



Instruction Manual

**INFRARED GAS
ANALYZER**

TYPE: ZRJ-6

PREFACE

We are grateful for your purchase of Fuji Infrared Gas Analyzer (type:ZRJ).

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

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

Delivered Items

Name	Quantity	Remarks
Analyzer main frame	1	
Power cable	1	
Fuse	2	Rating : 1 A
Instruction manual	1	
Side rail	2	Option

Request

- It is prohibited to transfer part or all of this manual without Fuji's permission.
- Description in this manual is subject to change without prior notice for further improvement.

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Issued in August, 2011

CAUTION ON SAFETY

First of all, read this “Caution on safety” carefully, and then use the analyzer in the correct way.

- The cautionary descriptions listed here contain important information about safety, so they should always be observed. Those safety precautions are ranked in 3 levels, “DANGER”, “CAUTION” and “PROHIBITION”.

 DANGER	Wrong handling may cause a dangerous situation, in which there is a risk of death or heavy injury.
 CAUTION	Wrong handling may invite a dangerous situation, in which there is a possibility of medium-level trouble or slight injury or only physical damage is predictable.
 PROHIBITION	Items which must not be done are noted.

Caution on installation and transport of gas analyzer	
 DANGER	<ul style="list-style-type: none"> • This unit is not explosion-proof type. Do not use it in a place with explosive gases to prevent explosion, fire or other serious accidents.
 CAUTION	<ul style="list-style-type: none"> • For installation, observe the rule on it given in the instruction manual and select a place where the weight of gas analyzer can be endured. Installation at an unsuited place may cause turnover or fall and there is a risk of injury. • For lifting the gas analyzer, be sure to wear protective gloves. Bare hands may invite an injury. • Before transport, fix the casing so that it will not open. Otherwise, the casing may be separated and fall to cause an injury. • During installation work, care should be taken to keep the unit free from cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.

Caution on piping	
 DANGER	<p>In piping, the following precautions should be observed. Wrong piping may cause gas leakage.</p> <p>If the leaking gas contains a toxic component, there is a risk of serious accident being induced.</p> <p>Also, if combustible gas is contained, there is a danger of explosion, fire or the like occurring.</p> <ul style="list-style-type: none"> • Connect pipes correctly referring to the instruction manual. • Exhaust should be led outdoors so that it will not remain in the locker and installation room. • Exhaust from the analyzer should be relieved in the atmospheric air in order that an unnecessary pressure will not be applied to the analyzer. Otherwise, any pipe in the analyzer may be disconnected to cause gas leakage. • For piping, use a pipe and a pressure reducing valve to which oil and grease are not adhering. If such a material is adhering, a fire or the like accident may be caused.

Caution on wiring	
 CAUTION	<ul style="list-style-type: none"> • Wiring work must be performed with the main power set to OFF to prevent electric shocks. • Enforce construction of class-D grounding wire by all means. If the specified grounding construction is neglected, a shock hazard or fault may be caused. • Wires should be the proper one meeting the ratings of this instrument. If using a wire which cannot endure the ratings, a fire may occur. • Be sure to use a power supply of correct rating. Connection of power supply of incorrect rating may cause fire.

Caution on use	
 DANGER	<ul style="list-style-type: none"> • For correct handling of calibration gas or other reference gases, carefully read their instruction manuals beforehand. Otherwise, carbon monoxide or other hazardous gases may cause an intoxication particularly.
 CAUTION	<ul style="list-style-type: none"> • Before leaving unused for a long time or restarting after left at such a status for an extended length of time, follow the directions of each instruction manual because they are different from normal starting or shutdown. Otherwise, the performance may be poor and accidents or injuries may be caused. • Do not operate the analyzer for a long time with its door left open. Otherwise, dust, foreign matter, etc. may stick on internal walls, thereby causing faults.

Caution on use	
 PROHIBITION	<ul style="list-style-type: none"> • Do not allow metal, finger or others to touch the input/output terminals in the instrument. Otherwise, shock hazard or injury may occur. • Do not smoke nor use a flame near the gas analyzer. Otherwise, a fire may be caused. • Do not allow water to go into the gas analyzer. Otherwise, hazard shock or fire in the instrument may be caused.

Caution on maintenance and check	
 DANGER	<ul style="list-style-type: none"> • When doors are open during maintenance or inspection, be sure to purge sufficiently the inside of the gas analyzer as well as the measuring gas line with nitrogen or air, in order to prevent poisoning, fire or explosion due to gas leak.
 CAUTION	<p>Be sure to observe the following for safe operation avoiding the shock hazard and injury.</p> <ul style="list-style-type: none"> • Remove the watch and other metallic objects before work. • Do not touch the instrument wet-handed. • If the fuse is blown, eliminate the cause, and then replace it with the one of the same capacity and type as before. Otherwise, shock hazard or fault may be caused. • Do not use a replacement part other than specified by the instrument maker. Otherwise, adequate performance will not be provided. Besides, an accident or fault may be caused. • Replacement parts such as a maintenance part should be disposed of as incombustibles. For details, follow the local ordinance.

Others	
 CAUTION	<ul style="list-style-type: none"> • If the cause of any fault cannot be determined despite reference to the instruction manual, be sure to contact your dealer or Fuji Electric's technician in charge of adjustment. If the instrument is disassembled carelessly, you may have a shock hazard or injury.

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1. OVERVIEW

The infrared gas analyzer (type ZRJ) measures the concentration of CO₂, CO, CH₄, SO₂, NO, and O₂ contained in sample gas.

CO₂, CO, CH₄, SO₂, and NO are measured by non-dispersion infrared method, while O₂ is measured by paramagnetic or fuel cell method. Up to 4 components including O₂ (3 at the maximum for measurement of components other than O₂) can be measured simultaneously.

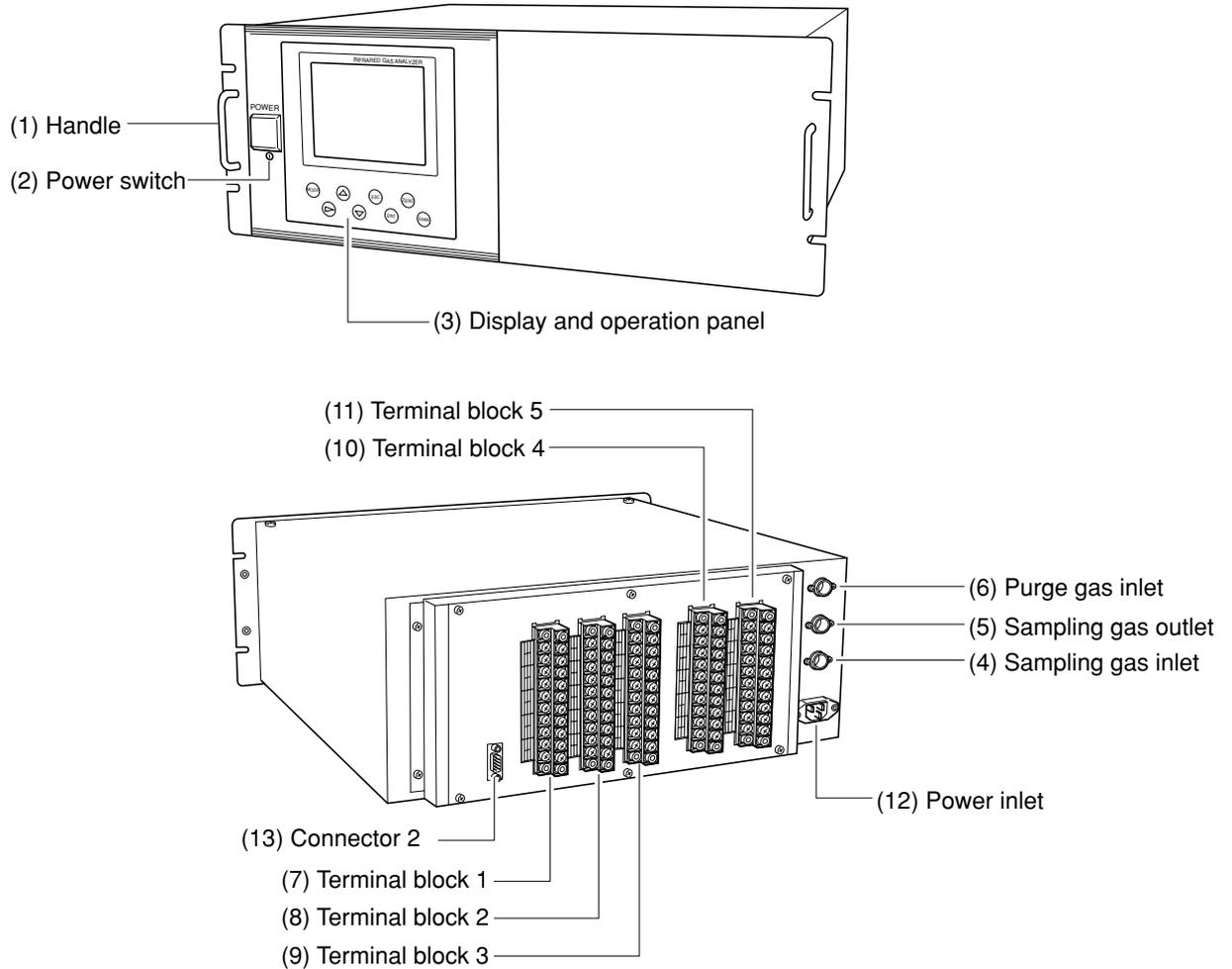
A high-sensitivity mass flow sensor is used in the detector unit of infrared method. Due to use of single beam system for measurement, maintenance is easy and an excellent stability is ensured for a long period of time.

In addition, a microprocessor is built in and a large sized liquid crystal display is provided for easier operation, higher accuracy and more functions.

This analyzer is thus optimum for combustion control of various industrial furnaces, botanical study and global atmospheric research.

2. NAME AND DESCRIPTION OF EACH PART

2.1 Description of each unit



Name	Description
(1) Handle	Draws the analyzer unit from the case.
(2) Power switch	Turns ON/OFF this analyzer.
(3) Display/Operation panel	Liquid crystal display and keys for various operational settings are arranged.
(4) Sampling gas inlet	Port for connecting the sample gas injection pipe.
(5) Sampling gas outlet	Port for connecting the pipe for discharging the gas after analysis.
(6) Purge gas inlet	Port for connecting the purge gas pipe.
(7) Terminal block 1	Analog output terminals
(8) Terminal block 2	O ₂ analyzer signal and contact input terminals
(9) Terminal block 3	Contact input/output terminals
(10) Terminal block 4	Contact output terminal
(11) Terminal block 5	Alarm output terminal
(12) Power inlet	Used to connect the power cable.
(13) Connector for communication	Used to connect the communication cable.

Fig. 2-1 Name and description of each unit

3. INSTALLATION

DANGER

This unit is not explosion-proof type. Do not use it in a place with explosive gases to prevent explosion, fire or other serious accidents.

CAUTION

- For installation, observe the rule on it given in the instruction manual and select a place where the weight of gas analyzer can be endured. Installation at an unsuited place may cause turnover or fall and there is a risk of injury.
- For lifting the gas analyzer, be sure to wear protective gloves. Bare hands may invite an injury.
- Before transport, fix the casing so that it will not open. Otherwise, the casing may be separated and fall to cause an injury.
- The gas analyzer is heavy. It should be transported carefully by two or more persons if manually required. Otherwise, body may be damaged or injured.
- During installation work, care should be taken to keep the unit free from cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.

3.1 Installation conditions

To install the analyzer for optimum performance, select a location that meets the following conditions;

- (1) Use this instrument indoors.
- (2) A vibration-free place
- (3) A place which is clean around the analyzer.
- (4) Power supply

Rated voltage	: 100V to 240V AC
Operating voltage	: 85V to 264V AC
Rated frequency	: 50/60 Hz
Power consumption	: 70 VA max.
Inlet	: Conformity to EN60320 class I type 3-pin inlet
- (5) Operation conditions

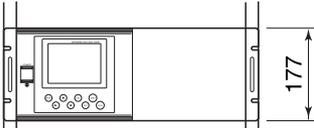
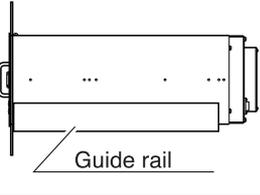
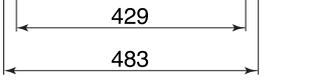
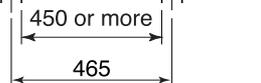
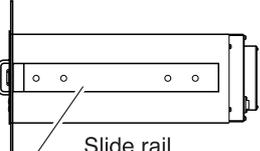
Ambient temperature	: -5 to 45°C
Ambient humidity	: 90% RH or less, no condensation

3.2 Installation of analyzer

There are two methods of installing the analyzer.

For detailed dimensions, see Chapter 9.3.

(Unit:mm)

Types		External dimensions	Mounting dimensions	Mounting method
19 inch rack mounting (Note)	Guide rail			
	Slide rail			

Note) The mounting method should be selected to meet the installation requirements since the top cover must be detached from the gas analyzer for maintenance and check.

Mounting method	Conditions	Remarks
Slide rail	No maintenance space is provided at the top.	These methods must be rigid enough to withstand the mass (about 10 kg) of the gas analyzer.
Guide rail	Maintenance space is provided at the top.	

Recommended slide rail: Equivalent to 305A-20, Accuride International Inc.

3.3 Piping

Caution on piping



In piping, the following precautions should be observed. Wrong piping may cause gas leakage.

If the leaking gas contains a toxic component, there is a risk of serious accident being induced.

Also, if combustible gas is contained, there is a danger of explosion, fire or the like occurring.

- Connect pipes correctly referring to the instruction manual.
- Exhaust should be led outdoors so that it will not remain in the locker and installation room.
- Exhaust from the analyzer should be relieved in the atmospheric air in order that an unnecessary pressure will not be applied to the analyzer. Otherwise, any pipe in the analyzer may be disconnected to cause gas leakage.
- For piping, use a pipe and a pressure reducing valve to which oil and grease are not adhering. If such a material is adhering, a fire or the like accident may be caused.

Observe the following when connecting the gas pipes.

- The pipes should be connected to the gas inlet and outlet at the rear panel of the analyzer, respectively.
- Connect the sampling system to the instrument by using corrosion-resistant tube such as Teflon, stainless steel, or polyethylene. In case where there is no danger of corrosion, don't use rubber or soft vinyl tube. Analyzer indication may become inaccurate due to the adsorption of gases.
- Piping connections are Rc1/4 (NPT1/4) female-threaded. Cut the pipe as short as possible for quick response. Pipe of \varnothing 4mm (inside diameter) is recommendable .
- Entry of dust in the instrument may cause operation fault. Use clean pipes and couplings.

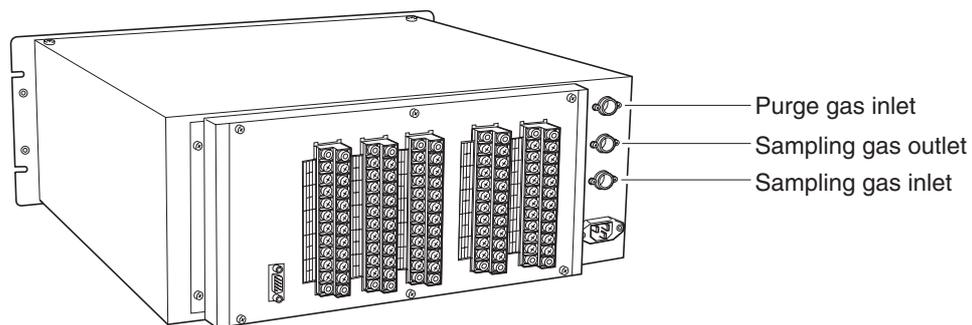


Fig. 3-1 Piping

- Sampling gas inlet: Connect the pipe so that zero/span calibration standard gas or measured gas pretreated with dehumidification is supplied properly. The gas flow rate should be kept constant within the range of 1L/min \pm 0.5L/min.
- Sampling gas outlet: Measured gas is exhausted after measurement. Connect the pipe so that the gas may escape through the gas outlet into the atmosphere.
- Purge gas inlet: It is used for purging the inside of the total gas analyzer. When the analyzer must be purged, refer to Item 3.4, Purging inside Analyzer. Use dry gas N₂ or instrumentation air for purge gas. (flow rate of 1L/min or more should be used and no dust or mist is contained).

3.4 Sampling

(1) Conditions of sample gas

- 1) The dust contained in sample gas should be eliminated completely with filters. The filter at the final stage should be capable of eliminating dust of 0.3 microns.
- 2) The dew point of sample gas must be lower than the ambient temperature for preventing formation of drain in the analyzer. If water vapor is contained in sample gas, its dew point should be reduced down to about 0°C through a dehumidifier.
- 3) If SO₃ mist is contained in sample gas, the mist should be eliminated with a mist filter, cooler, etc. Eliminate other mist in the same way.
- 4) If a large amount of highly corrosive gas such as Cl₂, F₂ or HCl is contained in sample gas, the service life of analyzer will be shortened. So, avoid such gases.
- 5) Sample gas temperature is allowed within a range from 0 to 50°C. Pay attention not to flow hot gas directly into the analyzer.

(2) Sampling gas flow rate

A flow rate of sampling gas must be 1L/min \pm 0.5L/min. A flow meter should be provided as shown in Fig. 3-2 to measure flow rate values.

(3) Preparation for standard gas

Prepare the standard gas for zero/span calibration.

	No O ₂ meter	Built in O ₂ meter	Externally mounted zirconia O ₂ meter
Zero gas	N ₂ gas	N ₂ gas	Dry air, air or gas in concentration of 80% or higher of the O ₂ range (CO ₂ should not be contained in zero gas if CO ₂ meter is provided.)
Span gas except for O ₂	Gas with concentration of 90% or more of full scale	Gas with concentration of 90% or more of full scale	Gas with concentration of 90% or more of full scale
Span gas for O ₂		Gas with concentration of 90% or more of full scale	1 to 2 % O ₂ gas

* We recommend you to feed the zero gas shown above by humidifying it, if NO or SO₂ is included in components to be analyzed.

(4) Reduction of moisture interference

NO and SO₂ measurement is subject to moisture interference.

As shown by the configuration example on the next page, provide a device for humidifying zero calibration gas, thus controlling the moisture content at a constant level (moisture content in sample gas should also be controlled here) in configuring a sampling system. That allows the same moisture content as in the case of measurement to be contained in zero gas for calibration.

(5) Purging of instrument inside

The inside of instrument need not be purged generally except for the following cases.

- 1) A combustible gas component is contained in sample gas.
- 2) Corrosive gas is contained in the atmospheric air at the installation site.
- 3) The same gas as the sample gas component is contained in the atmospheric air at the installation site.

In such cases as above, the inside of analyzer should be purged with the air for instrumentation or N₂.

Purging flow rate should be about 1L/min.

If dust or mist is contained in purging gas, it should be eliminated completely in advance.

(6) Pressure at sampling gas outlet

Pressure at the sampling gas outlet should be set to atmospheric pressure.

(7) Example of sampling system configuration

The system configuration may vary depending upon the nature of measured gas, coexistent gases or application. A typical configuration diagram is shown in Fig. 3-2. Since a system configuration depends upon measured gas, consult with Fuji Electric.

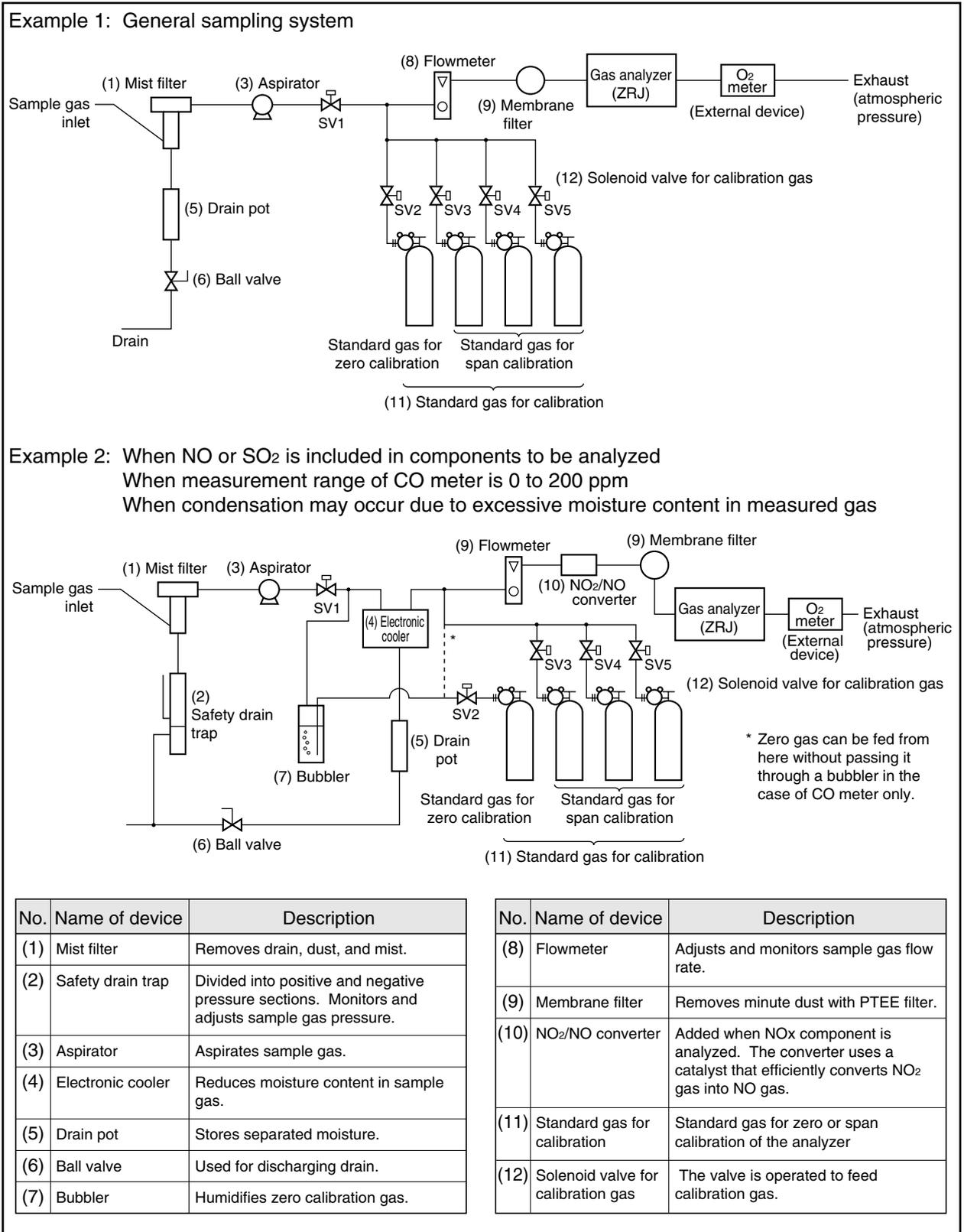


Fig. 3-2 A typical example of sampling system

3.5 Wiring method

Caution on wiring	
 CAUTION	<ul style="list-style-type: none">• Wiring work must be performed with the main power set to OFF to prevent electric shocks.• Enforce construction of class-D grounding wire by all means. If the specified grounding construction is neglected, a shock hazard or fault may be caused.• Wires should be the proper one meeting the ratings of this instrument. If using a wire which cannot endure the ratings, a fire may occur.• Be sure to use a power supply of correct rating. Connection of power supply of incorrect rating may cause fire.

Each external terminal is provided on the rear panel of the analyzer. (See Fig. 3-3)

Wire each terminal, referring to Fig. 3-3 and (1) to (7).

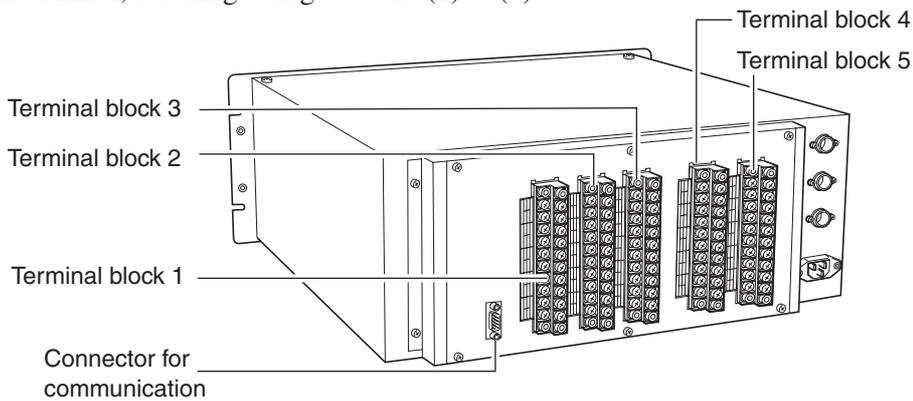


Fig. 3-3 Rear panel

(1) Power inlet

When using supplied power cable, connect the female side to the power inlet at the rear panel of the analyzer, and insert the male side into a receptacle matching the rating.

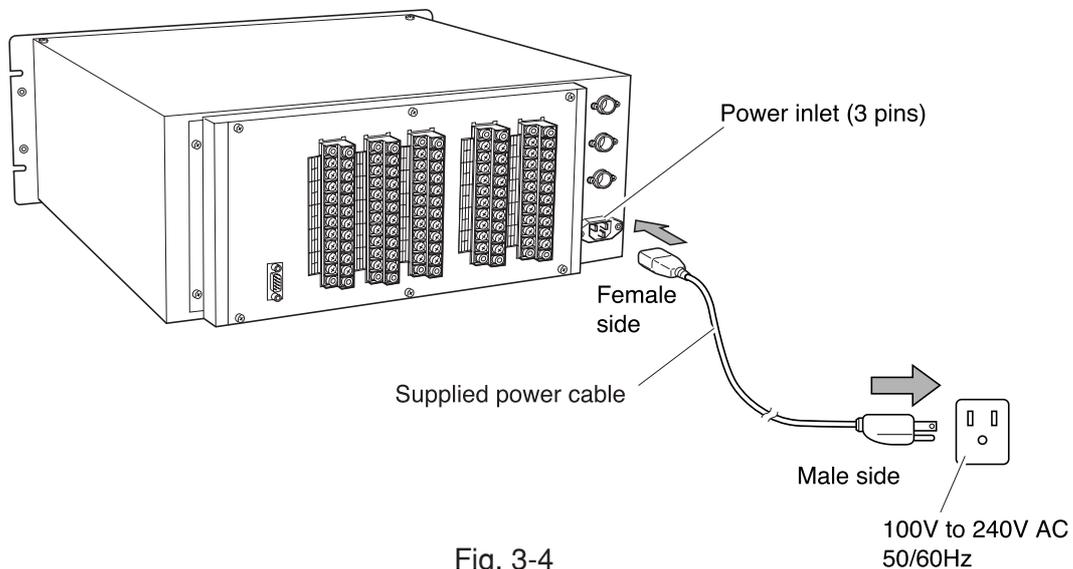
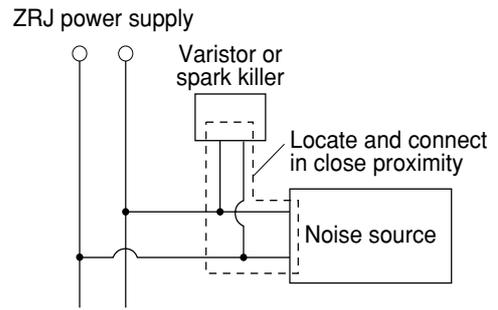


Fig. 3-4

When noise source is in the vicinity

Do not install the instrument near an electric device that generates noise from the power supply (such as high-frequency furnace and electric welder). If there is no other choice but to install it near such devices, provide completely separate power line to eliminate noise.

In case noise may enter from a relay, solenoid valve, etc. through power supply, connect a varistor or spark killer to the noise source as shown below. If the varistor or spark killer is located away from the noise source, no effect is obtainable. So, locate near the noise source.



(2) Analog output signal (AO): terminal block 1 (1) to (10), (15) to (20)

Output signal: 4 to 20 mA DC or 0 to 1 V DC (selected when ordering)

Non-insulated output

Allowable load: 4 to 20 mA DC, 550Ω or less

0 to 1 V DC, 100kΩ or less

- Analog output is provided from each terminal corresponding to the channel displayed in the measurement screen.

Note) All of analog output signals for the instrument are not isolated. It is recommended to isolate signals individually using an insulated converter, etc. to prevent interference from unnecessary signals or to prevent external interference, especially leading the cable of more than 30 meters or to outdoor.

(3) O₂ sensor input: terminal block 2 (1) – (2)

Input signal:

External zirconia O₂ analyzer: Zirconia O₂ sensor signal (Fuji ZFK7 output)

External O₂ analyzer: 0 to 1 V DC (DC input resistor of 1MΩ or more)

- It is used when the external zirconia O₂ analyzer or external O₂ analyzer is specified as order.
- To connect to the output of the external Zirconia analyzer or external O₂ analyzer prepared separately.
- In case of an external O₂ analyzer, input a signal of 0 to 1 V DC with respect to O₂ full scale of the analyzer.
- In case of built-in O₂ analyzer, do not use the terminals.

Note) O₂ sensor input is not isolated. It is recommended to isolate input signal to prevent interference from unnecessary signals or to prevent external interference. Zirconia O₂ sensor should be installed at a location that is as close to this instrument as possible.

(4) Contact input (DI): terminal block 2 (13) to (20), terminal block 3 (5) to (10)

- It is for a contact input at no voltage. An input is provided when switching to short circuit (on) or open (off).
- No voltage is applied to the terminals.

(5) Contact output (DO): terminal block 3 (13) to (20), terminal block 4 and terminal block 5

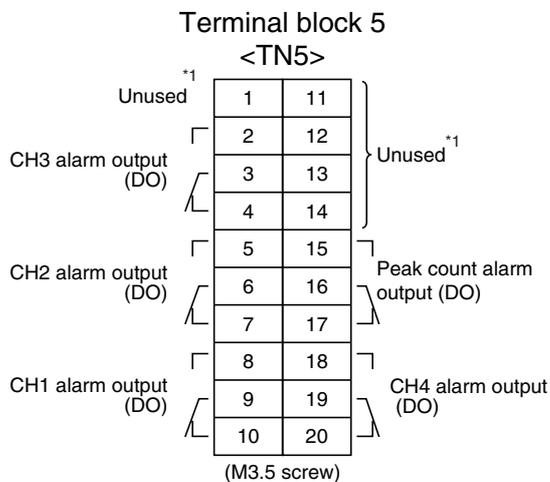
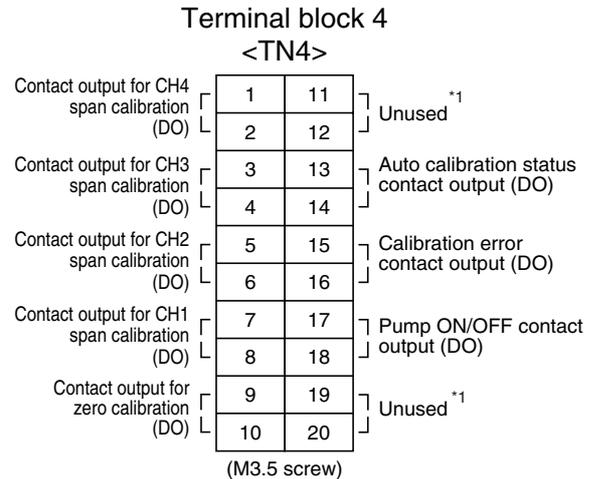
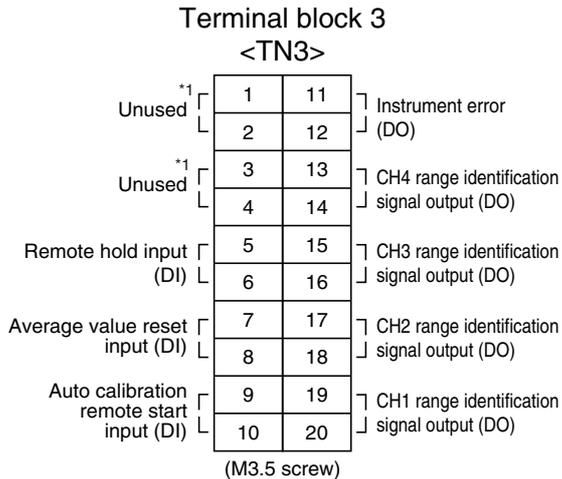
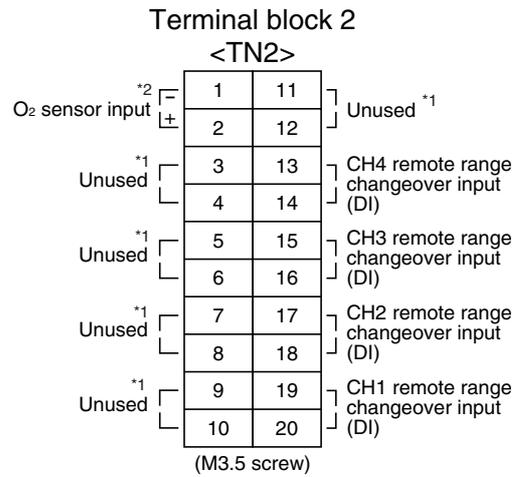
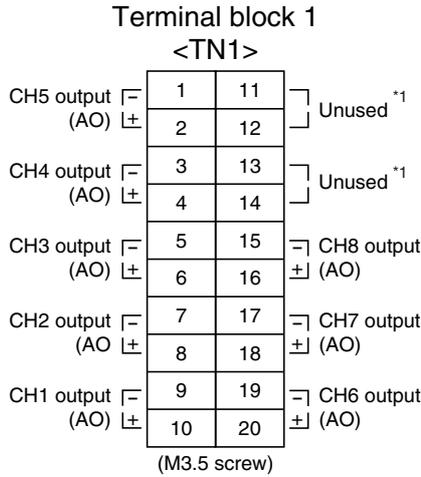
- Contact rating: 250V AC/2A, load resistance
- An output is for a relay contact output. An output is provided when switching to conductive (on) or open (off).

Note) The wires of analog output signals, O₂ sensor input and contact input should be fixed separately from power supply wiring and contact output wiring.

(6) Communication interface: connector for communication (RS-232C interface)

- Please refer to the manual (INZ-TN513327-E) about communication function.

(7) List of terminal blocks 1 to 5



- *1) Unused terminals are used for internal connection. So they should not be used as repeating terminals either.
- *2) O₂ sensor input is used when an external O₂ analyzer is selected.

(8) Description on terminal blocks 1 to 5

Terminal block 1

<TN1>

CH5 output (AO)	[-] 1	11	[-]	Unused
	[+] 2	12	[+]	
CH4 output (AO)	[-] 3	13	[-]	Unused
	[+] 4	14	[+]	
CH3 output (AO)	[-] 5	15	[-]	CH8 output (AO)
	[+] 6	16	[+]	
CH2 output (AO)	[-] 7	17	[-]	CH7 output (AO)
	[+] 8	18	[+]	
CH1 output (AO)	[-] 9	19	[-]	CH6 output (AO)
	[+] 10	20	[+]	

(M3.5 screw)

Terminal block 1 <TN1>

Terminal block for analog output (non-isolated output)

Output : 4 to 20 mA or 0 to 100V DC

Between 1 – 2 : CH5 output

Between 3 – 4 : CH4 output

Between 5 – 6 : CH3 output

Between 7 – 8 : CH2 output

Between 9 – 10 : CH1 output

Between 11 to 14 : For internal connection. Must not be wired. (Must not be used as junction terminal.)

Between 15 – 16 : CH8 output

Between 17– 18 : CH7 output

Between 19– 20 : CH6 output

Terminal block 2

<TN2>

O ₂ sensor input	[-] 1	11	[-]	Unused
	[+] 2	12	[+]	
Unused	[-] 3	13	[-]	CH4 remote range changeover input (DI)
	[+] 4	14	[+]	
Unused	[-] 5	15	[-]	CH3 remote range changeover input (DI)
	[+] 6	16	[+]	
Unused	[-] 7	17	[-]	CH2 remote range changeover input (DI)
	[+] 8	18	[+]	
Unused	[-] 9	19	[-]	CH1 remote range changeover input (DI)
	[+] 10	20	[+]	

(M3.5 screw)

Terminal block 2 <TN2>

Between 1– 2 : For O₂ sensor input. (Input for our Zirconia oxygen sensor or external O₂ sensor. Must not be used unless O₂ meter is added.)

Between 3 to12 : For internal connection. Must not be wired. (Must not be used as junction terminal.)

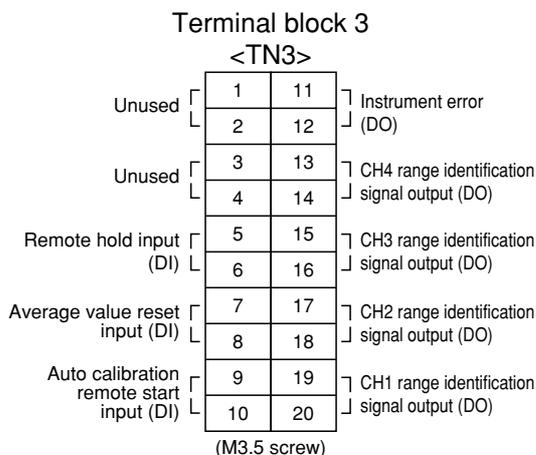
Between 13 – 14 : CH4 remote range changeover input

Between 15 – 16 : CH3 remote range changeover input

Between 17– 18 : CH2 remote range changeover input

Between 19– 20 : CH1 remote range changeover input

Note) High range is selected when open. Low range is selected when short-circuited. For details of action, refer to "6.7 Parameters Setting, "Remote Range".



Terminal block 3 <TN3>

Between 1 to 4 : For internal connection. Must not be wired. (Must not be used as junction terminal.)

Between 5 – 6 : Remote hold input. No hold when open. Output hold when short-circuited.

Between 7 – 8 : Average value reset input. Short-circuiting the contact input (for at 1.5 sec or more) resets O₂ average and O₂ correction average simultaneously. Opening it restarts the average value.

Between 9 – 10 : Automatic calibration remote start input. Open input after strapping for at least 1.5 seconds starts the automatic calibration whether automatic calibration setting is ON or OFF.

Between 11 – 12 : Conductive when analyzer unit error is produced. Normally open.

Between 13 – 14 : CH4 range identification signal

Between 15 – 16 : CH3 range identification signal

Between 17– 18 : CH2 range identification signal

Between 19– 20 : CH1 range identification signal

Note) Range identification signal is conductive at Low range or open at High range.
In case of 1-range system, the signal remains open.

**Terminal block 4
<TN4>**

Contact output for CH4 span calibration (DO)	1	11	Unused
	2	12	
Contact output for CH3 span calibration (DO)	3	13	Auto calibration status contact output (DO)
	4	14	
Contact output for CH2 span calibration (DO)	5	15	Calibration error contact output (DO)
	6	16	
Contact output for CH1 span calibration (DO)	7	17	Pump ON/OFF contact output (DO)
	8	18	
Contact output for zero calibration (DO)	9	19	Unused
	10	20	

(M3.5 screw)

Terminal block 4 <TN4>

Between 1 – 2 : CH4 span calibration contact output

Between 3 – 4 : CH3 span calibration contact output

Between 5 – 6 : CH2 span calibration contact output

Between 7 – 8 : CH1 span calibration contact output

Between 9 – 10 : Zero calibration contact output
When the calibration contact output is measured with manual calibration, the calibration contact corresponding to calibration channel is conductive.

For the automatic calibration, they are worked sequentially according to “6.4 Auto calibration setting”. If calibration is not performed, all of them are open.

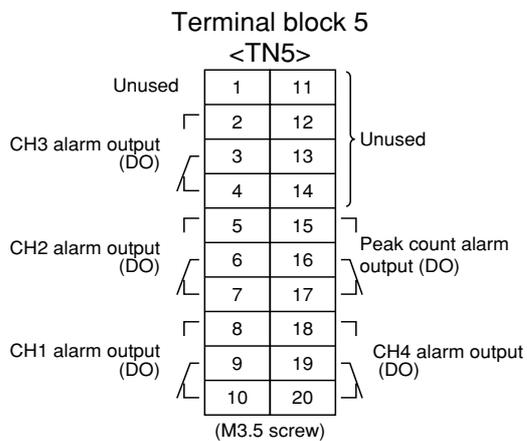
Between 11– 12 : For internal connection. Must not be wired. (Must not be used as junction terminal.)

Between 13– 14 : Automatic calibration in progress, contact output. Conductive during automatic calibration. Open otherwise.

Between 15– 16 : Calibration error contact output. Conductive when error is produced at zero or span calibration. Normally open.

Between 17– 18 : Pump ON/OFF contact output. (Used for turning ON/OFF the pump. Conductive during measurement and open at zero span calibration.)

Note: For the output of calibration contacts, see Item 3.5 (9) “Timing of calibration contact output”.



Terminal block 5 <TN5>

- 1 and 11 – 14 : For internal connection. Must not be wired. (Must not be used as junction terminal.)
- Between 2– 3 and 3– 4 : CH3 alarm output. Conductive at 2– 3 and open at 3– 4 when set value is exceeded. Open at 2– 3 and conductive at 3– 4 otherwise.
- Between 5– 6 and 6– 7 : CH2 alarm output. Conductive at 5– 6 and open at 6– 7 when set value is exceeded. Open at 5– 6 and conductive at 6– 7 otherwise.
- Between 8– 9 and 9– 10 : CH1 alarm output. Conductive at 8– 9 and open at 9– 10 when set value is exceeded. Open at 8– 9 and conductive at 9– 10 otherwise.
- Between 15– 16 and 16– 17 : Peak count alarm contact output. Conductive at 15 – 16 and open at 16 – 17 when preset peak count is exceed. Otherwise, open at 15 – 16 and conductive at 16 – 17. For setting and action, refer to instruction manual “6.6 Peak Alarm Setting”.
- Between 18– 19 and 19– 20 : CH4 alarm output. Conductive at 18– 19 and open at 19– 20 when set value is exceeded. Open at 18– 19 and conductive at 19– 20 otherwise.

(9) Timing of calibration contact output

1) Manual calibration (See "6.9 Calibration").

• Zero calibration

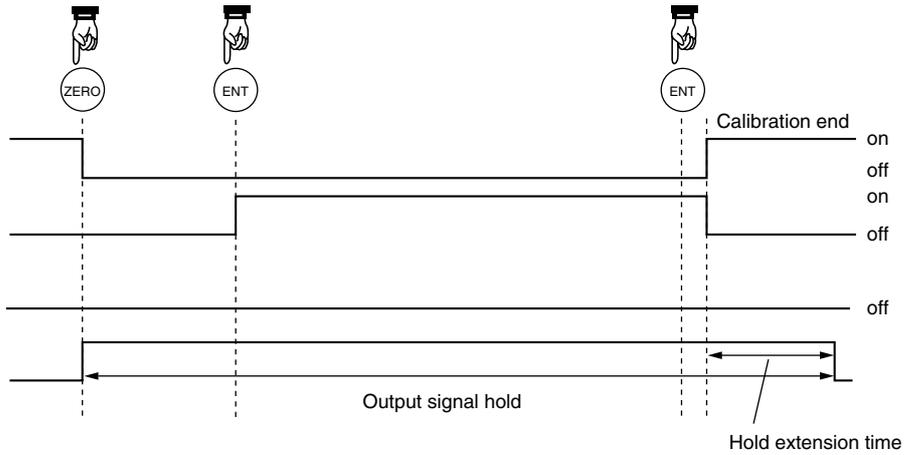
Pump ON/OFF contact

Zero calibration contact

CH1 to CH4 span calibration contact

Output hold function

(with hold ON setting)



• Span calibration

Pump ON/OFF contact

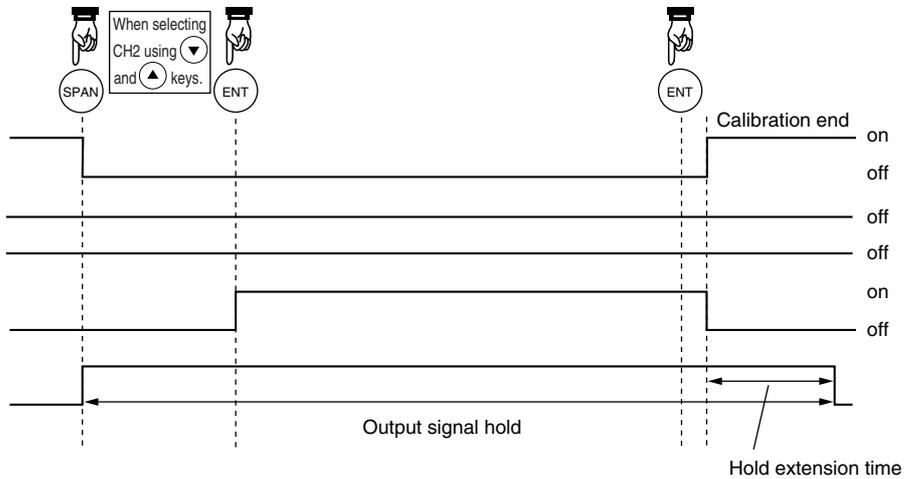
Zero calibration contact

Span 1 calibration contact

Span 2 calibration contact

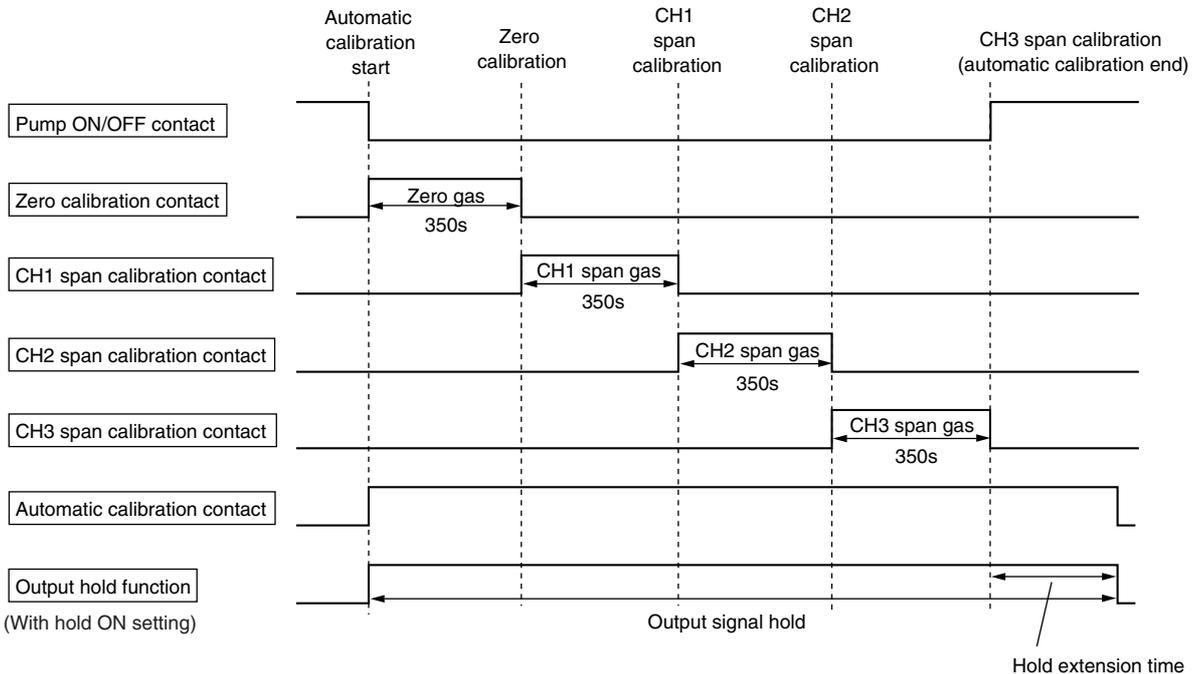
Output hold function

(with hold ON setting)



Note) The hold extension time depends on the gas flow time of the automatic calibration settings.

2) In case of automatic calibration (example shown in 6.4.1, Automatic calibration settings)



4. OPERATION

4.1 Preparation for operation

(1) Check of gas sampling tube, exhaust tube and wiring

Check that the pipes are correctly connected to the gas sampling port and drain port. Check that the analyzer is correctly wired as specified.

4.2 Warm-up operation and regular operation

(1) Operation procedure

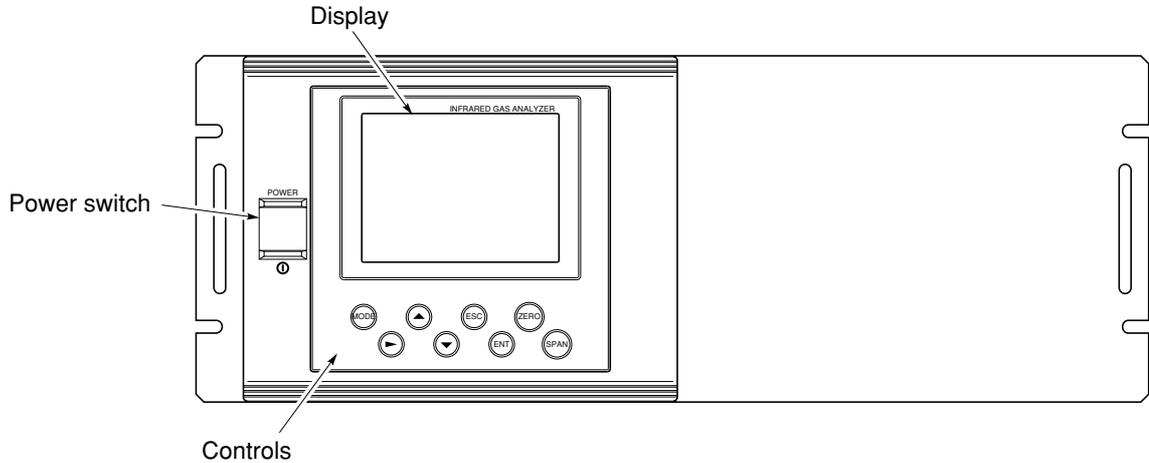
- 1) Turn ON the power switch at the left of the front panel.
In one or two seconds, the measurement screen will appear at the front panel.
- 2) About 2 hour warm-up operation
About 2 hours are needed until the operating performance is stabilized. Warm-up operation should be continued with the power ON.
- 3) Setting of various set values
Set required set values according to Chapter 6, "Setting and calibration".
- 4) Zero and span calibration
Perform zero calibration and span calibration after warm-up operation.
See Chapter 6.9, "Calibration".
- 5) Make moisture interference compensation adjustment (NO meter and SO₂ meter). (See "6.8 Maintenance mode" and "7.4 Moisture interference compensation adjustment" for details.)
Be sure to perform individual moisture interference compensation adjustment according to the system in the case of NO meter and SO₂ meter. Otherwise measurement is affected by moisture interference.
- 6) Introduction and measurement of measured gas
Start measurement by introducing measured gas into the analyzer.

Note) While in warm-up operation, the concentration reading may be beyond the upper limit of the range (range-over) or below the lower limit (range-under) . But this is not an error.

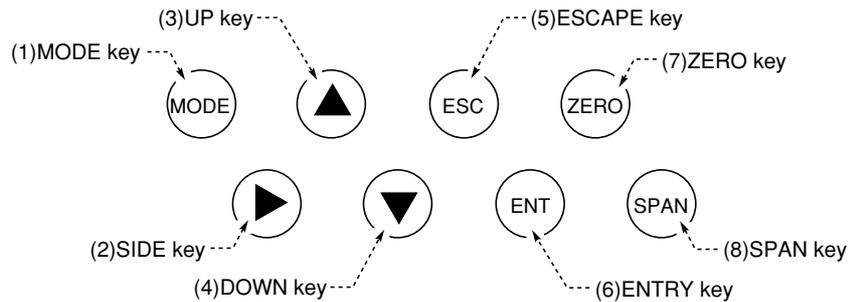
5. DESCRIPTION OF DISPLAY AND OPERATION PANEL

This section describes the display and operation panel of the gas analyzer. It also explains the name and description of function on the operation panel. See Fig. 5-1.

5.1 Name and description of operation panel



- Display : The measurement screen and the setting items are displayed.
- Controls : The configuration is as shown below.



Name	Description	Name	Description
(1) MODE key	Used to switch the mode.	(5) ESC key	Used to return to a previous screen or cancel the setting midway.
(2) SIDE key	Used to change the selected item (by moving the cursor) and numeral digit.	(6) ENT key	Used for confirmation of selected items or values, and for execution of calibration.
(3) UP key	Used to change the selected item (by moving the cursor) and to increase numeral value.	(7) ZERO key	Used for zero calibration.
(4) DOWN key	Used to change the selected item (by moving the cursor) and to decrease numeral value.	(8) SPAN key	Used for span calibration.

Fig. 5-1 Name and description of operation display and panel

5.2 Overview of display and operation panel

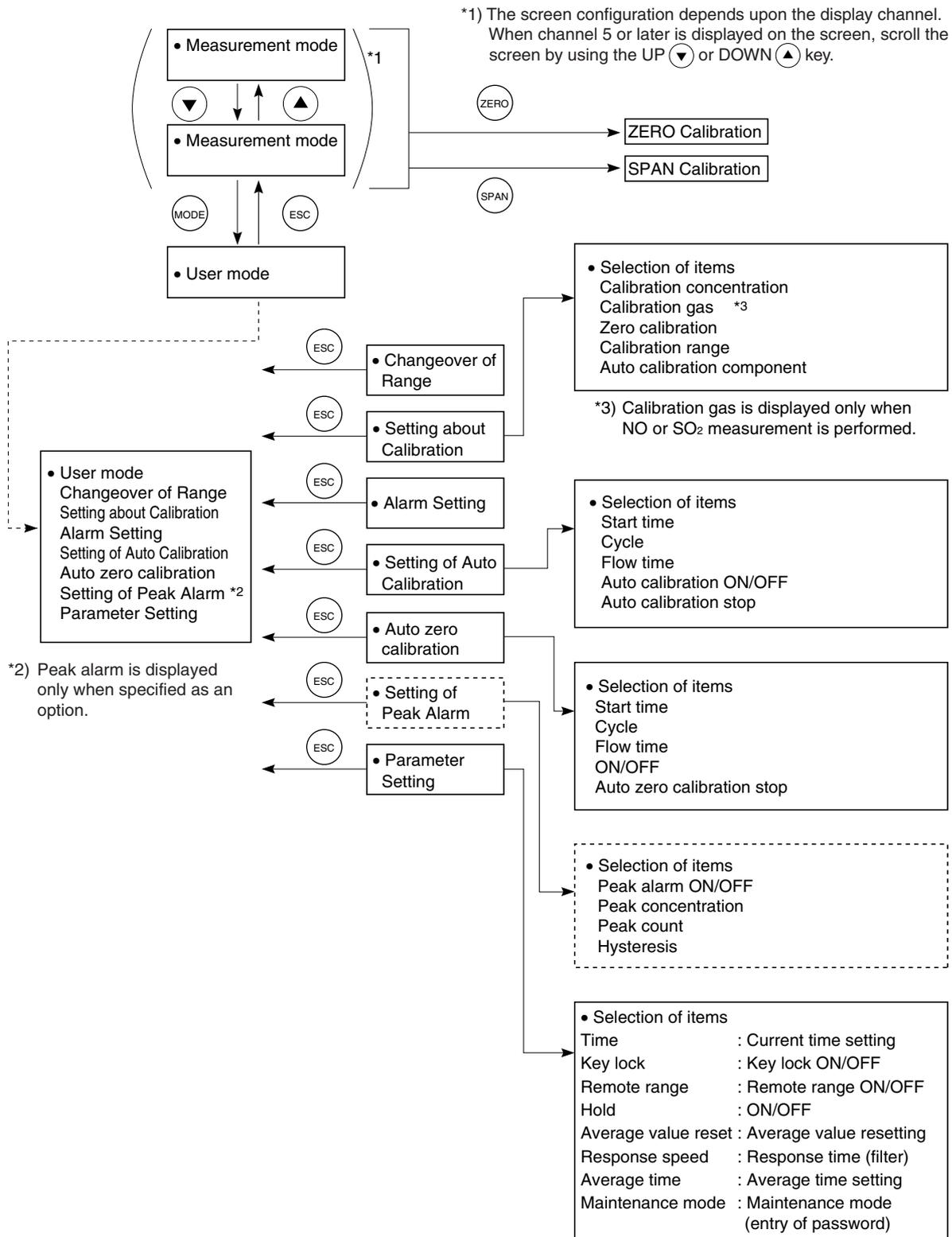


Fig. 5-2

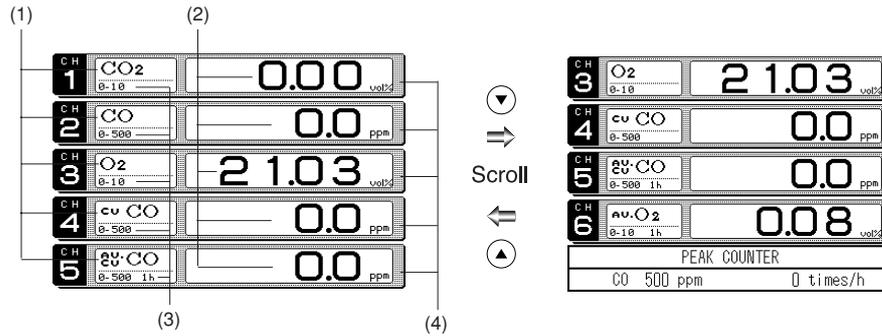
5.3 Overview of display screen

(1) Measurement mode screen

On turning on the power switch, the Measurement Mode screen will appear.

The measurement screen depends on the number of components. The following screen configuration shown as an example is for CO₂, CO, O₂ (Output at channel 6).

When channel 5 or later is displayed, scroll \blacktriangle or \blacktriangledown key to view another configuration which is beyond the screen.



No.	Name	Function	No.	Name	Description
(1)	Component display	Displays component of instantaneous value, converted instantaneous value, converted average value, etc.	(5)	Peak alarm component display	Displays peak alarm component.
(2)	Concentration display	Displays measured value of concentration.	(6)	Peak alarm concentration display	Displays peak alarm concentration (Upper limit value).
(3)	Range display	Displays range values.	(7)	Peak alarm count	Displays the alarm times exceeding the peak value.
(4)	Unit display	Displays unit with ppm and vol%.	(8)	Peak alarm unit display	Displays unit of peak alarm with times/h.

Fig. 5-3 Name and function of measurement mode screen

- **Instantaneous value and concentration value:**

The concentration display of CH (component) where sampling components such as “CO₂”, “CO” or “O₂” are displayed in the component display, indicates current concentration values of the measured components contained in gas that is now under measurement.

- **O₂ correction concentration values:**

CH (components) where “cv**” is displayed as “cv CO” in the component display are calculated from the following equation, by setting sampling components, O₂ instantaneous/concentration values and O₂ correction reference value (see item 6.8).

$$\text{Conversion output} = \frac{\frac{21 - O_n}{21 - O_s}}{K} \times C_s$$

On: The value of the O₂ correction reference value (Value set by application)

Os: Oxygen concentration (%)

Cs: Concentration of relevant measured component

K: The value of the fractional part is this equation.

where, K is When K ≥ 4, K=4. When K < 0, K=4.

When Cs < 0, K=0.

The correction components are CO and SO₂ only.

- **O₂ correction concentration average value:**

CH (component) where “ $\overset{AV}{CV}^{**}$ ” is displayed as “ $\overset{AV}{CV} CO$ ” in the component display and O₂ average value, a value obtained by averaging O₂ conversion concentration value or O₂ concentration value in a fixed time is output every 30 seconds.

Averaging time can be changed between 1 minute and 59 minutes or 1 hour and 4 hours according to the average time settings (See 6.7 Parameter setting).

(The set time is displayed as “1h”, for instance, in the Range display.)

* The measurement ranges of O₂ correction concentration value and O₂ correction concentration average value are the same as that of the measuring components. Also, the measurement range of O₂ average value is the same as that of O₂.

(2) Setting/selection screen

The setting/selection screen is configured as shown below:

- In the status display area, the current status is displayed.
- In the message display area, messages associated with operation are displayed.
- In the setting item and selection item display area, items or values to be set are displayed, as required. To work on the area, move the cursor to any item by using \uparrow , \downarrow and

\rightarrow keys.

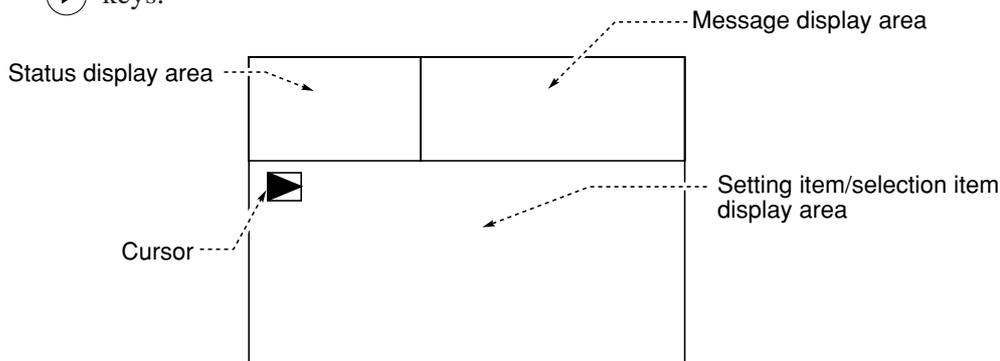


Fig. 5-4 Display screen

(3) Contents of measured channel (CH)

The contents in each measured CH corresponding to the type are given below:

Code symbol			Display/output contents corresponding to each channel (CH) No.							
5th digit	6th digit	20th digit	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Y	C	Y	O ₂							
P	Y	Y	NO							
A	Y	Y	SO ₂							
D	Y	Y	CO ₂							
B	Y	Y	CO							
E	Y	Y	CH ₄							
F	Y	Y	NO	SO ₂						
H	Y	Y	NO	CO						
2	Y	Y	CO ₂	CO						
3	Y	Y	CH ₄	CO						
4	Y	Y	CO ₂	CH ₄						
L	Y	Y	NO	SO ₂	CO					
5	Y	Y	CO ₂	CO	CH ₄					
P	A, B, C, D	Y	NO	O ₂						
A	A, B, C, D	Y	SO ₂	O ₂						
D	A, B, C, D	Y	CO ₂	O ₂						
B	A, B, C, D	Y, B	CO	O ₂						
E	A, B, C, D	Y	CH ₄	O ₂						
F	A, B, C, D	Y	NO	SO ₂	O ₂					
H	A, B, C, D	Y, B	NO	CO	O ₂					
2	A, B, C, D	Y, B	CO ₂	CO	O ₂					
3	A, B, C, D	Y, B	CH ₄	CO	O ₂					
4	A, B, C, D	Y	CO ₂	CH ₄	O ₂					
L	A, B, C, D	Y, B	NO	SO ₂	CO	O ₂				
5	A, B, C, D	Y, B	CO ₂	CO	CH ₄	O ₂				
P	A, B, C, D	A	NO _x	O ₂	Correct NO _x	Correct NO _x average	O ₂ average			
A	A, B, C, D	A	SO ₂	O ₂	Correct SO ₂	Correct SO ₂ average	O ₂ average			
B	A, B, C, D	A, C	CO	O ₂	Correct CO	Correct CO average	O ₂ average			
F	A, B, C, D	A	NO _x	SO ₂	O ₂	Correct NO _x	Correct SO ₂	Correct NO _x average	Correct SO ₂ average	O ₂ average
H	A, B, C, D	A, C	NO _x	CO	O ₂	Correct NO _x	Correct CO	Correct NO _x average	Correct CO average	O ₂ average
2	A, B, C, D	A, C	CO ₂	CO	O ₂	Correct CO	Correct CO average	O ₂ average		
3	A, B, C, D	A, C	CH ₄	CO	O ₂	Correct CO	Correct CO average	O ₂ average		
L	A, B, C, D	A, C	NO _x	SO ₂	CO	O ₂	Correct NO _x	Correct SO ₂	Correct CO	O ₂ average
5	A, B, C, D	A, C	CO ₂	CO ₂	CH ₄	O ₂	Correct CO	Correct CO average	O ₂ average	

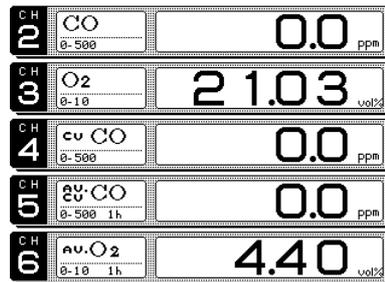
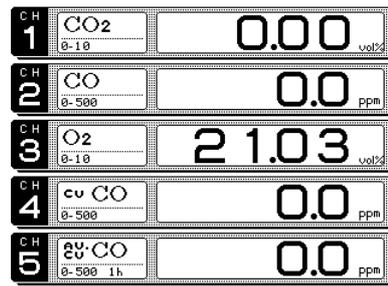
How to view the Table

When SO₂ is displayed in CH1, it means that display and output of CH1 correspond to SO₂ component.

5.4 General operation

- **Measurement mode**

The measurement mode can be displayed for up to 5 channels in a single screen. When viewing a channel beyond the 5 channels, press the (▲) or (▼) key and the screen can be scrolled one by one channel at a time.



⇒ See 6.9.1, Zero calibration

⇒ See 6.9.2, Span calibration



- **User mode displays the following settings.**

- Changeover of range
- Calibration setting
- Alarm setting
- Setting of auto calibration
- Setting of auto zero calibration
- Peak alarm setting
- Parameter setting

User Mode	Select an item with UP/DOWN and ENT Back with ESC
<input checked="" type="checkbox"/> Changeover of Range Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	



Measurement Mode

For setting settings, refer to “6, Setting and calibration”.

6. SETTING AND CALIBRATION

6.1 Changeover of range

This mode is used to select the ranges of measured components.

- (1) During measurement, press the  key to display the User mode.
- (2) Point the cursor to “Changeover of Range”. Press the  key.

- (3) The “Channel Selection” screen appears. Press the “” or “” key until the “” cursor moved selects a desired CH (component).
- (4) After selection, press the  key.

Note) The range of O₂ correction instantaneous values and O₂ correction average values is automatically switched by changing the range of instantaneous value of each CH (component).

- (5) In the Range Setting screen that appears, move the cursor by pressing the  or  key to select the range. (The range with a mark of  is currently selected.)
- (6) After selection, press the  key.
- (7) Measurement is conducted within the selected range. The range identification signal (CO) is shorted with the low range (Range 1), and open with the high range (Range 2).

Note) If the Remote Range is set to ON, the changeover of range cannot be performed on the screen.

To close Changeover of range
To close Changeover of range, or cancel the command midway, press the  key.
A previous screen will return.

↓ 

User Mode	Select an item with UP/DOWN and ENT Back with ESC
	Changeover of Range Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting

↓ 

Range Change	Select CH No. with UP/DOWN and ENT Back with ESC
	CH1 CO ₂ ▶ Range1 0-10 vol% Range2 0-20 vol%
	CH2 CO ▶ Range1 0-500 ppm Range2 0-2000 ppm
	CH3 O ₂ ▶ Range1 0-10 vol% Range2 0-25 vol%

↓  () 

Range Change	Select range with UP/DOWN and ENT Back with ESC
	CH1 CO ₂ ▶ Range1 0-10 vol%  Range2 0-20 vol%
	CH2 CO ▶ Range1 0-500 ppm Range2 0-2000 ppm
	CH3 O ₂ ▶ Range1 0-10 vol% Range2 0-25 vol%

↓  () 

End of Range Selection

6.2 Calibration setting

Concentration or operation in calibration can be selected as follows.

Items to be selected are calibration concentration, calibration gas, zero calibration operation, calibration range operation, and auto calibration component.

“Calibration gas” is displayed when NO or SO₂ is included in components to be analyzed.

6.2.1 Setting of calibration concentration

It allows you to set concentrations of the standard gas (zero and span) of each channel used for calibration.

(1) During measurement, press the  key to display the User mode.

(2) Point the cursor to “Setting about Calibration” by pressing the  or  key. Press the  key.

(3) In the “Setting about Calibration” screen that appears, point the cursor to “Calibration Value” by pressing the  or  key. Press the  key.

(4) In the “Calibration Concentration CH Selection” screen that appears, point the cursor to CH you want to set by using the  or  key. Press the  key.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range <input checked="" type="checkbox"/> Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	



Cal. Settings	Select an item with UP/DOWN and ENT Back with ESC
<input checked="" type="checkbox"/> Calibration Value Calibration Gas About ZERO Calibration About Calibration Range Auto Calibration Components	



Cal. Settings	Select CH No. for setting calibration value		
Cal. Value			
CH	RANGE	ZERO	SPAN
<input checked="" type="checkbox"/> CH 1	0-10vol%	000.00	010.00
CO ₂	0-20vol%	000.00	020.00
CH 2	0-500ppm	0000.0	0500.0
CO	0-2000ppm	00000	02000
CH 3	0-10vol%	00.00	10.00
O ₂	0-25vol%	00.00	25.00



- (5) In the “Calibration Concentration Selection” screen that appears, select any concentration item you want to set by pressing the \blacktriangle , \blacktriangledown , \blacktriangleright key.

Note) Analyzers other than the zirconia O₂ instrument cannot perform zero setting.

Cal. Settings		Select setting value	
CH	RANGE	ZERO	SPAN
CH1	0-10vol%	000.00	010.00
CO ₂	0-20vol%	000.00	020.00
CH2	0-500ppm	0000.0	0500.0
CO	0-2000ppm	00000	02000
CH3	0-10vol%	00.00	10.00
O ₂	0-25vol%	00.00	25.00

Cursor for setting value \downarrow \blacktriangledown (\blacktriangle) (ENT)

- (6) In the “Calibration Concentration Value Setting” screen that appears, enter calibration gas concentration values (zero and span). For value entry, press the \blacktriangle or \blacktriangledown key, and a 1-digit value increases or decreases. By pressing the \blacktriangleright , the digit moves. After setting, save the entry by pressing the (ENT) key. The saved value becomes valid from the next calibration process.

Note) Enter the set values corresponding to each range. When the O₂ measurement uses atmospheric air for the zero gas, set the concentration value to 21.00. When the cylinder air is used, set to the concentration value as indicated on the cylinder.

Cal. Settings		Set calibration value	
CH	RANGE	ZERO	SPAN
CH1	0-10vol%	000.00	010.00
CO ₂	0-20vol%	000.00	020.00
CH2	0-500ppm	0000.0	0500.0
CO	0-2000ppm	00000	02000
CH3	0-10vol%	00.00	10.00
O ₂	0-25vol%	00.00	25.00

\downarrow \blacktriangledown \blacktriangle \blacktriangleright (ENT)

**End of Calibration
Concentration Setting**

To close the setting

To close the calibration concentration value setting process or cancel this mode midway, press the (ESC) key. A previous screen will return.

Setting range of values

Paramagnetic O₂, CO₂, CO, SO₂ and CH₄ measurement : Zero gas : Fixed at 0
Span gas : Minimum digit, 1 to 100% of full scale
(Full scale (FS) is the same as each range value.)

Zirconia O₂ measurement : Zero gas : 5 to 25 vol%
Span gas : 0.01 to 5 vol%

The setting cannot be performed beyond the range.

6.2.2 Setting of calibration gas

Whether moisture is contained in zero gas and span gas used for calibration can be set in advance as follows. Make the setting according to the sampling system created.

If sampling system controls the moisture content in the calibration gas (ZERO or SPAN) to become the same as that in the sample gas to be fed to the analyzer using an electronic cooler, etc., set “With” water vapor.

- (1) Press the  key in measurement state to display the User mode.
- (2) Move the cursor to Setting about Calibration using the  or the  key, and then press the  key.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range <input checked="" type="checkbox"/> Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	

- (3) On the Setting about Calibration screen that appears, move the cursor to “Calibration Gas” using the  or the  key, and then press the  key.



Cal. Settings	Select an item with UP/DOWN and ENT Back with ESC
Calibration Value <input checked="" type="checkbox"/> Calibration Gas About ZERO Calibration About Calibration Range Auto Calibration Components	

- (4) On the “Gas Selection” screen that appears, move the cursor to the gas to be selected using the  or the  key, and then press the  key.



Cal. Settings	Select calibration gas
Cal. Gas	
	Water Vapor
<input checked="" type="checkbox"/> Zero Gas	without
Span Gas	without



(5) On the “Gas Selection” screen that appears, select “With” or “Without” of moisture content in calibration gas using the  or the  key.

- Select “With” to have the calibration gas contain a certain amount of moisture.
- Select “Without” to use dry gas (moisture content: saturated at 70°C or lower) such as cylinder gas as calibration gas.
- When “Without” is selected for zero gas, “With” cannot be selected for span gas.

After the selection is made, press the  key.

Cal. Settings Cal. Gas	Set with or without water
	Water Vapor
Zero Gas	with
Span Gas	without



End of calibration gas setting

To close the setting

To terminate or cancel calibration gas setting, press the  key.
The previous screen appears again.

Note: Be sure to make the setting according to the sampling system created. We recommend you to select “With” moisture in zero gas for the measurement of NO and SO₂. In this case, be sure to perform bubbling (humidification) of zero gas to make its moisture content kept at constant level before feeding the gas. (See “(6) Example of sampling system configuration” in “3.4 Sampling system.”)

6.2.3 Setting of zero calibration

If zero calibration is to be made manually, select whether to calibrate all components at once or each of them separately upon selection.

- (1) During measurement, press the  key to display the User mode.
- (2) Point the cursor to “Setting about Calibration” by pressing the  or  key. Press the  key.

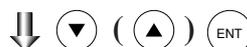


User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range <input checked="" type="checkbox"/> Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	



- (3) In the “Setting about Calibration” screen that appears, point the cursor to “About ZERO Calibration” by pressing the  or  key. Press the  key.

Cal. Settings	Select an item with UP/DOWN and ENT Back with ESC
Calibration Value Calibration Gas <input checked="" type="checkbox"/> About ZERO Calibration About Calibration Range Auto Calibration Components	



- (4) In the “CH Selection” screen that appears, point the cursor to CH you want to set by using the  or  key. Press the  key.

Cal. Settings ZERO Cal.	Select CH No.			
<input checked="" type="checkbox"/> CH1 CO ₂	<table border="1"> <tr> <td>Range1 0-10 vol%</td> <td rowspan="2">each</td> </tr> <tr> <td>Range2 0-20 vol%</td> </tr> </table>	Range1 0-10 vol%	each	Range2 0-20 vol%
Range1 0-10 vol%	each			
Range2 0-20 vol%				
CH2 CO	<table border="1"> <tr> <td>Range1 0-500 ppm</td> <td rowspan="2">both</td> </tr> <tr> <td>Range2 0-2000ppm</td> </tr> </table>	Range1 0-500 ppm	both	Range2 0-2000ppm
Range1 0-500 ppm	both			
Range2 0-2000ppm				
CH3 O ₂	<table border="1"> <tr> <td>Range1 0-10 vol%</td> <td rowspan="2">each</td> </tr> <tr> <td>Range2 0-25 vol%</td> </tr> </table>	Range1 0-10 vol%	each	Range2 0-25 vol%
Range1 0-10 vol%	each			
Range2 0-25 vol%				



(5) In the “Zero Calibration Selection” screen that appears, select “At once” or “Each” by pressing the \blacktriangle or \blacktriangledown key. When selecting “Both”, the CH (components) to be set can be zero-calibrated at the same time. When selecting “Each”, either of the CH (components) to be selected is zero-calibrated. After setting, press the ENT key, and the calibration you specified is carried out.

Cal. Settings ZERO Cal.		Set each or at once CH at ZERO Calibration	
CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%		at once
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm		at once
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%		each

To close “About ZERO Calibration”
To close “About ZERO Calibration” setting or to cancel this mode midway, press the ESC key. A previous screen will return.



End of Manual Calibration Setting

Example

Whether upon selection or at once can be determined for each CH (component).

•Setting upon selection

At a manual zero calibration, select the CH (component) and then perform zero calibration.

•Setting at once

At a manual zero calibration, CHs (components) for which “at once” was selected can simultaneously be calibrated.

*** When the zirconia O₂ analyzer uses the cylinder air or atmospheric air for the zero gas, select “At once”.**

Manual Calibration screen

When “Each” is set for each CH

ZERO Cal.	Select CH No. with UP/DOWN and ENT Back with ESC	
\blacktriangleright CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	2003
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	999.9
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	40.95

A single cursor will appear.

When “At once” is set for CH1 and CH2
(CH3 is set “each”)

ZERO Cal.	ENT:Go on calibration of selected CH ESC:Not calibration	
CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	\blacktriangleright 19.92
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	\blacktriangleright 999.9
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	40.95

Cursors will appear on all components where “at once” is set.

6.2.4 Setting of calibration range

This mode is used to set if the range of each CH (component) at the calibration (manual calibration or auto calibration) should be calibrated with a single range or 2 ranges.

- (1) During measurement, press the  key to display the User mode.
- (2) Point the cursor to “Setting about Calibration” by pressing the  or  key. Press the  key.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range <input checked="" type="checkbox"/> Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	

- (3) In the “Setting about Calibration” screen that appears, point the cursor to “About Calibration Range” by pressing the  or  key. Press the  key.



Cal. Settings	Select an item with UP/DOWN and ENT Back with ESC
Calibration Value Calibration Gas About ZERO Calibration <input checked="" type="checkbox"/> About Calibration Range Auto Calibration Components	

- (4) In the “Calibration Range CH Selection” screen that appears, point the cursor to the CH you want to set by pressing the  or  key. Press the  key.



Cal. Settings	Select CH No.		
Cal. Range			
<input checked="" type="checkbox"/> CH 1 CO ₂	Range1 0-10 vol%	Range2 0-20 vol%	current
CH 2 CO	Range1 0-500 ppm	Range2 0-2000ppm	current
CH 3 O ₂	Range1 0-10 vol%	Range2 0-25 vol%	current



(5) In the “Calibration Selection” screen that appears, select “Both” or “Current” by pressing the \blacktriangle or \blacktriangledown key.

- When selecting “both”, Range 1 and Range 2 of the set CH are calibrated together.
- When selecting “Current”, the range alone displayed at the set CH is calibrated.

Cal. Settings		Set calibration range	
Cal. Range		current or both range	
CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%		both
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm		current
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%		current

To close “Setting of Calibration Range”

To close “Setting of Calibration Range” or to cancel this mode midway, press the ESC key. A previous screen will return.



End of Manual Calibration Setting

Example

CH1 CO ₂	Range 1: 0 to 10 vol% Range 2: 0 to 20 vol%	both
CH2 CO	Range 1: 0 to 500 ppm Range 2: 0 to 2000 ppm	current

CH1: Range 1 and Range 2 are calibrated together, with zero or span calibration.

CH2: Only currently displayed range is calibrated, with zero or span calibration.

Manual Calibration screen

In case of “both” setting

ZERO Cal.		ENT:Go on calibration of selected CH ESC:Not calibration	
CH1 CO ₂	▶Range1 0-10 vol% Range2 0-20 vol%	▢	19.92
CH2 CO	▶Range1 0-500 ppm Range2 0-2000ppm	▢	999.9
CH3 O ₂	▶Range1 0-10 vol% Range2 0-25 vol%		40.95

Two cursors will appear in both ranges

Note) When calibration is performed by the “Both” setting under the normal operating condition, prepare a span gas cylinder on the normal operating range side. It is recommend to perform span gas calibration in the normal operating range.

The other range that is calibrated by “Both” may result in some error (max. of $\pm 5\%$ of FS).

6.2.5 Setting of auto-calibration component

It sets the CH (component) to be calibrated in the auto-calibration.

(1) During measurement, press the  key to display the User mode.

(2) Point the cursor to “Setting about Calibration” by pressing the  or  key. Press the  key.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range <input checked="" type="checkbox"/> Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	

(3) In the “Setting about Calibration” screen that appears, point the cursor to “Auto Calibration Components” by pressing the  or  key. Press the  key.



Cal. Settings	Select an item with UP/DOWN and ENT Back with ESC
Calibration Value Calibration Gas About ZERO Calibration About Calibration Range <input checked="" type="checkbox"/> Auto Calibration Components	

(4) In the “Auto Calibration Components” selection screen that appears, point the cursor to the CH you want to set by pressing the  or  key. Press the  key.



Cal. Settings	Select CH No.	
Auto Cal.		
<input checked="" type="checkbox"/> CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	enable
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	enable
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	enable



(5) In the “Auto Calibration Selection” screen that appears, select “enable” or “disable” by pressing the \blacktriangle or \blacktriangledown key. After setting, press the ENT key.

Cal. Settings Auto Cal.		Set enable or disable for auto calibration
CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	enable
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	enable
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	disable

To close Auto Calibration Component setting

To close “Setting of Auto Calibration Component” or to cancel this mode midway, press the ESC key.

A previous screen will return.



End of Manual Calibration Setting

Example

Auto calibration is made in the following rules according to the setting.

1. Zero calibration at once of CHs (components) which were set to “enable”.
2. The span of CHs (components) which were set to “enable” is calibrated in the ascending order of CH number.

Example 1. In case all of CH1: CO₂, CH2: CO, CH3: O₂, were set to “enable”.

Zero calibration (at once) of CH1 to CH3 → span calibration of CH1 (CO₂)
→ span calibration of CH2 (CO) → span calibration of CH3 (O₂)

Example 2. In case, out of CH1: CO₂, CH2: CO and CH3: O₂, CH1 (CO₂) was set to “enable”, CH2 (CO) was set to “enable” an CH3 (O₂) was set to “disable”.

Zero calibration (at once) of CH1 and 2 → span calibration of CH1 (CO₂) → span calibration of CH2 (CO)

Caution

The components which were set to “enable” is calibrated to zero at once at the time of auto calibration regardless of setting in “6.2.3 Setting of manual zero calibration”.

6.3 Alarm setting

6.3.1 Setting of alarm values

This mode is used to set the upper and lower limit value to provide an alarm output during measurement. Before changing the alarm setting, set the ON/OFF to OFF.

- (1) During measurement, press the  key to display the User mode.
- (2) Point the cursor to "Alarm Setting" by pressing the  or  key. Press the  key.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration <input checked="" type="checkbox"/> Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	



- (3) After the alarm setting CH selection screen has appeared, operate the  or  key until the cursor is aligned with a desired CH and press the  key.

Alarm Setting	Select CH No. or Hysteresis setting
<input checked="" type="checkbox"/> CH1 CO ₂ CH2 CO CH3 O ₂	
Hysteresis	00 %FS



- (4) After the alarm item selection screen has appeared, operate the  or  key until the cursor is aligned with a desired item and press the  key.

Alarm Setting CH1 CO ₂	Select an item with UP/DOWN and ENT Back with ESC
<input checked="" type="checkbox"/> Upper Range 1 10.00 vol% Range 2 10.00 vol% Lower Range 1 00.00 vol% Range 2 00.00 vol% Kind of Alarm Upper ON/OFF 0 F F	



Caution

Set the values so that upper limit value > lower limit value and that (upper limit value – lower limit value) > hysteresis error.
The alarm is activated in each range independently from the settings of each range.

After setting, the alarm setting is now completed by pressing the **ENT** key.

Cursor for setting value

To close the "Alarm Setting"
To close the " Alarm Setting" or to cancel this mode midway, press the **ESC** key. A previous screen will return.

Setting range
0 to 100% FS (Settable in each range).

Alarm Setting	Set value
CH1 CO ₂	
Upper Range 1	00.00 vol%
Range 2	10.00 vol%
Lower Range 1	00.00 vol%
Range 2	00.00 vol%
Kind of Alarm	Upper
ON/OFF	OFF



End of Alarm Setting

Description of setting items

Upper limit value: Sets the upper limit value (concentration) of alarm.

Lower limit value: Sets the lower limit value (concentration) of alarm.

Contact action: Selects one of upper limit alarm, lower limit alarm, and upper limit or lower limit alarm.

Upper limit alarm ... Alarm contact operates when above upper limit value.

Lower limit alarm ... Alarm contact operates when below lower limit value.

Upper limit alarm or lower limit alarm ... Alarm contact operates when above upper limit value or below lower limit value.

ON/OFF: Enables the alarm function if set at ON, or disables the alarm function if set at OFF.

* The upper limit value cannot be set below the lower limit value, and the lower limit value cannot be set above the upper limit value.

If it is desired to set the upper limit value below the lower limit value already stored in the memory, reduce the lower limit value beforehand, or vice versa.

Typical on-screen display when an alarm occurs

When an upper limit alarm has occurred, the "High alarm" message lights at CH (component) ("Low alarm" at lower limit alarm).

High alarm		----	vol%
CH 2	CO 0-500	0.0	ppm
CH 3	O ₂ 0-10	20.60	vol%
CH 4	cu CO 0-500	0.0	ppm
CH 5	av CO 0-500 1h	0.0	ppm

Caution

- For 10 minutes after turning on power, the alarm judgment is inactive.

6.3.2 Hysteresis setting

To prevent chattering of an alarm output near the alarm setting values, set hysteresis.

- (1) In the "Alarm Setting CH Selection" screen that appears, point the cursor to "Hysteresis" by pressing the \blacktriangle or \blacktriangledown key. Press the ENT key.

Alarm Setting	Select CH No. or Hysteresis setting
CH1	CO ₂
CH2	CO
CH3	O ₂
\blacktriangledown Hysteresis	00 %FS



- (2) In the "Hysteresis Value Setting" screen that appears, enter hysteresis values.

For the value entry, 1-digit value is increased or decreased by pressing the \blacktriangle or \blacktriangledown key, and pressing the \blacktriangleright key moves the digit. After setting, press the ENT key to carry out hysteresis.

Alarm Setting	Set Hysteresis 0 to 20%FS available
CH1	CO ₂
CH2	CO
CH3	O ₂
Hysteresis	00 %FS



To close Hysteresis Setting

To close the "Hysteresis Setting" or cancel the mode midway, press the ESC key. A previous screen will return.

Setting range

0 to 20% of full scale
A full scale means each range provides a full scale of width.

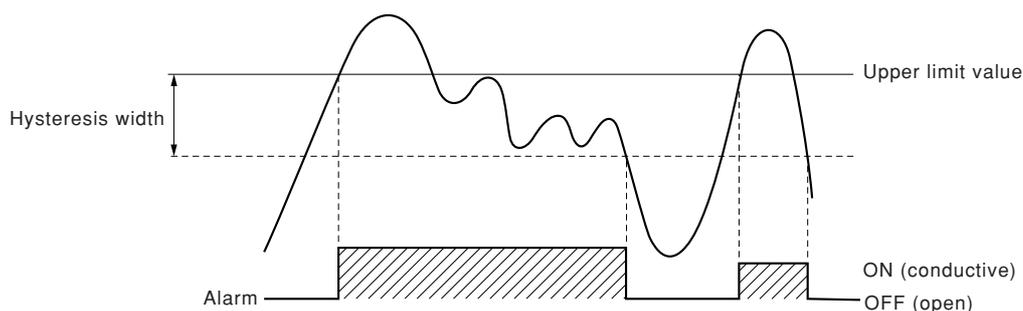
End of Hysteresis Setting

Caution

The hysteresis is common to all CHs (components).

Hysteresis

If hysteresis values exceed the upper limit value as shown in graph, an alarm output is provided. Once the alarm output is turned ON, it remains ON until the value falls below the set lower limit of the hysteresis indication.



6.4 Setting of auto calibration

6.4.1 Auto calibration

Auto calibration is automatically carried out when zero calibration and span calibration are set.

Before changing the setting of auto calibration, set the ON/OFF to OFF.

- (1) During measurement, press the  key to display the User mode.
- (2) Point the cursor to “Setting of Auto Calibration” by pressing the  or  key. Press the  key.

↓ 

User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration Alarm Setting <input checked="" type="checkbox"/> Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	

- (3) In the “Setting of Auto Calibration” screen that appears, point the cursor to any item you want by pressing the  or  key. Press the  key.

↓  () 

About Auto Cal.	Select setting item
<input checked="" type="checkbox"/> Start Time WED 11:30 Cycle 07 day Flow Time 060 sec. ON/OFF ON Time : WED 15:40	
Stop Auto Calibration	

- (4) In the “Auto Calibration Parameter Setting” screen that appears, perform the value entry or the setting. For the value entry or setting change, use the  or  key. For the value entry and setting, use the  or  key. To change the setting, use the  key to move the cursor to the right.

↓  () 

About Auto Cal.	Set Start Time
Start Time WED 11:30 Cycle 07 day Flow Time 060 sec. ON/OFF ON Time : WED 15:41	
Stop Auto Calibration	

After setting, press the  key, and auto calibration is carried out by the entered setting value.

↓    

End of Auto Calibration Setting

Description of setting items

- Start Time : Setting at the first calibration (day of the week, hour, minute)
- Cycle : A period between the start time of one calibration and another (unit : hour/day)
- Flow Time : The time required for the calibration gas to be replaced in the cell
- ON/OFF : Auto zero calibration ON or OFF

To close Setting of Auto calibration

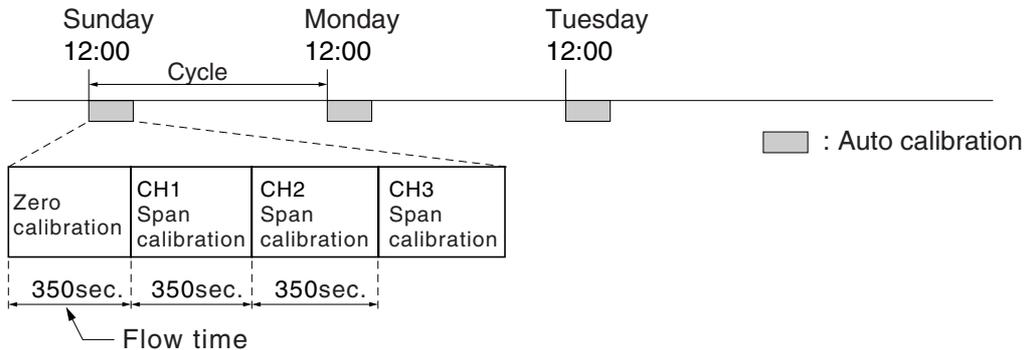
To close the “Setting of Auto calibration” or cancel this mode midway, press the (ESC) key. A previous screen will return.

The auto calibration status contact output is closed while auto calibration is in progress (hold extension time by the length of time the same as gas replacement time included if the hold setting is set to ON), and open in other cases.

Example

Start time SUN 12:00
 Cycle 1 day
 Flow time 350 sec
 ON/OFF ON

In case where auto calibration is carried out at the above setting.



(An example of “CH1: through CH3: enable”, as given in Item 6.2.4 “Auto Calibration Components”.)

Setting range

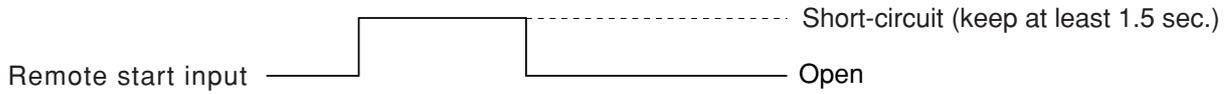
- Cycle : 1 to 99 hours or 1 to 40 days (initial value 7days)
- Flow time : 60 to 599 sec (initial value 300sec)

Caution

- When an auto calibration starts, the measurement screen automatically appears.
- Any operation other than forced stop of auto calibration (see Item 6.4.2) is not permitted during auto calibration. “Auto Calibration Cancel” cannot be performed with the key lock to ON. To cancel auto calibration forcedly, set the key lock to OFF and then execute “Auto Calibration Cancel”.
- Turn on the power again after it is turned off (including the case of power failure) at the time set as the next start time in auto calibration, and then repeat it in the set cycle.

Remote start

Whether the auto calibration is set at ON or OFF, an auto calibration is available by keeping the remote start input short-circuited for at least 1.5 seconds.



6.4.2 Forced stop of auto calibration

This mode is used to cancel the auto calibration forcibly.

- (1) In the User mode that is displayed, point the cursor to “Setting of Auto Calibration” by pressing the \blacktriangle or \blacktriangledown key. Press the ENT key.

User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration Alarm Setting \blacktriangleright Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	



- (2) In the “Setting of Auto Calibration” item selection screen that appears, point the cursor to “Setting of Auto Calibration” by pressing the \blacktriangle or \blacktriangledown key. Press the ENT key.

About Auto Cal.	Select setting item
Start Time WED 16:07 Cycle 07 day Flow Time 060 sec. ON/OFF ON Time : WED 16:19	
\blacktriangleright Stop Auto Calibration	



- (3) “Stop Auto Calibration” is inverted. A message appears, prompting you to verify that you want to cancel or continue auto calibration. To cancel the auto calibration, press the ENT key. If you press the ESC key, auto calibration is not stopped.

About Auto Cal.	Stop auto calibration? Stop with ENT Not with ESC
Start Time WED 11:30 Cycle 07 day Flow Time 060 sec. ON/OFF ON Time : WED 15:41	
Stop Auto Calibration	

“Auto Calibration” screen

Example

In case where setting the auto calibration components (see Item 6.2.5) to “CH1: enable” and “CH2: enable”.

• Zero calibration

A message, “Zero calibration” blinks at CH1 and CH2.

CH1	ZERO Cal.	0.00	vol%
CH2	ZERO Cal.	0.0	ppm
CH3	O ₂	20.60	vol%
CH4	cu CO	0.0	ppm
CH5	2y CO	0.0	ppm

• CH1 span calibration

A message, “Span calibration” blinks at CH1.

CH1	SPAN Cal.	8.02	vol%
CH2	CO	0.0	ppm
CH3	O ₂	0.00	vol%
CH4	cu CO	0.0	ppm
CH5	2y CO	0.0	ppm

• CH2 span calibration

A message, “Span calibration” blinks at CH2.

CH1	CO ₂	0.00	vol%
CH2	SPAN Cal.	322.0	ppm
CH3	O ₂	0.00	vol%
CH4	cu CO	0.0	ppm
CH5	2y CO	0.0	ppm

Caution

During auto calibration, any key operation is not permitted other than operations such as key lock ON/OFF and “Stop Auto Calibration”.

When the key lock is set at ON, even the “Stop Auto Calibration” cannot be used.

To stop “Auto Calibration” forcedly, set the key lock to OFF and then execute “Stop Auto Calibration”.

6.5 Setting of auto zero calibration

6.5.1 Auto zero calibration

Auto zero calibration is automatically carried out when zero calibration are set.

Components for which a calibration is to be made are determined by setting of auto calibration component in 6.2.5.

Before changing the setting of auto zero calibration, set the ON/OFF to OFF.

- (1) During measurement, press the  key to display the User mode.
- (2) Point the cursor to “Setting of Auto Zero Calibration” by pressing the  or  key. Press the  key.

- (3) In the “Setting of Auto Zero Calibration” screen that appears, point the cursor to any item you want by pressing the  or  key. Press the  key.

- (4) In the “Auto Zero Calibration Parameter Setting” screen that appears, perform the value entry or the setting. For the value entry or setting change, use the  or  key. To change the setting, use the  key to move the cursor to the right.

After setting, press the  key, and auto zero calibration is carried out by the entered setting value.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration Alarm Setting Setting of Auto Calibration <input checked="" type="checkbox"/> Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	

About Auto Zero Cal.	Select setting item
<input checked="" type="checkbox"/> Start Time SUN 12:00 Cycle 07 day Flow Time 300 sec. ON/OFF OFF Time : WED 15:42	
Stop Auto Zero Calibration	

About Auto Zero Cal.	Set Start Time
Start Time SUN 12:00 Cycle 07 day Flow Time 300 sec. ON/OFF OFF Time : WED 15:42	
Stop Auto Zero Calibration	

End of Auto Zero Calibration Setting

Description of setting items

- Start Time : Setting at the first calibration (day of the week, hour, minute)
- Cycle : A period between the start time of one calibration and another (unit : hour/day)
- Flow Time : The time required for the calibration gas to be replaced in the cell
- ON/OFF : Auto zero calibration ON or OFF

To close "Auto Zero Calibration"

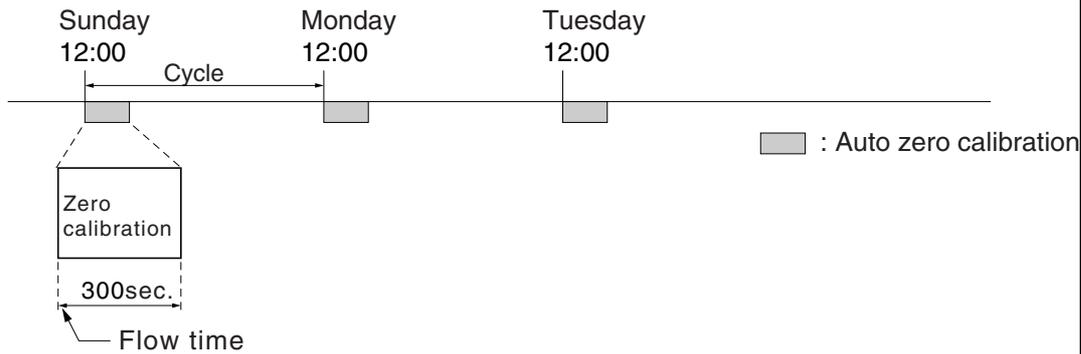
To close the "Auto Zero Calibration" or cancel this mode midway, press (ESC) key. A previous screen will return.

The auto calibration status contact output is closed while auto zero calibration is in progress (hold extension time by the length of time the same as gas replacement time included if the hold setting is set to ON), and open in other cases.

Example

Start time	SUN	12:00
Cycle	12	hour
Flow time	300	sec
ON/OFF	ON	

In case where auto zero calibration is carried out at the above setting.



(An example of "CH1: through CH3: enable", as given in Item 6.2.4 "Auto Calibration Components".)

Setting range

- Cycle : 1 to 99 hours or 1 to 40 days (initial value 7days)
- Flow time : 60 to 599 sec (initial value 300sec)

Caution

- When an auto zero calibration starts, the measurement screen automatically appears.
- Any operation other than forced stop of auto zero calibration (see Item 6.5.2) is not permitted during auto zero calibration. "Auto Zero Calibration Cancel" cannot be performed with the key lock to ON. To cancel auto zero calibration forcibly, set the key lock to OFF and then execute "Auto Zero Calibration Cancel".
- If the auto calibration period and auto zero calibration period have overlapped, the auto calibration is retained, ignoring the auto zero calibration of that period.
- Turn on the power again after it is turned off (including the case of power failure) at the time set as the next start time in auto zero calibration, and then repeat it in the set cycle.

6.5.2 Forced stop of auto zero calibration

This mode is used to cancel the auto zero calibration forcedly.

- (1) In the Menu mode that is displayed, point the cursor to “Setting of Auto Zero Calibration” by pressing the  or  key. Press the  key.

User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration Alarm Setting Setting of Auto Calibration <input checked="" type="checkbox"/> Setting of Auto Zero Calibration Setting of Peak Alarm Parameter Setting	



- (2) In the “Setting of Auto Zero Calibration” item selection screen that appears, point the cursor to “Setting of Auto Zero Calibration” by pressing the  or  key. Press the key.

About Auto Zero Cal.	Select setting item
Start Time SUN 12:00 Cycle 07 day Flow Time 300 sec. ON/OFF OFF Time : WED 16:19	
<input checked="" type="checkbox"/> Stop Auto Zero Calibration	



- (3) “Stop Auto Zero Calibration” is inverted. A message appears, prompting you to verify that you want to cancel or continue auto zero calibration. To cancel the auto zero calibration, press the  key. If you press the  key, auto zero calibration is not stopped.

About Auto Zero Cal.	Stop auto Zero calibration? Stop with ENT Not with ESC
Start Time SUN 12:00 Cycle 07 day Flow Time 300 sec. ON/OFF OFF Time : WED 16:20	
<input checked="" type="checkbox"/> Stop Auto Zero Calibration	

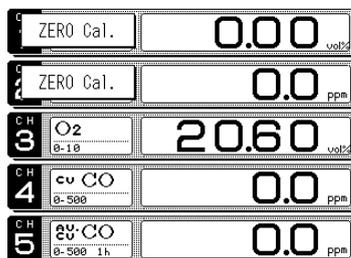
“Auto Zero Calibration” screen

Example

In case where setting the auto calibration components (see Item 6.2.5) to “CH1: enable” and “CH2: enable”.

• Zero calibration

A message, “Zero calibration” blinks at CH1 and CH2.



Caution

During auto zero calibration, any key operation is not permitted other than operations such as key lock ON/OFF and “Stop Auto Zero Calibration”.

When the key lock is set at ON, even the “Stop Auto Zero Calibration” cannot be used.

To stop “Auto Zero Calibration” forcedly, set the key lock to OFF and then execute “Stop Auto Zero Calibration”.

6.6 Peak alarm setting

When the number of peaks of which CO concentration exceeds the upper limit value exceeds the setting time, a peak alarm is outputted.

This section describes how to perform various settings of peak alarm.

Note) The setting is optional and is valid only when peak alarm function is provided.

- (1) Press the  key in the Measurement mode, and the User mode appears.
- (2) Point the cursor to "Setting of Peak Alarm" by pressing the  or  key. Press the  key.

↓ 

User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration <input checked="" type="checkbox"/> Setting of Peak Alarm Parameter Setting	

- (3) In the "Setting of Peak Alarm" item selection screen that appears, point the cursor to any item you want by pressing the  or  key. Press the  key.

↓  () 

Peak Alarm	Select setting item
<input checked="" type="checkbox"/> Peak Alarm OFF Alarm Value 0500 ppm Alarm Count 05 times Hysteresis 00 %FS	

- (4) Then, enter numeric values and perform the setting.

Entering or setting the numeric values should be carried out by using the  or  key.

After setting, press the  key, and the set values you entered are saved.

↓  () 

Peak Alarm	Set Peak Alarm ON or OFF
Peak Alarm OFF Alarm Value 0500 ppm Alarm Count 05 times Hysteresis 00 %FS	

↓  () 

End of Peak Alarm Setting

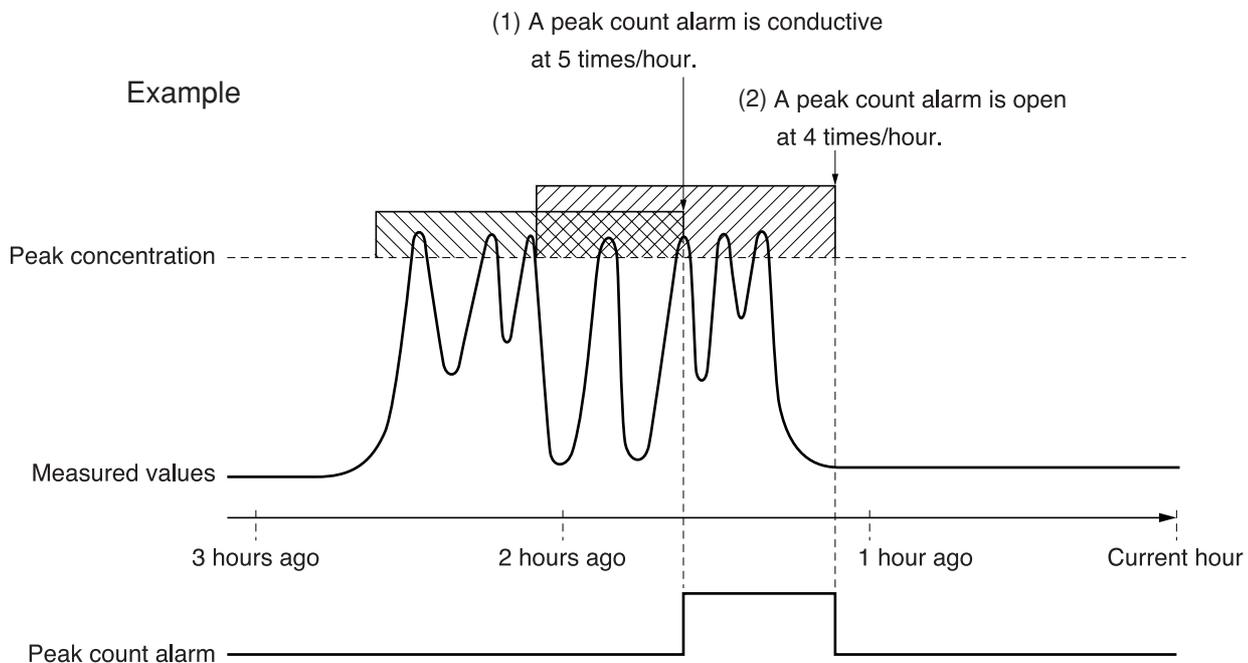
Description of setting items

- Peak Alarm : Setting of peak alarm is performed with ON/OFF.
- Alarm value : If peak concentrations exceed the set alarm value, a peak counter counts 1 time.
- Alarm Count : When a peak in excess of the setting time occurs, a peak count alarm output is provided.
- Hysteresis : To prevent possible chattering when the peak value may exceed the set peak concentration by only 1 time, the peak count has an allowance in the hysteresis width.

Setting range

- Alarm Value : 0 to 1000 ppm → 5 ppm step (initial value: 500 ppm)
- Alarm Count : 1 to 99 times (initial value: 5 times)
- Hysteresis : 0 to 20% of full scale (initial value: 0% of full scale)
* The hysteresis setting is made in terms of full scale.

Action of peak alarm



If CO concentration exceeds the alarm value, counting will begin. If the number of peaks is over the set times per hour, a peak count alarm becomes closed (ON). If it is less than the set times per hour, it is open (OFF). Since 5 times of peaks /hour is marked at (1)  section from the above graph, the peak count alarm is turned ON. Since peaks of more than 5 times per 1 hour occur at the interval between (1) and (2) , the peak count alarm remains ON. Since at (2), peaks are reduced to 4 times per hour, it is turned OFF.

Like the hysteresis of the alarm setting, the hysteresis prevents possible chattering when measured gas is fluctuated near the alarm value.

* For 10 minutes after the power is turned ON, a peak alarm counting is not carried out.

Releasing peak alarm

To release the peak alarm, set the peak alarm to OFF.

Turning on the peak alarm initiates counting from 0.

6.7 Parameter setting

It allows you to carry out the parameter setting such as time, key lock, etc., as required. Items to be set are as follows:

Description of setting items

- | | |
|-----------------------|--|
| • Current Time | : Sets the current day of the week, hour and time.
Note: The clock backup time is 2 days. If power is turned on after it is kept off for 2 days or longer, make the time setting again. |
| • Key Lock | : Sets with ON/OFF so that any key operation except the key lock OFF cannot be performed. |
| • Remote Range | : Sets with ON/OFF whether the Range Selection is made valid or invalid by external input. |
| • Output Hold | : Sets whether Calibration Output is held or not. |
| • Average Value Reset | : Resets the average value. |
| • Response Speed | : Sets the response time of electrical system. |
| • Average Time | : Sets the moving average time. |
| • Maintenance mode | : Enters passwords to switch to the Maintenance mode. |

* For the maintenance mode, see Item 6.8.

- (1) To display the User mode, press the  key in the measurement mode.
- (2) Point the cursor to "Parameter Setting" by pressing the  or  key. Press the  key.
- (3) In the "Parameter Setting" screen that appears, point the cursor to any item you want by pressing the  or  key. Press the  key.



User Mode	Select an item with UP/DOWN and ENT Back with ESC
Changeover of Range Setting about Calibration Alarm Setting Setting of Auto Calibration Setting of Auto Zero Calibration Setting of Peak Alarm <input checked="" type="checkbox"/> Parameter Setting	



Parameter Setting	Select setting item
<input checked="" type="checkbox"/> Current Time WED 15:43 Key Lock OFF Remote Range OFF Output Hold OFF Reset Av. Output Reset Response Time Average Period To Maintenance Mode 0000	



(4) In the Parameter Setting screen that appears, enter the numeric values and set the items. Entering the numeric values or setting the items should be carried out by using the \blacktriangle or \blacktriangledown key. To move the cursor to the right, press the \blacktriangleright key.

After setting, press the ENT key, that the parameter setting is carried out with the value you set.

To close Parameter Setting screen

To close the "Parameter Setting" screen or cancel this mode midway, press the

ESC key.

A previous screen will return.

Parameter Setting	Select setting item
\blacksquare Current Time	WED 15:43
Key Lock	OFF
Remote Range	OFF
Output Hold	OFF
Reset Av. Output	Reset
Response Time	
Average Period	
To Maintenance Mode	0000



End of Parameter Setting

Setting range

- Response time : 1 to 60sec. (Initial value: 3 sec)
- Average time : 1 to 59 min or 1 to 4 hours (Initial value: 1 hour)
When setting the unit of 1 to 59 minutes in terms of minute or 1 to 4 hours with hour
- Maintenance mode : 0000 to 9999 (Initial value: 0000)

Remote Range

A range can be switched via an external input by setting the Remote Range to ON. (The switching action affects all of instantaneous value, O_2 correction value, O_2 correction average value and O_2 average value.) If the Remote Range is set to OFF, the external input becomes invalid.

Opening the input gives the High range, or short-circuiting the input gives the Low range.

For the terminal input, refer to 3.4, Wiring.

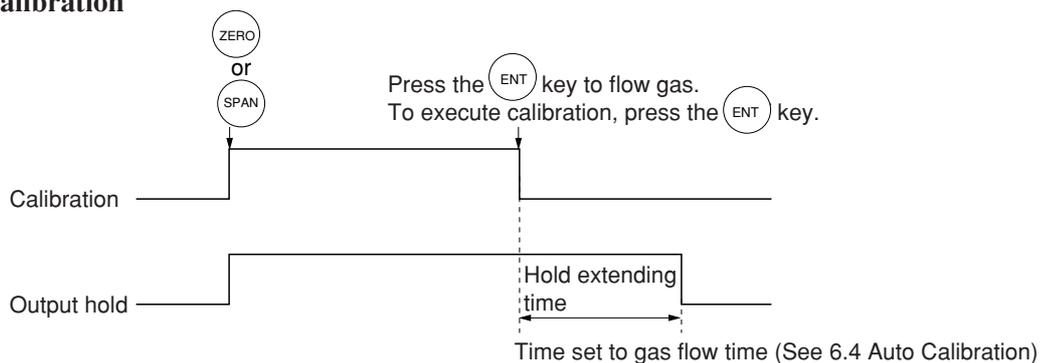
Switching the range cannot be performed by on-screen operation when the REMOTE RANGE is set to ON.

Note) In case of 1 range system, this function is overridden.

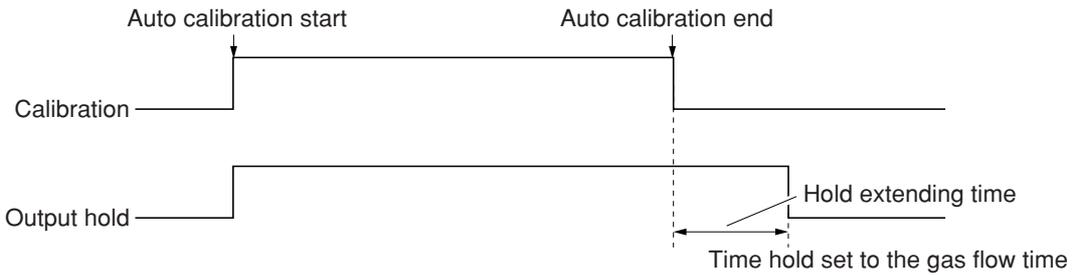
Output Hold

By setting an output hold to ON, an output signal of each channel are held during the calibration (manual calibration and auto calibration) and for the gas flow time (refer to 6.4, Setting of Auto Calibration). Regardless of Hold ON/OFF setting, an output signal can be held via an external input.

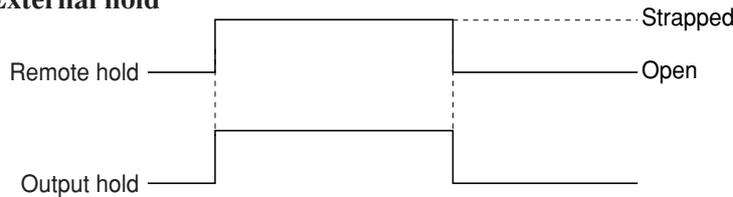
(1) Manual calibration



(2) Auto calibration



(3) External hold



(4) Screen display during holding

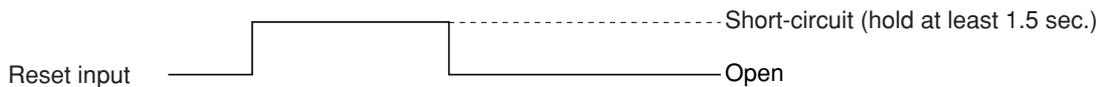
The “Holding” message blinks on the measuring screen.

Since the screen displays the process of calibration is displayed during the manual calibration, “Holding” is not displayed even if the screen is held, but the screen is displayed with the hold extending time.

(5) If calibration is cancelled after the calibration gas is supplied regardless of during manual calibration or auto calibration, an output hold of the holding extending time will be performed.

Average value reset

This mode is used to clear O₂ correction average value and O₂ average value, and restarts averaging. All average values are reset at a time. The indication value and output value is 0 ppm, vol% or so at the time of the reset input.



So long as short-circuited, resetting lasts.
At the edge of changing from short circuit to opening, the average action restarts.

Response time

The response time of the electrical system can be changed.

Setting is available by components.

Note) It does not provide exact seconds for the setting time, but it gives a guide of the setting time.

The setting value can be modified as requested by the customer.

Parameter Setting	Response Time	Select CH No.
▶ CH1	CO ₂	03 sec.
CH2	CO	03 sec.
CH3	O ₂	03 sec.

Average period

It allows you to set an average period of the average value of O₂ correction.

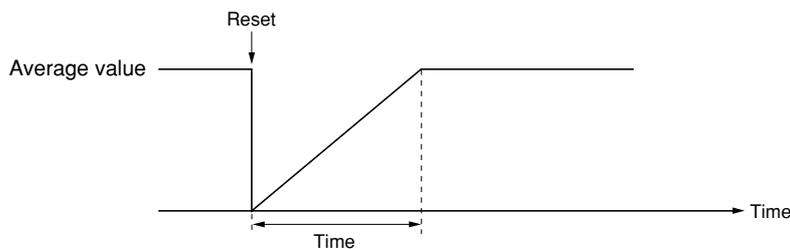
It enables you to set an average time of 1 to 59 minutes (1-minute step) or 1 to 4 hours (1-hour step).

Changing the setting resets the average value of O₂ correction and O₂ average value. (Pressing the ENT validates the resetting only for components whose setting was changed.)

Parameter Setting	Average Period	Set period of average output
CH5	AV·CO	01 hour
CH6	AV·O ₂	50 min

Example of average action

Suppose the average period is 1 hour.



- Sampling occurs every 30 seconds.
- Every 30 seconds, the average for last 1 hour (time setting) is output.
- At the instant of resetting, zero is assumed for all past values. It means that the average value will not be correct for 1 hour after resetting.

Maintenance mode

To open the maintenance mode, enter a password. After entering the password, press the **ENT** key.

The password can be used for the Password Setting in the Maintenance mode. A password is set to “0000” before factory-shipment. This value is available for the Maintenance mode.

6.8 Maintenance mode

Check of sensor input value, display of error log file, setting of O₂ correction reference value, adjustment of moisture interference, setting of auto off time of display backlight, and password setting can be performed as follows. A password is selected first. The password must be entered to perform measurement from next time onward. Select the maintenance mode in “6.7 Parameter setting,” and this screen is displayed. (Moisture interference adjustment is displayed only when NO of SO₂ is included in components to be analyzed.)

- (1) Select the Maintenance mode from the Parameter Setting screen to display the Password Setting screen.
- (2) Enter the password, and the Maintenance Mode item selection screen will be displayed. Point the cursor to the item you want by pressing the  or  key and press the  key.
- (3) Next, each Maintenance screen is displayed.

Note) “To Factory Mode” is used for our service engineers only. Refrain from using this mode.

Maintenance Mode	Select operating item
	<ul style="list-style-type: none">  1. Sensor Input Value 2. Error Log 3. O₂ ref. Value 12%O₂ 4. Password Setting 5. Station No. 00 6. Interference Compensation Adj. 7. Backlight Timer OFF 8. To Factory Mode



Each “Maintenance” screen

• Sensor Input Value screen

Description of Sensor Input Value screen

- CO₂ :CO₂ sensor input value
- CO :CO sensor input value
- O₂ :O₂ sensor input value
- Temperature:temperature sensor input value

Maintenance Sensor Input			
sensor	input	sensor	input
CO ₂	20291		
CO	20437		
O ₂	42471		
TEMP	17906		

• Error Log screen

Description of Error Log screen

Error history

For error number, date and time (days, period) of occurrence, channel and other details of error, refer to “8 ERROR MESSAGE”.

Maintenance Error Log	ENT:Clear Error Log ESC:Back
Error No. 1	WED 14:38
Error No. 10	WED 13:59
Error No. 1	WED 13:59
Error No. 10	WED 13:58
Error No. 1	WED 13:58
Error No. 10	WED 13:52
Error No. 1	WED 13:52
▼ Next page	Page. 1
 Clear Error Log	

• **O₂ correction reference value setting screen**

Description of O₂ correction reference value setting screen

O₂ correction value is calculated from the following equation by values set herein:

O₂ correction concentration value

$$= \frac{21 - \text{set value}}{21 - \text{O}_2 \text{ concentration measured value}} \times \text{component concentration measured value}$$

The value of the fractional part in this calculation is limited to 4.

If it is 4 or more, it is fixed at 4.

Maintenance Mode	Set O ₂ ref. Value
<ol style="list-style-type: none"> 1. Sensor Input Value 2. Error Log 3. O₂ ref. Value 12%O₂ 4. Password Setting 5. Station No. 00 6. Interference Compensation Adj. 7. Backlight Timer OFF 8. To Factory Mode 	

Setting range

- O₂ correction reference value : 00 to 19% in 1% step (Initial value: 12%)

• **Password Setting screen**

Description of Password Setting screen

It enables you to set a password to be used when switching the parameter setting mode to the maintenance mode.

Set Password: 0000

Note) The password set herein must be managed for safety. Failure to enter the correct password will not open the Maintenance mode.

• **Station No. setting screen (option)**

Setting range

- Station No. : 00 to 31 (Initial No.: 00)

Maintenance Mode	Set Station No. Allowable 00~31
<ol style="list-style-type: none"> 1. Sensor Input Value 2. Error Log 3. O₂ ref. Value 12%O₂ 4. Password Setting 5. Station No. 00 6. Interference Compensation Adj. 7. Backlight Timer OFF 8. To Factory Mode 	

* **Please refer to another manual (INZ-TN513327-E) about the communication function.**

• **Moisture interference compensation adjustment screen**

Description of moisture interference compensation adjustment screen

By setting the effect of moisture content in measured gas on this screen, the value of the effect is subtracted to find the measurement value. Adjustment is carried out by one of the following methods.

- Select a desired channel (CH) and change the value displayed at right.
- Select ALL and perform auto calculation for all the channels in batch.

Select RESET, and the interference compensation settings for all the channels are reset to 0.

Maintenance	Select CH No. ENT:Entry ESC:Back		
<input checked="" type="checkbox"/> CH1 NO _x	-7	+0532	
CH2 SO ₂	32	+0327	
ALL			
RESET			



* See “7.4 Moisture interference compensation adjustment” for details of moisture interference compensation adjustment procedure.

Maintenance	Adjust with UP/DOWN ENT:Memorized ESC:Back		
CH1 NO _x	-7	+0532	
CH2 SO ₂	32	+0327	
ALL			
RESET			



End of moisture interference correction adjustment

• **Backlight Timer setting screen**

Description of backlight timer setting screen

Automatic OFF of the backlight in the LCD can be selected. When the length of time set here elapses after the measurement screen appears, the backlight is automatically turned off.

Only when "ON" is selected, the time until automatic OFF is displayed. Press the key in this state, and you can change the time until auto backlight OFF.

Press an arbitrary key while the backlight is kept off, and the backlight comes on again.

Maintenance Mode	Set ON or OFF
<ol style="list-style-type: none"> 1. Sensor Input Value 2. Error Log 3. O₂ ref. Value 12%O₂ 4. Password Setting 5. Station No. 00 6. Interference Compensation Adj. 7. Backlight Timer <input checked="" type="checkbox"/> 05 min. 8. To Factory Mode 	

6.9 Calibration

6.9.1 Zero calibration

It is used for zero point adjustment. For zero calibration gas, see 3.3 (3), Preparation for standard gas in Sampling. Use a gas according to application.

- Press the  key on the Measurement screen to display the Manual Zero Calibration screen.

- Select the CH (component) to be calibrated by pressing the  or  key. After selection, press the  key, and zero gas will be supplied.

Caution

For the CH (components) that is set to "at once" in the "Zero Calibration" of the Calibration Setting mode, zero calibration is also carried out at the same time.

- Wait until the indication is stabilized with the zero gas supplied. After the indication has been stabilized, press the  key. Zero calibration in Range selected by the cursor is carried out.

To close Zero Calibration

To close the "Zero Calibration " or cancel this mode midway, press the  key. A previous screen will return.



ZERO Cal.	Select CH No. with UP/DOWN and ENT Back with ESC	
CH1 CO ₂	▶Range1 0-10 vol% Range2 0-20 vol%	10.01
CH2 CO	▶Range1 0-500 ppm Range2 0-2000ppm	9.9
▶CH3 O ₂	▶Range1 0-10 vol% Range2 0-25 vol%	10.95



ZERO Cal.	Select CH No. with UP/DOWN and ENT Back with ESC	
▶CH1 CO ₂	▶Range1 0-10 vol% Range2 0-20 vol%	10.06
▶CH2 CO	▶Range1 0-500 ppm Range2 0-2000ppm	9.9
CH3 O ₂	▶Range1 0-10 vol% Range2 0-25 vol%	10.95



ZERO Cal.	ENT:Go on calibration of selected CH ESC:Not calibration	
CH1 CO ₂	▶Range1 0-10 vol% Range2 0-20 vol%	◀ 00.01
CH2 CO	▶Range1 0-500 ppm Range2 0-2000ppm	▶ 000.9
CH3 O ₂	▶Range1 0-10 vol% Range2 0-25 vol%	20.95



To Measurement screen after executing Manual Zero Calibration

6.9.2 Span calibration

It is used to perform a span point adjustment. Supply calibration gas with concentration set to the span value to perform the span calibration. For the span calibration gas for the NO, SO₂, CO₂, CO, CH₄ measurement, use the standard gas with a concentration of 90% or more of the range value.

For the calibration gas for the O₂ measurement, use the standard gas of about 2 vol%.

- Press the **SPAN** key on the Measurement screen to display the Manual Span Calibration screen.

⇓ **SPAN**

SPAN Cal.		Select CH No. with UP/DOWN and ENT Back with ESC
▶CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	10.06
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	9.9
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	10.95

- Press the **▲** or **▼** key to select CH (component) to be calibrated. After selection, press the **ENT** key, and the span calibration contact output on corresponding to CH is turned ON. And supply span gas.

⇓ **▼** **▲** **ENT**

SPAN Cal.		Select CH No. with UP/DOWN and ENT Back with ESC
CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	10.06
▶CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	9.9
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	10.95

Caution

When Range Interlock from "Calibration Range" of the Calibration Setting mode is set, span calibration is performed together with 2 Ranges.

- Wait until the indication is stabilized in the state where the calibration gas is supplied. After the indication has been stabilized, press the **ENT** key. Span calibration of Range selected by the cursor is performed.

⇓ **ENT**

SPAN Cal.		ENT:Go on calibration of selected CH ESC:Not calibration
CH1 CO ₂	Range1 0-10 vol% Range2 0-20 vol%	0.02
CH2 CO	Range1 0-500 ppm Range2 0-2000ppm	▶ 459.0
CH3 O ₂	Range1 0-10 vol% Range2 0-25 vol%	0.00

To close Span Calibration

To close the " Span Calibration " or cancel this mode midway, press the **ESC** key. A previous screen will return.

⇓ **ENT**

**To Measurement screen after
executing Manual Span Calibration**

7. MAINTENANCE

7.1 Daily check

(1) Zero calibration and span calibration

- 1) It is used for zero point adjustment. For calibration, refer to 6.9.1, Zero calibration.
- 2) After zero calibration, perform span calibration. For calibration, refer to 6.9.2, Span calibration.
- 3) Zero calibration and span calibration should be performed once a week, if required.

(2) Flow check

- 1) Sampling gas flow rate and purge gas flow rate should be as follows;
 Sampling gas flow rate: 1.0L/min±0.5L/min (stable)
 Purge gas flow rate: About 1L/min
- 2) Maintenance and check should be carried out every day, if required.

7.2 Daily check and maintenance procedures

Table 7-1 Maintenance and check list

	Parts to be checked	Phenomena	Cause	Remedy
Every day	Recorder indication	Lower indication	(1) Dust is mixed in the sample cell.	(1) Clean sampling cell and check for sampling device, especially gas filter.
			(2) Air is sucked in anywhere in the sampling tube.	(2) Check for leak of the sampling line and repair, if required.
	Check for purge gas flow if purging the sampling gas flow instrument.	Standard flow rate is 1L/min. It is not within the range of the specified flow rate of 0.5 to 1.5 L/min.	_____	Adjust the flow rate with flow rater needle valve.
	Replacement of Monitor filter (membrane filter)	Much clogged	Primary filter is damaged.	(1) Replace primary filter. (2) Replace filter (filter paper).
Every week	Zero point of gas analyzer	Out of zero point	_____	Zero calibration
	Span point of gas analyzer	Out of the standard point	_____	Span calibration
	Replacement of monitor filter (membrane filter)	Irrespective of phenomena	_____	Replace filter (paper).
Every year	Gas analyzer	Irrespective of phenomena	_____	Overhaul.

7.3 Cleaning of measuring cell

Entry of dust or water drops in the measuring cell contaminates the interior of the cell, thus resulting in a drift. Clean the inside if dirty. Then, check the sampling device, especially the filter, to prevent the cell from being contaminated by dust or mist.

7.3.1 Disassembly and assembly of measuring cell

There are two kinds of measuring cells, on block cells (cell length: 4 mm, 8 mm, 16 mm, 32 mm) and pipe cells (Cell length: 6.4 mm, 125 mm and 250 mm).

2-component analyzer may incorporate both measuring cells in optical unit. In such a case, detach the pipe cell and then block cell (See Fig. 7-1).

(1) How to remove pipe cell (See Fig. 7-1)

- 1) Stop measured gas. If it is harmful, purge in the measuring cell thoroughly with zero gas.
- 2) Turn OFF the power switch.
- 3) Detach the top cover.
- 4) Remove the pipe connected to the measuring cell.
- 5) Slide the infrared ray light source unit (No. 5) toward the front panel by loosening the screw (No. 1) fastened to the base plate to provide clearance between the pipe cell (No. 12) and light source unit.
- 6) Loosen and remove a screw (No. 7) from the cell retainer (No. 11) fastening the pipe cell.
- 7) Remove the cell from the measuring unit and unscrew the infrared transmission window (No. 14) at the both ends in the right direction.

Note) The reflection plate in the cell is not closely attached to the cell.

- 8) For assembly, reverse the disassembly procedure. Provide 0.5 mm clearance between the infrared ray light source unit and cell, and the cell and detector, respectively.

No.	Name
1	Screw (for fixing light source unit)
2	Screw (for fixing detector)
3	Screw (for fixing base plate)
4	Base plate
5	Light source unit
6	Screw (for fixing support)
7	Screw (Fixing cell retainer)
8	Chopper motor connector
(9)	Filter
10	Support
11	Cell retainer
12	Pipe cell
13	O-ring
14	Infrared transmission window
15	Detector
16	Bridge PCB
17	Bridge resistance
(18)	Detector: Installed in 2-component analyzer only

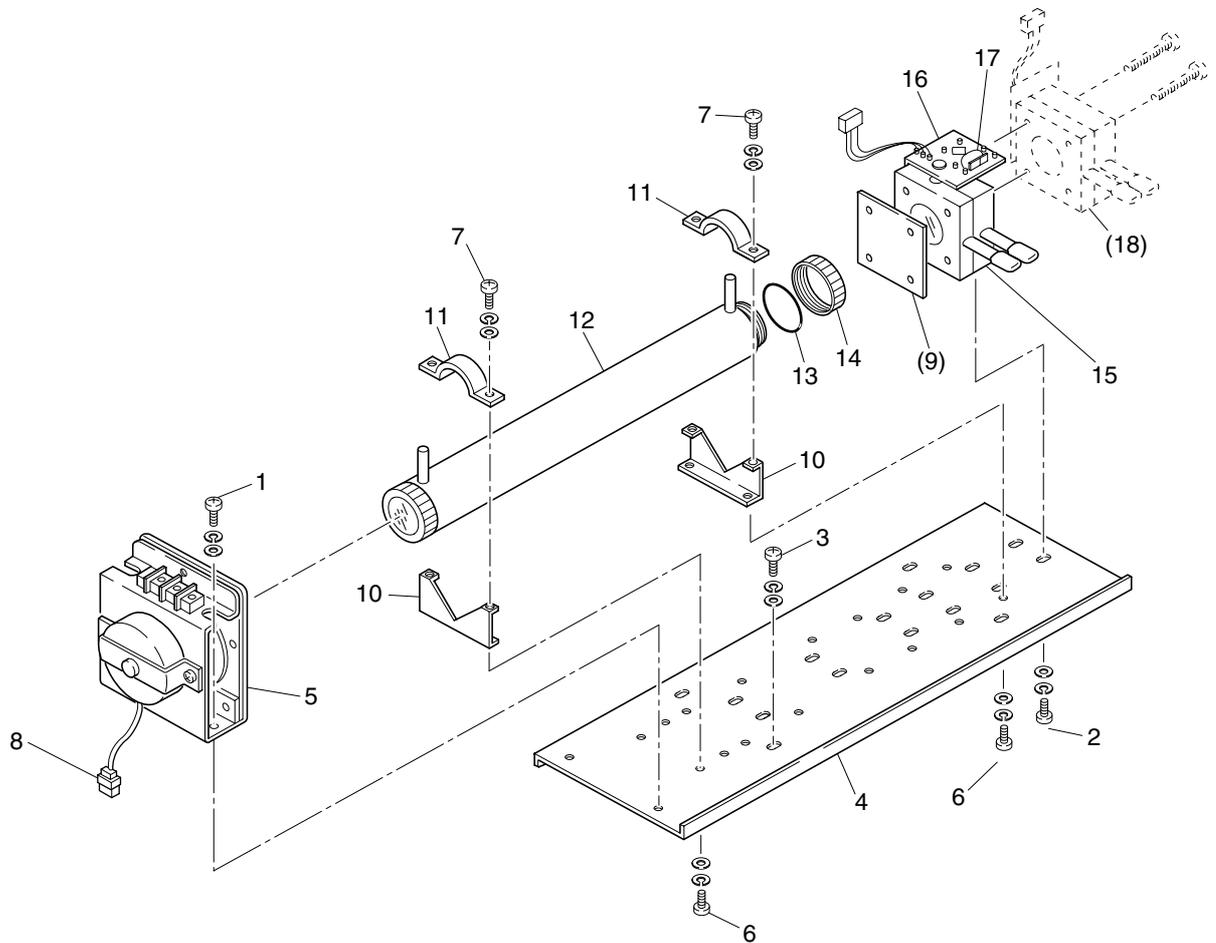


Fig. 7-1 Configuration of measuring unit (pipe cell)

(2) How to remove block cell (See Fig. 7-2)

- 1) For Step 1) to 4), see Item 7.3.1, (1) How to remove pipe cell.
- 5) Remove the connector to the detector output cord from the printed board. For the 2-component analyzer, remove the output cord connector of the 2-component analyzer detector (No. 13) from the printed board, and then remove the 2-component detector by unscrewing two mounting screws (No. 14) fastening the 2-component detector.
- 6) Unscrew the two screws (No. 10) that hold the detector to the infrared ray light source unit to remove the detector from the measuring unit. The cell can be removed together with the detector.
- 7) To remove the cell, unscrew the two screws (No. 6) holding the cell to the detector. The infrared transmission window is just sandwiched (not fixed) between the detector and block cell. Keep the detector facing up, when removing this window.
- 8) For assembly, reverse the disassembly procedures.

Note) The O-ring is placed between the window holder and cell. Take care about the O-ring position. With 2-component analyzer, install 2-component detector last. Take care so that no space is left between the 1-component and 2-component detectors. When inserting the detector output cord connector into the printed board, plug the connectors for 1-component detector and 2-component detector into position. The 1-component connector should be plugged into CN11 and 2-component connector into CN1, respectively.

No.	Name
1	Screw (for fixing light source unit)
(2)	Filter
3	Screw (for fixing detector)
4	Base plate
5	Light source unit
6	Screw (for fixing block cell)
7	Block cell
8	Infrared transmission window (window holder)
9	O-ring
10	Screw (for fixing base plate)
11	Chopper motors connector
12	Detector
(13)	Detector: Install in the 2-component analyzer
(14)	Screws: For mounting the 2-component detector

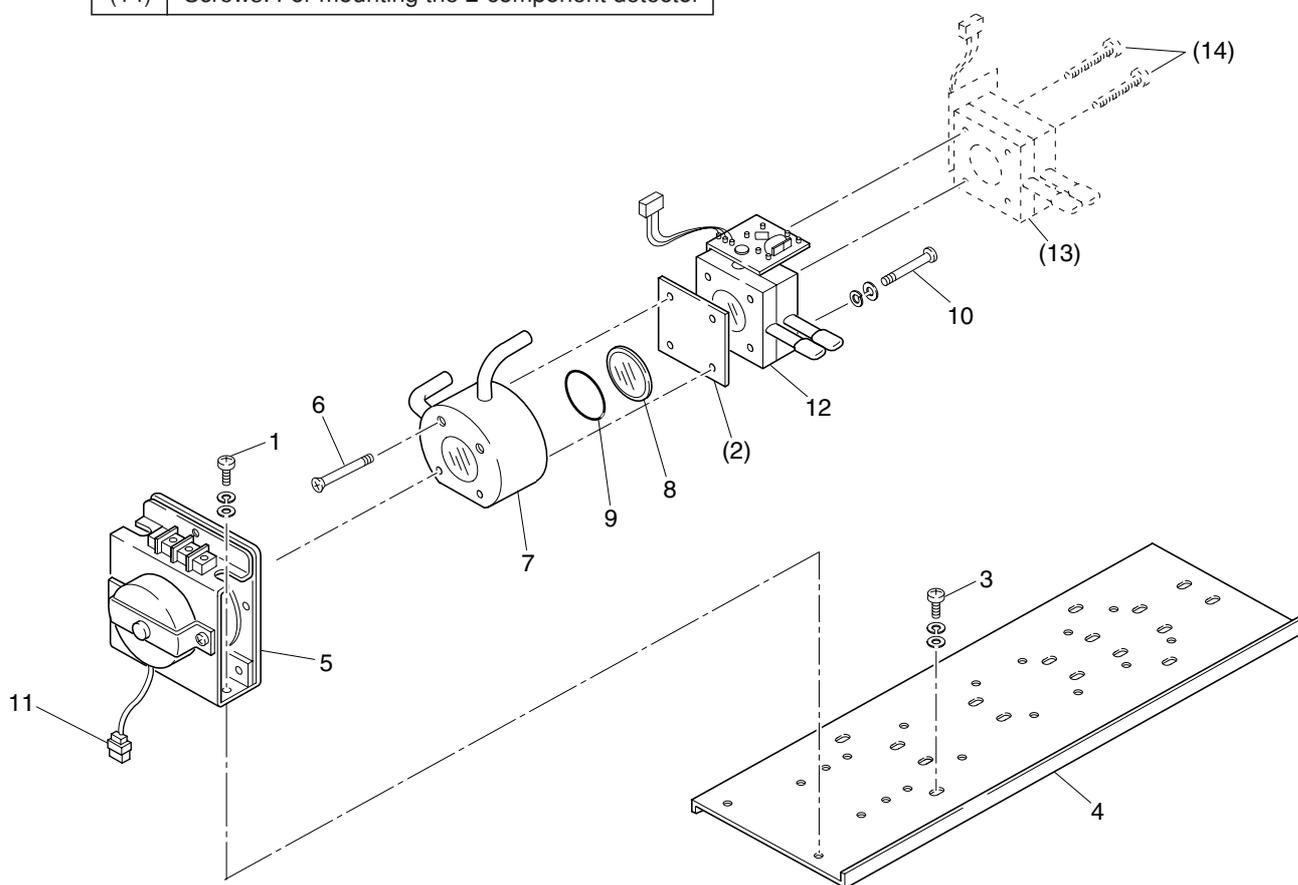


Fig. 7-2 Configuration of measuring unit (block cell)

(3) How to remove measuring unit (See Fig. 7-3)

- 1) For Step 1) to 4), see Item 7.3.1(1), How to remove pipe cell.
- 5) Remove the detector output cord connector from the printed board.
- 6) Remove wiring to the 2-pin terminals of the infrared ray light source assembly and chopper motor pin connector (No. 8) from the printed board.
- 7) Detach the 4 screws (No. 3) fastening the base plate (No. 4) to remove the measuring unit.

Note) Special care should be taken when assembling or disassembling the measuring cell to avoid the application of force to the detector pipe or infrared ray light source unit pipe. If the pipe is deformed or damaged by excessive force, there is a danger of gas leak, thus resulting in misoperation.

No.	Name
1	Screw (for fixing light source unit)
2	Screw (for fixing detector)
3	Base plate
4	Light source unit
5	Screw (for fixing block cell)
6	Block cell
7	Infrared transmission window
8	O-ring
9	Detector
10	Screw (for fixing base plate)
11	Support
12	Screw (Fixing cell retainer)
13	Cell retainer
14	Pipe cell
15	O-ring
16	Infrared transmission window
17	Screw (fixing detector)
18	Detector

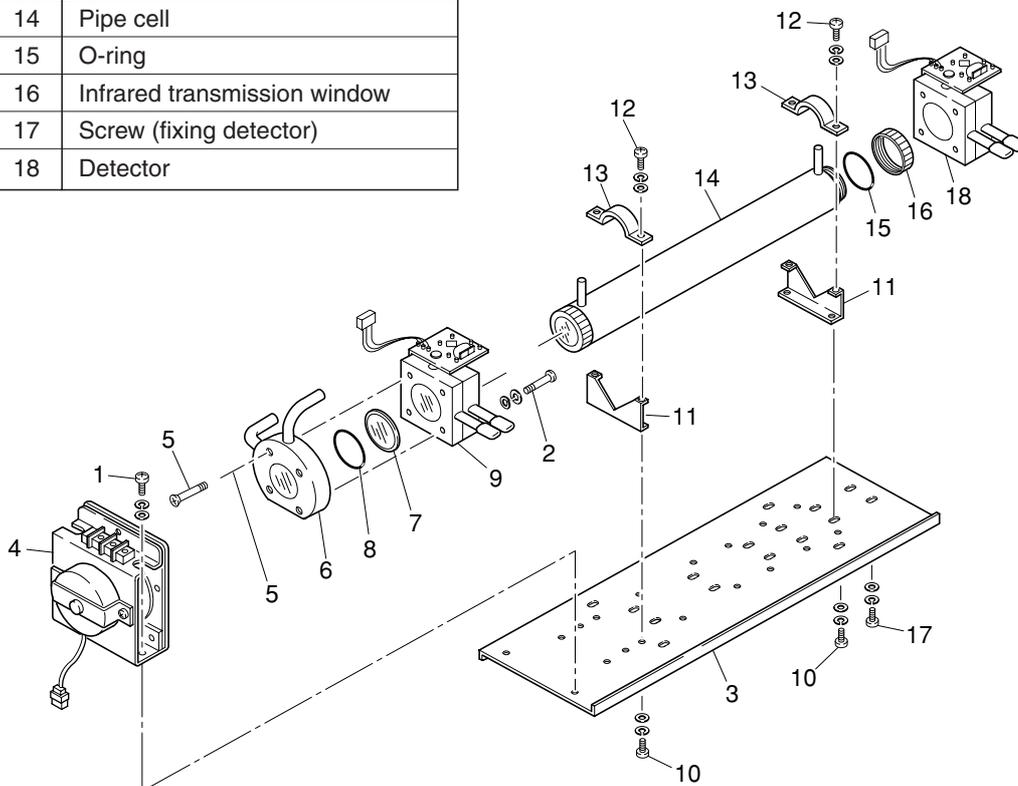


Fig. 7-3 Configuration of measuring unit (2-component analyzer: block cell + pipe cell)

7.3.2 How to clean cell

- 1) To clean the cell inside or infrared ray transmission window, first clear large dirt of it with a soft brush and then wipe with soft cloth lightly.

Don't use hard cloth.

Note) Handle the fragile window with care. Use care not to rub off the dirt from the window roughly.

- 2) If the window or the cell interior is very dirty, use a soft cloth moistened with absolute alcohol.
- 3) If the window is corroded, rub off the scale from the window lightly with a soft cloth to which chrome oxide powder is applied. If it is excessively corroded, it should be replaced with new one.
- 4) When cell or window cleaning is completed, assemble according to the cell disassembly and assembly procedures. Especially, the pipe should be closely connected without gas leak, and repair if the pipe is bent.

7.4 Moisture interference compensation adjustment

(1) Be sure to carry out moisture interference compensation adjustment at the following timing when NO or SO₂ is included in components to be analyzed.

- 1) Before starting operation for the first time after the analyzer is incorporated into the system
- 2) At periodic inspection to be performed at 6 month to 1 year intervals
- 3) After the cell is cleaned

(2) Adjustment procedure (See “Moisture Interference Compensation Adjustment screen” in “6.8 Maintenance mode.”).

- 1) Set the moisture interference correction value to 0 in advance. (Press RESET on the moisture interference adjustment screen.)

Select “Without” for moisture content in calibration gas. (See “6.2.2 Calibration gas.”)

- 2) Perform zero/span calibration after warm-up operation of the main unit is completed.

Calibrate zero gas and span gas also by feeding dry gas to the analyzer.

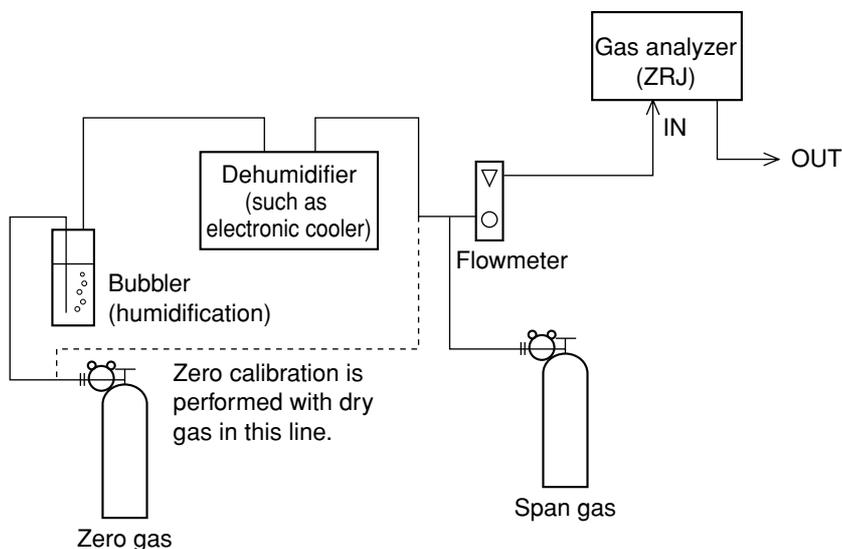
- 3) Perform bubbling (humidification) of zero gas, and feed it to the analyzer through the dehumidifier (such as electronic cooler) installed within the sampling system so that the moisture content becomes the same as that of the sample gas. (See the figure shown below.)

- 4) Select Moisture Interference Adjustment screen in “6.8 Maintenance mode”.

- 5) When the numeric value (measurement value) at left in the moisture interference adjustment screen (see figure at right) stabilizes, change the numeric value at right (interference correction value), adjusting so that the value falls within 0 ± 10 , and press the  key to confirm the selection.

Maintenance	Adjust with UP/DOWN ENT:Memorized ESC:Back		
CH1 NO _x	-7	+053	
CH2 SO ₂	32	+0327	
ALL			
RESET			

<How to feed gas for moisture interference adjustment>



8. ERROR MESSAGE

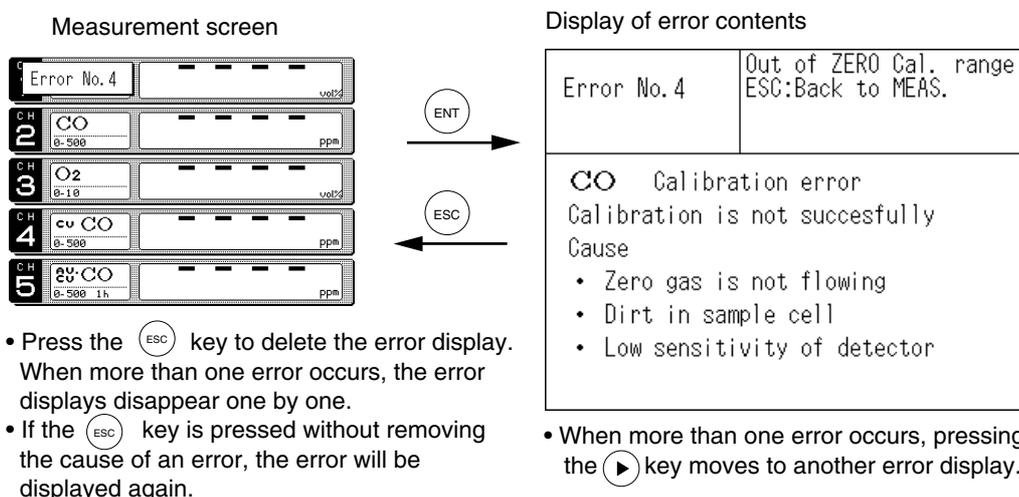
If errors occur, the following contents are displayed.

Error display	Error contents	Probable causes
Error No.1	Sector motor rotation detector signal is faulty.	<ul style="list-style-type: none"> • Infrared ray light source is faulty. • Sector motor rotation is faulty or stopped. • Motor rotation detector circuit is faulty. • Amplifier circuit is faulty.
Error No.3	A/D conversion signal is faulty.	<ul style="list-style-type: none"> • Circuit is faulty.
Error No.4	Zero calibration is not within the allowable range.	<ul style="list-style-type: none"> • Zero gas is not supplied. • Zero point is deflected much due to a dirty cell. • Detector is faulty.
Error No.5	A amount of zero calibration (indication value) is over 50% of full scale.	
Error No.6	Span calibration is not within the allowable range.	<ul style="list-style-type: none"> • Span gas is not supplied. • Calibrated concentration setting does not match cylinder concentration. • Zero calibration is not performed properly. • Span is deflected much due to dirty cell. • Detector sensitivity is deteriorated.
Error No.7	A amount of span calibration (difference between indication value and calibrated concentration value) is over 50% of full scale.	
Error No.8	Measured values fluctuate to much during zero and span calibration.	<ul style="list-style-type: none"> • Calibration gas is not supplied. • Time for supplying calibration gas is not short.
Error No.9	Calibration is abnormal during auto calibration.	<ul style="list-style-type: none"> • Error corresponding to No. 4 to No. 8 occurred during auto calibration.
Error No.10	Output cable connection is improper.	<ul style="list-style-type: none"> • Wiring is detached between analyzer and interface module. • Wiring is disconnected between analyzer and interface module.

Note) When errors No. 1, No. 3 and No. 10 occur, instrument error output contacts are conductive.
When errors No. 4 to No. 9 occur, calibration error output contacts are conductive.

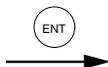
Screen display and operation at the occurrence of error

In case of Error No. 1 to No. 4, No. 6, No. 8 to No. 10



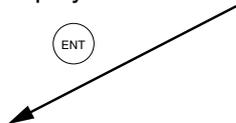
In case of Error No. 5 and No. 7

ZERO Cal.		ENT:Go on calibration of selected CH ESC:Not calibration	
CH1 CO ₂	▶ Error No. 5	vol% vol%	19.93
CH2 CO	▶ Range1 0-500 ppm Range2 0-2000ppm		999.9
CH3 O ₂	▶ Range1 0-10 vol% Range2 0-25 vol%		40.95

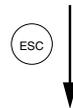


Error No. 5	ZERO cal. error ENT:Force Cal. ESC:Stop cal. and back to MEAS.
CO₂ Calibration error Cause <ul style="list-style-type: none"> • Zero gas is not flowing • Dirt in sample cell • Low sensitivity of detector 	

• Pressing delete the error display.



Calibration is continued. Unless another calibration error occurs, calibration is carried out to the end, the Measurement screen returns.



Error No. 5		
CH 2	CO	ppm
CH 3	O ₂	vol%
CH 4	cu CO	ppm
CH 5	av CO	ppm

(2) Error log file

If error occurs, the history is saved in an error log file. The error log file exists in the maintenance mode.

Error log screen

Maintenance Error Log		ENT:Clear Error Log ESC:Back	
Errors that occurred	Error No. 1	WED 14:38	Day of the week and time when an error occurred.
	Error No. 10	WED 13:59	Component with which the error occurred.
	Error No. 1	WED 13:59	
	Error No. 10	WED 13:58	
	Error No. 1	WED 13:58	
	Error No. 10	WED 13:52	
	Error No. 1	WED 13:52	
	▼ Next page		
		Page. 1	
	▶ Clear Error Log		

* Up to 14 errors can be saved in the error history; the oldest error will be deleted one by one every time a new occurs.

* If the power display supply is turned OFF, the contents in the error log file will not be lost or damaged.

Deletion of error history

Press the key on the above screen, and the “Error Log Clear” will be inverted. Further pressing the key will clear the error history.

9. SPECIFICATIONS

9.1 Specifications

(1) Standard specifications

Principle of measurement:

- CO₂, CO, CH₄, SO₂, NO;
 Non-dispersion infrared-ray absorption method
 Single light source and single beam (single beam system)
 O₂ ; Paramagnetic type (built in), fuel cell type (built in) or zirconia sensor method (O₂ sensor externally installed)

Measurable gas components and measuring range:

	Minimum range	Maximum range
CO ₂	0 – 500ppm	0 – 100vol%
CO	0 – 200ppm	0 – 100vol%
CH ₄	0 – 1000ppm	0 – 100vol%
SO ₂	0 – 500ppm	0 – 5000ppm
NO	0 – 500ppm	0 – 5000ppm
O ₂ (Built-in paramagnet)	0 – 5vol%	0 – 100vol%
O ₂ (External Zirconia)	0 – 5vol%	0 – 25vol%
O ₂ (Built-in galvanic cell)	0 – 10vol%	0 – 25vol%

- Max. 4 components measurement including O₂.
- 1 or 2 measuring range per component.
- Measuring range ratio ≤ 1:5 (except built in O₂) ≤ 1:20 (Built-in paramagnetic O₂ analyzer)

For measurable components and possible combinations of measuring ranges, refer to Tables 1 to 9.

Measured value indication:

- Digital indication in 4 digits (LCD with CFL back light)
- Instantaneous value of each component
 - Instantaneous value after O₂ correction (only in CO, NO, SO₂ measurement with O₂)
 - Average value after O₂ correction (only in CO, NO, SO₂ measurement with O₂)
 - O₂ average value

Analog output signals:

4 to 20mA DC or 0 to 1V DC, non-isolated output.
 Analog output corresponds to measured value indication in 1:1.
 Max. load ; 550Ω for 4 to 20 mA
 Min. load ; DC100kΩ for 0 to 1V DC
 * Refer to Table 10, for the channel No. of displayed values and analog output signals.

Analog input signal:

For signal input from externally installed O₂ sensor.
 Signal requirement;
 (1) Signal from Fuji's Zirconia O₂ sensor (TYPE: ZFK7)
 (2) 0 to 1V DC from an O₂ sensor
 Input section is not isolated. This feature is effective when an O₂ sensor is not built in.
 * Externally installed O₂ sensor should be purchased separately.

Relay contact output:

- 1a contact (250V AC/2A, resistive load)
 Instrument error, calibration error, range discrimination, auto calibration status, solenoid valve drive for auto calibration, pump ON/OFF.
 1c contact (250V AC/2A, resistive load)
 Upper/lower alarm contact output.
 Peak count alarm contact output.
 * All relay contacts are isolated mutually and from the internal circuit.

Contact input: Non-voltage contact (ON/0V, OFF/5V DC, 5mA flowing at ON)

Remote range changeover, auto calibration remote start, remote holding, average value resetting
 Isolated from the internal circuit with a photocoupler. Contact inputs are not isolated from one another.

*Only M3.5 screw terminals are used for all signal inputs and outputs.

Power supply: Voltage rating ; 100V to 240V AC

Allowable range; 85V to 264V AC
 Frequency ; 50Hz/60Hz
 Power consumption; 70VA max.
 Inlet ; Conform to EN60320 Protection Class I

Operating conditions:

Ambient temperature ; -5°C to 45°C
 Ambient humidity ; 90% RH max., non-condensing

Storage conditions:

Ambient temperature ; -20°C to 60°C
 Ambient humidity ; 100% RH max., non-condensing

Dimensions (H x W x D):

19-inch rack mounting type;
 177 x 483 x 493mm
 Desk-top type; 194 x 483 x 493mm

Mass: Approx. 10 kg

Finish color: Front panel; Off-white (Munsell 10Y7.5/0.5 or equivalent)

Casing; Steel-blue

Enclosure: Steel casing, for indoor use

Material of gas-contacting parts:

Gas inlet/outlet; SUS304
 Sample cell; SUS304/neoprene rubber
 Infrared-ray transmitting window; CaF₂
 Internal tubing; Toaron tube

Gas inlet/outlet:

Rc¹/₄ or NPT¹/₄ internal thread

Purge gas flow rate:

1L/min (when required)

Life time of fuel cell O₂ sensor:

2 years

(2) Standard functions

Output signal holding:

Output signals are held during manual and auto calibrations by activation of holding (turning on its setting).

The values to be held are the ones just before start calibration mode.

Indication values will not be held.

Remote output holding:

Output signal is held at the latest value by short-circuiting the remote output holding input terminals.

Holding is maintained while the terminals are short-circuited. Indication values will not be held.

Remote range changeover:

Measuring range can be changed according to an external signal when remote range changeover input is received.

Changeover is effective only when remote range setting is turned on. In this case, measuring range cannot be changed manually.

When the contact input terminals for each component are short-circuited, the first range is selected, and it is changed over to the second range when the terminals are open.

Range identification signal:

The present measuring range is identified by a contact signal.

The contact output terminals for each component are short-circuited when the first range is selected, and when the second range is selected, the terminals are open.

Auto calibration:

Auto calibration is carried out periodically at the preset cycle.

When a standard gas cylinder for calibration and a solenoid valve for opening/closing the gas flow line are prepared externally by the customer, calibration will be carried out with the solenoid valve drive contacts for zero calibration and each span calibration turned on/off sequentially at the set auto calibration timing.

Auto calibration cycle setting:

Auto calibration cycle is set.

Setting is variable within 1 to 99 hours (in increments of 1 hour) or 1 to 40 days (in increments of 1 day).

Gas flow time setting:

The time for flowing each calibration gas in auto calibration is set.

Settable within 60 to 599 seconds (in increments of 1 second)

Auto calibration remote start:

Auto calibration is carried out only once according to an external input signal. Calibration sequence is settable in the same way as the cyclic auto calibration.

Calibration starts by opening the auto calibration remote start input terminals after short-circuiting for 1.5 seconds or longer. Auto calibration is started when the contacts open.

Auto zero calibration:

Auto zero calibration is carried out periodically at the preset cycle.

This cycle is independent on "Auto calibration" cycle.

When zero calibration gas and solenoid valve for opening/closing the calibration gas flow line are prepared externally by the customer, zero calibration will be carried out with the solenoid valve drive contact for zero calibration turned on/off at the set auto zero calibration timing.

Auto zero calibration cycle setting:

Auto zero calibration cycle is set.

Setting is variable within 1 to 99 hours (in increments of 1 hour) or setting is variable within 1 to 40 days (in increments of 1 day).

Gas flow time setting:

The timing for flowing zero gas in auto zero calibration is set.

Settable 60 to 599 seconds (in increments of 1 second)

Upper/lower limit alarm:

Alarm contact output turns on when the preset upper or lower limit alarm value is reached.

Contacts close when the instantaneous value of each component becomes larger than the upper alarm limit value or smaller than the lower alarm limit value.

Instrument error contact output:

Contacts close at occurrence of analyzer error No. 1, 3 or 10.

Calibration error contact output:

Contacts close at occurrence of manual or auto calibration error (any of errors No. 4 to 9).

Auto calibration status contact outputs:

Contacts close during auto calibration.

Pump ON/OFF contact output:

During measurement, this contact close. While calibration gas is flowing, this contact open. This contact is connected in power supply of pump, and stop the sample gas while calibration gas flowing.

(3) Optional functions

O₂ correction: Conversion of measured CO and SO₂ gas concentrations into values at standard O₂ concentration

$$\text{Correction formula: } C = \frac{21 - O_n}{21 - O_s} \times C_s$$

C : Sample gas concentration after O₂ correction

C_s : Measured concentration of sample gas

O_s : Measured O₂ concentration

O_n : Standard O₂ concentration (value changeable by setting)

*The upper limit value of the fractional part in this calculation is 4.

The result of calculation is indicated and output in an analog output signal.

Average value after O₂ correction and O₂ average value calculation:

The result of O₂ correction or instantaneous O₂ value can be output as an average value in the determined period of time.

Used for averaging is the moving average method in which sampling is carried out at intervals of 30 seconds.

(Output is updated every 30 seconds. It is the average value in the determined period of time just before the latest updating.)

Averaging time is settable within 1 to 59 minutes (in increments of 1 minute) or 1 to 4 hours (in increments of 1 hour).

Average value resetting:

The above-mentioned output of average value is started from the initial state by opening the average value resetting input terminals after short-circuiting for 1.5 seconds or longer.

Output is reset by short-circuiting and restarted by opening.

CO concentration peak count alarm:

(added only for CO/O₂ measurement)

Alarm output turns on according to the preset concentration and count.

Whenever the instantaneous value of CO exceeds the preset concentration value, count increments. If the count exceeds the preset value in one hour, the alarm contacts close.

Communication function:

RS-232C (9pins D-sub)

Half-duplex bit serial

Start-stop synchronization

Modbus™ protocol

Contents: Read/Wright parameters

Read measurement concentration and instrument status

Remark: When connecting via RS-485 interface, a RS-232C ↔ RS-485 converter should be used.

(4) Applicable standards

Product safety: EN61010-1 :2001

EMC : EN61326-1 :1997, A1 :1998, A2 :2001

(5) Performance

Repeatability : ±0.5% of full scale

Linearity : ±1% of full scale

Zero drift : ±2% of full scale/week

Span drift : ±2% of full scale/week

Response time :

(for 90% FS response)

1 or 2 component measurement;

Within 15 seconds including replacement time of sample gas

More than 3 components measurement;

Within 30 seconds including replacement time of sample gas

Interference from other gases:

Interference component	CO ₂ analyzer	CO analyzer	CH ₄ analyzer	SO ₂ analyzer	NO analyzer	Built-in paramagnetic O ₂ analyzer
CO 1000ppm	≤ 1%FS	—	≤ 1%FS	≤ 0.5%FS	≤ 1%FS	—
CO ₂ 15%	—	≤ 1%FS (for 200ppm analyzer, ≤ 2.5%FS)	≤ 1%FS	≤ 1%FS	≤ 1%FS	≤ 2% FS —
H ₂ O saturation at 20°C	≤ 1%FS	≤ 1%FS (for 500ppm analyzer, ≤ 2.5%FS)	≤ 1%FS	—	—	—
H ₂ O saturation at 2°C	—	≤ 2.5%FS (for 200ppm analyzer)	—	≤ 50ppm* (≤ 2%FS with interference compensation)	≤ 60ppm* (≤ 2%FS with interference compensation)	—
CH ₄ 1000ppm	≤ 1%FS	≤ 1%FS	—	≤ 50ppm	—	—

*The H₂O interference of NO and SO₂ analyzer can be reduced by the interference compensation function.

(6) Standard requirements for sample gas

- Flow rate** : 1L / min \pm 0.5L / min
Temperature : 0 to 50°C
Pressure : 10 kPa or less (Gas outlet side should be open to the atmospheric air.)
Dust : 100 μ g/Nm³ or less in particle size of 0.3 μ m or less
Mist : Unallowable
Moisture : Below a level where saturation occurs at room temperature (condensation unallowable).
Below the level where saturation occurs at 2°C for CO measurement in 0 to 200 ppm range, NO measurement, and SO₂ measurement.

Corrosive component:

1 ppm or less

Standard gas for calibration:

Zero gas ; Dry N₂

Span gas ; Each sample gas having concentration 90 to 100% of its measuring range (recommended).

Gas beyond concentration 100% is unusable.

In case a zirconia O₂ analyzer is installed externally and calibration is carried out on the same calibration gas line:

Zero gas ; Dry air or atmospheric air

Span gas ; For other than O₂ measurement, each sample gas having concentration 90 to 100% of its measuring range

For O₂ measurement, O₂ gas of 1 to 2 vol%

(7) Installation requirements

- Indoor use (Select a place where the equipment does not receive direct sunlight, draft/rain or radiation from hot substances. If such a place cannot be found, a roof or cover should be prepared for protection.)
- Avoid a place where receives heavy vibration
- Select a place where atmospheric air is clean

9.2 Code symbols

Digit	Description	note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
4	<Custom specifications> Standard		Z	R	J																		
5	<Measurable component (SO ₂ , CO ₂ , CO, CH ₄) > None SO ₂ CO CO ₂ CH ₄ NO NO+SO ₂ NO+CO CO ₂ +CO CH ₄ +CO CO ₂ +CH ₄ CO ₂ +CO+CH ₄ NO+SO ₂ +CO Others	note 1				F																	
6	<Measurable component (O ₂)> None External zirconia type sensor (ZFK7) External O ₂ analyzer Built-in paramagnetic type O ₂ sensor Built-in fuel cell type O ₂ sensor	note 2 note 2																					
7	<Gas inlet/outlet> Rc1/4 on back face Rc1/4 on back face with purging NPT1/4 on back face NPT1/4 on back face with purging																						
8	<Revision code>																						
9	<Structure> Table-top type 19-inch rack mounting type 19-inch rack mounting type with slide rail																						
10	<Indication and power supply cable> In Japanese, Power cable rated 125V In English, Power cable rated 125V (UL) In English, Power cable rated 250V (CEE)	note 3																					
11	<Measuring range> 1st component, 1st range None 0 to 200ppm 0 to 500ppm 0 to 1000ppm 0 to 2000ppm 0 to 2500ppm 0 to 5000ppm 0 to 1% 0 to 2% 0 to 3% 0 to 5% 0 to 10% 0 to 20% 0 to 25% 0 to 40% 0 to 50% 0 to 70% 0 to 100% Others	note 4 note 1 note 5 note 6																					
12	<Measuring range> 1st component, 2nd range None 0 to 500ppm 0 to 1000ppm 0 to 2000ppm 0 to 2500ppm 0 to 5000ppm 0 to 1% 0 to 2% 0 to 5% 0 to 10% 0 to 20% 0 to 25% 0 to 50% 0 to 100% Others	note 4																					

Digit	Description	note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	← Digit No. of code	
13	<Measuring range> 2nd component, 1st range None 0 to 500ppm 0 to 1000ppm 0 to 2000ppm 0 to 2500ppm 0 to 5000ppm ----- 0 to 1% 0 to 2% 0 to 3% 0 to 5% 0 to 10% 0 to 20% 0 to 25% 0 to 40% 0 to 50% 0 to 70% 0 to 100% Others	note 4	Z	R	J																				
14	<Measuring range> 2nd component, 2nd range None 0 to 1000ppm 0 to 2000ppm 0 to 2500ppm 0 to 5000ppm ----- 0 to 1% 0 to 2% 0 to 5% 0 to 10% 0 to 20% 0 to 25% 0 to 50% 0 to 100% Others	note 4																							
15	<Measuring range> 3rd component, 1st range None 0 to 500ppm 0 to 1000ppm 0 to 2000ppm 0 to 2500ppm 0 to 5000ppm ----- 0 to 1% 0 to 2% 0 to 3% 0 to 5% 0 to 10% 0 to 20% 0 to 25% 0 to 40% 0 to 50% 0 to 70% 0 to 100% Others	note 4																							
16	<Measuring range> 3rd component, 2nd range None 0 to 1000ppm 0 to 2000ppm 0 to 2500ppm 0 to 5000ppm ----- 0 to 1% 0 to 2% 0 to 5% 0 to 10% 0 to 20% 0 to 25% 0 to 50% 0 to 100% Others	note 4																							
17	<O ₂ analyzer, 1st range> None 0 to 5% 0 to 10% 0 to 25% 0 to 50% 0 to 100% Others	note 4																							

Digit	Description	note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
18	<O ₂ analyzer, 2nd range> None 0 to 10% 0 to 25% 0 to 50% 0 to 100% Others	note 4	Z	R	J																Y M V P R Z		
19	<Output> 4 to 20mA DC 0 to 1V DC 4 to 20mA DC + Communication function 0 to 1V DC + Communication function																					A B C D	
20	<O ₂ correction and O ₂ average value output> None With O ₂ correction output and average output With Peak count alarm output With O ₂ correction and average output, and peak count alarm output Others	note 7 note 8																				Y A B C Z	
21	Adjustment, Unit Standard, Unit ppm For heat treatment, Unit ppm Standard, Unit mg/m ³ Others	note 9																					A B C Z

<Code specification for ordering>

(1) Code symbols should be specified.

(2) Range combination should be the one allowed in separate tables.

(note1) When only O₂ measurement is necessary, "Y" should be specified at the 5th digit.

In this case, specify O₂ measuring range at 17th 18th digits.

(note2) When "B" is specified at the 6th digit, O₂ sensor signal has to be set as 0-1V DC linear corresponding to full scale.

External Zirconia O₂ sensor and external O₂ analyzer are not included in the scope of supply, and has to be separately ordered..

(note3) Rated voltage and plug type of the attached power cable is different depending on the code "J", "E" and "U" in the 10th digit.

Select appropriate code according to operating power supply voltage in the final destination.

(note4) Refer to Table 1 to 9, for possible combination of measuring components and ranges in the data sheet.

(note5) "C" can be specified at 11th digits, ONLY for CO measurement.

(note6) "E" can be specified at 11th digits, except CH₄ measurement.

(note7) O₂ correction is calculated only for NO, SO₂ and CO.

Both average value output after O₂ calculation and O₂ average value output are provided at the same time.

Peak count alarm can be added only for CO measurement.

* With the triple-component analyzer for NO, SO₂, and CO, the values after correction only are displayed and output (average of corrected values is not output). If the average value should be output, specify Z, and separately describe what values should be output. Up to 8 values can be output.

Peak count alarm can be added only for CO measurement.

(note8) When no O₂ measurement, "Y" should be specified.

(note9) This analyzer has different calibration curve corresponding to sample gas composition.

When "B" or "Z" is specified at the 21th digit, the gas composition table should be issued.

"Standard" means N₂ balance adjustment.

In case that the measurement unit is specified as "mg/m³", it is necessary to select "unit : mg/m³" (Code "C") at the 21st digit.

Please refer to the table shown below for the corresponding range code based on "mg/m³".

Range code	In ppm	Corresponding range in mg/m ³		
		NO	SO ₂	CO
C	0 to 200ppm	—	—	0 to 250mg/m ³
E	0 to 500ppm	0 to 650mg/m ³	0 to 1400mg/m ³	0 to 600mg/m ³
F	0 to 1000ppm	0 to 1300mg/m ³	0 to 2800mg/m ³	0 to 1250mg/m ³
G	0 to 2000ppm	0 to 2600mg/m ³	0 to 5600mg/m ³	0 to 2500mg/m ³

The conversion formula "ppm" unit into "mg/m³" unit

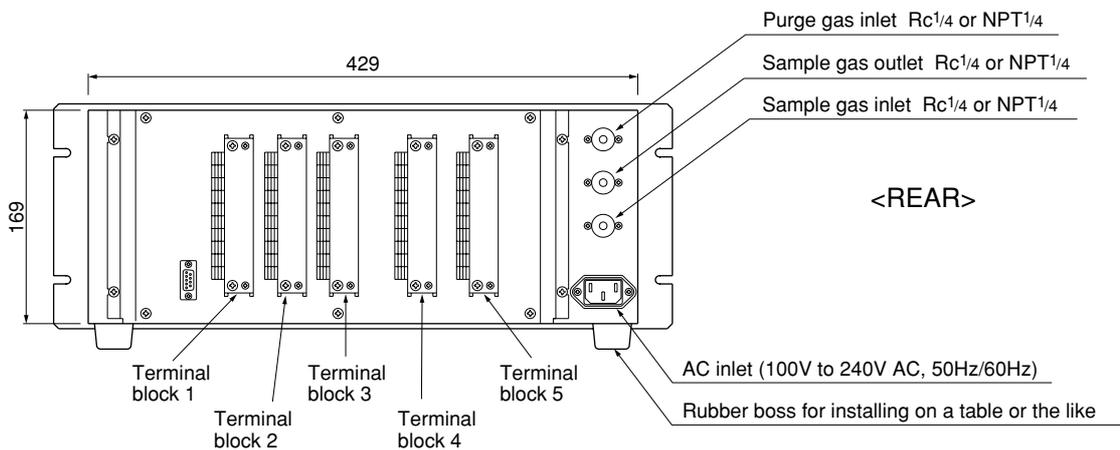
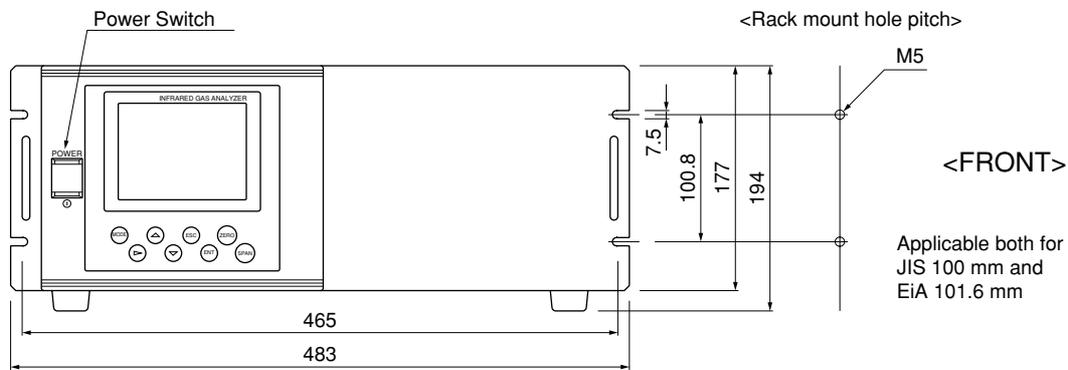
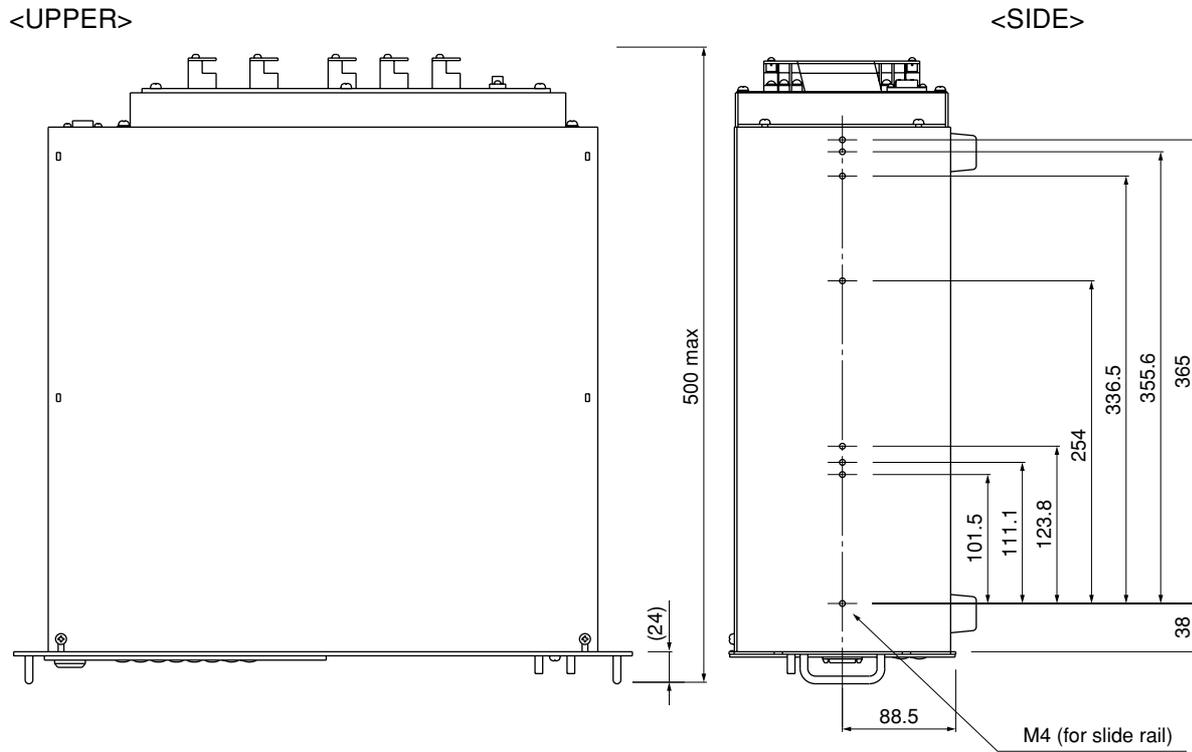
NO(mg/m³) = 1.34 × NO (ppm)

SO₂(mg/m³) = 2.86 × SO₂ (ppm)

CO(mg/m³) = 1.25 × CO (ppm)

9.3 Outline diagram (Unit : mm)

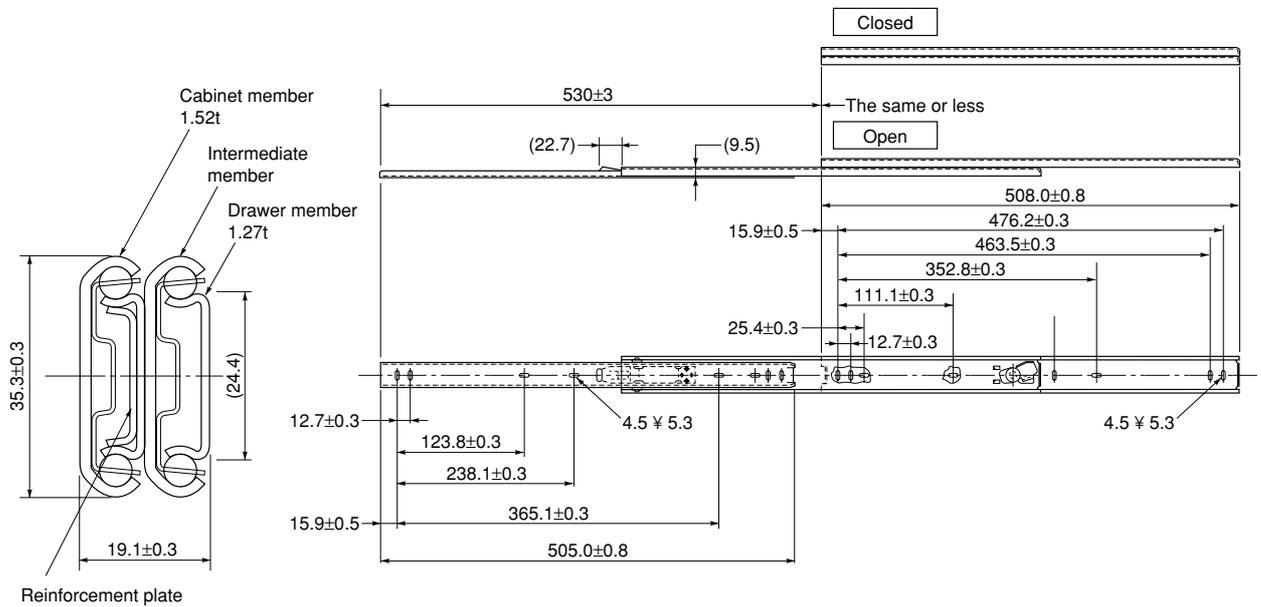
(1) Main unit



(2) Accessory slide rail (unit: mm)

*The slide rails are attached to this equipment when designated.

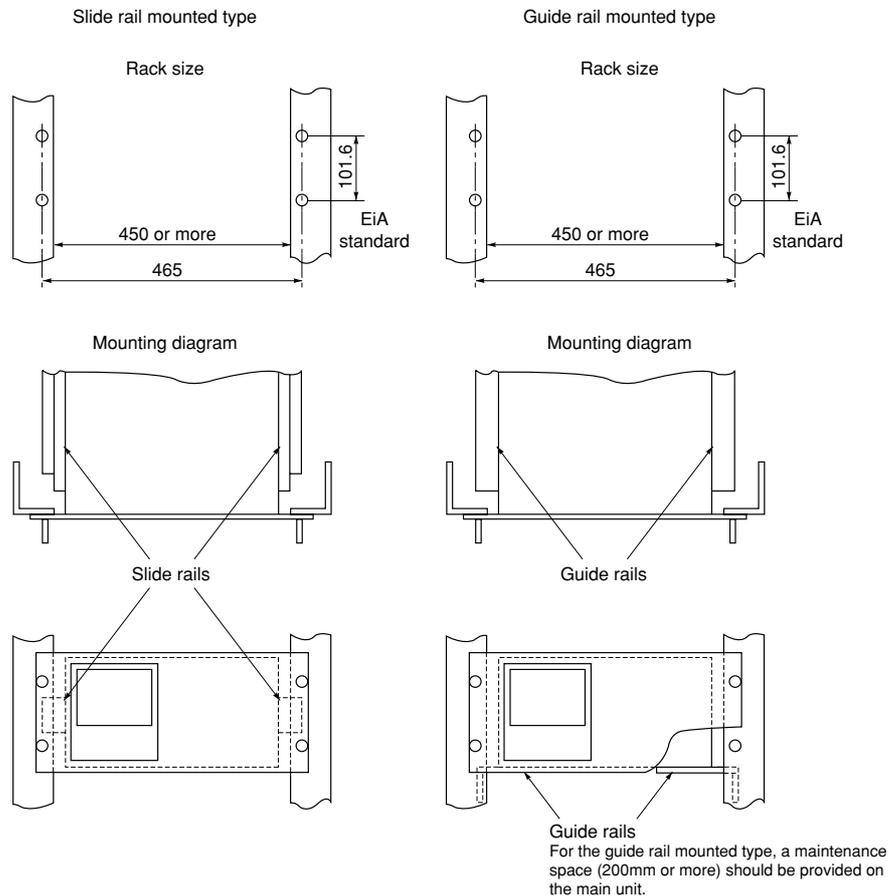
Model : 305A-20/Accuride International Inc.or equivalent



19-inch rack mounting method:

The mass of the instrument should be supported at the bottom of the unit (or the side of the unit when mounted with the slide rails).

Also, for facilitate maintenance, a structure which allows extraction of the main unit by using the slide rail is recommended.



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