Fuji Electric

Instruction Manual

COMPACT TYPE GAS ANALYZER

TYPE: ZSVS-2

INZ-TN2ZSVSa-E Fuji Electric Co., Ltd.

PREFACE

We are grateful for your purchase of Fuji Compact Type Gas Analyzer, TYPE: ZSVS.

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

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

Request

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

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CAUTION ON SAFETY

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

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

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

Caution on installation, transport and storage of gas analyzer	
⚠ DANGER	• This unit is not explosion-proof type. Do not use it in a place with explosive gases to prevent explosion, fire or other serious accidents.
⚠ CAUTION	• The gas analyzer is heavy. It should be installed with utmost care. Otherwise, it may tip over 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.

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 doors. • 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 for piping. Otherwise, fire may result.

Caution on wiring	
⚠ CAUTION	• Be sure to turn off all the power before installing wiring. Otherwise electric shock may result. • Be sure to perform class D grounding work. 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	• If unusual smell or sound has been produced, immediately stop the instrument. Any discharge produced may cause a fire.
⚠ 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, or accidents or injury may result. • Do not operate the analyzer for a long time with its door left open. Otherwise, dust, foreign matter, etc. may stick on internal walls, thereby causing faults.

Caution on use	
PROHIBITION	• Do not put stick or finger into the fan (exhaust gas outlet). You may get hurt by a turning fan. • Do not allow metal, finger or others to touch the power and input/output connectons in the instrument. Otherwise, faults, electric shock or injuries may be caused. • Do not smoke nor use a flame near the gas analyzer. Otherwise, a fire may be caused.

Caution on maintenance and check	
DANGER	• For correct handling of calibration gas or other reference gases, carefully read their instruction manuals beforehand. Otherwise, carbon monoxide or other hazardous gases may cause an intoxication particularly. • Before performing work 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. • Before replacing the gas filter of the gas analyzer or maintaining the washer, close the calibration gas valve and, if provided, the valve on the sample gas suction port. Otherwise, intoxication or accident may occur.
CAUTION	• If the fuse is blown, eliminate the cause, and then replace it with the one of the same capacity and type as before. Otherwise, shock hazard or fault may be caused. • Do not use a replacement part other than specified by the instrument maker. Otherwise, adequate performance will not be provided. Besides, an accident or fault may be caused. • Replacement parts such as a maintenance part should be disposed of as incombustibles. For details, follow the local ordinance. **Be sure to observe the following for safe operation avoiding the shock hazard and injury.** • Remove the watch and other metallic objects before work. • Do not touch the instrument wet-handed.

Others	
CAUTION	• If the cause of any fault cannot be determined despite reference to the instruction manual, be sure to contact your dealer or Fuji Electric's technician in charge of adjustment. If the instrument is disassembled carelessly, you may have a shock hazard 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 8, "Specifications".

3. Precautions and prohibitions

Refer to "Caution on safety"and Section 8, "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

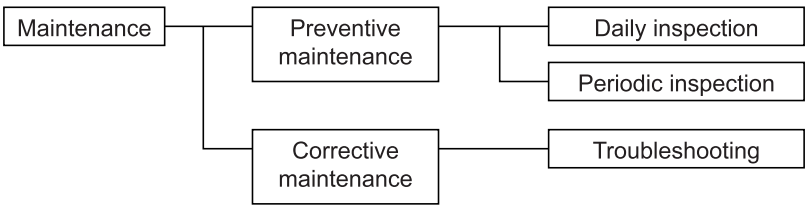
Regardless of the time period of the occurrence, if any failure occurs, the purchaser shall perform a primary failure diagnosis. However, at the purchaser's request, Fuji Electric or our service providers shall provide the diagnosis service for a fee. In such a case, the purchaser shall be charged for 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 5, "Inspection and maintenance".

(3) Corrective maintenance
Corrective maintenance is a measure to be taken after a trouble has occurred. Refer to Section 5 "Inspection and maintenance" and Section 7. "Troubleshooting". 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 equipment" 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.

Checking of contents of the package

• Check that all of the following are contained in the delivered package.

(1) Analyzer main unit

(2) Standard accessories (See “Table 1 Standard accessories.”)

Note: Consumable parts for about 6 months are included.

Table 1 Standard accessories

No.	Name	Q’ty	Note
1	Tubular fuse (2A)	2	(100V to 250V AC)
2	Power cord	1	The shape varies depending on specifications.
3	Ground wire	1	(5m)
4	Cable for output signals	1	(1m)
5	Filter paper for membrane filter (glass fiber)	5	
6	Pipe for connection	1	(5m)
7	Instruction manual (English)	1	INZ−TN1ZSVS−E

(3) Gas extractor (option)

(4) Gas tube (option)

(5) Spare parts for 1 year (by separate order) (See “6. Spare parts” for details.)

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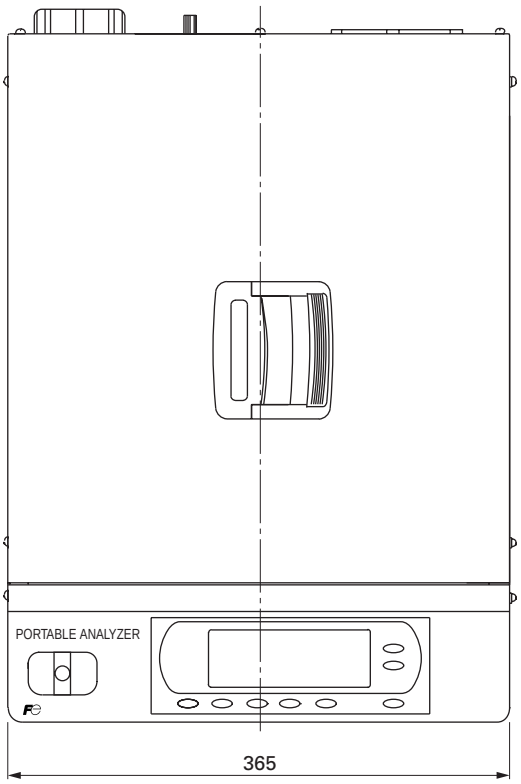
1. OVERVIEW

The compact type gas analyzer with built-in pump and filter is intended for heat treat furnace, plant cultivation, and research-purpose chemical analysis. With the gas extractor, either simplified measurement probe (non-fixed type) or continuous measurement probe (fixed type) is selectable at option. Since a high-sensitivity single-beam mass flow controller is adopted for the infrared sensor, long-term stability and maintainability are excellent.

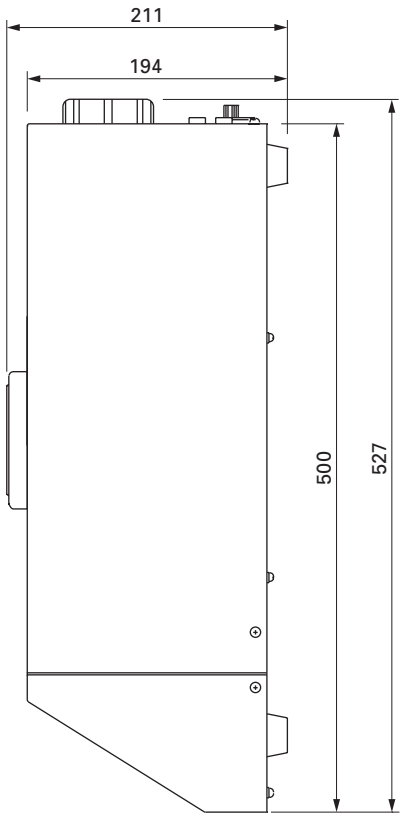
1.1 Outline diagram

1.1.1 Analyzing block (unit:mm)

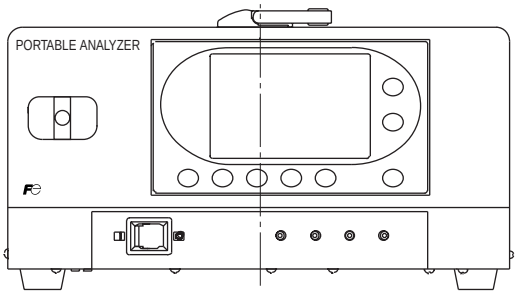
<Top view>



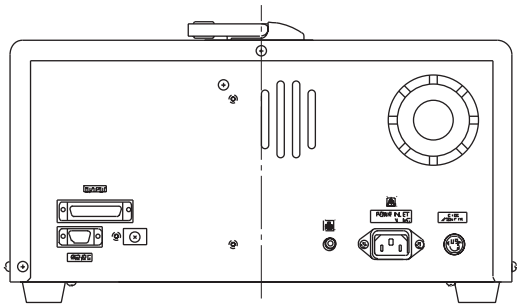
<Side view>



<Front view>



<Rear view>

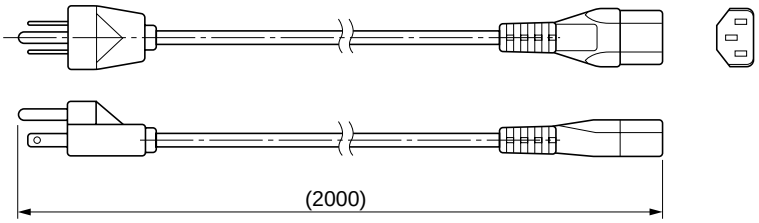


Mass : Approx. 12kg

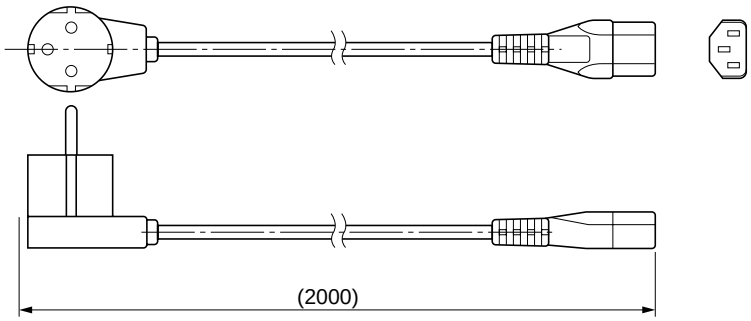
1.1.2 Power cord and signal cable (unit:mm)

- **Power cord for domestic and North American use (North American type), rated voltage 125V AC.**

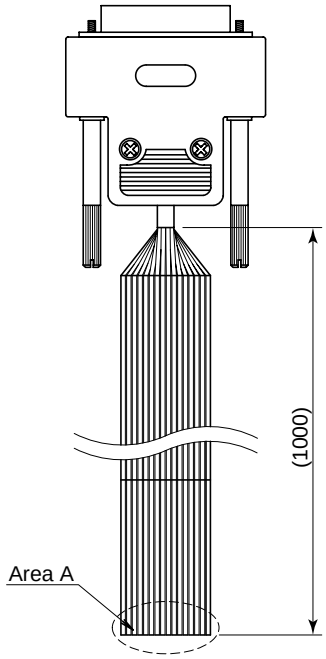
  Note: The standards for domestic and North American use are different, but the shape is the same.



- **Power cord for European use (European type), rated voltage 250 V AC**

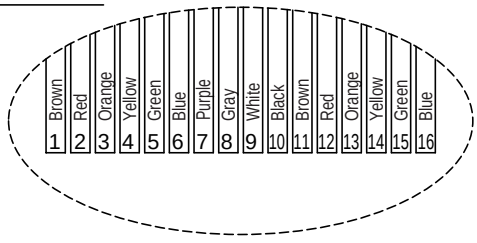


- **Output cable**

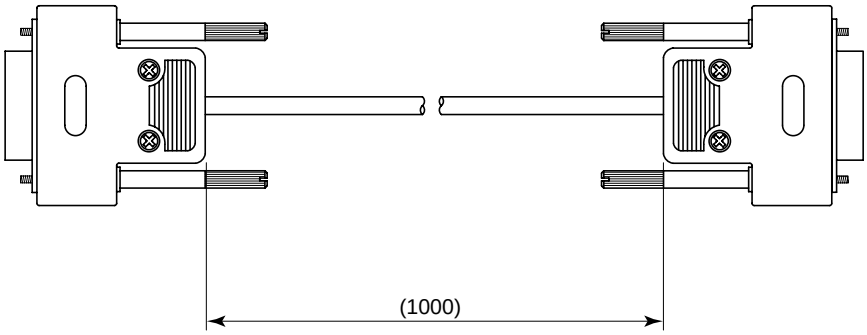


Output channel	+CH1−		+CH2−		+CH3−		+CH4−		+CH5−		+CH6−		+CH7−		+CH8−	
Connector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Cable color	Brown	Red	Orange	Yellow	Green	Blue	Purple	Gray	White	Black	Brown	Red	Orange	Yellow	Green	Blue

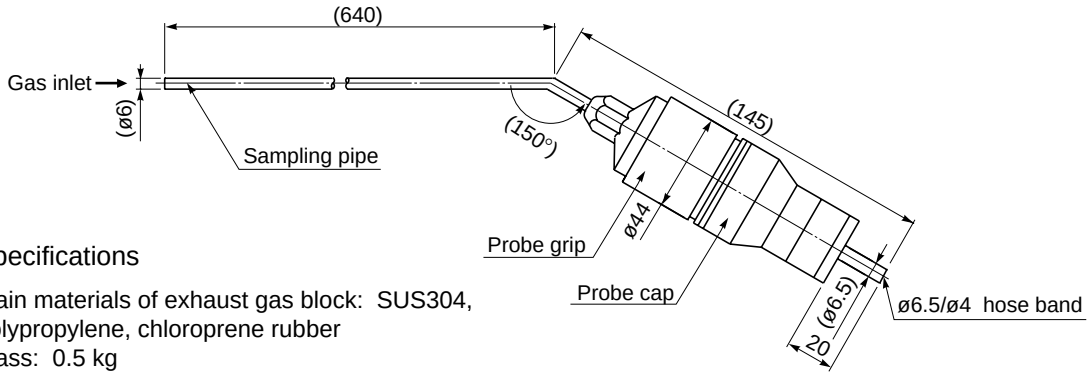
Details of area A



- **Control input/output cable**



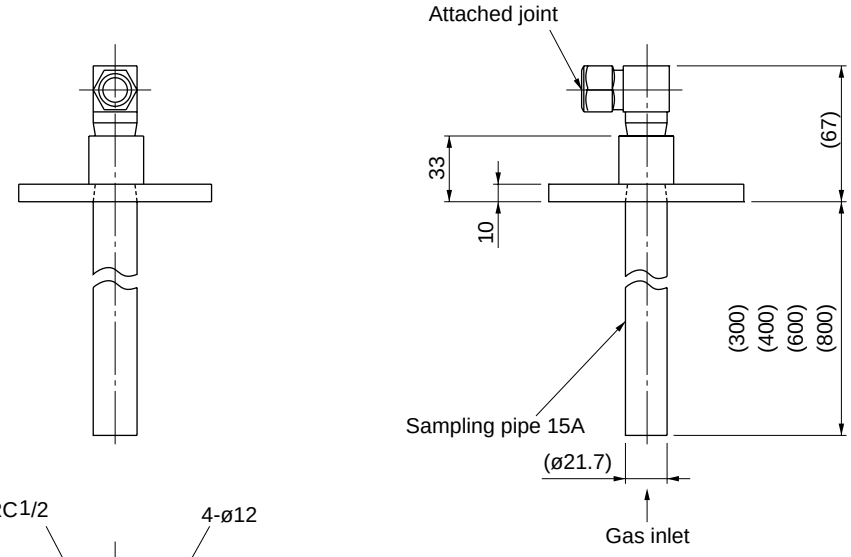
1.1.3 Non-fixed type gas extractor (unit:mm)

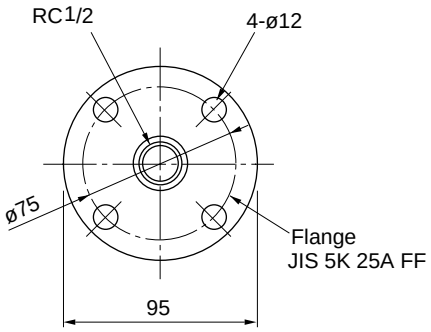


Specifications

Main materials of exhaust gas block: SUS304, polypropylene, chloroprene rubber
Mass: 0.5 kg

1.1.4 Fixed type gas extractor (unit:mm)



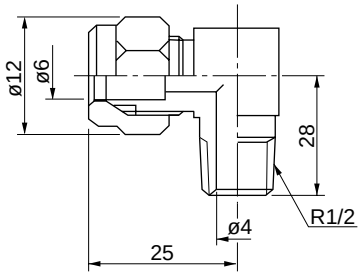


Specifications

Main materials of gas-contacting parts: SUS316, Teflon

Mass: 1 kg

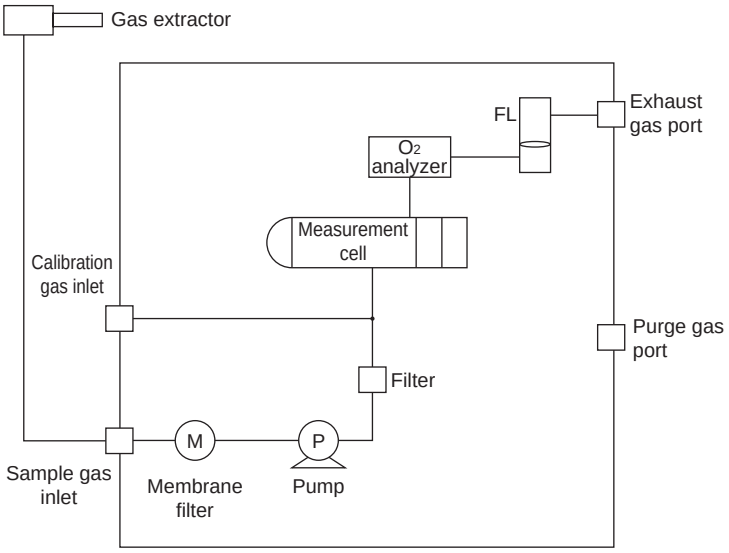
Attached joint (for ø6 pipe connection)



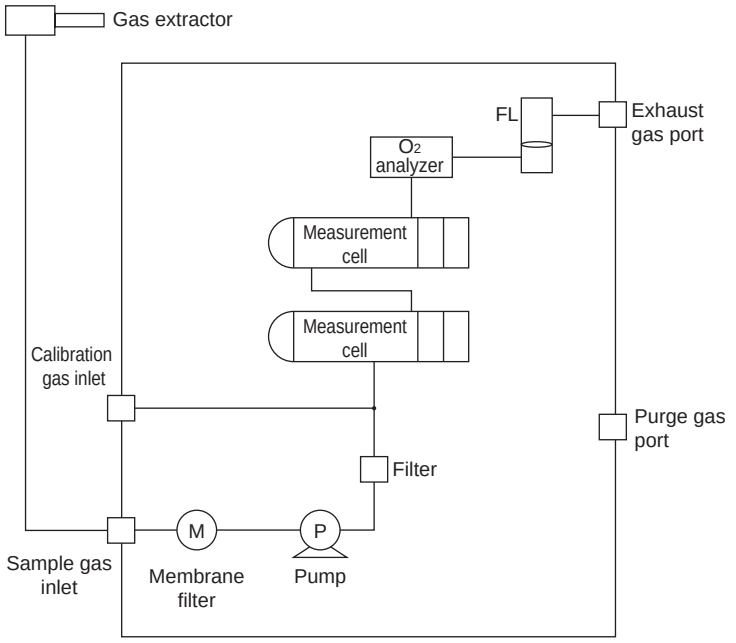
Material : Teflon

1.2 Sampling system diagram

(1) With 1 optical system
(1 to 3 component gas sampling system)



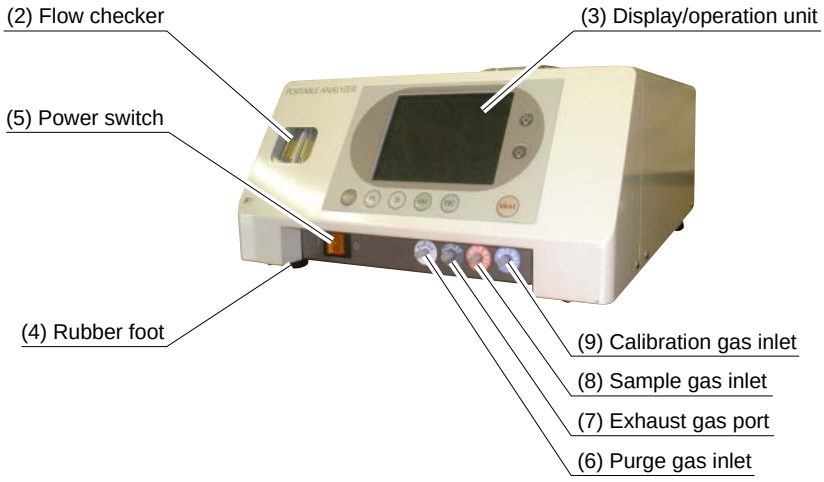
(2) With 2 optical systems
(3 to 4 component gas sampling system)

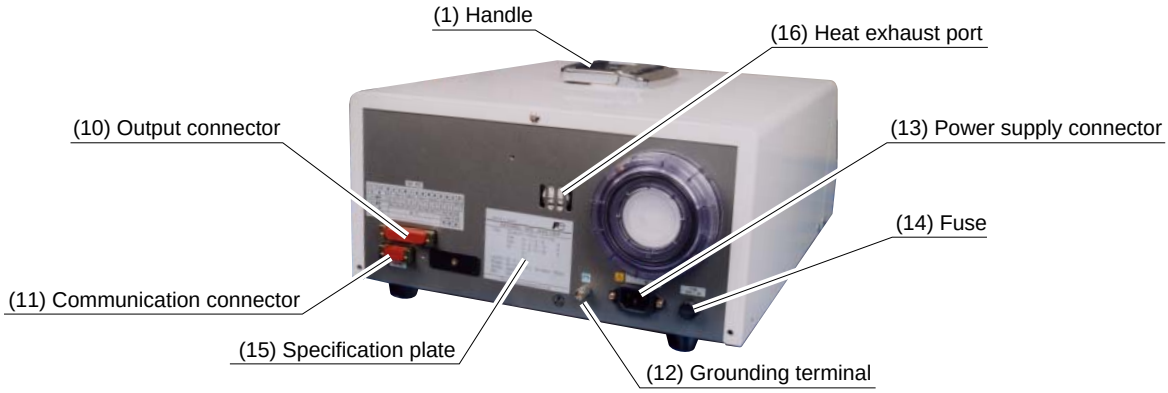


1.3 Name of each part and descriptions

1.3.1 Name of each part and descriptions

(1) Analyzer unit





Name	Description
(1) Handle	Used for transportation of main unit.
(2) Flow checker	Checks gas flow.
(3) Display/operation unit	LCD and various setting keys
(4) Rubber foot	
(5) Power switch	Set the power to ON/OFF.
(6) Purge gas inlet	Inlet for purge gas
(7) Exhaust gas port	Connected to exhaust line.
(8) Sample gas inlet	Connected to sampling gas.
(9) Calibration gas inlet	Connected to zero/span calibration gas.
(10) Output connector	Analog output signal connector
(11) Communication connector	Output signal connector for communication
(12) Grounding terminal	Connected to the ground.
(13) Power supply connector	Connect power cable.
(14) Fuse	Insert a fuse of rated capacity.
(15) Specification plate	Displays serial No., components to be measured, etc.
(16) Heat exhaust port	For changing internal heat.

1.3.2 Names of external connectors and descriptions

<Analog output connector>

Non-isolated linear connector for 4 to 20mA DC or 0 to 1V DC

Output of up to 8 channels is allowed.

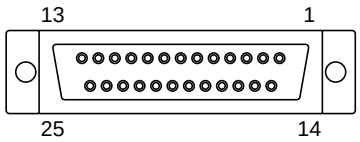
Output is made for corresponding channel No. on a one-to-one basis.

Permissible load: 4 to 20mA DC, 550Ω or lower
0 to 1V DC, 100kΩ or higher

A female connector is supplied for the main unit (DS-25S-T-N by Japan Aviation Electronics Industry Co., Ltd.)

Use the supplied cable (1m) (DB-25P) for connection.

Pin No. +	Pin No. –	Description
Between 1 and 2		Ch1 analog output
Between 3 and 4		Ch2 analog output
Between 5 and 6		Ch3 analog output
Between 7 and 8		Ch4 analog output
Between 9 and 10		Ch5 analog output
Between 11 and 12		Ch6 analog output
Between 13 and 14		Ch7 analog output
Between 15 and 16		Ch8 analog output
17 to 25		NC



<Communication output connector>

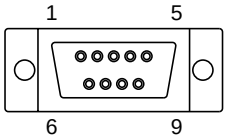
Input/output signal connector for RS232-C communication

Modbus protocol (Creation of communication program is required. Refer to separately sold transmission specifications.)

A male connector is supplied for the main unit.

Use commercially available cross cable (DE-9S) for connection.

Pin No. +	Pin No. –	Description
1		NC
2		TXD
3		RXD
4		NC
5		GND
6		NC
7		NC
8		NC
9		NC



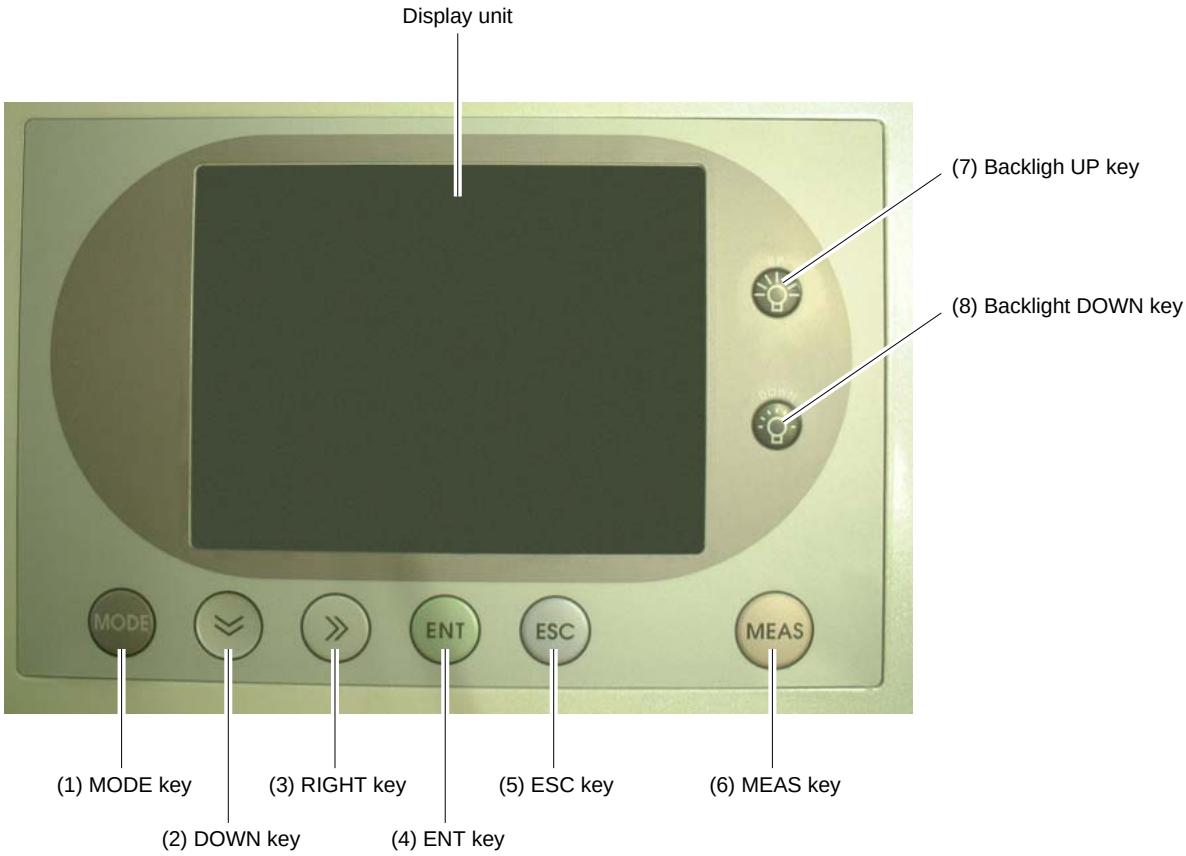
Note 1: NC indicates that the pin is not used.

Note 2: Different numbers are assigned for male (P) and female (S) pins. Make connections, paying attention to the numbers.

1.4 Operation panel and display

This section provides the names of each key for operation and display screens, and describes details of their operation.

1.4.1 Names of parts on the operation panel and descriptions

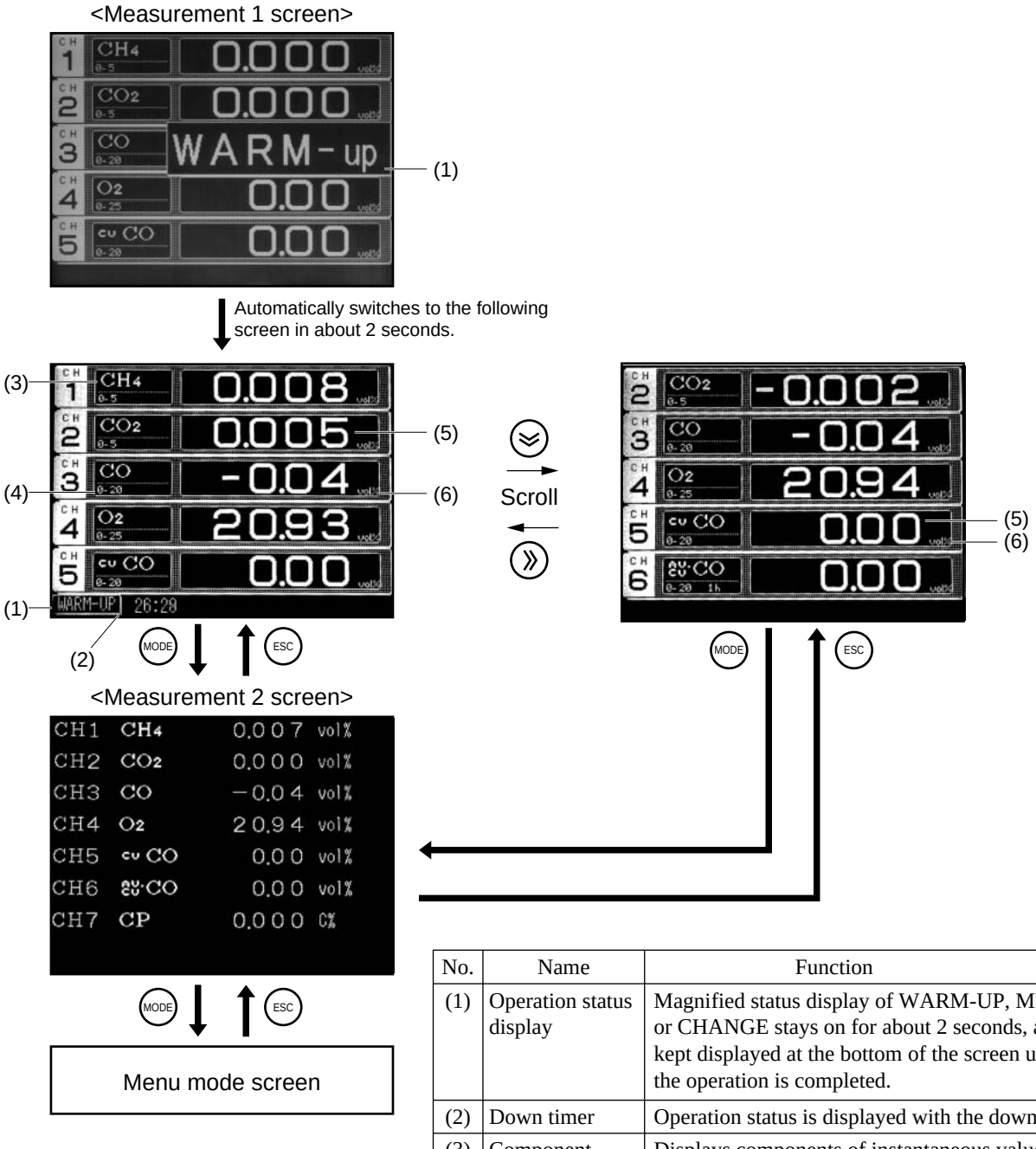


Name	Description	Name	Description
(1) MODE key	Used to switch mode display.	(5) ESC key	Used to return to the previous screen or exit the setting.
(2) DOWN key	Used to change select items (move cursor) and numeric settings.	(6) MEAS key	Used to switch between measurement mode and standby mode.
(3) RIGHT key	Used to change the digit of the setting.	(7) Backligh UP key	Increases the brightness of the backlight in display unit.
(4) ENT key	Used to confirm the selected items and changed numeric settings. Also used for executing calibration.	(8) Backlight DOWN key	Decreases the brightness of the backlight in display unit.

1.4.2 Outline of display screen

(1) Measurement mode screen (This screen appears immediately after the power is turned on.)

The measurement 1 screen varies depending on the number of components. The measurement 2 screen is displayed for the specifications of 6 channels or more. The following screen configuration example is for 4-component specifications (CH_4, CO, and O_2) (7 channels).



No.	Name	Function
(1)	Operation status display	Magnified status display of WARM-UP, MEAS, or CHANGE stays on for about 2 seconds, and is kept displayed at the bottom of the screen until the operation is completed.
(2)	Down timer	Operation status is displayed with the down timer.
(3)	Component display	Displays components of instantaneous value, instantaneous correction value, average correction value and CP calculation value.
(4)	Range display	Displays measurement range and average time.
(5)	Concentration display	Displays measured concentration value and correction value.
(6)	Unit display	Displays ppm or Vol%.

- **Instantaneous value and concentration value:**

  The concentration display of Ch (component) where sampling components such as "CO_2," "CO" or "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 correction concentration values:**

  Ch components where "cv**" is displayed as "cv CO" in the component display are calculated from the following equation, by setting sampling components, O_2 instantaneous/concentration values and O_2 correction reference value.

  $$\text{Correction output} = \left[\frac{21 - On}{21 - Os}\right] \times Cs$$

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

  Os: Oxygen concentration (%)

  Cs: Concentration of relevant measured component. Calculation is made with 20Vol% if Os is 20Vol% or higher.

  The corrected sampling components is CO only.

- **O_2 correction concentration average value:**

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

  Averaging time can be changed between 1 minute and 59 minutes or 1 hour and 4 hours according to the average time settings.

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

  Note) The measurement ranges of O_2 correction concentration value and O_2 correction concentration average value are the same as that of the measuring components.

- **CP calculation value:**

  The carbon potential of carburizing furnace and conversion furnace are calculated using furnace temperature (fixed input value) and CO concentration value (fixed or measured value) while referring to CO_2 measured value.

  Calculation equation; $CP = \dfrac{CPS \times (PCO)^2}{K1 \times PCO_2}$

  where,

  CPS ; Saturated carbon concentration (partial pressure)
  0.0028t–1.30 (800˚C ≦ 850˚C)
  0.0030t–1.47 (850˚C ≦ 950˚C)
  0.0034t–1.85 (950˚C ≦ 1000˚C)

  t ; Furnace temperature

  PCO ; CO concentration value (partial pressure)

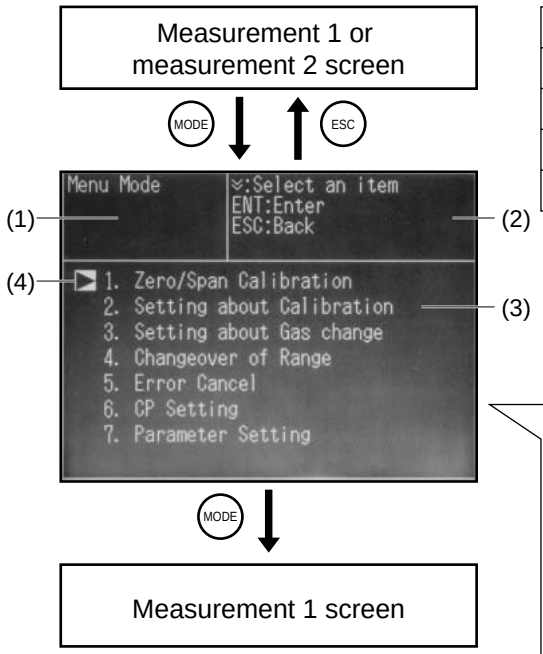
  PCO_2 ; CO_2 concentration value (partial pressure)

  K1 ; Constant $K1 = 10^{(9.06 - 15966/T)}$

  T ; Rankine temperature
  $(t \times 9/5 + 32 + 460)$

(2) Menu mode screen

The menu mode setting and select screen are shown below.



No.	Name	Function
(1)	Status display	Displays current status.
(2)	Message display	Displays guideline for operation.
(3)	Setting/select item	Select settings or select items to be changed or checked using the cursor.
(4)	Cursor	

Menu contents

1. Zero/span calibration
   1) Executes selection and calibration of zero/span gas.
      • "Wet Air/Dry", "Wet N_2/Dry"
   2) Executes span calibration operation and span calibration.
      • "Each, Both"

2. Zero calibration time/span concentration value setting
   1) Performs "zero calibration time setting."
   2) Performs "span calibration concentration value setting."

3. Gas change time setting
   • Performs "gas change time setting."

4. Changeover of range
   • Performs "range setting" of measurement target.

5. Error cancel
   • "Cancels" error display.

6. CP calculation value condition setting
   1) Performs "CO concentration value setting."
   2) Performs "Furnace temperature setting."

Note: This mode is not displayed if the optional function is not provided.

7. Parameter setting
   1) Performs "date/time setting."
   2) Performs "key lock setting."
   3) Performs "output hold setting."
   4) Performs "average output value reset."
   5) Performs "display OFF time setting."
   6) Performs "password input for entering maintenance mode."

2. BEFORE USE

⚠ 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

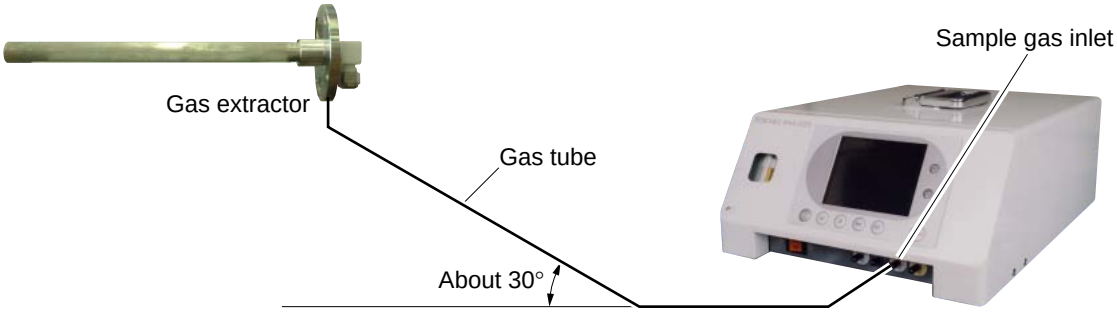
- Entrust the installation, movement or re-installation to a specialist or the supplier. A poor installation may cause accidental tipover, shock hazard, fire, injury, etc.
- The gas analyzer is heavy. It should be installed with utmost care. Otherwise, it may tipover or drop, for example, causing accident 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.

2.1 Installation

- Install the analyzer in a horizontal and stable place that endures the mass of the analyzer.
- Install the analyzer in a place not subject to direct sunlight, weather, or radiant heat from high-temperature objects. If installation to such a place is inevitable, provide a roof or cover to avoid the effect.
- Do not install the analyzer in a place subject to vibration.
- Select a place of clear atmosphere.
- Discharge the exhaust gas to the atmosphere in a safe place.

2.2 Piping in the gas analyzer

2.2.1 Piping procedure



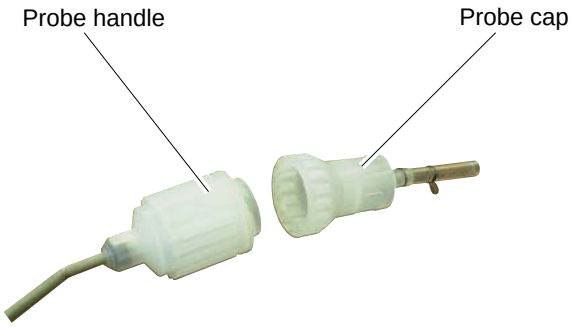
⚠ Caution on piping

- Use “Teflon” gas tube, which is low in adsorptive activity.
  Tilt the gas tube that connects the gas extractor and the analyzer unit by about 30° to prevent drain from staying within the tube.
- The maximum allowable gas tube length is 20m.
  To extend the tube length, use a separate external pump.

2.2.2 Connecting gas extractor

(1) Flexible gas extractor (option)

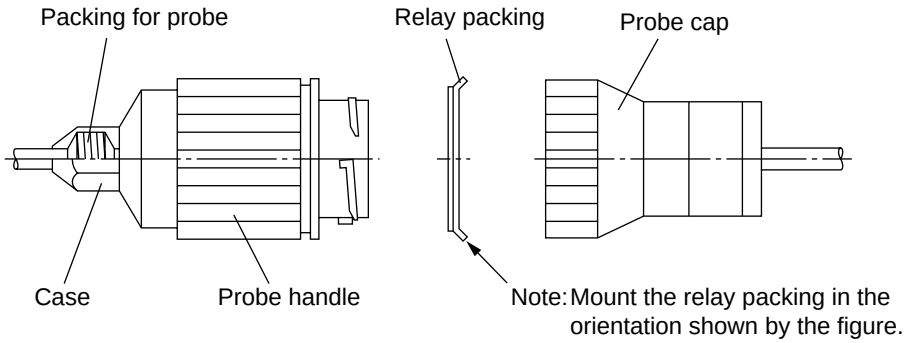
The flexible gas extractor consists of a probe handle and a probe cap.



The probe handle consists of packing for probe, case, and relay packing.

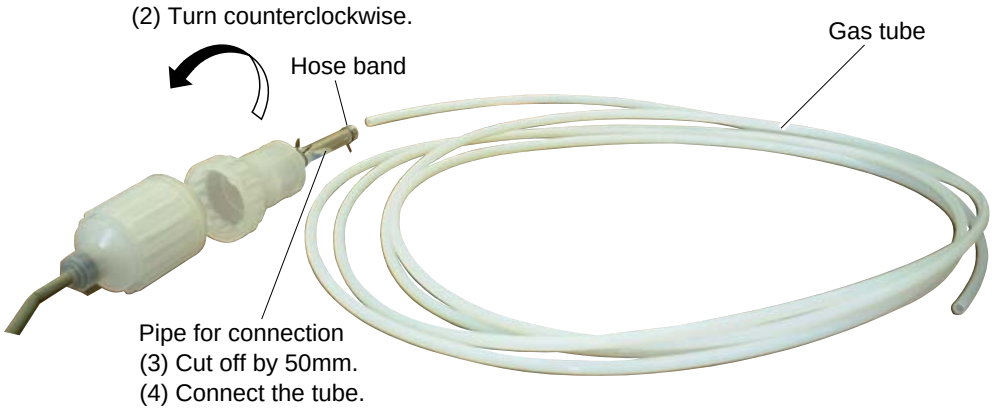
Connect the probe handle, probe cap, and gas tube, following the procedure shown below.

1) Check that the relay packing is inserted properly.



2) Turn the probe cap counterclockwise to connect it to the probe handle securely.
3) Cut off the pipe for connection (standard accessory, ø9/ø5) by about 50mm, and connect it to the probe cap ø6/ø4).
4) Insert the gas tube (Teflon, ø6/ø4, option) to the pipe for connection.

   Theu, use the supplied hose band for each connection.

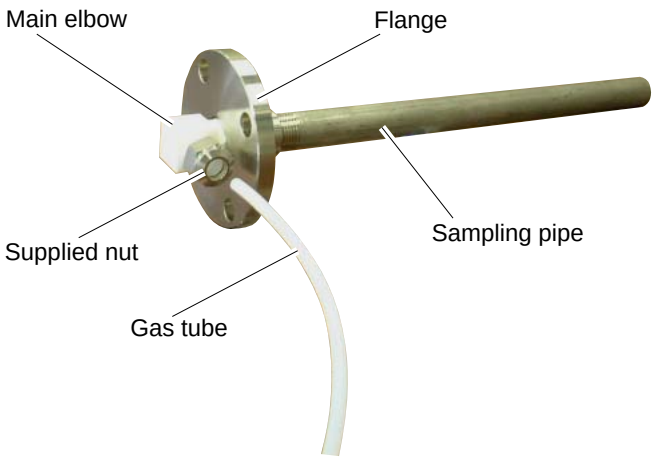


(2) Fixed gas extractor (option)

Flange is JIS 5K 25A FF made by SUS316.

The fixed gas extractor consists of sampling pipe, flange, and main elbow.

1) Insert the gas tube (Teflon, ø6/ø4, option) into the main elbow, and fasten it with the supplied nut.



2.3 Wiring

The power supply and the output connector are located on the rear face of the main unit.

⚠ CAUTION

- Be sure to turn off all the power before performing wiring. Otherwise electric shock may result.
- Be sure to perform Class D grounding work with the grounding lead. Otherwise electric shock or failure may result.
- Select appropriate wiring materials according to the ratings of the devices. Otherwise electric shock or fire may result.
- Connect the power supply that satisfies the rating. Otherwise fire may result.

⚠ CAUTION

⚠ Electric Shock

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

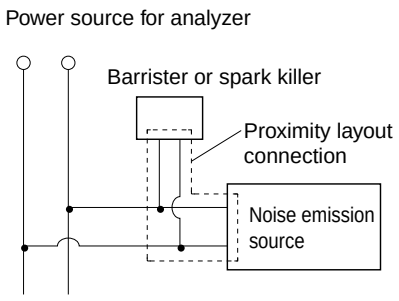
2.3.1 Power supply

(1) Connect the female side of the power cable to the power inlet on the rear face of the main unit, and insert the male side into the receptacle that satisfies the rating.

(2) If ground lead for power supply cable cannot be used, connect the supplied ground lead to the dedicated terminal.

When noise emission source is near the analyzer

- Do not install the analyzer near an electric device that generates power supply noise (such as high-frequency furnace or electric welder). If the use near such devices is inevitable, separately install the power supply line to avoid noise interference.
- If noise comes in from the power supply, mount a barrister (such as ENA211-1 by Fuji Electric) or a spark killer (such as S1201 by OKAYA) to the noise emission source as shown by the figure at right. Note that mounting one apart from the noise emission source does not produce sufficient effect.



2.3.2 Output connector

(1) Analog output

• Use supplied dedicated cable (DB-25P 25 male pin) for taking out output signals.
Fasten the cable securely using supplied screws.

Output signal: 4 to 20mA DC or 0 to 1V DC (by code symbols), non-isolated
Permissible load: 4 to 20mA DC, 550Ω or lower
0 to 1V DC, 100kΩ or higher

• The analog output corresponds to the channel (Ch) on the measurement screen display.

⚠ CAUTION

None of the analog outputs of this product is isolated. To prevent the effect of external interference, individually isolate signals before drawing out wiring to outdoors or extending the dedicated cable.

(2) Communication output

• Digital output signals are RS232-C Modbus capable.
Individual programming by referring to the attached "Description of Communication Function" is required.
Use a commercially available cable (D-sub 9 pin, female-female).

3. OPERATION

3.1 Warm-up operation

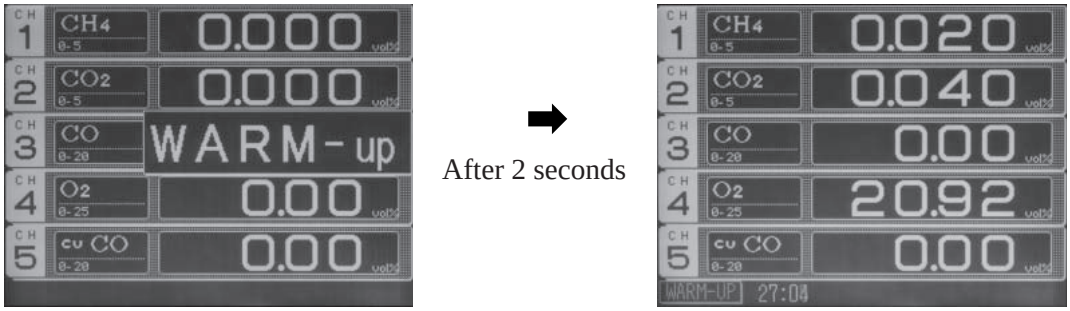
(1) Set power switch to ON. ("|": ON, "○": OFF). The lamp within the power switch comes on.

(2) The WARM-UP display comes on and stays on for about 2 seconds in the center. It then moves to the lower left-hand corner of the screen. The warm-up operation end time is displayed with the down timer.

Caution on operation

Key operation cannot be made while the WARM-UP display stays on in the center of the screen.

Wait until the display moves to the lower left-hand side corner of the screen.



(3) The warm-up time is about 30 minutes after the power is turned on.

On completion of the warm-up operation the WARM-UP display and the timer go off.

Caution on operation

Press the (MEAS) key during warm-up operation, and measurement can be made. In this case, fluctuation of the reading may result because the instrument has not been warmed up fully.

3.2 Zero/span calibration

Be sure to perform zero/span calibration of each component after the warm-up operation is completed.

3.2.1 Zero calibration time and span concentration value setting (See “4.1.2” for setting method.)

(1) Zero calibration time

1) Select <Menu Mode> → <2. Setting about Calibration> → <1. About Zero Calibration>, and select zero gas flow time.

(2) Span calibration concentration value setting

1) Select <Menu Mode> → <2. Setting about Calibration> → <2. Span Calibration Value>, and change calibration gas concentration value for each component range.

3.2.2 Switching ranges (See “4.1.4” for setting method.)

(1) Select <Menu Mode> → <4. Changeover of Range>, and enter span calibration concentration for each component range.

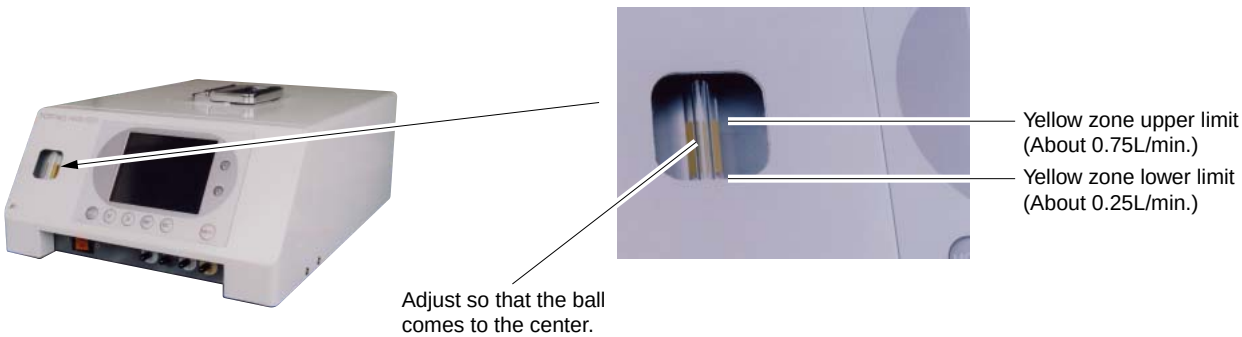
3.2.3 Zero/span calibration (See “4.1.1” for calibration method.)

(1) Select <Menu Mode> → <Zero/Span Calibration>, and perform zero/span calibration.

3.2.4 Adjusting flow rate

(1) A diaphragm is installed within the instrument to make sure that pressurizing the cylinder gas to 0.03MPa from the calibration gas inlet (CAL) allows the flow checker ball to come at the center of the yellow zone (approximately 0.5 L/min). Finely adjust the pressure of the cylinder gas, while checking the position of the flow checker ball.

(2) The same kind of diaphragm is also installed at the sample gas inlet. Check in the measurement state (while the pump is operated by setting the MEAS key to ON) that the flow checker ball comes at the upper limit of the yellow zone (approximately 0.7 L/min).



Caution on operation

- The flow channel of the sample gas (during measurement) within the instrument is different from that of the calibration gas (zero, span). Make an adjustment using the needle valve as required.

3.3 Starting and exiting measurement

Perform measurement after zero/span calibration is completed.

3.3.1 Starting measurement

(1) Display measurement 1 screen or measurement 2 screen.

(2) Press the (MEAS) key, and the pump is started to suck the gas from the sample gas inlet.

Caution on operation

- The (MEAS) key can be set to ON/OFF (measurement/standby mode) only on measurement screens 1 to 2. Be sure to check the displayed screen before setting the key to ON/OFF.
- Measurement can also be made during warm-up operation, but zero/span calibration cannot be performed.

  Note that insufficient warm-up operation may cause reading fluctuation.

3.3.2 Exiting measurement

(1) Display measurement 1 screen or measurement 2 screen.

(2) Press the (MEAS) key, and the pump is stopped and measurement is terminated.

3.3.3 Stopping operation

Set the power to OFF after performing the following operations.

(1) Purging of the sample gas line

Remove the pipe connected to the sample gas inlet.

Set the (MEAS) key to ON, and suck the air for 10 minutes or longer.

When the reading returns to around zero (excluding O_2 meter), press the (MEAS) key again.

(2) Replace the filter paper of the membrane filter. (See section 5.3.6.)

⚠ CAUTION

- Do not transport or store the instrument with drain. Otherwise possible leakage may cause electric shock or fire when the power is turned on, or inflow of residual drain into the optical system may cause reading errors.

4. SETTING AND MODE

4.1 Menu mode

4.1.1 Zero/span calibration

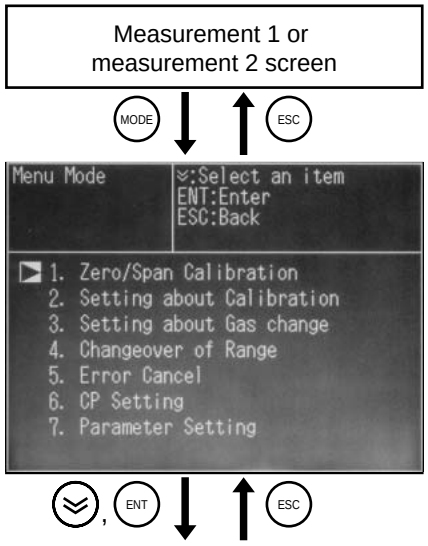
Perform zero and span calibrations in the menu mode.

Caution on operation

- If zero/span calibration is attempted during warm-up operation, WARM-UP is displayed on the upper right-hand corner of the screen, and the calibration cannot be executed.
- If zero calibration is not to be performed, press the (MODE) key on the gas selection screen, and the CH1 span calibration screen appears.
- Zero/span calibration can be performed either in measurement or standby mode. However, the output hold is not executed in standby mode irrespective of the setting (kept in OFF state).

(1) Zero calibration mode

1) Press the (MODE) key either on measurement 1 or measurement 2 screen to display menu mode screen.
2) Move the cursor to <1. Zero/Span Calibration> using the (≫) key, and then press the (ENT) key.

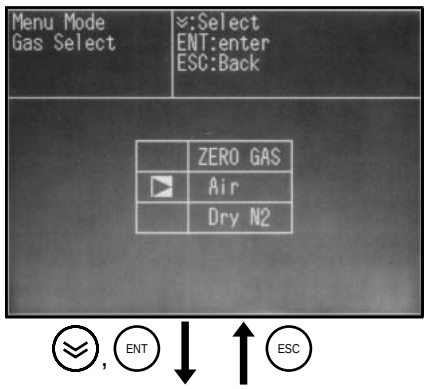


3) On the <Gas Select> screen that appears, select zero gas conditions using the (≫) key.

Setting contents

- The setting screen varies depending on calibration gas conditions. Perform calibration according to the following descriptions.

When <Air> is selected:
Zero gas: Clean air
Span gas: Dry gas in cylinder
When <Dry N2> is selected
Zero gas: Dry N2 in cylinder
Span gas: Dry gas in cylinder

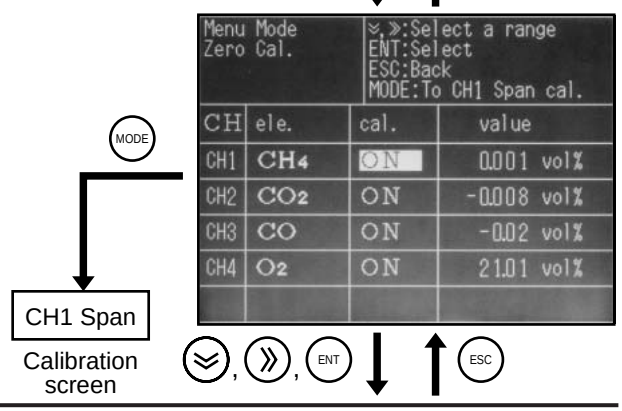


4) Press the (ENT) key, and the <Zero Cal.> mode screen appears.
5) Select ON/OFF of zero calibration using the (≫) and the (》) keys.

Setting contents

ON : Executes zero calibration.
OFF : Does not execute zero calibration.

6) Press the (ENT) key.



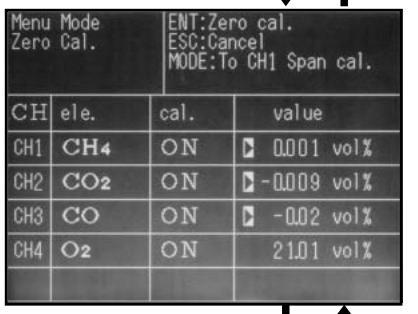
<In the case of Air>

<In the case of Dry N_2>

Caution on operation

- If O_2 analyzer is provided, even if "ON" is selected for O_2 zero calibration, calibration is not performed because O_2 is contained in the zero gas.

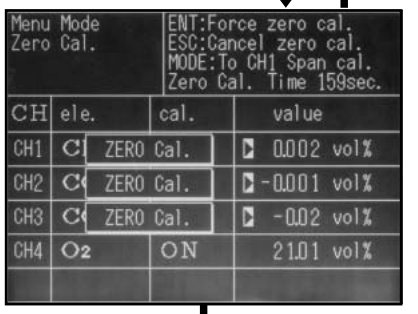
7) The cursor moves to the reading. Remove the pipe connected to the sample gas inlet.



MODE → CH1 span

Calibration screen

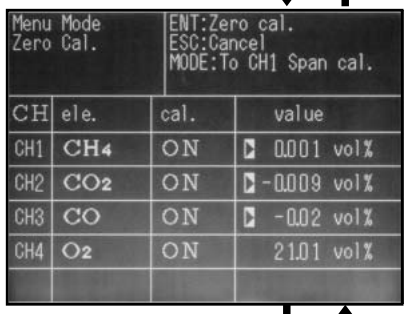
8) Press the ENT key, and the air is automatically sucked from the sample gas inlet. Check that the flow rate reading of the flow checker is kept at approximately 0.5 L/min.



MODE → CH1 span

Calibration screen

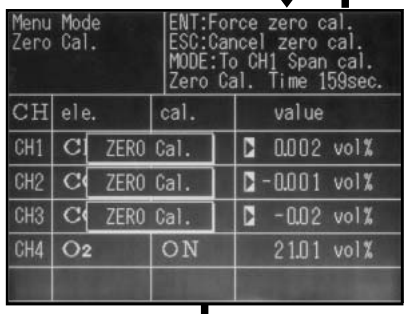
7) The cursor moves to the reading.



MODE → CH1 span

Calibration screen

8) Connect N_2 gas to the calibration gas inlet. Press the ENT key and check that the flow rate reading of the flow checker is kept at approximately 0.5 L/min.

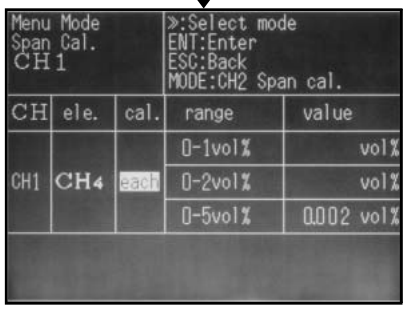


MODE → CH1 span

Calibration screen

Auto

9) After arbitrarily set time elapses, the CH1 span calibration screen appears.



MODE

Caution on operation

- Zero calibration is performed in batch for all the ranges of selected components.
- If "OFF" is selected for zero calibration of all the components, all zero calibrations are not performed.
- Zero calibration is performed at the time arbitrarily set. The time of completion of zero calibration is displayed at the upper right-hand corner of the screen.

How to forcibly perform zero calibration

To forcibly perform zero calibration without waiting for the arbitrarily set time of calibration to elapse, press the ENT key in 8).

Zero calibration of O_2 analyzer

1. When <Dry N2> is selected in zero calibration mode

(1) Calibration is performed simultaneously with the infrared ray sensor.

See 4.1.1 (1) Zero calibration mode.

2. When <Air> is selected in zero calibration mode

⚠ CAUTION

- The O_2 zero calibration screen is displayed when the O_2 analyzer is added.

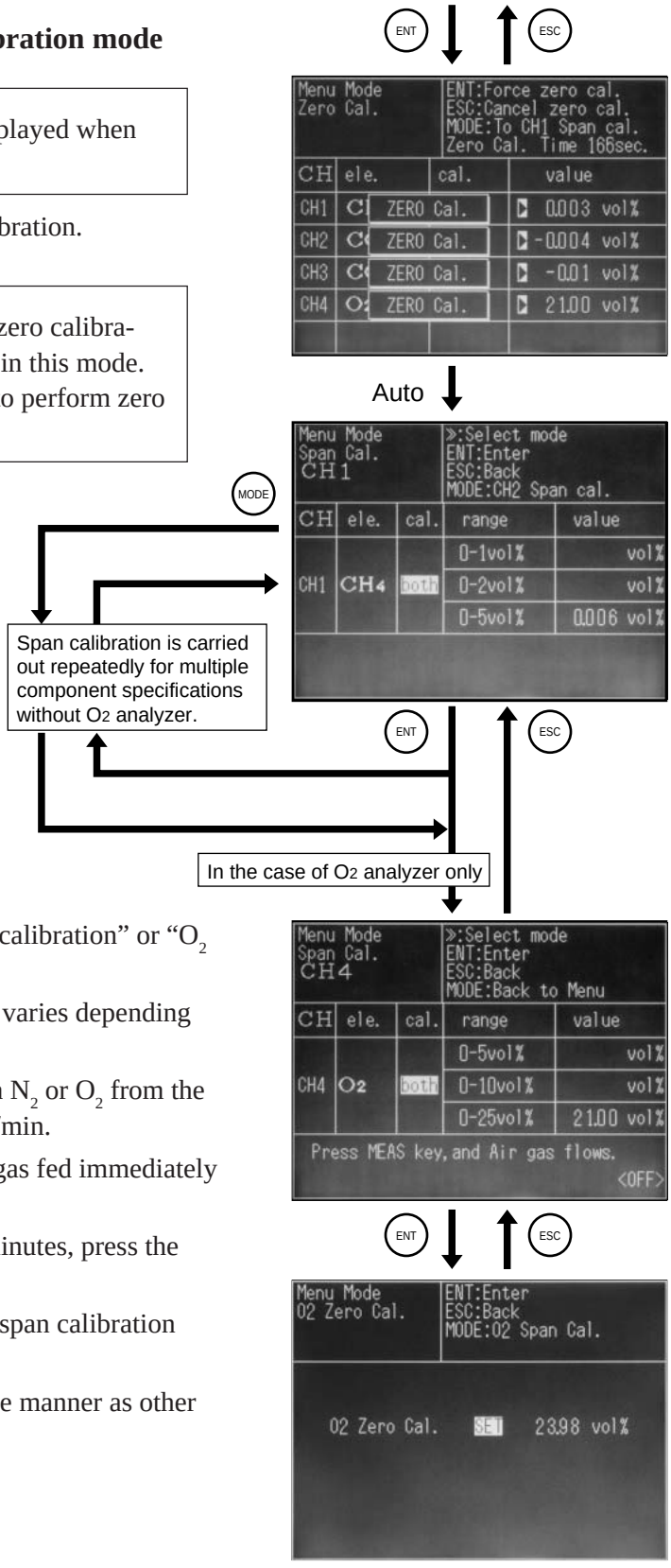
(1) Press the ENT key to perform zero calibration.

⚠ CAUTION

- If "ON" is selected for O_2 analyzer, zero calibration of O_2 analyzer is not performed in this mode. Follow the procedure shown below to perform zero calibration of the O_2 analyzer.

(2) The screen is automatically switched to the span calibration screen of the 1st component (Ch1).

(3) Select "both" or "each," and then press the ENT key to carry out span calibration. See 4.1.1 (2) Span calibration mode.



(4) The screen switches to "Next Ch span calibration" or "O_2 zero calibration."

The number of span calibration screen varies depending on specifications.

(5) Feed the span gas that does not contain N_2 or O_2 from the calibration gas inlet at the rate of 0.5L/min.

Example: Continuously feed the span gas fed immediately before.

(6) When the display stabilizes in 2 to 3 minutes, press the ENT key.

(7) When calibration is completed, the O_2 span calibration screen appears.

(8) Perform O_2 span calibration in the same manner as other span calibrations.

(2) Span calibration mode

Caution on operation

- When span calibration of the target Ch is completed, the screen automatically switches to the span calibration screen of the next Ch. Press the (MODE) key not to perform span calibration, and the screen switches to the span calibration screen of the next Ch.

Setting contents

"both" : Carries out span calibration of 3 ranges in batch.

"each" : Carries out span calibration by range.

Note on operation

"both" : Calibration of each component can be carried out with the same span gas, which is ideal when the place of measurement is changed frequently.

"each" : Span calibration is carried out by each component range.

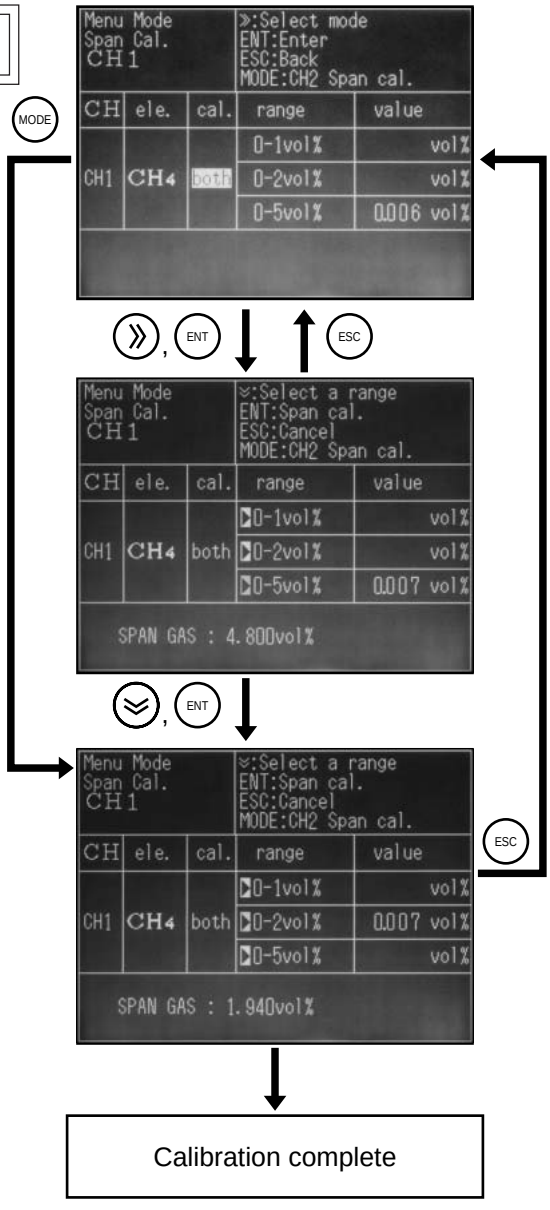
Operation in the case where "both" is selected

1) Select "both" for calibration operation using the (≫) key, and press the (ENT) key.
2) The cursor appears for all the ranges, and flickers at only one range. The concentration is also displayed for that range.

   The display indicates the calibration reference range.

   Span calibration concentration value is displayed at the bottom of the screen.
3) Move the flickering cursor using the (≪) key, and change the calibration reference range.
4) Feed the span gas for the target of calibration.

   Adjust the flow rate at about 0.5L/min.
5) When the reading stabilizes in about 2 to 3 minutes, press the (ENT) key.
6) The display automatically switches to Ch span calibration mode screen.
7) Follow the procedure in 3) to 6) to carry out span calibration for all the components.



Caution on operation

- To change span gas calibration concentration value, select <Menu Mode> → <2. Setting about Calibration> → <2. Span Calibration Value>.

Calibration has now been completed.

Operation in the case where “each” is selected

1) Select “each” for calibration operation using the (≫) key, and press the (ENT) key.
2) The cursor and concentration value are displayed only for the target range.

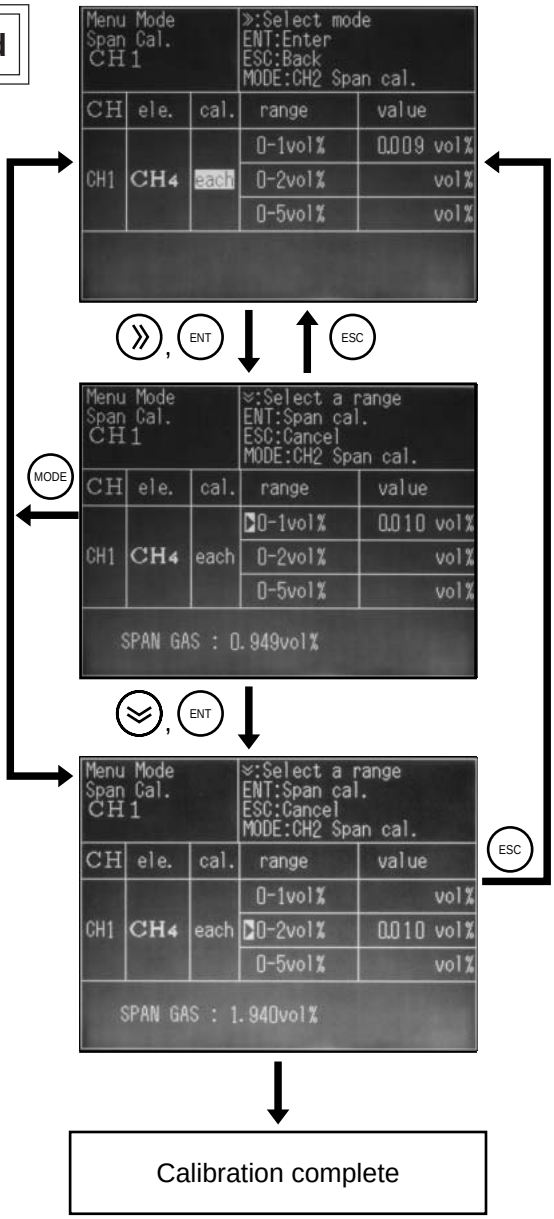
   Span calibration concentration value is also displayed at the bottom of the screen.
3) Change the span calibration concentration value using the (≪) key.
4) Feed the span gas for target of calibration.

   Adjust the flow rate at about 0.5L/min.
5) When the reading stabilizes in about 2 to 3 minutes, press the (ENT) key.
6) The mode automatically switches to the Ch span calibration mode.
7) To calibrate other ranges, press the (ESC) key, and repeat the procedure in 3) to 6)
8) Follow the procedure in 3) to 7) to carry out span calibration of all the components.

Caution on operation

- To change span gas calibration concentration value, select <Menu Mode> → <2. Setting about Calibration> → <2. Span Calibration Value>.

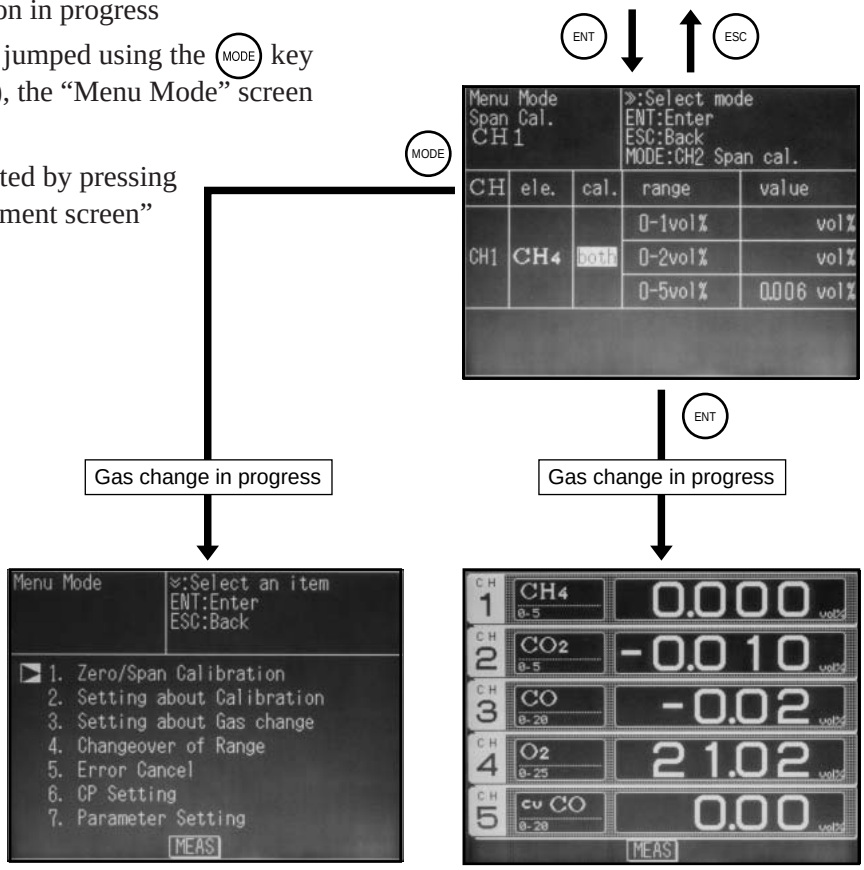
Calibration has now been completed.



(3) Zero/span calibration complete screen

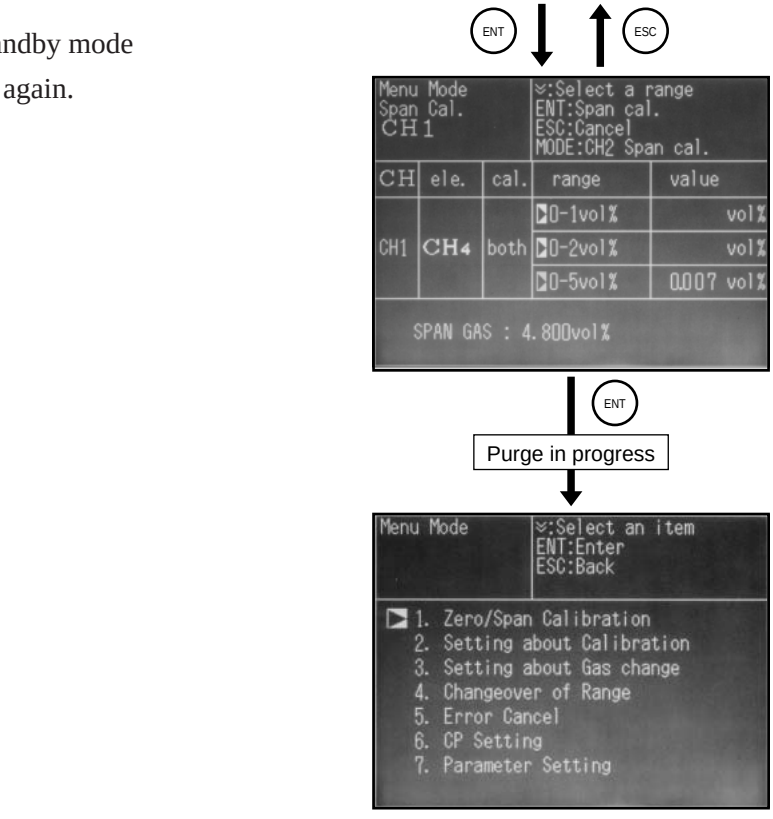
1) Exiting zero/span calibration in progress

- If span calibration mode is jumped using the (MODE) key (calibration not performed), the "Menu Mode" screen appears again.
- If span calibration is executed by pressing the (ENT) key, the "Measurement screen" appears again.



2) Exiting zero/span calibration in standby mode

- The "Menu Mode" screen appears again.



4.1.2 Setting zero calibration time and span concentration value

(1) Setting zero calibration time

Set the gas feed time for zero calibration.

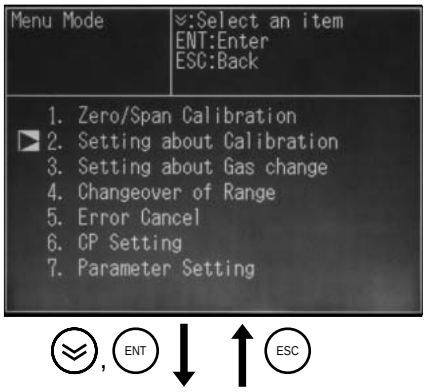
Setting range and contents

- Zero gas feed time : "180 to 999 sec" (in steps of 1 sec)

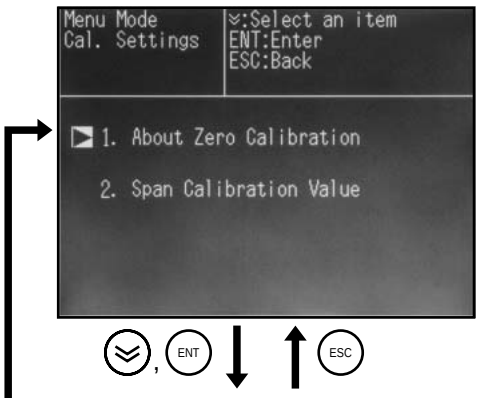
Initial value

- Zero gas feed time : 180 sec

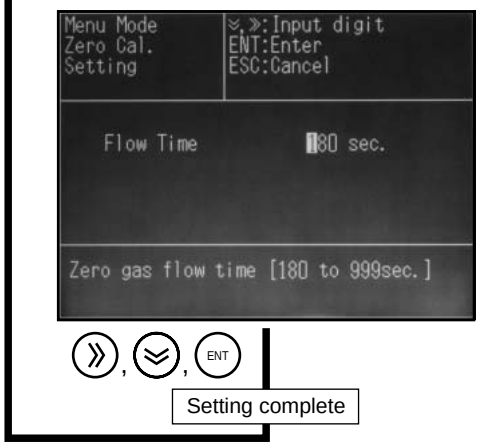
1) Move the cursor to <2. Setting about Calibration> using the ⋙ key, and press the ENT key.
   The screen switches as shown at right.



2) Move the cursor to <1. About Zero Calibration> using the ⋙ key, and press the ENT key.



3) The screen is switched and the cursor moves to the value to be entered.
4) Select a digit using the ⋘ key, and change the value using the ⋙ key.
   Then press the ENT key.
   The previous screen appears again.



(2) Setting span calibration value

Enter span calibration gas concentration value for each component and each range.

Setting range

- Minimum display value to full scale value (FS) of each range

  Note that the accuracy of span gas concentration value is guaranteed within 80 to 100% range of the full scale.

  Use a proper gas cylinder.

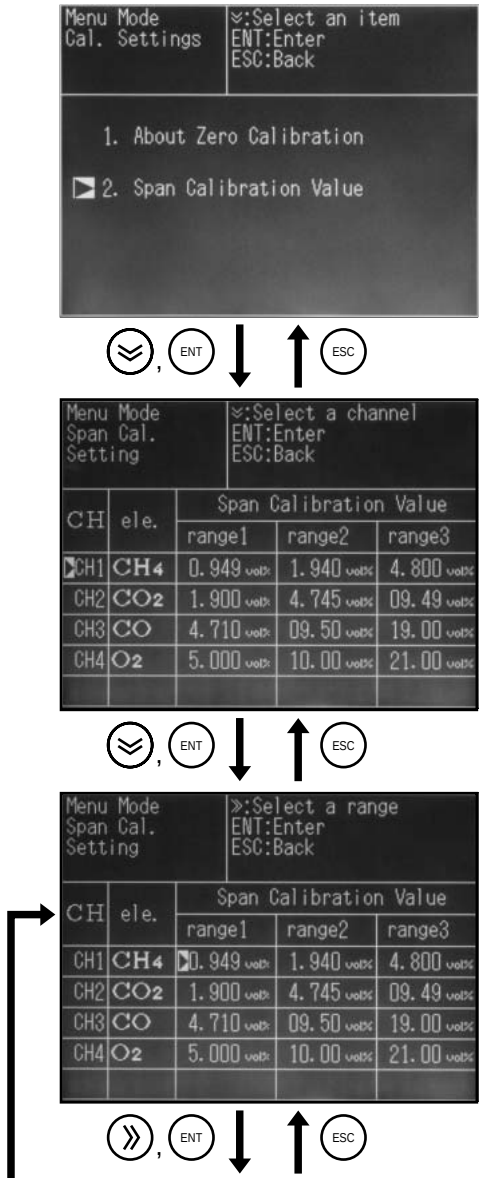
Example of input range: In the case of 500ppm range

- Input can be made within the range from 000.1ppm to 500.0ppm.
- Input of 000.0ppm and 500.1ppm or higher are regarded as an error (previous input is retained).

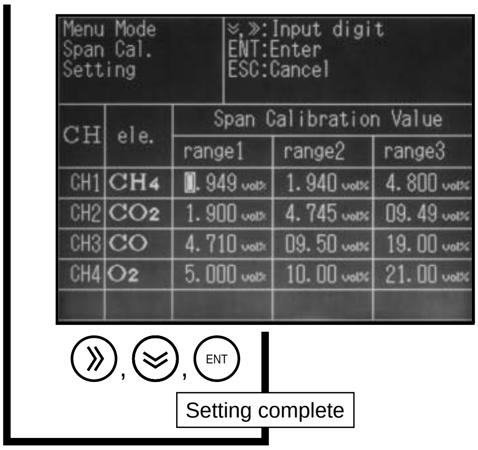
Initial value

- Each component and range: In-house span adjustment value or full-scale value

1) Move the cursor to <2. Span Calibration Value> using the ⋙ key, and press the ENT key. The screen switches as shown at right.
2) Move the cursor to the component (Ch) to be set using the ⋙ key, and press the ENT key.
   The cursor moves to range 1 (Ch1).
3) Move the cursor to the range to be set using the » key, and press the ENT key.
   The cursor moves to the span calibration value.



4) Select a digit using the ≫ key, and change the value using the ︾ key.
Press the ENT key.
The previous screen appears again.



5) Make the setting for other components and ranges in the same manner.

The setting has now been completed.

4.1.3 Setting gas change time

Change gas is automatically fed when calibration is completed during measurement.
The duration of feed can be set as follows.

Description of gas change

- Gas change : After calibration is completed during measurement, sample gas is fed for a period of time arbitrarily selected.

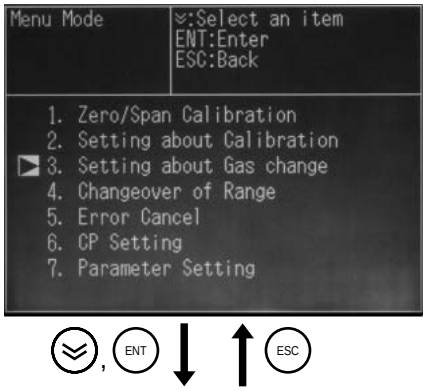
Setting range

- "30 to 300 sec" (in steps of 1 sec)

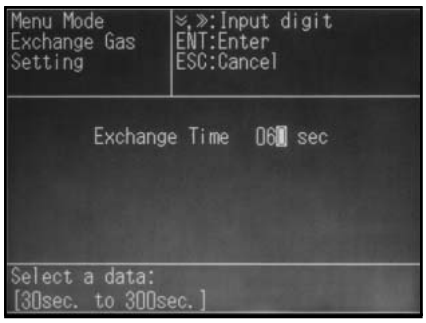
Initial value

"60 sec"

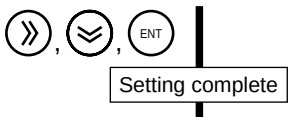
1) Move the cursor to <3. Setting about Gas change> using the (≫) key, and press the (ENT) key.
   The screen switches as shown at right.

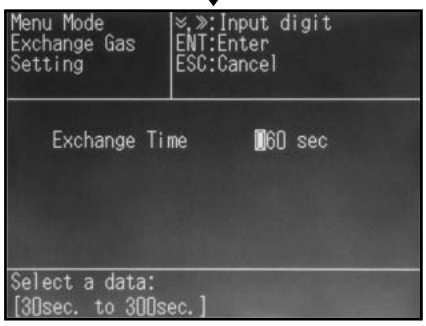


2) Select a digit using the (≫) key, and change the value using the (≫) key.
   Press the (ENT) key to register the setting.
   The cursor moves to the most significant digit of the setting.



The setting has now been completed.





4.1.4 Switching ranges

The range and the display selected in this mode is output.

The correction value, the average correction value and CP calculation value are also calculated in selection range.

Initial value

- "Minimum range"

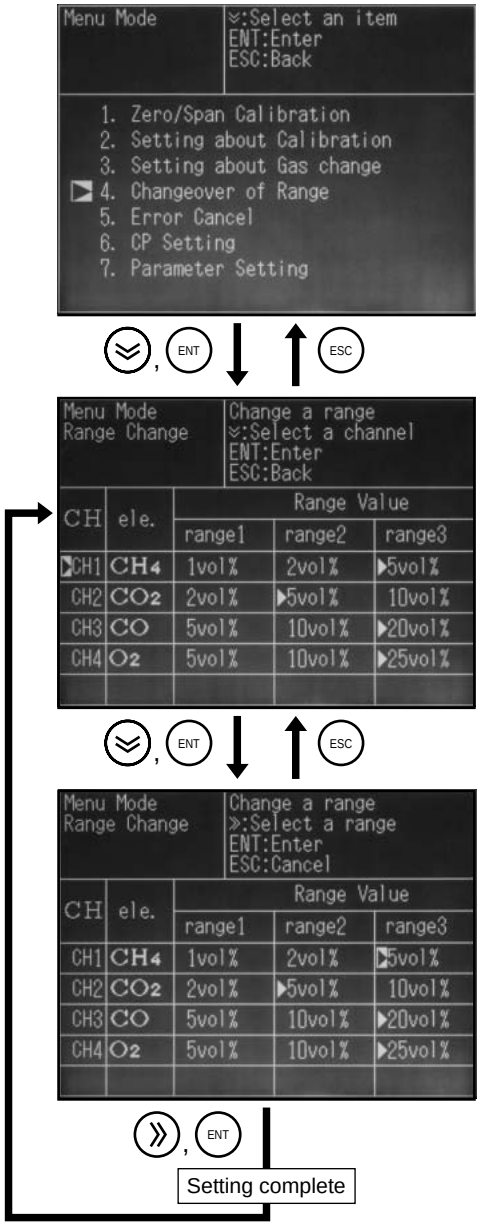
1) Move the cursor to <4. Changeover of Range> using the ≫ key, and press the ENT key.
   The screen switches as shown at right.

2) Move the cursor to the component (Ch) to be set using the ≫ key, and press the ENT key.
   The cursor moves to the range currently selected.

3) Move the cursor to the range to be set using the » key, and then press the ENT key.
   The cursor at the selected range is highlighted as ▶, and the previous screen appears again.

4) Make the setting for other components in the same manner.

The setting has now been completed.



4.1.5 Canceling errors

The error display can be canceled in this mode.

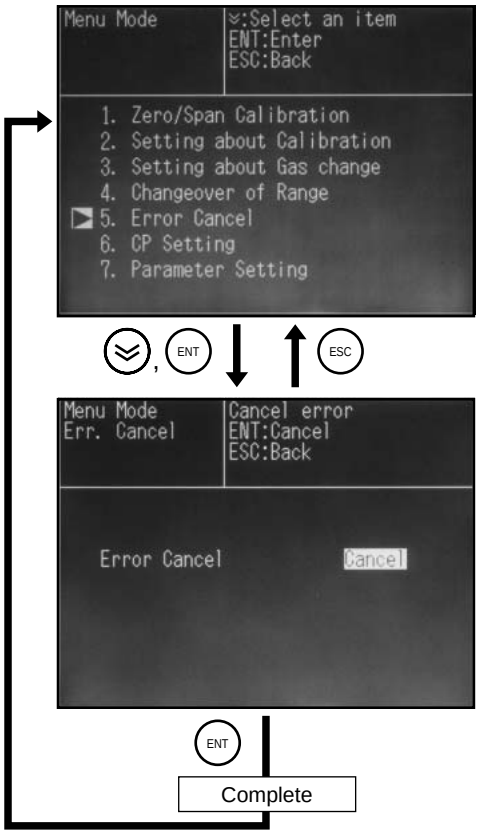
Caution on handling

- The error display only can be deleted in this mode.
  If the cause of occurrence of the error is not removed, the error display appears again.

(1) Move the cursor to <6. Error Cancel> using the ⌄⌄ key, and press the ENT key.
The screen switches as shown at right.

(2) Press the ENT key again.
The Menu Mode screen appears again.

The work has now been completed.



4.1.6 Setting CP calculation value conditions

Set the conditions necessary for CP calculation in this mode.

Caution on handling

- The mode is displayed when CP calculation value is selected for the output type.

Setting range

- CO concentration : Regular value; “10.0 to 40.0% CO” (In steps of 0.1%)
- Furnace temperature setting : “800°C to 1000°C” (In steps of 1°C)

Initial value

- CO concentration : “Regulated to 20.0% CO”
- Furnace temperature setting : “900°C”

1) Move the cursor to <7. CP calculation Value Condition Setting> using the ⋙ key and then press the ENT key, and the screen is switched.

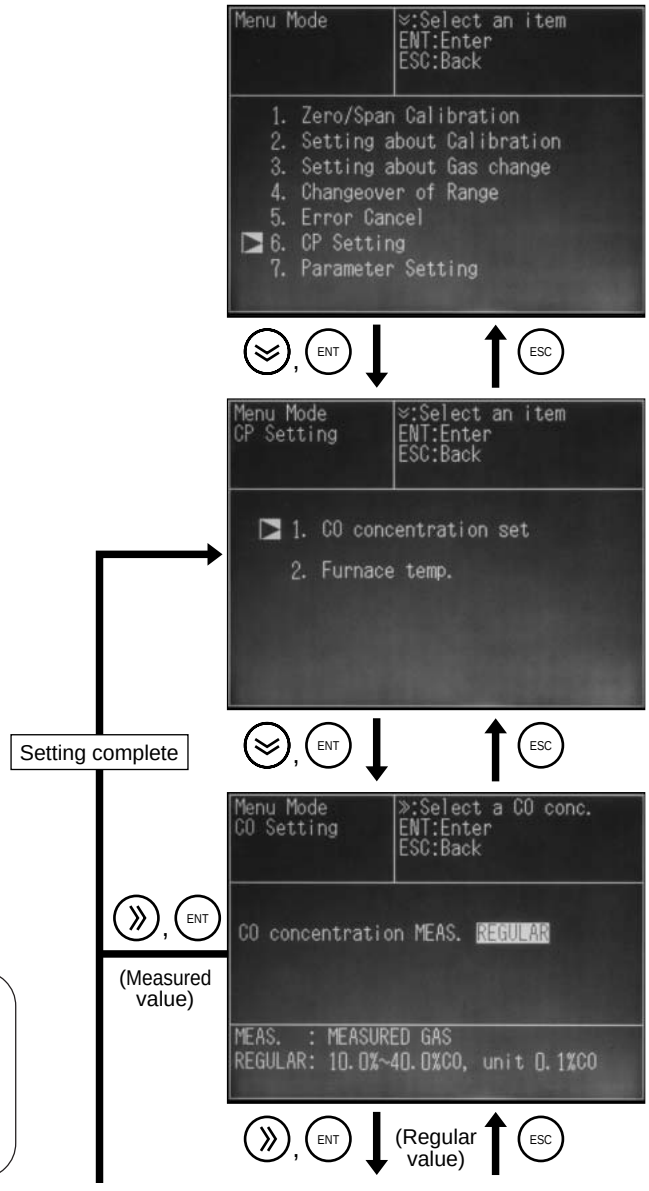
(1) CO concentration setting

Select <Measured Value> or <Regular Value> as CO concentration required for calculation.

2) Move the cursor to <1. CO Concentration Setting> using the ⋙ key and then press the ENT key, and the screen is switched.
3) Select measured value or regular value using the ⋙ key.
   - Select the measured value and press the ENT key to return to the previous screen.
   - Select the regular value and press the ENT key, and temporary CO concentration value is displayed.

     Select a digit using the ⋙ key, and change the value using the ⋙ key.

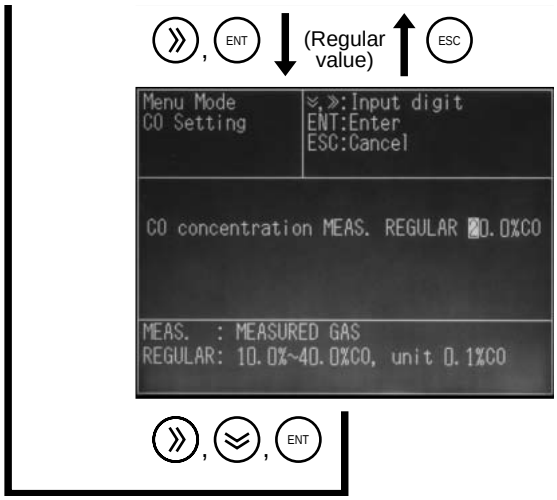
     Press the ENT key to return to the previous screen.



Caution on setting

If CO analyzer is not provided, setting the CO concentration value to <Measured Value> results in a calculation error. Be sure to enter the value properly.

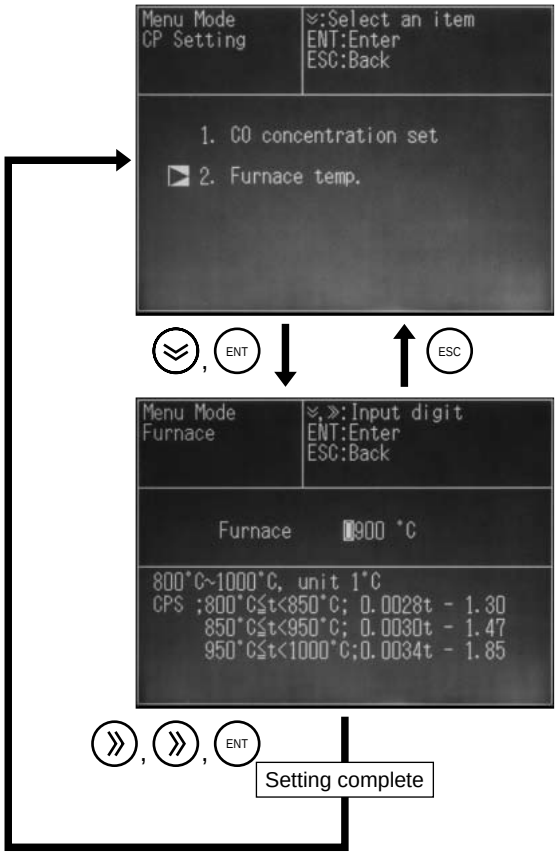
The setting has now been completed.



(2) Furnace temperature setting

Enter temporary furnace temperature value.

2) Move the cursor to <2. Furnace Temperature Setting> using the ≪ key and then press the ENT key, and the screen is switched.



3) Select a digit using the ≫ key and change the value using the ≪ key.
Press the ENT key to return to the previous screen.

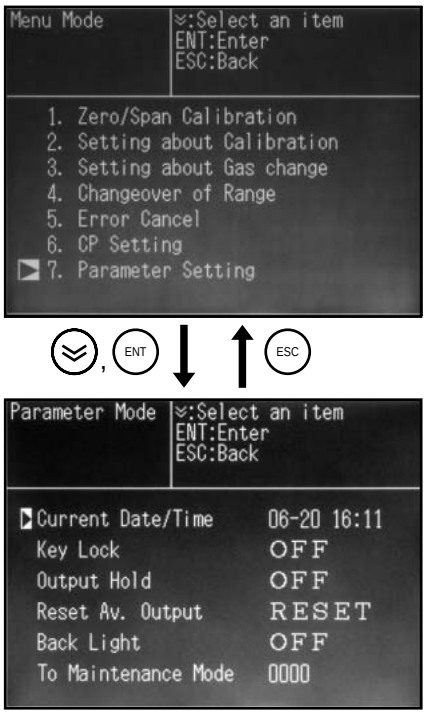
The setting has now been completed.

4.1.7 Parameter setting

The parameter setting screen can be entered in this mode.

See 4.2 for details of parameter setting.

(1) Move the cursor to <7. Parameter Setting> using the ⌄⌄ key, and press the ENT key.
The Parameter Mode screen appears.



4.2 Parameter mode

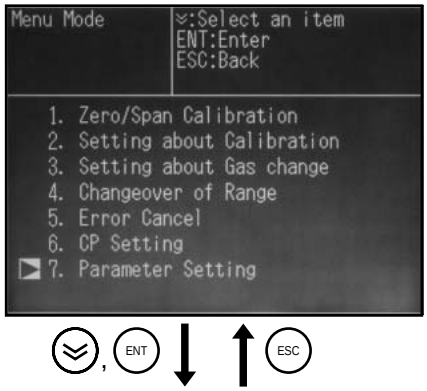
Make the parameter setting, observing the following.

Setting item

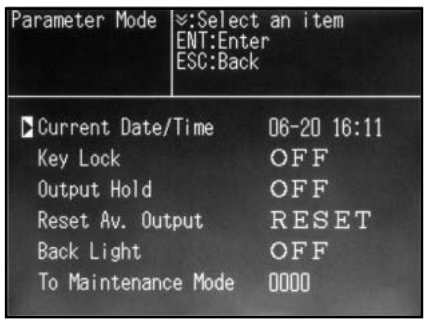
- Current Date/Time : Set current month, date, hour, and minute.
- Key Lock : Key operations can be disabled.
- Output Hold : The output can be held during calibration in measurement.
- Reset Av. Output : The average value can be reset.
- Back Light : The back light can be automatically turned off in standby mode. And also OFF time of the backlight can be set.
- To Maintenance Mode : Enter the password for entering the maintenance mode.

* See “4.3 Maintenance mode” for details of the maintenance mode.

(1) Move the cursor to <Menu Mode> → <7. Parameter Setting> using the ⌄⌄ key, and press the ENT key.



(2) On the Parameter Mode screen that appears, move the cursor to the item to be set using the ⌄⌄ key, and then press the ENT key.



4.2.1 Setting date/time

The setting is made to record the date and time of occurrence of an error.

See <Maintenance Mode> → <13. Error Log> for the contents to be recorded.

Caution on handling

- This mode is backed up with a battery. However, if the power is kept off for 7 days or longer, the clock is made to stop. Resetting is required in this case.

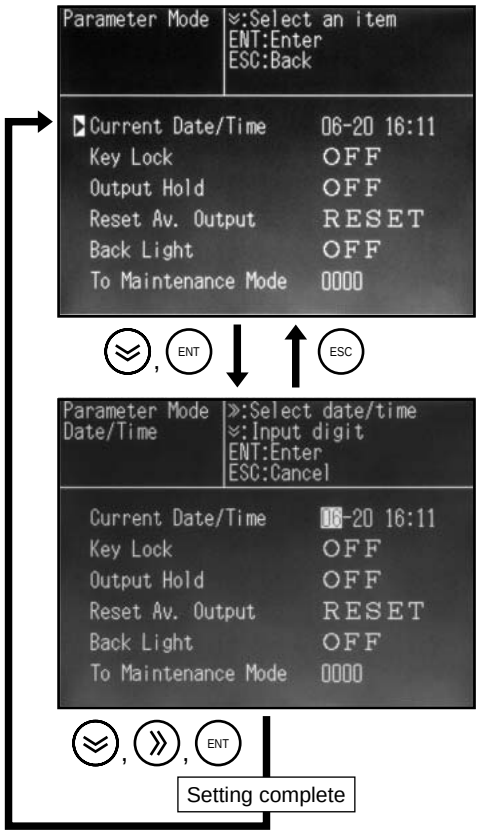
Setting range

- Month : 01 to 12
- Date : 01 to 31
- Hour : 00 to 23
- Minute : 00 to 59

(1) Move the cursor to <Current Date/Time> using the ⋙ key, and press the ENT key.
The cursor moves to the value to be entered.

(2) Select current date and time using the ⋙ and the ≫ keys.

(3) Press the ENT key to register the setting.
Then the item selection screen appears again.



The setting has now been completed.

4.2.2 Key lock

The key lock function can be used to prevent improper operation and entry by an unauthorized person.

Setting contents

- ON : Enables key lock.
- OFF : Resets key lock.

Initial value

- OFF

Caution on setting

- The following operations can be made even when key lock is set to “ON.”

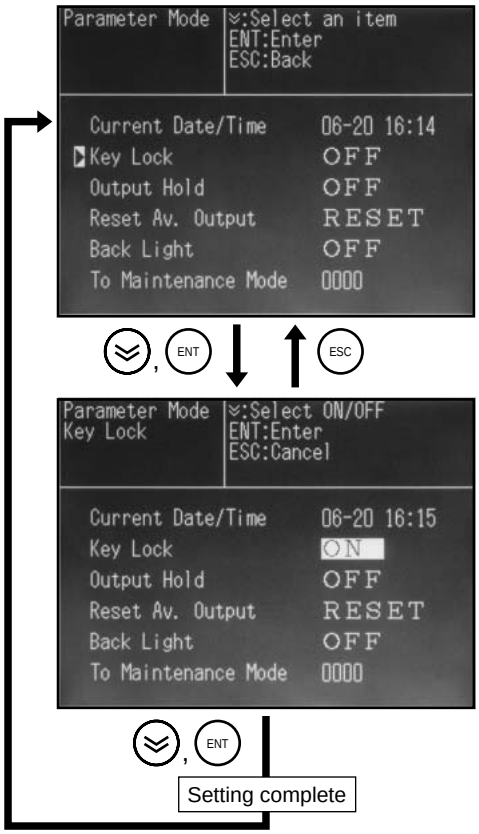
(1) ON/OFF of the (MEAS) key (switching between the measurement and the standby modes)
(2) Execution of zero/span calibration
(3) Execution or error cancel
(4) ON/OFF setting of this mode (key lock)
(5) Adjustment of brightness

- Set this mode to “OFF” before making settings other than the above.

(1) Move the cursor to <Key Lock> using the (≫) key, and press the (ENT) key.
The cursor moves to the value to be entered.

(2) Select “ON/OFF” using the (≫) key.
(3) Press the (ENT) key to register the setting.
Then the item selection screen appears again.

The setting has now been completed.



4.2.3 Output hold

Output signals are put to hold during calibration in measurement (zero and span calibrations), and gas change.

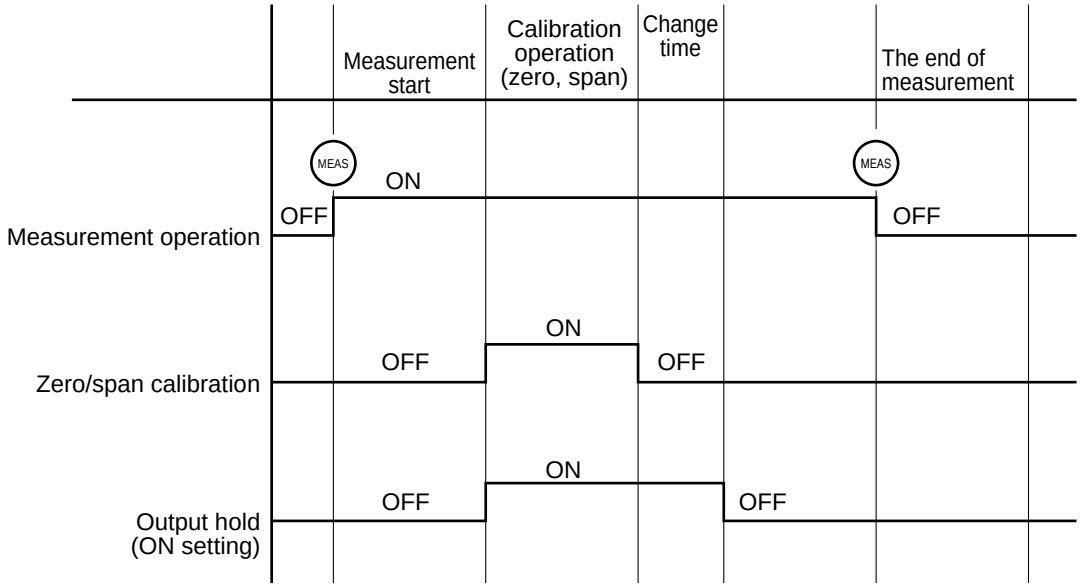
Setting contents

- ON : Holds output signals.
- OFF : Resets the hold of output signals.

Initial value

- OFF

1. Calibration and hold operations in measurement



1. Change time after calibration : Keeps holding.
2. Zero/span calibration : Holds.

Note 1:

Gas change : On completion of calibration in measurement, sample gas is fed and CHANGE is displayed.

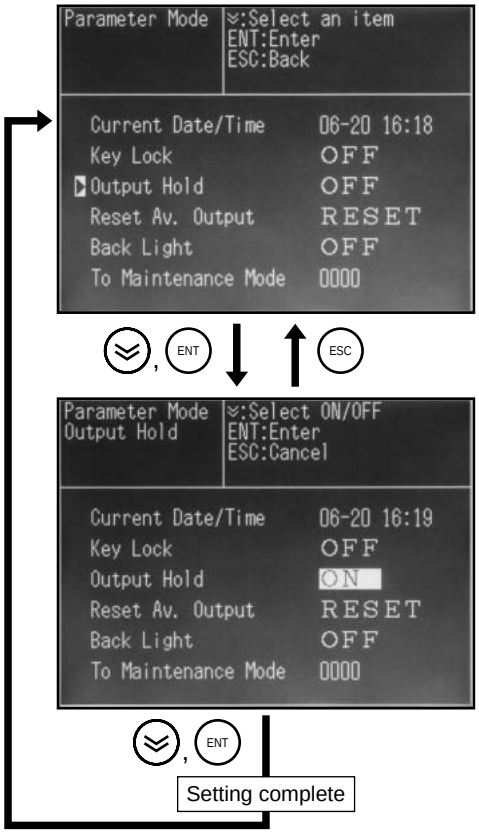
2. Hold operation in standby mode

Output is not put to hold irrespective of hold “ON/OFF” setting.

(1) Move the cursor to <Output Hold> using the ⌄⌄ key, and then press the ENT key.
The cursor moves to the value to be entered.

(2) Select “ON/OFF” using the ⌄⌄ key.
(3) Press the ENT key to register the setting.
The item selection screen appears again.

The setting has now been completed.

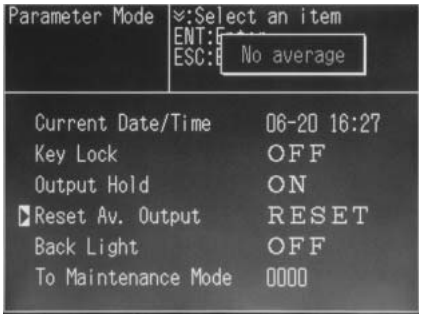


4.2.4 Resetting average output value

Integrated average output value and display can be reset as follows.

Caution on operation

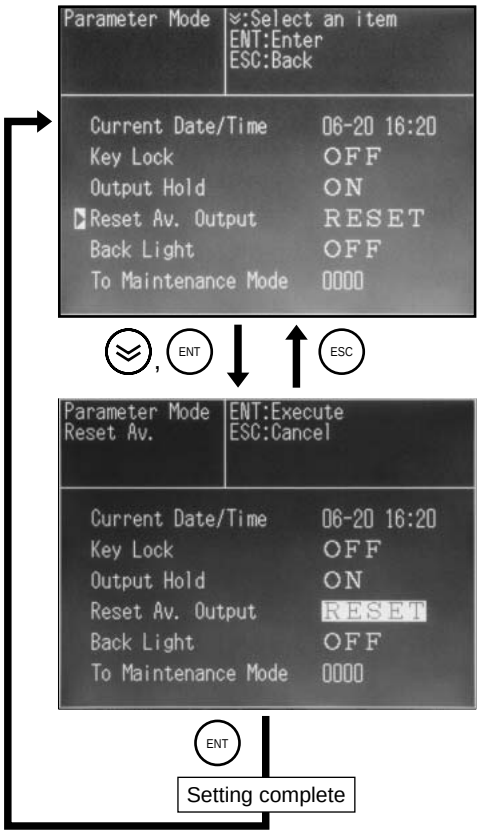
- Immediately after the reset is "execute," the reading and the output value appear as 0ppm, vol%.
- Reset is allowed only for the instrument of specifications with average value output provided. If average value output is not provided, NO AVERAGE is displayed as shown at right.
- See <Maintenance Mode> → <1. CH No.> and <Maintenance Mode> → <2. Average Time> for the setting of average value.



(1) Using the ⌄⌄ key, move the cursor to <Reset Av. Output>, and then press the ENT key.
The cursor moves within the mode.

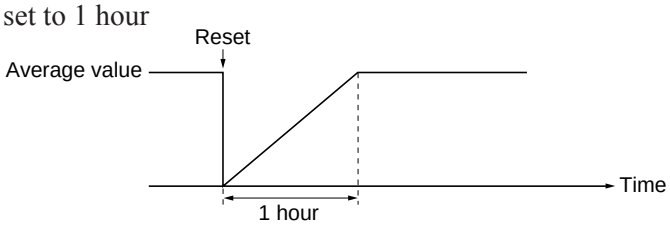
(2) Press the ENT key, and reset is executed, and the item select screen appears again.

Reset has now been completed.



Example of average operation and reset operation

When average value is set to 1 hour



- Sampling cycle is 30 seconds (fixed irrespective of the average time setting).
- The average of the values up to 1 hour before the current time is output at the intervals of 30 seconds.
- At the time of reset, all the values up to the current time are regarded as 0 for calculation. Consequently, accurate average value can be obtained 1 hour after the reset.

4.2.5 Setting indicator lamp OFF time

Automatic ON/OFF and OFF time of the indicator backlight can be set as follows.

OFF condition

- Set the setting to “ON.”
- When the set time elapses since any key is pressed last on “measurement 1 screen or measurement 2 screen” in “standby state,” the backlight automatically goes off.

ON condition

- When any key is pressed while the backlight stays off, it automatically comes on.

Setting contents

- ON : The backlight goes off when arbitrarily set time elapses. The setting range is from 01 to 30 minutes (in steps of 1 minute).
- OFF : The backlight does not go off.

Initial value

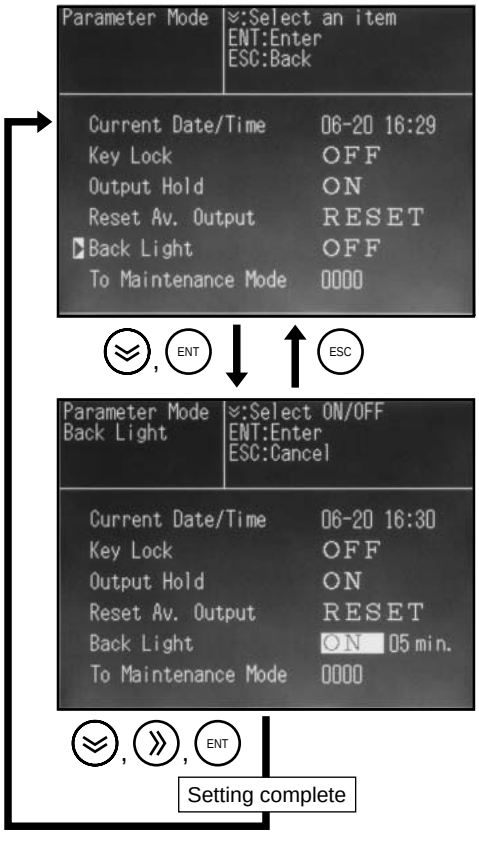
- OFF (05 minutes if ON is selected)

(1) Using the ⌄⌄ key, move the cursor to <Back Light >, and press the ENT key.
The cursor moves to the value to be entered.

(2) Select “ON/OFF” using the ⌄⌄ key.
Select “ON,” and the OFF time is displayed.
Move the cursor using the ⟩⟩ key, and change the setting using the ⌄⌄ key.

(3) Register the setting by pressing the ENT key. Then the item select screen appears again.

The setting has now been completed.



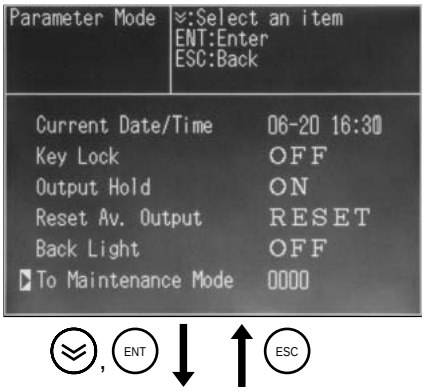
4.2.6 Maintenance mode

Enter the password to go into the maintenance mode.

Initial password

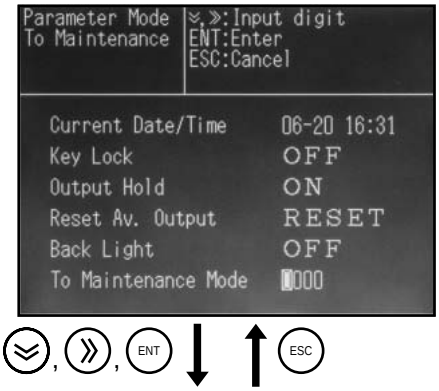
- The password is set to “0000” at the time of delivery from the factory.
- Select <Maintenance Mode> → <10. Password Set> to change the password.

(1) Move the cursor to <Maintenance Mode> using the ⋙ key, and press the ENT key.
The cursor moves to the password entry field.

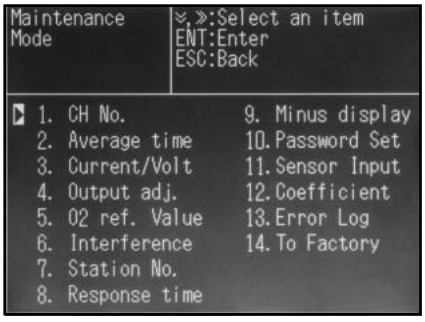


⋙, ENT ↓ ↑ ESC

(2) Enter the password using the ⋙ and the ⋗⋗ keys.
(3) Press the ENT key, and the <Maintenance Mode> screen appears.



⋙, ⋗⋗, ENT ↓ ↑ ESC



If you forget the password

Enter the common password “6284.”

4.3 Maintenance mode

Change of output value, periodic inspection, and failure analysis are performed in the maintenance mode.

See 4.2.6 Maintenance Mode for the procedure to enter the maintenance mode.

Description of setting item

1. CH No.	:	Select “corrected instantaneous value” or “corrected average value” or “CP calculation value” for display and output value.
2. Average time	:	Select average time of “corrected average value.”
3. Current/Volt	:	Select current output or voltage output.
4. Output adj.	:	Adjust zero value and span value of output signals.
5. O2 ref. Value	:	Set reference O_2 concentration value.
6. Interference	:	Unused mode (Special specification: Mode for correcting the moisture interface on NO_X and SO_2 analyzers)
7. Station No.	:	Set when using communication input/output.
8. Response time	:	Set the response time of internal operation.
9. Minus display	:	Set with/without of minus display.
10. Password Set.	:	Password setting to enter the maintenance mode
11. Sensor Input	:	Displays digital values after A/D conversion.
12. Coefficient	:	Check the internal operation coefficient.
13. Error Log	:	Date of occurrence of error or error contents can be checked.
14. To Factory	:	Enters the factory adjustment mode. (You do not have to carry out adjustment or setting.)

Caution on operation

- You have to enter the password to enter into this mode.
  Record your password after it is established just in case you forget it.
- The maintenance mode is an important setting mode in which output adjustment, moisture interference adjustment, etc. are made to maintain the accuracy of the instrument.

4.3.1 Selecting output type

Instantaneous correction value or average correction value or CP calculation value can be selected in this mode.

Caution on setting

- Setting can be made only when CO, and CO_2 (CO calculation value) analyzers are added for measured components.
- Be sure to select "NONE" not to make the setting.
- See "1.4.2 Outline of display screen" for each operational expression.

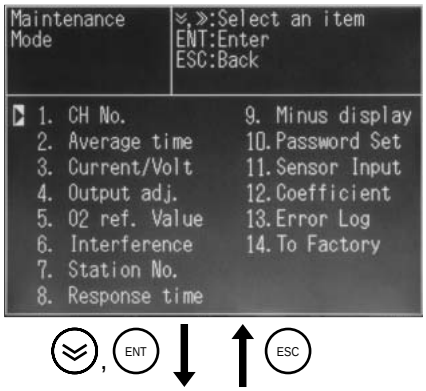
Setting contents

Selection can be made from "Corrected concentration value," "Corrected average concentration value," "CP calculation value" or "None."

Initial value

"Depends on specifications."

(1) Move the cursor to <1. CH No.> using the ⋙ key, and press the ENT key.
The screen switches as shown at right.



(2) Move the cursor to the channel (CH) to be set using the ⋙ key.
Press the ENT key, and the cursor moves to the entry field.

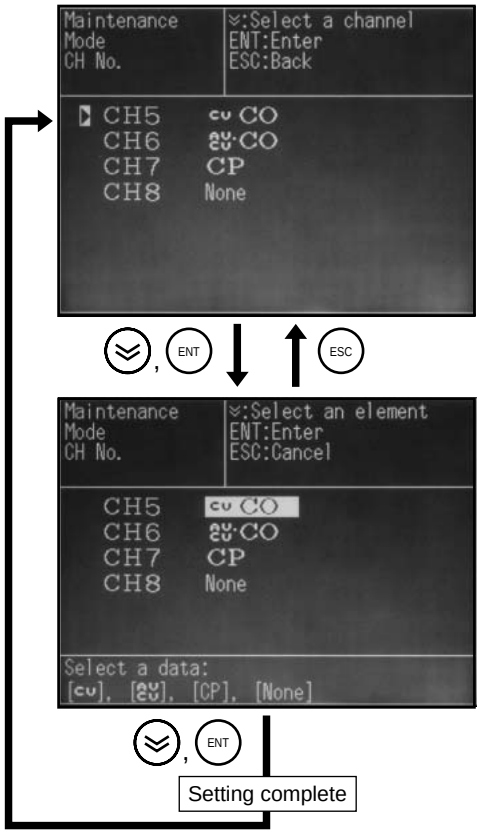
Caution on setting

- Be sure to make the setting, following the proper order.
- Do not select the same output type.

(3) Select setting contents using the ⋙ key, and press the ENT key.
The CH selection screen appears again.

(4) Make the setting of other channels in the same manner.

Setting has now been completed.



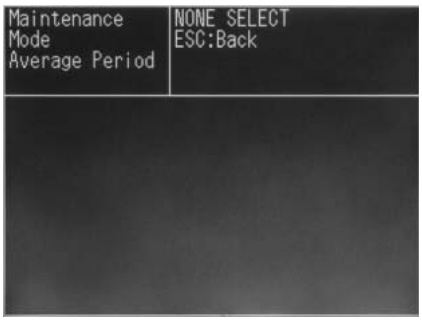
4.3.2 Average output time

Average corrected time can be set in this mode.

Caution on setting

- The message shown at right is displayed if average corrected value is not selected in "4.3.1 Selecting output type."
- Sampling cycle is 30 seconds.
- The average of the values from the current time to before the time of setting is output at intervals of 30 seconds.

  Accurate average value can be obtained when the set time elapses after the data is input.



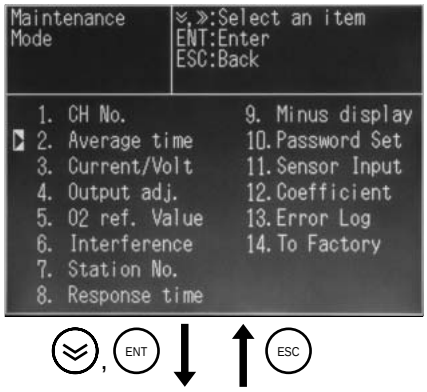
Setting contents

- "01 to 59 minutes (in steps of 1 minute)" or "01 to 04 hours (in steps of 1 hour)"

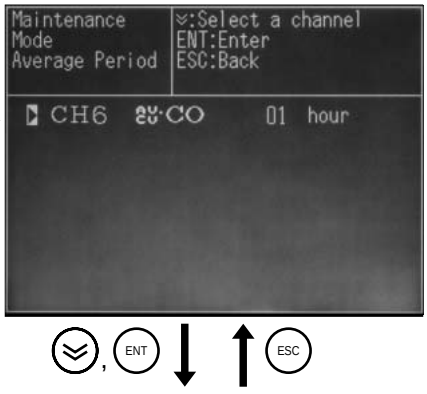
Initial value

"01 hour"

(1) Move the cursor to <2. Average time> using the ⋙ key, and press the ENT key.
The screen switches as shown at right.



(2) Move the cursor to the channel (CH) to be set using the ⋙ key.
Press the ENT key, and the cursor moves to the time to be set.



(3) Move the cursor to "Hour" and "Minute" using the ⋘ key, and enter numeric values using the ⋙ key.
Move the cursor to the "numeric value" using the ⋘ key again, change the value using the ⋙ key, and then press the ENT key.

(4) Make the setting for other channels in the same manner.

The setting has now been completed.

4.3.3 Selecting output

Current output (4 to 20mA DC) or voltage output (0 to 1V DC) can be selected in this mode.
To switch between current and voltage outputs, switch the jumper pin of the control printed board.

Caution on setting

- When making the setting in this mode, be sure to switch the jumper pin of the control printed board. Otherwise accurate output signal cannot be obtained.

Setting contents

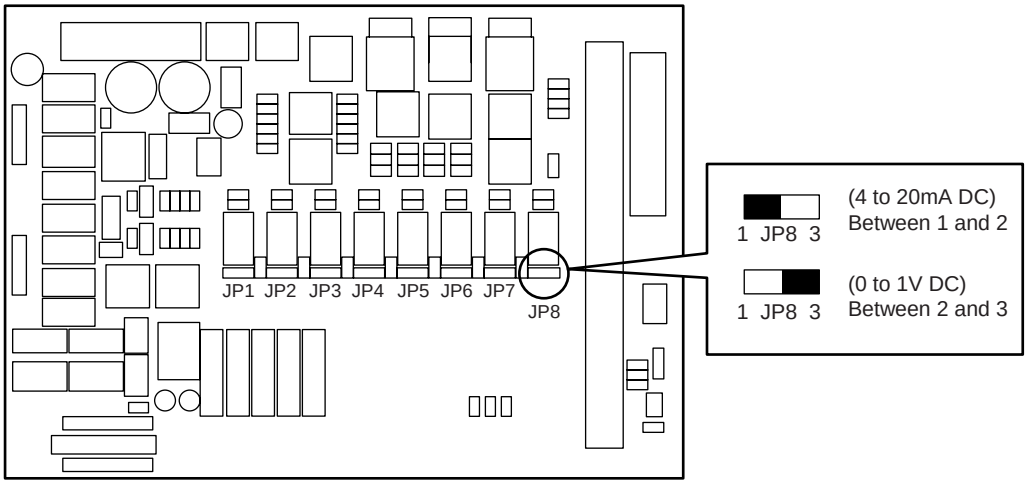
Select “4 to 20mA DC” or “0 to 1V DC.”

Initial value

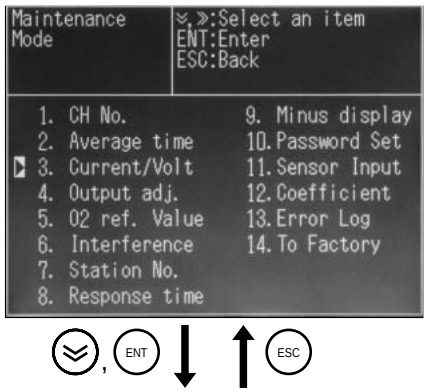
“Depends on specifications.”

Jumper switching

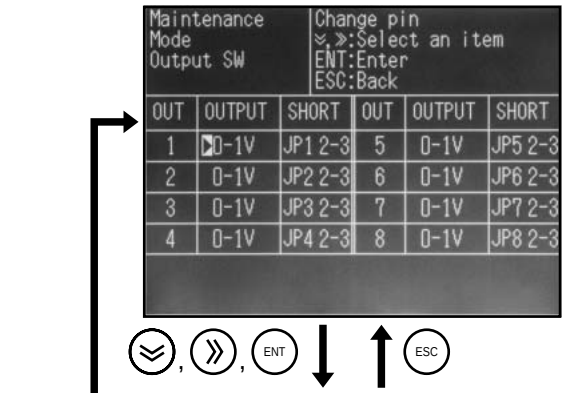
Output cannel	Jumper	4 to 20mA DC	0 to 1V DC
CH1	JP1	1–2	2–3
CH2	JP2	1–2	2–3
CH3	JP3	1–2	2–3
CH4	JP4	1–2	2–3
CH5	JP5	1–2	2–3
CH6	JP6	1–2	2–3
CH7	JP7	1–2	2–3
CH8	JP8	1–2	2–3



(1) Move the cursor to <3. Current/Volt> using the ≪ key, and press the ENT key.
The screen switches as shown at right.

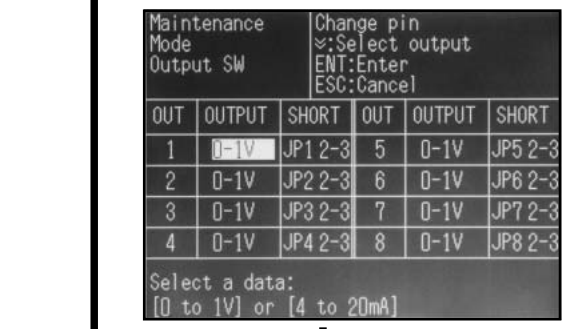


(2) Move the cursor to the output to be selected using the ≪ or the ≫ key.
Press the ENT, and the cursor moves to the value to be entered.



(3) Change the setting contents using the ≪ key, and press the ENT key.
The output No. selection screen appears again.

(4) Make the setting of other output signals in the same manner.



The setting has now been completed.

Setting complete ≪, ENT

4.3.4 Adjusting output

Zero value and span value of output signals can be adjusted as follows.

Preparation for the setting

- Connect an ammeter or a voltmeter to the analog output connector.

Caution on setting

- The variable setting value is for internal operation.

  Check the adjusted output value with an ammeter or a voltmeter.

Tolerance of output value

- In the case of 4 to 20mA DC

  Zero: 4mA±0.05mA

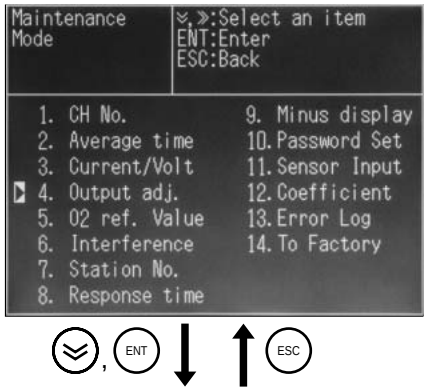
  Span: 20mA±0.05mA
- In the case of 0 to 1V DC

  Zero: 0V±0.005A

  Span: 1V±0.005A

(1) Move the cursor to <4. Output adj.> using the ≪ key, and press the ENT key.

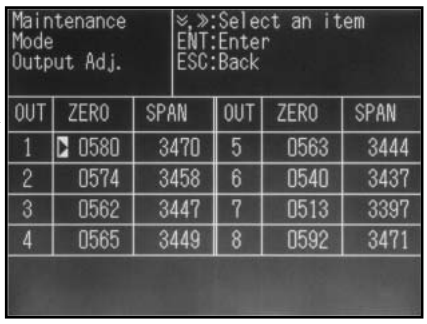
The screen switches as shown at right.



≪, ENT ↓ ↑ ESC

(2) Move the cursor to the output (zero, span) to be set using the ≪ or the ≫ key.

Press the ENT key, and the cursor moves to the value to be entered.



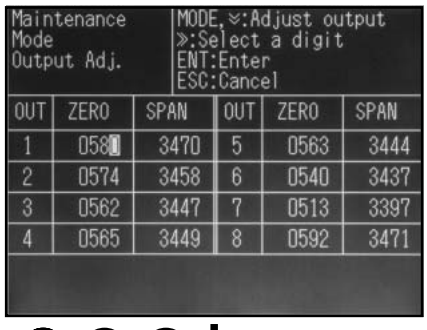
≪, ≫, ENT ↓ ↑ ESC

(3) Select a digit using the ≫ key, and change the value using the MODE (UP) key and the ≪ (DOWN) key.

At this time, make the setting so that the ammeter or the voltmeter connected to the output signal indicates the specified value.

Press the ENT key, and the data is registered.

The output signal selection screen appears again.



(4) Make the setting for other zero and span output signals in the same manner.

MODE, ≪, ≫, ENT

Setting complete

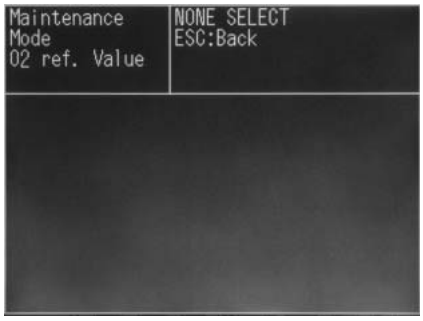
The setting has now been completed.

4.3.5 Setting O_2 reference value

Reference O_2 correction concentration value can be set to obtain O_2 correction concentration value.

Caution on setting

- Valid only when CO analyzer is added.
- If O_2 analyzer is not added, the message shown at right is displayed.



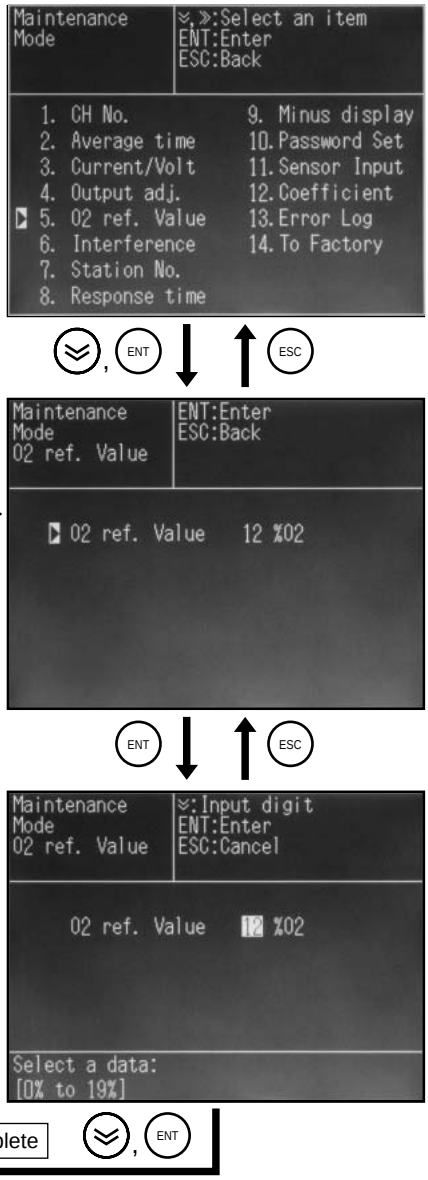
Setting range

"00 to 19%"

Initial value

"12%"

(1) Move the cursor to <5. O_2 ref. Value> using the ⌄⌄ key, and press the ENT key.
The screen switches as shown at right.



(2) Press the ENT key again, and the cursor moves.

(3) Change the setting using the ⌄⌄ key, and press the ENT key.
The previous screen appears again.

The setting has now been completed.

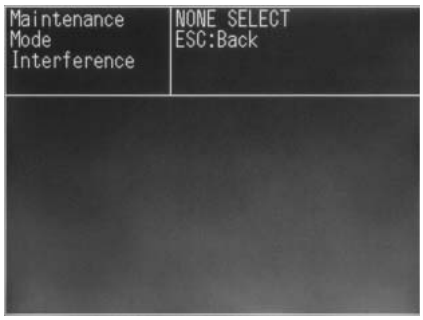
4.3.6 Adjusting moisture interference (Targeted for NO_X and SO_2 analyzers of special specifications)

The moisture interference adjustment is for NO_X and SO_2 analyzers only, and is not performed in general situations. This is an adjustment mode for correcting the effect of moisture interference.

See "5.3.3 Interface" for details of adjustment.

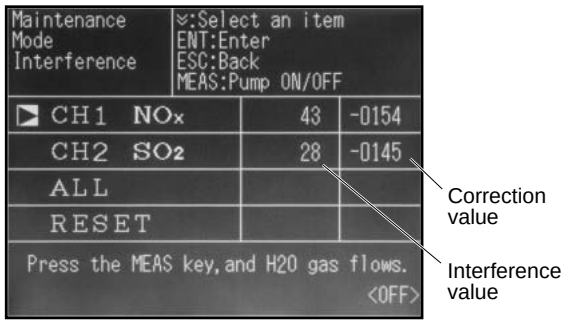
Caution on setting

- Adjustment is required when either NO_X analyzer or SO_2 analyzer is added.
- If neither NO_X analyzer nor SO_2 analyzer is added, the message shown at right is displayed.



Description of the screen

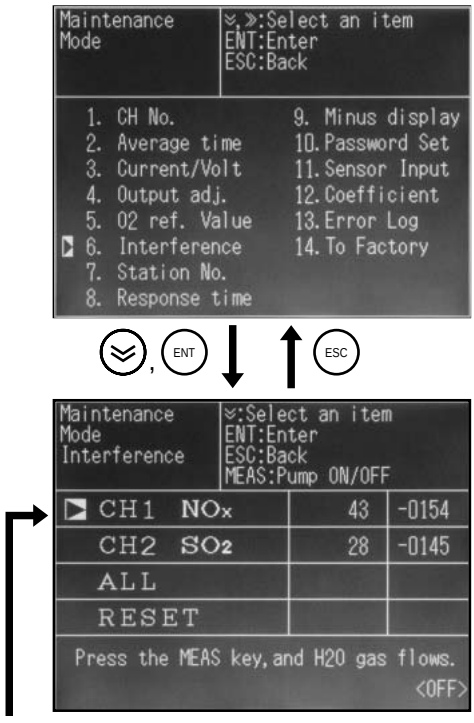
- "CH1 NO_X" or "CH2 SO_2":
  Makes an adjustment for each component.
- "ALL": Makes an adjustment for all the components.
- "RESET": Resets the correction value to "0."
- Correction value: Displays the correction volume in internal operation value.
- Interference value: Displays the interference value in internal operation value.



<Adjusting CH1 NO_X or CH_2 SO_2 by component>

(1) Move the cursor to <6. Interference> using the ≫ key, and press the ENT key.
The screen switches as shown at right.

(2) Move the cursor to the component to be adjusted using the ≫ key.

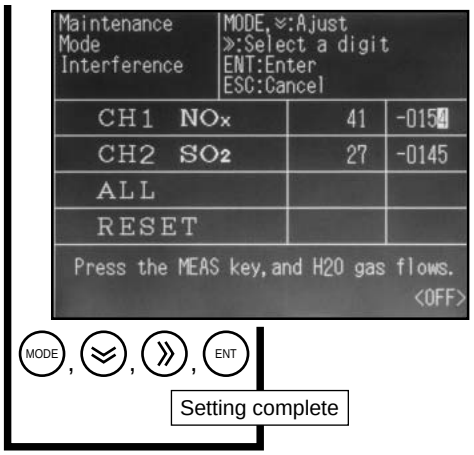


(3) Feed the moisture interference gas using the (MEAS) key.
Press the (ENT) key, and the cursor moves to the correction value.

(4) When the interference value stabilizes, enter correction value using the (MEAS) (UP) key, (≫) (DOWN) key, and the (⟫) (digit) key so that the interference value becomes 0.

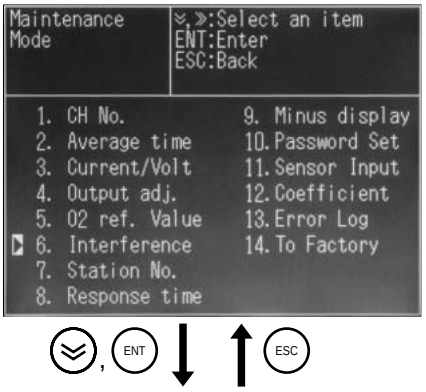
(5) Press the (ENT) key, and the data is registered.

The setting has now been completed.

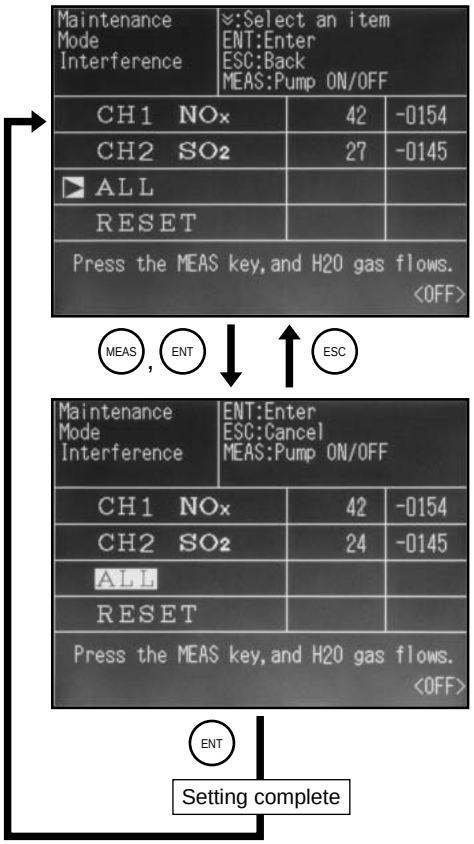


<Adjusting 2 components simultaneously by ALL>

(1) Move the cursor to <6. Interference> using the (≫) key, and press the (ENT) key.
The screen switches as shown at right.



(2) Move the cursor to ALL using the (≫) key.



(3) Press the (MEAS) key, and the moisture interference gas is fed.
Press the (ENT) key, and the cursor is moved.

(4) When the interference value stabilizes, press the (ENT) key.
Automatic adjustment is carried out, and the component selection screen appears again.

The setting has now been completed.

4.3.7 Setting transmission station No.

The station No. for Modbus communication can be set as follows.

Caution on use

- Establish communication program separately, referring to a separate document “Communication Function.”

Setting range

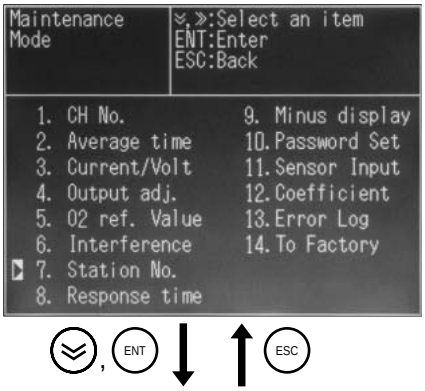
“01 to 31”

Initial value

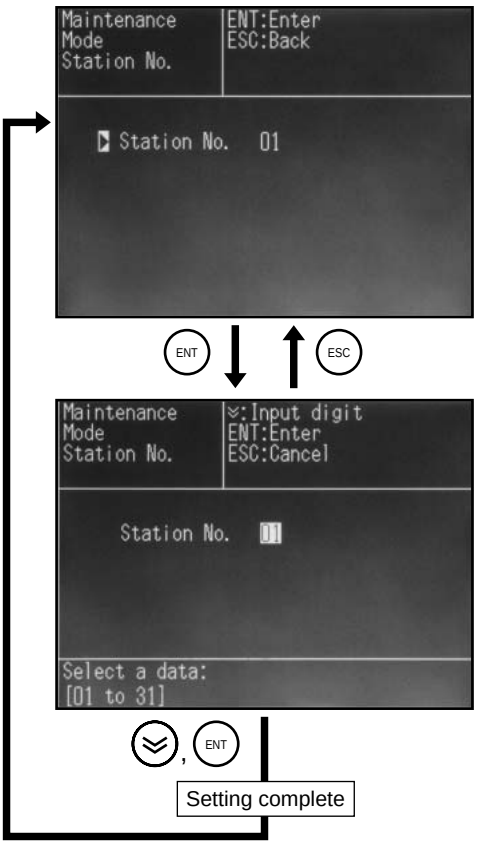
“01”

(1) Move the cursor to <7. Station No.> using the ⌄⌄ key, and press the ENT key.

The screen switches as shown at right.



(2) Press the ENT key again, and the cursor moves to the value to be entered.



(3) Change the setting using the ⌄⌄ key, and press the ENT key.

The setting has now been completed.

4.3.8 Response time

Response time by internal operation (moving average) can be set as follows.

Caution on use

- The set time is for guidelines.
- The response time set here does not include gas feed and gas change time.
- In general, the longer the response speed, the slower the response time and less the fluctuation of reading.

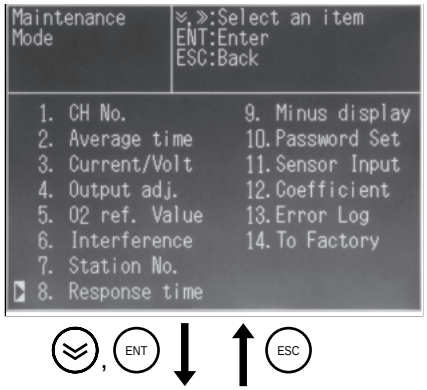
Setting range

"01 to 60 sec"

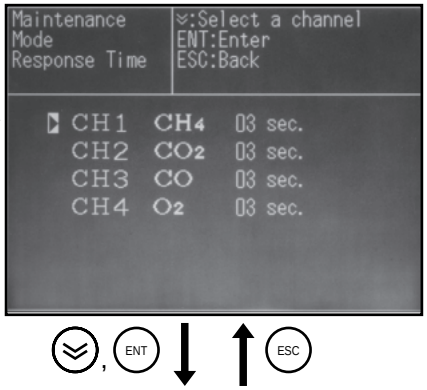
Initial value

"03 sec"

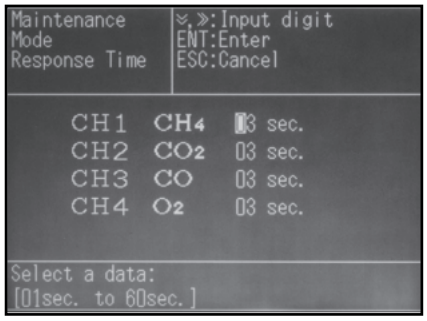
(1) Move the cursor to <8. Response time> using the ⋙ key, and press the ENT key.
The screen switches as shown at right.



(2) Move the cursor to the component to be set using the ⋙ key.
Press the ENT key, and the cursor moves to the value to be entered.



(3) Select a digit using the ⋘ key, and change the value using the ⋙ key.
Press the ENT key, and the data is registered and the previous screen appears again.



The setting has now been completed.

4.3.9 Minus display

The function turns minus reading into “0.”

Setting contents

- ON : Outputs minus reading. (Outputs minus values.)
- OFF : Does not output minus reading. (Does not output minus values.)

* The same applies to concentration value display.

Initial value

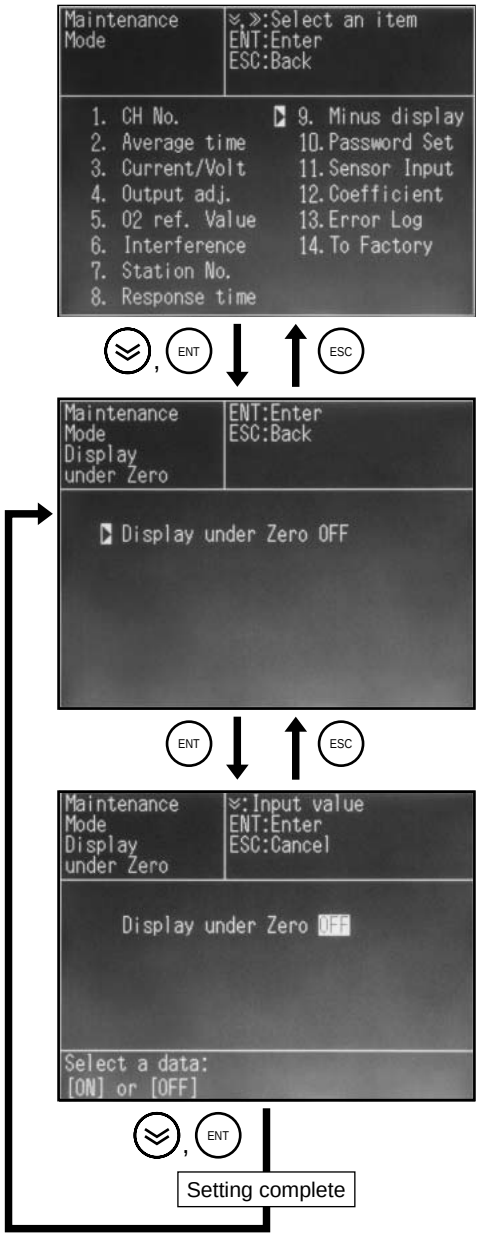
“OFF”

(1) Move the cursor to <9. Minus display> using the ⋙ key, and press the ENT key.
The screen switches as shown at right.

(2) Press the ENT key again, and the cursor moves to the value to be entered.

(3) Change the setting using the ⋙ key, and press the ENT key.

The setting has now been completed.



4.3.10 Password setting

The password for moving from <Parameter Mode> to <Maintenance Mode> can be set as follows.

⚠ Caution on setting

- Be sure to record and store your established password just in case you forget it.

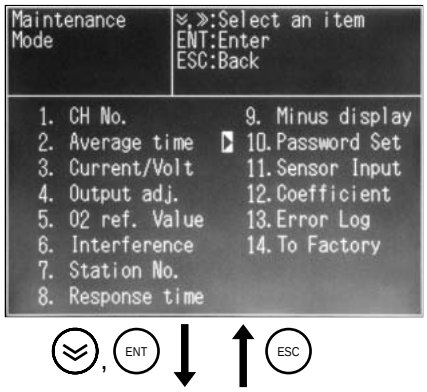
Setting range

"0000 to 9999"

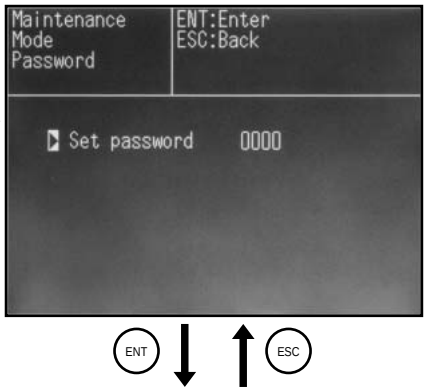
Initial value

"0000"

(1) Move the cursor to <10. Password Set.> using the ⋙ key, and press the ENT key.
The screen switches as shown at right.



(2) Press the ENT key again, and the cursor moves to the value to be entered.



(3) Select a digit using the ⋙ key, and change the value using the ⋘ key.
Press the ENT key, and the data is registered and the previous screen appears again.

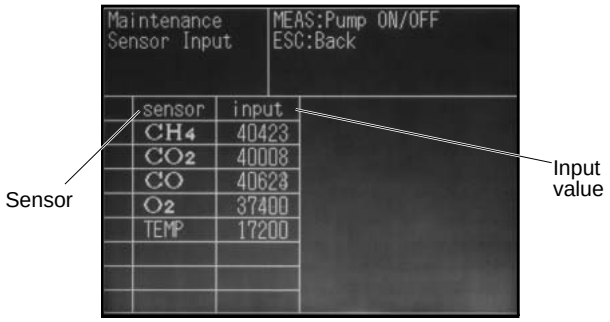
The setting has now been completed.

4.3.11 Sensor input

The A/D conversion values of sensor input signals can be displayed.

Description of the screen

- Sensor : Displays sensor components.
- Input value : Displays the values immediately after A/D conversion in count values.



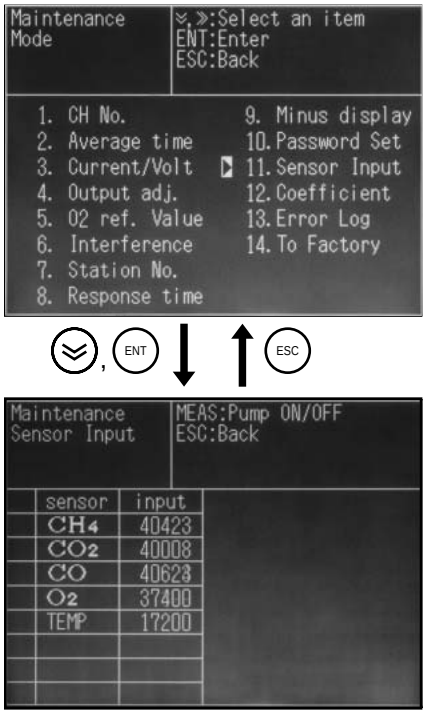
Caution on operation

- This mode is for displaying input values. Entry by key operation cannot be made.

(1) Move the cursor to <11. Sensor Input> using the ⌄⌄ key, and press the ENT key.

The screen switches as shown at right.

(2) Press the ESC key, and the previous screen appears again.



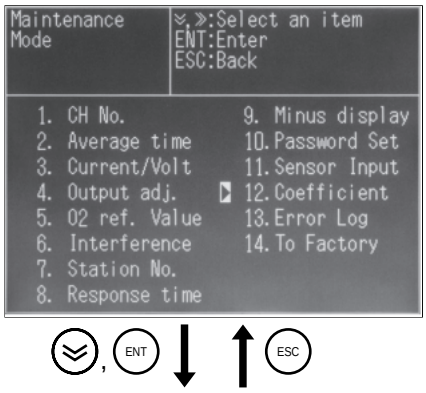
4.3.12 Checking coefficient

Internal operation coefficient of “offset value” and “zero/span correction value” can be checked in this mode.

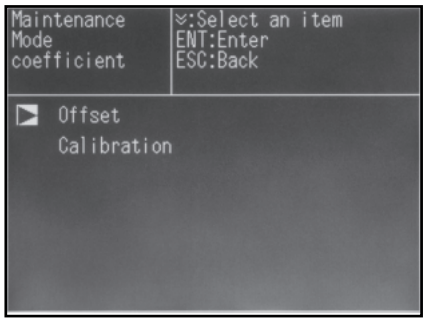
Caution on operation

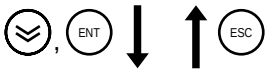
- This mode is for checking the coefficient.
  Entry by key operation is not allowed.

(1) Move the cursor to <12. Coefficient> using the ⋙ key, and press the ENT key.
The screen switches as shown at right.

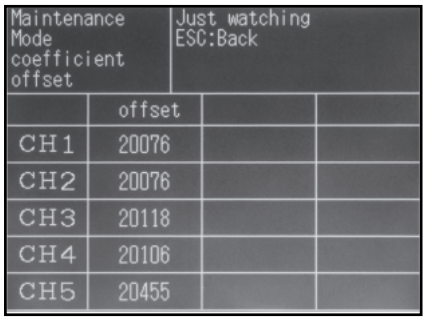


(2) Move the cursor to the item to be checked using the ⋙ key, and press the ENT key, to enter the mode.

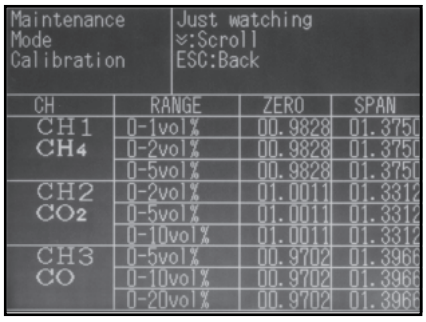


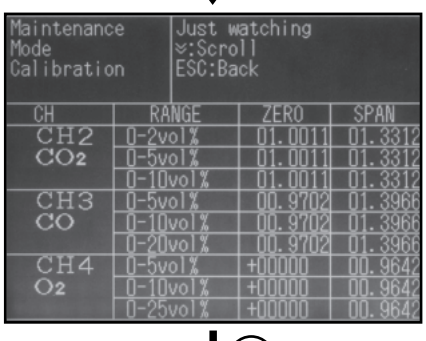


(3) The channels (CH) on the <Coefficient> screen can be scrolled using the ⋙ key.



or





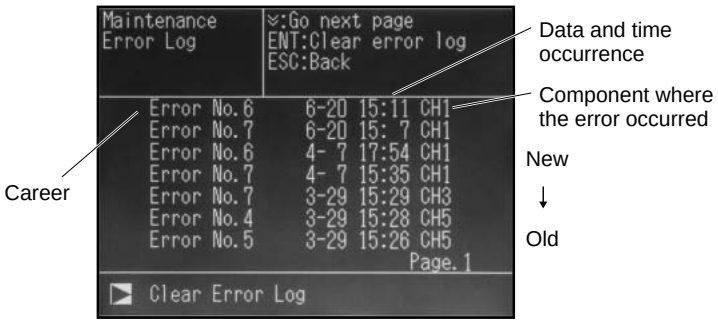
(4) Press the ESC key to return to the previous screen.

4.3.13 Error log file

The error code history can be checked in this mode.

Description of the screen

- History: Displays error No.
- Date of occurrence:
  Displays the date and time of occurrence of the error
- Component of occurrence:
  Displays the channel where the error occurred.



* Up to 14 error logs are stored as history. If more than 14 errors should occur, the logs are deleted from the oldest.

* There are two error log screens. Press the ≫ key to witch between Page1 and Page 2.

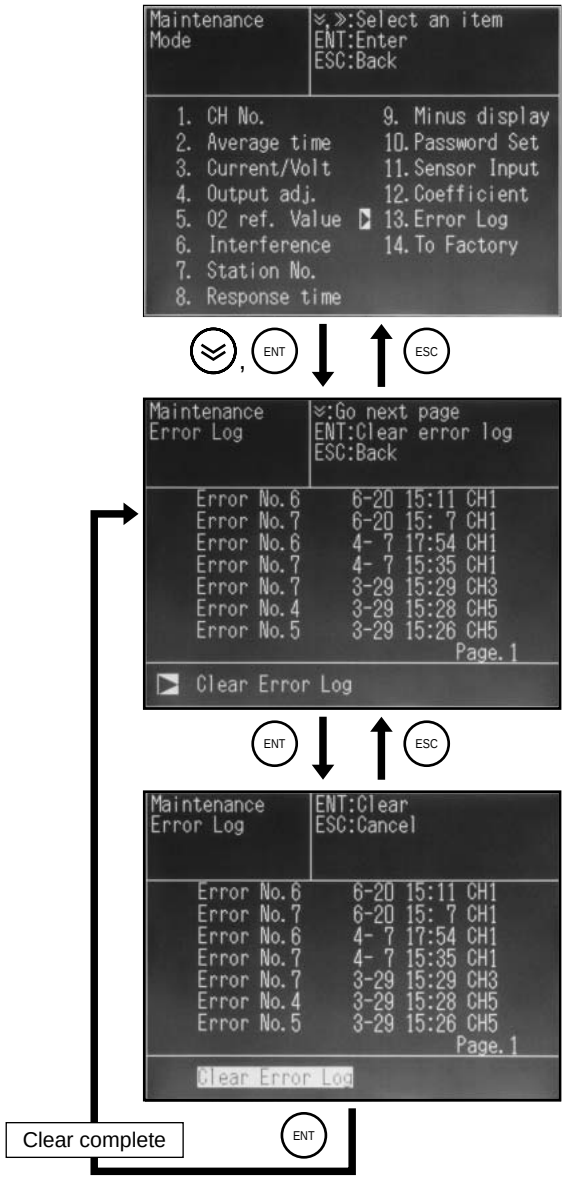
(1) Move the cursor to <13. Error Log> using the ≫ key, and press the ENT key.
The screen switches as shown at right.

(2) Press the ESC key to carry out checking only, and the previous screen appears again.

(3) Press the ENT key to clear the error log, and the cursor moves to Clear Error Log

(4) Press the ENT key again, and the error display is cleared and the previous screen appears again.

The work has now been completed.



4.3.14 Factory mode

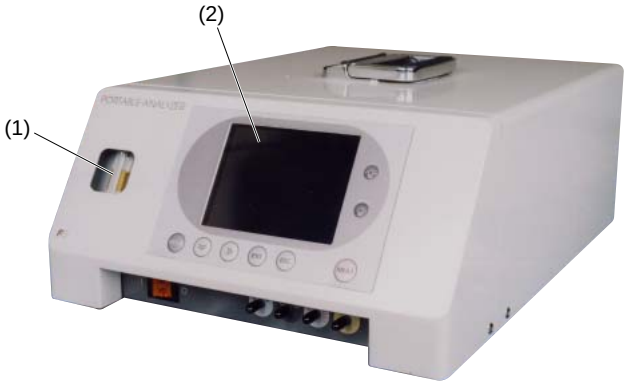
You can enter the factory mode, but you need not carry out adjustment or setting.

Description of the screen

- Changing the data in the factory mode may cause malfunction of the instrument. Do not change the data in factory mode by yourself.
- If setting change is required, contact our service representative in charge.
- See “Service Manual” for details of the factory mode.

5. INSPECTION AND MAINTENANCE

5.1 Daily inspection (Be sure to perform daily.)



	Name of unit	Inspection	Judgment criteria	Judgment criteria
(1)	Flow checker Needle valve	Flow rate check	Check that the flow rate falls within the specified range. If not: 1) Check that the internal capillary is not clogged with dust, etc. 2) Replace membrane filter. See “5.3.6 Replacing filter paper of membrane filter.” 3) Check air-tightness and repair as required. See “5.4.1 Airtight test.” 4) Replace the diaphragm of the pump by referring to section 5.3.7 (Replacing the diaphragm).	The ball is kept at the center of the yellow zone. (0.5L/min±0.1L/min)
(2)	Display unit	Reading check	When reading is lower than normal: 1) Check air-tightness and repair as required. See “5.4.1 Airtight test.” 2) Clean within the sample cell of the analyzer unit. See “5.3.8 Cleaning measurement cell.”	The reading is normal.

5.2 Periodic inspection

In addition to daily inspections, perform periodic inspections.

Item of maintenance and inspection	Maintenance and inspection procedure	Interval
Zero/span calibration	Perform zero/span calibration. See “3.2 Zero/span calibration.”	Once/ 5 days
Check of gas aspirator	1) When the flow rate does not increase to the specified value 2) Periodic replacement Replace the diaphragm. See “5.3.7 Replacing diaphragm.”	Once/year

5.3 Maintaining analyzer unit

5.3.1 Internal composition of analyzer unit

See separate “Service Manual” for internal composition and replacement/adjustment of repair parts.

5.3.2 Replacing power fuse

⚠ Caution on replacement

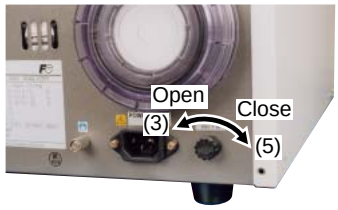
- Be sure to remove the power cable before starting the work.
- Be sure to find the cause of fuse blowing before starting the work.

The fuse holder is located on the rear face of the analyzer unit.

(1) Set the power switch on the front face of the analyzer unit to OFF.

(2) Remove the power cable from the socket on the rear face.

(3) Turn the cap of the fuse holder counterclockwise, and pull it toward you.

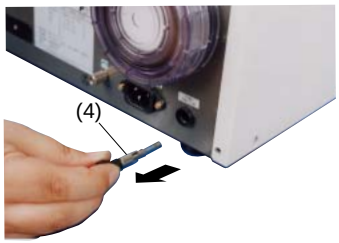


(4) Take out the fuse, and replace it with a new one (250V/2A AC, slow-blow type)

(5) Insert the cap into the fuse holder, and turn it clockwise.

(6) Insert the power cable, and turn on the power switch on the front face.

Check that the unit operates normally.



The work has now been completed.

5.3.3 Adjusting moisture interference (Targeted for NO_X and SO_2 analyzers of special specifications)

Since the compact type gas analyzer performs measurements, using specific wave range of infrared ray, moisture wavelength over the entire wave range interferes with the measurement, thus causing reading error.

To reduce the effect, corrective operation is required.

The moisture interference adjustment function is added to NO_X and SO_2 analyzers, whose wave ranges overlap in large area.

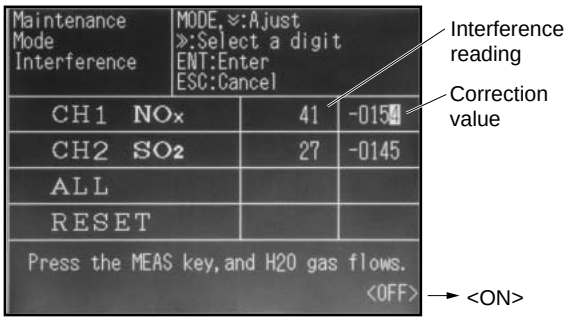
(1) Adjusting moisture interference (Auto adjustment ALL mode)

1) Select <Maintenance Mode> → <6. Interference>, referring to "4.3.6."
   To clear moisture correction value already entered,
2) Move the cursor to <RESET> using the (≫) key.
3) Press the (ENT) key, and the cursor moves to <RESET>.
4) Press the (ENT) key again, and the moisture correction value is changed to "0."
   To adjust the new correction value, perform reference zero/span calibration as follows.
5) Directly feed dry N2 or dry Air gas into the sample gas inlet at the rate of 0.5 L/min.
   (Adjust the flow rate so that the flow checker ball comes to the center.)
6) Select <Dry N_2> in <Zero Cal.> mode, and then select <ON> for NO_X and SO_2 only.

⚠ Caution on operation

- Directly feed dry zero gas and dry span gas to perform reference zero/span calibration.
- Select a gas for zero calibration mode in Dry N_2 setting.

7) Perform zero calibration
8) Perform span calibration of NO_X and SO_2 analyzers.
   Then, to feed moisture interference gas (H_2O, saturated at 2°C)
9) Perform bubbling to humidify N_2 gas. Feed the bubbled N_2 gas from the calibration gas inlet through the 2°C dehumidifier (electron cooler).
10) Return to <Maintenance Mode> → <6. Interference>, and then select <All>.
11) When the interference reading stabilizes in about 3 minutes, press the (ENT) key twice.
12) The reading becomes "0" and "correction value" is input.



Moisture interference adjustment has now been completed.

(2) Adjusting moisture interference (Manual adjustment)

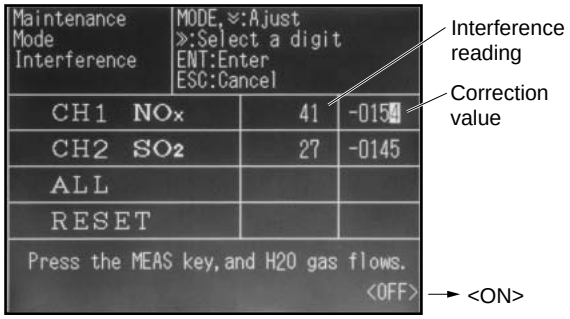
Follow the procedure shown below to manually adjust the interference.

1) Directly feed dry N_2 or dry Air gas to the sample gas inlet at the rate of 0.5L/min.
   (Adjust the gas flow rate so that the flow checker ball comes to the center.)
2) Select <Dry N_2> in <Zero Cal.> mode, and select <ON> for NO_X and SO_2 only.

⚠ Caution on operation

- Directly feed dry zero gas and dry span gas to perform reference zero/span calibration.
- Select a gas for zero calibration mode in Dry N_2 setting.

3) Perform zero calibration.
4) Perform span calibration of NO_X and SO_2 analyzers.
   Then, to feed moisture interference gas (H_2O, saturated at 2°C)
5) Perform bubbling to humidify N_2 gas. Feed the bubbled N_2 gas from the calibration gas inlet through the 2°C dehumidifier (electron cooler).
6) Enter <Maintenance Mode> → <6. Interference> mode.
7) Move the cursor to <CH1 NO_X> using the (≫) key, and press the (ENT) key.
   The cursor moves to the correction value.
8) When the reading stabilizes in about 3 minutes, adjust the value to "0" using the (MODE) (UP) key and the (≫) (DOWN) key.
9) Press the (ENT) key to memorize the correction value.



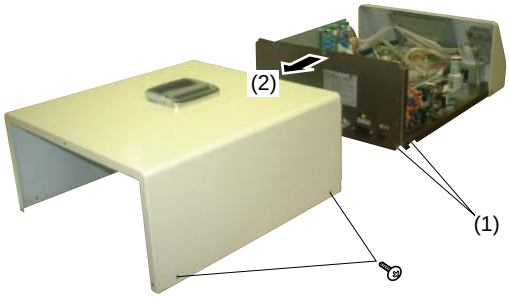
Moisture interference adjustment has now been completed.

5.3.4 Replacing galvanic O_2 sensor (when provided with the sensor)

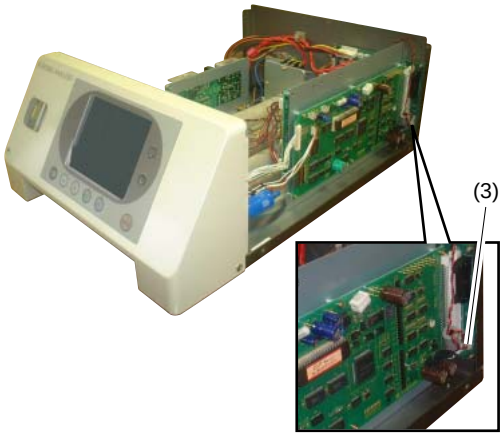
The service life of this sensor is about 18 months from the date of delivery.
We recommend periodic replacement of the sensor.

Replacement parts order No.: TK7M3502C1

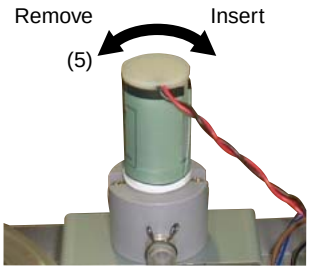
(1) Remove the screws (M4 × 7 pcs.) on the rear and the side faces of the main unit.
(2) Pull out the cover toward the rear.



(3) Remove the O_2 sensor connector.
(Control printed board CN9)
(4) You can see the O_2 sensor fastened to the mounting rack at the left of the front face.

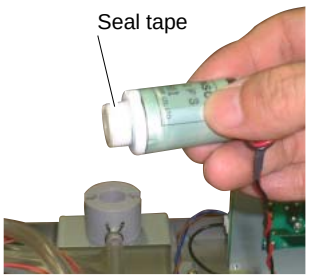


(5) Turn the O_2 sensor counterclockwise to remove it.



(6) Wrap seal tape around the screw of the replacement sensor to assure air-tightness.
(7) Reverse the procedure from (1) to (5) to assemble the sensor.
(8) Perform zero/span calibration.

Replacement has now been completed.



Caution on handling

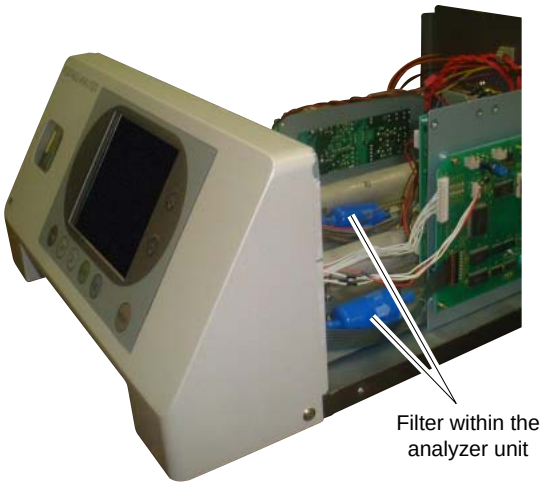
- Avoid having impact on the sensor.
  Otherwise damage may result.

5.3.5 Replacing filter within the analyzer unit

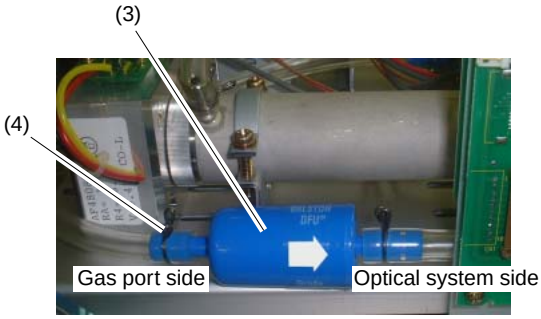
Periodic replacement of this filter is not required.
Replace the filter if drain flows into the filter or clogging by dust is found.

Replacement parts order No.: TK7L8925P1

(1) Remove the cover by referring to 5.4.4.
(2) Remove the filter attached to sample gas inlet (case color: blue).



(3) Mount the filter in proper orientation as shown by the photo at right.
(4) Be sure to use a hose band to connect the tube.



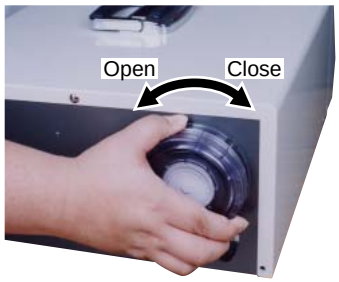
Replacement has now been completed.

⚠ Caution on replacement

- The filter has IN/OUT orientation. Be careful not to mount it in wrong orientation.
- Use hose band for the connection of the tube to assure sufficient air-tightness.

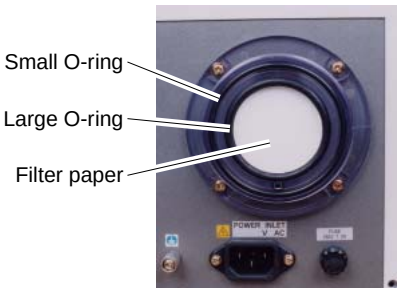
5.3.6 Replacing filter paper of membrane filter

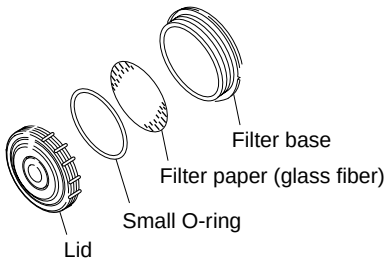
Replacement parts order No.: TK700735P2 (Filter paper: Glass fiber)
8553765 (Large O-ring)
TK733572P1 (Small O-ring)

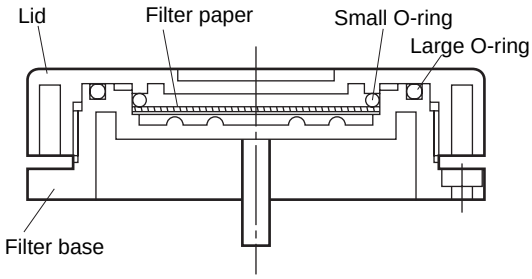


(1) Replacing filter paper

1) Turn the lid of the membrane filter counterclockwise.
2) Remove the small O-ring, and then remove the contaminated filter paper. Check at this time that no contaminated filter paper or dust is attached.
3) Place a new filter paper (glass fiber) textured face up, and press it with the small O-ring. (Use a fixing bracket for the Teflon filter paper.)



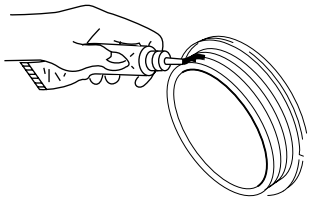




(4) Turn the filter lid clockwise to fasten it securely.

Replacement of filter paper has now been completed.

Note: If the lid cannot be removed easily, apply vacuum grease or silicon grease thinly to the large O-ring and the screws.



⚠ Caution on replacement

- The service life of large and small O-rings is 12 months. Replace them periodically.

(2) Cleaning membrane filter

Wipe the dust off the filter with clean cloth soaked in water or washing detergent first. Then wipe it fully with dry cloth. When removing dust within the container, be careful not to allow dust to enter the gas outlet.

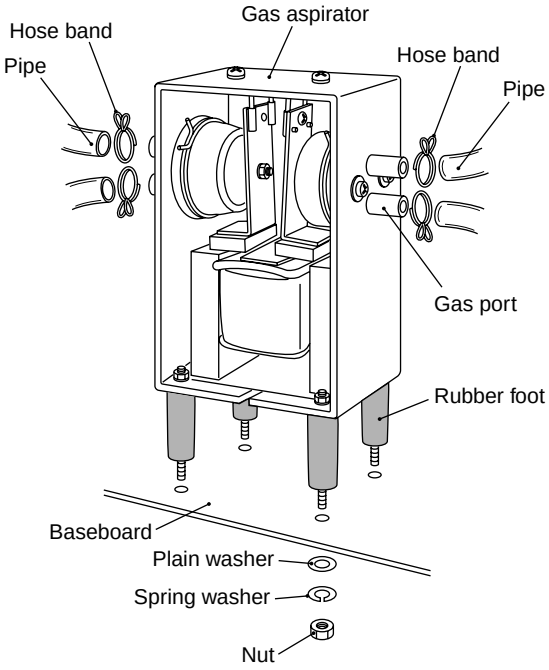
5.3.7 Replacing diaphragm

Replacement parts order No.: TK713248P1

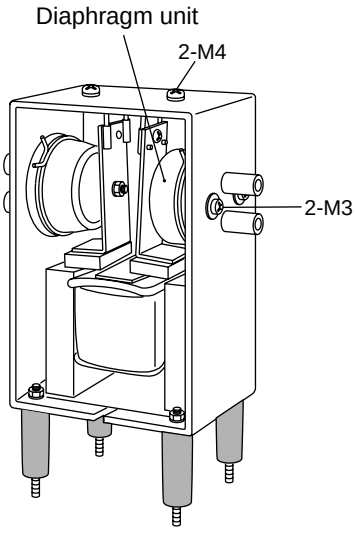
(1) The gas aspirator is fixed on the baseboard with nuts (M3 × 4 pcs.)

Remove the nuts and then take the gas aspirator out of the main unit.

(2) Remove the hose band, and then take the pipe out of the gas port.

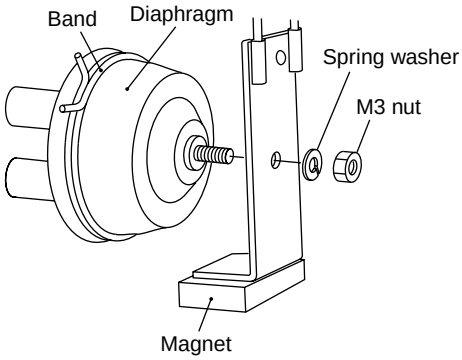


(3) Remove the screws located on top of the gas aspirator (M4 × 2 pcs.) and those on the side provided with the gas port (M3 × 2 pcs.), and then remove the diaphragm unit.



(4) The diaphragm unit and the magnet are fastened with nuts. Remove the nuts, and replace the diaphragm with a new one.

(5) Reverse the procedure in (1) to (4) to assemble the unit.



Diaphragm replacement work has now been completed.

⚠ Caution on replacement

- Be sure to use hose band for connection of the pipe to assure sufficient air-tightness.

5.3.8 Cleaning measurement cell

Entry of dust or water drops into the measurement cell may cause internal contamination, which may result in drifting.

Be sure to clean the measurement cell if contamination is found.

At the same time, check the filter in particular, to prevent the entry of dust or mist into the cell.

Two types of cells are available for measurement, namely, the block cell (length: 4mm, 8mm, 16mm, 32mm) and the pipe cell (length: 64mm, 125mm, 250mm).

There may be a case where both cells of the two-component analyzer may be included in the optical system. In this case, remove the pipe cell, and then the block cell. (See Fig. 5-1.)

(1) Cleaning the pipe cell (See Fig. 5-1.)

1) Stop feeding the gas for measurement. If toxic gas is contained, purge the measurement cell fully with zero gas.
2) Turn off the power switch.
3) Remove the pipe connected to the measurement cell.
4) Loose the screw (No.1 in Fig. 5-1) that fastens the infrared ray light source unit (No.5 in Fig. 5-1) to create a gap between the unit and the pipe cell (No.12 in Fig. 5-1).
5) Remove the screw (No.7 in Fig. 5-1) of the cell presser (No.11 in Fig. 5-1) fastening the pipe cell.
6) Remove the cell, and then remove the windows on both sides (No.14 in Fig. 5-1). The screw of the window is right-handed.

   Note: The reflection board within the cell is attached to the cell and cannot be removed.
7) When cleaning the internal surface of the cell and the infrared ray penetration window, remove large dust using a soft brush first, and then carefully wipe them with soft cloth.

   Never use hard cloth.

⚠ CAUTION

The window can be broken easily.

Handle it with care, and be careful not to wipe it strongly.

8) If severe contamination is found on the window or within the cell, paste absolute ethanol on soft cloth, and wipe off the contamination with it.
9) If the window is found to have corroded, attach chrome oxide powder to soft cloth, and wipe the window with it if the corrosion is not so severe. If corrosion has progressed significantly, replace the window.
10) Reverse the procedure in 3) to 6) to assemble the cell. Allow a gap of 0.5mm between the infrared ray light source unit and the cell, and the cell and the detector when assembling the unit.

No.	Name
1	Screw (for fastening light source unit)
2	Screw (for fastening detector)
3	Screw (for fastening base plate)
4	Base plate
5	Infrared ray light source unit
6	Screw (for fastening support)
7	Screw (for fastening cell presser)
8	Connector for chopper motor
(9)	Filter
10	Support
11	Cell presser
12	Pipe cell
13	O-ring
14	Window
15	Detector
16	Printed board for bridge
17	Bridge resistor
(18)	Detector: For 2-component analyzer, Mounting

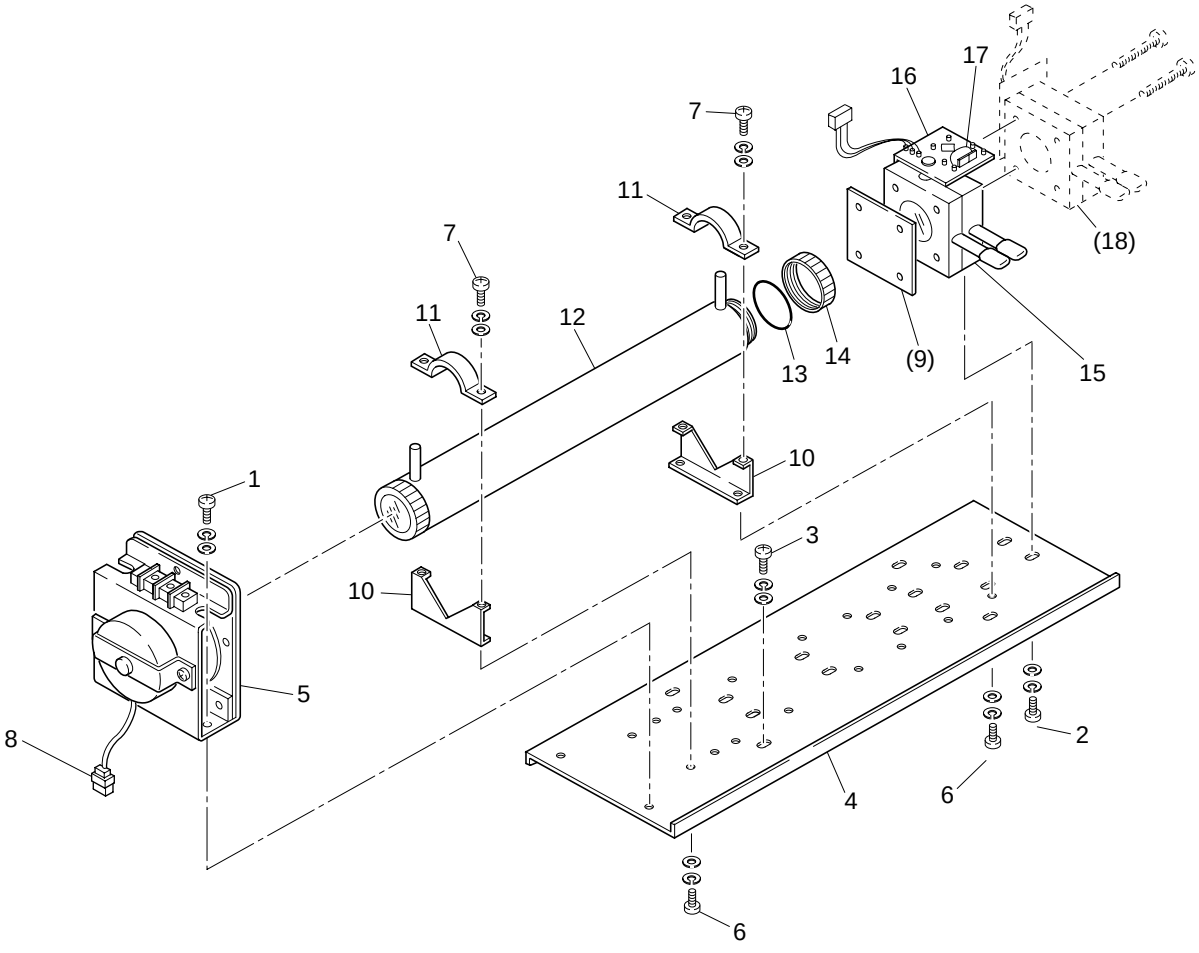


Fig. 5-1 Composition of measurement unit (pipe cell)

(2) Cleaning the block cell (See Fig. 5-2)

1) Stop feeding the gas for measurement. If toxic gas is contained, purge the measurement cell fully with zero gas.
2) Turn off the power switch.
3) Remove the pipe connected to the measurement cell.
4) Remove the connector of the detector from the printed board.

   In the case of 2-component analyzer, also remove the connector of the detector for the second component (No.13 of Fig. 5-2) from the printed board. Loosen the two screws fastening the detector for the second component (No.14 in Fig. 5-2), and remove the detector for the second component.
5) Remove the two screws (No.10 in Fig. 5-2) fastening the detector for the first component to the infrared ray light source unit. The cell can be removed together with the detector.
6) Loosen the two screws fastening the cell (No.6 in Fig. 5-2), and remove the cell. One of the windows of the block cell is sandwitched between the detector and the block cell, but is not fastened. Remove the cell with the detector facing up, being careful not to drop it.
7) When cleaning the internal surface of the cell and the infrared ray penetration window, remove large dust using a soft brush first, and then carefully wipe them with soft cloth.

   Never use hard cloth.

⚠ CAUTION

The window can be broken easily.

Handle it with care, and be careful not to wipe it strongly.

8) If severe contamination is found on the window or within the cell, paste absolute ethanol on soft cloth, and wipe off the contamination with it.
9) If the window is found to have corroded, attach chrome oxide powder to soft cloth, and wipe the window with it if the corrosion is not so severe. If corrosion has progressed significantly, replace the window.
10) Reverse the procedure in 3) to 6) to assemble the cell.

⚠ CAUTION

Place the O-ring between the window holder and the cell. Be careful not to place it in a wrong place.

In the case of 2-component analyzer, mount the detector for the second component lastly, being careful not to create a gap between the detector and that for the first component.

Insert the output cord connectors of the detector into the printed board, paying attention not to reverse the positions for the first and the second components. Insert the connector for the first component to CN11, and that for the second component to CN1.

No.	Name
1	Screw (for fastening light source unit)
(2)	Filter
3	Screw (for fastening base board)
4	Base board
5	Infrared ray light source unit
6	Screw (for fastening block cell)
7	Block cell
8	Window
9	O-ring
10	Screw (for fastening detector)
11	Connector for chopper motor
12	Detector
(13)	Detector: For 2-component analyzer, Mounting
(14)	Screw: For mounting 2-component detector

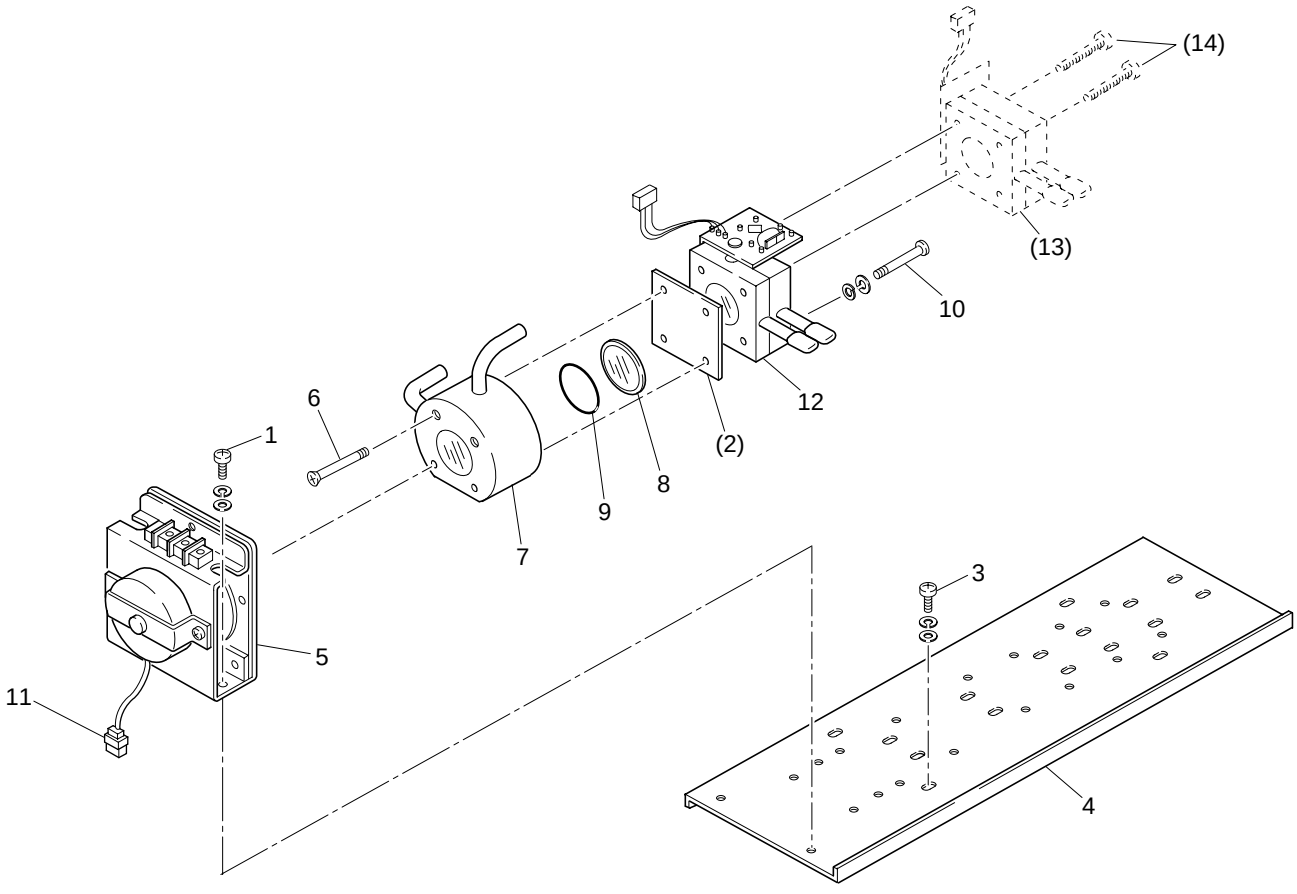


Fig. 5-2 Composition of measurement unit (block cell)

5.3.9 How to mount pressure regulator for standard gas cylinder

(1) Before mounting a pressure regulator to the gas cylinder, clean the gas cylinder adapter. Entry of dust into the pressure regulator may result in gas leaks.

(2) If packing is not inserted in the mounting nut for the cylinder or it is damaged, replace it with supplied spare one.

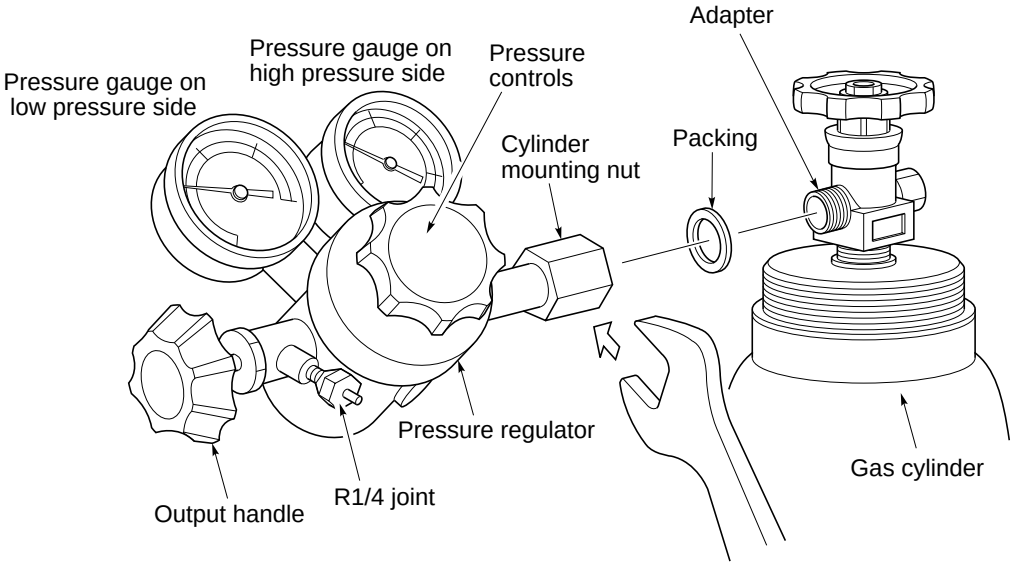
(3) Use a spanner of a proper size, fasten the cylinder mounting nut to the gas cylinder.

(4) Loosen the pressure controls and then tighten the output handle.

(5) Open a valve of the gas cylinder, and the pressure gauge on the high pressure side indicates a pressure of the gas cylinder by flowing gas into the pressure regulator.

(6) Turn the pressure controls clockwise to increase the secondary pressure; adjust the pressure controls so that a pressure gauge on the low pressure side reads 30 kPa.

(7) Open the outlet controls to release gas.



5.4 Airtight test

Perform an airtight test following the procedure shown below.

Set the power switch to OFF, and perform airtight test for the analyzer unit and the sampling unit separately.

5.4.1 Airtight test of analyzer unit

(1) Close the exhaust gas port (OUTLET).

(2) Connect the sample gas inlet and calibration gas inlet with a T tube.

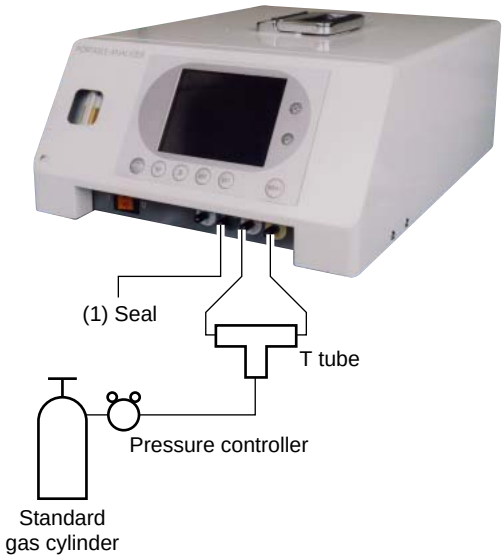
(3) Connect standard gas cylinder (N_2 or Air cylinder) provided with pressure controller to the inlet of the T tube.

(4) Open the valve for the standard gas, and adjust the pressure on the low-pressure side to 30kPa using the handle for pressure regulation of the pressure regulator.

(5) Fully open the handle on the outlet side, close the master valve of the standard gas cylinder, and open the handle for pressure regulation of the pressure regulator.

(6) Maintain the above state for one minute and check that no change is found in the reading of the pressure gauge on the low-pressure side of the pressure regulator.

(7) Airtight test of the analyzer unit has now been completed.



If leak is found, apply soap water in small quantity to each connecting section within the case to locate the position of the leak, and take measures accordingly.

⚠ Caution on performing the test

- Do not feed the standard gas at high pressure (100kPa or higher). Otherwise the optical system may be damaged.

5.5 Adjustment in heat treatment furnace

- **What is the adjustment in heat treatment furnaces?**

If, in plant gases to be measured actually, a large amount of other lower-molecular-weigh gases than nitrogen (N_2) such as hydrogen (H_2), or a large amount of other higher-molecular-weight gases than nitrogen (N_2) such as argon (Ar) are contained, including the measuring components, it is known that the calibration curve (output performance to gas concentration) of gas analyzers will be affected (pressure broadening).

In such a case, analyzer is adjusted with gases similar to plant gas compositions in manufacturing (adjustment by scale gas). After this adjustment, the analyzer is checked the calibration curve with N_2 balance gas (calibration curve by check gas). Graphs with these calibration curves drawn are attached to products to be supplied.

Since measurement in a heat treatment furnace has much gas of such composition, it is considering as the adjustment for heat treatment furnaces.

In order to perform exact measurement, perform the following span calibration.

Composition of the standard gas for span calibration used for each method and its method are explained using an example. For the standard gas for zero calibration, use N_2 or Air in any case so that zero point will not be affected.

<Example> Assume that a 0-1% CO_2 meter of the infrared ray gas analyzer measures CO_2 contained in plant gases.
When plant gases are composed of 0.5% CO_2, 23% CO, 30% H_2, 0.2% CH_4 and 44.3% N_2, either of the following is used as the span calibration standard gas.

	Standard gas type	Composition of standard gas	Method for span adjustment
1	Standard gas with the same composition as plant gases (scale gas)	0.9% to 1% CO_2, 25%CO, 30%H_2, remaining N_2 *	Perform span calibration directly.
2	Check gas	0.9% to 1% CO Remaining N_2	Perform span calibration indirectly.

* A small amount of gas like 0.2% CH_4 with little effect on span calibration may be excluded from the standard gas.

(1) Method for span calibration by standard gas with the same composition as plant gas

When using the standard gas with the same composition as plant gases given in 1, calibration can be performed without correction, as an error in calibration curve does not occur.

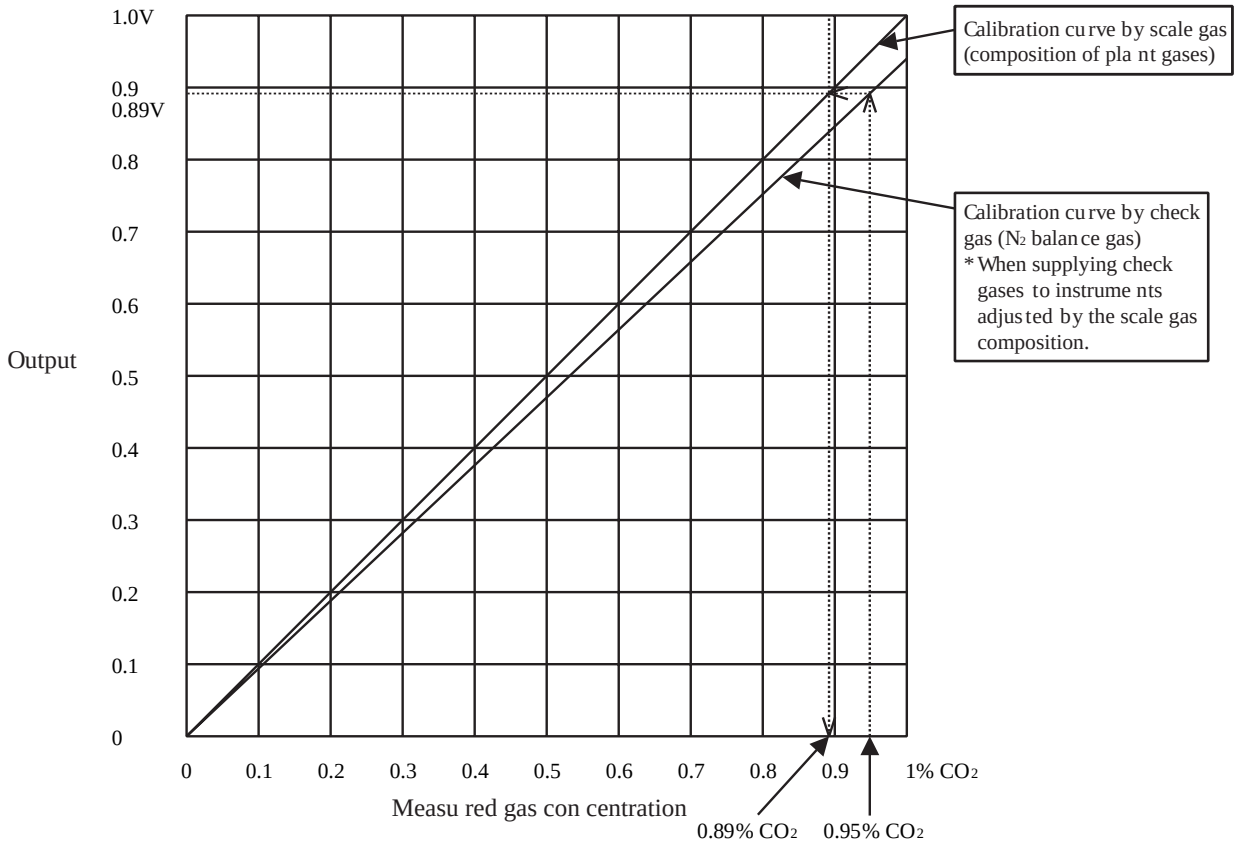
1) Set CO_2 concentration to span calibration concentration set value.
2) Perform span calibration by using the operation key.

(2) Method for span calibration by check gas

The method for span calibration by use of check gas (give in 2) is explained. Since span calibration has an error of calibration curve, preset a calibration indication on the calibration curve graph attached to this analyzer for indirect calibration.

1) The following calibration curve graph is attached to the test results for the product.

In graph, the calibration curve by the scale gas (that is similar to plant gas and determines scales of this analyzer) and the calibration curve by the check gas that is adjusted by the scale gas (gas of simple composition of N_2 balance gas to facilitate the analyzer check) are drawn.



Calibration curve graph attached to the analyzer

2) When using 0.95% CO_2 and remainder N_2 (check gas) as calibration gas, in graph, a point of 0.95% on X-axis should be stretched to upward, draw a line toward Y-axis from the cross point with the check gas calibration curve. From the cross point with calibration curve on the scale gas composition, 0.89% or equivalent values can be obtained.

3) Set this point (0.89%) to the span calibration concentration of the calibration concentration set value.

4) Supply 0.95% check gas to perform span calibration. It is calibrated to 0.89%.

Measurement suited to actual plants can be performed by this error correction of calibration curve.

6. SPARE PARTS

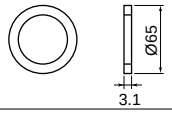
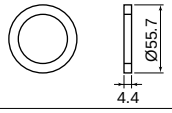
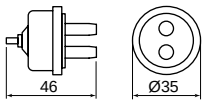
⚠ CAUTION

- Do not use replacement parts other than recommended ones. Otherwise, it could result in accident or damage to the instrument.
- Useless replacement parts for maintenance should be disposed of as non-combustible matter.

6.1 Spare parts for 1-year measurement

(1) List of spare parts for one year

Note: The replacement cycle varies depending on the conditions of the measured gas.

	Name	Type or parts No.	Q'ty	Application/ replacement cycle	Note	Simplified diagram
1	Filter paper of membrane filter	TK700735P2	1pc (25 sheets)	Once/month	Glass fiber 0.5µm	
2	Large O-ring for membrane filter	8553765	1	Once/year	Chloroprene	
3	Small O-ring for membrane filter	TK733572P1	1	Once/year	Chloroprene	
4	Diaphragm for gas aspirator	TK713248P1	1	For gas aspirator Once/year	Viton	

7. TROUBLESHOOTING

⚠ CAUTION

• In case you find it difficult to judge what happened to the instrument, avoid disassembling the instrument without consulting our sales agent or service engineers. Otherwise, it may result in electrical shock or personal injury.

Phenomena	Items	Check	Remedy
Sample gas flow rate is low	Filter	Check if filter is clogged.	Clean or replace.
	Diaphragm gas aspirator	Check if aspirator is operating normally.	Clean aspirator or replace diaphragm or valve.
		Check for abnormal sound or vibration.	Retighten screws or replace aspirator.
	Gas leaks	Check if there are gas leaks somewhere in tube connecting to aspirator or joints.	Retighten or replace parts.
	Flow checker	Check if drain or dust is attached to the flow checker.	Replace parts.
	Tube, capillary	Check the tube for breakage, or clogging.	Replace.
Indication value varies considerably.	Gas leak	Check the mist filter, tube, joints connecting to aspirator for gas leaks.	Retighten or replace parts.
	Diaphragm aspirator	Check if the aspirator is operated normally. Check if sample gas flow is supplied as set.	• Clean the aspirator or replace diaphragm or valve. • Adjust the sample gas flow.
	Dissolution of gas	Check if drain remains in tube.	Clean or tilt tube.
Indication differs from the anticipated one.	Gas leak	Check if there is gas leak anywhere before the aspirator.	Retighten or replace parts.
	Measuring range	Check if correct range is selected.	Switch to correct range.
	Zero, span	Check zero and span using the standard gas.	Adjust zero and span correctly.
Indication is not deflected.	Power supply and fuse	Check power supply voltage and fuse.	Replace fuse.
Freeze-up	Tubing, exhaust gas inlet	Check for freeze-up in the tubing.	Implement heat insulation for preventing freeze-up.

Error message

If errors occur, the following contents are displayed.

Error display	Error contents	Probable causes
Error No.1	Motor rotation detection signal faulty	• Motor rotation is faulty or stopped. • Motor rotation detector circuit is faulty.
Error No.4	Zero calibration is not within.	• Zero gas is not supplied. • Zero is deflected much 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 is deflected much 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.

Screen display and operation at the occurrence of error

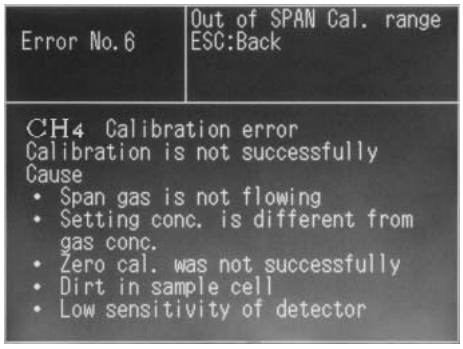
(1) In case of Error No. 1, No. 4, No. 6 and No. 8

Measurement screen

ENT

ESC

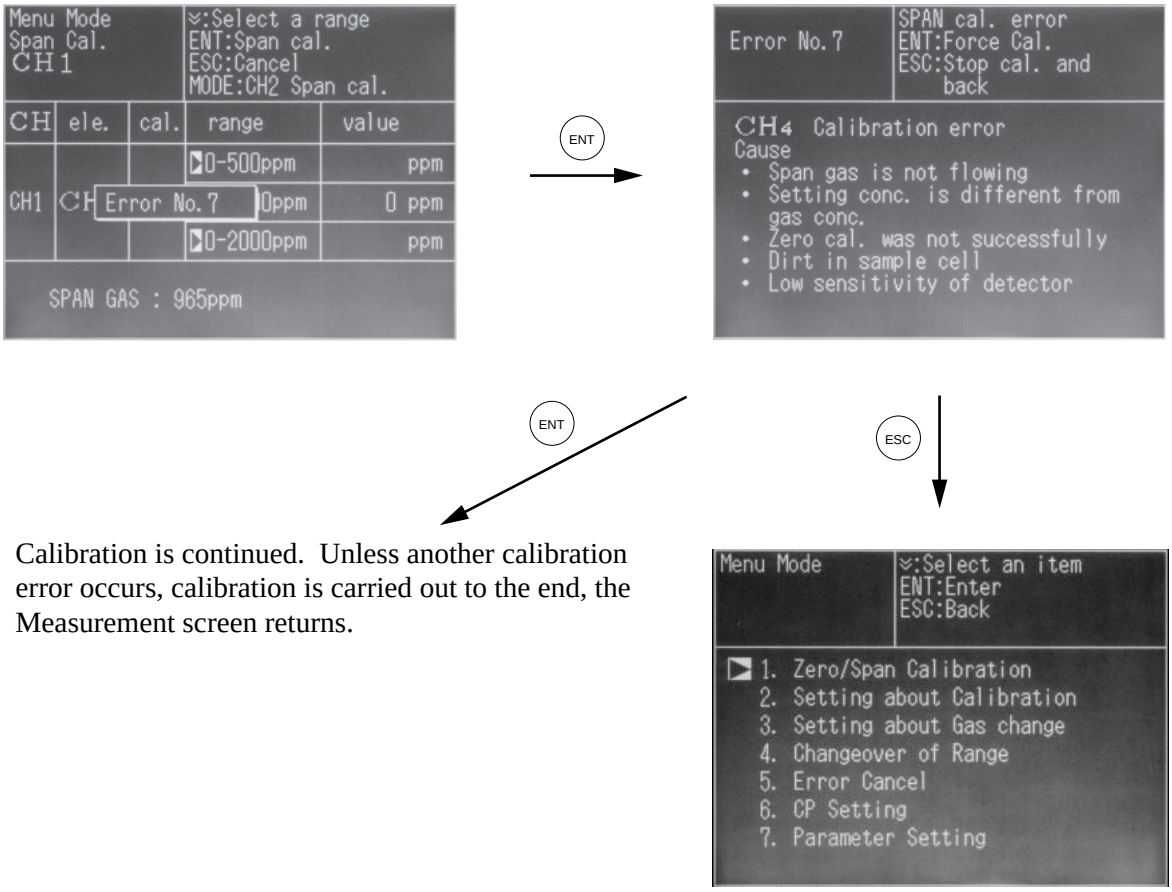
Display of error contents



- To cancel the error, select <Menu Mode> and execute <6. Cancel Error>.
- Even if the error is canceled, the error display appears again unless the cause of the error is eliminated.

- When more than one error occurs, pressing the (»)key moves to another error display.

(2) In case of Error No. 5 and No. 7

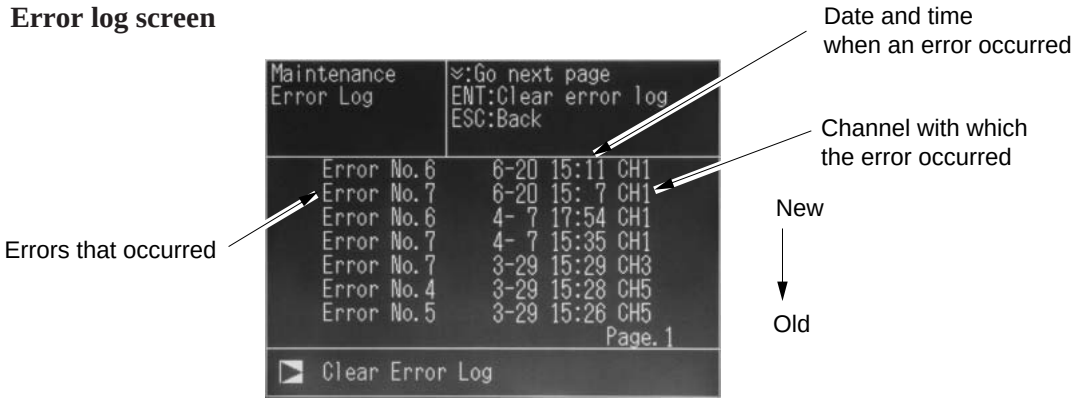


Calibration is continued. Unless another calibration error occurs, calibration is carried out to the end, the Measurement screen returns.

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 occurs.

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

Deletion of error history

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

8. SPECIFICATION

This product is not explosion-proof. When handling dangerous gas, adequate attention shall be paid.

8.1 Specification

Standard Specifications

- Measuring system:
  CO_2, CO and CH_4; Non-dispersive infrared absorption method with single light source and single beam (single beam method)
  O_2; Galvanic cell method
- Measurable component and min./max. measuring range:
  CO_2; 0 to 200 ppm / 0 to 100 %
  CO; 0 to 200 ppm / 0 to 100 %
  CH_4; 0 to 1000 ppm / 0 to 100 %
  O_2; 0 to 5 % / 0 to 25 %
  Max. 4 components measurable including O_2
- Number of measuring ranges:
  3 ranges
  • Max. range ratio 1:5
- Warm-up time: 30 min after power-on
  Provided with count-down timer indicating function.
- Analog output: In up to 8 channels.
  4 to 20 mA DC or 0 to 1 V DC (linear)
  Non-isolated output
  Allowable load; 4 to 20 mA DC, 550Ω or less
  0 to 1 V DC, 100 kΩ or more
  • Instantaneous value output of each gas component
  • Instantaneous value output after O_2 correction (when provided with O_2 analyzer)
  • Average value output after O_2 correction (when provided with O_2 analyzer)
  • CP calculation value output (when provided with CO_2 analyzer)
  * The channel numbers of indicated value and output value correspond to each other one by one.
  * An exclusive 25-pin cable is standard-equipped.
- Communication output:
  RS-232C Modbus protocol
  * Use a commercially available product (D-sub 9-pin cable).
- Indicated values:
  Digital 4-digit indication (by LCD with back light)
  • Instantaneous values of respective gas components
  • Instantaneous values after O_2 correction (when provided with O_2 analyzer)
  • Average value after O_2 correction (when provided with O_2 analyzer)
  • CP calculation value display (when provided with CO_2 analyzer)
  * The channel numbers of indicated value and output value correspond to each other one by one.
- Power supply: Rated voltage;
  100 to 115 V AC or 200 to 240 V AC
  Working voltage;
  85 to 132 V AC or 180 to 264 V AC
  * Depending on customer's code selection.
  Rated frequency; 50/60 Hz
  Max. rated power; 150 VA
  Inlet; Class 1 type conforming with EN60320
- Operating conditions:
  Ambient temperature; 0 to 40˚C
  Ambient humidity; 90% RH or less
  * Condensation unallowable
- Storage conditions:
  Ambient temperature; −20 to 60˚C
  Ambient humidity; 95% RH or less
  * Condensation unallowable.
- External dimensions (H × W × D mm):
  211 × 365 × 527
- Mass: Approx. 12 kg
- Finish color: Cover; White pearl mica
  Base; Medium gray metallic
- Enclosure design:
  Casing made of steel plates for indoor installation.
- Gas-contacting part materials:
  Gas inlet/outlet; Polypropylene
  Sample cell; SUS304/neoprene rubber
  Transparent window: CaF2
  Internal pipes: Toalon tube/Teflon tube
- Gas inlet/outlet: ϕ6/ϕ3 hose end
- Purge gas flow rate:
  1 L/min (to be purged as required)

Standard Function

• Zero gas flow time:
180 to 999 sec (settable in 1-sec step)

• Auto indication off:
Indication automatically turns off when no key is operated for the determined period of time in the standby status.
Light off time; OFF/ON (1 to 30 min)
(settable in 1-min step)

• Output holding: At calibration during measurement, output holds the value just before the calibration according to hold setting. In the standby status, output will not be held. Indication will not be held either.
Hold setting; OFF/ON

• Key lock: None of the set values can be changed when key lock is turned ON.
This is helpful for reducing operation errors and wrong inputs.

• Instrument/calibration error indication:
When the instrument or calibration is abnormal, an error number is indicated to help analysis of the error.

• O_2 correction: Conversion of measured CO gas concentrations into values at standard O_2 concentration
Calculating equation;

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

C; Sample gas concentration after O_2 correction
Cs; Measured concentration of sample gas
Os; Measured O_2 concentration
On; Standard O_2 concentration for conversion (settable within 0 to 19%)
The result of conversion is indicated and output in a signal simultaneously.
* An Os value of 20% or more is taken as 20% for calculation.

• Averaging after O_2 correction;
The result of O_2 correction is subjected to moving average for the determined period of time. And the result of averaging is indicated and output in a signal simultaneously.
Average value will be taken at a cycle of 30 sec. (Indication and output are updated every 30 sec.)

• Resetting of output average value:
Indication and output of average value are cleared in response to resetting.
* Effective only when average value selection is specified in CODE SYMBOLS.

• CP calculation: The carbon potential of carburizing furnace and conversion furnace are calculated using furnace temperature (fixed input value) and CO concentration value (fixed or measured value) while referring to CO_2 measured value.

Calculation equation; $CP = \frac{CPS \times (PCO)^2}{K1 \times PCO_2}$

where,
CPS ; Saturated carbon concentration (partial pressure)
0.0028t–1.30 (800˚C ≦ 850˚C)
0.0030t–1.47 (850˚C ≦ 950˚C)
0.0034t–1.85 (950˚C ≦ 1000˚C)
t ; Furnace temperature
PCO ; CO concentration value (partial pressure)
PCO_2; CO_2 concentration value (partial pressure)
K1 ; Constant $K1 = 10^{(9.06-15966/T)}$
T ; Rankine temperature
$(t \times 9/5+32+460)$

Performance

• Repeatability: Within ±0.5% of full scale
• Linearity: Within ±2% of full scale
• Zero drift: Within ±1% of full scale/day
• Span drift: Within ±1% of full scale/day
• Response time: 90% response time: Within 50 sec Galvanic cell type O2 analyzer: Within 3 min
• Other gases' influence:

Interference component concentration \ Sample component/range	CO_2 analyzer		CO analyzer		O_2 analyzer	CH_4 analyzer
	200ppm max	500ppm min	200ppm max	500ppm min	All ranges	All ranges
NO 1000ppm	Within ±2%		Within ±2%		Within ±2%	Within ±2%
SO_2 1000ppm	Within ±2%		Within ±2%		Within ±2%	Within ±2%
CO_2 15%	–	–	Within ±3%	Within ±3%	Within ±2%	Within ±5%
CO 1000ppm	Within ±2%		–	–	Within ±2%	Within ±2%
CH_4 1000ppm	Within ±2%		Within ±2%		Within ±2%	–
NH_3 50ppm	Within ±2%		Within ±2%		Within ±2%	Within ±2%
H_2O 2˚C saturation	Within ±3%	Within ±2%	Within ±3%	Within ±2%	Within ±2%	Within ±2%

Standard Requirements for Sample Gas

- Flow rate: 0.5 L/min ±0.2 L/min
- Temperature: 0 to 40˚C at inlet of sampling gas
  10 to 70˚C at tip of non-fixed type probe (available at option)
  70 to 400˚C at tip of fixed type probe (available at option)
- Pressure: 0 to 2 kPa (Gas shall be discharged into atmospheric air.)
- Dust: 10 mg/Nm^3 or less
- Mist: Unallowable
- Corrosive gas: HCl 10 ppm or less
  Others Unallowable
- Standard gas for calibration:
  Zero gas; N_2 or clean air
  However, clean air cannot be used if CO_2 and O_2 are included in sample gas components.
  Span gas; Concentration limited within 90 to 100% of the range of each sample gas component.
  Unusable at concentrations beyond 100%.

Options

- Gas extractor: Used for aspirating sample gas.
  Non-fixed type; Since this type is used for intermittent measurement, it cannot be fixed.
  Material;
  SUS304/polypropylene
  Fixed type; Used for continuous measurement. Flange 5K25A FF
  Sampling pipe length selectable among 300, 400, 600 and 800mm
  Material; SUS316
- Sample inlet tube:
  Used for delivering gas from the extractor to sampling block.
  Shape; $\phi 6/\phi 4 \times 5$ m or $\phi 6/\phi 4 \times 10$ m
  Material; Teflon

Installation Requirements

- Selection of a place which does not receive direct sunlight, rain, wind nor radiation from hot substances.
  If such a place cannot be found, a roof or cover should be prepared for protection.
- Avoidance of a place under heavy vibration
- Selection of a place where atmospheric air is clean
- Discharge of exhaust gas into atmospheric air at a safe location
- Avoidance of use in an explosion-proof area

Scope of Delivery

- Gas analyzer system
- Standard accessories (Refer to the table at top Following table.)
- Instruction manual

Item to be Prepared Separately

- Standard gas (ZBM) and pressure regulator (ZBD)
- Recorder (when necessary, Fuji's product type PHR)

8.2 Code symbols

Digit	Description	note	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 ← Digit No. of code Z S V S Y 2 - Y - Y
4	< Specification > Analyzing block		S
5	< Sample components (CO_2, CO, CH_4) > 1-component analyzer CO CO_2 CH_4 2-component analyzer (1st component + 2nd component) CO_2+CO CH_4+CO CO_2+CH_4 3-component analyzer (1st component + 2nd component + 3rd component) CH_4+(CO_2+CO) Without Other	 note 2 	 B D E G H J S Y Z
6	< Sample component (O_2) and measuring range > Galvanic cell type oxygen analyzer/0 to 5%/10%/25% Without	 	 1 Y
8	< Revision code >		2
9	< Power supply > For domestic use 100 to 115V AC, 50/60Hz For European use 200 to 240V AC, 50/60Hz For North American use 100 to 115V AC, 50/60Hz	note 3 	 1 2 3
10	< Measuring range (1st component) > 0 to 200ppm/500ppm/1000ppm 0 to 500ppm/1000ppm/2000ppm 0 to 1000ppm/2000ppm/5000ppm 0 to 2000ppm/5000ppm/1% 0 to 5000ppm/1%/2% 0 to 1%/2%/5% 0 to 2%/5%/10% 0 to 5%/10%/20% 0 to 10%/20%/50% 0 to 20%/50%/100% Without	note 4 note 2	 A B C D E F G H J K Y
11	< Measuring range (2nd component) > 0 to 200ppm/500ppm/1000ppm 0 to 500ppm/1000ppm/2000ppm 0 to 1000ppm/2000ppm/5000ppm 0 to 2000ppm/5000ppm/1% 0 to 5000ppm/1%/2% 0 to 1%/2%/5% 0 to 2%/5%/10% 0 to 5%/10%/20% 0 to 10%/20%/50% 0 to 20%/50%/100% Without	note 4 note 2	 A B C D E F G H J K Y
12	< Measuring range (3rd component) > 0 to 200ppm/500ppm/1000ppm 0 to 500ppm/1000ppm/2000ppm 0 to 1000ppm/2000ppm/5000ppm 0 to 2000ppm/5000ppm/1% 0 to 5000ppm/1%/2% 0 to 1%/2%/5% 0 to 2%/5%/10% 0 to 5%/10%/20% 0 to 10%/20%/50% 0 to 20%/50%/100% Without	note 4 note 2	 A B C D E F G H J K Y

Digit	Description	note	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 ← Digit No. of code Z S V Y 2 - Y - Y
14	< Output > 0 to 1 V DC, non-isolated 4 to 20 mA DC, non-isolated		1 2
15	< Output type > Instantaneous value after O_2 correction Average value after O_2 correction CP calculation value Without	note 5,7 note 10 note 6	0 1 2 Y
17	< Language > Japanese English		1 2
18	< Gas extractor > Non-fixed type (for intermittent measurement) Fixed type (for continuous measurement), flange 5K25A, L = 300 mm Fixed type (for continuous measurement), flange 5K25A, L = 400 mm Fixed type (for continuous measurement), flange 5K25A, L = 600 mm Fixed type (for continuous measurement), flange 5K25A, L = 800 mm Without		1 2 3 4 5 Y
19	< Sample inlet tube > 5m×ϕ6/ϕ4, Teflon 10m×ϕ6/ϕ4, Teflon 20m×ϕ6/ϕ4, Teflon Without	note 8	A B C Y
20	< Adjustment > Standard adjustment Adjustment for heat treatment furnace Other	note 9	A B Z

Note 1) A parenthesized sample component stands for the 2nd optical system.

Note 2) Specify code Y when only O_2 analyzer is needed.

Note 3) Between “1”, “2” and “3” of the 9th digit, the rated voltage and plug shape of the attached power cord are different.
“1”: For domestic use, rated voltage 125V AC (PSE), plug shape North American type
“2”: For European use, rated voltage 250V AC (CEE), plug shape European type
“3”: For North American use, rated voltage 125V AC (UL), plug shape North American type

Note 4) For possible combinations of sample component and measuring range, refer to the following tables (Tables 1 to 4).

Note 5) Specify this code when “1” or “2” is specified at the 6th digit.

Note 6) When “Y” is specified at the 6th digit, “Y” should also be specified at the 15th digit.

Note 7) The kind of output after O_2 correction will be added to all target components only when an analyzer for CO is specified.

Note 8) Sample inlet tube should be connected within 20 m.

Note 9) Calibration curve varies with gas components contained in sample gas.
“A ; standard adjustment” stands for adjustment in N_2 balance.
“B ; adjustment for heat treatment furnace” is applied to CO analyzer and CO_2 analyzer.
CO_2 analyzer: CO_2 range gas + 25% CO + 31% H_2/N_2
CO analyzer: CO range gas + 5% CO_2 + 31% H_2/N_2
When “Z; other” is specified, a gas composition table should be attached.

Note 10) Can be manufactured only when “CO_2 analyzer” is selected for the 5th digit.

Tables of Sample Component and Measuring Range - Availability Check Tables -

Table 1: 1-Component Analyzer (CO_2, CO, CH_4)

Sample component / Range		CO_2 analyzer	CO analyzer	CH_4 analyzer
		D	B	E
A	0 to 200/500/1000ppm	○	○	—
B	0 to 500/1000/2000ppm	○	○	—
C	0 to 1000/2000/5000ppm	○	○	○
D	0 to 2000/5000ppm/1%	○	○	○
E	0 to 5000ppm/1/2%	○	○	○
F	0 to 1/2/5%	○	○	○
G	0 to 2/5/10%	○	○	○
H	0 to 5/10/20%	○	○	○
J	0 to 10/20/50%	○	○	○
K	0 to 20/50/100%	○	○	○

○ : Product available

Table 2: 2-Component Analyzer (CO_2 analyzer + CO analyzer)

CO_2 analyzer range / CO analyzer range		Range values are the same as those of CO2 analyzer.									
		A	B	C	D	E	F	G	H	J	K
A	0 to 200/500/1000ppm	○	○	—	—	—	—	—	—	—	—
B	0 to 500/1000/2000ppm	○	○	○	—	—	—	—	—	—	—
C	0 to 1000/2000/5000ppm	—	—	○	○	—	—	—	—	—	—
D	0 to 2000/5000ppm/1%	—	○	○	○	○	—	—	—	—	—
E	0 to 5000ppm/1/2%	—	○	○	○	○	○	○	○	—	—
F	0 to 1/2/5%	○	○	○	○	○	○	○	○	○	—
G	0 to 2/5/10%	○	○	○	○	○	○	○	○	○	○
H	0 to 5/10/20%	○	○	○	○	○	○	○	○	○	○
J	0 to 10/20/50%	—	○	○	○	○	○	○	○	○	○
K	0 to 20/50/100%	—	○	○	○	○	○	○	○	○	○

○ : Product available

Table 3: 2-Component Analyzer (CH_4 analyzer + CO analyzer)

CH_4 analyzer range / CO analyzer range		Range values are the same as those of CH_4 analyzer.									
		A	B	C	D	E	F	G	H	J	K
A	0 to 200/500/1000ppm	—	—	—	—	—	—	—	—	—	—
B	0 to 500/1000/2000ppm	—	—	—	—	—	—	—	—	—	—
C	0 to 1000/2000/5000ppm	—	—	—	—	—	—	—	—	—	—
D	0 to 2000/5000ppm/1%	—	—	—	—	—	—	—	—	—	—
E	0 to 5000ppm/1/2%	—	—	○	○	○	○	—	—	—	—
F	0 to 1/2/5%	—	—	○	○	○	○	○	○	—	—
G	0 to 2/5/10%	—	○	○	○	○	○	○	○	○	○
H	0 to 5/10/20%	—	○	○	○	○	○	○	○	○	○
J	0 to 10/20/50%	—	○	○	○	○	○	○	○	○	○
K	0 to 20/50/100%	—	○	○	○	○	○	○	○	○	○

○ : Product available

Table 4: 2-Component Analyzer (CO_2 analyzer + CH_4 analyzer)

CO_2 analyzer range \ CH_4 analyzer range		Range values are the same as those of CO_2 analyzer.									
		A	B	C	D	E	F	G	H	J	K
A	0 to 200/500/1000ppm	—	—	—	—	—	—	—	—	—	—
B	0 to 500/1000/2000ppm	—	—	—	—	—	—	—	—	—	—
C	0 to 1000/2000/5000ppm	—	—	—	—	○	—	—	—	—	—
D	0 to 2000/5000ppm/1%	—	—	—	○	○	○	—	—	—	—
E	0 to 5000ppm/1/2%	—	—	—	○	○	○	○	—	—	—
F	0 to 1/2/5%	—	—	—	○	○	○	○	○	—	—
G	0 to 2/5/10%	—	—	—	○	○	○	○	○	○	—
H	0 to 5/10/20%	—	—	—	○	○	○	○	○	○	○
J	0 to 10/20/50%	—	—	—	○	○	○	○	○	○	○
K	0 to 20/50/100%	—	—	—	○	○	○	○	○	○	○

○ : Product available

• 3-component analyzer (CH_4 analyzer + CO_2 analyzer + CO analyzer);
Possible range in combination of Table 1 (CH_4 analyzer) and Table 2 (CO_2 analyzer + CO analyzer)

Fuji Electric Co., Ltd.

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