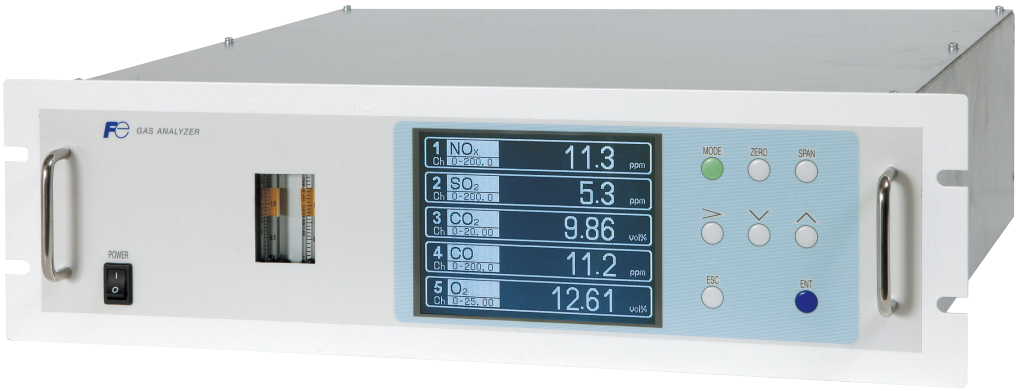
Fuji Electric

Instruction Manual

NDIR TYPE INFRARED GAS ANALYZER

TYPE: ZPB



INZ-TN2ZPBc-E Fuji Electric Co., Ltd.

PREFACE

Thank you very much for purchasing Fuji's Infrared Gas Analyzer (Type: ZPB).

- Be sure to read this instruction manual carefully before performing installation, wiring, operation, and maintenance of the analyzer. Improper handling may result in accidents 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 will not bear any responsibility for a trouble caused by such a modification.
- The person who actually operates the analyzer should keep this instruction manual.
- After reading through the manual, be sure to keep it near at hand for future reference.
- This instruction manual should be delivered to the end user without exception.

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

Request

- No part or the whole of this manual may be reproduced without written permission of Fuji.
- Description in this manual is subject to change without prior notice for further improvement.

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CAUTION ON SAFETY

To operate the analyzer properly, be sure to read "Caution on Safety" carefully.

- The descriptions listed here provide important information on safety. Be sure to observe them at all times. Those safety precautions are classified into 3 levels, "DANGER," "CAUTION" and "PROHIBITION."

⚠ **DANGER**	Improper handling may cause dangerous situations that may result in death or serious injury.
⚠ **CAUTION**	Improper handling may cause dangerous situations that may result in medium-level troubles, minor injury, or property damage.
⊘ **PROHIBITION**	Items which must not be done are indicated.
⚠ **CAUTION**	Items which indicates the possibility of receiving electric shock if it is handled incorrectly.

Caution on installation and transport of gas analyzer	
⚠ **DANGER**	• The unit is not of explosion-proof specifications. Do not use it in an atmosphere of explosive gases. Otherwise, serious accidents such as explosion or fire may result.
⚠ **CAUTION**	• For installation, observe the rule on it given in the instruction manual, and select a place where the weight of analyzer can be supported. Installation in an inadequate place may cause turnover or falling, resulting in injury. • Be sure to wear protective gloves when lifting the analyzer. Lifting it with bare hands may result in injury. • Be sure to fix the cover before transporting the analyzer. Transportation in unstable state may result in injury. • The gas analyzer is heavy. To transport the analyzer, please use a hand cart or equivalent. Prevent from carrying analyzer by hand as much as possible. Otherwise, unexpected harm to your body or injury may result. • Take care not to let cable chips and other foreign objects enter the unit during installation work. Otherwise, fire, failure, or malfunction may result.

Caution on piping	
⚠ DANGER	**Be sure to observe the following precautions while installing piping. Improper piping may result in gas leakage.** **If the leaking gas contains a toxic component, serious accidents may result. If it contains combustible gases, explosion or fire may result.** • Connect pipes correctly referring to the instruction manual. • Discharge the exhaust gas outdoors to prevent it from remaining within the sampling device or indoors. • Relieve the exhaust gas from the analyzer to the atmospheric pressure to prevent buildup of undesirable pressure to the analyzer. Otherwise, piping within the analyzer may be disconnected, resulting in gas leakage. • Use pipes and pressure reducing valves to which no oil/grease is attached to the piping. Otherwise, fire may result.

Caution on wiring	
⚠ CAUTION	• Be sure to turn off the power before installing wiring. Otherwise, electric shock may result. • Be sure to perform protective earth ground connection. Otherwise, electric shock or failure may result. • Select a proper wiring material that satisfies the ratings of the instrument. Otherwise, electric shock or fire may result. • Be sure to connect a power supply of correct rating. Otherwise, fire may result.

Caution on use	
⚠ DANGER	• Be sure to read the instruction manual for standard gases before handling standard gases such as calibration gas to use them properly.
⚠ CAUTION	• Leaving the analyzer unused for a long time or restarting it after long-term suspension requires procedures different from normal operation or suspension procedures. Be sure to follow the instructions in each instruction manual. Otherwise, intended performance may not be achieved. Also, accidents or injury may result. • Do not operate the analyzer for a long time with its cover left open. Otherwise, dust, foreign matter, etc. may contaminate on internal walls, thereby causing faults.

Caution on use	
PROHIBITION	• Do not touch the input/output terminals with metal or finger. Otherwise, electric shock or injury may result. • Do not smoke or use flames near the analyzer. Otherwise, fire may result. • Do not allow water to enter the analyzer. Otherwise, electric shock or internal fire may result.

Caution on maintenance and check	
DANGER	• Before performing work with the cover of the analyzer kept open for maintenance and check, be sure to purge completely not only within the analyzer but also measuring gas lines with nitrogen or air. Otherwise, poisoning, fire, or explosion may result due to gas leakage.
CAUTION	**Be sure to observe the following to perform work safely, avoiding electric shock or injury.** • Remove the watch and other metallic objects before work. • Do not touch the instrument with wet hands. • If the fuse is blown, eliminate the cause and replace it with the one of the same capacity and type. Otherwise, electric shock or accidents may result. • Do not use replacement parts other than those specified by the manufacturer. Otherwise, intended performance may not be achieved. Besides accidents or failures may result. • Dispose replacement parts such as maintenance parts as incombustibles according to the local waste disposal regulations.

Others	
CAUTION	• If the cause of any fault cannot be identified by referring to the instruction manual, be sure to contact your dealer or Fuji's technician in charge of adjustment. Disassembling the instrument carelessly may result in electric shock or injury.

WARRANTY AND MAINTENANCE

1. Scope of application

To use this equipment, the following conditions must be met:

- the use of the equipment incurs no risk of a serious accident even if a failure or malfunction occurs on the equipment, and
- in case of product failure or malfunction, safety measures such as redundant design, prevention of malfunction, fail safe system, foolproof mechanism are provided outside of the equipment.

Be sure to use this instrument under the conditions or environment mentioned in this instruction manual. Please consult us for the use for the following applications:

Radiation-related facilities, systems related to charging or settlement, or other usages which may have large impact on lives, bodies, property, or other rights or interests.

2. Operating conditions and environment

Refer to "Caution on safety" and Section 9, "Specifications".

3. Precautions and prohibitions

Refer to "Caution on safety"and Section 9, "Specifications".

4. Warranty

4-1. Period of warranty

(1) Warranty period for this product including accessories is one year after delivery.
(2) Warranty period for the parts repaired by our service providers is six months after the completion of repair.

4-2. Scope of warranty

(1) If any failure or malfunction attributable to Fuji Electric occurs in the period of warranty, we shall provide the product after repairing or replacing the faulty part for free of charge at the place of purchase or delivery. The warranty does not apply to failure or malfunctions resulting from:
   1) inappropriate conditions, environment, handling or usage that is not instructed in a catalog, instruction book or user's manual, or overuse of the product,
   2) other devices not manufactured by Fuji Electric,
   3) improper use, or an alteration or repair that is not performed by Fuji Electric,
   4) inappropriate maintenance or replacement of expendable parts listed in the instruction book or the catalog,
   5) damages incurred during transportation or fall after purchase,
   6) any reason that Fuji Electric is not responsible for, including a disaster or natural disaster such as earthquake, thunder, storm and flood damage, or inevitable accidents such as abnormal voltage.

(2) Regardless of the time period of the occurrence, Fuji Electric is not liable for the damage caused by the factors Fuji Electric is not responsible for, opportunity loss of the purchaser caused by malfunction of Fuji Electric product, passive damages, damage caused due to special situations regardless of whether it was foreseeable or not, and secondary damage, accident compensation, damage to products that were not manufactured by Fuji Electric, and compensation towards other operations.

5. Failure diagnosis

Regardless of the time period of the occurrence, if any failure occurs, the purchaser shall perform a primary failure diagnosis. However, at the purchaser's request, Fuji Electric or our service providers shall provide the diagnosis service for a fee. In such a case, the purchaser shall be charged for the service.

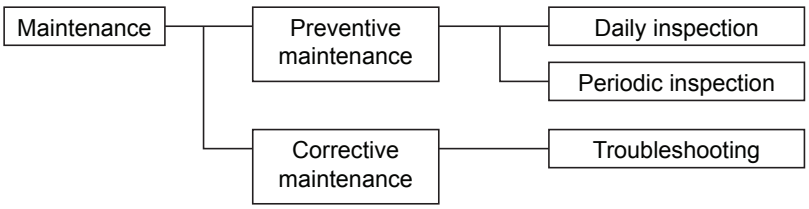
6. Service life

This product, excluding limited-life parts and consumable parts, is designed for a service life of 10 years under general operating conditions (with an average ambient temperature of 30°C).

The service life may be shortened depending on operating conditions and environment. To ensure the service life, it is important to perform planned maintenance of the product including limited-life parts and consumable parts.

7. Maintenance plan

Maintenance can be divided into "preventive maintenance" and "corrective maintenance". Preventive maintenance can further classified into "daily inspection" and "periodic inspection". Preventive maintenance is achieved through systematic implementation of "daily inspection" and "periodic inspection".



(1) Daily inspection
Be sure to perform daily inspection prior to operation to check for any problem in daily operation. For the specific items of daily inspection, refer to Section 7, "Maintenance".

(2) Periodic inspection
Periodic inspection is to replace limited-life parts before their service lives are over, thus preventing failure. Recommended inspection interval is 6 months to 12 months. If you are using the instrument under harsh environment, we recommend you to shorten the inspection interval. For the specific items of periodic inspection, refer to Section 7, "Maintenance".

(3) Corrective maintenance
Corrective maintenance is a measure to be taken after a trouble has occurred. Refer to Section 7 "Maintenance" and Section 8. "Error messages". If the measures mentioned in this instruction manual do not solve the problem, please contact one of our sales offices or service offices.

8. Limited-life parts and consumable parts

This product contains the following limited-life parts and consumable parts which may affect the service life of the product itself.

(1) Aluminum electrolytic capacitor

- Design life: 5 years under general working conditions (annual average of ambient temperature: 30°C)
- Symptoms when a capacitor loses its capacity: deterioration of power quality, malfunction
- Factors which affect battery life: temperature. The life is shortened by half when the temperature rises by 10°C. (Arrhenius' law)
- Replacement: Estimate the lifetime of capacitor according to your operating environment, and have the capacitor replaced or overhauled at appropriate time, at least once in 10 years.

Do not use capacitors beyond its lifetime. Otherwise, electrolyte leakage or depletion may cause odor, smoke, or fire. Please contact Fuji Electric or its service providers when an overhaul is required.

(2) LCD

- Design life: approx. three years for continuous use
- Symptoms when LCD is depleted: unclear indication, back light not working
- Factors which affect battery life: temperature. The life is shortened by half when the temperature rises by 10°C. (Arrhenius' law)
- Replacement: Estimate the lifetime of built-in battery according to your operating environment, and replace it at appropriate time.

9. Spare parts and accessories

Refer to "Confirmation of delivered item" and/or Section 7 "Maintenance" for spare parts and accessories.

10. Period for repair and provision of spare parts after product discontinuation (maintenance period)

The discontinued models (products) can be repaired for 5 years from the date of discontinuation. Also, most spare parts used for repair are provided for five years from the date of discontinuation. However, some electric parts may not be obtained due to their short life cycle. In this case, repair or provision of spare parts may be difficult even in the above period.

Please contact one of our sales offices or service offices for further information.

CONTENTS

1. OVERVIEW

This instrument measures the concentration of NO, SO_2, CO_2, CO and O_2 contained in sampling gas on the principle that different atomic molecules have an absorption spectrum in the wave band of infrared rays, and the intensity of absorption is determined by the Lambert-Beer law.

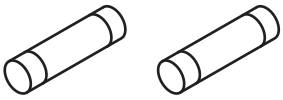
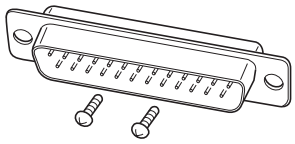
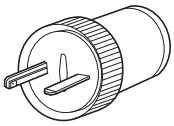
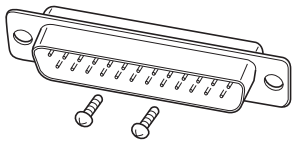
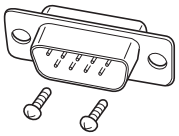
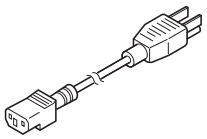
Since this instrument incorporates a compact O_2 sensor, it allows measuring up to 5 components simultaneously by using the built-in O_2 sensor (up to 4 components if O_2 sensor is excluded).

Furthermore, use of a microprocessor and large sized liquid crystal display realizes improvement of operability, accuracy and multi-functions.

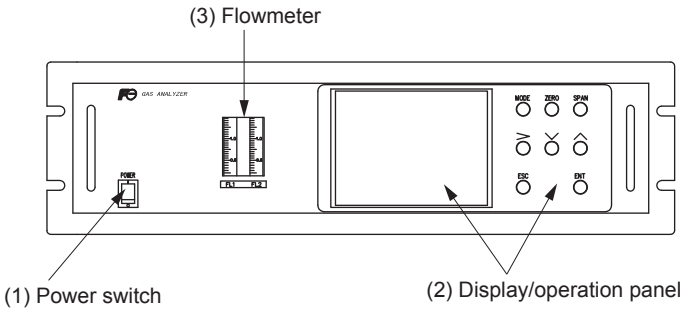
This instrument is optimum for measuring combustible gas exhausted from boilers or incinerators, and it is effective for steel gas analysis [blast furnace, steel converter, thermal treatment furnace, sintering (Pellet equipment), coke furnace], storage and maturity of vegetable and fruit, biochemistry (microbe), [fermentation], air pollution [incinerator, exhaust gas desulfurization, denitration], automotive emission (excluding tester), protection against disasters [detection of explosive gas and toxic gas, combustion gas analysis of new building material], growth of plants, chemical analysis [petroleum refinery plant, petroleum chemistry plant, gas generation plant], environment [landing concentration, tunnel concentration, parking lot, building management] and various physical and chemical experiments.

2. NAME OF DELIVERED ITEMS AND EACH PARTS

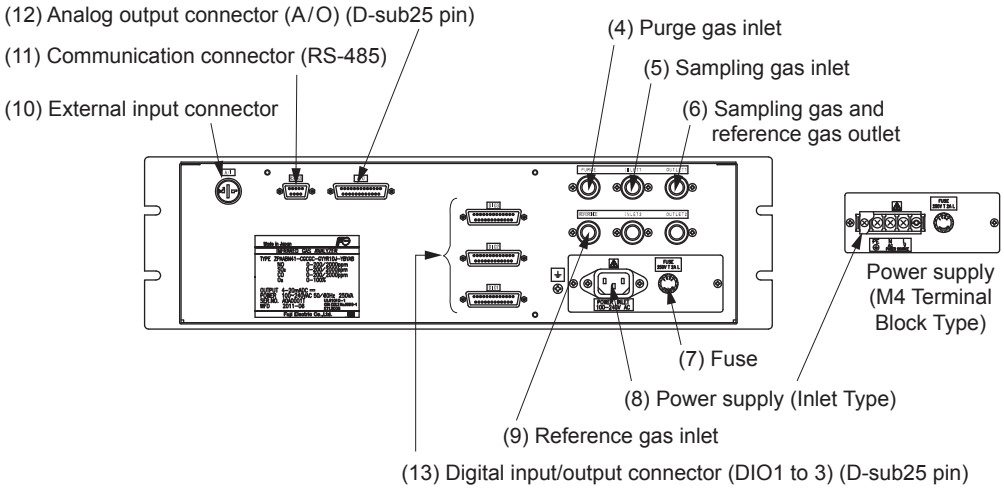
2.1 Confirmation of delivered items

Analyzer: 1 unit		
Fuse: 2 pcs		Standard: IEC127-2 Size: ø5 × 20mm Rating: 250V/2A delay type Part No.: R75796N17
Analog output connector: 1 Fixing screws: 2		25 pin D-sub connector (male) Part No.: R77256N262 M2.6 × 4mm
Instruction manual (this manual): 1 copy (INZ-TN2ZPBb-E)		
External input connector: 1 (External O_2 analyzer and External zirconia O_2 analyzer are specified)		Part No.: R77240N35
Digital input/output connector: 3 max. with the number of DIO Fixing screws: 6 max. (When digital input/output function is specified)	 Max. 3 sets	25 pin D-sub connector (male) Part No.: R77256N262 M2.6 × 4mm
RS-485 connector: 1 Fixing screws: 2 (When provided with communication function)		9 pin D-sub connector (male) Part No.: R77256N284 M2.6 × 4mm
Ferrite core: 1 For power cable (When terminal block for power supply is specified)		Part No.: R79181N14
Power supply cord: 1 (When power inlet is specified) Standard inlet type		Part No.: R77419N14

2.2 Name and description of analyzer



< Front panel >



< Rear panel >

Name	Description	Name	Description
(1) Power switch	Used for ON/OFF the analyzer.	(9) Reference gas inlet	For connecting to the reference gas tube.
(2) Display/operation panel	Liquid crystal display and keys for setting various functions.	(10) External input connector	For connecting to the output of externally installed O_2 analyzer.
(3) Flow meter	For checking the flow rate of sampling gas and reference gas.	(11) Communication connector	RS-485 connector for communication.
(4) Purge gas inlet	For connecting to the purge gas tube.	(12) Analog output connector (D-sub25 pin)	Connector for the analog output
(5) Sampling gas inlet	For connecting to the measuring gas tube.	(13) Digital input/output connector (D-sub25 pin)	Connector for the digital input/output
(6) Sampling gas and reference gas outlet	For connecting to the exhaust line.		
(7) Fuse	Fuse inside		
(8) Terminal block for power supply	For connecting to the power supply line.		

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

- Entrust the installation, movement or re-installation to a specialist or the supplier. A poor installation may cause accidental tipover, electric shock, fire, injury, etc.
- The gas analyzer is heavy. It should be installed with utmost care. Otherwise, it may tipover or drop, for example, causing accident or injury.
- For lifting the gas analyzer, be sure to wear protective gloves. Bare hands may invite an injury.
- This unit should be installed in a place which conforms to the conditions noted in the instruction manual. Otherwise, it may cause electric shocks, fire or malfunction of the unit.
- During installation work, care should be taken to keep the unit free from entry of cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.

3.1 Installation conditions

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

(1) This instrument is system built in type. This instrument should be used while embedded in a panel, locker, or enclosure of steel sheet.
Keep a minimum clearance of 10 cm above the analyzer for heat dissipation. The same clearance is required for each analyzers when you install several units on a multistage rack.

(2) Use this instrument indoors.

(3) A vibration-free place

(4) A place which is clean around the analyzer.

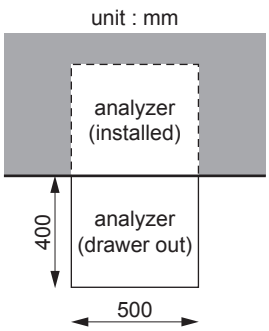
(5) Power supply

Rated voltage	: 100V to 240V AC
Operating voltage	: 85V to 264V AC
Rated frequency	: 50/60 Hz
Power consumption	: 100 VA max.

(6) Operation conditions

Ambient temperature	: –5° to 45°C (max. 40°C when two optical units are used, and the power supply is more than 200V AC)
Ambient humidity	: 90 % RH or less, no condensation

(7) Maintenance space
When analyzer is installed by itself, please make sure to keep the space shown in the dimension of the figure for maintenance. In case analyzer is installed as an unit, please refer to the instruction manual of the analyzer unit.



(8) A switch or a circuit-breaker should be included in the installation.

(9) A breaker should be installed near the analyzer where an operator can access it.

(10) A label that clearly identifies the breaker should be placed on it.

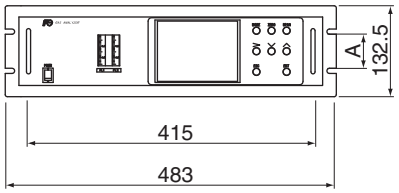
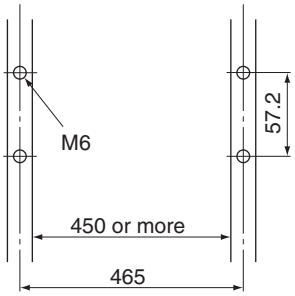
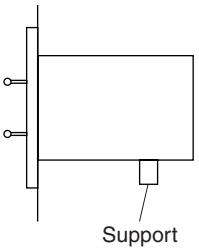
(11) The breaker rating should meet the analyzer rating max 2A and a breaker should conform to all necessary approvals.

3.2 Installation

3.2.1 Installation of analyzer main frame

Installation methods for the analyzer main unit is shown below.

(Unit : mm)

Type	External dimensions	Mounting dimensions	Mounting method
19-inch rack mounting	 “A” : 57.2 (EIA)		

Note) • The analyzer weight must be supported at the bottom of the casing.

• The analyzer should be installed in a place where ambient temperature is within -5 to 45°C (max. 40°C when two optical units are used, and the power supply is more than 200V AC), and temperature fluctuation during using is minimum.

• Where vibration is unavoidable, protect the analyzer from vibrating.
For example, install rubber material around the case to isolate vibration from the suppot structure.

3.3 Piping

⚠ CAUTION

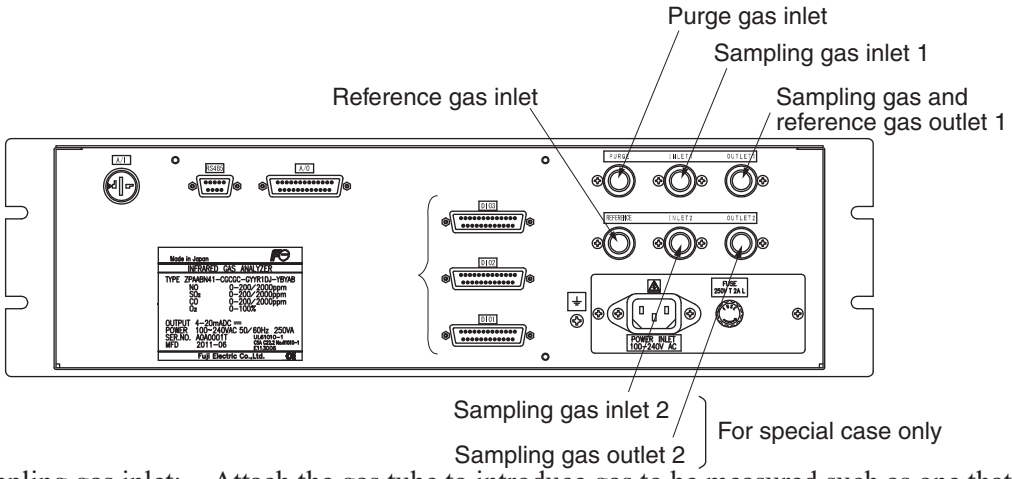
In addition to a sample/reference gas inlet and outlet, there is a purge gas inlet at the rear panel of the analyzer.

When improper connection is carried out here, combustible gas, poisonous gas, and explosive fumes may be accumulated into the analyzer.

Be careful of a connection place in the rear panel of piping connection.

Observe the following when connecting the gas tube.

- Piping should be connected to the gas inlets and outlets at the rear panel of the analyzer.
- Use a corrosion resistant tube of Teflon, stainless steel or polyethylene to connect the instrument to a sampling system. Even if there is a danger of corrosion, refrain from using a tube of rubber or soft vinyl. The instrument provides inaccurate indication due to gas absorption by piping materials.
- Pipe connection port is Rc1/4 female thread (or NPT1/4). Piping should be cut as short as possible for a quick response. About 4 mm inner diameter is recommended.
- Entry of dust into the instrument may result in defective operation. Use a clean piping and coupling.



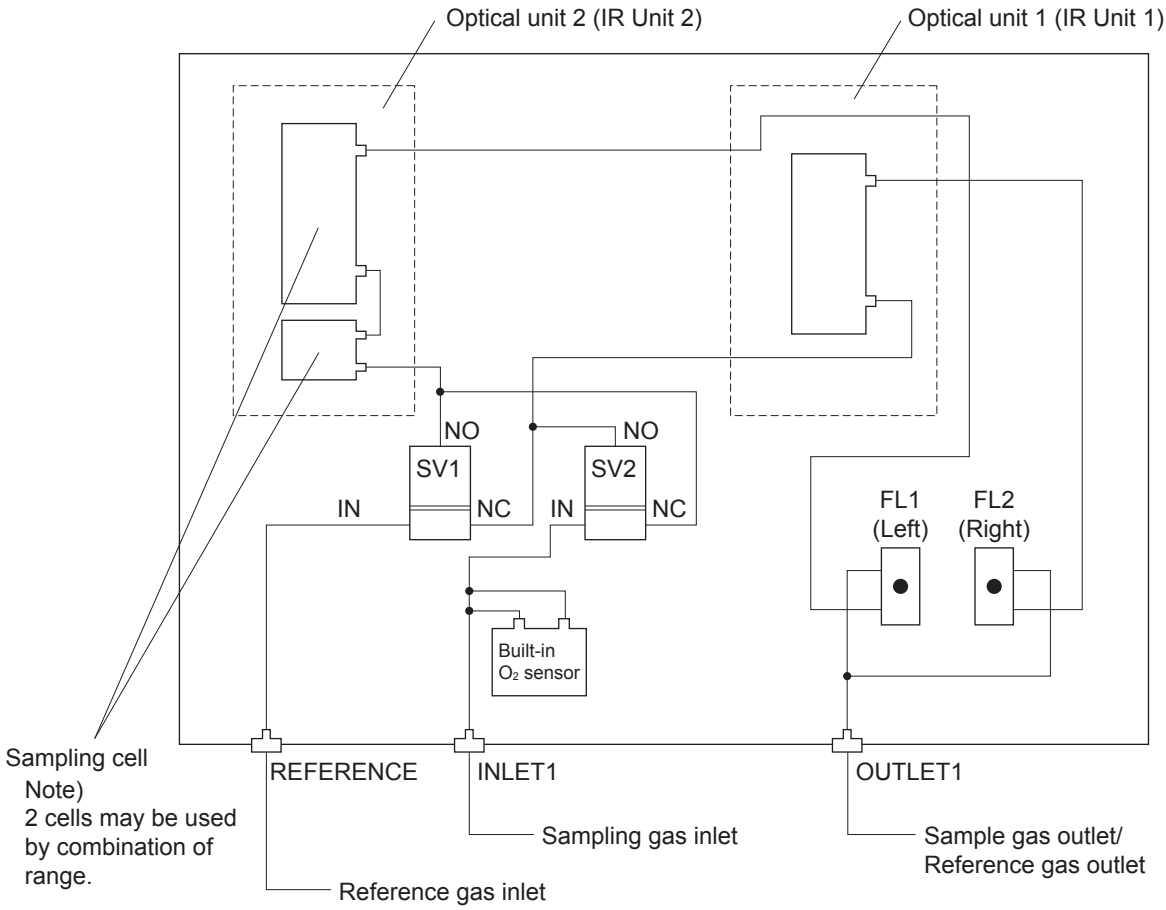
Sampling gas inlet: Attach the gas tube to introduce gas to be measured such as one that has completed dehumidification process and standard gases for zero and span calibration to this inlet.
Gas flow to be introduced should be constant within the range of 1.0 L/min ±0.2 L/min.

Sample gas outlet/Reference gas outlet (For horizontal type:1 port, for vertical type: 2 port):
Exhaust measured gas through the outlet. Attach the tube to exhaust measured gas outdoors or to the atmosphere.

Purge gas inlet: It is used for purging the inside of the total gas analyzer.
Use dry gas N_2 or instrumentation air for purge gas. (Flow rate is 1L/min or more, and dust or moisture/mist are unallowable.)

Reference gas inlet: inlet for reference gas used in sample switching system. Use dry air, dry N2, sample gas, or ambient air after preprocessing such as dehumidification and component elimination. Air flow rate should be constant within the range of 1.0 L/min ±0.2 L/min.

Internal piping diagram



Correspondence of measured components and optical units

Measuring components	Optical unit 1	Optical unit 2
1-component for NO, SO_2, CO_2, CO and CH_4	Each component	None
2-components for CO_2/CO	CO_2/CO	None
2-components for NO/CO, NO/SO_2	NO NO	CO SO_2
3-components for NO/SO_2/CO	NO	SO_2/CO
4-components for NO/SO_2/CO_2/CO	NO	SO_2/CO_2/CO

3.4 Sampling

3.4.1 Conditions of sampe gas

(1) Dust contained in the sample gas should be completely removed with a filter. For the final stage filter, use a filter that allows removing dust particles of 0.3μm.

(2) Dew point of the sample gas must be lower than the ambient temperature to avoid occurrence of drain in the gas analyzer. If vapor is contained in the sample gas, dew point should be lowered to 2˚C by using a dehumidifier.

(3) If SO_3 mist is contained in the sample gas, use a mist filter or cooler to remove SO_3 mist. Other mists should be removed by using a mist filter or gas dryer.

(4) Corrosive gases such as Cl_2, F_2 and HCl, if they are contained in the sample gas in considerable amounts, will shorten the life of component parts.

(5) Temperature of the sample gas should be within 0 to 50˚C. Pay attention not to flow hot gas directly into the instrument.

3.4.2 Sample gas flow

Flow of sample gas should be 1.0L/min ± 0.2L/min.

Avoid flow fluctuation during measurement.

Observe the flow reading by a flowmeter provided as shown in the example of the sampling system configuration (Section 3.4.6).

3.4.3 Preparation of standard gas

Routine calibration is required by standard gas for keeping this instrument under normal operation condition (once a week). Prepare a standard gas cylinder for zero calibration and span calibration.

	Analyzer without O_2 measurement	Analyzer with built-in O_2 sensor	Analyzer with external zirconia O_2 sensor
Zero gas	N_2 gas	N_2 gas	Dry air
Span gas other than for O_2 measurement	Gas with concentration of 90 to 100% of its measuring range, barance N_2.	Gas with concentration of 90 to 100% of its measuring range, barance N_2.	Gas with concentration of 90 to 100% of its measuring range, barance N_2.
Span gas for O_2 measurement	———	Gas with concentration of 90 to 100% of its measuring range or atmospheric air (21% O_2).	O_2 gas of 1 to 2%

3.4.4 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 the 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 dry N_2.

Purging flow rate should be about 1L/min.

Purging gas, if used, must not contain dust or moisture.

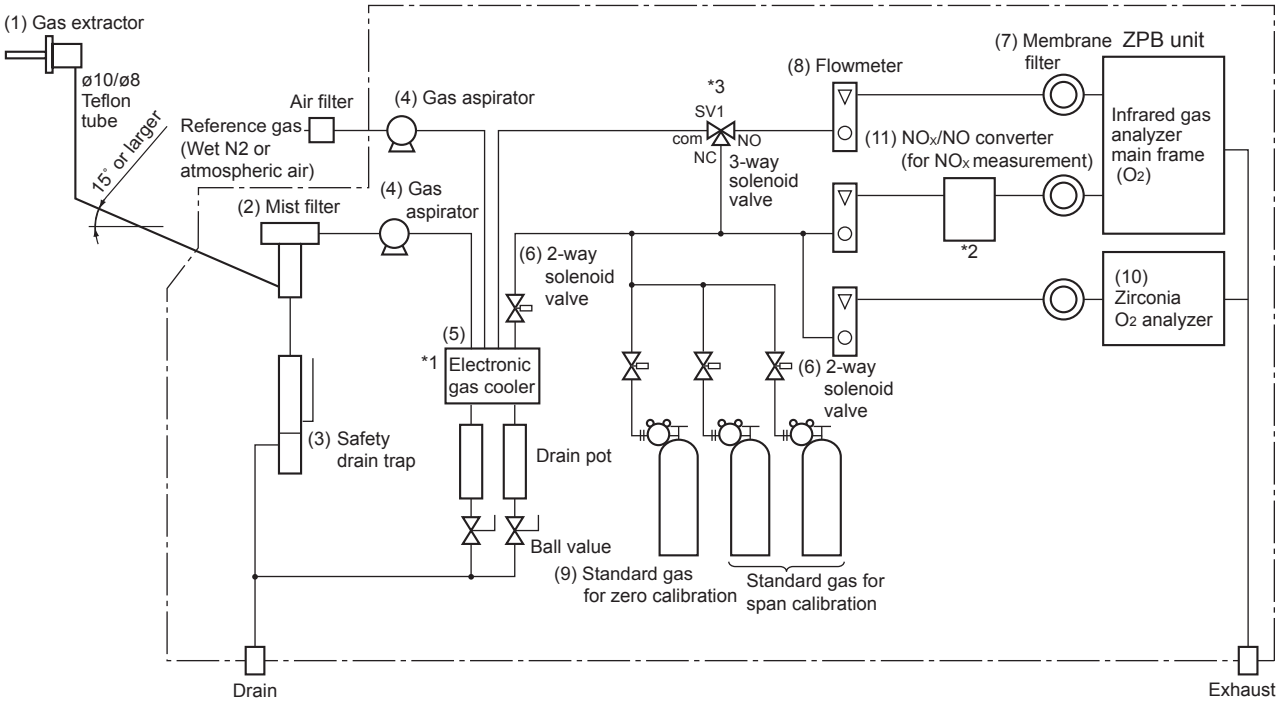
3.4.5 Pressure at sampling gas outlet

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

3.4.6 Example configuration of gas sampling system

The following illustrates a typical system configuration for 5 component gas measurement for monitoring combustion exhaust gas from boiler, refuse incinerator, etc.

Contact Fuji Electric for system configuration matching the particular use or further information.



*1) Be sure to remove the moisture to be temperature 5ºC or lower from measuring gas by electronic cooler and water concentration should be equalized in reference gas and sample gas.
*2) Be sure to use NO_2/NO converter in case of measuring NO_x.
*3) Connect to the contact for zero calibration.

Name	Description	Name	Description
(1) Gas extractor	Gas extractor with a heating type stainless steel filter of standard mesh 40µm	(8) Flowmeter	Adjusts and monitors the flow rate of the sample gas, reference gas and standard gas for calibration.
(2) Mist filter	Removes drain, mist, and dust.	(9) Standard gas	Standard gas used for calibrating zero and span of the analyzer, depending on the measured component.
(3) Safety drain trap	The safety drain trap is divided into two spaces for positive and negative pressure. It monitors and adjusts the sample gas pressure.		
(4) Gas aspirator	For aspiration of the sample gas and reference gas	(10) Zirconia O_2 analyzer	External zirconia oxygen sensor used for measuring the oxygen concentration in sample gas. (This is not necessary in case when O_2 sensor is built-in.)
(5) Electronic gas cooler	Dries the moisture in the sample gas and reference gas to a dew point of approx. 2˚C.		
(6) Solenoid valve	Used for flowing the standard gas.		
(7) Membrane filter	PTFE filter used to eliminate fine dust particles.	(11) NO_2/NO converter	Added to NOx analyzer. A special catalyst material for efficient conversion of NO_2 gas to NO is used.

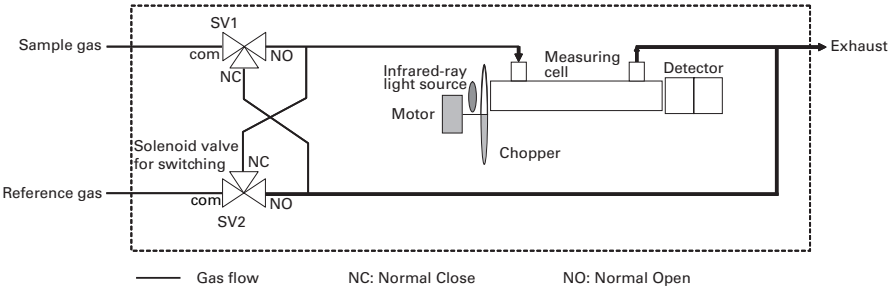
3.4.7 Gas requirements for measurement and calibration

		From reference gas inlet	From sample gas inlet	Remarks
Calibration	Zero calibration	Dry N_2 or dry air	Dry N_2 or dry air	Use dry gas (cylinder) for both zero and span calibrations.
	Span calibration	Dry N_2 or dry air	Dry span gas	
Measurement	When sample gas is wet	N_2 or air dehumidified to the dew point of 2 degrees Celsius or lower	Sample gas dehumidified to the dew point of 2 degrees Celsius or lower	If the sample gas contains moisture, dehumidify both the reference gas and the sample gas to the dew point of 2 degrees Celsius or lower.
	When sample gas is dry	Dry N_2 or dry air	Dry sample gas	

Calibration

Zero calibration: dry N_2 or dry air
Span calibration: dry span gas

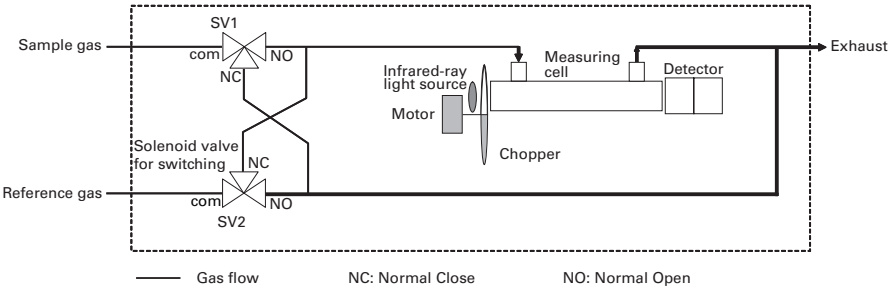
Zero calibration: dry N_2 or dry air
Span calibration: dry N_2 or dry air



Measurement (wet sample gas)

Sample gas dehumidified to the dew point of 2 degrees Celsius or lower

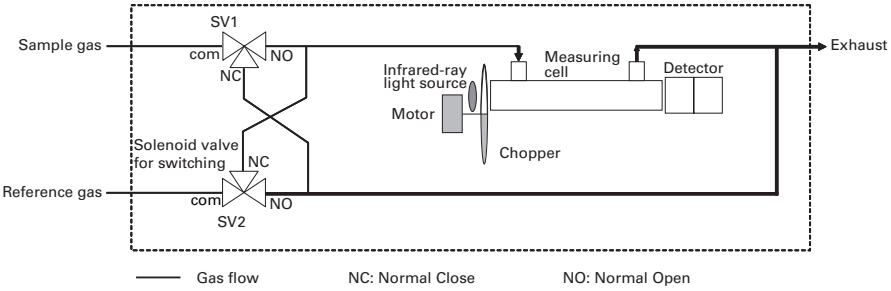
N_2 or air dehumidified to the dew point of 2 degrees Celsius or lower



Measurement (dry sample gas)

Dry sample gas

Dry N_2 or dry air



3.5 Wiring

⚠ CAUTION

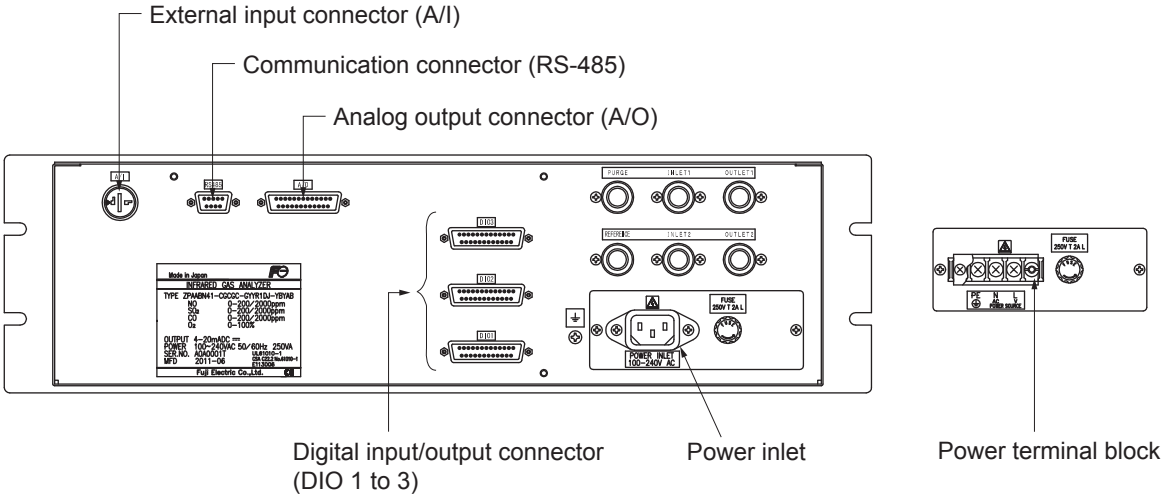
- Be sure to turn off the power before installing wiring. Otherwise, electric shock may result.
- Be sure to perform protective earth connection. Otherwise, electric shock or failure may result.
- Select a proper wiring material that satisfies the ratings of the instrument. Otherwise, electric shock or fire may result.
- Be sure to connect a power supply of correct rating. Otherwise, fire may result.

⚠ CAUTION

⚠ Electric Shock

Please be sure to make ground (grounding) connection for safety.

The power terminal block or the power inlet and external input/output connector is provided at the rear panel. Refer to the following.

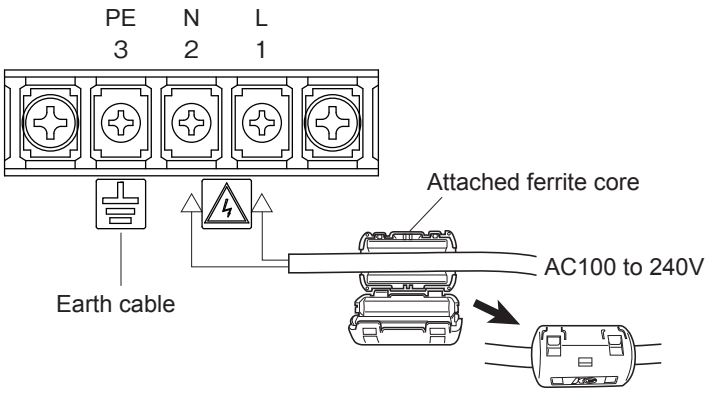


(1) Power supply

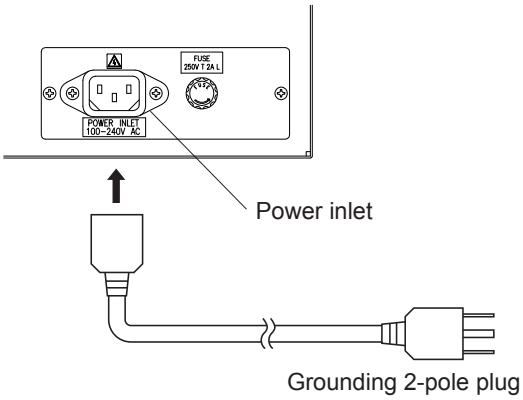
Connect the given power supply to the power terminal, and connect the ground wire to the grounding terminal. Be sure to perform protective earth connection. Use solderless terminals (for M4) for connection to the terminals (power and earth).

Please install an accessory ferrite core (To the power supply terminal block side) on the power supply wiring line of ZPB. Application line diameter ø9.5 to ø10.5

<Terminal block for power supply>



<Power inlet>

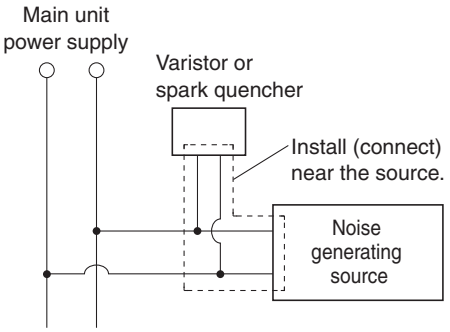


⚠ CAUTION

After the wiring work, be sure to put the protective cover on the terminal blocks to ensure safety.

When noise source is in the vicinity

- Avoid installing this instrument near an electrical unit (high frequency furnace or electric welder) that generates much electrical noise. If using the instrument near such a noise generating unit is unavoidable, use a different power line to avoid noise.
- Mount a noise suppressor such as varistor or spark quencher as shown at right figure to the noise generating unit when noise is generated from relays or solenoid valves.
  Mount the suppressor near the noise generating source, or it will have no effect.



(2) Analog output signal: Analog output connector (A/O)

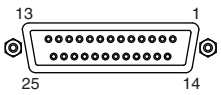
Output signal : 4 to 20 mA DC or 0 to 1 V DC (selected when ordering)

Minus lines for the insulation and signal are common from the ground and internal circuit

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

0 to 1 V DC, 100kΩ or more

< Analog output > A/O connector



D-sub 25-pin female

Note) Display Ch number is same as the AO number under standard specifications.

①	AO1+
⑭	AO1−
②	AO2+
⑮	AO2−
③	AO3+
⑯	AO3−
④	AO4+
⑰	AO4−
⑤	AO5+
⑱	AO5−
⑥	AO6+
⑲	AO6−
⑦	AO7+
⑳	AO7−
⑧	AO8+
㉑	AO8−
⑨	AO9+
㉒	AO9−
⑩	AO10+
㉓	AO10−
⑪	AO11+
㉔	AO11−
⑫	AO12+
㉕	AO12−
⑬	NC

The analog output signals of the instrument are not isolated individually. It is recommended to isolate the signals individually to eliminate the interference from the unnecessary signals or the effect of external interference, especially if the cable exceeds 30 meters or leads to outdoors.

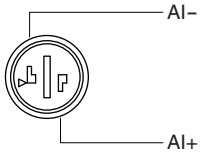
(3) O_2 sensor input: External input connector (A/I)

Input signal:

External zirconia O_2 analyzer : Zirconia O_2 sensor signal (Fuji ZFK7 output)

External O_2 analyzer : 0 to 1 V DC (DC input resistor of 1MΩ or more)

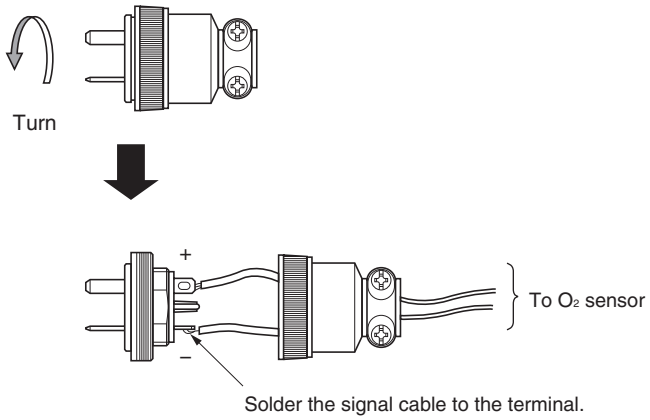
< External input > A/I connector (O_2 sensor input)



- It is used when the external zirconia O_2 analyzer or the external O_2 analyzer is specified as ordered.
- Connect the dedicated connector (accessory) to the output of the external Zirconia analyzer or the external O_2 analyzer (received separately).
- In case of an external O_2 analyzer, input a signal of 0 to 1 V DC with respect to O_2 full scale of the analyzer. The O_2 concentration display, output, and O_2 correction can be performed.
- Do not connect when the built-in O_2 analyzer is installed.

O_2 sensor input is not isolated. It is recommended to isolate when an external O_2 analyzer is installed apart from this analyzer. Zirconia O_2 sensor (Fuji ZFK7) should be installed at a location that is as close to this instrument as possible.

* How to connect the O_2 signal to the dedicated connector (accessory).

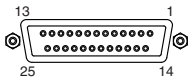


(4) **Contact input/output (DIO):** digital input/output connector (DIO1 to 3)

Contact input signal : Voltage is applied from the external 12 to 24 V DC, max 15mA
Photo-coupler isolation (from each DI and ground)

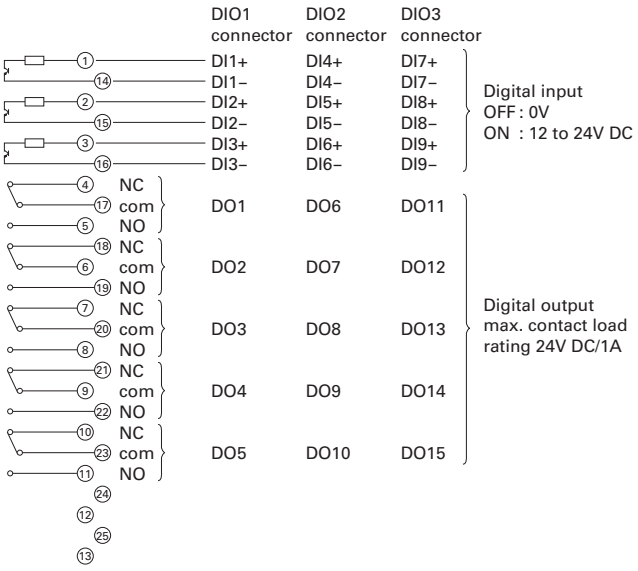
Contact capacity : C contact relay output 24V/1A AC/DC resistive load

< Digital input/output > Connector for DIO 1 to 3 (option)



D-sub 25-pin female

Note) DIO 1 to 3 have the same internal circuit of the connector.



Contents of digital input signal

DI1	Remote hold
DI2	Average value reset
DI3	A. cal. start
DI4	A. zero. cal. start
DI5	Remote range Ch1
DI6	Remote range Ch2
DI7	Remote range Ch3
DI8	Remote range Ch4
DI9	Remote range Ch5

Allocation table of digital input signal

22th digit →	A	B	C	D	E	F	G	H	Y
DI1	○	○	○	○	○	○	○	○	
DI2	○	○	○	○	○	○	○	○	
DI3		○			○		○	○	
DI4		○			○		○	○	
DI5				○		○	○	○	
DI6				○*		○*	○*	○*	
DI7				○*		○*	○*	○*	
DI8				○*		○*	○*	○*	
DI9				○*		○*	○*	○*	

○ sign shows the function is valid.
* : The function might be invalid depending on the number of measurable components.
For example: DI5 corresponds to 1st component, DI6 corresponds to 2nd components.

Contents of digital output signal

	Independent on the number of component	1-component analyzer		2-component analyzer	3-component analyzer
22th digit →	A,C	B,E	D,F,G,H	B,D,E,F,G,H	B,D,E,F,G,H
DO1	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error
DO2	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error
DO3		A.cal.status	(A.cal.status)	(A.cal.status)	(A.cal.status)
DO4		For zero gas	(For zero gas)	(For zero gas)	(For zero gas)
DO5		For span gas Ch1	(For span gas Ch1)	(For span gas Ch1)	(For span gas Ch1)
DO6	(Alarm1)	(Alarm1)		(For span gas Ch2)	(For span gas Ch2)
DO7	(Alarm2)	(Alarm2)			(For span gas Ch3)
DO8	(Alarm3)	(Alarm3)			(Range identification Ch1)
DO9	(Alarm4)	(Alarm4)		(Range identification Ch1)	(Range identification Ch2)
DO10	(Alarm5)	(Alarm5)	Range identification Ch1	(Range identification Ch2)	(Range identification Ch3)
DO11			(Alarm1)	(Alarm1)	(Alarm1)
DO12			(Alarm2)	(Alarm2)	(Alarm2)
DO13			(Alarm3)	(Alarm3)	(Alarm3)
DO14			(Alarm4)	(Alarm4)	(Alarm4)
DO15			(Alarm5)	(Alarm5)	(Alarm5)

The items in the parentheses may not be available depending on the selected type on 22th digit.

The normal open side (NO) of digital output is close when the function is active without range ID.

In case of range ID, normal open (NO) side is close with Lo-range.
The normal close (NC) side is close with Hi-range.

	4-component analyzer				5-component analyzer		
22th digit →	B,E	D,F	G	H	B,E	D,F	G
DO1	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error
DO2	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error
DO3	A.cal.status		A.cal.status	A.cal.status	A.cal.status		A.cal.status
DO4	For zero gas		For zero gas	For zero gas	For zero gas		For zero gas
DO5	For span gas Ch1		For span gas Ch1	For span gas Ch1	For span gas Ch1		For span gas Ch1
DO6	For span gas Ch2		For span gas Ch2	For span gas Ch2	For span gas Ch2	Range identification Ch1	For span gas Ch2
DO7	For span gas Ch3	Range identification Ch1	For span gas Ch3	For span gas Ch3	For span gas Ch3	Range identification Ch2	For span gas Ch3
DO8	For span gas Ch4	Range identification Ch2	For span gas Ch4	For span gas Ch4	For span gas Ch4	Range identification Ch3	For span gas Ch4
DO9		Range identification Ch3		Range identification Ch1	For span gas Ch5	Range identification Ch4	For span gas Ch5
DO10		Range identification Ch4		Range identification Ch2		Range identification Ch5	
DO11	(Alarm1)	(Alarm1)		(Alarm1)	(Alarm1)	(Alarm1)	Range identification Ch1
DO12	(Alarm2)	(Alarm2)	Range identification Ch1	(Alarm2)	(Alarm2)	(Alarm2)	Range identification Ch2
DO13	(Alarm3)	(Alarm3)	Range identification Ch2	(Alarm3)	(Alarm3)	(Alarm3)	Range identification Ch3
DO14	(Alarm4)	(Alarm4)	Range identification Ch3	Range identification Ch3	(Alarm4)	(Alarm4)	Range identification Ch4
DO15	(Alarm5)	(Alarm5)	Range identification Ch4	Range identification Ch4	(Alarm5)	(Alarm5)	Range identification Ch5

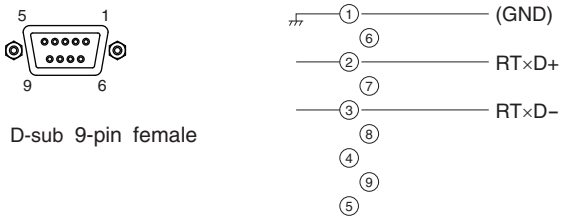
• Isolated output (from each DO and ground)

To avoid external interference, wiring of analog output signal, O_2 sensor input and contact input should be run separately from that of power supply and contact output.

Note) To avoid the effect of noise generated from external units, be sure to ground the analyzer main unit and use properly shielded cables.

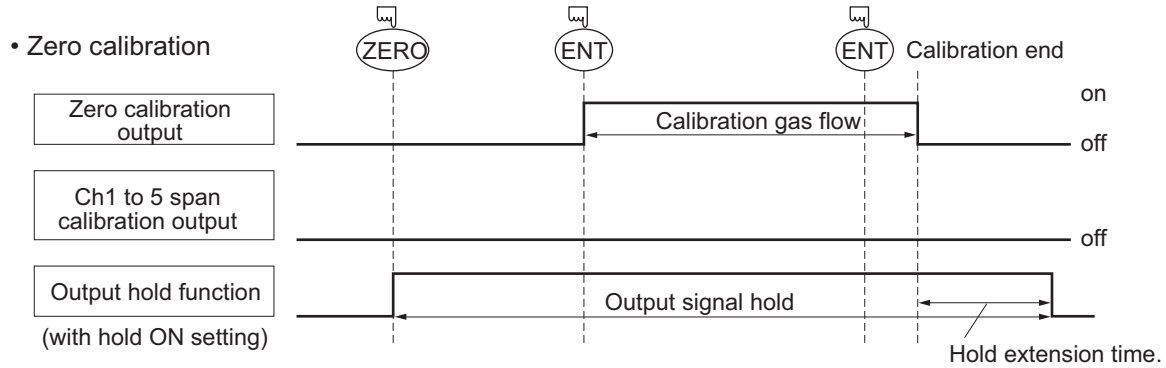
(5) Communication: RS-485 connector

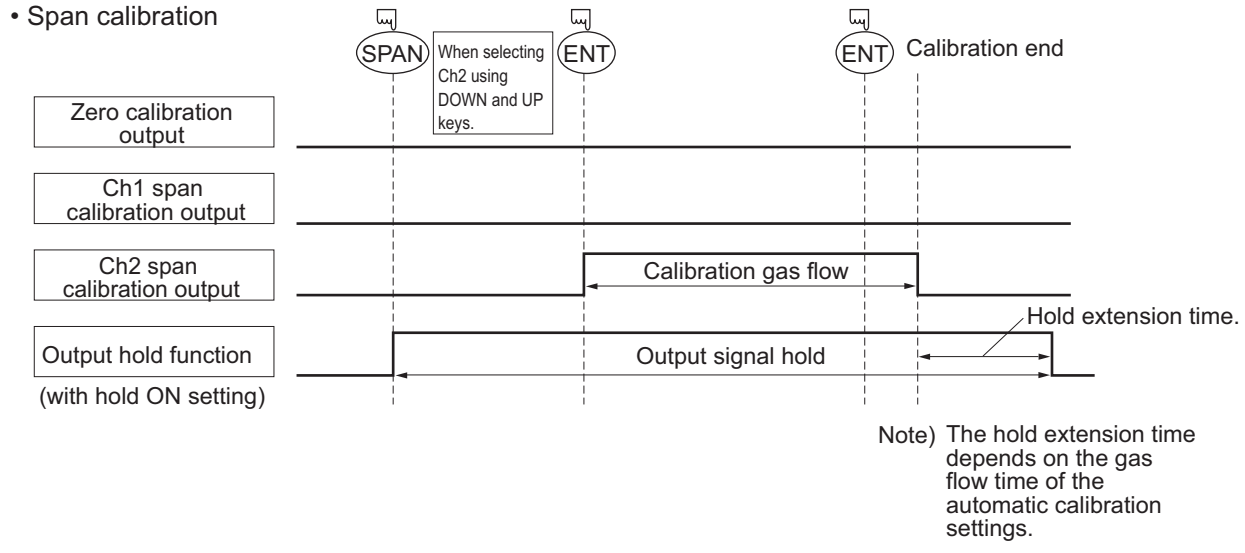
< RS-485 connector >



3.6 Timing of contact output for calibration

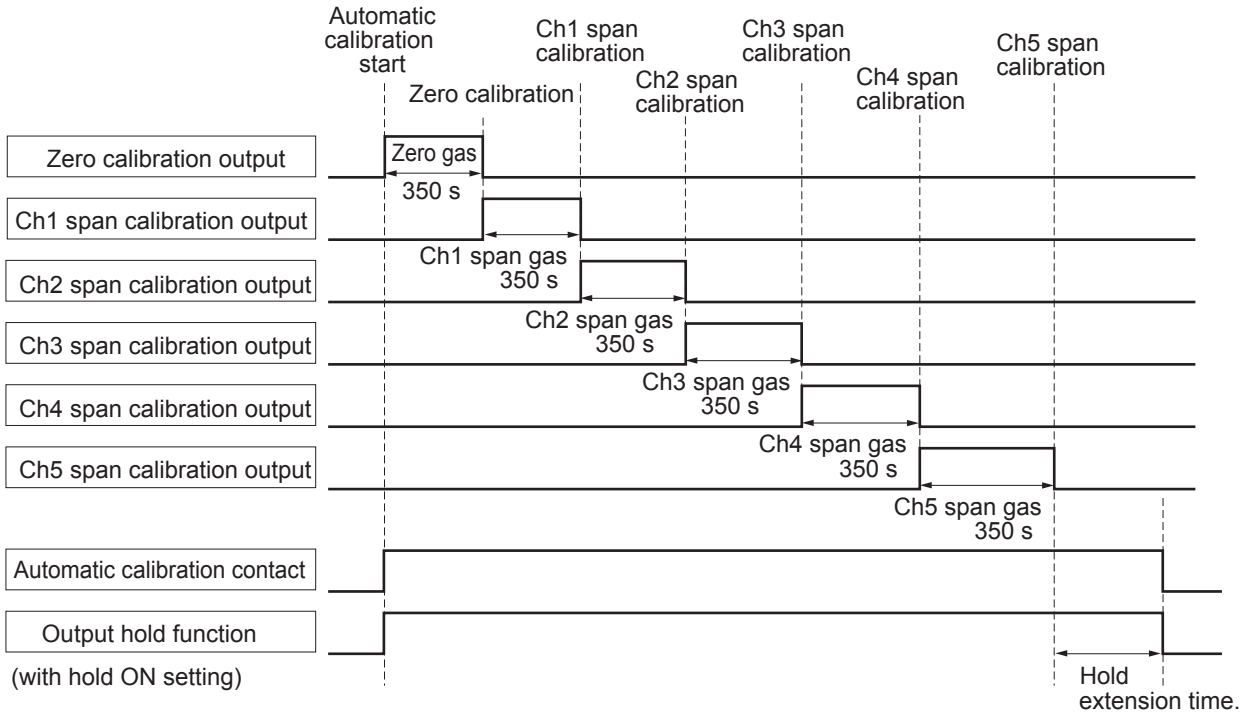
1) Manual calibration (See "Section 6.8 Calibration".)





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 Section 6.4.1, Auto calibration)



4. OPERATION

4.1 Preparation for operation

(1) Piping and wiring check

Double-check if piping of the gas sampling and exhaust ports are correctly connected.
Double-check for proper wiring.

4.2 Warm-up operation and regular operation

(1) Operation procedure

1) Turn ON the power switch on the left side when facing the front panel of the analyzer unit.
The measurement screen appears on the front display panel in 1 to 2 seconds.

2) Wait for about 2 hours until the instrument is warmed up.
About 2 hours are required until the instrument allows accurate measurement.

⚠ CAUTION

When in warm-up, the concentration reading may be beyond the upper limit of range.

But, it is not an error.

3) Setting of various set values
Perform the various settings according to Section 6 “Setting and Calibration”.

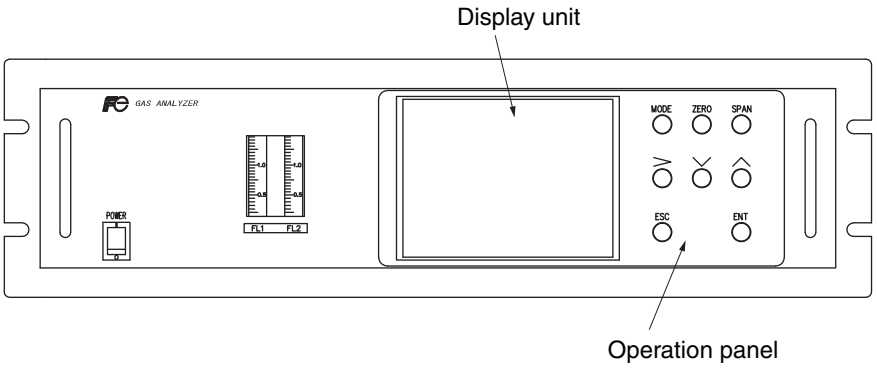
4) Zero calibration and span calibration
Perform zero/span calibration after warm-up operation.
Refer to Section 6.8 “Manual calibration procedure”.

5) Introduction and measurement of sample gas
Introduce the sample gas into the analyzer unit before starting measurement.

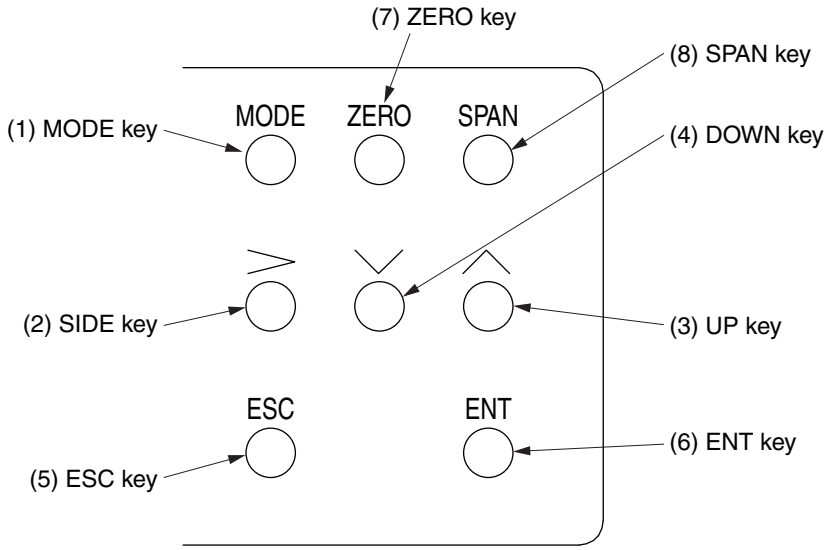
5. DESCRIPTION OF DISPLAY AND OPERATION PANELS

This section describes the display unit and operation panel of the analyzer unit. It also explains the name and description of function on the operation panel.

5.1 Name and description of operation panel

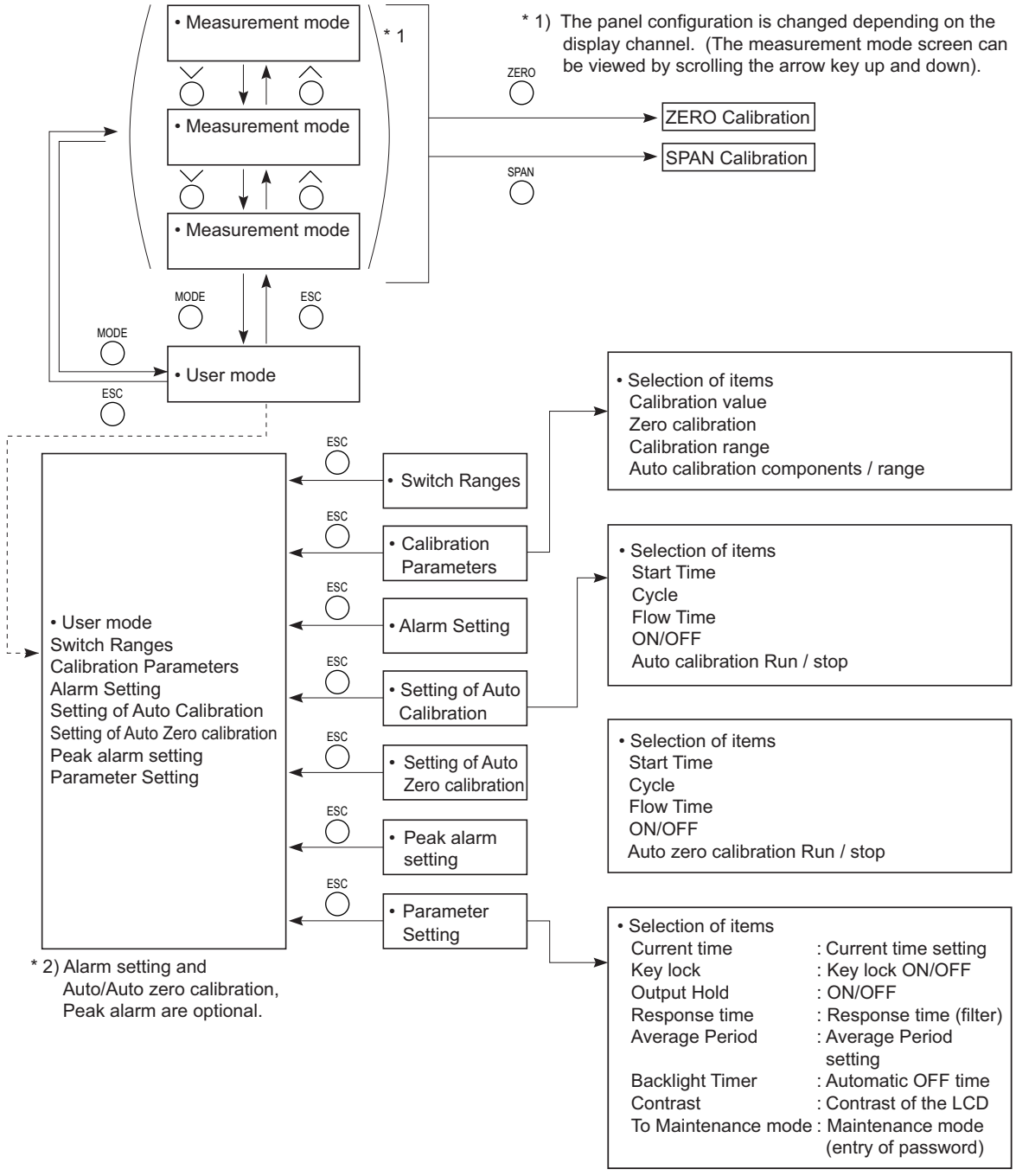


- Display unit: The measurement screen and the setting items are displayed.
- Operation panel: The configuration is as shown below.



Name	Description	Name	Description
(1) MODE key	Used to switch the mode.	(5) ESC key	Used to return to the previous screen or cancel the setting midway.
(2) SIDE key	Used to change the selected item (by moving the cursor) and the 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 the 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 the numeral value.	(8) SPAN key	Used for span calibration.

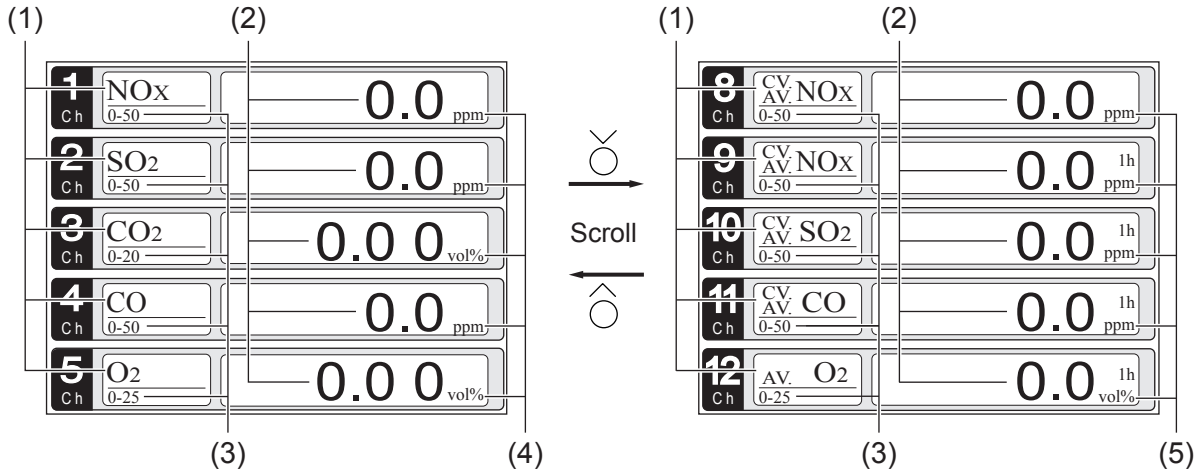
5.2 Overview of display and operation panels



5.3 Outline of display screen

(1) Measurement mode screen (appears when the power is turned ON)

The measurement screen depends on the number of components. The following screen configuration is shown as an example for NO, SO_2, CO_2, CO and O_2 (output: 12 channels).



* For outputs of more than 5 channels, scroll the ⌃ or the ⌄ key to view.

No.	Name	Function
(1)	Component display	Displays the component of instantaneous value, corrected instantaneous value, corrected average value, etc.
(2)	Concentration display	Displays the measured value of concentration.
(3)	Range display	Displays the range values.
(4)	Unit display	Displays the unit with ppm or mg/m^3 and vol%.
(5)	Average time display	Displays the average time.

- **Instantaneous value and concentration value:**

  The concentration display of Ch (component) where sampling components such as "CO_2", "CO" and "O_2" are displayed in the component display, indicates current concentration values of the measured components contained in gas that is now under measurement.

- **O_2 corrected concentration values:**

  Ch components in which "cv**" is displayed as "cv CO" in the component display are calculated from the following equation. Refer to Section 6.7 "Maintenance mode - Other parameter".

$$C = \frac{21 - On}{21 - Os} \times Cs$$

On: The value of the O_2 correction reference value (Value set by application)

Os: Oxygen concentration (vol %)

Cs: Concentration of relevant measured component.
Note that Os does not exceed the O_2 limit value set in section 6.7 "Maintenance mode - Other parameter"

C: Sample gas concentration (O_2 corrected)

The corrected sampling components are NO_X, SO_2 and CO only.

- **O_2 corrected concentration average value:**

  In the Ch (component) and O_2 average value where "$\overset{CV}{AV}$ **" is displayed as "$\overset{CV}{AV}$ CO" in the component display, a value obtained by averaging O_2 corrected concentration value or O_2 average value in a fixed time is output every 30 seconds.

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

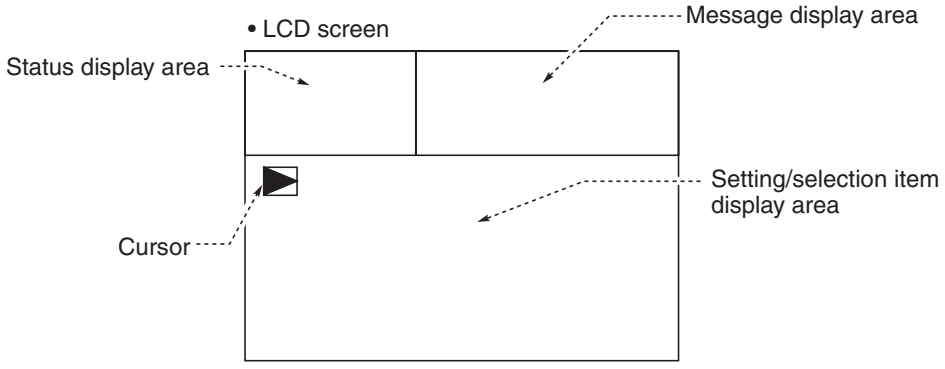
  (The averaging set time is displayed as "1h" , for instance, in the range display.)

  * The measurement ranges of O_2 corrected concentration value and O_2 correction concentration average value are the same as that of the measuring components. Also, the measurement range of O_2 average value is the same as that of O_2.

(2) Setting/selection screen

The setting/selection screen is configured as shown below:

- In the status display area, the current display item 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 UP, DOWN and SIDE keys.



(3) Contents of measured channel (Ch)

The following table gives measurement channels and their contents according to the symbols.

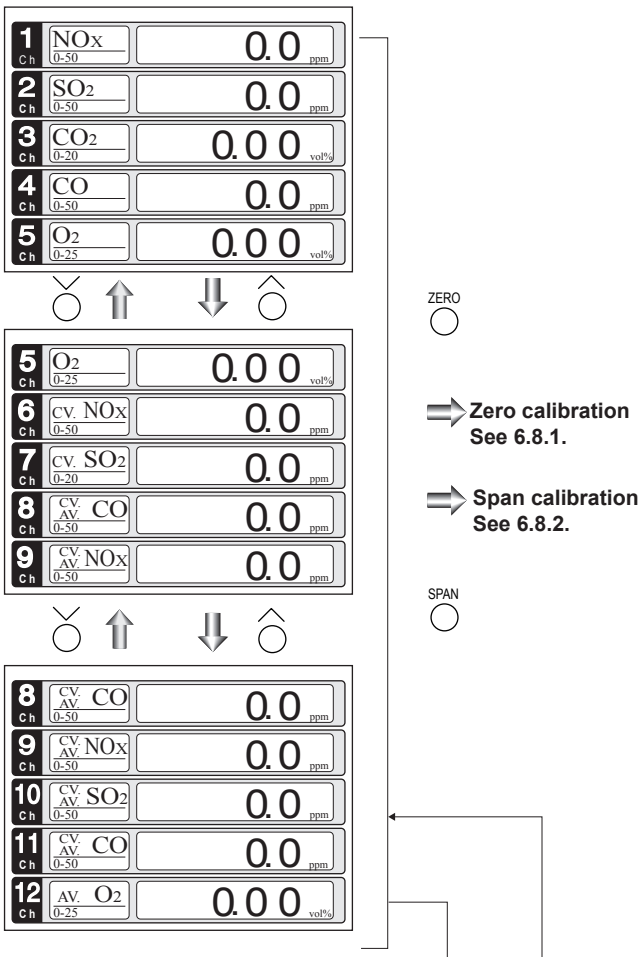
Code symbol			
6th digit	7th digit	21st digit	Display/output contents
P	Y	Y	Ch1:NO
A	Y	Y	Ch1:SO_2
D	Y	Y	Ch1:CO_2
B	Y	Y	Ch1:CO
F	Y	Y	Ch1:NO, Ch2:SO_2
G	Y	Y	Ch1:NO, Ch2:CO
J	Y	Y	Ch1:CO_2, Ch2:CO
N	Y	Y	Ch1:NO, Ch2:SO_2, Ch3:CO
V	Y	Y	Ch1:NO, Ch2:SO_2, Ch3:CO_2, Ch4:CO
P	1 to 4	Y	Ch1:NO, Ch2:O_2
A	1 to 4	Y	Ch1:SO_2, Ch2:O_2
D	1 to 4	Y	Ch1:CO_2, Ch2:O_2
B	1 to 4	Y	Ch1:CO, Ch2:O_2
F	1 to 4	Y	Ch1:NO, Ch2:SO_2, Ch3:O_2
G	1 to 4	Y	Ch1:NO, Ch2:CO, Ch3:O_2
J	1 to 4	Y	Ch1:CO_2, Ch2:CO, Ch3:O_2
N	1 to 4	Y	Ch1:NO, Ch2:SO_2, Ch3:CO, Ch4:O_2
V	1 to 4	Y	Ch1:NO, Ch2:SO_2, Ch3:CO_2, Ch4:CO, Ch5:O_2
P	1 to 4	A *	Ch1:NOx, Ch2:O_2, Ch3:corrected NOx
A	1 to 4	A *	Ch1:SO_2, Ch2:O_2, Ch3:corrected SO_2
B	1 to 4	A *	Ch1:CO, Ch2:O_2, Ch3:corrected CO
F	1 to 4	A *	Ch1:NOx, Ch2:SO_2, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected SO_2
G	1 to 4	A *	Ch1:NOx, Ch2:CO, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected CO
J	1 to 4	A *	Ch1:CO_2, Ch2:CO, Ch3:O_2, Ch4:corrected CO
N	1 to 4	A *	Ch1:NOx, Ch2:SO_2, Ch3:CO, Ch4:O_2, Ch5:corrected NOx, Ch6:corrected SO_2, Ch7:corrected CO
V	1 to 4	A *	Ch1:NOx, Ch2:SO_2, Ch3:CO_2, Ch4:CO, Ch5:O_2, Ch6:corrected NOx, Ch7:corrected SO_2, Ch8:corrected CO
P	1 to 4	C *	Ch1:NOx, Ch2:O_2, Ch3:corrected NOx, Ch4:corrected NOx average
A	1 to 4	C *	Ch1:SO_2, Ch2:O_2, Ch3:corrected SO_2, Ch4:corrected SO_2 average
B	1 to 4	C *	Ch1:CO, Ch2:O_2, Ch3:corrected CO, Ch4:corrected CO average
F	1 to 4	C *	Ch1:NOx, Ch2:SO_2, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected SO_2, Ch6:corrected NOx average, Ch7:corrected SO_2 average
G	1 to 4	C *	Ch1:NOx, Ch2:CO, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected CO, Ch6:corrected NOx average, Ch7:corrected CO average
J	1 to 4	C *	Ch1:CO_2, Ch2:CO, Ch3:O_2, Ch4:corrected CO, Ch5:corrected CO average
N	1 to 4	C *	Ch1:NOx, Ch2:SO_2, Ch3:CO, Ch4:O_2, Ch5:corrected NOx, Ch6:corrected SO_2, Ch7:corrected CO, Ch8:corrected NOx average, Ch9:corrected SO_2 average, Ch10:corrected CO average
V	1 to 4	C *	Ch1:NOx, Ch2:SO_2, Ch3:CO_2, Ch4:CO, Ch5:O_2, Ch6:corrected NOx, Ch7:corrected SO_2, Ch8:corrected CO, Ch9:corrected NOx average, Ch10:corrected SO_2 average, Ch11:corrected CO average

* When the 21st digit code is A or C, the component of the NO analyzer is displayed as NOx.

5.4 Basic operation

• Measurement mode

The measurement mode can display up to 5 channels in a single screen. If more than 5 channels are configured, press the ⌃ or the ⌄ key to scroll the channels one by one.



• User mode displays

Switch Ranges

Calibration Parameters

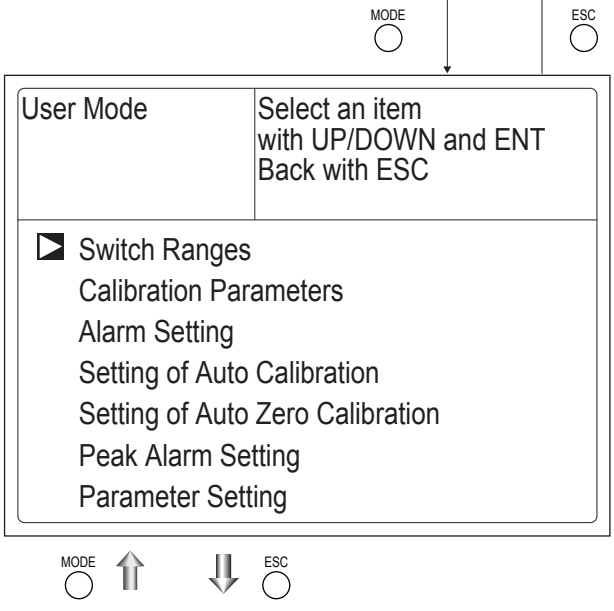
Alarm Setting

Setting of Auto Calibration

Setting of Auto Zero Calibration

Peak Alarm Setting

Parameter Setting.



Press the ⌃ or the ⌄ key and move the cursor preceding the each display item.

Each display item is displayed by pressing the ENT key.

For the setting contents, refer to Section 6 “Setting and calibration”.

Measurement Mode Screen

6. SETTING AND CALIBRATION

6.1 Switch of range

6.1.1 Setting of range switch mode

Set the range switch mode as follows.

(1) Press the MODE key in measurement mode to display the User mode screen.

(2) Move the cursor to "Switch Ranges" and press the ENT key.

(3) In the "Channel Selection" screen that appears, move the ▶ cursor by pressing the ∧ or the ∨ key, and select Ch (component).

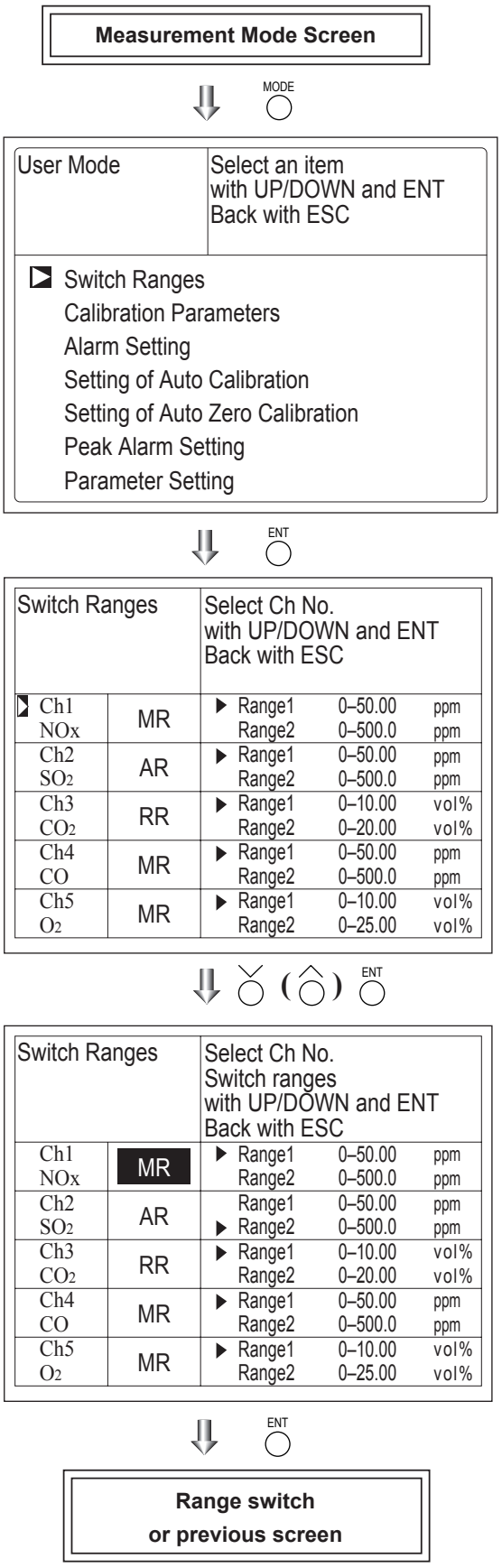
(4) Then press the ENT key.

(5) Selected range switch mode is highlighted.
Press the ∧ or the ∨ key to select a desired switch mode.

Description of setting

MR: Select a desired range on this screen.
RR: Select a desired range according to the remote range switch contact input.
AR: Automatically switched from Range 1 to Range 2 when the measured concentration exceeds 90% of Range 1. Automatically switched from Range 2 to Range 1 when the measured concentration becomes less than 80% of Range 1.
* Operation set for each Ch only can be performed.

(6) Then press the ENT key to confirm the selection.
If "MR" is selected, the cursor moves to "Range Switch."



6.1.2 Manual range switch

The range of the measured component can be switched manually as follows.

(1) Select "MR" as range switch mode, and then press the ENT key.

Switch Ranges		Select Ch No. Switch ranges with UP/DOWN and ENT Back with ESC		
Ch1 NOx	MR	▶ Range1 Range2	0–50.00 0–500.0	ppm ppm
Ch2 SO_2	AR	Range1 ▶ Range2	0–50.00 0–500.0	ppm ppm
Ch3 CO_2	RR	▶ Range1 Range2	0–10.00 0–20.00	vol% vol%
Ch4 CO	MR	▶ Range1 Range2	0–50.00 0–500.0	ppm ppm
Ch5 O_2	MR	▶ Range1 Range2	0–10.00 0–25.00	vol% vol%

⇓ ENT

(2) Move the highlight of the cursor to range selection, and then select a desired range by pressing the ∧ or the ∨ key. (The ▶ mark indicates the currently selected range.)

(3) Then press the ENT key, and the measurement is carried out in the selected range.

Switch Ranges		Select Ch No. with UP/DOWN and ENT Back with ESC		
Ch1 NOx	MR	▶ Range1 Range2	0–50.00 0–500.0	ppm ppm
Ch2 SO_2	AR	▶ Range1 Range2	0–50.00 0–500.0	ppm ppm
Ch3 CO_2	RR	▶ Range1 Range2	0–10.00 0–20.00	vol% vol%
Ch4 CO	MR	▶ Range1 Range2	0–50.00 0–500.0	ppm ppm
Ch5 O_2	MR	Range1 ▶ Range2	0–10.00 0–25.00	vol% vol%

⇓ ∨ (∧) ENT

End of Range Switch

Note) If "RR" or "AR" is selected as range switch mode, this operation cannot be performed.

The ranges for O_2 correction value, O_2 correction average value, and O_2 average value are automatically switched according to the instantaneous value range switch settings. (Same as for "RR" or "AR".)

To close the setting

Press the ESC key to end the setting of range switch mode or range switch operation or stop the operation in the middle. The setting operation is made invalid and the previous screen appears.

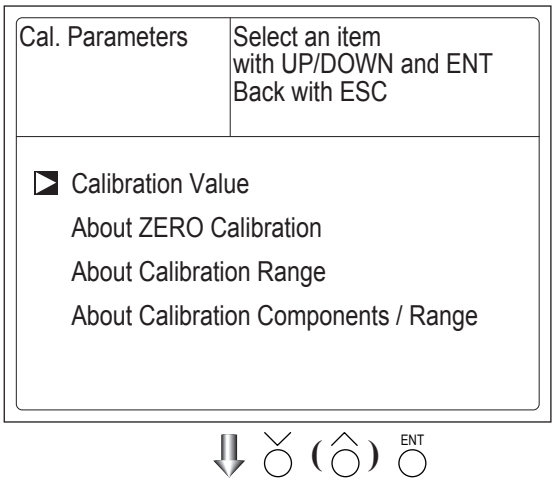
Range identification contact operation

The range identification contact output corresponding to each Ch (component) is closed when Range 1 is active, and open when Range 2 is active, no matter.
If the measurement value is held by remote contact input or during calibration routine and range switch conditions are met, the contact will change position only after the hold condition is removed.

6.2 Calibration setting

This mode is used to set calibration concentration and actions. The calibration setting involves calibration concentration, zero calibration, calibration range and auto calibration component/range.

Select the “Calibration Parameters”, the screen appears shown at right.



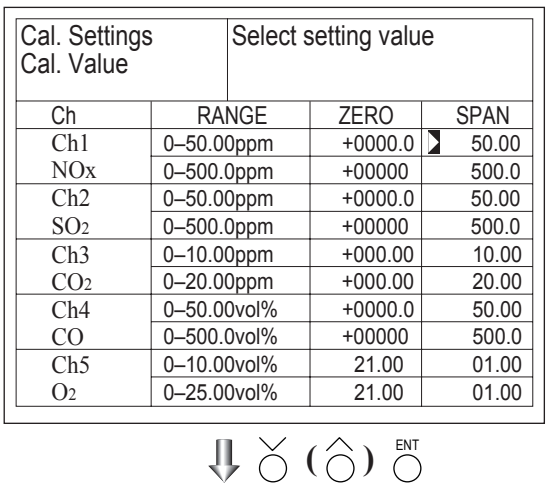
6.2.1 Setting of calibration concentration

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

(1) Select < User mode > → < Calibration parameters > → < Calibration value >. “Calibration Value Settings” screen appears as shown at right.

(2) Select the Ch you want to change by pressing the ∧ or the ∨ key. Press the ENT key and cursor moves preceding the value.

(3) Select the concentration item you want to set by pressing the ∧, ∨ key or the > key (movable within the selected Ch). Then press the ENT key, and the selected value is highlighted.



(4) Then, enter calibration gas concentration values (zero and span). For value entry, press the ∧ or the ∨ key, and a 1-digit value increases or decreases. By pressing the > key, 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 settings that correspond to each range. If zirconia type is used as O_2 sensor, select 21.00 for the field of Zero (when ambient air is used), and select the concentration listed on the cylinder as required.

Cursor for setting value

Cal. Settings Cal. Value		Set calibration value	
CH	RANGE	ZERO	SPAN
Ch1	0–50.00ppm	+0000.0	50.00
NOx	0–500.0ppm	+00000	500.0
Ch2	0–50.00ppm	+0000.0	50.00
SO_2	0–500.0ppm	+00000	500.0
Ch3	0–10.00ppm	+000.00	10.00
CO_2	0–20.00ppm	+000.00	20.00
Ch4	0–50.00vol%	+0000.0	50.00
CO	0–500.0vol%	+00000	500.0
Ch5	0–10.00vol%	21.00	01.00
O_2	0–25.00vol%	21.00	01.00

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

NOx, SO_2, CO_2, CO, external O_2 measurement and built-in O_2 sensor	Span gas: 1 to 105% of full scale (Full scale (FS) is the same as each range value.)
External Zirconia O_2 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 manual zero calibration

When zero calibration is made manually, set if all measurement components should be calibrated simultaneously one by one.

(1) Select < User mode > → < Calibration parameters > → < Zero calibration >. "Zero Calibration" screen appears as shown at right.

(2) Select the Ch you want to change by pressing the ∧ or the ∨ key. Press the ENT key and the setting content is highlighted.

(3) Select "at once" or "each" by pressing the ∧ or ∨ key.
- When selecting "at once", the Ch (components) to be set can be zero-calibrated at the same time.
- When selecting "each", the individual Ch (component) as shown at right is selected and zero-calibrated.
  Press the ENT key after the setting, and the specified calibration is performed.

Cell. Settings ZERO Call.		Set each or at once Ch at ZERO Calibration
Ch1 NOx	Range1 0–50.00 ppm Range2 0–500.0 ppm	at once
Ch2 SO_2	Range1 0–50.00 ppm Range2 0–500.0 ppm	at once
Ch3 CO_2	Range1 0–10.00 vol% Range2 0–20.00 vol%	at once
Ch4 CO	Range1 0–50.00 ppm Range2 0–500.0 ppm	at once
Ch5 O_2	Range1 0–10.00 vol% Range2 0–25.00 vol%	each

⇓ ∨ (∧) ENT

End of Manual Zero Calibration Setting

To close the setting

To close the manual zero calibration setting or to cancel this mode midway, press the ESC key.
A previous screen will return.

Description of setting

Whether "each" or "at once" can be determined for each Ch (component).

•Setting "each"
Select the Ch (component) on the manual zero calibration screen and then perform the zero calibration.

•Setting "at once"
At a manual zero calibration, Ch (components) for which "at once" was selected can simultaneously be zero-calibrated.

Manual Calibration screen

• When setting all components to “each”:

ZERO Call.			ENT : Go on Calibration of selected Ch ESC : Not calibration
Ch1 NOx	▶ Range1 Range2	0–50.00 ppm 0–500.0 ppm	-2.1
Ch2 SO_2	▶ Range1 Range2	0–50.00 ppm 0–500.0 ppm	-0.5
Ch3 CO_2	▶ Range1 Range2	0–10.00 vol% 0–20.00 vol%	0.00
Ch4 CO	▶ Range1 Range2	0–50.00 ppm 0–500.0 ppm	0.0
Ch5 O_2	Range1 ▶ Range2	0–10.00 vol% 0–25.00 vol%	21.00

A single cursor will appear.

• When setting all components to “at once”:

ZERO Call.			ENT : Go on Calibration of selected Ch ESC : Not calibration
Ch1 NOx	▶ Range1 Range2	0–50.00 ppm 0–500.0 ppm	0.0
Ch2 SO_2	▶ Range1 Range2	0–50.00 ppm 0–500.0 ppm	0.3
Ch3 CO_2	▶ Range1 Range2	0–10.00 vol% 0–20.00 vol%	0.00
Ch4 CO	▶ Range1 Range2	0–50.00 ppm 0–500.0 ppm	-0.1
Ch5 O_2	Range1 ▶ Range2	0–10.00 vol% 0–25.00 vol%	21.00

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

6.2.3 Setting of calibration range

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

(1) Select < User mode >→ < Calibration parameters > → < Calibration range >. "Calibration Range" screen appears as shown at right.

(2) Select the Ch you want to change by pressing the ⌃ or the ⌄ key. Press the ENT key and the setting contents is highlighted.

(3) Select "both" or "current" by pressing the ⌃ or the ⌄ key.

- If "both" is selected, zero or span calibration is performed with Range 1 and Range 2 of the selected Ch interlocked when calibration is performed.
- If "current" is selected, zero or span calibration is performed only for the range displayed when calibration is performed. Press the ENT key after the selection, and the specified calibration is performed.

Cell. Settings Cell. Range		Set calibration range current or both range
Ch1 NOx	Range1 0–50.00 ppm Range2 0–500.0 ppm	both
Ch2 SO_2	Range1 0–50.00 ppm Range2 0–500.0 ppm	current
Ch3 CO_2	Range1 0–10.00 vol% Range2 0–20.00 vol%	current
Ch4 CO	Range1 0–50.00 ppm Range2 0–500.0 ppm	both
Ch5 O_2	Range1 0–10.00 vol% Range2 0–25.00 vol%	current

⇩ ⌄ (⌃) ENT

End of Calibration Range Setting

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.

Example

Ch1 NOx	Range 1: 0 to 50 ppm Range 2: 0 to 500 ppm	both
Ch2 SO_2	Range 1: 0 to 50 ppm Range 2: 0 to 500 ppm	current

Ch1: Range 1 and Range 2 are calibrated together.
Ch2: Only currently displayed range is calibrated.

Note

To perform calibration for "both," set the same calibration gas concentration for both ranges.

Manual Calibration screen

When setting NOx and CO to "both"

ZERO Call.		ENT : Go on Calibration of selected Ch ESC : Not calibration
Ch1 NOx	▶ Range1 0–50.00 ppm Range2 0–500.0 ppm	-0.6
Ch2 SO_2	▶ Range1 0–50.00 ppm Range2 0–500.0 ppm	0.4
Ch3 CO_2	▶ Range1 0–10.00 vol% Range2 0–20.00 vol%	0.00
Ch4 CO	▶ Range1 0–50.00 ppm Range2 0–500.0 ppm	-0.1
Ch5 O_2	Range1 0–10.00 vol% ▶ Range2 0–25.00 vol%	21.00

Two cursors will appear in both ranges (Ch1 and Ch4).

6.2.4 Setting of auto calibration component/range

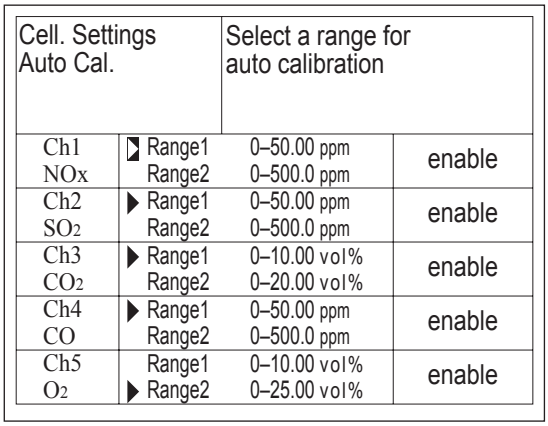
Select the Ch (component) and the range for which auto calibration is to be performed. The Ch for which "AR" has been selected as range switch mode is calibrated in the range set here. Auto calibration and the manual calibration of the component for which "AR" has been selected as range switch mode are performed in the range selected here.

(1) Select < User mode > → < Calibration parameters > → < Auto calibration component/range >. "Auto Calibration Component Range" setting screen appears as shown at right.

(2) Select the Ch you want to change by pressing the ∧ or the ∨ key. Press the ENT key and the selected cursor is highlighted.

(3) Select the range to be calibrated mainly by pressing the ∧ or the ∨ key.

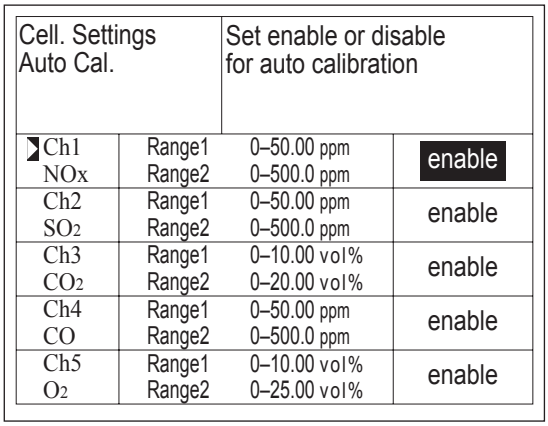
(4) Then press the ENT key, and calibration is performed in the selected range when auto calibration or auto zero calibration is performed.



∨ (∧) ENT

End of Auto Calibration Range Setting

∨



∨ (∧) ENT

End of Auto Calibration component setting

"Auto Calibration Component/range" setting

Auto calibration and the manual calibration of the component for which "AR" has been selected as range switch mode are performed in the range selected here. In this case, once the calibration is started, the range is automatically switched, and on completion of the calibration, the original range is resumed.

The range identification contact is interlocked with the range after the switch. However, if the hold setting is set to "ON," the contact status before calibration is maintained.

(5) Press the ∨ key in the state described in (3), and the highlight is switched between "enable" and "disable" auto calibration.

(6) Select "enable" or "disable" by pressing the ∧ or the ∨ key.

(7) Then press the ENT key.

To close the setting

Press the ESC ◯ key to exit automatic calibration component/range setting, and the previous screen appears.

Operation by setting

Auto calibration is performed under the following rules.

1. Zero calibration is performed at the same time, for the Ch (component) in which “enable” is selected at the time of auto calibration and auto zero calibration.
2. Span calibration is performed in the order from smallest Ch No., for the Ch (component) for which “enable” is selected at the time of auto calibration.

⚠ **CAUTION**

ZERO calibration on auto calibration and auto zero calibration of the component for which “enable” is selected are performed in batch irrespective of the description in Section 6.2.2 “Setting of manual zero calibration.”

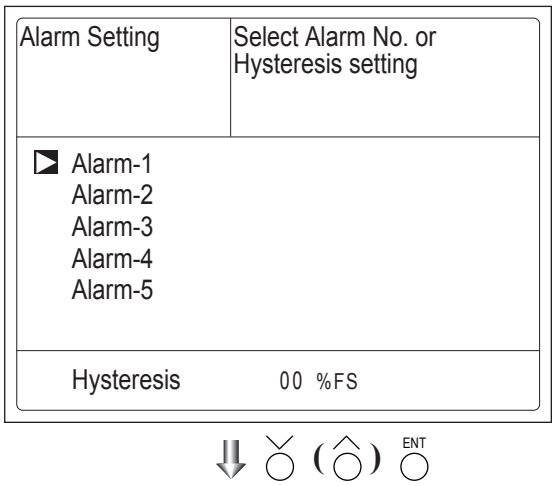
6.3 Alarm setting

6.3.1 Setting of alarm values

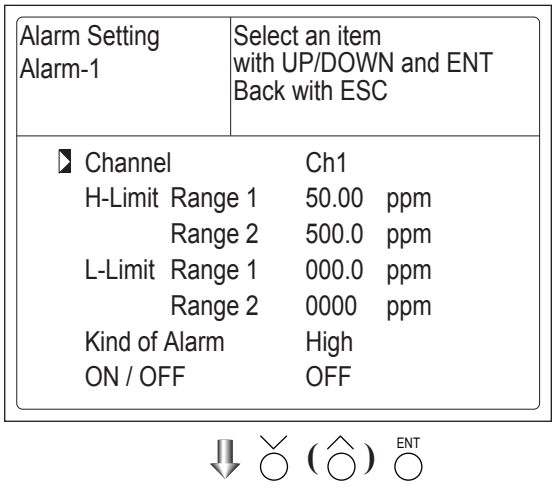
The High/Low limit alarm output setting for the measured concentration setting can be made. 5 different alarm contact outputs can be used.

To change alarm setting, set the alarm ON/OFF setting to OFF, and then change the value.

(1) Enter the "Setting of Alarm No." screen from the user mode, and the display shown at right appears. Point the cursor to the Alarm No. or hysteresis you want to set by pressing ◯ or the ◯ key. Press the ENT ◯ key.



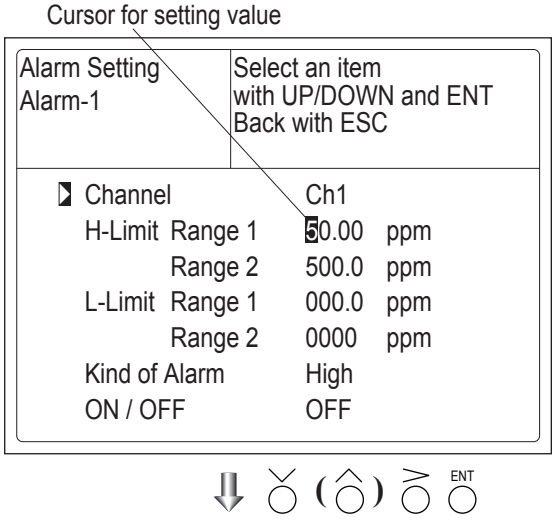
(2) Select the alarm 1 to 5 to display the screen shown at right. Operate the ◯ or the ◯ key until the cursor is aligned with a desired item and press the ENT ◯ key.



⚠ CAUTION

Set the values so that H-limit value > L-limit value and that (H-limit value - L-limit value) > hysteresis.
When "0" is set, the alarm operation is not performed.

(3) After setting, the alarm setting is now completed by pressing the ENT ◯ key.



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).

End of Alarm Setting

Description of setting items

The alarm contact assigned the same number as the alarm is operated accordingly.

Channel: Channel setting targeted for issuance of alarm.
One Ch No. can be selected for multiple alarms.

H-Limit value: Sets the high limit value (concentration) of alarm.

L-Limit value: Sets the low limit value (concentration) of alarm.

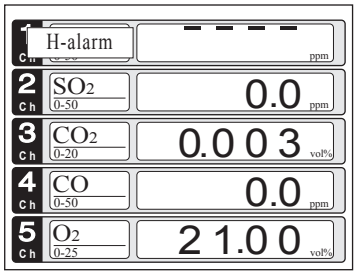
Kind of Alarm: Selects one of High limit alarm, Low limit alarm, and High limit or Low limit alarm, HH limit alarm, and LL limit alarm.
High, HH …… Alarm contact closes when above H-limit alarm.
Low, LL …… Alarm contact closes when below L-limit alarm.
High or Low… Alarm contact closes when above H-limit value or below lower limit value.

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

* The H-limit value cannot be set below the L-limit value, and the L-limit value cannot be set above the H-limit value.
If it is desired to set the H-limit value below the L-limit value, reduce the L-limit value beforehand, and vice versa.

Typical on-screen display when an alarm occurs

When an H-limit alarm occurs, the “H-alarm” message comes on in the field of relevant Ch (component).
(“L-alarm” for L-limit alarm, “HH-alarm” for HH limit alarm, and “LL-alarm” for LL limit alarm)



⚠ CAUTION

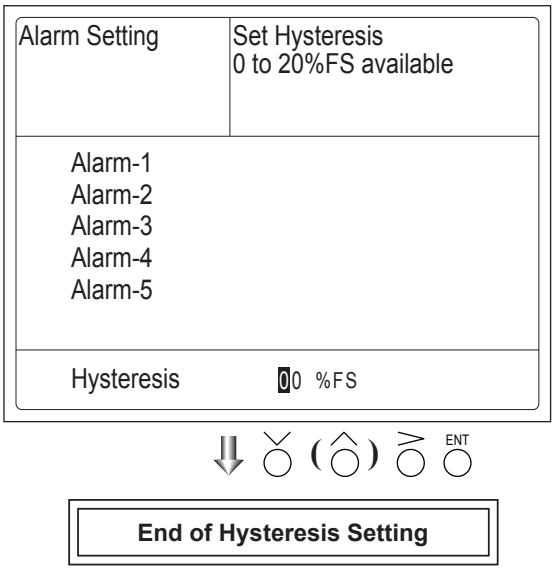
After turning on power, the alarm logic trigger is inactive for 10 minutes.

6.3.2 Hysteresis setting

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

(1) In the "Alarm Setting" screen that appears, point the cursor to "Hysteresis" by pressing the ◯ or the ◯ key. Press the ENT ◯ key to display the screen shown at right.

(2) Then, enter hysteresis values.
For the value entry, 1-digit value is increased or decreased by pressing the ◯ or the ◯ key, and pressing the ◯ key moves the digit. After setting, press the ENT ◯ key to make the "Hysteresis" valid.



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

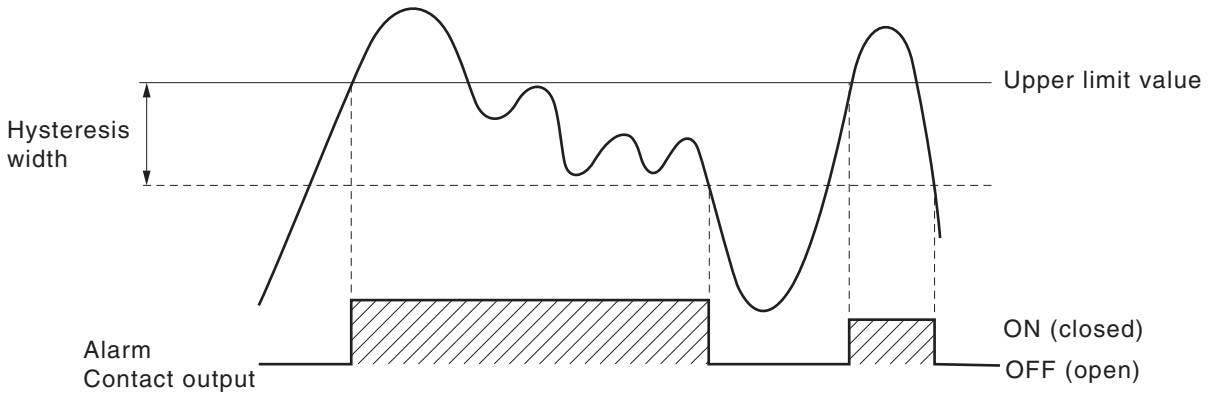
0 to 20% of full scale
[% full scale (% FS)] represents the percentage with the width of the component measurement range regarded as 100%.

⚠ CAUTION

The hysteresis is common to all alarms (components).
Hysteresis in peak alarm setting described in Section 6.3.3 should be set separately.

Hysteresis (In case of upper limit alarm)

An alarm output is turned ON if measurement value exceeds the upper limit value as shown below. Once the alarm output has been turned ON, it is not turned OFF as long as the indication does not fall below the hysteresis width from the upper limit value.



6.3.3 Peak alarm setting

When the peak number of times CO concentration exceeds the upper limit value during measurement reaches the set number, an alarm is provided.

The peak alarm and this setting screen appear only when an option is added.

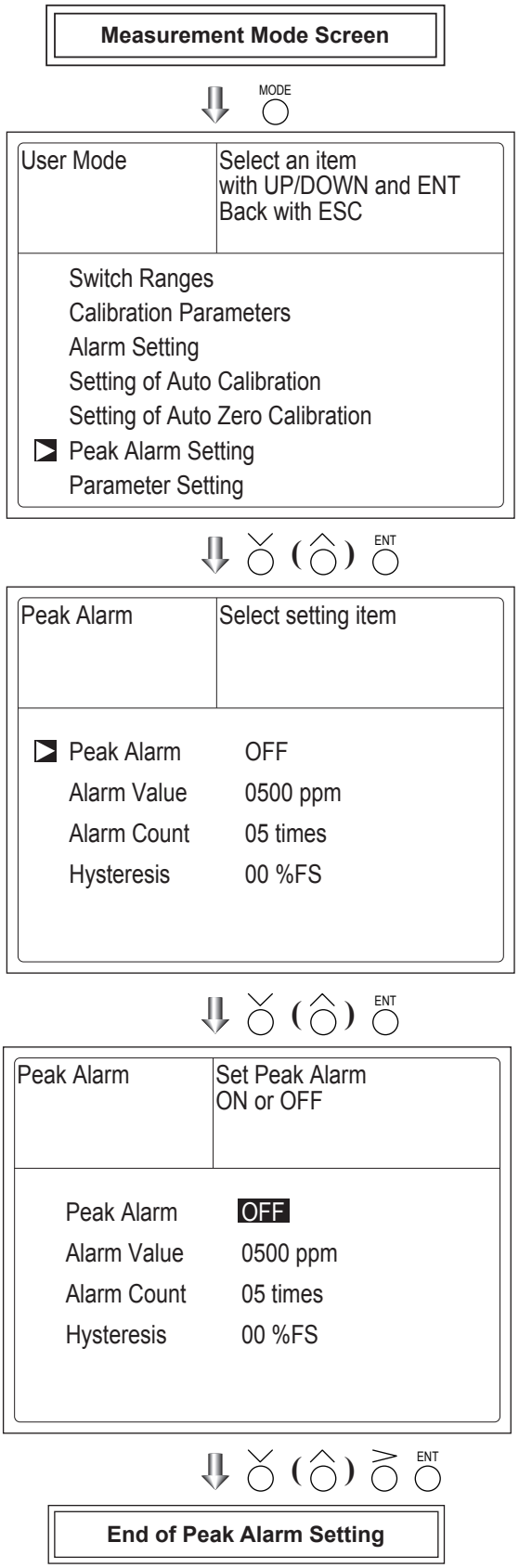
(1) Press the MODE key in the Measurement mode, and the User mode appears.

(2) Point the cursor to "Setting of Peak Alarm" by pressing the ∧ or ∨ key. Press the ENT key.

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

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

Entering the numeric values or setting the items should be carried out by using the ∧ or ∨ key.
After setting, press the ENT key, and the set values are saved.



Description of setting items

- Peak Alarm : ON/OFF of peak alarm
- Alarm Value : If measuring value exceeds the set alarm value, a peak counter counts 1 time.
- Alarm Count : When the alarm value is exceeded this many times per hour, the peak count alarm is activatied (closed).
- Hysteresis : To prevent possible chattering when the measuring value may exceed the set peak concentration by only 1 time, the peak count has an allowance in the hysteresis width.

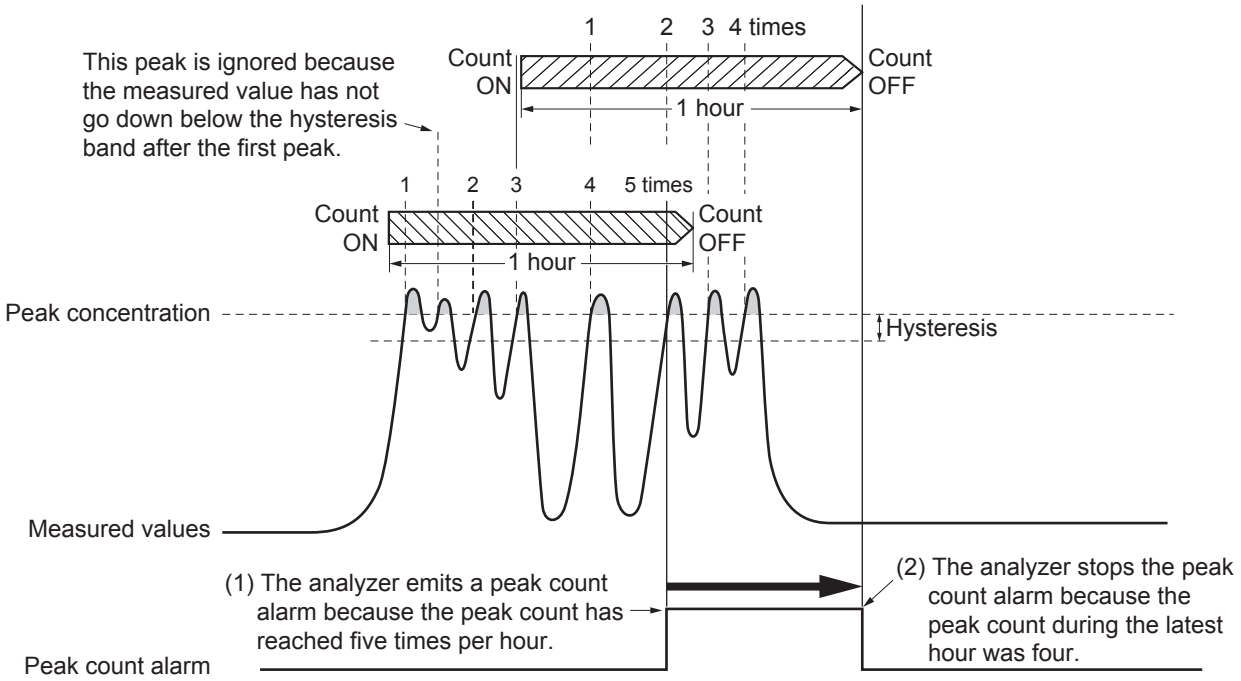
Setting range

- Alarm value : 10 to 1000 ppm → 5 ppm step (initial value: 500 ppm)
- Alarm count : 1 to 99 times (per hour) → (initial value: 5 times)
- Hysteresis : 0 to 20 % of full scale → (initial value: 0% of full scale)

[% full scale] represents the percentage with the CO range regarded as 100%.

Action of peak alarm

Example



If CO concentration exceeds the alarm value, counting will begin. If the number of peaks is over the set times per hour, a peak alarm contact output 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 logic is not carried out.

Releasing peak count alarm

To release the peak count alarm, set the peak alarm to OFF.
Turning on the peak alarm initiates counting from 0.

6.4 Setting of auto calibration

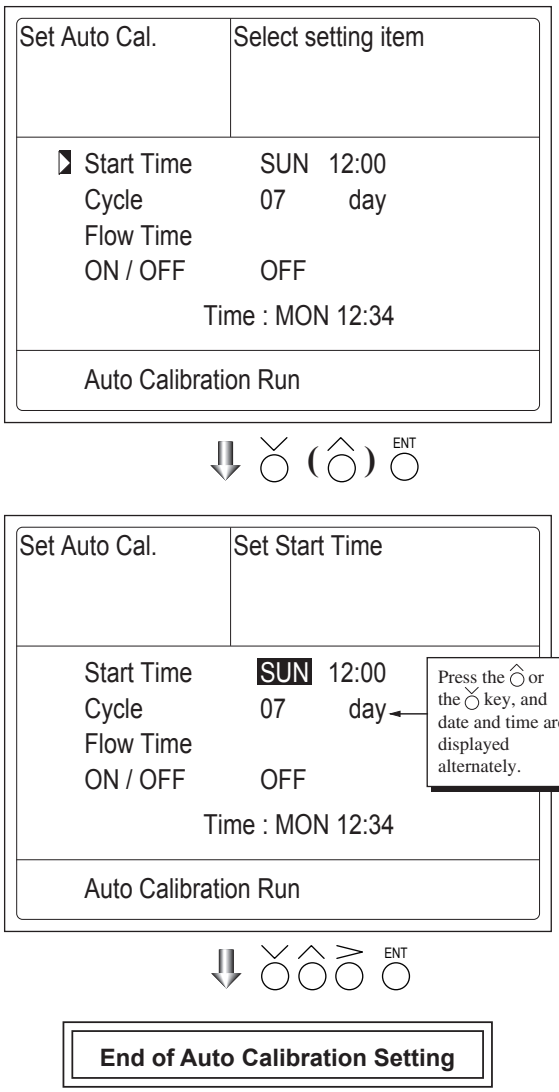
6.4.1 Auto calibration

Auto calibration is automatically carried out at the time when zero and span calibration are set. Before changing the setting of auto calibration, set the ON/OFF to OFF.

(1) Enter the "Setting of Auto Calibration" screen from the user mode, and the display shown at right appears. Operate the ⌃ or the ⌄ key until the cursor is aligned with a desired item and press the ENT key.

(2) In the "Setting of Auto Calibration" screen that appears, perform the value entry or the setting. For the value entry or setting change, use the ⌃ or the ⌄ key, and the > key to move the cursor to the right.

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



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 the next (unit : hour/day)
- Flow Time : The time required for replacement by calibration gas
  Time required for replacement of sample gas after the calibration is completed (Set by calibration gas. See the next page.)
- ON/OFF : ON/OFF of auto calibration

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.

<Gas flow time> setting

(1) Press the ENT key in a state where the cursor is placed preceding "Flow Time," and the flow time setting screen appears.

(2) Move the cursor to the gas you want to change by pressing the ^ or the v key, and then press the ENT key.

(3) The highlighted value can be changed. Change the value by pressing the ^ or the v key, and then move the cursor to the right by pressing the > key.

(4) After changing the value, press the ENT key.

(5) Press the ESC key to return to the automatic calibration setting screen.

Note) Only the Chs used are displayed on this screen. The Ex. time is the output signal hold extension time after the completion of calibration. It is valid only when the hold setting is set to "ON." The Ex. time set here is also the hold extension time at the time of manual calibration.

Set Auto Cal.	Set flow time of calibration gas 60 to 900 sec
ZERO	350 sec.
Ch1 Span	350 sec.
Ch2 Span	350 sec.
Ch3 Span	350 sec.
Ch4 Span	300 sec.
Ch5 Span	300 sec.
Ex. time	300 sec.

⇓ v ^ > ENT

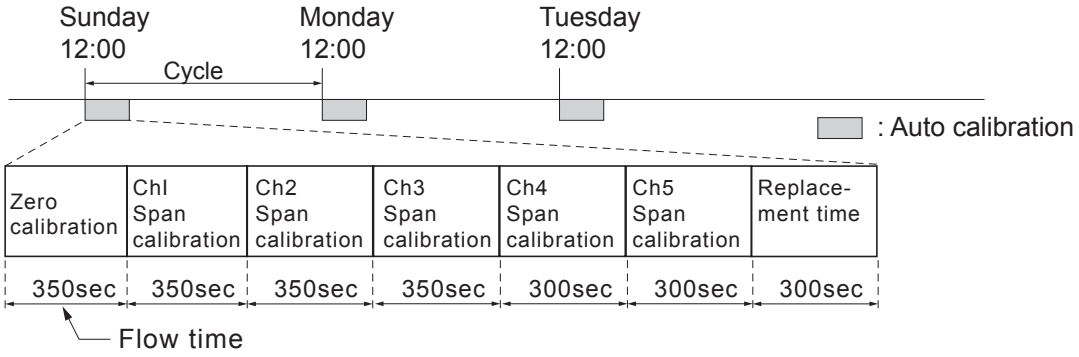
End of Gas flow time Setting

Auto calibration status contact output is closed during auto calibration (NO side), and is open in other cases.

Example

Start Time	SUN	12:00
Cycle	1	day
Flow Time	Zero	350 sec
	Ch1 Span	350 sec
	Ch2 Span	350 sec
	Ch3 Span	350 sec
	Ch4 Span	300 sec
	Ch5 Span	300 sec
	EX. time	300 sec
ON/OFF	ON	

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



(An example of "Ch1 through Ch5: enable", as given in Section 6.2.4 "Auto Calibration Components/range")

Setting range

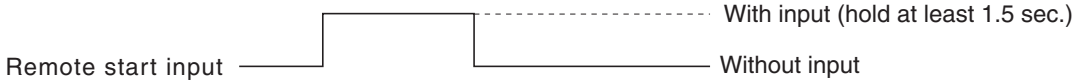
Cycle : 1 to 99 hours or 1 to 40 days (initial value 7 days)
Flow time : 60 to 900 sec (initial value 300 sec)

⚠ CAUTION

- When an auto calibration starts, the measurement screen appears automatically.
- During auto calibration, any key operation is not permitted other than operations such as key lock ON/OFF and "Forced stop of auto calibration" (see Section 6.4.2.2). When the key lock is set at ON, even the "Forced stop of auto calibration" cannot be performed. To cancel auto calibration forcedly, set the key lock to OFF and then execute "Forced stop of auto calibration".
- 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.
- When the hold setting is set to ON, the hold time of auto calibration contact and measurement value output signal are extended after calibration for gas replacement time.

Remote start

Whether the auto calibration is set at ON or OFF, an auto calibration is available by remote start input.

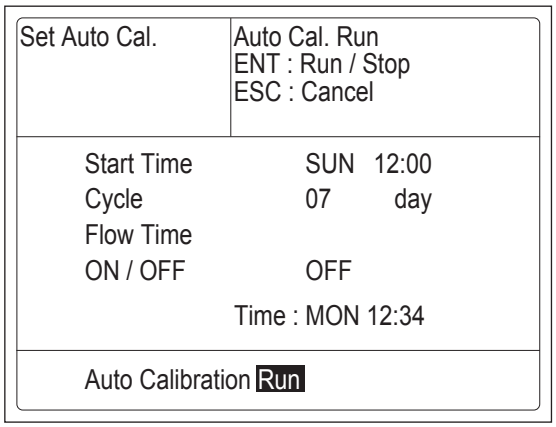


6.4.2 Forced run/stop of auto calibration

Auto calibration can be performed just once or forcibly stopped while the calibration is performed.

6.4.2.1 Execution of auto calibration (only once)

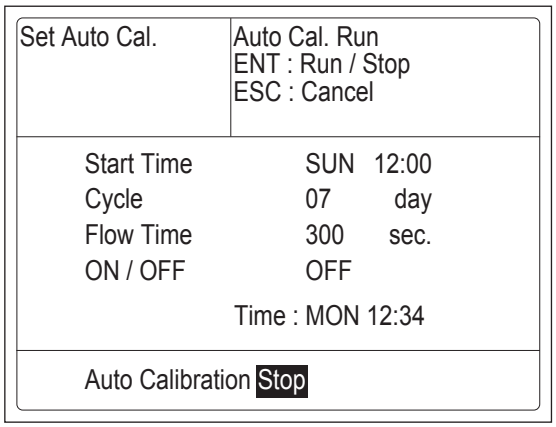
(1) In the "Setting of Auto Calibration" screen that appears, point the cursor to "Auto Calibration Run" by pressing the ^ or the v key. Press the ENT key.
(2) "Run" is highlighted, displaying a message to confirm the execution of auto calibration. Press the ENT key to execute the auto calibration, and press the ESC key to cancel.



6.4.2.2 Forced stop of auto calibration

This mode is used to stop the auto calibration forcibly.

(1) In the "Setting of Auto Calibration" screen that appears, point the cursor to "Auto Calibration Stop" by pressing the ^ or the v key. Press the ENT key. ("Auto Calibration Stop" appears when the screen is selected while auto calibration is performed.)
(2) "Stop" is highlighted, displaying a message to confirm the stop of auto calibration. Press the ENT key to stop the auto calibration, and press the ESC key to cancel (not stopped).



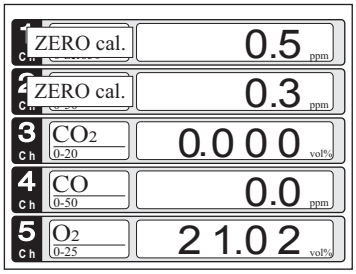
"Auto Calibration" screen

Example

In case where setting the auto calibration components (see Section 6.2.4) to "Ch1: enable" and "Ch2: enable"

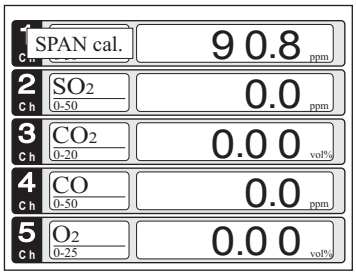
• Zero calibration

A message, "Zero cal." blinks at Ch1 and Ch2.



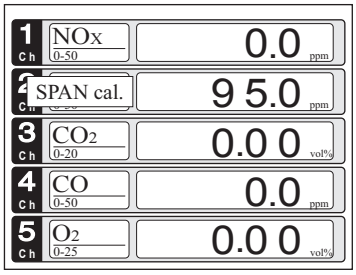
• Ch1 span calibration

A message, "Span cal." blinks at Ch1.



• Ch2 span calibration

A message, "Span cal." blinks at Ch2.



⚠ CAUTION

During auto calibration, any key operation is not permitted other than operations such as key lock ON/OFF and "Forced stop of auto calibration".
When the key lock is set at ON, even the "Forced stop of auto calibration" cannot be performed.
To cancel "Auto Calibration" forcedly, set the key lock to OFF and then execute "Forced stop of auto calibration".

6.5 Setting of auto zero calibration

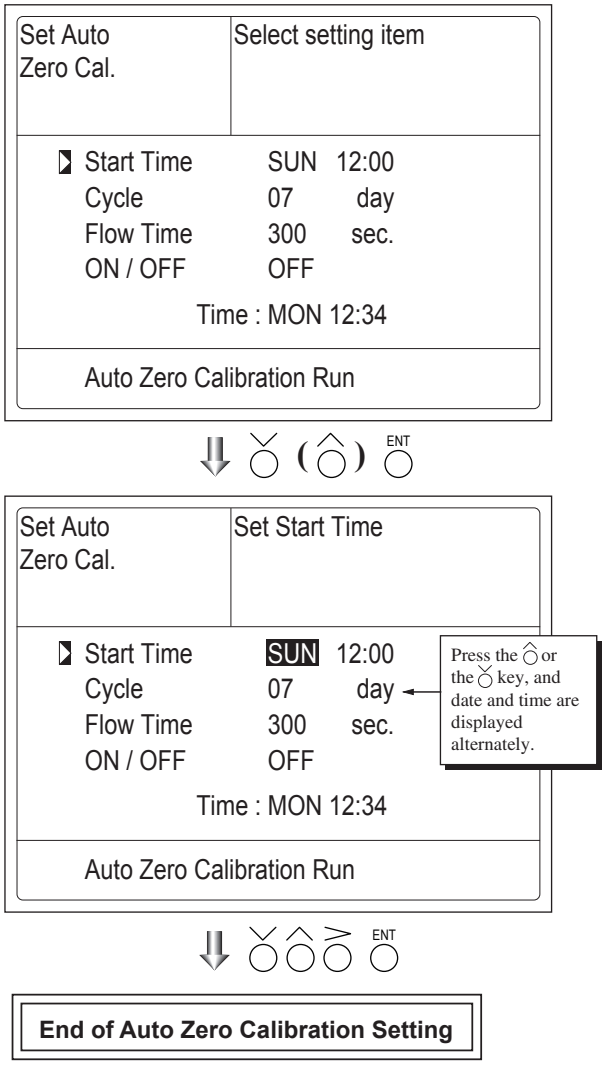
6.5.1 Auto zero calibration

Auto zero calibration is automatically carried out at the time when zero calibration is set. Components for which a calibration is to be made are determined by setting of auto calibration component in Section 6.2.4.
Before changing the setting of auto zero calibration, set the ON/OFF to OFF.

(1) Enter the "Setting of Auto Zero Calibration" screen from the user mode, and the display shown at right appears. Operate the ◯ or the ◯ key until the cursor is aligned with a desired item and press the ENT ◯ key.

(2) In the "Setting of Auto Zero Calibration" screen that appears, perform the value entry or the setting. For the value entry or setting change, use the ◯ or the ◯ key and the ◯ key to move the cursor to the right.

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



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 the next (unit : hour/day)
- Flow Time : The time required for the calibration gas to be replaced in the sampling cell
- ON/OFF : ON/OFF of auto zero calibration

To close "setting of Auto Zero Calibration"

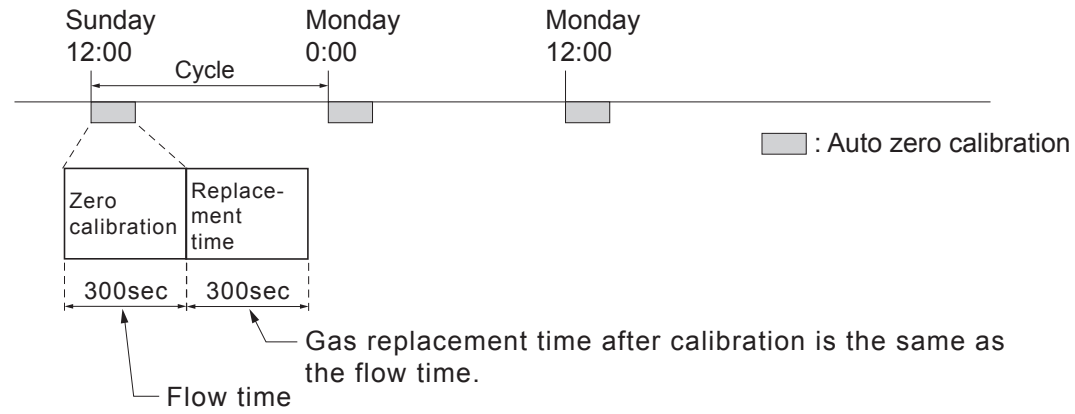
To close the "Setting of Auto Zero Calibration" or cancel this mode midway, press the ESC ◯ key. A previous screen will return.

Auto calibration status contact output is closed during auto zero calibration (NO side), and is 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 Ch5: enable," as given in Section 6.2.4 "Setting of auto calibration components/range")

Setting range

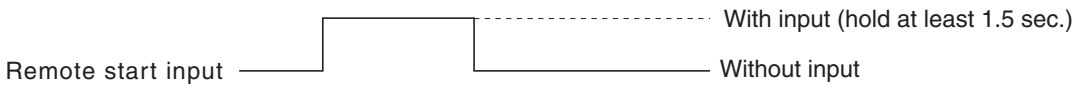
Cycle : 1 to 99 hours or 1 to 40 days (initial value 7 days)
Flow time : 60 to 900 sec (initial value 300 sec)

⚠ CAUTION

- When an auto zero calibration starts, the measurement screen automatically appears.
- During auto zero calibration, any key operation is not permitted other than operations such as key lock ON/OFF and "Forced stop of auto zero calibration" (see Section 6.5.2.2).
  When the key lock is set at ON, even the "Forced stop of auto zero calibration" cannot be performed. To cancel auto zero calibration forcedly, set the key lock to OFF and then execute "Forced stop of auto zero calibration".
- 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.
- 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.
- When the hold setting is set to ON, the hold time of auto calibration contact and measurement value output signal are extended after calibration for gas replacement time.

Remote start

Whether the auto zero calibration is set at ON or OFF, an auto zero calibration is available by remote start input.



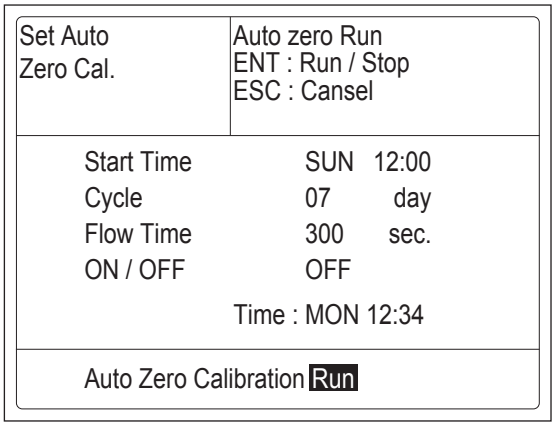
6.5.2 Forced run/stop of auto zero calibration

Auto zero calibration can be performed just once, or auto zero calibration can be forcibly stopped during calibration.

6.5.2.1 Execution of auto zero calibration (only once)

(1) In the "Setting of Auto Zero Calibration" screen that appears, point the cursor to "Run" by pressing the ∧ or the ∨ key. Press the ENT key.

(2) "Run" is highlighted, displaying a message to confirm execution of auto zero calibration. Press the ENT key to execute the calibration, and press the ESC key to cancel.

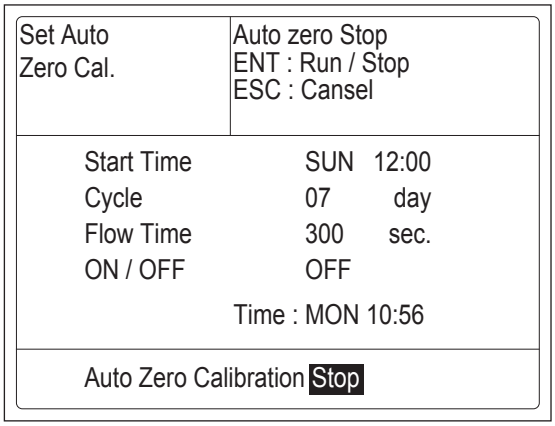


6.5.2.2 Forced stop of auto zero calibration

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

(1) In the "Setting of Auto Zero Calibration" screen that appears, point the cursor to "Stop" by pressing the ∧ or the ∨ key. Press the ENT key.
("Auto Zero Calibration Stop" appears when the screen is selected while auto zero calibration is performed.)

(2) "Stop" is highlighted, displaying a message to confirm the stop of auto zero calibration. Press the ENT key to stop the auto zero calibration and the ESC key to cancel (not stopped).



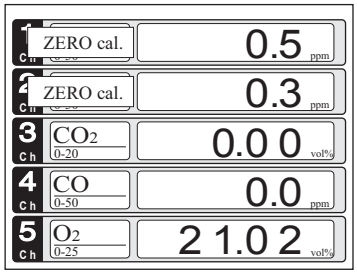
"Auto Zero Calibration" screen

Example

In case where setting the auto calibration components (see Section 6.2.4) to "Ch1: enable" and "Ch2: enable"

• Zero calibration

A message, "Zero cal." 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 "Forced stop of auto zero calibration".
When the key lock is set at ON, even the "Forced stop of auto zero calibration" cannot be performed.
To stop "auto zero calibration" forcedly, set the key lock to OFF and then execute "Forced stop of auto zero calibration".

6.6 Parameter setting

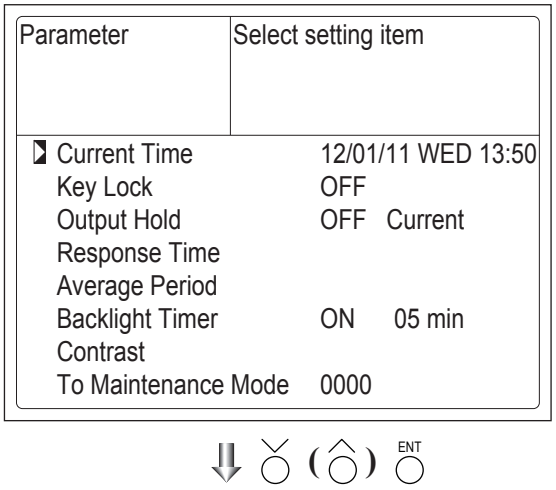
It allows you to carry out the parameter setting such as time, key lock, etc., as required.
Items to be set are as follows:

Description of setting items

• Current Time	: Current year, month, date, day of the week, hour, and minute setting (The display appears in this order.) Note) The clock backup time is 2 days. If power is turned on after it is kept off for 2 days or longer, check the time setting again.
• Key Lock	: Invalidates any key operation except canceling the key lock.
• Output Hold	: Sets whether measurement value output during calibration is held or not, and the holding value setting.
• Response time	: Sets the response time of electrical system.
• Average Period	: Sets the moving average time.
• Backlight Timer	: Sets automatic OFF of the backlight of display unit and the time until backlight out.
• Contrast	: Adjusts contrast of the LCD.
• Maintenance mode	: Enters passwords to switch to the Maintenance mode.

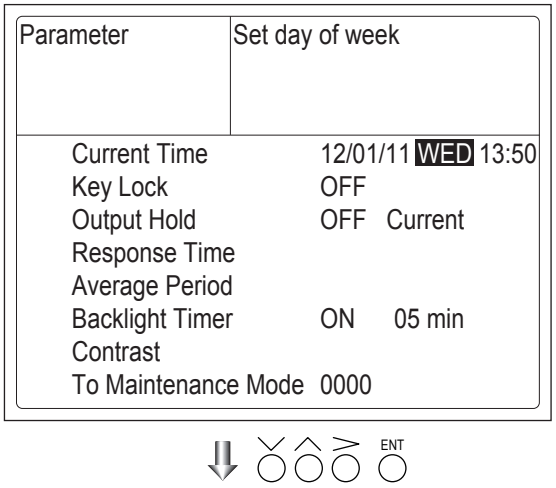
* For the maintenance mode, see Section 6.7.

(1) Enter the "Parameter setting" screen from the user mode, and the display shown at right appears. Operate the ^ or the v key until the cursor is aligned with a desired item and press the ENT key.



⇓ v (^) ENT

(2) In the "Parameter Setting" screen that appears, perform the value entry or the setting. For the value entry or setting change , use the ^ or the v key, and the > key move the cursor to the right.



⇓ v ^ > ENT

End of Parameter Setting

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.

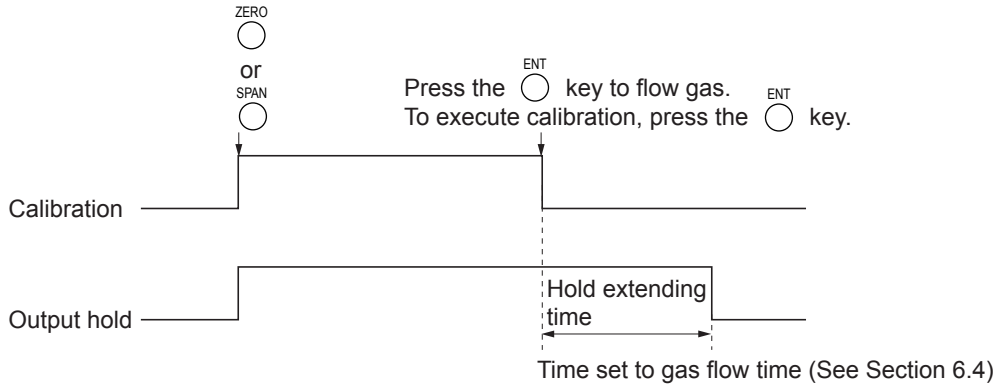
Setting Range

• Hold setting	: 0 to 100% FS	
• Response time	: 1 to 60 sec.	(Initial value: 15 sec)
• Average period	: 1 to 59 min or 1 to 4 hours 1 to 59 minutes when the unit is set to minute and 1 to 4 hours when it is set to hour.	(Initial value: 1 hour)
• Backlight Timer	: 1 to 60 min	(Initial value: 5 min)
• Maintenance mode	: 0000 to 9999	(Initial value: 0000)

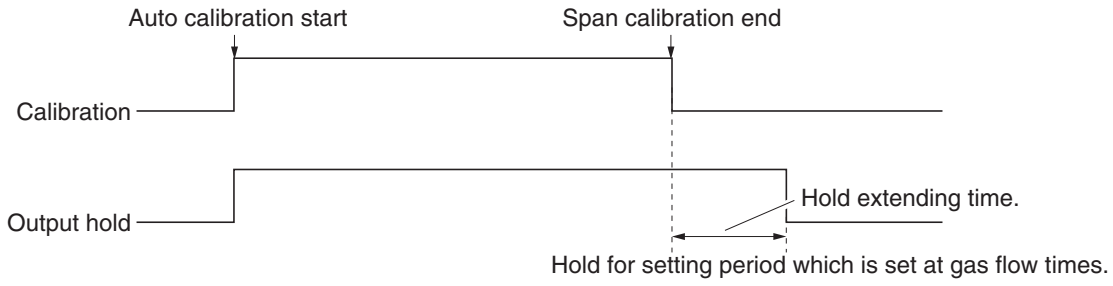
Output Hold

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

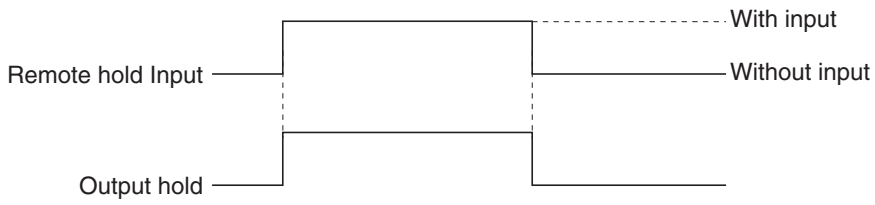
a. Manual calibration



b. Auto calibration



c. Remote hold



d. Screen display during Holding

The “Hold ON” message blinks on the measuring screen.

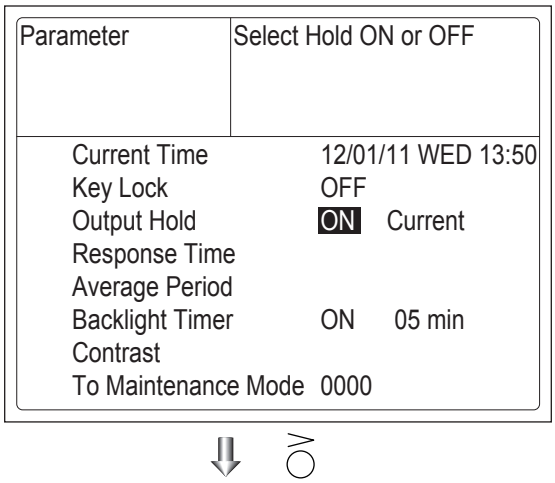
Since the screen displays the process of calibration during the manual/auto calibration, “Hold ON” is not displayed even if the output signal is held, but the screen is displayed with the hold extending time.

e. If calibration is cancelled after the calibration gas is supplied regardless of manual or auto operation, the hold extending time will be performed.

f. You can select the value for hold from the value immediately before entering output hold, "current," and arbitrary value, "setting."

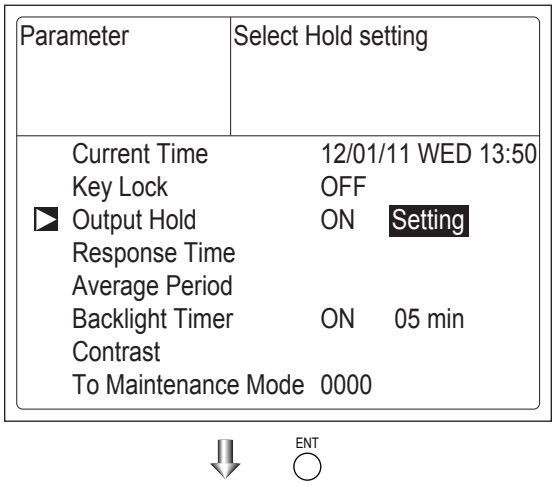
Follow the procedures shown below to set.

(1) In the "Parameter setting" screen that appears, select "Output Hold".
"ON" or "OFF" is highlighted by pressing the ENT key. Press the ∧ or the ∨ key to select ON/OFF. Press the ENT key to return to (1).

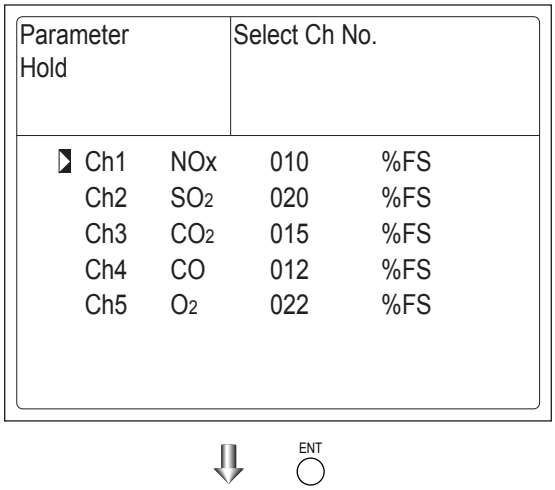


(2) Where ON is highlighted, press the > key. "Current" or "Setting" is highlighted. Select "Current" or "Setting" by pressing the ∧ or the ∨ key.

(3) Press the ENT key while "Current" is selected to return to (1). Press the ENT key while "Setting" is selected to go to the parameter hold screen.
"Current": Holds the value immediately before the hold.
"Setting": Holds the value arbitrarily set.

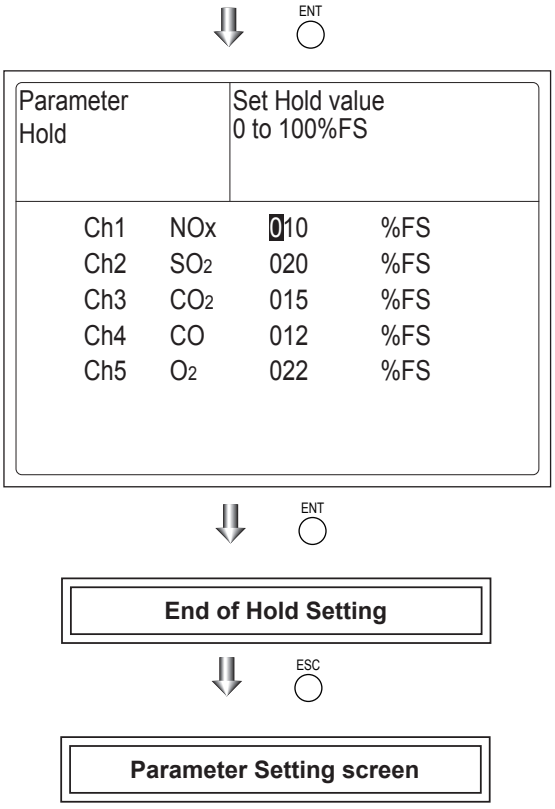


(4) On the parameter hold screen that appears, move the cursor next to the Ch (component) you want to change by pressing the ∧ or the ∨ key, and then press the ENT key.



(5) The value is highlighted, indicating that the value can be changed. Change the value by pressing the ∧ or the ∨ key, and then move the cursor to the right digit by pressing the > key.

(6) After the value is changed, press the ENT key.



Meaning of setting

The setting is expressed as 1/1 full scale range for both respective ranges.
When 0 to 1000 ppm is selected as the range, and 10% FS is selected as hold setting, the output equivalent to 100 ppm is held irrespective of the measure-ment value at that time.

(7) Press the ESC key to return to the parameter setting screen.

Description of setting

- Instantaneous measurement value that is displayed cannot be held. (Output only can be held.)
- Optional modbus communications “Measurement concentration” registor values are held.
- If set value is selected for hold, instantaneous O_2 correction value is calculated and held based on the set value.
- Range identification contact output cannot be switched even if the range is switched during the hold.

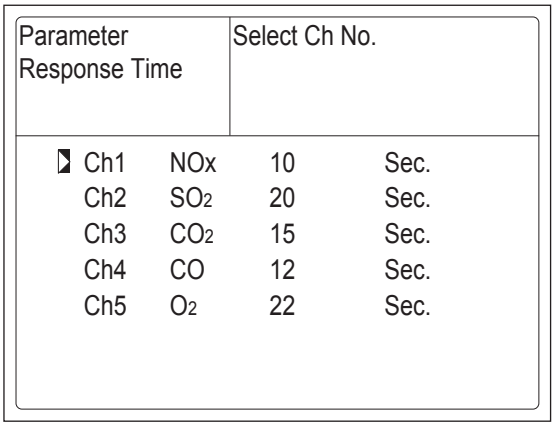
Response time

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.



Average period

It allows you to set an averaging period of the average values of O_2 correction and O_2 average.

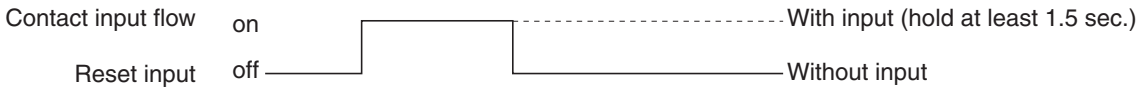
It enables you to set an average time of 1 to 59 minutes (1-minute step) or 1 to 4 hours (1-hour step).

Changing the setting also resets the averaging of O_2 correction and O_2 average value. (Pressing the ENT key resets averaging only for components whose setting was changed.)

Parameter Average Period	Select Ch No.		
Ch9	AV. CU NOx	01	hour
Ch10	AV. CU SO_2	01	hour
Ch11	AV. CU CO_2	01	hour
Ch12	AV. O_2	01	hour
Reset AV. Output		Reset	

Average value reset

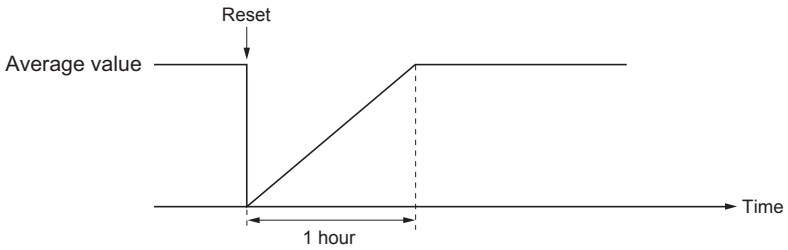
This mode is used to clear all average values O_2 correction average and O_2 average, and restarts averaging. All average values are reset simultaneously. The indication value and output value is 0 ppm, vol% or so at the time of the reset input (based on average period settings).



So long as with input, resetting lasts.
At the edge of changing from “with input” to “without input,” the average action restarts.

Example of average action

In case the average period was set to 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.

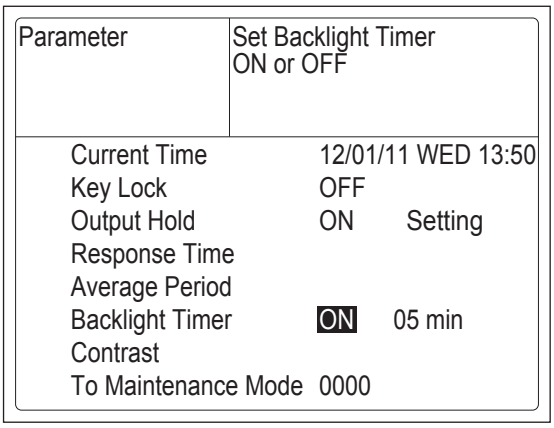
Backlight Timer

Automatic OFF setting of the backlight of the LCD unit can be made.

When the specified time elapses during the measurement screen display with no key operation, the backlight is automatically turned off. Press any key to reset backlight OFF.

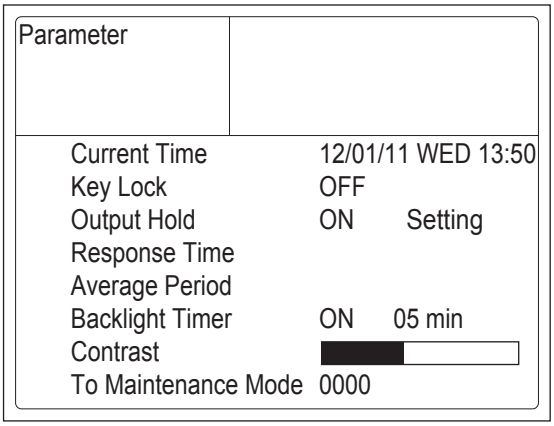
Only when ON is selected, the time until auto OFF is displayed. Press the ◯ key in this state, and the time setting can be changed by pressing the ◯ or the ◯ key. Press the ENT ◯ key to confirm the selection.

If OFF is selected, the backlight is not turned off.



Contrast

Contrast of the LCD can be adjusted. The contrast changes by pressing the ◯ or the ◯ key. Adjust to the best contrast and save it by the ENT ◯ key.



Maintenance mode

Enter the password and then press the ENT ◯ key to enter the maintenance mode. The password can be set by the password setting in maintenance mode. Default password setting at the time of delivery from the factory is “0000.” You can enter the maintenance mode with this value before the password is changed.

6.7 Maintenance mode

This mode is used to check sensor input values, display of error log files or setting of passwords, etc. First, enter a password and then use it from the next operation. This mode is displayed by selecting the Maintenance Mode from "Section 6.6 Parameter Setting."

(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 to set by pressing the ∧ or the ∨ key and press the ENT key.

(3) Next, each Maintenance screen is displayed.

Note) "To Factory Mode" is used for our service engineers only.

(4) Press the ESC key to return to the Maintenance Mode item selection screen from each screen.

Maintenance Mode	Select operating item
▶ 1. Sensor Input Value 2. Error Log 3. Cal. Log 4. Output Adj. 5. Other Parameter 6. To Factory Mode	

⇓ ∨ (∧) ENT

Each "Maintenance" screen

- **Sensor Input Value screen**

Description of Sensor Input Value screen

- Input 1 to 4 : NDIR sensor digital value
- Input 5 : O_2 sensor digital value

Maintenance Sensor Input	ENT : Selectable flow gas
Input 1	100821
Input 2	96118
Input 3	102241
Input 4	82856
Input 5	11050
▶ GAS Sample	

- **Error Log screen**

Description of Error Log screen

Error history. 14 newest errors are logged.
For error number, date and time (year, month, day, period) of occurrence, channel and other details of error, refer to Section 8 "Error message".
Select Clear Error Log and press the ENT key, and the error log is cleared completely.

Maintenance Error Log	ENT : Clear Error Log ESC : Back					
error No.	YY	MM	DD	HH	MM	Ch
No. 10	15	9	8	13	5	
No. 9	15	6	17	10	40	2
No. 5	15	6	17	10	40	2
No. 9	15	6	17	10	40	1
No. 5	15	6	17	10	36	1
No. 7	15	6	17	10	33	1
No. 7	15	5	26	16	40	2
▼ Next page						Page1
▶ Clear Error Log						

- **Calibration Log screen**

Description of Calibration Log screen

Past calibration history is displayed.
Sensor input value, concentration value, and the date when zero/span calibration is performed are logged. The 10 newest calibration data are logged by each component.
Move the cursor to Clear Calibration Log and press the ENT key, and the calibration log is cleared completely.

Z1 : Zero calibration (Z) of Range 1
S1 : Span calibration (S) of Range 1
Cnt : Value of measuring detector at the time of calibration
Con : Concentration value displayed before calibration

Maintenance Cal. Log	Select Ch No.
▶ Ch1 NOx Ch2 SO_2 Ch3 CO_2 Ch4 CO Ch5 O_2	
Clear Error Log	

⇩ ENT

Maintenance Cal. Log Ch1 NOx						
R	Cnt	Con	M	D	H	M
Z1	48523	-0.2	12	11	18	10
S1	44176	189.5	12	11	18	10
Z1	48530	-0.5	12	11	18	8
Z1	48529	-0.5	12	11	18	3
Z1	48530	-0.4	12	11	17	55
Z1	48531	-0.4	12	11	17	50
S1	44172	189.1	12	11	10	43
S1	44170	188.8	12	11	10	35
Z1	48525	-0.2	12	11	9	3
Z1	48524	-0.2	12	11	9	0

- **Output adjustment screen**

Description of output adjustment screen

Analog output adjustment screen.
Connect the digital multi meter to the output terminal corresponding to the number of OUT to be adjusted, and adjust the value so that 4mA or 0V is output at zero and 20mA or 1V is output at span.

Move the cursor using the ◯, ◯, or the ◯ key to the output (OUT No. and zero/span) to be adjusted, and then press the ENT ◯ key.
The selected value is highlighted. Adjust the value, while watching the output, by pressing the ◯ or the ◯ key. Press the ◯ key to select the next digit.
On completion of the adjustment, press the ENT ◯ key.

Maintenance Mode Output Adj.			Adjust OUTPUT ZERO and SPAN		
OUT	Zero	Span	OUT	Zero	Span
1	00600	03700	7	00600	03700
2	00600	03700	8	00600	03700
3	00600	03700	9	00600	03700
4	00600	03700	10	00600	03700
5	00600	03700	11	00600	03700
6	00600	03700	12	00600	03700

ENT ◯

Maintenance Mode Output Adj.			Zero / Span adjustment		
OUT	Zero	Span	OUT	Zero	Span
1	00600	03700	7	00600	03700
2	00600	03700	8	00600	03700
3	00600	03700	9	00600	03700
4	00600	03700	10	00600	03700
5	00600	03700	11	00600	03700
6	00600	03700	12	00600	03700

- **Other parameter**

Description of each setting screen

Password Set : Set the password used to move from the parameter setting screen to the maintenance mode. Arbitrary 4-digit number can be selected.

O_2 ref. Value : Set the oxygen concentration reference value at the time of oxygen correction calculation. Settable in the range from 00 to 19%.

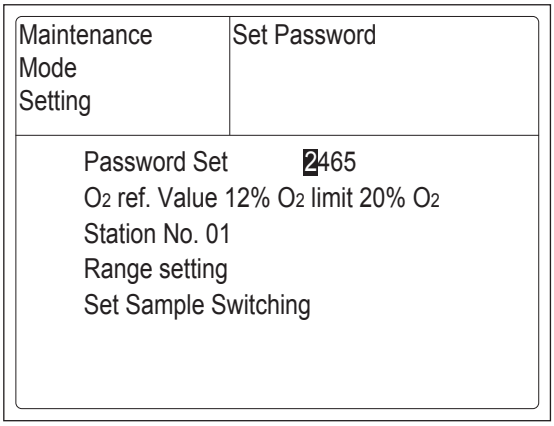
Limit : Set the oxygen concentration limit at the time of oxygen correction calculation. Settable in the range from 01 to 20%.

* Refer to the O_2 correction concentration value in 5.3 “Outline of display screen” for oxygen correction calculation procedure.

Station No. : Set the station No. for MODBUS communication. Settable in the range from 00 to 31.

Range setting : Set or change the measuring range.

Set Sample Switching : Set or change parameters about Sample Switching.



Press the ⌃ or the ⌄ key to move the cursor to the item whose setting is to be changed.

The values for password, oxygen correction, limit, and station No. are highlighted.

Press the ⌃ or the ⌄ key to change the value to desired one, and then press the ENT key.

⚠ CAUTION

Pay attention not to forget the password.
Otherwise you cannot enter the maintenance mode.

<How to set/change the range>

The measuring range can be arbitrarily selected in the minimum and the maximum range specified at the time of purchase. The range to be used can be selected 1 or 2.

(1) Move the cursor to the item to be set by pressing the ∧ or the ∨ key, and then press the ENT key.

(2) Move the cursor to the Ch (component) whose setting is to be changed by pressing the ∧ or the ∨ key, and then press the ENT key.

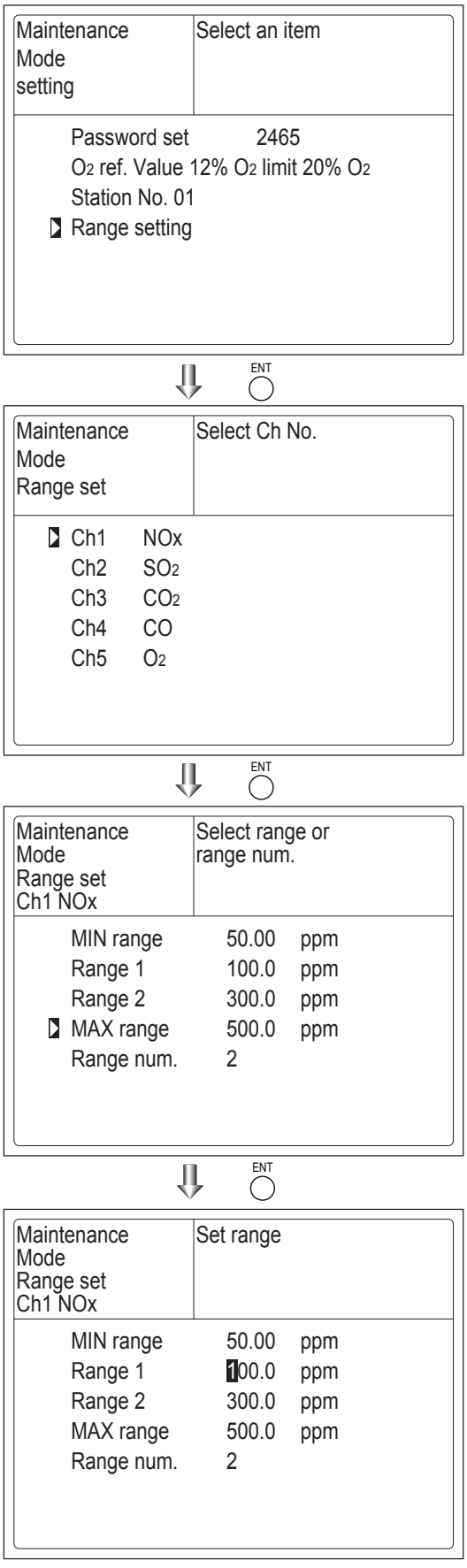
(3) Move the cursor to the item whose setting is to be changed by pressing the ∧ or the ∨ key, and then press the ENT key.

Settable range

The value for range 1 and range 2 must fall within the range from the MIN and the MAX range (including the MIN and the MAX range), and at the same time range 1 must be smaller than range 2.
The number of ranges is 1 or 2.

(4) Press the ∧ or the ∨ key to change the value. Press the > key to select the next digit. The unit cannot be changed.
In a state where the decimal point is highlighted, press the ∧ or the ∨ key, and the decimal point position can be changed.

(5) When necessary change is made, press the ENT key.



⚠ CAUTION

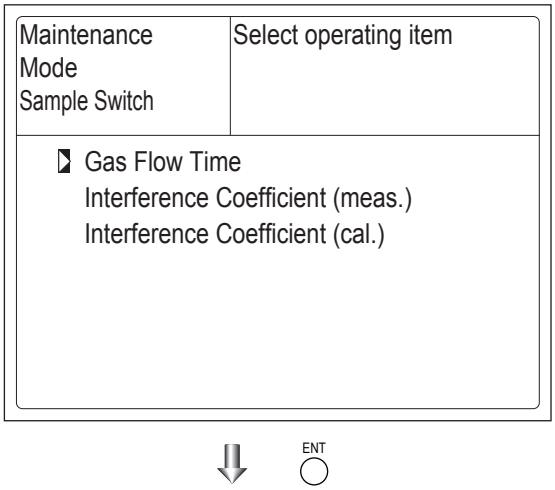
Be sure to perform zero / span calibration when the range setting is changed.
Otherwise, the measurement value may not be output properly.

6.7.1 Sample switch setting

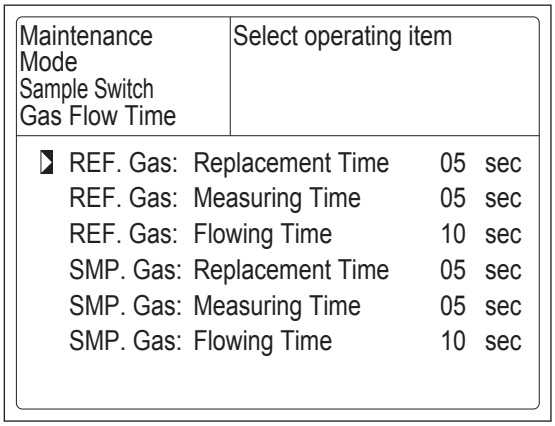
Set up the setting for the required operation of sample switch. Set up the gas flow time and interference compensation coefficients.

6.7.1.1 How to change the setting of gas flow time

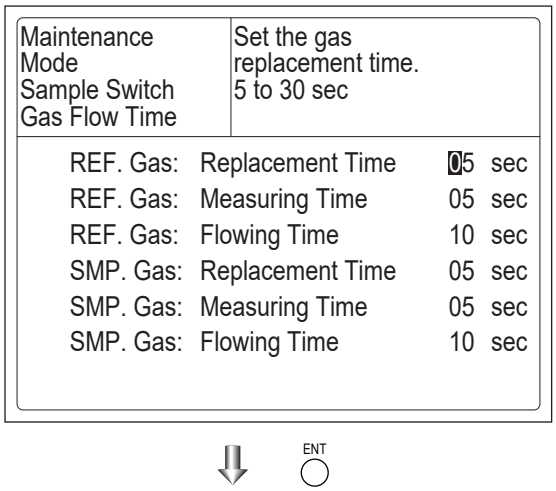
(1) Select the Sample Switch Setting from the Maintenance Mode, and the display shown at right appears.



(2) When the gas flow time is chosen on the sample switch setting, screen will be appeared as shown on the right.
Selectable a switching time and flow time of the reference gas with ◯ ◯ key operation.



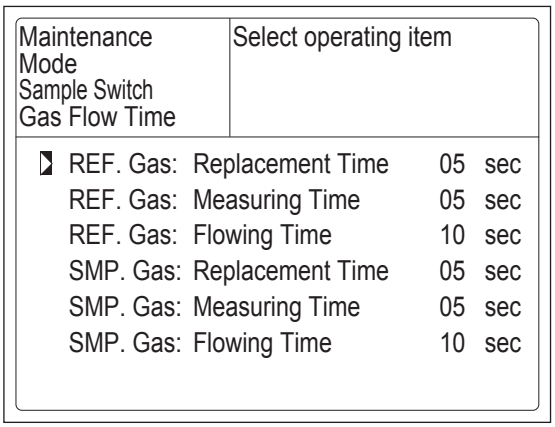
(3) Settable the each setting time by pressing ENT key.
Refer to the "explanation" below regarding setting range.



ENT

(4) When press the ENT key, the cursor will be returned and setting value will be memorized.
Also switching time and measuring time of the sample gas are set automatically based on following relational expression.

Note: This setting time is very important setting when sample switch is carried out.
Do not change the setting time unless it is required.



Explanation

Set up switching time and measuring time of the reference gas.

Switching time of reference gas : 5 to 30s (Initial value 5 sec)
Measuring time of reference gas : 5 to 60s (Initial value 5 sec)

Note) Switching time of the sample gas, measuring time of the sample gas, flow time of the reference gas and flow time of the sample gas
are updated automatically based on following relational expression.

Switching time of sample gas (t1) = Switching time of reference gas (t3)
Measuring time of sample gas (t2) = Measuring time of reference gas (t4)
Flow time of sample gas (Ts) = Flow time of reference gas (Tr)

Flow time of reference gas (Tr) =
Switching time of reference gas (t3) + measuring time of reference gas (t4)
Flow time of sample gas (Ts) =
Switching time of sample gas (t1) + measuring time of sample gas (t2)

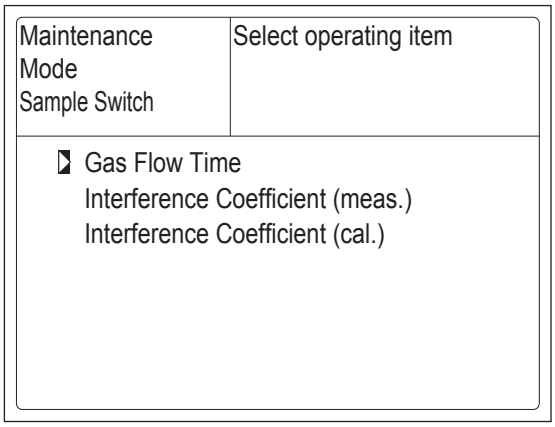
1 cycle = flow time of reference gas (Tr) + flow time of sample gas (Ts)

6.7.1.2 Interference compensation coefficient

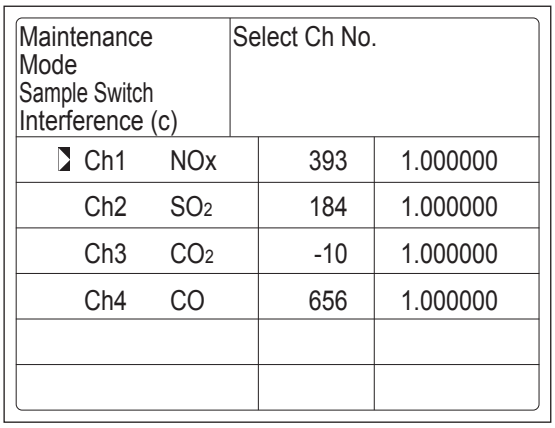
⚠ CAUTION

If the following operation is maladjusted, the measurement may adversely be affected. If you are not trained for adjustment, do not carry out this operation but contact the distributor or our service-man.

(1) Select the Sample Switch Setting from the Maintenance Mode, and the display shown at right appears.



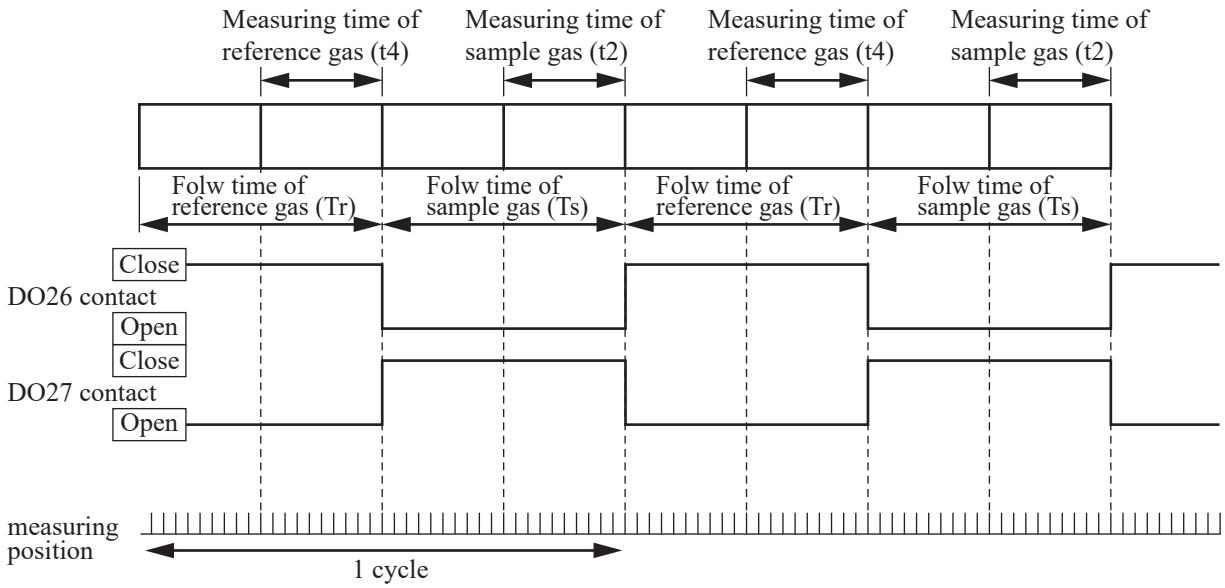
(2) When the interference compensation coefficient is chosen on sample switch setting, the screen will be appeared as shown on the right.
Select the interference compensation coefficient for each desired Ch. to be set with ^ v key operation.
When the ENT key is pressed, screen will be moved to interference compensation value.



(3) When ENT key is pressed after changing the parameter value, the cursor will be returned and setting value will be memorized.

6.7.1.3 Explanation of sample switch method

Flow time of reference gas and sample gas are switched by sample switch method at the following timing.



Switching time of reference gas : 5 to 30s (Initial value 5 sec)
Measuring time of reference gas : 5 to 60s (Initial value 5 sec)

Note) Switching time of the reference gas, measuring time of the sample gas, flow time of the reference gas and flow time of the sample gas are updated automatically based on following relational expression.

Switching time of sample gas (t1) = Switching time of reference gas (t3)
Measuring time of sample gas (t2) = Measuring time of reference gas (t4)
Flow time of sample gas (Ts) = Flow time of reference gas (Tr)

Flow time of reference gas (Tr) =
Switching time of reference gas (t3) + measuring time of reference gas (t4)
Flow time of sample gas (Ts) =
Switching time of sample gas (t1) + measuring time of sample gas (t2)

1 cycle = flow time of reference gas (Tr) + flow time of sample gas (Ts)

6.8 Manual calibration procedure

6.8.1 Manual zero calibration

It is used for zero point adjustment. Proper zero gas, suitable for the application, should be used. Refer to Section 3.4.3 “Preparation of standard gas”.

(1) Press the ZERO key on the Measurement screen to display the Manual Zero Calibration screen.

(2) Select the Ch (component) to be calibrated by pressing the ∧ or the ∨ key. After selection, press the ENT key, and zero gas will be supplied.

⚠ CAUTION

For the Ch (components) in which “at once” is set in the zero calibration (see Section 6.2.2) - zero calibration is carried out simultaneously. And for the Ch (components) in which “both” is set in the calibration range setting (see Section 6.2.3) - zero calibration is carried out on both ranges.

(3) Wait until the indication is stabilized with the zero gas supplied. After the indication has been stabilized, wait for additional 5 minutes and press the ENT key. Zero calibration in range selected by the cursor is carried out.

Note: For the Ch (component) for which “AR” is selected in 6.1.1 “Setting of range switch mode”, the cursor automatically moves to the range selected in “Setting of auto calibration component/range” (Section 6.2.4), and cali bration is carried out within that range.

To close "Zero Calibration"

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

Measurement Mode Screen

⇩ ZERO

ZERO Cal.	Select Ch No. with UP / DOWN and ENT Back with ESC	
▶ Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch2 SO_2	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch3 CO_2	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	0.00
▶ Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch5 O_2	Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	20.09

⇩ ∨ (∧)

ZERO Cal.	Select Ch No. with UP / DOWN and ENT Back with ESC	
▶ Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch2 SO_2	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch3 CO_2	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	0.00
▶ Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch5 O_2	Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	20.09

⇩ ENT

ZERO Cal.	ENT : Go on calibration of selected Ch. ESC : Not calibration	
Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	▶ 0.0
Ch2 SO_2	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	▶ 0.9
Ch3 CO_2	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	▶ 0.34
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	▶ 1.1
Ch5 O_2	Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	▶ 20.09

⇩ ENT

To Measurement screen after executing Manual Zero Calibration

6.8.2 Manual 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_X, SO_2, CO_2, CO measurement, use the standard gas with a concentration of 90 to 100% of its measuring range value. For the span calibration gas for the O_2 measurement, use the standard gas with a concentration of 90 to 100% of its measuring range value when measuring with the built-in O_2 sensor, and use the standard gas of 1 to 2 vol% when measuring with an external zirconia O_2 sensor.

(1) Press the SPAN key on the Measurement screen to display the Manual Span Calibration screen.

(2) Select Ch (component) to be calibrated by pressing the ∧ or the ∨ key and press the ENT key. The calibration gas is supplied.

⚠ CAUTION

For the Ch (components) in which "both" is set in the calibration range setting (Refer to Section 6.2.3) - span calibration is completed for both ranges.

(3) Wait until the indication is stable. After the indication has been stabilized, wait for additional 5 minutes and press the ENT key. Span calibration of Range selected by the cursor is performed.

Note: For the Ch (component) for which "AR" is selected in Section 6.1.1 "Setting of range switch mode", the cursor automatically moves to the range selected in "Setting of auto calibration component/range" (Section 6.2.4), and calibration is carried out within that range.

To close "Span Calibration"

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

Measurement Mode Screen

⇩ SPAN

SPAN Cal.	Select Ch No. with UP / DOWN and ENT Back with ESC	
▶ Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
Ch2 SO_2	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
Ch3 CO_2	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	0.00
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
Ch5 O_2	Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	20.09

⇩ ∨ (∧) ENT

SPAN Cal.	Select Ch No. with UP / DOWN and ENT Back with ESC	
Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
▶ Ch2 SO_2	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
Ch3 CO_2	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	0.00
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	0.0
Ch5 O_2	Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	20.09

⇩ ENT

SPAN Cal.	ENT : Go on calibration of selected Ch. ESC : Not calibration	
Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	▶ 0.0
Ch2 SO_2	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	▶ 0.9
Ch3 CO_2	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	▶ 0.34
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	▶
Ch5 O_2	Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	▶ 20.09

⇩ ENT

To Measurement screen after executing Manual Span Calibration

7. MAINTENANCE

7.1 Daily check

(1) Zero calibration and span calibration

(1) Perform zero calibration. For the calibration procedures, refer to Section 6.8.1 “Manual zero calibration”.

(2) Then, perform span calibration. For the calibration procedures, refer to Section 6.8.2 “Manual span calibration”.

(3) Zero/span calibration should be carried out once a week, or as required.

(2) Flow rate check

(1) Flow rate of sample gas, reference gas and purge gas are as follows:

- Sample gas flow : 1.0L/min ± 0.2L/min
- Reference gas flow : 1.0L/min ± 0.2L/min
- Purge gas flow : About 1L/min

(2) Check and maintenance should be carried out every day, or as required.

7.2 Daily check and maintenance procedures

Table 7.1 Maintenance and check table

	Parts to be checked	Phenomena		Remedy
Daily check	Indication value	Indication values are too low. Indication values are too high.	(1) Dust contamination in sampling cell.	(1) Clean the sampling cell. In addition, check sampling devices, especially gas filter.
			(2) Air is absorbed midway in the sampling piping.	(2) Find out cause of leak and repair.
	Flow rate of sampling gas, reference gas and purge gas (Purge gas flow is included when purging).	Deviation from regulated flowing quantity (0.8L/min to 1.2L/min).	———	Adjust by needle valve of flow rater.
Weekly check	Zero point of gas analyzer	Deviation from zero point.	———	Zero adjustment
	Span point of gas analyzer	Deviation from span point.	———	Span adjustment
Yearly check	Gas analyzer	Regardless of any phenomena		Overhaul or service in accordance with proper service

7.3 Long term maintenance

Create a long-term maintenance component procurement plan based on the “Gas analyzer annual inspection plant” indicated below.

Gas analyzer annual inspection plan

The recommended replacement period of components varies depending on the installation conditions.

1) The recommended replacement period is a recommented standard criterion, and varies depending on the environment of the field, conditions of measuring gas and other factors.
2) The recommended replacement period is not the warranty period. It is provided as a preventative maintenance program baseline schedule.

• Installation conditions

1) Ambient temperature: –5˚C to +40˚C
2) Humidity: 90%RH or less
3) Corrosive gases: None
4) No radiated heat, direct sunlight or rain/wind
5) Dust: No more than local environmental standards permit
6) Vibration: None

• Sample gas conditions

1) Flow rate: 1.0 ±0.2L / min
2) Temperature: 0 to 50˚C
3) Dust: 100 μg/Nm^3 or less in particle size of 0.3 μm or smaller
4) Mist: Unallowable
5) Moisture: For CO, NO, SO_2 measurement: less than 2˚C saturation point.
   For CO_2 measurement: less than -30˚C saturation point (with comparable moistive levels in sample and reference gases).

Please consult with us regarding gas analyzer maintenance service requirements.

We may assist in providing access and support via a qualified service network.

No.	Component name	Q'ty	Recommended replacement period (year)	Year										
				Delivered year	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Fuel cell O_2 analyzer (build-in)	1	2			○		○		○		○		○
2	Infrared light source	1	5						○					○
3	O-ring for sampling cell	2	2			○		○		○		○		○
4	Detector	1	5						○					○
5	LCD	1	3				○			○			○	
6	Solenoid Valve	2	3				○			○			○	
7	Main power supply unit	1	5						○					○
8	Main power PCB	2	5						○					○

7.4 Cleaning of sampling cell

Entry of dust or water drops in the sampling 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.

⚠ CAUTION

Maintenance actions should only be accomplished by properly trained and qualified personel. Not withstanding these maintenance steps, local facility and organizational safety program requrirements must be followed.

7.4.1 Disassembly and assembly of sampling cell

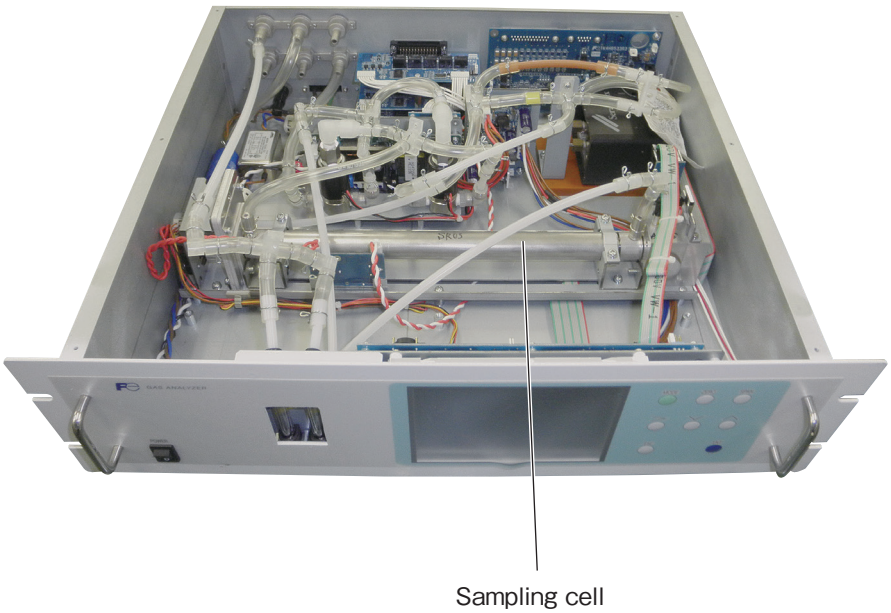
There are two kinds of sampling cells, block cells (cell length: 4 mm, 8 mm, 16 mm, 32 mm) and pipe cells (Cell length: 64 mm, 125 mm, 250 mm and 300 mm).

2-component analyzer may incorporate both sampling cells in one optical unit. In such a case, detach the pipe cell and then block cell (See Fig. 7-3).

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

1) Stop measured gas. If it is harmful, purge the pipe cell thoroughly with zero gas.
2) Turn OFF the power switch and disconnect the Power supply cord.
3) Remove the cover (with loose 6 screws on the cover).
4) Remove the tube connected to the pipe cell.
5) Loosen and remove a screw (No. 7) from the cell retainer (No. 11) fastening the pipe cell (bothends).
6) Remove the cell from the measuring unit and unscrew the infrared transmission window (No. 14) at both ends in the right direction.
7) For assembly, reverse the disassembly procedure and make sure to put the space in 0.5mm between light source unit and measuring cell and detector.

   In addition screw the pipe part of gas inlet (No. 14) with window on the both side to the measuring cell with matching the pipe part and marked part of measuring cell.



No.	Name
1	Screw (for fixing the light source unit)
2	Screw (for fixing the detector)
3	Screw (for fixing the gas filter)
4	Base plate
5	Light source unit
6	Screw (for fixing the support)
7	Screw (for fixing the cell retainer)
8	Gas filter
9	Filter
10	Support
11	Cell retainer
12	Pipe cell
13	O-ring
14	Infrared transmission window
15	Detector
16	Light source power PCB

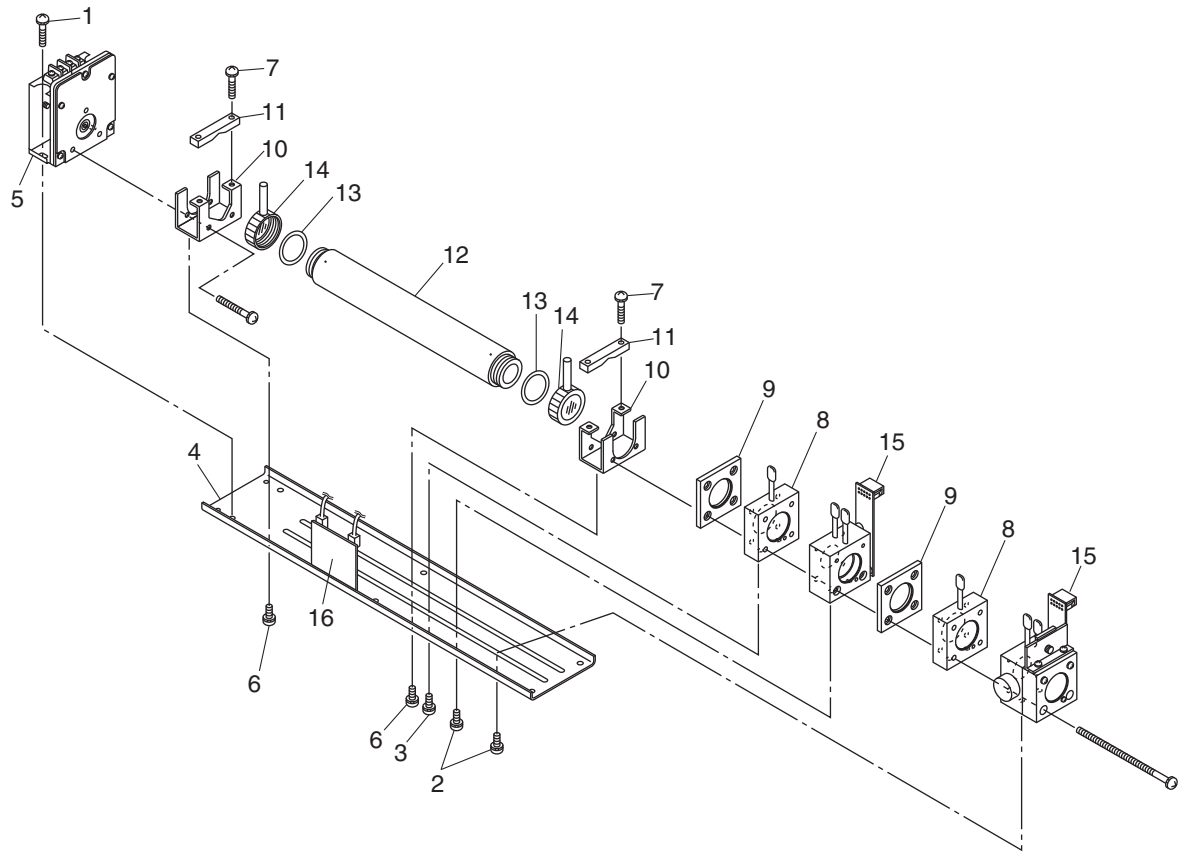


Fig. 7-1 Configuration of measuring unit (pipe cell)

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

1) For Steps 1) to 4), see 7.4.1 a. How to remove pipe cell.
5) Disconnect and remove detector output cables from detector output circuit board (No.12). Applying identification mark on top of removed cable connector will ensure proper pin assignment later.
6) Unscrew the two screws (No. 10) that hold the detector to the light source unit to remove the detector from the measuring unit. The block cell can be removed together with the detector.
7) To remove the block cell, unscrew the two screws (No. 6) holding the block cell to the detector. The infrared transmission window (No. 8) 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 (No. 9) is placed between the window holder and block 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 cable connector into the PCB, be careful to attach the connector with proper pin assignment (top/bottom).

No.	Name
1	Screw (for fixing the light source unit)
2	Filter
3	Screw (for fixing the detector)
4	Base plate
5	Light source unit
6	Screw (for fixing the block cell)
7	Block cell
8	Infrared transmission window (window holder)
9	O-ring
10	Screw (for fixing the measuring unit)
11	Gas filter
12	Detector
13	Light source power PCB

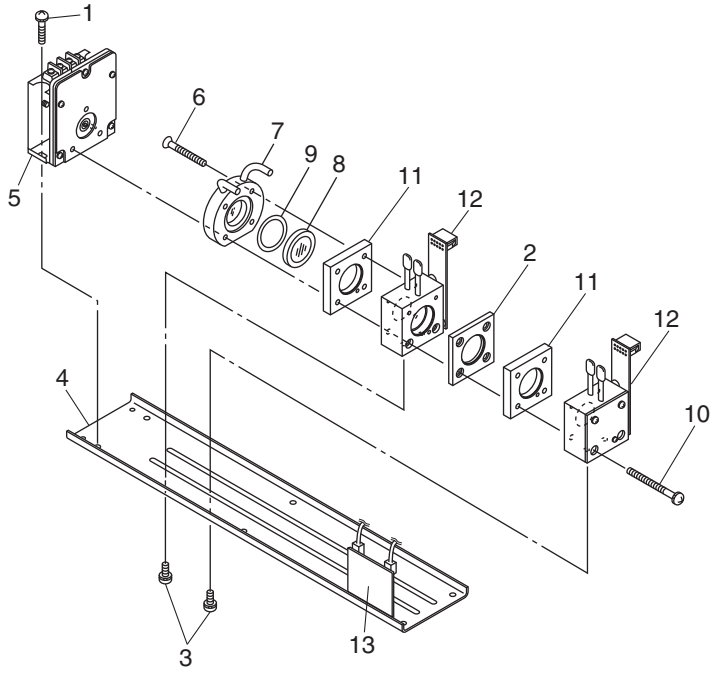


Fig. 7-2 Configuration of measuring unit (block cell)

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

1) For Steps 1) to 4), see 7.4.1 a, How to remove pipe cell.
5) Disconnect and remove detector output cables from detector output circuit board (No.9). Applying identification mark on top of removed cable connector will ensure proper pin assignment later.
6) Disconnect wiring to the 2-pin terminals of the infrared ray light source assembly and chopper motor pin connector from the PCB (No. 17).
7) Detach the 6 screws (No. 16) fastening the base plate (No. 3) to remove the measuring unit.
8) For assembly, reverse the disassembly procedures.

Note) Special care should be taken when assembling or disassembling the measuring cell to avoid the application of force to the detector pipe or 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 the light source unit)
2	Screw (for fixing the detector)
3	Base plate
4	Light source unit
5	Screw (for fixing the block cell)
6	Block cell
7	Infrared transmission window
8	O-ring
9	Detector
10	Gas filter
11	Support
12	Screw (for fixing the cell retainer)
13	Cell retainer
14	Pipe cell
15	Filter
16	Screw (for fixing the base plate)
17	Light source power PCB

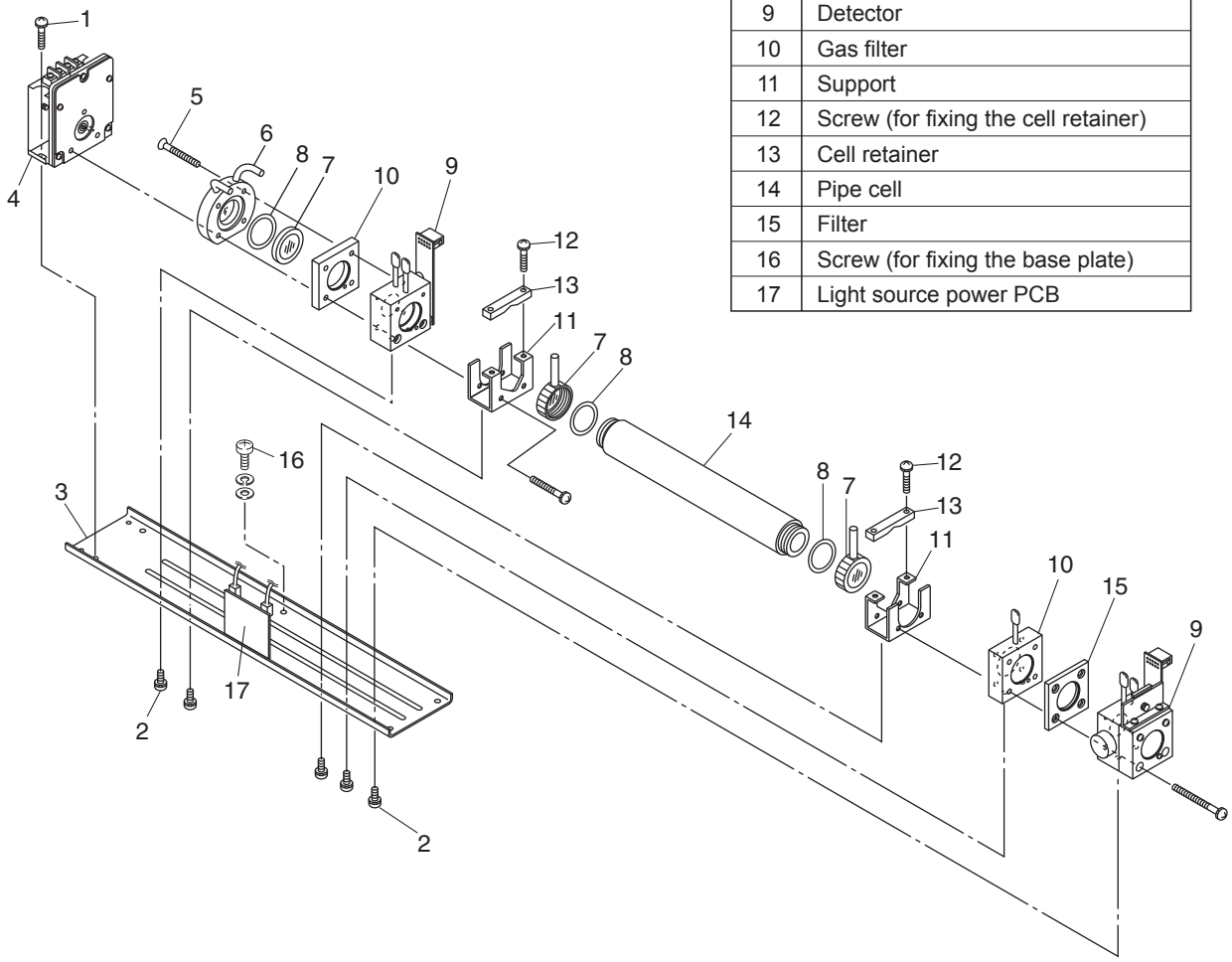


Fig. 7-3 Configuration of measuring unit (2-component analyzer: block cell + pipe cell)

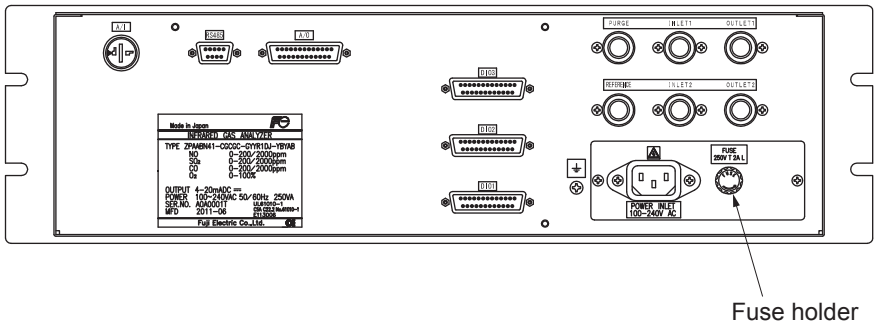
7.4.2 How to clean sampling cell

1) To clean the sampling cell inside or infrared ray transmission window, first clear large dirt of it with a soft brush and then wipe lightly with soft cloth.
   Do not use abrasive or paper 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 sampling cell interior is very dirty, use a soft lint-free 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 the sampling cell or window cleaning is completed, assemble according to the sampling cell disassembly and assembly procedures. Assemble the pipe carefully. If it becomes bent or damaged, replace it with a new part.
5) Do not wash the sample cell components with water.

7.5 Replacement of fuse



Rear view

Note) Prior to the following work, be sure to repair blown down fuse (short, etc), if any.

(1) Turn "OFF" the main power supply switch to the analyzer.
(2) Turn the fuse holder cap (shown in the figure above) counterclockwise and pull it out, and the cap will be removed. Remove a fuse out of the holder. Replace it with a new one. (250VAC/2A, Time-lag type).
(3) Reinstall the fuse holder cap, turn ON the power supply switch. The work will be completed if the analyzer starts up normally.

8. ERROR MESSAGE

If errors occur, the following contents are displayed.

Error display	Error contents	Probable causes
Error No.1	Light source/motor rotation is faulty.	• Infrared light source is faulty. • Sector motor is not properly run or is stopped. • Amplifier circuit is faulty.
Error No.2	Detector failure	• Detector voltage circuit is faulty. • Detection element is broken or faulty. • Amplifier circuit is faulty.
Error No.3	A/D error	• A/D conversion circuit is failure.
Error No.4	Zero calibration is not within the allowable range.	• Zero gas is not supplied. • Zero error due to dirty cell. • Detector is faulty.
Error No.5	Amount of zero calibration (indication value) is over 50% of full scale.	
Error No.6	Span calibration is not within the allowable range.	• Span gas is not supplied. • Calibrated concentration setting does not match cylinder concentration. • Zero calibration is not performed normally. • Span error due to dirty cell. • Detector sensitivity has deteriorated.
Error No.7	Amount of span calibration (difference between indication value and calibrated concentration) is over 50% of full scale.	
Error No.8	Measured values fluctuate too much during zero and span calibration.	• Calibration gas is not supplied. • Time for flowing calibration gas is short.
Error No.9	Calibration is abnormal during auto calibration.	• Error corresponding to No. 4 to No. 8 occurred during auto calibration.
Error No.10	Output cable connection is improper.	• DIO circuit is failure. • Internal wiring to the DIO circuit is broken.

When errors No. 1 to No. 3 and No. 10 occur, instrument error (FAULT) contact output is closed.

When errors No. 4 to No. 9 occurs, calibration error contact output is closed.

<Troubleshooting at the occurrence of error>

When error No.1 occurs, remove the top cover of the analyzer and check the LED on the light source power PCB. If LED light is turned off, this has been caused by disconnection of the light source.

When errors No. 1 to No. 3 and No. 10 occurs, the analyzer is faulty. Contact your dealer or our sales office.

When errors No. 4 to No. 8 occurs, the calibration procedure may be incorrect.

Check the following items, and if error still occurs, contact us as shown above.

(1) Is the calibration gas supplied in the analyzer?

(2) Does the calibration operation match the supplied gas? (For example, zero calibration is performed while flowing the span gas.)

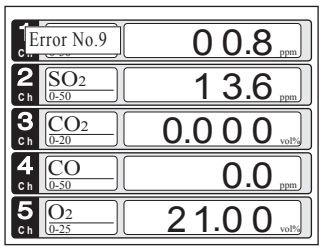
(3) Does the supplied gas concentration match the gas concentration set at the calibration concentration setting?

Also, when errors No. 5 and No. 7 occurs, you can perform calibration forcibly, following the procedure shown below. Use it as fault recovery when calibration fails and calibration contents are missed.

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

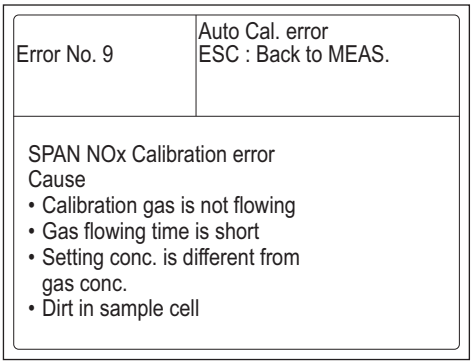
Measurement screen



ENT

ESC

Display of error contents

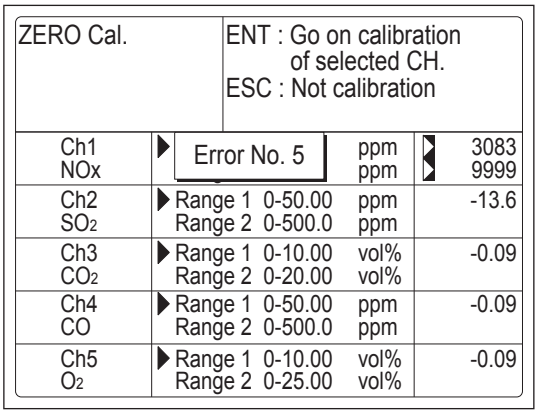


• Press the ESC key to delete the error display.

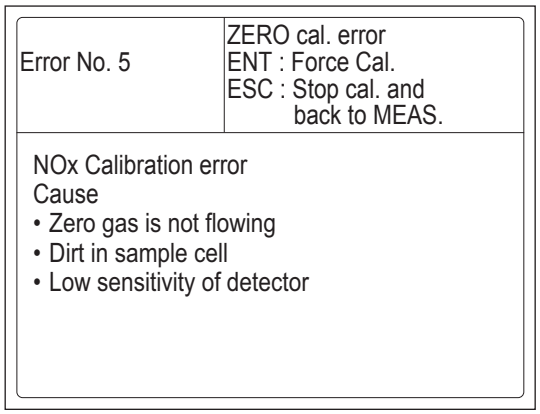
• If the ESC key is pressed without removing the cause of an error, the error will be displayed again.

• When more than one error occurs, pressing the > key moves to another error display.

In case of Error No. 5 and No. 7



ENT



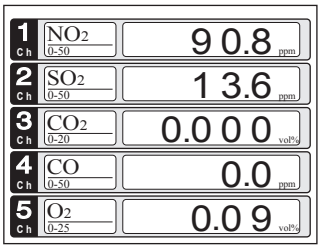
• Pressing ESC deletes the error display.

ENT

Calibrated forcedly

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

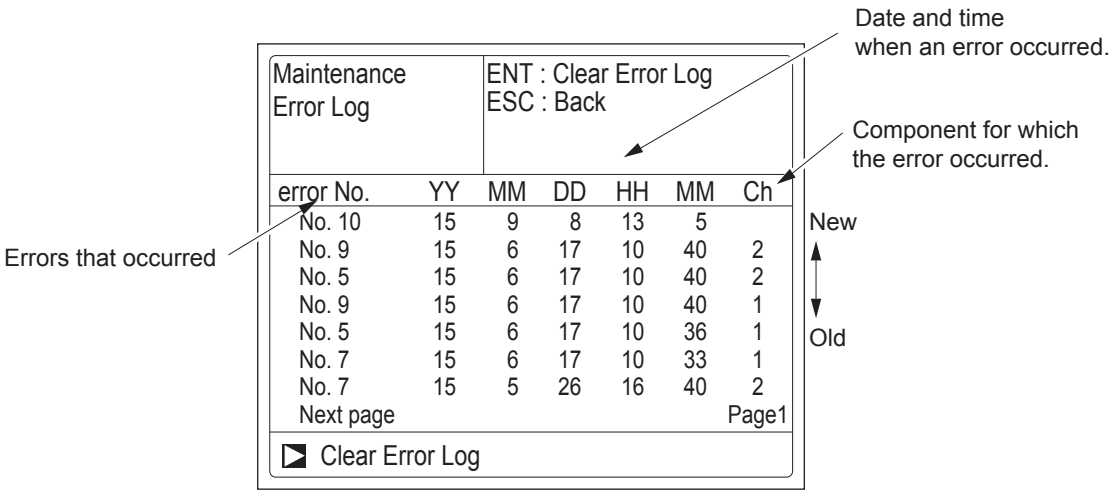
ESC



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



* Up to 14 errors can be saved in the error history; the oldest error will be deleted one by one every time a new error occurs.
* If the power supply is turned OFF, the contents in the error log file will not be lost or damaged.

Deletion of error history

Press the ENT key on the above screen, and the "Error Log Clear" will be highlighted. Further pressing the ENT key will clear the error history.

9. SPECIFICATIONS

9.1 General specifications

1. Standard Specifications

Principle of measurement:

NO, SO_2, CO_2, CO;
Non-dispersion infrared-ray absorption method (NDIR method)
Single light source and single beams (single beam system)

O_2 ;Fuel cell O_2 analyzer (built in) or paramagnetic O_2 analyzer (built-in) or zirconia O_2 analyzer (externally installed TYPE: ZFK7)

Measurable gas components and measuring range:

	Minimum range	Maximum range
NO	0 - 50ppm	0 - 5000ppm
SO_2	0 - 50ppm	0 - 5000ppm
CO_2	0 - 50ppm	0 - 25vol%
CO	0 - 50ppm	0 - 5000ppm
O_2 (built in fuel cell)	0 - 10vol%	0 - 25vol%
O_2 (built-in Paramagnetic)	0 - 5vol%	0 - 100vol%
O_2 (External Zirconia)	0 - 5vol%	0 - 25vol%

- Max. 5 components measurement including O_2.
- Measuring range ratio max. 1:10 (except O_2)
- Measuring ranges are changeable between the specified minimum and maximum range
  Settable one range or two ranges
  * In measurement range, low range is called first range, high range is called second range.
- For possible combinations of components and ranges, refer to Table 1.

Measured value indication:

Digital indication in 4 digits
(LCD panel with LED back light)

- Instantaneous value of each component
- Instantaneous value after O_2 correction (only in NO, SO_2, CO measurement with O_2)
- Average value after O_2 correction (only in NO, SO_2, CO measurement with O_2)
- O_2 average value

Analog output signals:

4 to 20mA DC or 0 to 1V DC,
isolated internally from circuit and ground.
Output lines are non-isolated each other.;
12 outputs max.
Allowable load 550Ω for 4 to 20mA DC
Allowable load 100kΩ for 0 to 1V DC

* Refer to Section 5.3 (3) “Contents of measured channel (Ch)” for the channel No. of displayed values and analog output signals.

Analog input signal:

For signal input from externally installed O_2 analyzer.
Signal requirement;
(1) Signal from Fuji’s Zirconia O_2 analyzer (TYPE: ZFK7)
(2) 0 to 1V DC from an O_2 analyzer
Input section is not isolated. This feature is effective when an O_2 sensor is not built in.

* Externally installed O_2 analyzer should be purchased separately.

Digital output: (Option)

1c contact (24V DC/1A, resistive load) max.15 outputs
Instrument error, calibration error, range identification, auto calibration status, solenoid valve drive for auto calibration, High/Low limit alarm contact output

* All relay contacts are isolated mutually and from the internal circuit.

Digital input: (Option)

Voltage contact (supply 12 to 24V DC (15mA max)) Max.9 inputs
Remote range change over, auto calibration remote start, remote hold, average value reset, Isolated from the internal circuit with photocoupler.

Power supply:
Voltage rating ; 100V to 240V AC
Allowable range ; 85V to 264V AC
Frequency ; 50Hz/60Hz
Power consumption ; 110VA max.

Operation conditions:
Ambient temperature ;
–5˚C to 45˚C
(40°C max. when 2 optical systemat 200V AC power source)
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 × W × D):
133 x 483 x 382mm

Mass: Approx. 13 kg

Finish color: Front panel; Cool gray (PANTON 1C-F)

Enclosure: Steel casing, for indoor use

Material of gas-contacting parts:
Gas inlet/outlet; SUS304
Sample cell; SUS304,chloroprene rubber
Infrared-ray transmitting window; CaF2
Paramagnetic O_2 sensor cell; SUS316
Fuel cell O_2 sensor cell; ABS resin
Internal piping; Toaron, Teflon, Polypropylene
Solenoid valve; fluoro-rubber

Gas inlet/outlet: Rc1/4 or NPT1/4 internal thread

Purge gas flow rate: 1L/min (when required)

Life time of fuel cell O_2 analyzer: 2 years

2. Standard Functions

Output signal holding:
Output signals are held unchanged during manual and auto calibrations by activation of holding (turning "ON" its setting).
The values held are those just before start calibration mode or setting value.
Usage is selectable.
Indication of instantaneous values will not be held.

Switch ranges: The switch ranges function is available in manual, auto, and remote modes. Only preset switch method is effective.

Manual: Allows range to switch by key operation.

Auto: Automatically switched from first range to second range when the measured value exceeds 90%FS of first range.
Automatically switched from second range to first range when the measured value drops to 80% or less first range.

Remote: (Option) Voltage contact input
Allows range to switch via an external signal when remote range switch input is received.
When the contact input terminals for each component are input voltage, the first range is selected, and it is switched to the second range when the terminals are open.

* These switch range value are settable between the first range and second range values (low/high range values).

3. Optional Functions

Remote output holding:
Output signal is held at the last value or preset value by voltage input to the remote output holding input terminals.
Holding is maintained while is voltage input to the terminals. Indication of instantaneous values are not held.

Range identification signal:
The present measuring range is identified by a contact position.
The contact output terminals close for each component when the first range is selected, and open when the second range is selected.

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 900 seconds (in increments of 1 second)

Auto calibration remote start:
Auto calibration starts by opening the auto calibration remote start input terminal after short circuiting for 1.5 sec or longer.
Auto calibration starts when contacts open.

Auto zero calibration:
Auto zero calibration is carried out periodically at the preset cycle.
This cycle is independent from "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 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 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 within 60 to 900 seconds (in increments of 1 second)

High/low limit alarm:
Alarm contact output turns on when measurement value reaches the preset high or low limit alarm value.
Contacts close when the instantaneous value of each channel exceeds the high alarm limit value or falls below the low alarm limit value.

Instrument error contact output:
Contacts turn on at occurrence of analyzer error No. 1, 2, 3 or 10.

Calibration error contact output:
Contacts turn on at occurrence of manual or auto calibration error (any of errors No. 4 to 9).

Auto calibration status contact outputs:
Contacts turn on during auto calibration.

O_2 correction: Correction of measured NO, SO_2 and CO gas concentrations into values at reference O_2 concentration.

Correction formula:

$$C = \frac{21-On}{21-Os} \times Cs$$

C : Sample gas concentration after O_2 correction
C_S : Measured concentration of sample gas
O_S : Measured O_2 concentration (Limit setting: 1 to 20% O_2)
O_n : Reference O_2 concentration (value changeable by setting.0 to 19% O_2)

Average value after O_2 correction and O_2 average value calculation:

The result of O_2 correction or instantaneous O_2 value can be output as an average value over the preset period of time.
Moving average method is used. Sampling interval is 30 secs.
(Output is updated every 30 seconds. Update is the averaged value of the most recently elapsed averaging time period.)
Averaging time period 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 sec or longer.
Output is reset by input voltage and restarted by opening the terminal circuit.

Communication function:

RS-485 (9pins D-sub connector)
Half-duplex bit serial
Start-stop synchronization
ModbusTM protocol
Contents : Read/Write parameters
Read measurement concentration and instrument status.
Remark : When connecting via RS-232C interface, an RS-232C ↔ RS-485 converter should be used.

Atmospheric pressure correction:

Measure atmospheric pressure and calculate compensation (for use, be sure to relieve the exhaust gas from analyzer to the atmosphere)

After atmospheric pressure correction;
Zero point : No influenced
Span point: The change is 0.5% measured value or less relating to the change of the atmospheric pressure 1%.
Correction range: 700hPa-1050hPa

4. Performance

Repeatability: ±0.5% of full scale
Linearity: ±1% of full scale
prior to atmospheric pressure correction (option)
Zero drift: ±0.5% of full scale/week (measurable component of NDIR)
±2.0% of full scale/week (O_2 sensor)
Span drift: ±2.0% of full scale/week
Response time (T_{90}) :
30 seconds or better
Response interval may be changed depending on timing of the switching gas by sample switching operation. (Td=5-20 seconds)

Interference from other gases:

Sample switching design effectively minimizes interference. But it may occur depending on component gas and its concentration.
Preprocessing can further decrease influence in this case.
Contact manufacturer for application specific advice.

5. EC Directive Compliance CE

LVD:
EN 61010-1
EN 62311

EMC:
EN 61326-1 (Table 2)
EN 61000-3-2 (Class A)
EN 61000-3-3
EN 61326-2-3

RoHS:
EN IEC63000

6. Requirements for Sample Gas

Flow rate: 1.0L / min ±0.2L / min
Temperature: 0 to 50˚C
Pressure: 10 kPa or less (Gas outlet side should be open to the atmospheric air.)
Dust: 100 µg/Nm^3 or less in particle size of 0.3 µm or smaller
Mist: Unallowable
Moisture: Less than 2°C saturation point. (Contain comparable sample gas and reference gas)
Corrosive component:
1 ppm or less

Standard gas for calibration:

Zero gas ; Dry N_2

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

In case a zirconia O_2 analyzer is installed externally and calibration is carried out on the same calibration gas line:

Zero gas ; Dry air or atmospheric air (Do not use with CO_2 measurement)

Span gas ; For other than O_2 measurement, each sample gas having concentration 90 to 100% of its measuring range
For O_2 measurement, O_2 gas of 1 to 2 vol%/remains N_2 gas

Reference gas for sample switching:

For sample gas dewpoint > 2°C sample switching reference gas is wet N_2 or atmospheric air.

For sample gas dewpoint < 2°C use dry N_2 or dry air. (Not contain measurement component gas.)

With CO_2 measurement, do not use atmospheric air and use N_2.

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 unit receives heavy vibration.
- Select a place where atmospheric air is clean.

9.2 Measurable component and range - availability check table -

Procedure of range selection

On one component analyzer:

First determine 1st range, then select 2nd range from the corresponding right column.

More than two components analyzer:

The 2nd range in the tables for two and more components is maximum available range.

Select the 2nd range less than or equal to the “2nd range (max)”.

1-component analyzer:NO

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm		
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

1-component analyzer:SO_2

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	0-1%
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

1-component analyzer:CO

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	0-1%
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

1-component analyzer:CO_2

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	0-1%
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

2-component analyzer:NO/SO_2

1-component:NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

2-component:SO_2	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

The second component should be selected as shown in the right table.

2-component analyzer:NO/CO

1-component:NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

2-component:CO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

The second component should be selected as shown in the right table.

2-component analyzer:CO_2/CO

1-component:CO_2		2-component:CO
1st range	2nd range (max)	1st range/2nd range (max)
0-50ppm	0-500ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-100ppm	0-1000ppm	
0-200ppm		
0-250ppm		
0-300ppm		
0-500ppm		
0-200ppm	0-2000ppm	0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-250ppm	0-2500ppm	
0-300ppm		
0-500ppm	0-5000ppm	
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-3000ppm		
0-3000ppm		
0-3000ppm		
0-5000ppm		
0-5%	0-25%	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-10%	0-25%	
0-20%	0-25%	
0-25%	0-25%	

3-component analyzer:NO/SO_2/CO >>> Combination of 1st component NO and 2nd component SO_2/3rd component CO

1-component:NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

+

2-component:SO_2		3-component:CO
1st range	2nd range (max)	1st range/2nd range (max)
0-50ppm	0-500ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/2000ppm, 0-1000/2000ppm, 0-2000ppm
0-100ppm	0-1000ppm	
0-200ppm	0-2000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/3000ppm, 0-1000/3000ppm, 0-2000/3000ppm, 0-2500/3000ppm, 0-3000ppm
0-250ppm	0-2500ppm	
0-300ppm		
0-500ppm	0-3000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-500ppm	0-5000ppm	0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-3000ppm	0-5000ppm	0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-5000ppm	None	

4-component analyzer:NO/SO_2/CO_2/CO >>> 1st NO/4th CO and 2nd SO_2/3rd CO_2

1-component:NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

+

2-component:SO_2		4-component:CO
1st range	2nd range (max)	1st range/2nd range (max)
0-50ppm	0-500ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/2000ppm, 0-1000/2000ppm, 0-2000ppm
0-100ppm	0-1000ppm	
0-200ppm	0-2000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/3000ppm, 0-1000/3000ppm, 0-2000/3000ppm, 0-2500/3000ppm, 0-3000ppm
0-250ppm	0-2500ppm	
0-300ppm		
0-500ppm	0-3000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-500ppm	0-5000ppm	0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-3000ppm	0-5000ppm	0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-5000ppm	None	

+

CO_2 component analyzer

3-component:CO_2	
1st range	2nd range (max)
0-5vol%	0-25vol%

Table 2 Channel (Ch) No. and display/output contents comparison table

Code symbol			
6th digit	7th digit	21st digit	Display /output contents
P	Y	Y	Ch1:NO
A	Y	Y	Ch1:SO_2
D	Y	Y	Ch1:CO_2
B	Y	Y	Ch1:CO
F	Y	Y	Ch1:NO, Ch2:SO_2
G	Y	Y	Ch1:NO, Ch2:CO
J	Y	Y	Ch1:CO_2, Ch2:CO
N	Y	Y	Ch1:NO, Ch2:SO_2, Ch3:CO
V	Y	Y	Ch1:NO, Ch2:SO_2, Ch3:CO_2, Ch4:CO
P	1to 4	Y	Ch1:NO, Ch2:O_2
A	1to 4	Y	Ch1:SO_2, Ch2:O_2
D	1to 4	Y	Ch1:CO_2, Ch2:O_2
B	1to 4	Y	Ch1:CO, Ch2:O_2
F	1to 4	Y	Ch1:NO, Ch2:SO_2, Ch3:O_2
G	1to 4	Y	Ch1:NO, Ch2:CO, Ch3:O_2
J	1to 4	Y	Ch1:CO_2, Ch2:CO, Ch3:O_2
N	1to 4	Y	Ch1:NO, Ch2:SO_2, Ch3:CO, Ch4:O_2
V	1to 4	Y	Ch1:NO, Ch2:SO_2, Ch3:CO_2, Ch4:CO, Ch5:O_2
P	1to 4	A *	Ch1:NOx, Ch2:O_2, Ch3:corrected NOx
A	1to 4	A *	Ch1:SO_2, Ch2:O_2, Ch3:corrected SO_2
B	1to 4	A *	Ch1:CO, Ch2:O_2, Ch3:corrected CO
F	1to 4	A *	Ch1:NOx, Ch2:SO_2, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected SO_2
G	1to 4	A *	Ch1:NOx, Ch2:CO, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected CO
J	1to 4	A *	Ch1:CO_2, Ch2:CO, Ch3:O_2, Ch4:corrected CO
N	1to 4	A *	Ch1:NOx, Ch2:SO_2, Ch3:CO, Ch4:O_2, Ch5:corrected NOx, Ch6:corrected SO_2, Ch7:corrected CO
V	1to 4	A *	Ch1:NOx, Ch2:SO_2, Ch3:CO_2, Ch4:CO, Ch5:O_2, Ch6:corrected NOx, Ch7:corrected SO_2, Ch8:corrected CO
P	1to 4	C *	Ch1:NOx, Ch2:O_2, Ch3:corrected NOx, Ch4:corrected NOx average
A	1to 4	C *	Ch1:SO_2, Ch2:O_2, Ch3:corrected SO_2, Ch4:corrected SO_2 average
B	1to 4	C *	Ch1:CO, Ch2:O_2, Ch3:corrected CO, Ch4:corrected CO average
F	1to 4	C *	Ch1:NOx, Ch2:SO_2, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected SO_2, Ch6:corrected NOx average, Ch7:corrected SO_2 average
G	1to 4	C *	Ch1:NOx, Ch2:CO, Ch3:O_2, Ch4:corrected NOx, Ch5:corrected CO, Ch6:corrected NOx average, Ch7:corrected CO average
J	1to 4	C *	Ch1:CO_2, Ch2:CO, Ch3:O_2, Ch4:corrected CO, Ch5:corrected CO average
N	1to 4	C *	Ch1:NOx, Ch2:SO_2, Ch3:CO, Ch4:O_2, Ch5:corrected NOx, Ch6:corrected SO_2, Ch7:corrected CO, Ch8:corrected NOx average, Ch9:corrected SO_2 average, Ch10:corrected CO average
V	1to 4	C *	Ch1:NOx, Ch2:SO_2, Ch3:CO_2, Ch4:CO, Ch5:O_2, Ch6:corrected NOx, Ch7:corrected SO_2, Ch8:corrected CO, Ch9:corrected NOx average, Ch10 :corrected SO_2 average, Ch11:corrected CO average

* When the 21st digit code is A or C, the component of the NO analyzer is displayed as NOx.

9.3 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 22 23 24 25 ← Digit
			Z P B B 2 - - -
4	<Specification/structure>		
	Horizontal type(Terminal block for power supply)		A
	Horizontal type(Power inlet,with lock)	note1	D
5	<Mounting>		
	19 inch rack mounting type EIA comformity(horizontal type)		B
6	<Measurable component (NDIR)>		
	1st component / 2nd component / 3rd component / 4th component		
	NO / - / - / -		P
	SO_2 / - / - / -		A
	CO_2 / - / - / -		D
	CO / - / - / -		B
	NO / SO_2 / - / -		F
	NO / CO / - / -		G
	CO_2 / CO / - / -		J
	NO / SO_2 / CO / -		N
	NO / SO_2 / CO_2 / CO		V
	Others		Z
7	<Measurable component (O_2)>		
	None		Y
	External O_2 analyzer	note2	1
	External zirconia O_2 analyzer (ZFK7)		2
	Built-in fuel cell O_2 analyzer		3
	Built-in paramagnetic O_2 analyzer		4
8	<Revision code>		2
9	<Measuring range (NDIR)>1st component, 1st range	note3	
10	<Measuring range (NDIR)>1st component, 2nd range	note3	
11	<Measuring range (NDIR)>2nd component, 1st range	note3	
12	<Measuring range (NDIR)>2ndcomponent, 2nd range	note3	
13	<Measuring range (NDIR)>3rd component, 1st range	note3	
14	<Measuring range (NDIR)>3rd component, 2nd range	note3	
15	<Measuring range (NDIR)>4th component, 1st range	note3	
16	<Measuring range (NDIR)>4th component, 2nd range	note3	
17	<Measuring range (O_2)>		
	None		Y
	0-5/10vol%		A
	0-5/25vol%		B
	0-10/25vol%		C
	0-5vol%		L
	0-10vol%		M
	0-25vol%		V
	0-50vol%		P
	0-100vol%		R
	Others		Z
18	<Gas connection>		
	$Rc^1/_4$		1
	$NPT^1/_4$		2
19	<Output>		
	DC0-1V		A
	DC4-20mA		B
	DC0-1V+Communication function		C
	DC4-20mA+Communication function		D
20	<Indication/power supply cord>		
	In Japanese, cord rated 125V (PSE)	note4	J
	In English, cord rated 125V (UL)	note4	E
	In English, cord rated 250V (CEE)	note4	U
	In Chinese, cord rated 250V (CCC)	note4	C
21	<O_2 correction and O_2 correction average output>	note5	
	None		Y
	O_2 correction		A
	O_2 correction average		B
	O_2 correction and O_2 correction average		C
22	<Optional function (DIO)>		
	FAULT / A. Cal. / H/L Alarm / RangeID/Remote range		
	None		Y
	○		A
	○ / ○		B
	○ / ○		C
	○ / ○		D
	○ / ○ / ○		E
	○ / ○		F
	○ / ○ / ○		G
	○ / ○ / ○ / ○		H

Digit	Description	note
23	<Pressure compensation> None Pressure compensation	 note6
24	<Unit> ppm, Vol% mg/m³, g/m³	 note7
25	<Adjustment> For standard(combustion exhaust) Others	note8

RANGE CODE

Range	Code
0~50ppm	A
0~100ppm	B
0~200ppm	C
0~250ppm	D
0~300ppm	S
0~500ppm	E
0~1000ppm	F
0~2000ppm	G
0~2500ppm	U
0~3000ppm	T

Range	Code
0~5000ppm	H
0~1vol%	J
0~2vol%	K
0~3vol%	Q
0~5vol%	L
0~10vol%	M
0~20vol%	N
0~25vol%	V
Others	Z

O_2 measurement range

Measurement range	Range code	Fuel cell O_2 sensor (built - in)	Paramagnetic O_2 sensor (built - in)	Zirconia O_2 sensor (external)
0~5/10 vol%	A		○	○
0~5/25 vol%	B		○	○
0~10/25 vol%	C	○	○	○
0~5 vol%	L		○	○
0~10 vol%	M	○	○	○
0~25 vol%	V	○	○	○
0~50 vol%	P		○	
0~100 vol%	R		○	

note1)When “D” is specified at 4th digit, Power supply cord is supplied in the scope of supply. Cord specification should be specified at the 20th digit.

note2)When "1"is specified at 7th digit, O_2 pt analyzer signal has to be set as 0-1V DC linear corresponding to full scale. External zirconia O_2 analyzer and external O_2 analyzer are not included in the scope of supply, and has to be separately ordered.

note3)Select the range code for each range from the range code table shown above. Range of fuel cell O_2 analyzer is 0-10vol% or more.

note4)Select the type of voltage rating, plug type and applicable standard of the power supply cord by 20th digit. Select a power supply cord for using at the location of end-user.

note5)O_2 correction is calculated only for NO, SO_2 and CO.

note6)When 5 components measurement is specified, "H" must not be specified at 22nd digit. When 4 components measurement is specified and "H" is specified at 22nd digit, 3 points is maximum for alarm output function.

note7)When "B" is specified at 24th digit, measuring range should be specified by ppm range code. In this case NO,SO_2 and CO measuring range are corresponding range in mg/m³. Please refer to the table shown below for the corresponding range code based on "mg/m³".

note8)When "A"is specified at 25th digit ,the analyzer will be adjusted and delivered with the balance gas N_2. When other adjustment is required, please specify "Z". When "Z" is specified, please attach a list of gas composition contained in the measuring gas.

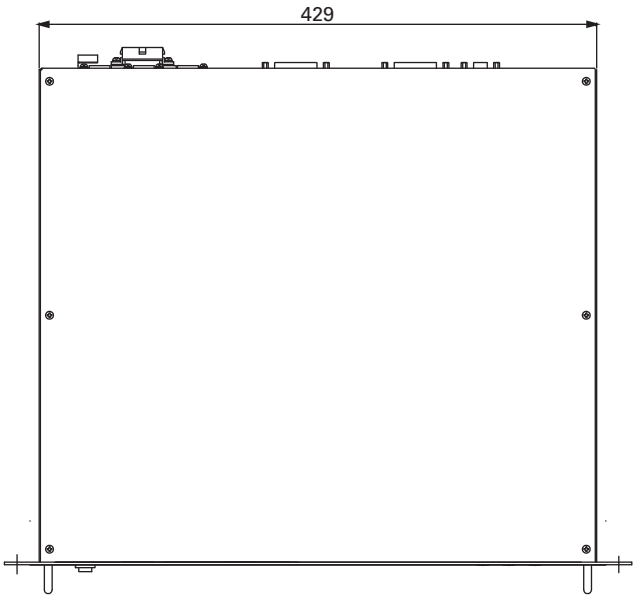
Corresponding mg/m³

Corresponding range in mg/m³				
Range code	Unit : ppm	NO	SO_2	CO
A	0-50ppm	0-65.0mg/m³	0-140mg/m³	0-60.0mg/m³
B	0-100ppm	0-130mg/m³	0-280mg/m³	0-125mg/m³
C	0-200ppm	0-260mg/m³	0-570mg/m³	0-250mg/m³
D	0-250ppm	0-325mg/m³	0-700mg/m³	0-300mg/m³
S	0-300ppm	0-400mg/m³	0-850mg/m³	0-375mg/m³
E	0-500ppm	0-650mg/m³	0-1,400mg/m³	0-600mg/m³
F	0-1,000ppm	0-1,300mg/m³	0-2,800mg/m³	0-1,250mg/m³
G	0-2,000ppm	0-2,600mg/m³	0-5,600mg/m³	0-2,500mg/m³
U	0-2,500ppm	0-3,300mg/m³	0-7,100mg/m³	0-3,000mg/m³
T	0-3,000ppm	0-4,000mg/m³	0-8,500mg/m³	0-3,750mg/m³
H	0-5,000ppm	0-6,600mg/m³	0-14.00g/m³	0-6,250mg/m³

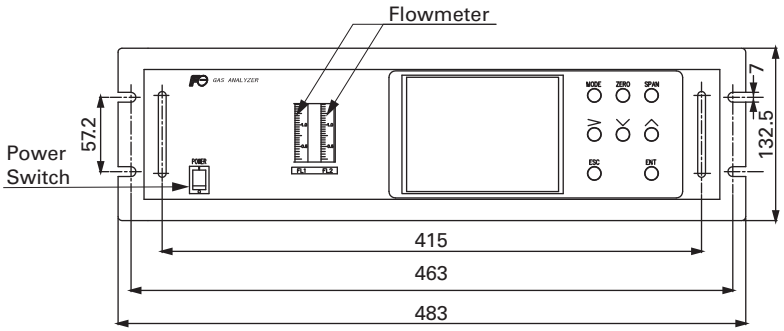
The conversion formula "ppm" unit into "mg/m³" unit.
NO (mg/m³) = 1.34 × NO (ppm)
SO_2 (mg/m³) = 2.86 × SO_2 (ppm)
CO (mg/m³) = 1.25 × CO (ppm)

9.4 Outline diagram (Unit : mm)

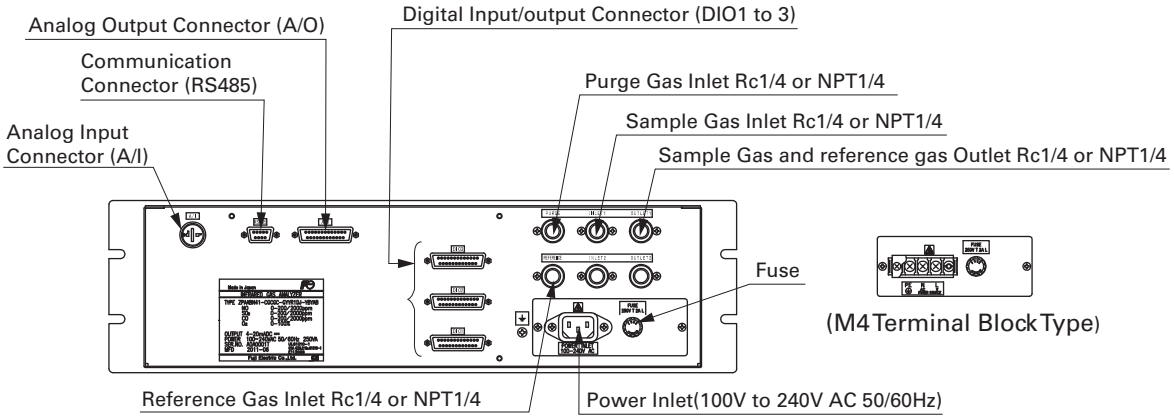
<TOP VIEW>



<FRONT VIEW>

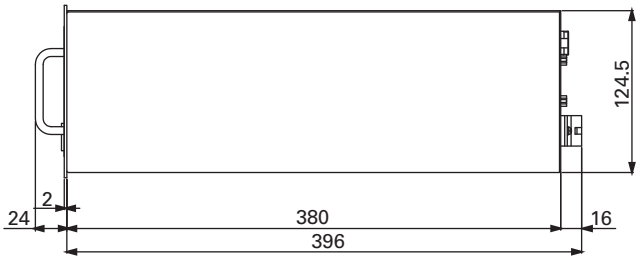


<REAR VIEW>

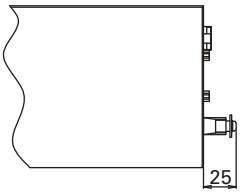


(M4 Terminal Block Type)

<SIDE VIEW>



(Power Inlet Type(100V to 240V AC 50/60Hz))



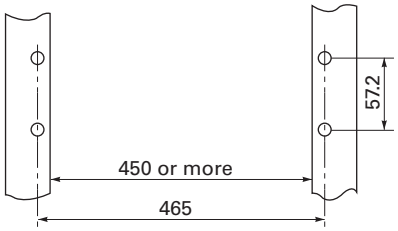
(M4 Terminal Block Type)

Mounting method

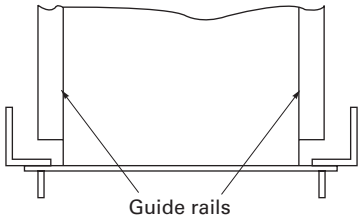
The analyzer weight should be supported at the bottom of the case.

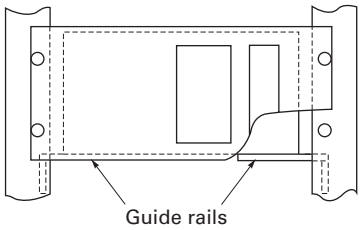
19-inch rack mounting type

<Rack dimensions>



Mounting diagram





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