	3	RANGE L	MAINTE	ALARM H&L	PURGE	ERROR
	4	AIR	ZERO	RANGE H	MAINTE	ERROR
	5	AIR	ZERO	SPAN	MAINTE	ERROR
	6	ZERO	SPAN	RANGE H	MAINTE	ERROR
	7	SPAN	ALARM H&L	RANGE H	MAINTE	ERROR
	(8)	AIR	ALARM H&L	RANGE H	MAINTE	ERROR
	A	AIR	PURGE	ALARM H&L	MAINTE	ERROR
	B	AIR	ALARM H&L	PURGE	MAINTE	ERROR
	C	AIR	ZERO	PURGE	MAINTE	ERROR
	D	AIR	PURGE	RANGE H	MAINTE	ERROR
	E	AIR	PURGE	ALARM H	MAINTE	ERROR
	Z					
Wiring to the terminal block		(Yes) None	Yes (None)	Yes (None)	(Yes) None	(Yes) None

Used contact input items	IN1	IN2	IN3	IN4	IN5
	——	——	*REM CAL*	——	——

Used contact output items	RY1	RY2	RY3	RY4	RY5
	AIR	——	——	*MAINTE*	*ERROR*

DTF-102 Receiver

DTF-102 contact input setting	IN1	IN2	IN3
	REM CAL	*REM PURGE*	*SLEEP*

DTF-102 contact output setting	RY1	RY2	RY3	RY4A	RY4B
	AIR	*PURGE*	*MAINTE*		*ERROR*

■Contact Input

Contact input setting table of DTF-102	Symbol	IN1	IN2	IN3
	A	OFF	OFF	OFF
	B	REM RANGE	OUT HOLD	SLEEP
	(C)	REM CAL	REM PURGE	SLEEP
	D	REM CAL	REM PURGE	REM RANGE
	E	REM CAL	REM PURGE	OUT HOLD
	F	REM CAL	REM RANGE	OUT HOLD
	Z			

■Contact Output

Contact Output setting table of DTF-102	Symbol	RY1	RY2	RY3	RY4A	RY4B
	A	OFF	OFF	OFF	ERROR	
	B	RANGE H	PURGE	MAINTE	ERROR	
	C	ALARM H&L	PURGE	MAINTE	ERROR	
	(D)	AIR	PURGE	MAINTE	ERROR	
	E	AIR	PURGE	MAINTE	ERROR or ALARM H&L	
	F	AIR or PURGE	ALARM H&L	MAINTE	ERROR	
	G	AIR or PURGE	RANGE H	MAINTE	ERROR	
	H	AIR or PURGE	RANGE H	MAINTE	ERROR or ALARM H&L	
	Z					

■Product number of receiver

KX-621038 - A C F A D C

【DTF-101】

IN1	IN2	IN3	VS+	IP+	H+	S+	OUT+	RY1	RY2	RY3	RY4	RY5	POWER	POWER
COM	IN4	IN5	VS-	IP-	H-	S-	OUT-	RY1	RY2	RY3	RY4	RY5	E	

【DTF-102】

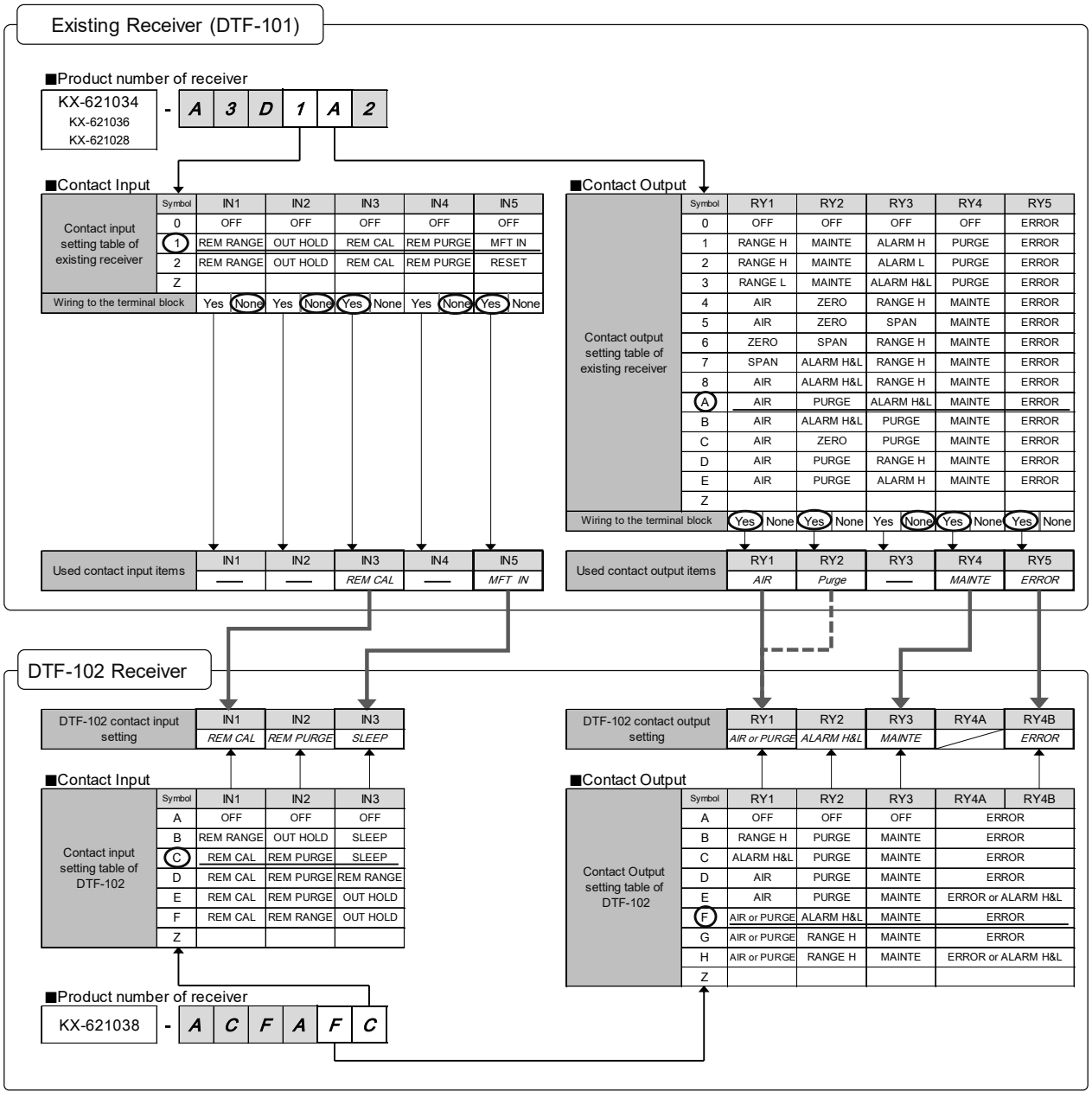
IN1	IN2	VS+	IP+	H+	S+	OUT+	RY1	RY2	RY3	RY4A	RY4B		POWER	POWER
COM	IN3	VS-	IP-	H-	S-	OUT-	RY1	RY2	RY3	RY4A	RY4B		E	

Fig. 3-13　Wiring for usage example 1 (contact input/output only)

【Wiring confirmation sheet　usage example 2 】

◇Usage example conditions

- Product No. of existing receiver　: KX-621034-A3D1A2
- Wiring location of existing receiver　: IN3、IN5、RY1、RY2、RY4、RY5
- Product No. of DTF-102 receiver　: KX-621038-ACFAFC



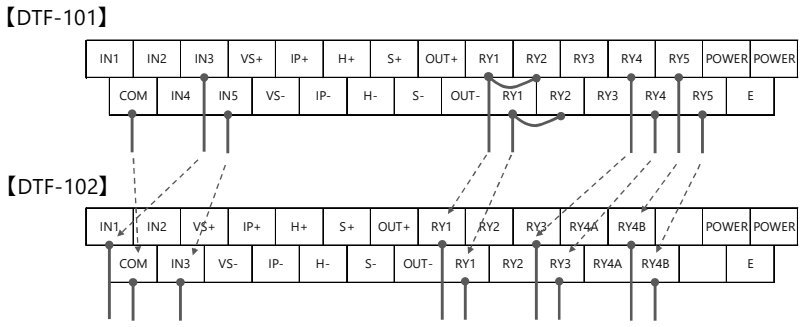


Fig. 3-14　Wiring for usage example 2 (contact input/output only)

4 Measurements

When "Starting measurement"

⚠ WARNING	**Fire, Electric shocks, Malfunction** ● Before turning ON the power, make sure that the power wiring is properly connected.

Note

- Be sure to check the safety precautions for the oxygen sensor (transmitter) to be used before starting to use it.

4.1 Necessary Steps before Starting

When using the product for the first time or after replacing the sensor, always perform following before starting measurement.

- Setting the sensor parameters
- Air Point Calibration

Refer

- For Air Point Calibration method, see “5 Calibration”.

4.1.1 Setting Items of Sensor Parameters

Set the sensor parameters of the sensor connected to the receiver.
There are two sensor parameters that need to be set: “Linearizer No.” and “Heater normal temp resistance”.
For setting value of sensor parameters, see inspection report that attached the product.

Table 4-1 Sensor Parameters that Need to be Set

Item	CH No.	Set value	Remarks
Linearizer No.	143	See inspection report	
Heater normal temp resistance	192	See inspection report	If "Heater normal temp resistance" is not listed in "Inspection report", no setting is required.

Refer

- Detail of setting method, see “4.3.5 Data Setting/Checking Method”.

4.2 Starting and Stopping Measurement

● Starting Measurement

After turn the power supply ON, this analyzer goes through 3-minutes countdown (temperature rise) to enter measurement state. And display the oxygen concentration, output the analog output (4-20 mA). However, in order to make stable measurements, warm up the instrument sufficiently before using it.

warm-up time as a guide：Approx. 2 hours

Note

- If the ambient temperature is lower than -10°C, turn ON the power after the ambient temperature reaches -10°C or higher.

● Stopping Measurement

The measurement stops when the power supply to the analyzer is turned OFF.

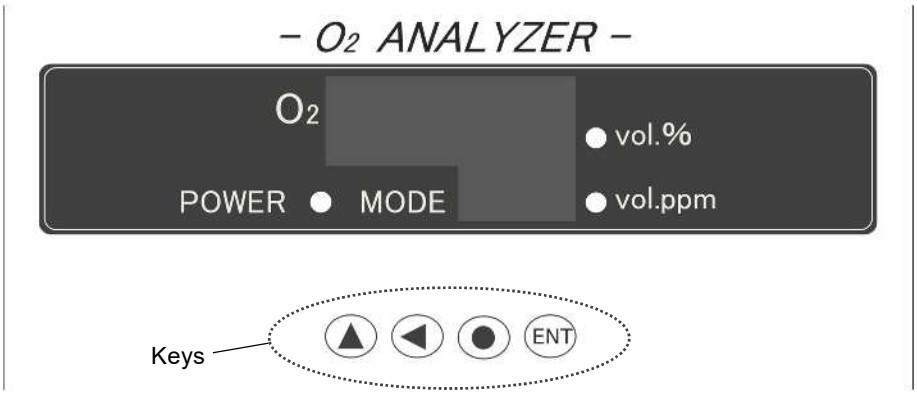
4.3 Key Operation

The key operation is used to setting sensor parameters, calibration operations, recover from error conditions, and change other settings. This is a very important operation, so be sure to check it.

Note

- Key operation may change the oxygen concentration output. Therefore, when using the oxygen concentration output for control purposes, release the control functions before operating the keys.

4.3.1 Explanation of Keys



▲ Key
- Switch from "Normal Display" to "CH No. selection state".
- Change the number of CH No. and setting data.

◀ Key
- Switch from "Normal Display" to "CH No. selection state".
- Moves the CH No. and setting data digit to the left. (The digit that can be changed blinking.)

ENT Key
- Decide CH No. → CH data setting state.
- Decide CH data → CH No. selection state.

● Key
- Switch from "CH No. selection state" to "Normal Display".
- Cancel the CH data setting and move to "CH No. selection state".
- Clear error when an error occurs.
- Insert a decimal point in the blinking digit.
- Switch between plus and minus of setting data.

4.3.2 Display Transition

After the power is turned ON, the display of the receiver changes as shown in Figure 4-1, depending on the state change of the receiver and key operation.

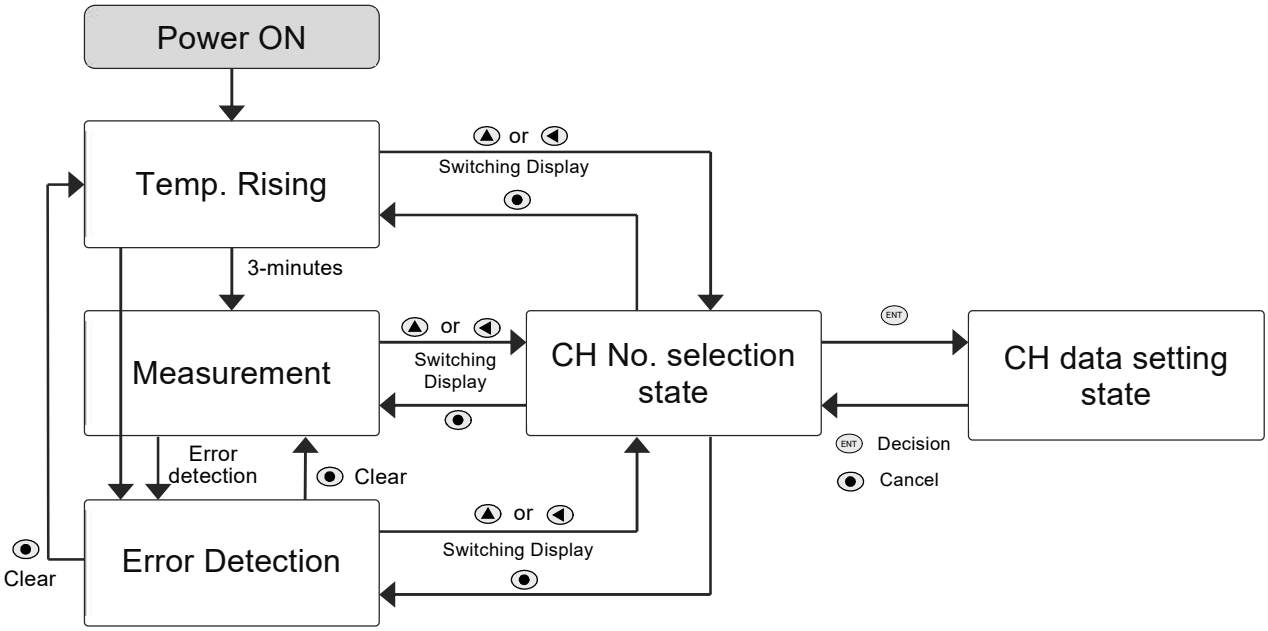
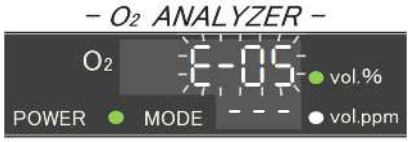


Fig.4-1 Display Transition

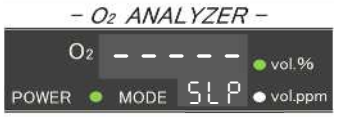
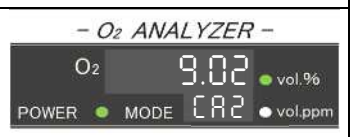
Table 4-2 Display by State of Receiver

States	Contents	Display example
Temp. Rising	3 minutes countdown to completion of temperature rise on display 1	
Measurement	Display 1 : Oxygen concentration measurement Display 2 : Symbol of Analog output range " - H - " : HIGH range " - L - " : LOW range	
Error Detection	Error code on display 1	
CH No. selection state	Display 1 : CH data of selected CH No. Display 2 : CH No. Change the number of CH No. by ▲ · ◀ Key Move to CH data setting state by ENT key	
CH data setting state	Display 1 : CH data of selected CH No. Display 2 : CH No. Change CH data by ▲ · ◀ Key Decide CH data by ENT key Cancel CH data setting by ● Key	

4.3.3 Display by Operating State

Operating states such as Sleep mode, Calibrating, Purging, etc. are indicated by symbols on display 2. In any operating state, the display can be switched to "CH No. selection state" with the ▲ or ◀ keys.

Table 4-3 Display by Operating Sates

Operating states	Contents	Display 2	Display 1	Display example
Sleep Mode	During Sleep Mode	SLP	-----	
Air Point Calibrating	During Air supply at Semi Auto / Auto Calibration	CAA	Measured value	
Zero Point Calibrating	During Zero gas supply at Semi Auto / Auto Calibration	CA1	Measured value	
Span Point Calibrating	During Span gas supply at Semi Auto / Auto Calibration	CA2	Measured value	
Purging ON	During purge air supply at Semi Auto / Auto Purge	Pon	Measured value	
Purging OFF	During purge air not supply at Semi Auto / Auto Purge (interval)	PoF	Measured value	
Recovery Time	During Recovery Time at Semi Auto / Auto Calibration or Semi Auto / Auto Purge	rEC	Measured value	
Manual Output Holding	During Manual Output Holding	HoL	Measured value	
Concentration Upper Limit Alarm	Detecting Concentration Upper Limit Alarm	AH	Measured value	
Concentration Lower Limit Alarm	Detecting Concentration Lower Limit Alarm	AL	Measured value	

Note

- If the operating states in the table overlap, the contents listed in the upper row of the table take precedence.
  e.g.) "Concentration Upper Limit Alarm" and "Manual Out Holding" : indicate "HoL"

4.3.4 Data Settings Overview

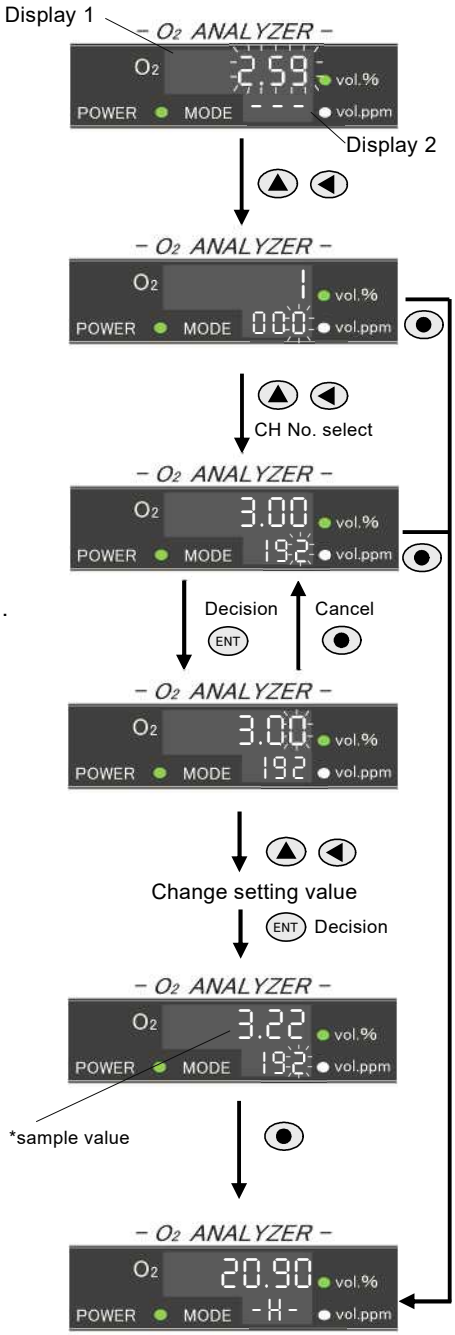
This product has various setting items assigned to each 3-digit CH number.
To change or check the setting value, select the CH No. corresponding to the setting item, and change/check the setting value of that CH No.

Refer

- Detail of CH data, see “7.6 CH Setting Data Table".

4.3.5 Data Setting/Checking Method

The basic operations for setting and checking CH data are as follows.



1. Turn ON the power supply

When the receiver is OFF, turn it ON.
*Data setting and checking are possible even when the sensor is not connected.

2. Switch the display to "CH Data Display"

Press ◀ key or ▲ key to enter "CH No. selection state".
→3-digit number (CH No.) will be displayed on Display 2.
*Immediately after the power is turned ON, it is in Temp. Rising state, but you can switch to the display.

3. Select CH No.

Use ◀ key and ▲ key to change to the CH No. to set the number on Display 2.
→The data of the selected CH No. is displayed on the Display 1.

4. Set CH data

- Set the Display 2 to CH No. to be set and press ENT key to move "CH data setting state".
  (Data of Display 1 blinks by one digit)
- Use ◀ key, ▲ key to change the number on Display 1 to the set value.
- Press ENT key to decide the set value.
  The set value will be reflected and return to "CH No. selection state".
  To continue setting data, select CH No. and set the value.
- Use ● key When you cancel CH data setting and return to "CH No. selection state".

5. Return to "Normal Display"

Press ● key to return "Normal Display".
*When the sensor temperature rising is not completed, it returns to Temp. Rising state.

5 Calibration

5.1 About Calibration

In order to correctly measure oxygen concentration, perform gas calibration using the reference gas (hereinafter referred to as calibration) in following cases.

- When using analyzer for the first time.
- After replacing the oxygen sensor.
- Periodic inspections.

  Recommended calibration cycle
  Air-Point Calibration：1/month

Remark

- Warm up sufficiently before Calibration.
  Warm-up time as a guide：Approx. 2 hours

5.2 Calibration Point and Calibration Type

5.2.1 Calibration Point Type

Oxygen analyzers using our limiting current type zirconia oxygen sensor can perform measurement only by calibrating the air point.
Normally, it is used for 1-Point Calibration with the calibration point as the air point.
For the air point, use "instrument air", "atmosphere", or "standard gas with atmospheric equivalent concentration".
Other calibrations are performed to further improve accuracy for specific gas concentrations, or when accuracy confirmation and calibration using standard gases are required.

Table 5-1 Calibration Point Type

Cal. points	Contents	Examples of reference gases
Air-point	Calibrate the entire measuring range at the Air-point (Normally measured by Air-point calibration only)	◇Instrument air ISO 8573-1:2010[3:4:3] Calibration gas concentration :"20.90vol.%" ◇Atmosphere Atmospheric oxygen concentration calculated from temperature and relative humidity. Or typical value ："20.60vol.%" ◇Standard gas cylinder Standard gas with oxygen concentration equivalent to atmospheric air (N_2 base)
Zero-point	Calibrate the Zero-point of High-range and Low-range	Standard gas equivalent to 5 to 10% of measuring range e.g.) 0 to 25vol.% range：2.0vol.%O_2/N_2 base
Span-point	Calibrate the Span-point of Low-range	Standard gas equivalent to 85 to 90% of measuring range e.g.) 0 to 10vol.% range：9.0vol.%O_2/N_2 base
Minus span-point	Calibrate the Minus span-point of Minus range	3 kinds of mixed gas e.g.) -8vol.% (CO:9vol.%, H_2:7vol.%, CO_2:9vol.% /N_2 base)

5.2.2 Calibration method Type

This product can be calibrated by the following three methods.
When changing the calibration method, it is necessary to change the CH data setting.
Normally, we set the calibration method according to the customer's usage at the time of shipment.

Table 5-2 Calibration Method Type

Cal. method	CH 270 setting	Contents	Required plumbing system
Manual Calibration	0	A calibration method in which the operation of supplying and stopping the calibration gas to the oxygen sensor, waiting for the indicated value to stabilize, and the operation of loading the calibration value are all performed manually.	Calibration gas plumbing system with manual valve operation e.g.) 3.1.1 System Configuration Example 1
Semi Auto Calibration	1	A calibration method in which the "calibration start operation" is performed by key operation of the receiver or contact input. The operation of feeding and stopping the calibration gas to the oxygen sensor, waiting for stabilization, and loading the calibration value are performed automatically.	Plumbing system that can open and close solenoid valves with receiver contact output. e.g.) 3.1.2 System Configuration Example 2 3.1.3 System Configuration Example 3
Auto Calibration	2	A calibration method in which the "calibration start operation" is performed automatically using the receiver's internal timer. The operation of feeding and stopping the calibration gas to the oxygen sensor, waiting for stabilization, and loading the calibration value are performed automatically. Calibration start operation by receiver key operation and contact input can be used together.	

5.3 Manual Calibration

5.3.1 Manual Calibration (Air Point)

When performing Air-point calibration by Manual Calibration, set the table 5-3 in advance.
After setting it once, it is necessary to reset only when the set value is changed.

Table 5-3 CH Setting for Air-point Calibration by Manual Calibration

CH No.	Contents	Set value	Remarks
123	Air-point calibration concentration [vol.%]	20.90	Instrument air
		20.60 or calculated value	Atmosphere
		Standard gas concentration	Standard gas cylinder
180	Calibration point selection by Manual Calibration	8	8：Air-point
276	Calibration point setting used for calculation	0	When used only for Air-point

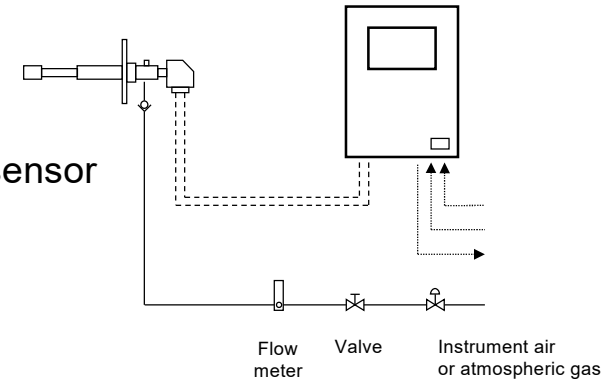
Air-point calibration by Manual Calibration is performed in the following procedure.

1. Set CH setting

Set " Table 5-3"
Omit it When it has already been set.

2. Send calibration air to the oxygen sensor

Send calibration air to the oxygen sensor
by operating the valve, etc.



3. Check the flow rate, wait for the measurement value is stable

Check that the flow rate with the flowmeter.
And wait for the measurement value is stable.
Check the flow rate to be sent in the instruction manual of the oxygen sensor (transmitter).

4. Perform Air-point calibration (set "1" in CH No.181)

After confirming the stability of the measurement value, set "1" in "CH No.181".
Calibration is executed and the displayed value becomes the value set in "Air-point calibration concentration".

5. Stop the calibration air

Stop the sending calibration air by operating the valve, etc.

Tip

- If you want to hold the analog output during Manual Calibration, you can hold the analog output by using CH No.029 Manual output hold. For details, see "7.1.3 Output hold function".

5.3.2 Manual Calibration (Air Point & Other Points)

When performing other points calibration by Manual Calibration, set the table 5-4 in advance.
After setting it once, it is necessary to reset only when the set value is changed.

Table 5-4 CH Setting for Air-point Calibration and Other Points Calibration by Manual Calibration

CH No.	Contents	Set value	Remarks
120	Zero-point calibration concentration [vol.%]	Standard gas concentration	
121	Span-point calibration concentration [vol.%]	Standard gas concentration	
122	Minus span-point calibration concentration [vol.%]	Standard gas concentration	
123	Air-point calibration concentration [vol.%]	20.90	Instrument air
		20.60 or calculated value	Atmosphere
		Standard gas concentration	Standard gas cylinder
180	Calibration point selection by Manual Calibration	Select from right	5 : Zero-point 6 : Span-point 7 : Minus span-point 8 : Air-point
276	Calibration point setting used for calculation *1	Select from right	0 : Air 1 : Air and Zero 2 : Air and Span 3 : Air and Zero and Span 4 : Span 5 : Zero and Span
277	Span-point calibration plus / minus *2	Select from right	0 : Plus(+) 1 : Minus(-)

*1 Calibration point setting used for calculation : Calibration point used for oxygen concentration calculation

*2 Span-point calibration plus / minus : CH No.277 is data for manufacturer setting.
Please contact us if any changes are required.

Air-point calibration, Zero-point calibration and Span-point calibration by Manual Calibration are performed in the following procedure.

1. Set CH setting

Set the calibration point to be calibrated in "CH No.276".
Set the gas concentration of the calibration point to be calibrated to "CH No.120-123".

2. Perform Air-point calibration

Perform Air-point calibration in the same way "5.3.1 Manual Calibration (Air Point)".

3. Send Zero-gas to the oxygen sensor

Send Zero-gas to the oxygen sensor by operating the valve, etc.

4. Check the flow rate, wait for the measurement value is stable

Check that the flow rate with the flowmeter. And wait for the measurement value is stable.
Check the flow rate to be sent in the instruction manual of the oxygen sensor (transmitter).

5. Perform Zero-point calibration

After confirming the stability of the measurement value, set "5" in "CH No.180".
Next, "1" in "CH No.181".
Calibration is executed and the displayed value becomes the value set in "Zero-point calibration concentration".

6. Stop the zero gas

Stop the sending Zero-gas by operating the valve, etc.

Zero-point calibration only

7. Send Span-gas to the oxygen sensor

Send Span-gas to the oxygen sensor by operating the valve, etc.

8. Check the flow rate, wait for the measurement value is stable

Check that the flow rate with the flowmeter. And wait for the measurement value is stable.
Check the flow rate to be sent in the instruction manual of the oxygen sensor (transmitter).

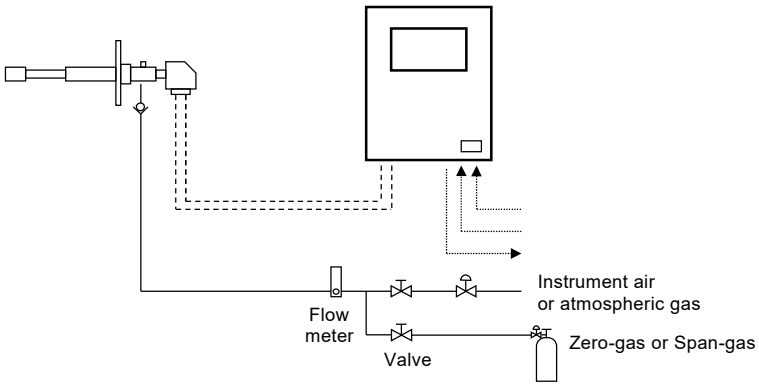
9. Perform Span-point calibration

After confirming the stability of the measurement value, set "6" in "CH No.180".
Next, "1" in "CH No.181". (When calibrating Minus span-point, set "7" in "CH No.180".)
Calibration is executed and the displayed value becomes the value set in "Span-point calibration concentration".

10. Stop the Span-gas

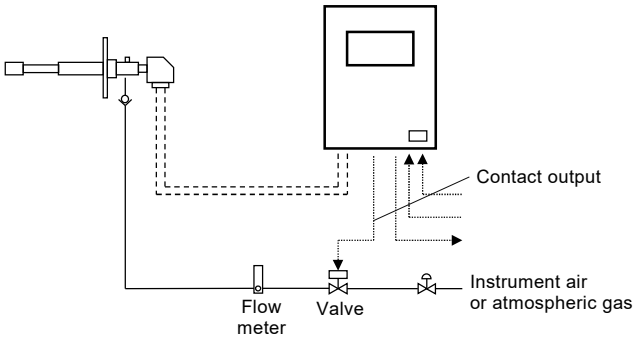
Stop the sending Span-gas by operating the valve, etc

Span-point calibration only



5.4 Semi Auto / Auto Calibration

Semi-auto and Auto calibration require a piping system that drives the solenoid valve for calibration gas using the contact output of the receiver.



5.4.1 Semi Auto / Auto Calibration (Air Point) - advance setting –

When performing Air-point calibration by Semi Auto Calibration or Auto Calibration, set the table 5-5 in advance. After setting it once, it is necessary to reset only when the set value is changed.

Table 5-5 CH Setting for Air-point Calibration by Semi Auto Calibration or Auto Calibration

CH No.	Contents	Set value	Remarks
123	Air-point calibration concentration [vol.%]	20.90	Instrument air
		20.60 or calculated value	Atmosphere
		Standard gas concentration	Standard gas cylinder
208	Using contact input for calibration	0 or 1	0 : No use 1 : Use
270	Calibration method type	1 or 2	0 : Manual Calibration 1 : Semi Auto Calibration 2 : Auto Calibration
271	Air-point gas sending time [min]	Any setting (Default : 5)	Setting range : 1 - 99
273	Recovery-time [min] *3	Any setting (Default : 3)	Setting range : 1 - 99
274	Calibration cycle time [XX day – XX hour] *4	Any setting (Default : 30-00)	Setting range : [00-01] – [99-23]
275	Calibration delay time [XX day – XX hour] *4	Any setting (Default : 00-07)	Time until first calibration start after power ON or timer reset Setting range : [00-01] – [99-23]
276	Calibration point setting used for calculation	0	When only use Air-point calibration
279	Calibration point selection by Semi Auto Cal. or Auto Cal.	0	When only use Air-point calibration

*3 Recovery-time： The grace period until the calibration gas returns to the sample gas after the calibration gas supply is stopped.
The contact output "Maintenance" is closing until the Recovery-time ends.

*4 Setting required only when using Auto Calibration

Note

- Set CH271, 273, 274, 275 arbitrarily by the customer before starting use.

5.4.2 Semi Auto Calibration (Air-Point) - Key Operation or Contact Input -

Air-point calibration by Semi Auto Calibration is performed in the following procedure.

1. Set CH setting

Set " Table 5-5 "

Omit it When it has already been set.

2. Air-point calibration start operation (Set "1" in "CH No.278" or Contact input close)

Using key on receiver : set "1" in "CH No.278"

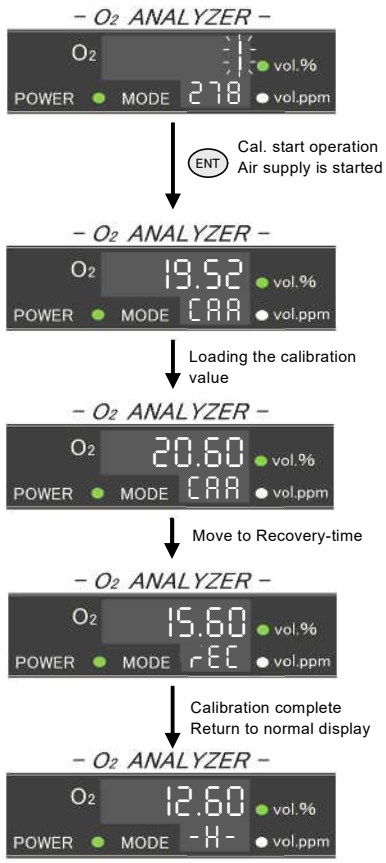
Using contact input : Corresponding contact input terminals close for 0.1 seconds or more.

For detail of contact input see "7.3 Contact Input".

3. (Check the Air-point calibration starting)

- When Air-point calibration starts, display 2 switches to "CAA". (Switching is about 5 seconds after calibration start operation)
- After the completion of loading the calibration value, it moves to the Recovery-time (Display 2 shows "rEC").
- After the recovery time ends, the display returns to normal.

Indication during Air-point Calibration (using key on receiver)



Tip

- CH No.278 is a switch that starts/stops Semi-Auto Calibration.
  Start calibration : set "1"
  Stop calibration : set "2"

Operation of contact input/output, display, and analog output during Air-point calibration by Semi Auto Calibration are as shown in "Fig. 5-1 Semi Auto Calibration (Air-point) Timing Chart".

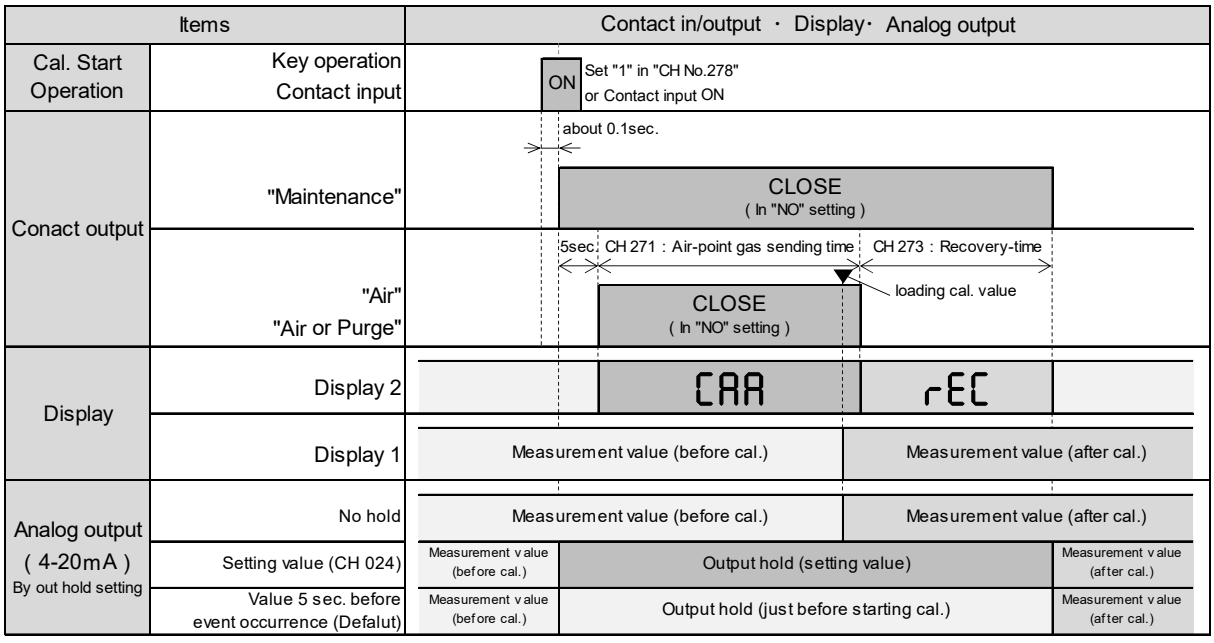


Fig.5-1 Semi Auto Calibration (Air-point) Timing Chart

5.4.3 Auto Calibration (Air-point)

Air-point calibration by Auto Calibration is performed in the following procedure.

1. Set CH setting

Set " Table 5-5 "

Omit it When it has already been set.

2. Reset calibration cycle

Turn OFF the power switch of receiver and turn ON the power again.

Or set "1" in "CH No.314".

Calibration is started automatically after "Calibration delay time".

After the first calibration is started, the calibration is automatically started at the cycle set in "calibration cycle time".

Refer

- Detail for operation of calibration cycle reset see "6.4 Reset of Cycle Timer and Countdown".

Operation of contact output, display during Air-point calibration by Auto Calibration is as shown in "Fig. 5-2 Auto Calibration (Air-point) Timing Chart". Operation of display 1 and analog output same as Semi Auto Calibration.

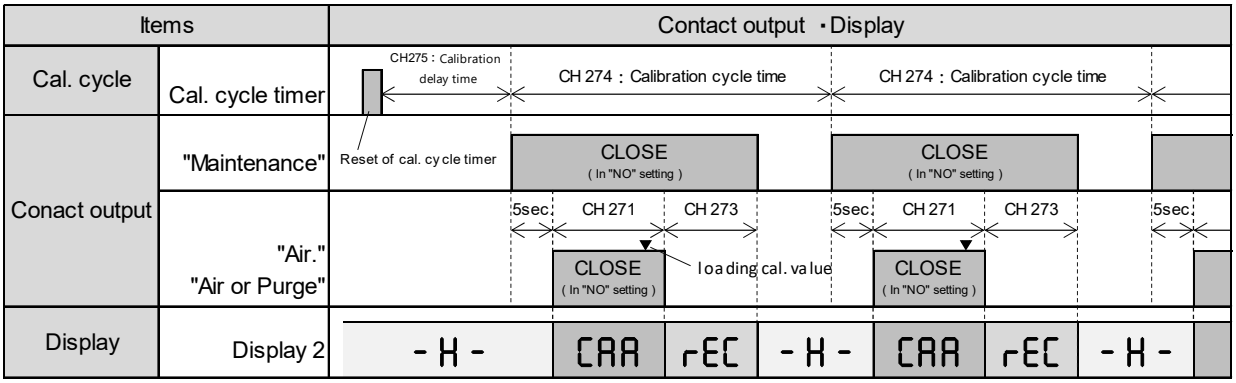


Fig.5-2 Auto Calibration (Air-point) Timing Chart

5.4.4 Semi Auto/Auto Calibration (Air Point & Other Points) - advance setting -

When performing other point calibration by Semi Auto Calibration or Auto Calibration, set the table 5-6 in advance. After setting it once, it is necessary to reset only when the set value is changed.

Table 5-6 CH Setting for other point Calibration by Semi Auto Calibration or Auto Calibration

CH No.	Contents	Set value	Remarks
120	Zero-point calibration concentration [vol.%]	Standard gas concentration	
121	Span-point calibration concentration [vol.%]	Standard gas concentration	
122	Minus span-point calibration concentration [vol.%]	Standard gas concentration	
123	Air-point calibration concentration [vol.%]	20.90	Instrument air
		20.60 or calculated value	Atmosphere
		Standard gas concentration	Standard gas cylinder
208	Using contact input for calibration	0 or 1	0 : No use 1 : Use
270	Calibration method type	1 or 2	0 : Manual Calibration 1 : Semi Auto Calibration 2 : Auto Calibration
271	Air-point gas sending time [min]	Any setting (Default : 5)	Setting range : 1 to 99
272	Zero-point and Span-point gas sending time [min]	Any setting (Default : 5)	Setting range : 1 to 99
273	Recovery-time [min]	Any setting (Default : 3)	Setting range : 1 to 99
274	Calibration cycle time [XX day – XX hour]	Any setting (Default : 30-00)	Setting range : [00-01] to [99-23]
275	Calibration delay time [XX day – XX hour]	Any setting (Default : 00-07)	Time until first calibration start after power ON or timer reset Setting range : [00-01] to [99-23]
276	Calibration point setting used for calculation *5	Select from right	0 : Air 1 : Air and Zero 2 : Air and Span 3 : Air and Zero and Span 4 : Span 5 : Zero and Span
279	Calibration point selection by Semi Auto Cal. or Auto Cal. *6	Select from right	0 : Air 1 : Air and Zero 2 : Air and Span 3 : Span

*5 Calibration point setting used for calculation : Calibration point used for oxygen concentration calculation

*6 Calibration point selection by Semi Auto Cal. or Auto Cal. : Calibration points that operated by Semi Auto Calibration or Auto Calibration. When calibrate Air-point and other point, set "1" or "2".

Note

- CH271,272,273,274 and 275 must be set by the customer before use.

5.4.5 Semi Auto Calibration (Air Point & Other Points)
- Key Operation or Contact Input -

Air-point calibration, Zero-point calibration and Span-point calibration by Semi Auto Calibration are performed in the following procedure.

1. Set CH setting

Set " Table 5-6 "
Omit it When it has already been set

2. Calibration start operation (Set "1" in "CH No.278" or Contact input close)

Using key on receiver：set "1" in "CH No.278"
Using contact input：Corresponding contact input terminals close for 0.1 seconds or more.
For detail of contact input see "7.3 Contact Input".

3. (Check the Air-point calibration starting)

- When calibration starts, display 2 switches to below.
  (Switching is about 5 seconds after calibration start operation)
  Air-point & Zero-point：「CAA」→「CA1」→「rEC」
  Air-point & Span-point：「CAA」→「CA2」→「rEC」
  (Switching is about 5 seconds after calibration start operation)
- After the completion of loading the calibration value, it moves to the Recovery-time (Display 2 shows "rEC").
- After the recovery time ends, the display returns to normal.

Operation of contact input/output, display, and analog output during Air-point and Zero-points calibration by Semi Auto Calibration are as shown in "Fig. 5-3 Semi Auto Calibration (Air-point & Zero-point) Timing Chart". For Air-point and Span-point calibration, contact output "Zero" operation changes to "Span" operation.

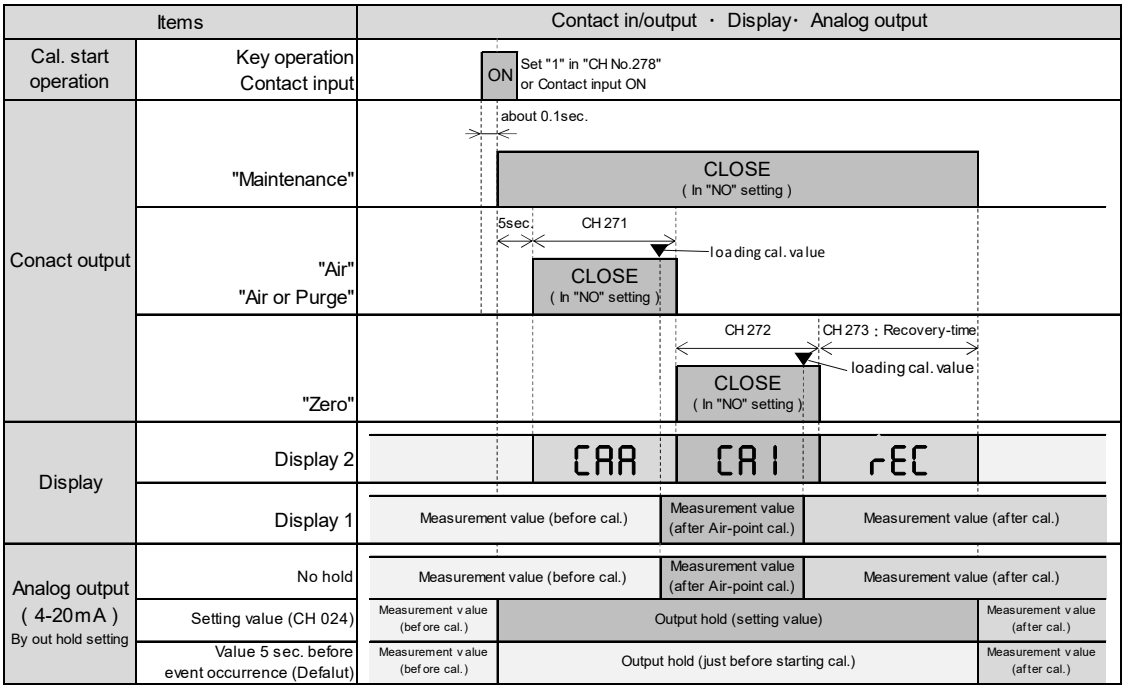


Fig.5-3 Semi Auto Calibration (Air-point & Zero-point) Timing Chart

5.4.6 Auto Calibration (Air Point & Other Points)

Air-point & Zero-point calibration or Air-point & Span-point calibration by Auto Calibration are performed in the following procedure.

1. Set CH setting

Set " Table 5-6 "

Omit it When it has already been set

2. Reset calibration cycle

Turn OFF the power switch of receiver and turn ON the power again.

Or set "1" in "CH No.314".

Calibration is started automatically after "Calibration delay time".

After the first calibration is started, the calibration is automatically started at the cycle set in "calibration cycle time".

Refer

- Detail for operation of calibration cycle reset see "6.4 Reset of Cycle Timer and Countdown".

Operation of contact output during Air-point and Zero-points calibration by Auto Calibration are as shown in "Fig. 5-4 Auto Calibration (Air-point & Zero- point) Timing Chart". For Air-point and Span-point calibration, contact output "Zero" operation changes to "Span" operation. Operation of display 1 and analog output during calibration are same as Semi Auto Calibration.

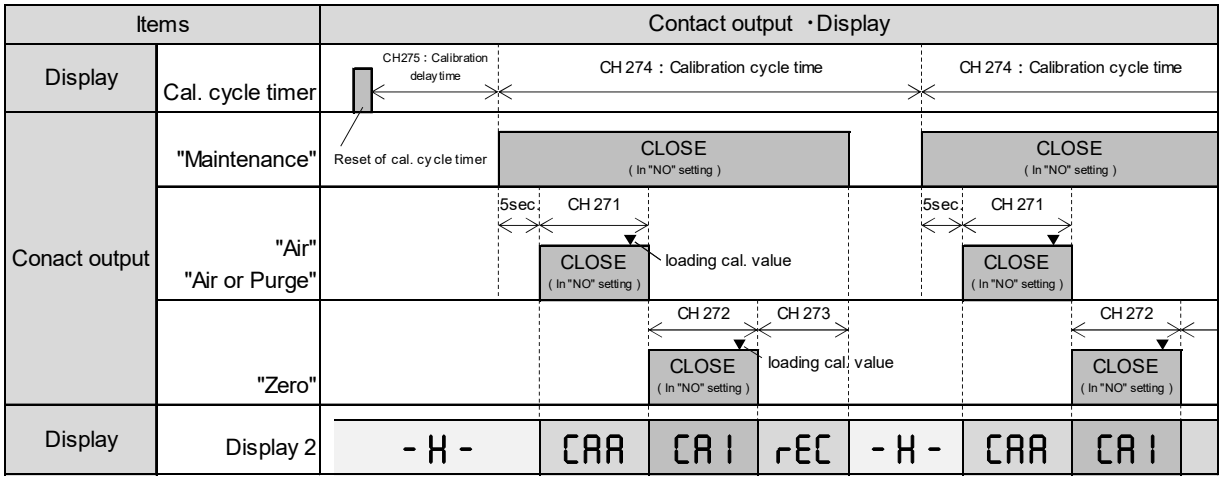


Fig.5-4 Auto Calibration (Air-point & Zero-point) Timing Chart

5.4.7 Calibration Stop Operation

During Semi Auto Calibration or Auto Calibration, you can stop calibration by key operation on the receiver. If "2" is set in "CH No.278" while the calibration gas is being supplied, the calibration gas is stopped and the display returns to normal after the Recovery-time. The calibration data of the calibration points that have already been loaded will be reflected in the measured values.
Calibration data are loaded approximately 5 seconds before the end of calibration gas supply.

CH No.	Contents	Default	Remarks
278	Start / Stop of Semi Auto Cal.	0	1 : Start Calibration 2 : Stop Calibration

6 Purging

6.1 About Purging

Purging is the process of blowing compressed air to remove dust and other foreign matter (hereafter referred to as dust) that has entered or deposited in the measurement gas flow path around the oxygen sensor or inside the sampling probe.
If dust is contained in the sample gas, purge as necessary to reduce dust accumulation and clogging.
In addition, continuous purging prevents dust from entering the measurement gas flow path, so it is possible to protect the oxygen sensor and measurement gas flow path during periods when measurements are not performed.
This product can configure a system that performs semi-automatic or automatic purging by opening and closing the solenoid valve installed in the flow path of compressed air for purging with contact output.

6.2 Purge Method Type

This product can purge by the following two methods.
When changing the purge method, it is necessary to change the CH data setting.
Normally, we set the purge method according to the customer's usage at the time of shipment.

Table 6-1 Purge Method Type

Purge method	CH 280 setting	Contents	Required plumbing system
No use	0	No use the purging	—
Semi Auto Purge	1	A purge method in which the "purge start operation" is performed by key operation of the receiver or contact input. The operation of feeding and stopping the purge air are performed automatically.	Plumbing system that can open and close solenoid valves with receiver contact output. e.g.) 3.1.2 System Configuration Example 2 3.1.3 System Configuration Example 3
Auto Purge	2	A purge method in which the "purge start operation" is performed automatically using the receiver's internal timer. The operation of feeding and stopping the purge air are performed automatically. Purge start operation by receiver key operation and contact input can be used together.	

6.3 Semi Auto Purge / Auto Purge

6.3.1 Semi Auto Purge / Auto Purge - advance setting -

When performing purge by Semi Auto or Auto, set the table 6-2 in advance.
After setting it once, it is necessary to reset only when the set value is changed.

Table 6-2 CH Setting for Semi Auto Purge or Auto Purge

CH No.	Contents	Set value	Remarks
209	Using contact input for calibration	0 or 1	0：No use 1：Use
280	Purge method type	1 or 2	0：No use 1：Semi Auto purge 2：Auto purge
282	Purge ON time [sec]	Any setting (Default：10)	One purge ON time Setting range：1 to 99
283	Purge OFF time [sec]	Any setting (Default：10)	Time between purge ON and purge ON Setting range：1 to 99
284	Purge ON/OFF repetition count	Any setting (Default：5)	Number of repetitions when "purge ON to OFF" is set to 1 time Setting range：1 to 99
285	Purge recovery-time [min] *7	Any setting (Default：3)	Setting range：1 to 99
286	Purge cycle time [XX day – XX hour] *8	Any setting (Default：01-00)	Setting range：[00-01] to [99-23]
287	Purge delay time [XX day – XX hour] *8	Any setting (Default：00-02)	Setting range：[00-01] to [99-23] Time until first purge starting after power ON or timer reset

*7 Purge recovery-time：The grace period until the purge air returns to the sample gas after the purge air supply is stopped. The contact output "Maintenance" is closing until the purge recovery-time ends.

*8 Setting required only when using Auto Purge

Note

- For CH282, 283, 284, 285, 286, and 287, the customer should change the setting values according to the actual use such as dust adhesion.

6.3.2 Semi Auto Purge - Key Operation or Contact Input -

Semi Auto Purge is performed in the following procedure.

1. Set CH setting

Set "Table 6-2".

Omit it When it has already been set.

2. Purge start operation (Set "1" in "CH No.281" or Contact input close)

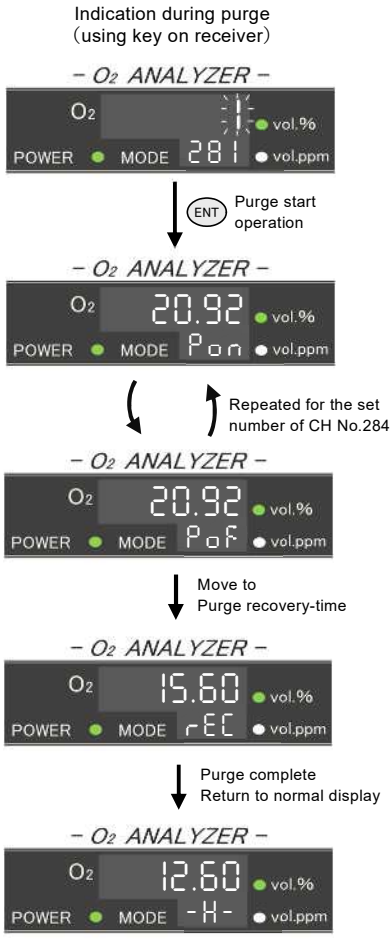
Using key on receiver : set "1" in "CH No.281"

Using contact input : Corresponding contact input terminals close for 0.1 seconds or more.

For detail of contact input see "7.3 Contact Input".

3. (Check the purge starting)

- When purge starts, display 2 switches to "Pon". (Switching is about 5 seconds after purge start operation)
- After that, "Pon" → "PoF" is repeated for the set number of times.
- After the completion of purge, it moves to the purge recovery-time (Display 2 shows "rEC")
- After the purge recovery-time ends, the display returns to normal.



Tip

- CH No.281 is a switch that starts/stops Semi-Auto Purge.
  Start purge : set "1"
  Stop purge : set "2"

Operation of contact input/output, display, and analog output during Semi Auto Purge are as shown in "Fig. 6-1 Semi Auto Purge Timing Chart".

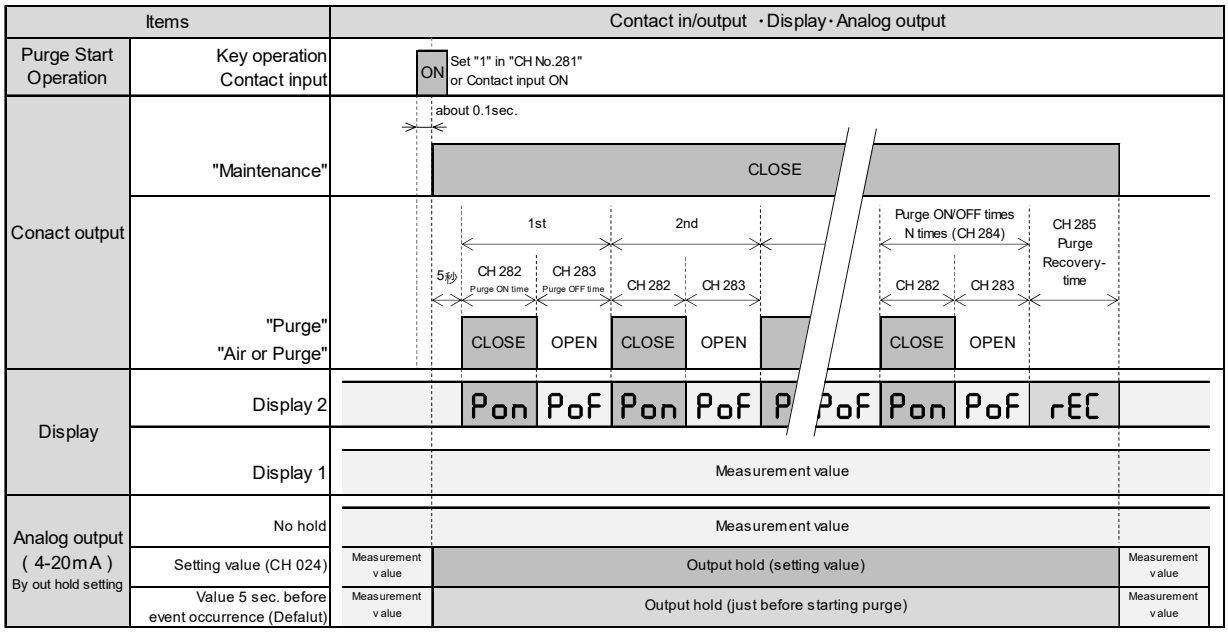


Fig.6-1 Semi Auto Purge Timing Chart

6.3.3 Auto Purge

Auto Purge is performed in the following procedure.

1. Set CH setting

Set " Table 6-2 "

Omit it When it has already been set.

2. Reset purge cycle

Turn OFF the power switch of receiver and turn ON the power again.

Or set "1" in "CH No.314".

Purge is started automatically after "Purge delay time".

After the first purge is started, the purge is automatically started at the cycle set in "purge cycle time".

Refer

- Detail for operation of purge cycle reset see "6.4 Reset of Cycle Timer and Countdown".

Operation of contact output during Auto Purge is as shown in "Fig. 6-2 Auto Purge Timing Chart".
Operation of display 1, display 2 and analog output during purge are same as Semi Auto Purge.

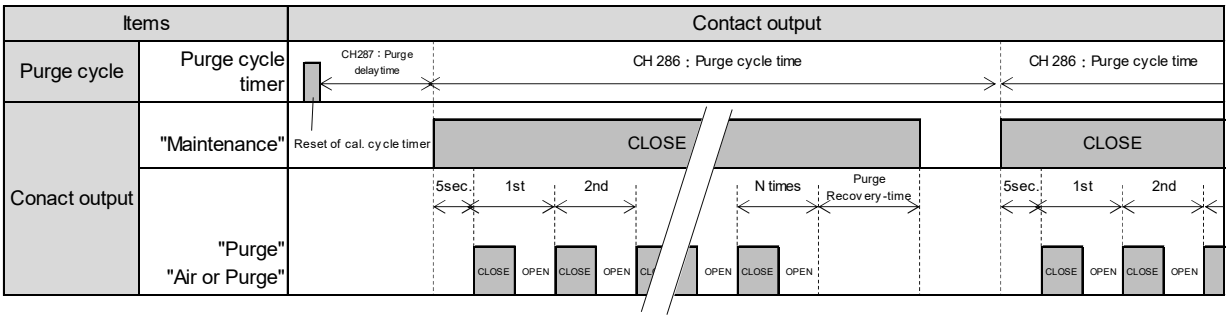


Fig.6-2 Auto Purge Timing Chart

6.3.4 Purge Stop Operation

During Purge, you can stop purge by key operation on the receiver.
If "2" is set in "CH No.281" during purge, purge operation is stopped and the display returns to normal after the Purge Recovery-time.

CH No.	Contents	Default	Remarks
281	Start / Stop of Purge	0	1 : Start Purge 2 : Stop Purge

6.4 Reset of Cycle Timer and Countdown

6.4.1 Reset Method of Cycle Timer

Resetting the Auto Calibration and Auto Purge cycle timer restarts the delay time count.
Table 6-3 shows how to reset the cycle timer.

Table 6-3 Reset Method of Cycle Timer

Timer reset method	Detailed procedure	Reset target	Operation after reset
Setting CH No.314	Set "1" in CH No.314	Calibration delay time Calibration cycle time Purge delay time Purge cycle time	Recount starts from calibration delay time and purge delay time
Power restart	Turn OFF the power of the receiver and turn it ON after a few seconds.	Calibration delay time Calibration cycle time Purge delay time Purge cycle time	After Temp. Rising, recount starts from calibration delay time and purge delay time
Setting CH No.270	After setting CH No.270 to something other than "2" once, set it to "2" again.	Calibration delay time Calibration cycle time	Recount starts from calibration delay time
Setting CH No.280	After setting CH No.280 to something other than "2" once, set it to "2" again.	Purge delay time Purge cycle time	Recount starts from purge delay time

Note

- The delay time and cycle time of Auto Calibration and Auto Purge are not applied immediately even if the set value is changed without resetting the cycle timer.
  Reset the cycle timer as necessary.
  In addition, if the reset operation is not performed after changing the set value, the count will start with the changed set value after the currently counting timer finishes counting.
  Example)
  - During cycle time counting : After the count of cycle time with the old setting value ends, the count of cycle time starts with the new setting value.
  - During delay time counting : After counting with the delay time of the old setting, counting starts with the cycle time of the new setting
- During error detection, the reset operation is disabled. Recover from the error and perform the reset operation.

6.4.2 Cycle Timer Countdown

The time until the next Auto Calibration and Auto Purge indicate in "CH No.288" and "CH No.289".

CH No.	Contents	Data	Remarks
288	Next Auto Calibration countdown	XX-XX	Indicate the time until the next Auto Calibration starts as "XX day - XX hour"
289	Next Auto Purge countdown	XX-XX	Indicate the time until the next Auto Purge starts as "XX day - XX hour"

Tip

- By checking this CH data after the timer reset operation, it is possible to check whether the reset operation has been completed. When the reset operation is completed, this CH data has changed to the delay time setting value.

7 Other Settings/Functions

7.1 Analog Output

7.1.1 Analog Output Specifications

- Output number : One
- Item : O_2 concentration
- Output : DC 4 to 20 mA Isolated output Load resistance 550Ω or less

7.1.2 Setting, Checking and Switching of Output Range

Two ranges (HIGH range and LOW range) can be used for the output range corresponding to 4 to 20 mA DC. The setting and checking of the output range are performed with "CH No.30, 31, 34, 35".

CH No.	Contents	Default	Remarks
030	HIGH range span concentration	25	Setting range : 1 to 99999 Default : 0 to 25 vol.%
031	LOW range span concentration	10	Setting range : 1 to 99999 Default : 0 to 10 vol.%
034	HIGH range unit	2	0 : No use 1 : vol.ppm 2 : vol.%
035	LOW range unit	2	

There are two ways to switch the output range.

- Key operation on receiver
- Contact input

【Switching the output range by key operation of receiver】
Select the output range to be used in "CH No.20".
In the case of "output range switching state by contact input", range selection by "CH No.20" is invalid.

CH No.	Contents	Default	Remarks
020	Output range selecting	1	1 : HIGH range 2 : LOW range

【Switching the output range by contact input】
If "3" is set to any of CH No.227~229, it be output range switching state by contact input.

CH No.	Contents	Conditions under which output range switching is possible using contact input	Remarks
227	Contact input 1 (IN1)	Set "3" to either	COM - Corresponding contact * ON : LOW range OFF : HIGH range
228	Contact input 2 (IN2)		
229	Contact input 3 (IN3)		

* The corresponding contact is the contact input terminal corresponding to the CH No. set to "3".

7.1.3 Output Hold Function

This function holds the analog output at a constant value when the sample gas is not being measured, such as during Temp. Rising, Calibration, Purging, Error occurrence, or Sleep Mode.
The output hold operation is set by "CH No.23" and "CH No.24".
Alternatively, You can hold the analog output by key operation or contact input regardless of the receiver status using "CH No. 029".

CH No.	Contents	Default	Remarks
023	Output hold setting	2	0：No hold 1：Setting value (CH 024) 2：Value 5 seconds before event occurrence
024	Output hold value setting(%FS)	100	
029	Manual output holding	0	0：OFF 1：Hold ON 2：Using contact input

Table 7-1 Operation of Output Hold by States

Operating states	Setting value of CH No.023		
	0：No hold	1：Setting value (CH 024)	2：Value 5 seconds before event occurrence (Default)
Temp. Rising	Setting value (CH 024)	Setting value (CH 024)	Setting value (CH 024)
During Calibration	No hold		Value 5 seconds before event occurrence
During Purge ON/OFF			
During Recovery Time			
During Error Detecting	Value 5 seconds before event occurrence		
During Sleep Mode			
During Concentration Upper Limit Alarm/ Lower Limit Alarm	No hold	No hold	No hold
During Manual Output Holding	Value 5 seconds before event occurrence	Setting value (CH 024)	Value 5 seconds before event occurrence

- "Output hold value setting [%FS]" of "CH No.024" sets the output in %FS.

  e.g. CH No.024 setting is "0" → Output 4 mA
  CH No.024 setting is "50" → Output 12 mA
  CH No.024 setting is "100" → Output 20 mA

- The output hold status by error detection is released when the error is restored.

7.1.4 Simulated Output

This is a function to output an arbitrary value for loop check of analog output.
Set the output value to be output in "CH No.225". And switch the simulated output stop/output in "CH No.224".

CH No.	Contents	Default	Remarks
224	Simulated output	0	0：Stop 1：Output
225	Simulated output value setting [%FS]	0	Setting range：0.0 to 100.0

- " Simulated output value setting [%FS]" of "CH No.225" sets the output in %FS.

  e.g. CH No.225 setting is "0" → Output 4 mA
  CH No.225 setting is "50" → Output 12 mA
  CH No.225 setting is "100" → Output 20 mA

7.1.5 Adjustment of Analog Output

When there is an error between the analog output value of the receiver side and the input value of the customer side device (recorder, control device), the analog output adjustment function at "CH No.027" of the receiver can reduce the error.

1. Connect your device

Connect your device (recorder, control equipment, ammeter, etc.),
make sure that the input current of the customer's device can be confirmed.

2. Select CH No. 027 (Output Adjustment)

Select “CH No. 027”.
Display 1 displays “cAL 1”.

3. Adjust Zero output (4 mA)

When the (ENT) key is pressed, move to the output adjustment status
and “0” is displayed on the Display 1.
When the (●) key is pressed, the Display 1 will change to "100".
When "0" is displayed, it is the zero side (4 mA) adjustment state,
and when "100" is displayed, it is the span side (20 mA) adjustment state.
Adjust the zero side (4 mA) using the (▲) and (◀) keys
while "0" is displayed on the Display 1.

(▲) Key：Increase the output.
(◀) Key：Reduce the output.

4. Adjust Span output (20 mA)

Press (●) key to switch the Display 1 to "100".
Adjust the span side (20 mA) using the (▲) and (◀) keys
while "100" is displayed on the Display 1.

5. Finish the adjustment

After the adjustment, press (ENT) key to return to the CH No. selection state.

7.2 Contact Output

7.2.1 Contact Outputs Specifications

- Output number : 4 points
- Output : No-voltage relay contact
  capacity AC 250 V 1A Resistance load
  DC 30 V 1A Resistance load
- Terminal : RY1,RY2,RY3,RY4A,RY4B

7.2.2 Contact Outputs Items and Setting

For contact output, set the output item of each contact in "CH No.200 to 203", Also, set the operation of each contact "normally open: NO/normally closed: NC" in "CH No.204 to 207".
See Table 7-2 and Table 7-3 for contact output details and operation.

CH No.	Contents	Default	Remarks
200	Contact output item RY1	—	0 : No use 1 : Error (Analyzer error) 2 : Range H 3 : ----(No use at this product) 4 : Temp. rising 5 : Alarm H (Concentration upper limit alarm) 6 : Alarm L (Concentration lower limit alarm) 7 : ----(No use at this product) 8 : Ready 9 : Maintenance 10 : Air 11 : Span 12 : Zero 13 : Purge 14 : Air or Purge 15 : Alarm H&L 16 : Error or Alarm H&L
201	Contact output item RY2	—	
202	Contact output item RY3	—	
203	Contact output item RY4A, RY4B	(1 or 16)	
204	Contact output operation RY1	0	0 : NO 1 : NC
205	Contact output operation RY2	0	
206	Contact output operation RY3	0	
207	Contact output operation RY4A, RY4B	1	

Note

- RY4A and RY4B are dedicated terminals for "Error" or "Error or Alarm H&L".
  Set "1" or "16" in "CH No.203", and use "1" in "CH No.207".

Refer

- When using "Alarm H", "Alarm L", or "Alarm H&L", It is also necessary to set "CH No.220 to 223". For details, see "7.5.1 Concentration upper/lower limit alarm".

Table 7-2 Details of Contact Output Contents and Operation (for RY1 - RY3)

Selection number in "CH 200 to 202"	Item	Contents (purpose)	Contact operation		
			Receiver state	CH 204 - 206 setting	
				0 : NO	1 : NC
0	No use	—	—	OPEN	CLOSE
2	Range H	Outputs a contact according to the output range in use. (If set to NC, the contact will be CLOSE while using the LOW range.)	HIGH range in use	CLOSE	OPEN
			LOW range in use	OPEN	CLOSE
5	Alarm H (Concentration upper limit alarm)	Judges whether the measured value is “higher than the set value/or less”.	Temp. rising	OPEN	OPEN
			Measured value is higher than set value	CLOSE	OPEN
			Measured value is set value or less	OPEN	CLOSE
6	Alarm L (Concentration lower limit alarm)	Judges whether the measured value is “lower than the set value/or more”.	Temp. rising	OPEN	OPEN
			Measured value is set value or more	OPEN	CLOSE
			Measured value is lower than set value	CLOSE	OPEN
8	Ready	Judges "during normal measurement / otherwise".	Power OFF	OPEN	OPEN
			Temp. rising	OPEN	CLOSE
			During error detecting	OPEN	CLOSE
			During calibration	OPEN	CLOSE
			During purge	OPEN	CLOSE
			During recovery-time	OPEN	CLOSE
			During sleep mode	OPEN	CLOSE
			During measurements other than the above	CLOSE	OPEN
9	Maintenance	Judges "during maintenance / otherwise".	Power OFF	OPEN	OPEN
			Temp. rising	CLOSE	OPEN
			During error detecting	OPEN	CLOSE
			During calibration	CLOSE	OPEN
			During purge	CLOSE	OPEN
			During recovery-time	CLOSE	OPEN
			During sleep mode	CLOSE	OPEN
			During measurements other than the above	OPEN	CLOSE
10	Air	Used to open/close the solenoid valve for Air-point calibration.	When opening the solenoid valve for Air	CLOSE	OPEN
11	Span	Used to open/close the solenoid valve for Span-point calibration.	When opening the solenoid valve for Span gas	CLOSE	OPEN
12	Zero	Used to open/close the solenoid valve for Zero-point calibration.	When opening the solenoid valve for Zero gas	CLOSE	OPEN
13	Purge	Used to open/close the solenoid valve for Purge.	When opening the solenoid valve for Purge	CLOSE	OPEN
14	Air or Purge	Used when sharing the solenoid valve for Air-point calibration and Purge.	When opening the solenoid valve for Air or Purge	CLOSE	OPEN
15	Alarm H&L	"Applicable/not applicable to either Alarm H or Alarm L" to judge.	Power OFF	OPEN	OPEN
			Measured value is higher than upper limit setting	CLOSE	OPEN
			The measured value is between the upper limit setting value and the lower limit setting value.	OPEN	CLOSE
			Measured value is lower than lower limit setting	CLOSE	OPEN

Table 7-3 Details of Contact Output Contents and Operation (for RY4A, RY4B)

Selection number in "CH 203"	Item	Contents (purpose)	Contact operation		
			Receiver state	RY4A	RY4B
1	Error (Analyzer error)	Detects power failure and error occurrence.	Power OFF	OPEN	CLOSE
			Temp. rising	CLOSE	OPEN
			During measuring	CLOSE	OPEN
			During error detecting	OPEN	CLOSE
16	Error or Alarm H&L	"Applicable/not applicable to either Error or Alarm H&L" to judge.	Power OFF	OPEN	CLOSE
			Temp. rising	CLOSE	OPEN
			During measuring	CLOSE	OPEN
			During error detecting	OPEN	CLOSE
			During Alarm H&L detecting	OPEN	CLOSE

7.3 Contact Input

7.3.1 Contact Inputs Specifications

- Input number : 3 points
- Input : Input no-voltage contact
  Operating current 5 mA （ contacts close for 0.1 seconds or more ）
  (DC 24 V is applied between these terminal and COM)
- Terminals : (IN1, IN2, IN3) - COM

Note

- Be sure Input no-voltage contact. Connecting a contact with voltage may cause a malfunction.
- Do not use the input contact in parallel connection or series connection with other devices. (Figure 7-1) It may damage the receiver or other equipment.

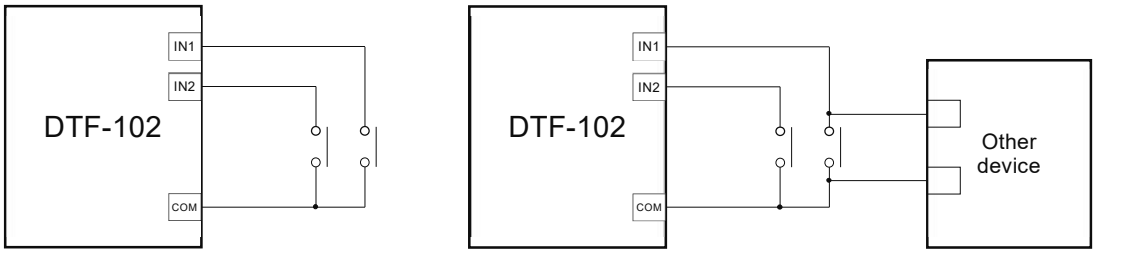


Fig.7-1 Wiring Example for Contact Input

7.3.2 Contact Inputs Items

For contact input, set the input items for each contact with "CH No.227 to 229".
See Table 7-4 for detail and actions of contact input.

CH No.	Contents	Default	Remarks
227	Contact input item IN1	—	0：No use 1：Calibration start 2：Purge start 3：Output range switching 4：Manual output hold 5：Sleep mode
228	Contact input item IN2	—	
229	Contact input item IN3	—	

Table 7-4 Contact Input Contents and Actions

CH 227 to 229	Contents	Detail	CH No. and setting values that need to be set together
1	Calibration start	Contact CLOSE : Semi Auto Calibration start	CH No.208= "1"
2	Purge start	Contact CLOSE : Semi Auto Purge start	CH No.209= "1"
3	Output range switching	Used to switch the output range. Contact OPEN : HIGH range Contact CLOSE : LOW range	—
4	Manual output hold	Contact CLOSE : Analog output is held The concentration value on display 1 is not held.	CH No.29= "2"
5	Sleep mode	Contact CLOSE : Switch to sleep mode	CH No.197= "2"

7.4 Sleep Mode

7.4.1 About Sleep Mode

Sleep mode is a function that protects the oxygen sensor and measurement gas flow path from exhaust gases by continuously supplying purge air while the oxygen sensor is not driven.
There are cases that non-driving oxygen sensor, measurement gas flow path and transmitter are exposed to exhaust gas and residual gas in the furnace, when combustion equipment is stopped for a long period of time due to installation, test, inspection or repair. While the sensor is in driving, the zirconia oxygen sensor is durable against dirty gases such as exhaust gas. However, when the sensor is not driven (low temperature), If exposed to dirty gas such as exhaust gas or residual gas in the furnace, the sensor will deteriorate in a short period of time and may not be able to measure. In addition, dust accumulation and clogging may occur in the sample gas flow path.
In sleep mode, the oxygen sensor is not driven, and purge air is continuously supplied to protect the oxygen sensor and measurement gas flow path from exhaust gas.
When performing continuous purging automatically using the sleep mode, a system is required to operate the solenoid valve as shown in "3.1.2 System Configuration Example 2" or "3.1.3 System Configuration Example 3".

7.4.2 Switch to Sleep Mode and Operation

There are two ways to switch to "Sleep mode" : "receiver key operation" and "contact input".
It set in "CH No.197".

CH No.	Contents	Default	Remarks
197	Sleep mode	0	0 : No use 1 : Sleep mode ON 2 : Using contact input

The operation when changing to sleep mode and returning is as shown in "Fig. 7-2 Timing Chart in Sleep Mode".

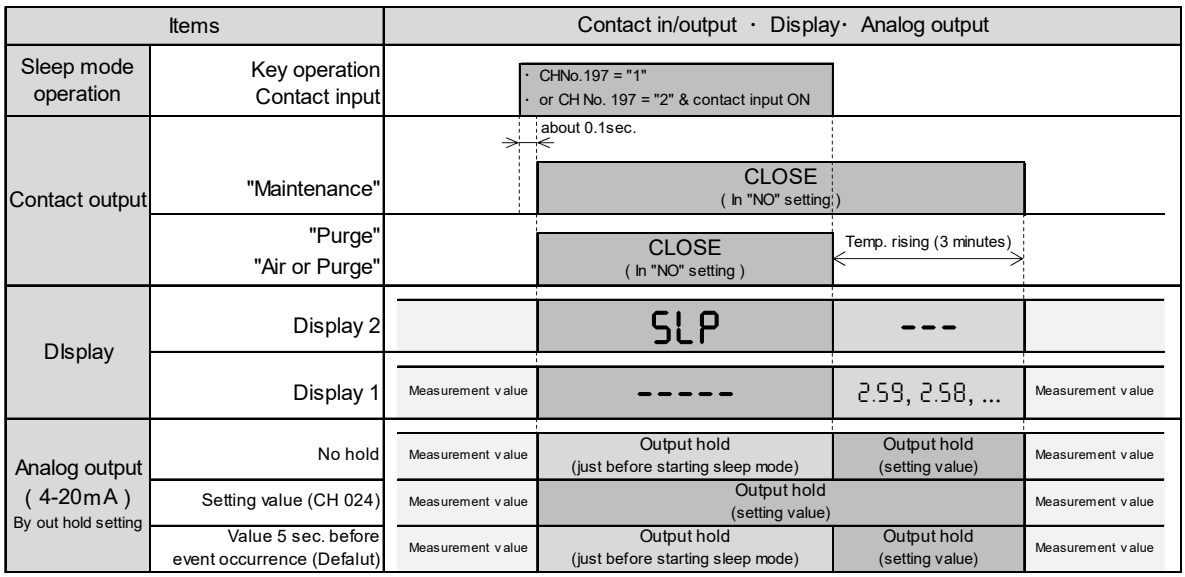


Fig. 7-2 Timing Chart in Sleep Mode

- During sleep mode, the contact output "Purge" and "Air or Purge" are CLOSE, and display 2 changes to "SLP". Also, the analog output is held.
- When the sleep mode is canceled, it always starts with 3 minutes of Temp. rising.

7.5 Other Functions

7.5.1 Concentration Upper / Lower Alarm (Alarm H, Alarm L, Alarm H&L)

This function judges whether the measured value is "higher than the set value" or "lower than the set value" and outputs an alarm or contacts.
When using this function, set "CH No.220 to 223". Also, when outputting with contact output, setting of contact output is also required.

CH No.	Contents	Default	Remarks
220	Concentration upper limit alarm setting value	90	Set about upper limit value, lower limit value Setting range：0.0 to 9990.0
221	Concentration lower limit alarm setting value	10	
222	Concentration upper limit value unit	0	0：No use 1：vol.ppm 2：vol.%
223	Concentration lower limit value unit	0	

[Concentration upper limit alarm detected]
"AH" is displayed on display 2

[Concentration lower limit alarm detected]
"AL" is displayed on display 2

Fig. 7-3 Display Example of Concentration Upper Limit Alarm and Concentration Lower Limit Alarm

7.5.2 Primary Delay Calculation Function

This function calculates primary delay of measurement value, to display and analog output.
With the value (seconds) set in "CH No.016", primary delay calculation processing for display and output is performed.

CH No.	Contents	Default	Remarks
016	Primary delay time [sec]	0	Unit：sec.(0→63%) Setting range：0 to 99

7.5.3 Moving Average Function

This function calculates moving average of measurement value, to display and analog output.
With the value (seconds) set in "CH No.017", moving average processing for display and output is performed.

CH No.	Contents	Default	Remarks
017	Moving average time [sec]	0	Unit：sec. Setting range：0 to 30

7.5.4 Protection Function of Set Value

This function prohibits changing CH data by key operation.
Whether or not you can change CH data is set in "CH No. 310".

CH No.	Contents	Default	Remarks
310	Data setting change password	102	0：Cannot be changed 102：Changeable

7.6 CH Data Table

Table 7-5 CH Data Table (1/3)

CH No.	Contents	Setting range	e.g. Default	Remarks
000	Normal display setting	0：----- 1：Oxygen concentration	1	
001	Sensor Vs monitor [mV]	—	Monitor	
002	Sensor Ip1 monitor [mA]	—		
003	Sensor Ip2 monitor [μA]	—		
004	Sensor Vp monitor [V]	—		
005	Sensor heater voltage monitor [V]	—		
006	Sensor heater current monitor [A]	—		
010	Measuring mode setting	2：Normally measuring mode [%] 3：Reducing atmosphere measurement mode [-%]	2	＊,◇
016	Primary delay time [sec]	0 to 99	0	
017	Moving average time [sec]	0 to 30	0	
020	Output range selecting	1：HIGH range 2：LOW range	1	
023	Output hold setting	0：No hold 1：Setting value (CH 024) 2：Value 5 seconds before event occurrence	2	
024	Output hold value setting [%FS]	0 to 100	100	
027	Output adjustment	Adjustment for DC 4 to 20 mA	–	
029	Manual output holding	0：OFF 1：Hold ON 2：Using contact input	0	
030	HIGH range span concentration	0 to 99999	25	
031	LOW range span concentration	0 to 99999	10	
034	HIGH range unit	0：No use 1：vol.ppm 2：vol.%	2	
035	LOW range unit		2	
120	Zero-point calibration concentration [vol.%]	0.00 to 99.90	5.00	
121	Span-point calibration concentration [vol.%]	0.00 to 99.90	15.00	
122	Minus span-point calibration concentration [vol.%]	-99.90 to 99.90	-5.00	
123	Air-point calibration concentration [vol.%]	0.00 to 99.90	20.60	
143	Linearizer No.	0 to 3	See inspection report	
180	Calibration point selection by Manual Calibration	5：Zero-point 6：Span-point 7：Minus span-point 8：Air-point	8	
181	Calibration by Manual Calibration	0：OFF 1：Perform calibration	0	

- CH No. marked with "＊" in the Remarks has different default values depending on the part number of the receiver.
- CH No. marked with "◇" in the Remarks cannot be changed by the customer. Please contact us if you would like to make any changes.
- CH numbers not listed in the "CH Data Table" are manufacturer setting data. Do not change it by yourself.

Table 7-6 CH Data Table (2/3)

CH No.	Contents	Setting range·Remarks	e.g. Default	Remarks
190	Heater control mode	0：Heater OFF 1：Constant voltage control 2：Constant resistance control 1 3：Constant resistance control 2	TF-10：3 TF-Ⅲ：2	＊, ◇
191	Heater voltage setting [V]	5.00 to 11.00	10.50	
192	Heater normal temp resistance [Ω]	0.01 to 99.90	See inspection report	
193	Heater reference resistance ratio	1.00 to 99.90	TF-10：2.80 TF-Ⅲ：2.70	＊
197	Sleep mode	0：No use 1：Sleep mode ON 2：Using contact input	0	
200	Contact output item RY1	0：No use 1：Error (Analyzer error) 2：Range H 3：---- (No use at this product) 4：Temp. rising 5：Alarm H (Concentration upper limit alarm) 6：Alarm L (Concentration lower limit alarm) 7：---- (No use at this product) 8：Ready 9：Maintenance 10：Air 11：Span 12：Zero 13：Purge 14：Air or Purge 15：Alarm H&L 16：Error or Alarm H&L	10	＊
201	Contact output item RY2		13	＊
202	Contact output item RY3		9	＊
203	Contact output item RY4A, RY4B		1	＊
204	Contact output operation RY1	0：NO 1：NC	0	＊
205	Contact output operation RY2		0	＊
206	Contact output operation RY3		0	＊
207	Contact output operation RY4A, RY4B		1	＊
208	Using contact input for calibration	0：No use 1：Use	1	＊
209	Using contact input for calibration	0：No use 1：Use	1	＊
220	Concentration upper limit alarm setting value	0.0 to 9990.0	90	
221	Concentration lower limit alarm setting value	0.0 to 9990.0	10	
222	Concentration upper limit value unit	0：No use 1：vol.ppm 2：vol.%	0	
223	Concentration lower limit value unit		0	
224	Simulated output	0：Stop 1：Output	0	
225	Simulated output value setting [%FS]	0.0 to 100.0	0	
227	Contact input item IN1	0：No use 1：Calibration start 2：Purge start 3：Output range switching 4：Manual output hold 5：Sleep mode	1	＊
228	Contact input item IN2		2	＊
229	Contact input item IN3		3	＊

- CH No. marked with "＊" in the Remarks has different default values depending on the part number of the receiver.
- CH No. marked with "◇" in the Remarks cannot be changed by the customer. Please contact us if you would like to make any changes.
- CH numbers not listed in the "CH Data Table" are manufacturer setting data. Do not change it by yourself.

Table 7-7 CH Data Table (3/3)

CH No.	Contents	Setting range·Remarks	e.g. Default	Remarks
270	Calibration method type	0 : Manual Calibration 1 : Semi Auto Calibration 2 : Auto Calibration	2	*
271	Air-point gas sending time [min]	1 to 99	5	
272	Zero-point and Span-point gas sending time [min]	1 to 99	5	
273	Recovery-time [min]	1 to 99	3	
274	Calibration cycle time [XX day - XX hour]	[00-01] to [99-23]	30-00	
275	Calibration delay time [XX day - XX hour]	[00-01] to [99-23]	00-07	
276	Calibration point setting used for calculation	0 : Air 1 : Air and Zero 2 : Air and Span 3 : Air and Zero and Span 4 : Span 5 : Zero and Span	0	*
277	Span calibration value polarity	0 : Puls (+) 1 : Minus(-)	0	*,◇
278	Start / Stop of Semi Auto Cal.	0 : OFF 1 : Start Calibration 2 : Stop Calibration	0	
279	Calibration point selection by Semi Auto Cal. or Auto Cal.	0 : Air 1 : Air and Zero 2 : Air and Span 3 : Span	0	*
280	Purge method type	0 : No use 1 : Semi Auto purge 2 : Auto purge	2	*
281	Start / Stop of Purge	0 : OFF 1 : Start Purge 2 : Stop Purge	0	
282	Purge ON time [sec]	1 to 99	10	
283	Purge OFF time [sec]	1 to 99	10	
284	Purge ON/OFF repetition count	1 to 99	5	
285	Purge recovery-time [min]	1 to 99	3	
286	Purge cycle time [XX day - XX hour]	[00-01] to [99-23]	01-00	
287	Purge delay time [XX day - XX hour]	[00-01] to [99-23]	00-02	
288	Next Auto Calibration countdown	—	Monitor	
289	Next Auto Purge countdown	—	Monitor	
300	HIGH range minus span concentration [%]	-99 to 99	0	*,◇
301	LOW range minus span concentration [%]	-99 to 99	0	*,◇
310	Data setting change password	0 : Cannot be changed 102 : Changeable	102	
314	Timer reset	0 : OFF 1 : Timer reset	0	

- CH No. marked with "＊" in the Remarks has different default values depending on the part number of the receiver.
- CH No. marked with "◇" in the Remarks cannot be changed by the customer. Please contact us if you would like to make any changes.
- CH numbers not listed in the "CH Data Table" are manufacturer setting data. Do not change it by yourself.

8 Maintenance

The following maintenance and inspection procedures are important in order to maintain normal functioning and accurate measurement. Make sure you thoroughly understand the procedure before performing maintenance.

When "Maintenance work"	
⚠ WARNING	**Fire, Electric shocks, Malfunction** ● Be sure to turn OFF the main power supply before performing wiring connection work or wiring check. ● Before turning ON the power, make sure that the power wiring is properly connected. ● If the fuse blows, check the cause and replace it with one of the same capacity and type. Also, when replacing the fuse, be sure to turn OFF the main power supply before starting work. ● Be sure to use parts specified by our company for replacement parts and consumables.

Note

- Be sure to check the safety precautions for the oxygen sensor (transmitter) to be used before starting to maintenance it.
- Do not disassemble the parts other than those specified in this manual.
- Do not modify by the customer.

8.1 Daily / Periodic Inspection

Daily/periodic inspection items is nothing for this product (receiver). Below is a list of standard daily and periodic inspections for the oxygen sensor. Check the instruction manual for the oxygen sensor (transmitter) you are using for the actual details of daily and periodic inspections.

Table 8-1 Standard Daily / Periodic Inspection Items for Sensors (Reference)

Air-point Calibration	Recommended cycle	1 / month
	Method	See "5 Calibration".
	Others	Periodically check that the calibration gas is flowing at the set flow rate during calibration.
Replacement of Oxygen Sensor	Recommended period	2 years
	Method	Refer to the instruction manual of the oxygen sensor (transmitter) used.

8.2 Consumable Parts and Spare Parts

There are no consumable parts for this product (receiver).
The spare parts for this product (receiver) are as shown in the table below.

Table 8-2 Spare Part Table

Name	No./Spec.	Q'ty/1 unit	Replacement
Fuse	MF-51NR2A	1	When fuse blowout occurs

9 Troubleshooting

9.1 Phenomena and Countermeasures

Table 9-1 Phenomena and Countermeasures

Phenomena	Cause	Countermeasures
Unable to change data.	CH No.310 is entered with something other than "102"	Set "102" in CH No.310.
	Receiver problem	Replace the receiver or repair by Maker.
Analyzer output, display value does not change.	During output hold state (Display value is changing)	Reconfirm receiver status and settings. The output value is held according to the setting during "Temp. rising", "Calibration", "Purging", "Analyzer error", "Sleep mode", and "Manual output hold".
	Gas pipe leak	Check for leaks, tighten pipe fittings.
	During An analyzer error is occurring	- Turn OFF the power once and turn it ON again after 10 seconds. - Deal with the error code Refer to "9.2 Error Code Table" - Press the ◉ key to clear
	Receiver problem	Replace the receiver or repair by Maker.
Analyzer output, display value error	Setting error	Check the setting data related to analog output Refer to "7.1 Analog Output".
	Gas calibration error	- Check the setting data related to calibration - Perform Air-point calibration
	Gas flow rate is outside range.	Readjust gas flow rate.
	Poor wiring contact	Check for poor contact in the analog output wiring and sensor signal wiring.
	Gas pipe leak	Check for leaks, tighten pipe fittings.
	Sensor deterioration	Replace the sensor.
Analyzer output, display value is zero	Setting error	Check the setting data related to analog output Refer to "7.1 Analog Output".
	Gas calibration error	- Check the setting data related to calibration - Perform Air-point calibration
	Gas flow rate is outside range.	Readjust gas flow rate.
	Flammable gas included in measuring gas	Eliminate flammable gas from measuring gas.
	Sensor deterioration	Replace the sensor.
Analyzer output and display value do not match	Output adjustment is inaccurate	Perform output adjustment in "CH No.027".
	Output range is different	Check output range setting (CH No.020, 030,031,034,035)
	Receiver problem	Replace the receiver or repair by Maker.
Slow response	Filter clogged	Replace the filter (Only transmitters using filters)
	Gas pipe leak	Check for leaks, tighten pipe fittings.
	Calibration gas pipe clogged	Purging, cleaning and replacing in piping
	Condensation in the calibration gas pipe	Purging, cleaning in piping and add installation of keep warming structure
	Sampling gas pipe and probe clogged	Purging, cleaning and replacing in piping/probe
	Insufficient sampling flow rate	Adjust sampling gas flow rate. (Only sampling type)
	Primary delay time setting value is too large	Check the data in CH No.016 and set "0"[sec].
	Moving average time setting value is too large	Check the data in CH No.017 and set "0"[sec].
	Sensor deterioration	Replace the sensor.

9.2 Error Code Table

Table 9-2 Error Code

Error Code	Contents	Cause	Countermeasures
E-01 E-02 E-03	Abnormality in ROM, RAM, and/or EEPROM	- Receiver abnormality - Temporary malfunction due to external noise	Turn OFF power supply and turn ON after 10 seconds.
E-04	Heater current too over	- Sensor heater abnormality - Setting value abnormality - Receiver abnormality	- Press ◉ key, or turn OFF power supply and turn ON after 10 seconds. - To clear the error display, press ◉ key after the cause of the error has been eliminated.
E-05	Heater current too under		
E-06	Heater voltage too over		
E-07	Heater voltage too under		
E-20	Heat up does not complete		
E-08	Vs voltage too over	- Sensor abnormality - Sensor wiring abnormality - Setting value abnormality - Receiver abnormality	- Press ◉ key, or turn OFF power supply and turn ON after 10 seconds. - To clear the error display, press ◉ key after the cause of the error has been eliminated.
E-09	Vs voltage too under		
E-10	Ip current too over		
E-11	Ip current too under		
E-12	Vp voltage too over		
E-13	Vp voltage too under		
E-14	Heater terminals (S+, S-) not closed	Defective contact in wiring between S+ and S-	- Check the wiring. - Press ◉ key to clear the error display.
E-21	Data out of the specified range	Data setting error	- Setting data within the specified range. - Press ◉ key to clear the error display.
E-35	Calibration value out of range in Zero-point calibration	- Zero-point calibration abnormality - Sensor abnormality	- Press ◉ key to clear the error display. - Check the calibration gas concentration and setting value. - Check the calibration gas flow rate. - Perform calibration again Replace the sensor if it does not recover.
E-36	Calibration value out of range in Span-point calibration	- Span-point calibration abnormality - Sensor abnormality	
E-38	Calibration value out of range in Air-point calibration	- Air-point calibration abnormality - Sensor abnormality	
E-45	Ip data out of range in N2 calibration	- N_2 calibration abnormality - Sensor abnormality	
E-46	Calibration-value error (Air point)	- Air-point calibration abnormality - Sensor abnormality	
E-60	"Not used" range is selected.	Data setting error about analog output range	Set "CH No.34,35" to other than "0".

The analyzer needs to repair by Maker when all the actions above should fail.

9.2.1 Oxygen Sensor Failed

If "E-05" or "E-07" occurs during using (after a normal measurement period), the oxygen sensor may have failed due to its life. Follow the steps below to check the cause and restore the analyzer.

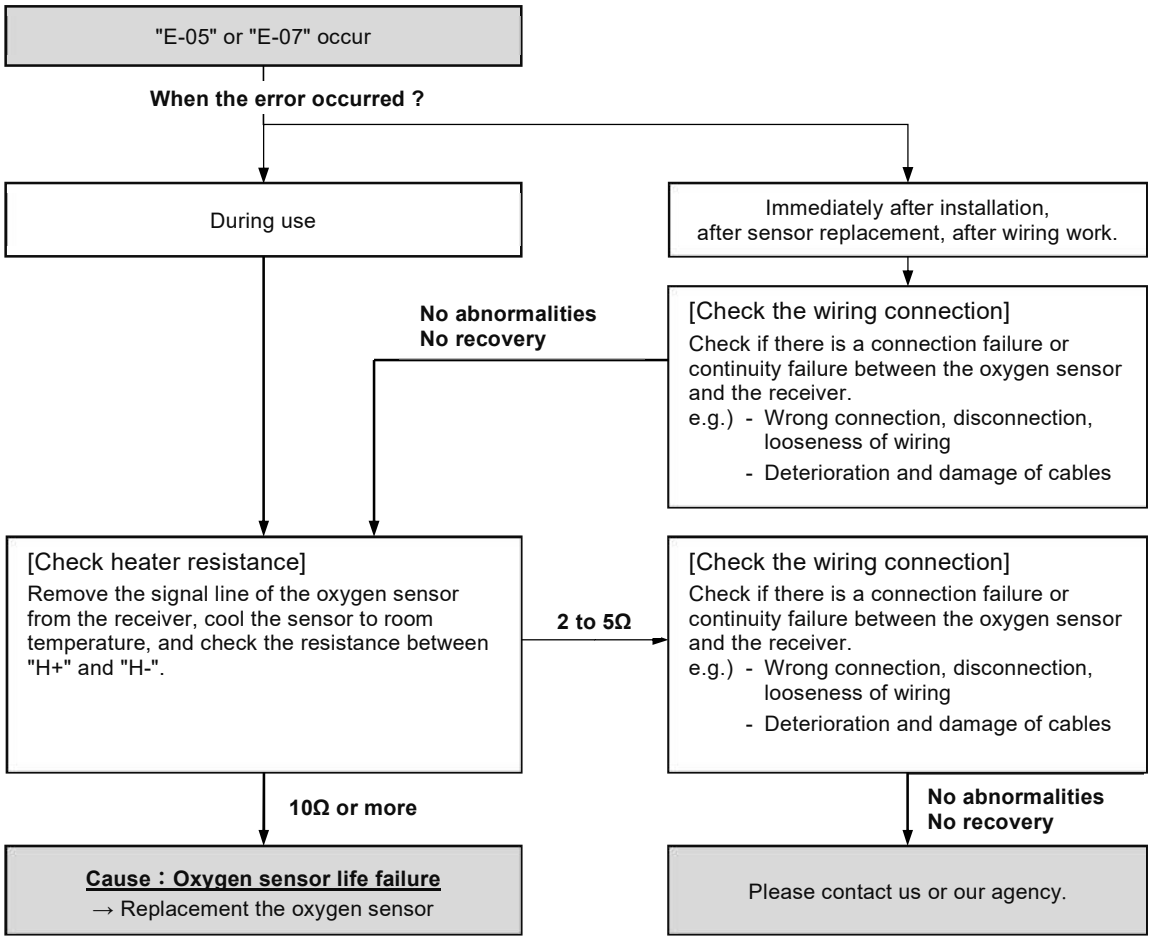


Fig. 9-1 Confirmation Procedure When Occurred “E-05” and “E-07”

Note

- If receiver detecting multiple errors at the same time, pressing ⦿ key once will display another error code. Press ⦿ key multiple times until the Temp. rising state is temporarily entered, and check for recurrence of the error.
- Timing of occurrence

  - During use and sensor usage time is long (1 year or more) :
    →High possibility of oxygen sensor life failure.
  - During use and sensor usage time is short :
    →Check the setting data in CH No.190,192,193.
  - After installation, replacement the sensor, maintenance :
    →High possibility of poor contacts or incorrect connection.
- If the resistance value between "H+" and "H-" is 5Ω < R <10Ω, cool the sensor sufficiently and then check again.

10 Technical Data

10.1 Specifications

1.	Power supply	AC 100 to 240 V±10%　50/60 Hz　max.50 VA	
2.	External dimensions	300×250×156 [mm]	
3.	Weight	Approx. 6.5 kg	
4.	Measurement item	O_2	
5.	Measurement range	0 to 25vol.%	
6.	Linearity *	±1.0％F.S.（F.S.＝0 to 25vol.%）	
		±2.0％F.S.（F.S.＝0 to 10vol.%, 0 to 5vol.%）	
7.	Repeatability *	±0.5％F.S.（F.S.＝0 to 25vol.%, 0 to 10vol.%, 0 to 5vol.%）	
8.	Response time *	5 seconds or less（T90）	
9.	Analog output	Item	: O_2 concentration
		Output	: DC 4 to 20 mA Isolated output Load resistance 550Ω or less
		Output range	: HIGH range　0 to 25vol.%（Default）
			LOW range　0 to 10 vol.%（Default）
		Range switching	: Key operation/Contact input
		Output hold	: No hold/Setting value/ Value 5 seconds before event occurrence
10.	Contact output	Number	: 4 points
		Output	: No-voltage relay contact
			capacity　AC 250 V　1 A　Resistance load
			DC 30 V　1 A　Resistance load
		Output item	: Refer to "7.2.2 Contact Outputs Items and Setting"
11.	Contact input	Number	: 3 points
		Input	: Input no-voltage contact
			Operating current 5 mA　（contacts close for 0.1 seconds or more）
		Input item	: Refer to "7.3.2 Contact Inputs Items"
12.	Installation Conditions	Installation location	: Indoor
		Ambient temperature	: -10 to +50℃
		Ambient humidity	: 90％RH or less(Not condensation)
		Environmental protection	: No waterproof structure
13.	Other functions	"Manual/Semi-Auto/Auto calibration", "Semi-Auto/Auto Purging", "Abnormality self-diagnosis", "Manual output hold", "Concentration upper/lower alarm", "Analog output adjustment", "Simulated output", "Sleep mode", "Primary delay calculation", "Moving average".	

* "Linearity", "Repeatability" and "Response time" are reference values when using a TF-10 type probe transmitter (L=500). It depends on the oxygen sensor (transmitter) used.

MEMO

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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