

Gas Detector Head

GD-84D-EX Series

GD-84D-EX-EC

GD-84D-EX

GD-84D-EX-ET-EC

GD-84D-EX-ET

GD-84D-EX-EA-EC

GD-84D-EX-EA

Operating Manual

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1

Product Overview

1-1 Introduction

Thank you for purchasing this GD-84D-EX series Gas Detector ("product" hereinafter).

This operating manual describes product operating procedures and specifications. The manual provides information essential to the correct use of the product.

Make sure you have read and fully understood the contents of this manual before using the product.

Keep this operating manual on hand to allow ready reference during use.

The contents of this manual are subject to change without notice to allow product improvements. Any duplication or reproduction of this manual without permission is prohibited, whether in whole or in part.

Riken Keiki accepts no liability for accidents or damage resulting from use of the product, whether within or outside the warranty period.

Review the warranty policy indicated on the warranty.

Before using the product, please confirm that the model of the product you purchased matches the model of the product covered by this operating manual.

<Models covered by this operating manual>

- GD-84D-EX-EC
- GD-84D-EX
- GD-84D-EX-ET-EC
- GD-84D-EX-ET
- GD-84D-EX-EA-EC
- GD-84D-EX-EA

<This operating manual>

Where descriptions differ for different product models, this operating manual uses the following icons to indicate each model:

GD-84D-EX-EC GD-84D-EX	4 - 20 mA models	4-20mA
GD-84D-EX-ET-EC GD-84D-EX-ET	ET models	ET
GD-84D-EX-EA-EC GD-84D-EX-EA	EA models	EA

Operating procedures and specifications for which no icons appear apply to all models.

1-2 Product intended use and features

This product is a fixed multi-gas detector head that detects leaks of various gases used in semiconductor factories and similar locations.

It detects combustible gases and toxic gases in the surrounding atmosphere and activates alarms if preset concentrations are exceeded.

Gas alarms are safety devices. They are not gas concentration meters nor gas analyzers designed to analyze or measure gas quality or gas volumes.

Use the device correctly after confirming you understand the product's features and characteristics.

1-2-1 Communication systems by model and corresponding sensors

This line of products features various models incorporating the following communication systems and corresponding sensors.

Check the specifications before use to confirm the correct gases will be detected in accordance with the intended purpose.

Model	Communication method	Corresponding sensor	Power source		Contact output	
			24 V DC	PoE+	Alarm	Fault
GD-84D-EX-EC	4 - 20 mA	ESF	○		○	○
GD-84D-EX	4 - 20 mA	NCF, SGF, SHF, ESF	○		○	○
GD-84D-EX-ET-EC	Ethernet	ESF		○		
GD-84D-EX-ET	Ethernet	NCF, SGF, SHF, ESF		○		
GD-84D-EX-EA-EC	Ethernet 4 - 20 mA	ESF	○*	○*	○	○
GD-84D-EX-EA	Ethernet 4 - 20 mA	NCF, SGF, SHF, ESF	○*	○*	○	○

* Do not use a 24 V DC power supply and PoE+ at the same time.

<Sensor models and detection principles>




Sensor model	Detection principle
NCF	New ceramic type
SGF	Semiconductor type
SHF	Hot-wire semiconductor type
ESF	Electrochemical type

1-2-2 Product features

- This product incorporates gas sensors that detect leaking combustible and/or toxic gases or oxygen deficiency.
- The detected gas concentration is displayed on a full-dot LCD.
- This product incorporates a pump to draw in gas and perform gas detection.
- The product can be equipped with up to four sensors to detect up to four gas types.

1-3 DANGER, WARNING, and NOTE

This operating manual uses the following categories to indicate potential damage/hazards if the user disregards the information provided and uses the product incorrectly:

 DANGER	This indicates situations in which improper handling may result in fatal or serious injury or significant property damage.
 WARNING	This indicates situations in which improper handling may result in serious injury or significant property damage.
 CAUTION	This indicates situations in which improper handling may result in minor injury or minor property damage.

Additionally, usage recommendations are indicated as follows:

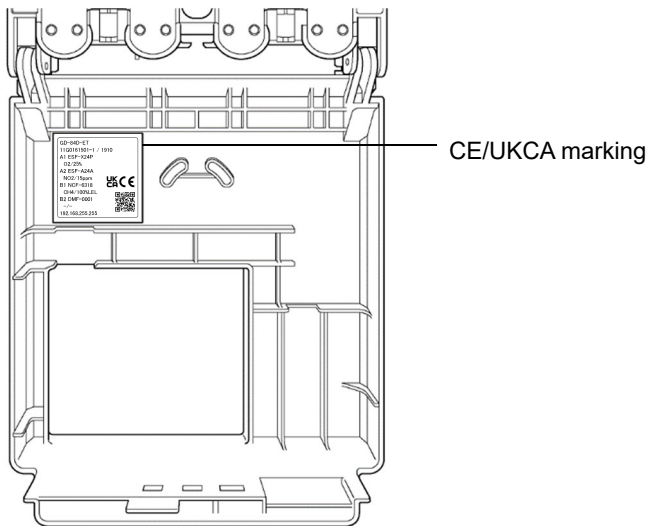
NOTE	This indicates items that will be helpful to know when using the product.
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1-4 Checking CE/UKCA marking

CE/UKCA marking compliant models will feature CE/UKCA marking labels. Check actual product specifications before use.

Before using products with CE/UKCA marking, please refer to the “Declaration of Conformity” provided at the end of this manual.

The CE/UKCA marking is found on the nameplate affixed to the rear of the front cover.



Location of CE/UKCA marking
(Rear of front cover)

2

Important Safety Information

2-1 Danger information



DANGER

- The product is a non-explosion-proof device. Never attempt to use the product to detect gases above the lower explosive limit (LEL).
-

2-2 Warning information



WARNING

Power source

- Before turning on the power for the product, be sure to confirm that the power source meets the specified voltage requirements. Avoid using unstable power sources; doing so may lead to malfunctions.

Protective grounding required

- Do not cut the protective grounding cable of the product or disconnect the protective grounding terminal.

Defects of protective functions

- Before operating the product, check the protective functions for defects.
Do not turn on the product if you suspect any problems with the protective grounding and other protective functions.

External connections

- Be sure to provide secure protective grounding before connecting the product to the detection target or external control circuit.

Pipes

- Avoid applying excessive pressure to the product's sampling pipe openings.
This product is designed to perform gas detection by drawing in gas at atmospheric pressure. Applying excessive pressure to the product's sampling pipe openings (GAS IN, GAS OUT) is dangerous. Doing so may cause the detection target gas to leak from the product.
- Discharge exhaust gas after detection to a location confirmed to be safe by connecting an exhaust pipe to the detection target gas outlet (GAS OUT) located on the bottom of the main unit.

Sensor handling

- Never disassemble the sensor.
Electrochemical type sensors (ESF) contain electrolyte. Contact with electrolyte may result in skin inflammation. Contact with eyes may result in blindness. Contact with clothing may result in discoloration or damage to the fabric.
If contact occurs, rinse the area immediately with water.

Zero calibration in surrounding atmosphere (air calibration)

- Check the atmosphere for freshness before performing zero calibration in the surrounding atmosphere (air calibration for oxygen deficiency alarm models). Proper calibration is not possible in the presence of interference gases. The presence of interference gases is also extremely dangerous because the product may not detect actual gas leaks correctly.
-

Operating in an environment with gases

- Do not operate this product in locations where combustible or explosive gases or vapor are present. Operating this product in such environments is extremely hazardous.

Action when a gas alarm occurs

- A gas alarm indicates the presence of extreme danger. The user must take appropriate action after taking appropriate steps to ensure safety.
- Depending on the type of gas detected, the sensor characteristics may be severely degraded. If the gas alarm is triggered, we recommend performing maintenance on all sensors fitted to this product to check their gas sensitivity.

2-3 Caution information



CAUTION

Do not use walkie-talkies near the product.

- Radio waves from walkie-talkies or other radio transmitting devices near the product or cables may affect readings. Use walkie-talkies or similar devices only in locations where they will not affect product functions.

Wait at least five seconds after turning off the power before turning the power back on.

- The product may not function correctly if the power is turned on again within five seconds.

Confirm that the flow display is the stipulated flow before using the product.

- If the flow display is not the stipulated flow, gas will not be detected properly. Check whether the flow is unstable or absent.

Attach a dust filter.

- Attach the specified filters when using this product to avoid the effects of gas absorption and airborne dust.

The correct dust filter type depends on the type of gas to be detected. Contact our sales department for more information.

Observe the specified operating range to avoid condensation in the pipes.

- Condensation within the pipes may lead to gas adsorption, blockages, and other problems that make it impossible to detect gases accurately. To prevent condensation within the pipes, carefully monitor temperature and humidity both at the sampling point and within the general environment. When detecting gases that become more corrosive when dissolved in water (e.g., highly acidic gases), note that consequences may include impaired capacity to detect gases and corrosive damage to internal parts.

Do not use external output from the product to control other devices.

- The product is not a control device. Never attempt to use the external output of the product to control other devices.

Do not disassemble or modify the product or alter the settings unless absolutely necessary.

- Product performance cannot be guaranteed if the product is disassembled or modified. Additionally, altering the settings unnecessarily without a proper understanding of the details may prevent the alarm from operating correctly.

Read this operating manual carefully to ensure correct use of the product.

Be sure to perform regular maintenance.

- The product is a safety device. Maintain the product periodically to ensure safety. Continuing to use the product without adequate maintenance will result in sensor sensitivity variations, preventing accurate gas detection.

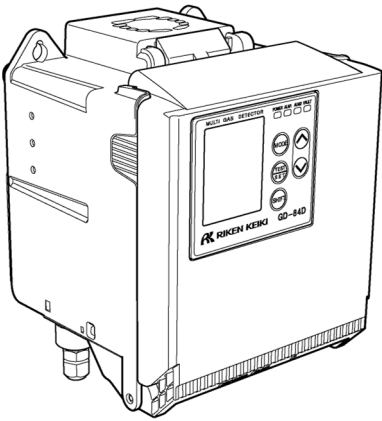

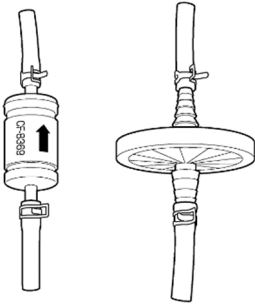
3

Product Configuration

3-1 Main unit and accessories

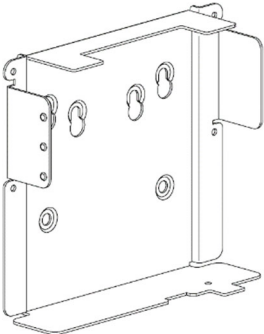
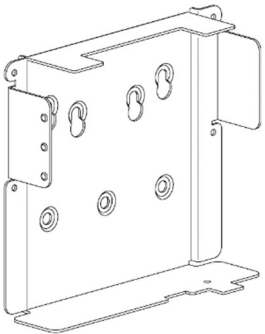
Open the box and packaging and inspect the main unit and accessories.
If any accessories are missing, contact our sales department.

<ET models>

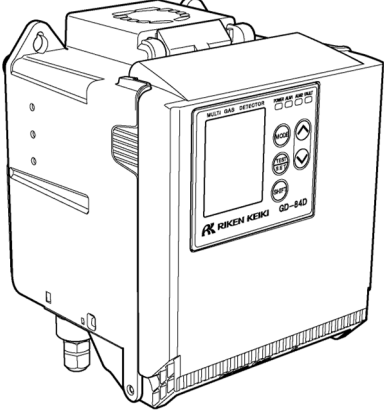

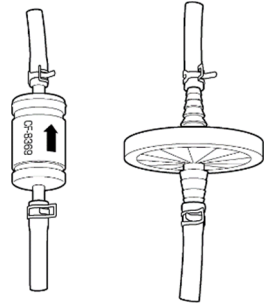
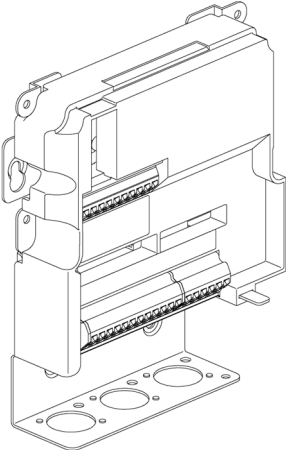
Main unit	Standard accessories		
	Protective rubber caps* ¹ (2)	Dust filter* ² (1)	Operating Manual (1)
			

*1 These caps protect the GAS IN and GAS OUT ports. Remove them when the product is in use.

*2 One dust filter is supplied. The dust filter supplied depends on the model.

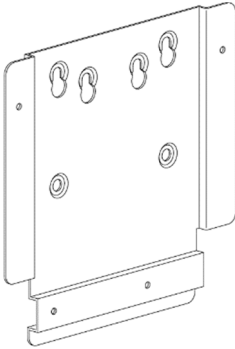
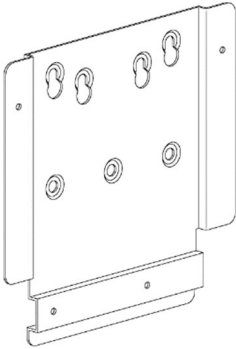
Optional accessories	
Mounting plate for compatibility with GD-70D (to use with four mounting screws)	Mounting plate for compatibility with GD-70D (for use with three or four mounting screws)
	

<4 - 20 mA models, EA models>

Main unit	Standard accessories		
	Protective rubber caps*1 (2)	Dust filter*2 (1)	Terminal unit
			

*1 These caps protect the GAS IN and GAS OUT ports. Remove them when the product is in use.

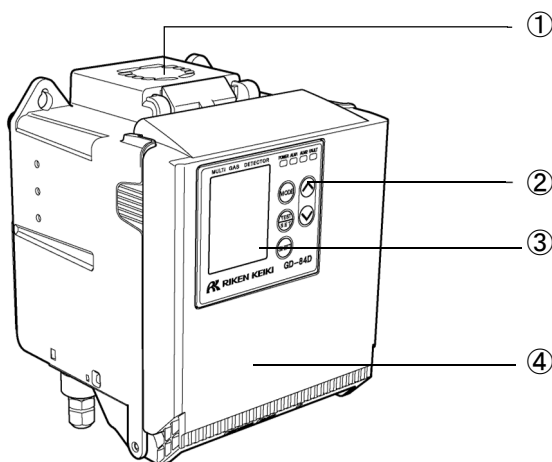
*2 One dust filter is supplied. The dust filter supplied depends on the model.

Optional accessories	
Mounting plate for compatibility with GD-70D (for use with four mounting screws)	Mounting plate for compatibility with GD-70D (for use with three or four mounting screws)
	

3-2 Part names and functions

3-2-1 Main unit part names and functions

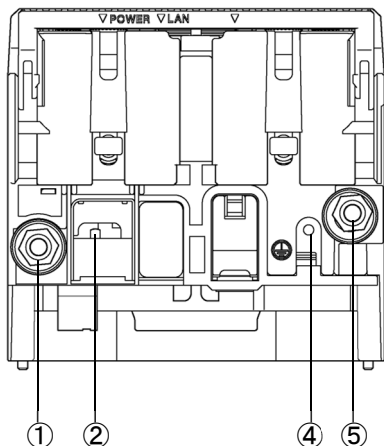
<Front of main unit>



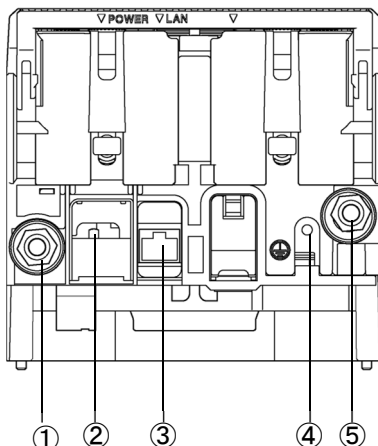
No.	Name	Function
①	Fan	This is the cooling fan. GD-84D-EX-EC, GD-84D-EX-ET-EC, and GD-84D-EX-EA-EC lack fans.
②	Front panel	The LCD display and keys used to operate the product are located on this panel.
③	LCD screen	Full-dot LCD screen that displays gas concentration and other information
④	Front cover	This cover protects the units inside the main unit.

<Underside of main unit>

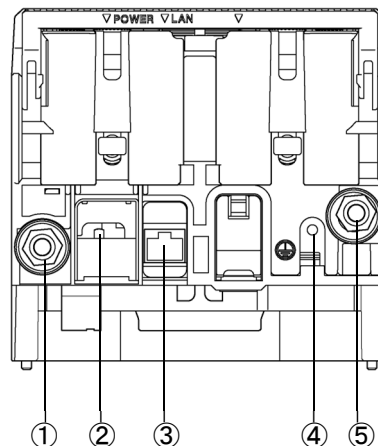
<4 - 20 mA models>



<ET models>

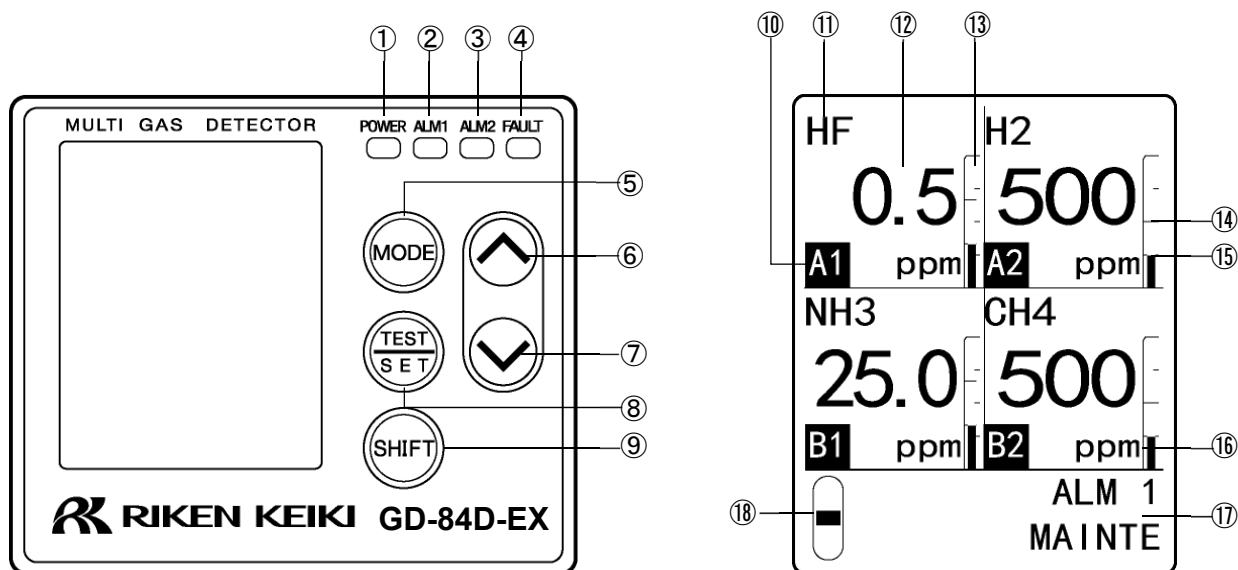


<EA models>



No.	Name	Function
①	GAS IN	This is the sampling pipe opening on the IN side.
②	Power switch	Power ON/OFF switch.
③	Ethernet cable connection inlet	RJ-45 connector for connecting Ethernet cable
④	Grounding terminal	Grounding wires are connected to this terminal.
⑤	GAS OUT	This is the sampling pipe opening on the OUT side.

3-2-2 Front panel and LCD screen part names and functions



No.	Name	Function
①	Power LED (POWER)	This is the power LED. Lights up (green) when the power is ON.
②	Alarm lamp (ALM1)	This is the ALM1 (first alarm) alarm lamp. This lights up (red) when the alarm setpoint for ALM1 (first alarm) is reached.
③	Alarm lamp (ALM2)	This is the ALM2 (second alarm) alarm lamp. This lights up (red) when the alarm setpoint for ALM2 (second alarm) is reached.
④	Fault lamp (FAULT)	This is the Fault lamp. This lights up (yellow) when there is an abnormality with the product.
⑤	MODE key	Hold down in detection mode to switch to user mode. In user mode or maintenance mode, this key is used to cancel settings and to return to the previous screen. Hold down this key in user mode or maintenance mode to return to detection mode.
⑥	▲ key	Used to select sensors or adjust values (UP)
⑦	▼ key	Used to select sensors or adjust values (DOWN)
⑧	TEST/SET key	Hold down in detection mode to switch to the mode used to perform alarm tests. This key is used in various modes to confirm values or make settings.
⑨	SHIFT key	This key is used for supplementary functions in various modes.
⑩	Sensor positioning indicators	These indicate the positions of the sensors. Sensors [A1] and [A2] are fitted in flow passage A. Sensors [B1] and [B2] are fitted in flow passage B. (Refer to '4-5-1 Configuration of the main unit'.)
⑪	Gas name displayed	Displays the name of the detection target gas by chemical formula. This can be changed to suit the fitted sensors. (Refer to '7-10-24 Displayed gas name setting (GAS NAME)'.)
⑫	Concentration display	Displays the gas concentration and other information.
⑬	Concentration bar display	The segmented detection range (full scale) displays gas concentrations as bars. It indicates concentrations as ratios of the full scale.

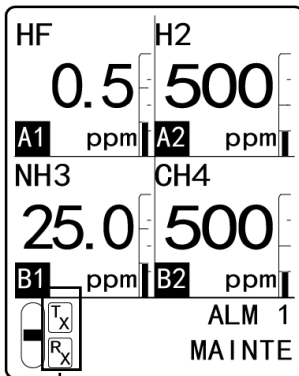
⑭	Second alarm setpoint display	This indicates in points the second alarm setpoint as a ratio of the full scale.
⑮	First alarm setpoint display	This indicates in points the first alarm setpoint as a ratio of the full scale.
⑯	Units display	Displays units matching sensor specifications (ppm, ppb, vol%, %, %LEL).
⑰	Maintenance display section	Setting details are displayed in user mode and maintenance mode. Alarm contacts are disabled when [MAINTE] is displayed.
⑱	Flow display	Indicates the suction flow rate. The suction is 0.6 L/min (standard flow rate) when the suction flow rate indicator bar is positioned in the middle.

* The screen display examples used in this operating manual show H₂, NH₃, and CH₄ as example detection target gases.

<About the communication indicators>



Icons on the maintenance display section indicate whether the product is transmitting or receiving when data is being transmitted or received to/from upstream devices.



Icons indicating the product is transmitting or receiving

NOTE

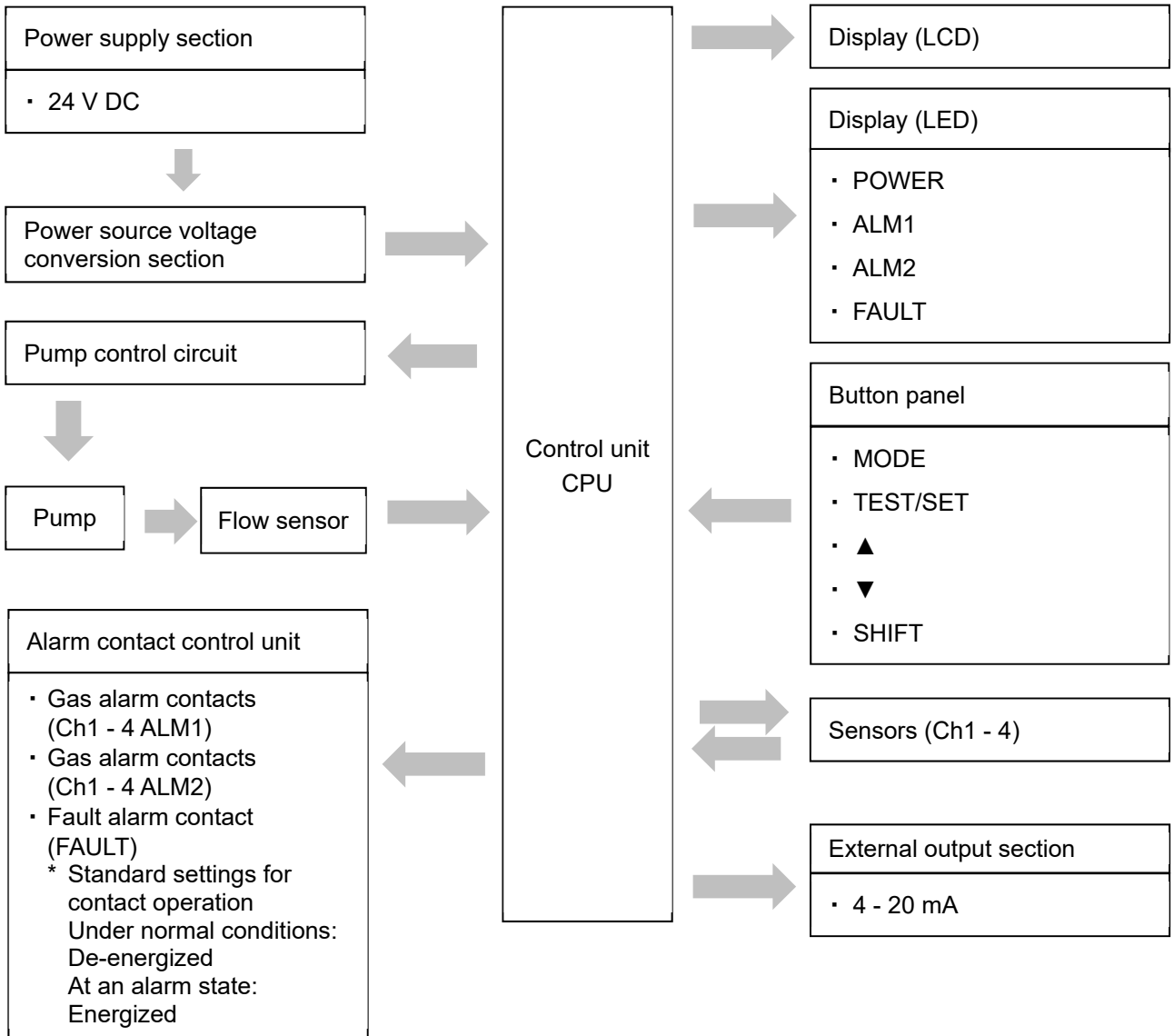
- ▶ The suction flow rate for this product is automatically adjusted by the automatic flow adjuster function. The flow rate is automatically adjusted even if the flow display varies from the stipulated flow rate. No flow adjustment is normally required. Messages indicating [FLOW] (flow instability) or [E-05] (flow abnormality) are displayed if pipe blockages, leaks, or other factors prevent automatic adjustment. If this happens, identify the cause, then adjust manually until the flow reaches the stipulated value. (Refer to '7-6-2 Manually adjusting the flow (FLOW)').

3-3 Block diagram

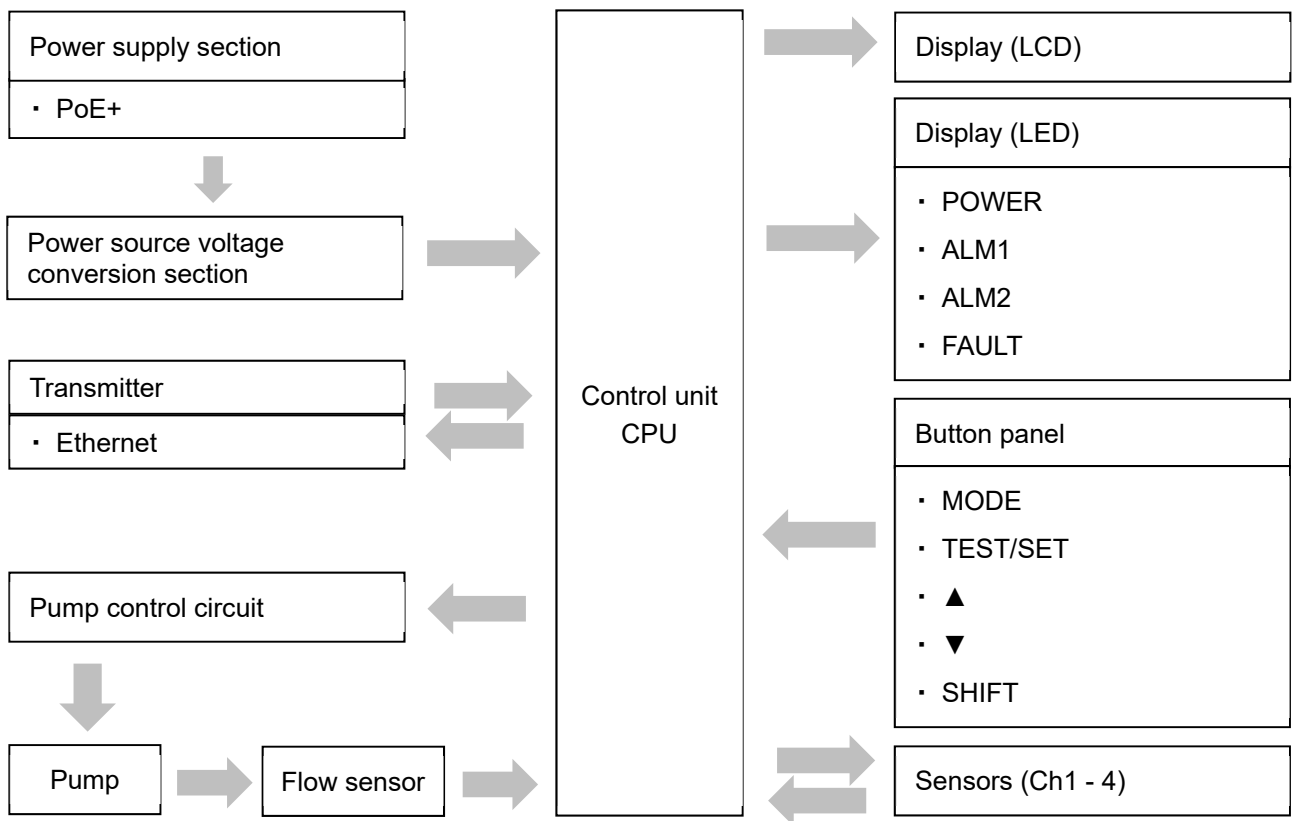
3-3-1 Electrical circuit diagram

Refer to the product electrical circuit diagram provided below.

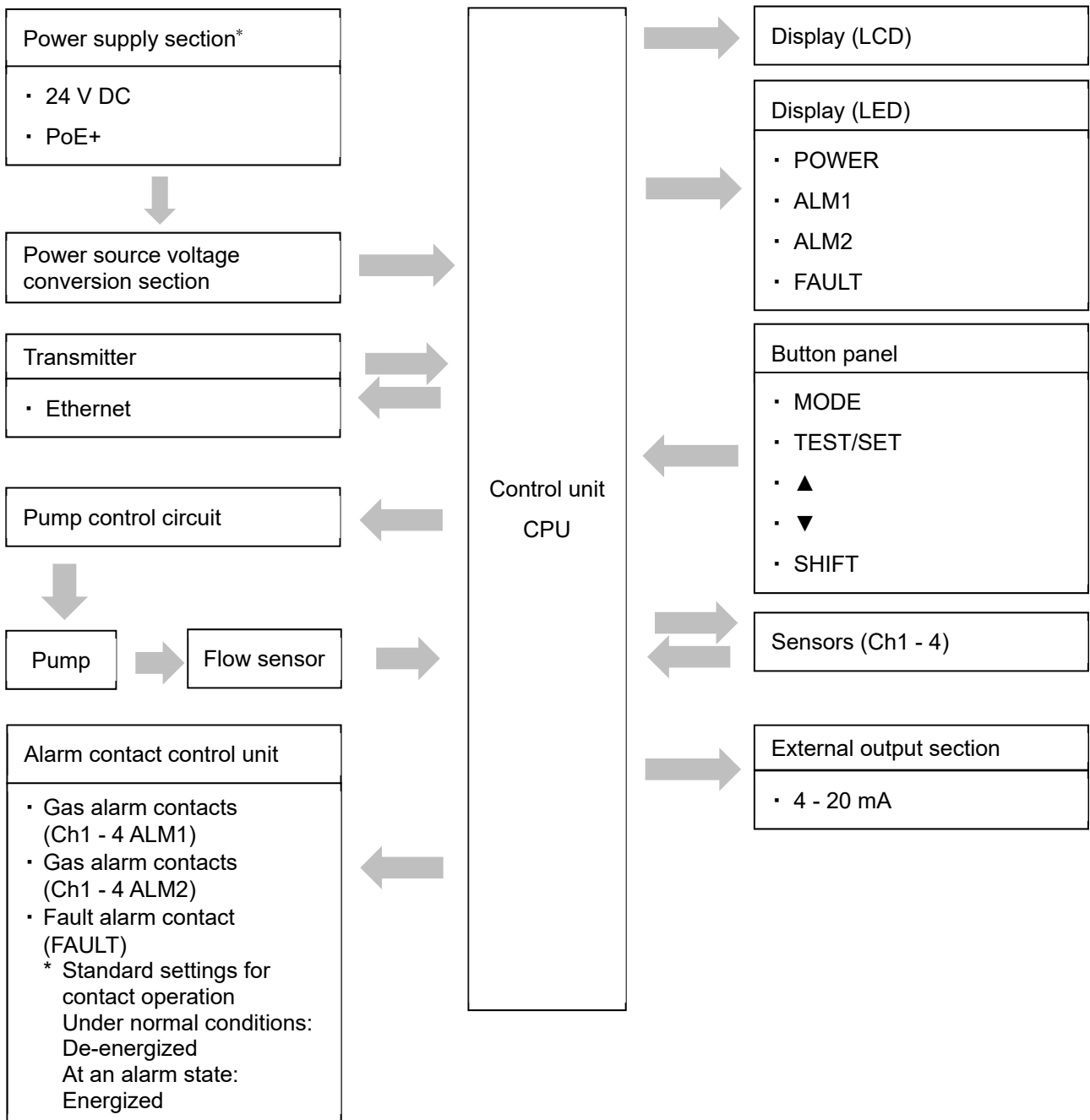
<4 - 20 mA models>



<ET models>



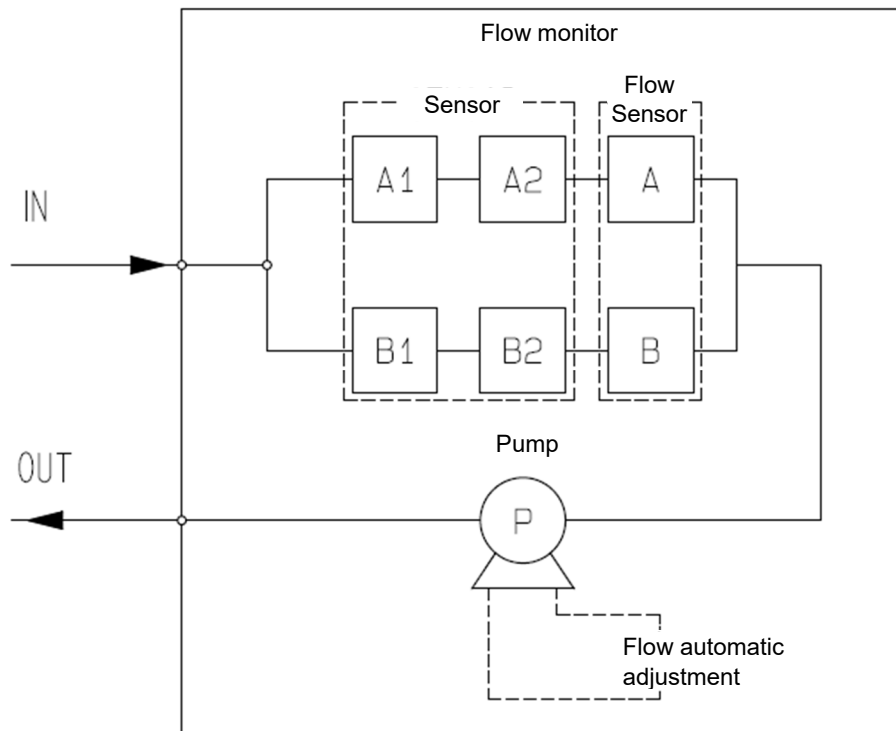
<EA models>



* Do not use a 24 V DC power supply and PoE+ at the same time.

3-3-2 Piping diagram

Refer to the product piping circuit diagram provided below.



4

Installation

4-1 Installation precautions

Be sure to observe the following precautions when performing installation tasks.
Failure to observe these precautions may result in product failure and/or inability to detect gas correctly.



- The product is a precision device. The expected performance of this product may be affected by the location (environment) in which it is installed. Assess conditions at the installation location and take appropriate measures.
- The product plays a key role in safety and disaster prevention. Install the required number of products at appropriate locations to ensure efficacy.
- Areas where gas is likely to leak or accumulate may differ depending on the specific gas and the specifics of the work spaces. Install products after duly considering the location and number of units.

<Do not install in locations subject to vibration or impact>

The product contains precision electronic components. Install the product in a stable location not exposed to vibration, impact, or risk of falling.

<Do not install in locations exposed to water, oil, or chemicals>

Avoid installing in locations associated with risk of splashing water, oil, chemicals, or other liquids.

<Do not install in locations where temperatures can fall below -10 °C or exceed 40 °C>

The product is designed for use in environments with ambient temperatures between -10 °C and 40 °C. Install in a location where temperatures will not exceed the operating temperature range.

<Do not install in locations exposed to direct sunlight or sudden temperature fluctuations>

Avoid installing in locations subject to direct sunlight or radiant heat (infrared radiation from high-temperature bodies) or in locations subject to sudden temperature changes.

Condensation may form inside the product, or the product may be unable to adjust to sudden temperature fluctuations.

<Install away from noise-emitting devices (main unit and cables)>

Install away from locations where high-frequency or high-voltage devices are present.

The product may be affected by electromagnetic noise, etc.

<Do not install in locations where maintenance is hazardous or not possible>

The product requires regular maintenance.

Do not install in the following or similar locations where maintenance is hazardous or not possible:

- Within systems where the system must be stopped for maintenance
- Locations where part of the system must be detached to allow maintenance
- Locations where the product cannot be removed due to the presence of pipes or racks
- Locations where maintenance work is hazardous: for example, near high-voltage cables

<Do not install in improperly grounded systems>

When installing within a system chassis, make sure the system is properly grounded to Class D or equivalent.

<Do not install in the presence of interference gases>

Do not install the product in locations where miscellaneous gases are present.

<Do not use cleaning products when cleaning this product>

When cleaning this product, do not use cleaning products.

4-2 System design precautions



- Unstable power sources or noise may result in malfunctions or false alarms.
- When designing systems based on or incorporating this product, be sure to incorporate the information provided on this page and in the 'System Construction Manual'.

<Use of a stable power source>

The product's external output and alarm contacts may activate while the system stabilizes at power-on or in the event of an instantaneous power failure. If you do not want the external output and alarm contacts to activate, use a UPS (uninterruptible power system) or take appropriate measures on the receiving end. Supply this product with the following power sources:

Power source voltage	4 - 20 mA models : 24 V DC \pm 10 % (main unit terminal voltage) ET models : PoE+ connection EA models : 24 V DC \pm 10 % (voltage of main unit terminal) or PoE+ connection (not to be supplied simultaneously)	
Time allowed for instantaneous power failures	Up to approx. 10 ms*	Example of countermeasure: Deploy an external UPS (uninterruptible power system) or similar to guarantee continuous operation and functionality.
Miscellaneous	Do not use with power sources subject to very high power loads or high frequency noise.	Example of countermeasure: Where necessary, use a line filter or other device. Keep the product away from noise sources.

* To recover from an instantaneous power failure exceeding 10 ms, restart the product.

<Design accounting for heat dissipation>

If you plan to install the product in a closed instrument panel or similar space, install ventilation fans at the top and bottom of the panel.

Install the fans so that the temperature inside the instrument panel remains below 40 °C. Account for the heat produced by the unit itself.

<Lightning protection>

In factories or plants where cabling is configured as follows, damage may result in the event of lightning strikes. The cables connected to the product may function as receiving antennas for the lightning:

- When cables are installed outdoors
- When cables are installed in the same duct as cables supplied from outside

Lightning strikes may damage devices connected to the cable. Additionally, note that inductive lightning surges due to lightning strikes cannot be entirely prevented, even if cables are installed in metal ducts or buried underground. While it is not possible to completely protect against disasters caused by lightning, the following protective measures are available:

<Protection against lightning>

Take appropriate measures based on environmental conditions and the importance of the facility.

- Passing the signal transmission path through optical fiber, etc.
- Protection using a lightning arrester (cable safety retainer)

A lightning arrester (cable safety retainer) can be installed before the field devices and central processing equipment to safeguard against inductive lightning surges transmitted through the cable. For information on how to use lightning arresters, please contact the manufacturer.

<Grounding>

Surge noise is caused by lightning strikes and other factors. This product must be grounded to protect against these factors.

NOTE

- ▶ Lightning arresters include circuits to remove surge voltages that may damage field devices. For this reason, installing a lightning arrester can attenuate signals. Perform an operation check before installing lightning arresters. Additionally, lightning arresters cannot remove all surge voltages.

<Using alarm contacts correctly>

The alarm contacts on this product are designed to transmit signals to activate external buzzers, alarm indicators, revolving lights, etc.

Do not use for control purposes (e.g., controlling shutoff valves).

CAUTION

- When relay contacts are to be left in a constantly closed state, burning may occur at the contacts with minimal vibration.
- A de-energized b contact (break contact) may cause a momentary open operation due to external forces or other physical impact.
- If a b contact is used as an alarm contact, implement measures to account for such momentary operations—for example, add a delay operation (of approximately 1 second) to the signal on the b contact receiving side.

The alarm contact specifications of the product assume resistance loads. If the alarm contacts use inductive loads, a counter - electromotive force will occur at the contacts, leading to the following potential problems:

- Relay contact welding, insulation failure, contact failure
- Damage to electrical components due to high voltages occurring inside the product
- Malfunctions due to CPU runaway

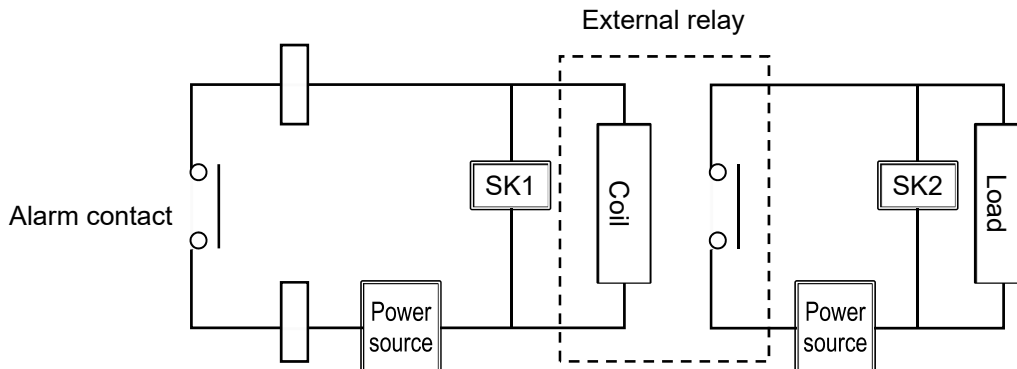
CAUTION

- As a rule, do not use the alarm contacts of the product to operate inductive loads. In particular, never use to operate devices like fluorescent lamps and motors.
- If operating inductive loads, link using an external relay (contact amplification). However, since the external relay coil also constitutes an inductive load, use a relay that runs on low voltage (within 100 V AC) and a suitable surge protector (CR circuit, etc.) to protect the contacts of this product.

When operating a load, stabilize the operation of this product, then take the following measures, where appropriate, to protect the alarm contacts.

- Link the circuits (contact amplification) using an external relay (not exceeding 24 V DC). Add a surge absorber (SK1) appropriate for the rating to the external relay.
- Where necessary, add a surge absorber (SK2) to the load side of the external relay.
- In certain cases, due to load conditions, it may be preferable to attach the surge absorber to the contact side. Confirm load behavior and determine the optimal attachment point.

<On GD-84D-EX>



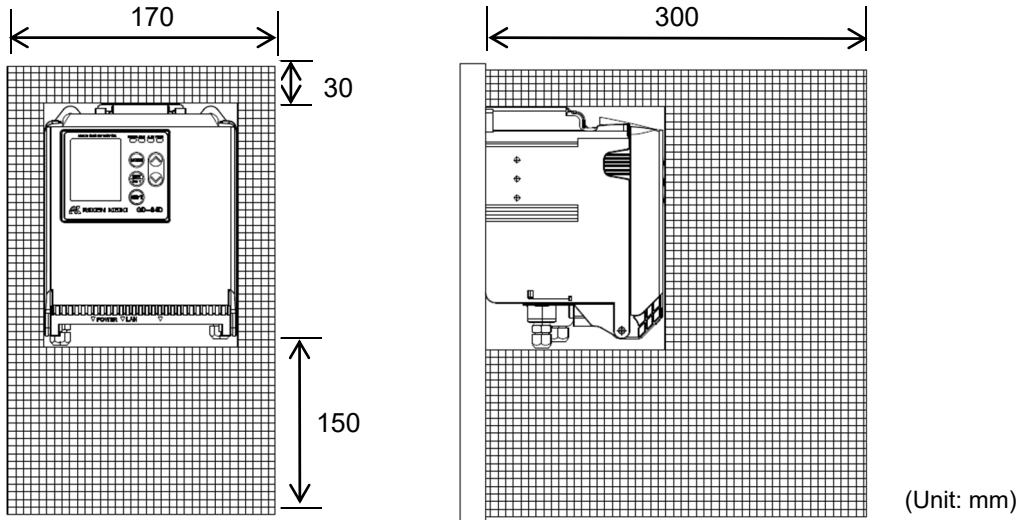
* SK1, SK2: Surge absorbers

4-3 Providing maintenance space

When installing the product, make sure there is space for maintenance.

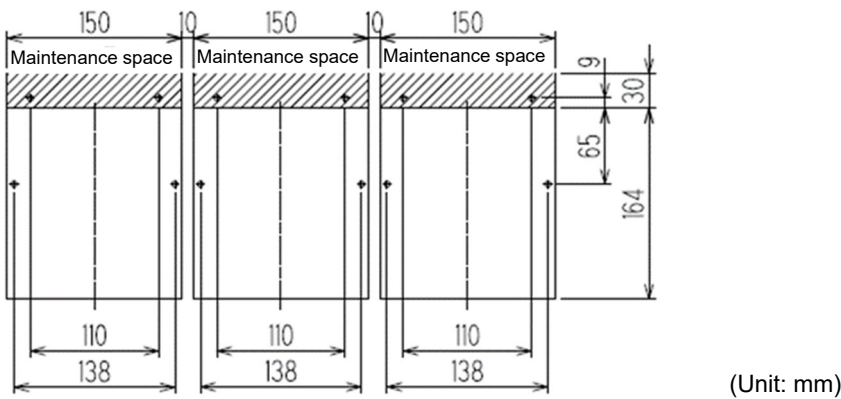
4-3-1 Maintenance space **ET**

<When installing one unit of this product>



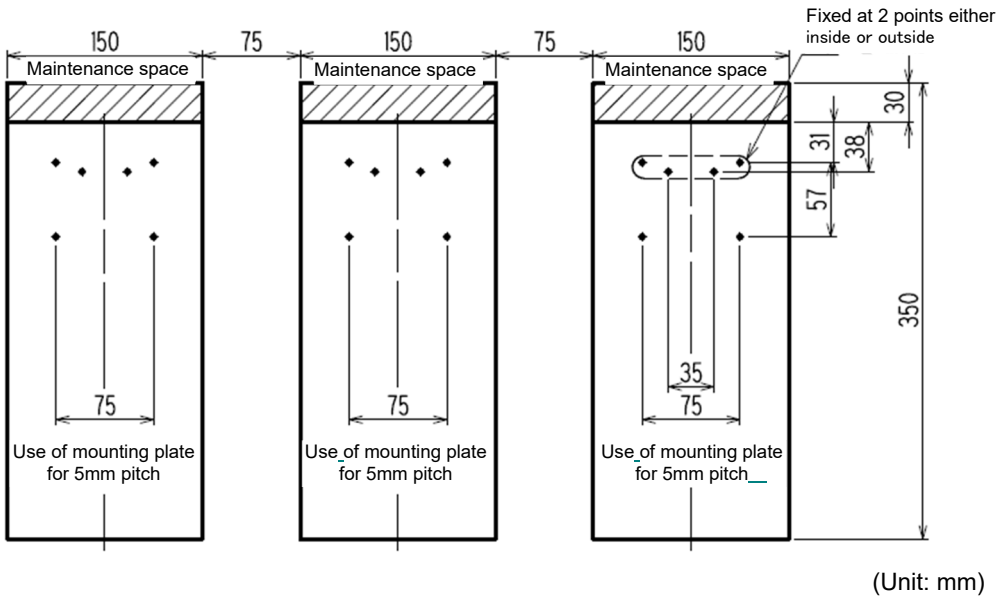
<When installing this product in series>

<When not using the mounting plate for compatibility with the GD-70D>

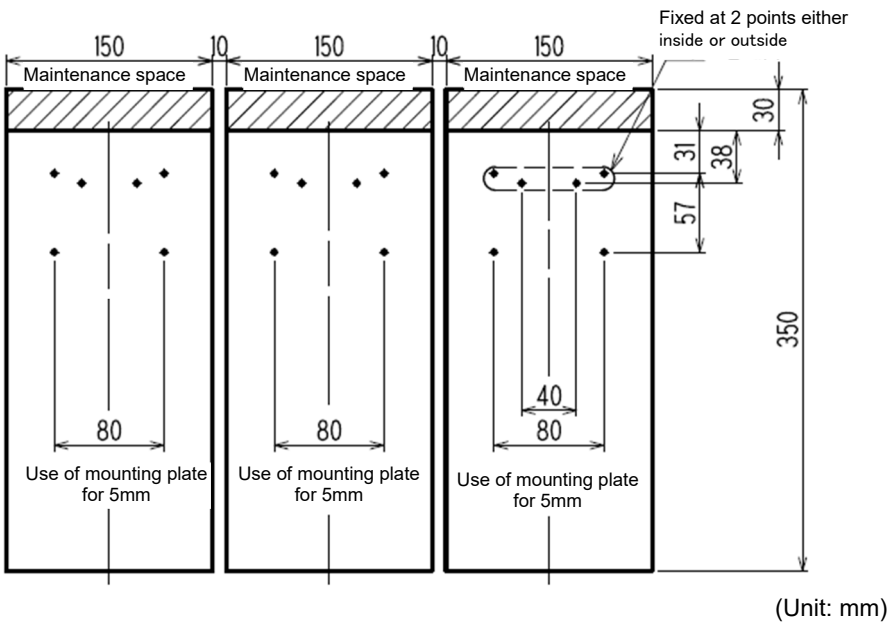


<When using the mounting plate for compatibility with the GD-70D>

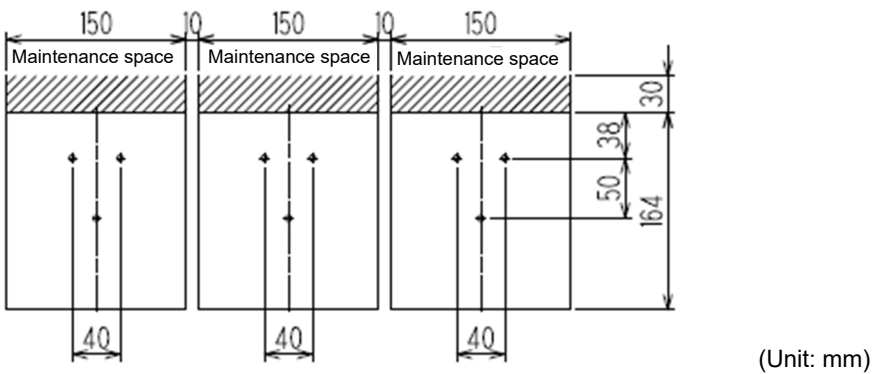
- When GD-70D is installed at a pitch of 5 mm



- When GD-70D is installed at a pitch of 10 mm



- When securing with three points as with GD-70D

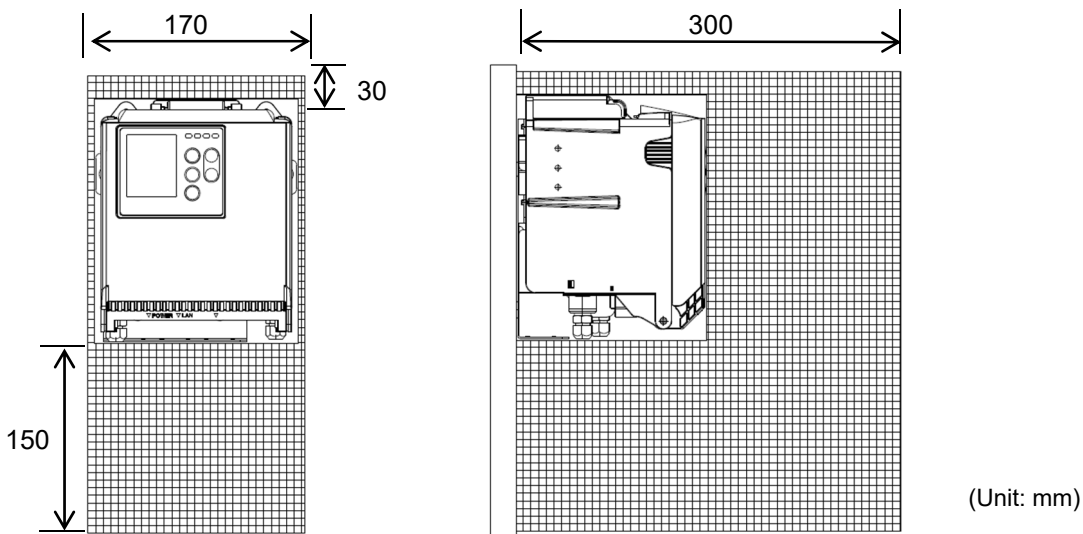


CAUTION

- We recommend installing at a minimum pitch of 10 mm. Make this a minimum of 10 mm. If a wall is located either to the left or right end of the installed series of devices, leave 10 mm or more between the wall and the left or right end of the installed devices.
- To install the product in series, install on a rack or wall to protect against vibrations. If the rack or wall on which the products are installed lacks sufficient strength, the vibration of the built-in pumps may generate resonance between the products. If this occurs, take appropriate measures—for example, reinforcing the rack or wall.

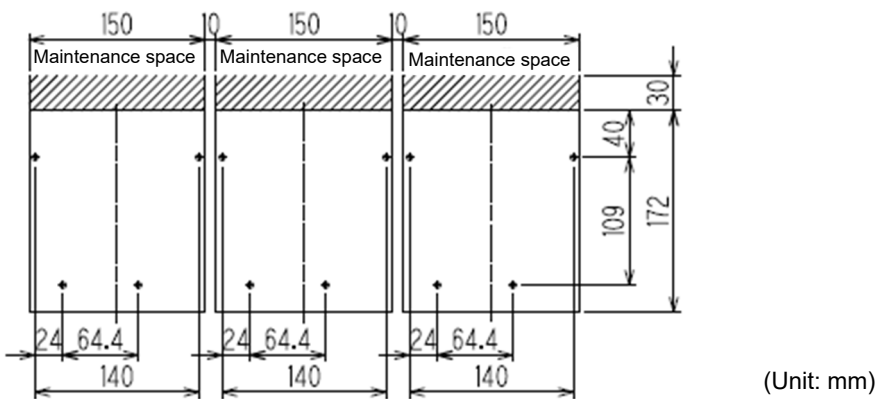
4-3-2 Maintenance space **4-20mA** **EA**

<When installing one unit of this product>



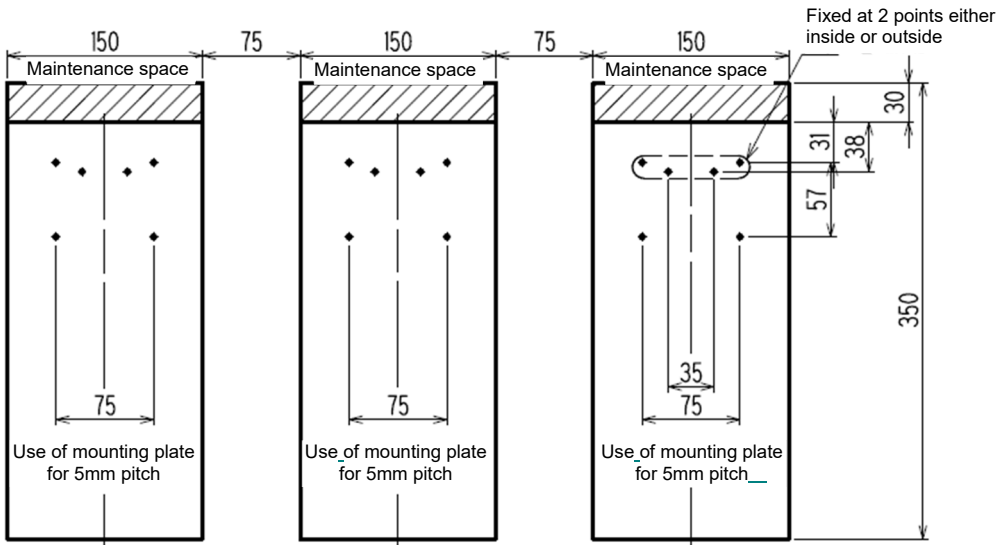
<When installing this product in series>

<When not using the mounting plate for compatibility with the GD-70D>



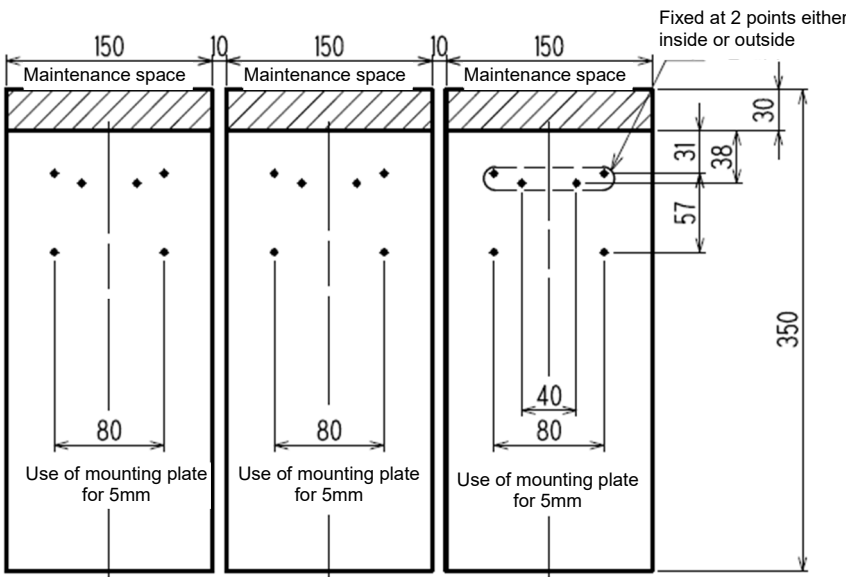
<When using the mounting plate for compatibility with the GD-70D>

- When GD-70D is installed at a pitch of 5 mm



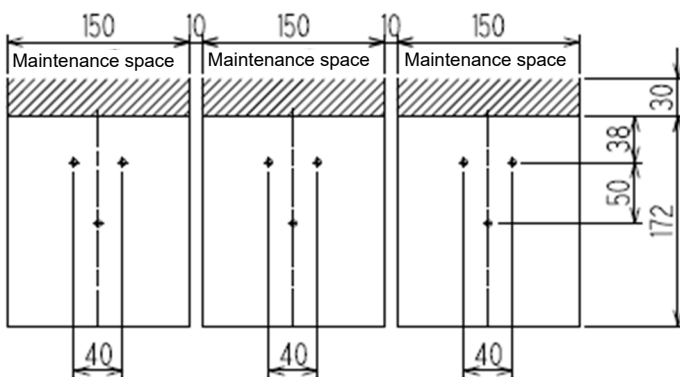
(Unit: mm)

- When GD-70D is installed at a pitch of 10 mm



(Unit: mm)

- When securing with three points as with GD-70D



(Unit: mm)

CAUTION

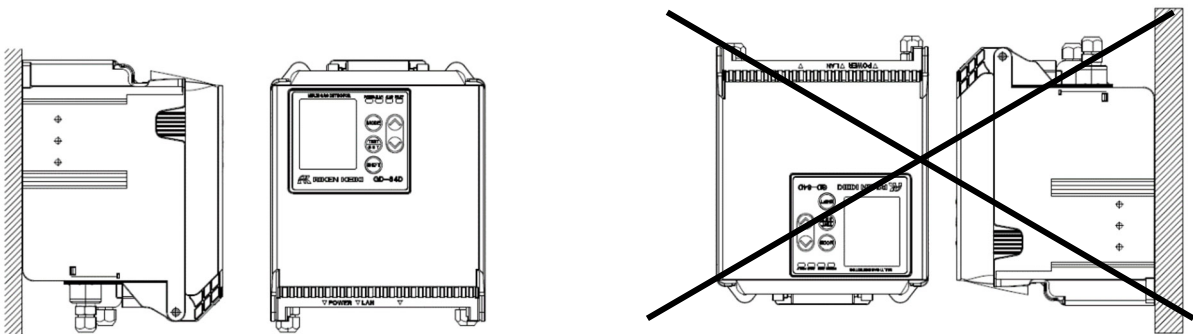
- We recommend installing at a minimum pitch of 10 mm. Make this a minimum of 10 mm. If a wall is located either to the left or right end of the installed series of devices, leave 10 mm or more between the wall and the left or right end of the installed devices.
- To install the product in series, install on a rack or wall to protect against vibrations. If the rack or wall on which the products are installed lacks sufficient strength, the vibration of the built-in pumps may generate resonance between the products. If this occurs, take appropriate measures; for example, reinforcing the rack or wall.

4-4 Installing the main unit

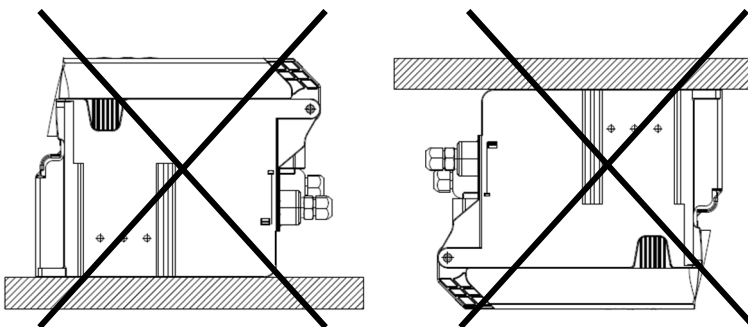
CAUTION

- For performance reasons, this product must be installed facing in a particular direction. Install the product horizontally as shown in the figure below. Keep the product oriented horizontally as shown in the figure below when carrying, temporarily removing, or relocating the product.

<Wall mounting>



<Ceiling mounting>



4-4-1 Installing the main unit (without the mounting plate for compatibility with the GD-70D)

CAUTION

- Before installing this product, remove the protective rubber caps fitted to GAS IN and GAS OUT. If the product is installed with the rubber caps still attached, excess loads will be imposed on the pumps and sensors when the power is turned ON. This may result in damage.

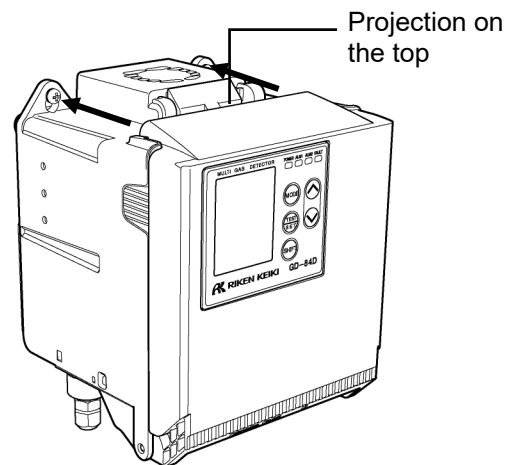
<ET models>

- 1 Place the main unit against the installation surface and secure with two screws.**

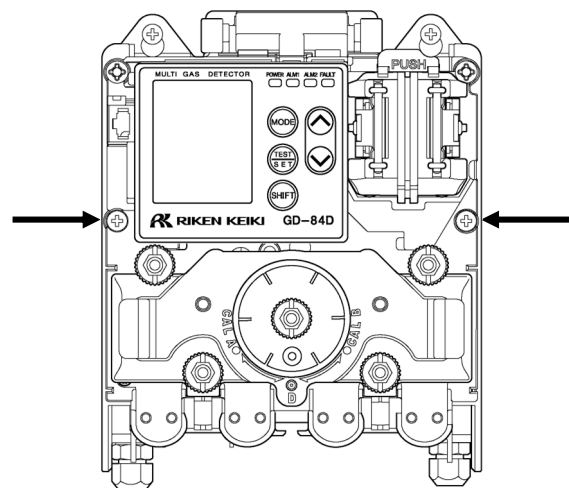
We recommend double SEMS screws (M4-14).

- 2 Pull the projection on the top of the main unit towards you to open the front cover.**

The front cover opens to approximately 120°. Push further down to open to 180°.

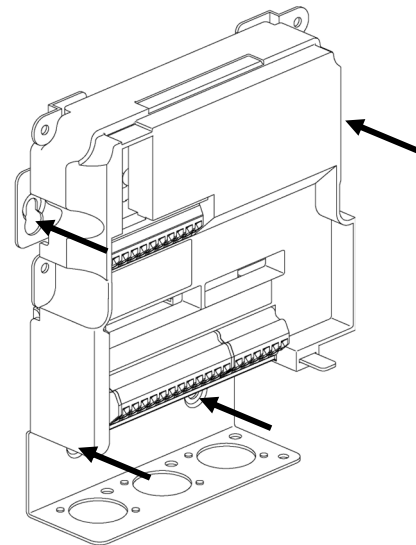
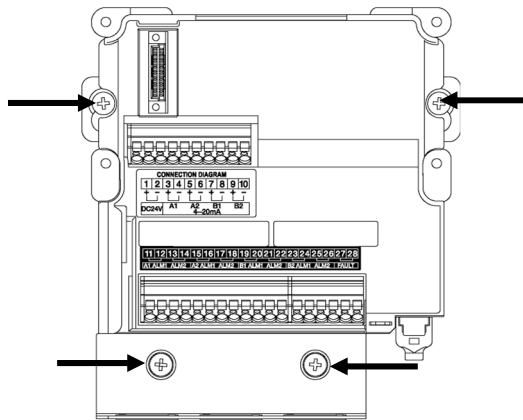


- 3 Use two screws to secure the main unit to the installation surface.**

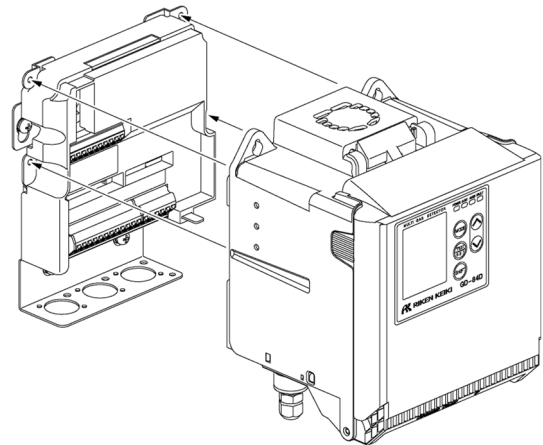


<4 - 20 mA models, EA models>

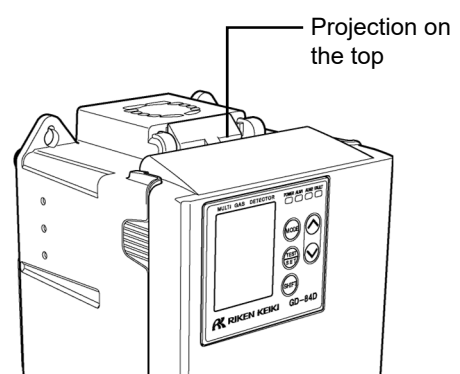
- 1 Place the terminal unit against the installation surface and secure with four screws.



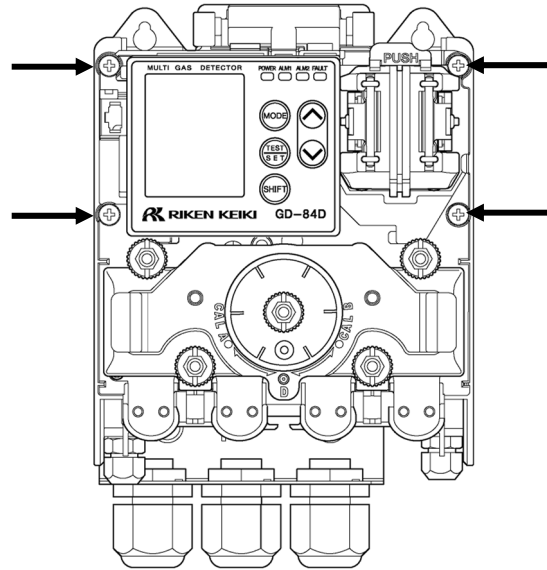
- 2 Mount the main unit to the terminal unit.



- 3 Pull the projection on the top of the main unit towards you to open the front cover.
The front cover opens to approximately 120°. Push further down to open to 180°.



- 4 Use four screws to secure the main unit to the terminal unit.



- 5 Close the front cover on the main unit.
Close the front cover firmly so that it clicks back into place.

4-4-2 Installing the main unit (using the mounting plate for compatibility with the GD-70D)

CAUTION

- Install so that there is no gap between the mounting plate for compatibility with the GD-70D and the surface on which it is installed.
A gap may result in unnecessary vibrations and noise.
- Before installing this product, remove the protective rubber caps fitted to GAS IN and GAS OUT. If the product is installed with the rubber caps still attached, excess loads will be imposed on the pumps and sensors when the power is turned ON. This may result in damage.

<ET models>

1 Use four double SEMS screws (M4/M5) to secure the mounting plate for compatibility with the GD-70D to the installation surface.

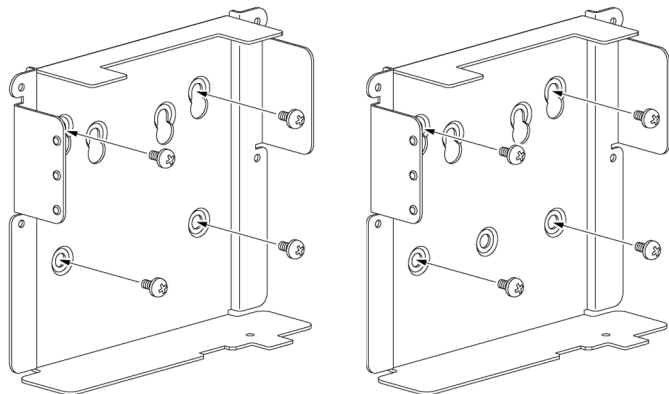
You can also use three double SEMS screws (M4/M5) when using the mounting plate for compatibility with the GD-70D for three or four mounting screws.

The following screws are recommended for mounting:

- Screw type: double SEMS M4 or M5
- Screw length: 8 mm or more

When securing with three double SEMS screws, use the mounting plate for three or four mounting screws. You cannot use the mounting plate for four mounting screws.

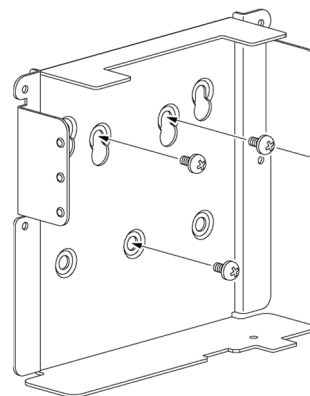
<Securing with four double SEMS screws>



Mounting plate for four mounting screws

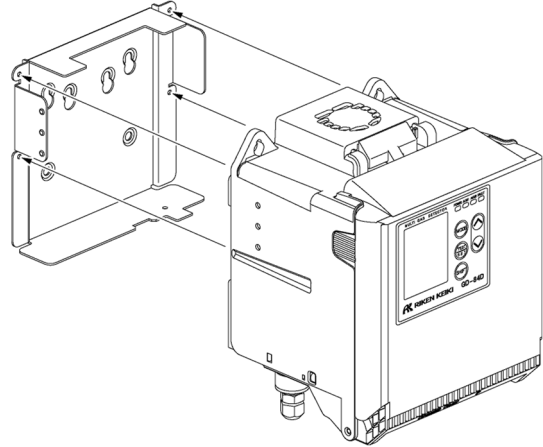
Mounting plate for three or four mounting screws

<Securing with three double SEMS screws>

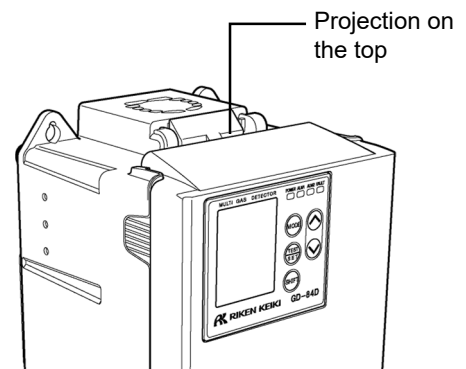


Mounting plate for three or four mounting screws

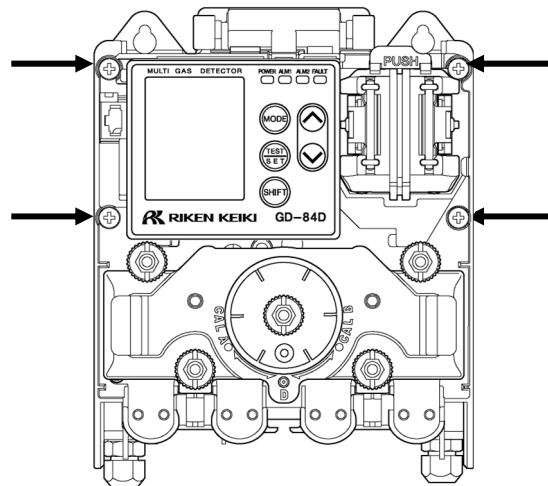
- 2 Mount the main unit on the mounting plate for compatibility with the GD-70D.**



- 3 Pull the projection on the top of the main unit towards you to open the front cover.**
The front cover opens to approximately 120°. Push further down to open to 180°.



- 4 Use four screws to secure the main unit to the mounting plate for compatibility with the GD-70D.**



- 5 Close the front cover on the main unit.**
Close the front cover firmly so that it clicks back into place.

<4 - 20 mA models, EA models>

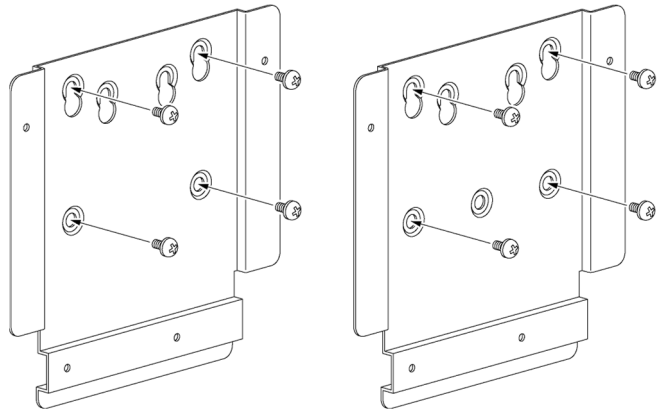
1 Use four double SEMS screws (M4/M5) to secure the mounting plate to the installation surface (for compatibility with the GD-70D).

You can also use three double SEMS screws (M4/M5) when using the mounting plate for compatibility with the GD-70D for three or four mounting screws.

The following screws are recommended for mounting:

- Screw type: double SEMS M4 or M5
- Screw length: 8 mm or more

<Securing with four double SEMS screws>

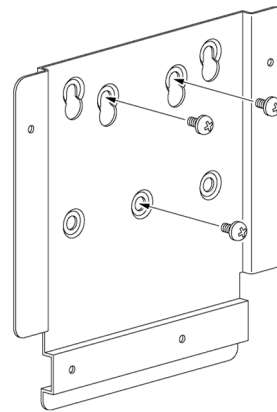


Mounting plate for four mounting screws

Mounting plate for three or four mounting screws

When securing with three double SEMS screws, use the mounting plate for three or four mounting screws. You cannot use the mounting plate for four mounting screws.

<Securing with three double SEMS screws>

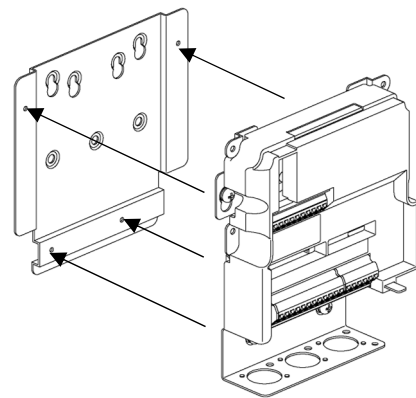
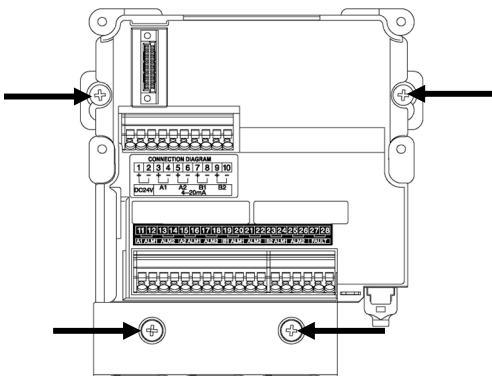


Mounting plate for three or four mounting screws

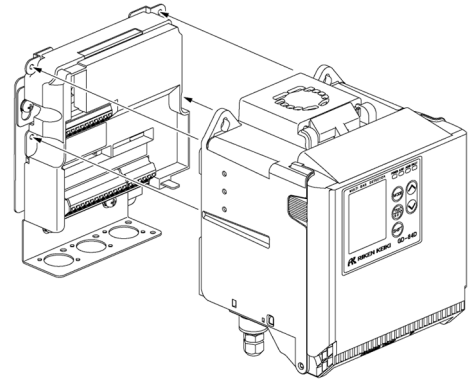
2 Use four screws (M4) to secure the terminal unit to the mounting plate for compatibility with the GD-70D.

Use the supplied screws.

- Screw type: M4
- Screw length: 6 mm

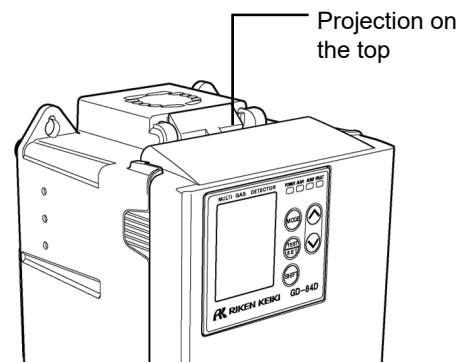


3 Mount the main unit to the terminal unit.

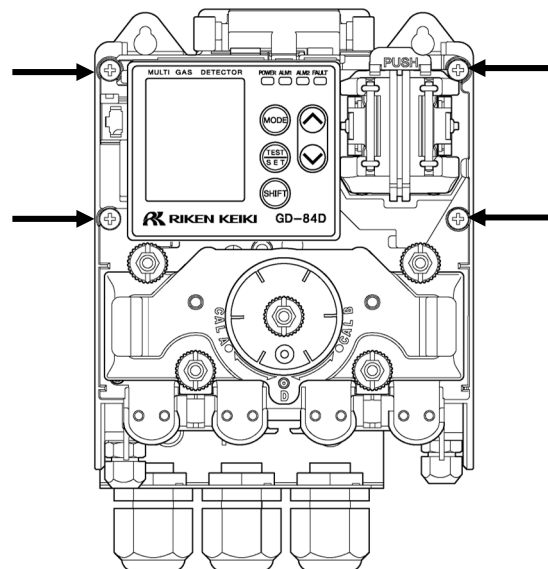


4 Pull the projection on the top of the main unit towards you to open the front cover.

The front cover opens to approximately 120°. Push further down to open to 180°.



5 Use the four screws to secure the main unit to the terminal unit.

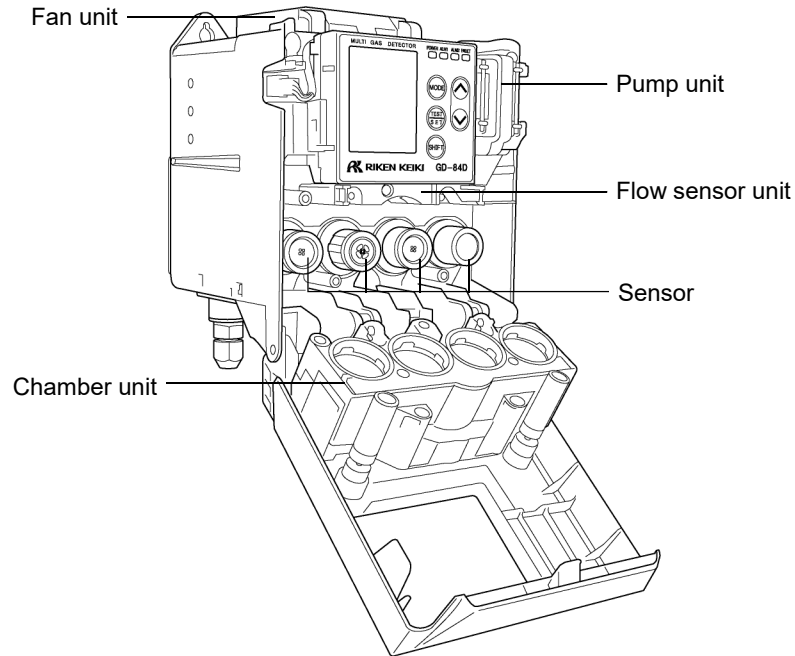


6 Close the front cover on the main unit.

Close the front cover firmly so that it clicks back into place.

4-5 Fitting sensors

4-5-1 Configuration of the main unit



CAUTION

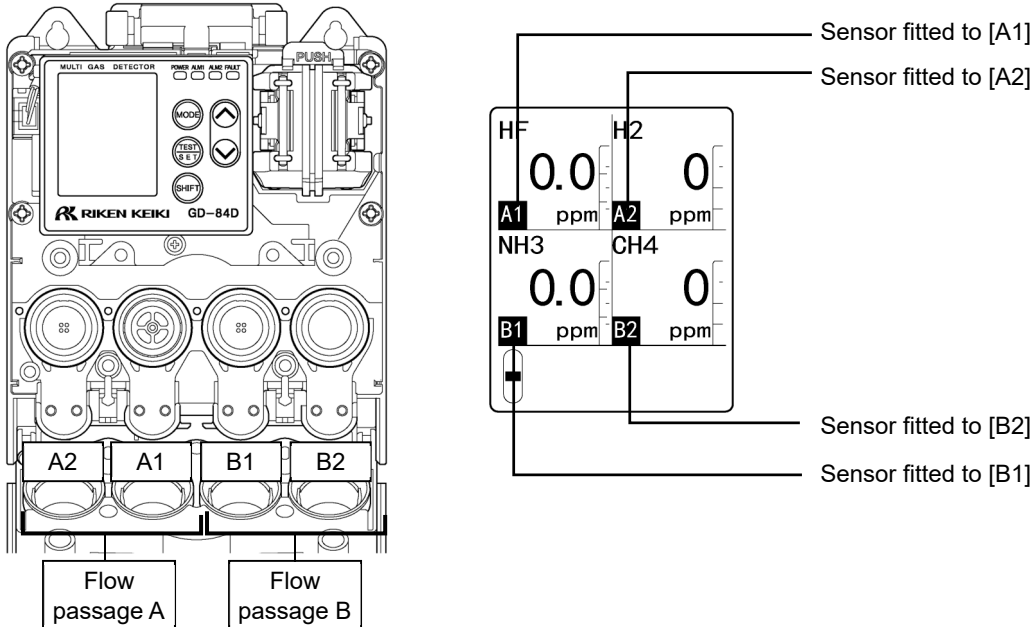
- Each unit is composed of precision components. In particular, be careful to avoid dropping the sensors when removing them. Dropping or exposing to strong impact can cause sensors or units to malfunction. Dropping or exposing to strong impact may also impair sensor performance.

<Sensor positioning>

Up to four sensors can be fitted in this product.

The two passages on the left belong to the A side. The two on the right belong to the B side.

The positions for the sensors are [A2] [A1] [B1] [B2], in order from left. These correspond to the [A2] [A1] [B1] [B2] on the LCD screen.

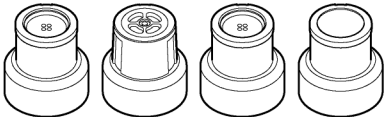


<Sensor handling>

Whatever the detection principle, all sensors fitted to the product have the same shape. It is also possible to swap sensors (excluding the D-84D-EX-EC, GD-84D-EX-ET-EC, and GD-84D-EX-EA-EC).

However, certain restrictions apply to sensor combinations.

The handling of each of the sensors depends on the operating principles in question. Contact our sales department or sales office for more information.

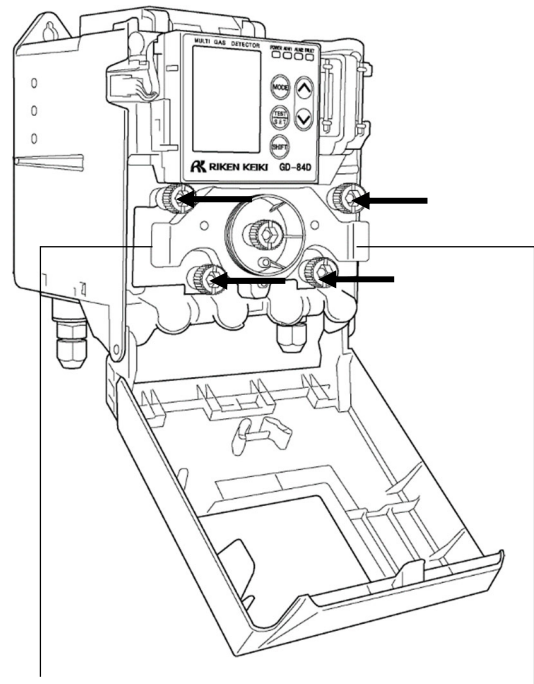


CAUTION

- From a quality and safety standpoint, handle the sensors used in these products with care. Sensor storage requires setting aside a storage compartment specifically for the sensors, including facilities for supplying power. As a rule, avoid handling or storing the sensors after removing them from the product. Contact Riken Keiki to handle sensor disposal.
- Take particular care not to fit the sensors incorrectly. [C-02] is displayed on the LCD when a sensor is fitted that uses a different principle or has different specifications from those at the time of shipping. If [C-02] is displayed, check the sensor specifications.
- Perform calibration (zero calibration, span adjustment) after sensor replacement.

4-5-2 Fitting sensors

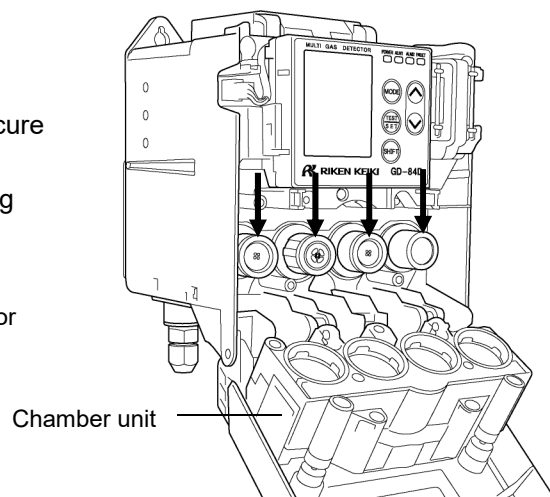
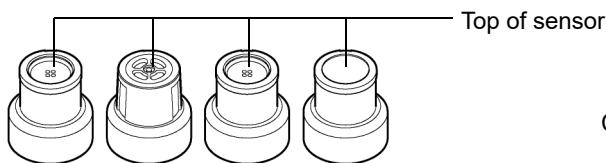
- 1 Pull the projection on the top of the main unit towards you to open the front cover.**
The front cover opens to approximately 120°. Push further down to open to 180°.
- 2 Loosen the four white knurled screws on the chamber unit.**
- 3 Grasp the projections on the left and right of the chamber unit. Pull towards you, then lower to open.**



Chamber unit projection

Chamber unit projection

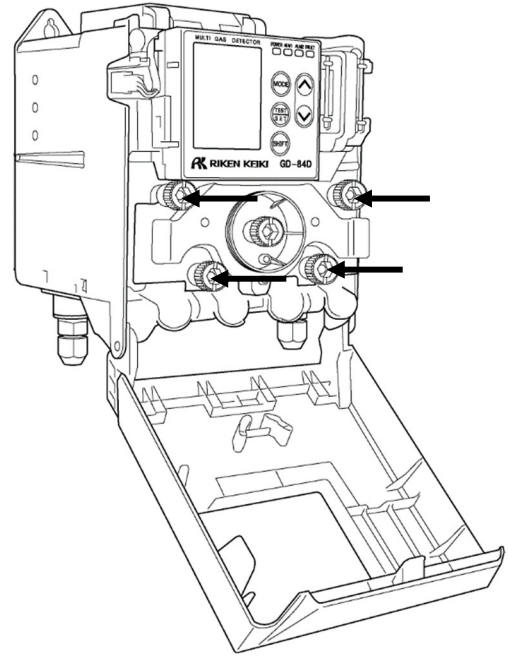
- 4 Attach the sensor.**
Grasp the cylindrical part of the sensor. Match the face of the connector on the main unit and the connector on the sensor, then push in firmly to secure into place.
Avoid pressing on the top of the sensor while doing this. Doing so may damage sensor.



5 Return the chamber unit to its original position.**6 Tighten the four white knurled screws on the chamber unit.**

Tighten the knurled screws so that the chamber unit is secured in place.

Gas leaks may result if the knurled screws are not tightened properly.

**7 Close the front cover on the main unit.**

Close the front cover firmly so that it clicks back into place.

**CAUTION**

- To attach the sensor to the main unit, push the sensor connector in firmly so that it is secured in place. Improper attachment may cause the sensor to fall out and damage the connector.

4-6 Wiring procedure



CAUTION

- Take care to avoid damaging internal electronic circuits during wiring work. Additionally, avoid excessive cable weights or cable routing that may generate excessive stress.
- Do not route the power cable and signal cable alongside power lines for motors or similar equipment.

If you must lay the cables to run parallel, pass the power cable and the signal cable through a metal conduit. Additionally, ground the conduit.

- If using stranded cable, ensure strands from one core do not make contact with the other core strands.
- Use a flathead screwdriver (3.5 mm wide or less, 0.5 mm thick or less) to perform wiring.

4-6-1 Recommended cables

<4 - 20 mA models>

Communication method	Recommended cables
Power source	CVV or other two-core cable (1.25 mm ²)
4 - 20 mA	CVVS or other shielded cable (1.25 mm ²)
Contacts	CVV or similar cable (1.25 mm ²)

<ET models>

Communication method	Recommended cables
PoE+	Ethernet cable (category 5e or better)

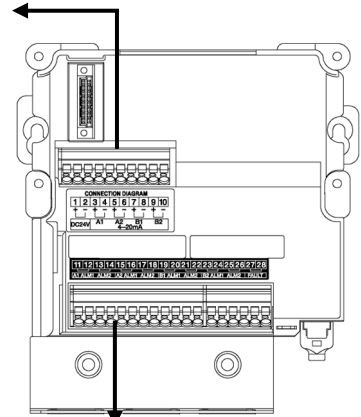
<EA models>

Communication method	Recommended cables
PoE+	Ethernet cable (category 5e or better)
Power source	CVV or other two-core cable (1.25 mm ²)
4 - 20 mA	CVVS or other shielded cable (1.25 mm ²)
Contacts	CVV or similar cable (1.25 mm ²)

4-6-2 Terminal plate specifications **4-20mA** **EA**

<Terminal plate>

1	2	3	4	5	6	7	8	9	10
+	-	+	-	+	-	+	-	+	-
24 V DC		A1 4 - 20 mA		A2 4 - 20 mA		B1 4 - 20 mA		B2 4 - 20 mA	



11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A1 ALM1		A1 ALM2		A2 ALM1		A2 ALM2		B1 ALM1		B1 ALM2		B2 ALM1		B2 ALM2		FAULT	

NOTE

▶ With EA models, do not use 24 V DC terminals 1 and 2 when using the PoE+ connection.

<Terminal plate specifications>

- Rated voltage: 300 V AC
 - Rated current: 10 A
- However, this will vary depending on the cable used.

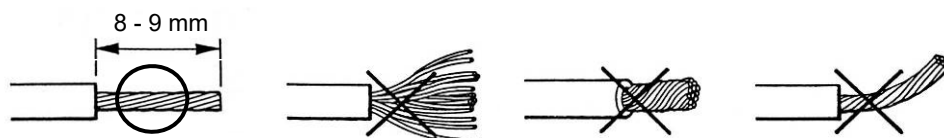
<Connecting conditions>

- Solid wire cable, flexible stranded wire: 0.08 - 2.5 mm²
- Flexible stranded wire fitted with ferrule: 0.25 - 2.5 mm²
- Insulation stripped length: 8 - 9 mm
- Tools for connection: Flathead screwdriver (3.5 mm wide or less, 0.5 mm thick or less) (Manufacturer tool: 210-720)

CAUTION

Be sure to strip the cable to the specified length.

- Conduction faults or overheating may result if the stripped wire length is too short and the wire is clamped incorrectly.
- Conduction faults or overheating may result if the stripped wire length is too short and the wire sheathing is clamped.
- An insulation failure or short circuit may result if the stripped wire length is too long and the wire is exposed.
- Make sure the wire does not splay. Insulation failure or overheating may result if the wire splays when inserted.



<Compatible bar terminals>

Use the following bar terminals:

- Bar terminal (ferrule): Model 216 series (WAGO)
 - Crimping tool: Variocrimp 4 (206- 204) (WAGO)
-

**CAUTION**

- Be sure to use the specified bar terminal. Performance is guaranteed only for the bar terminals specified.
-

4-6-3 Terminal plate connections

Use a flathead screwdriver (3.5 mm wide or less, 0.5 mm thick or less) to connect the cables to the terminal plate.

**CAUTION**

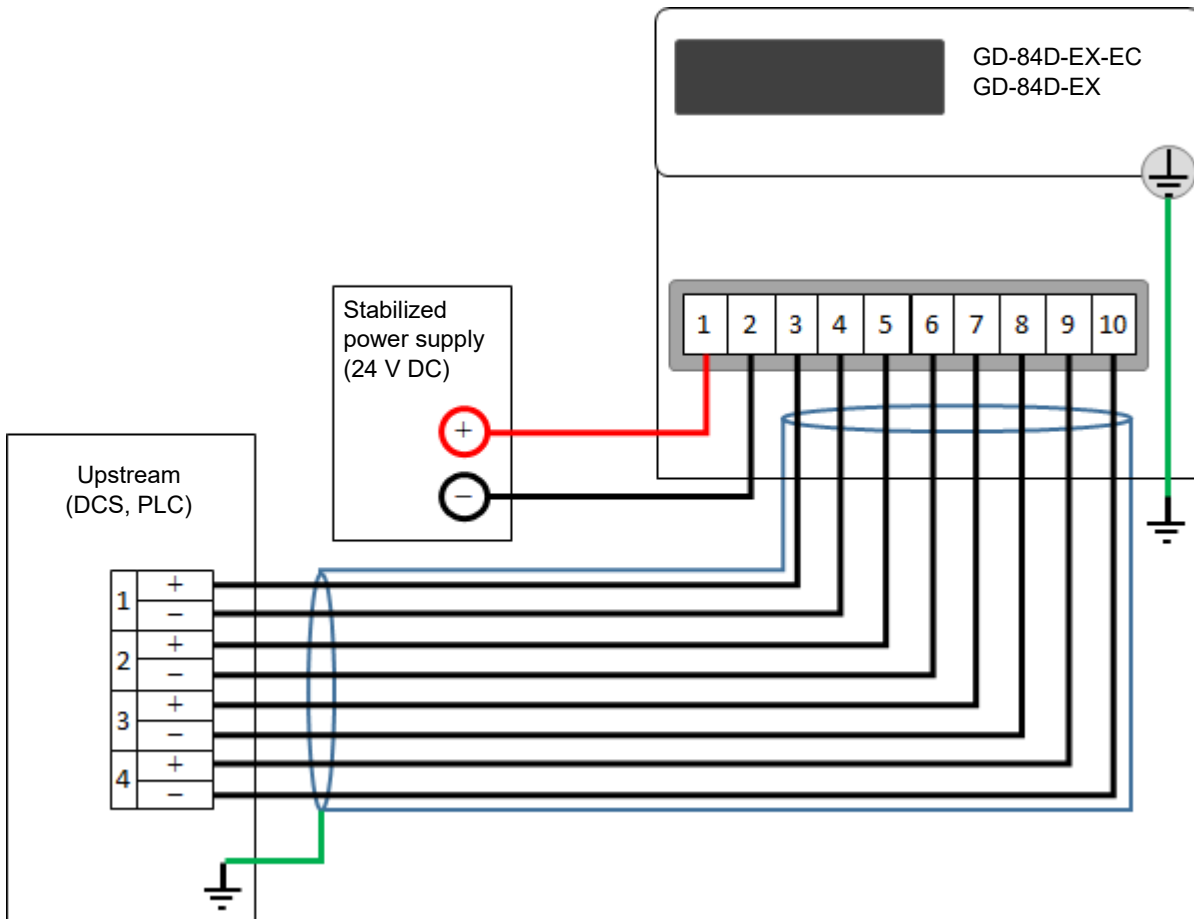
- Be sure to use the correct tools.
 - In general, connect only one cable to one wire inlet.
-

4-6-4 Grounding terminal connections



- Be sure to ground the product before supplying power.
- Ground the product to ensure stable operation and safety. Never connect grounding wires to gas pipes.
- Make sure the grounding is Class D or equivalent (grounding resistance not exceeding 100 Ω).
- Use cable lugs on the grounding wire to ensure safe grounding with the cable free of slack and twisting.
- Do not ground to or near the same point used to ground other high-frequency devices or high-voltage devices.

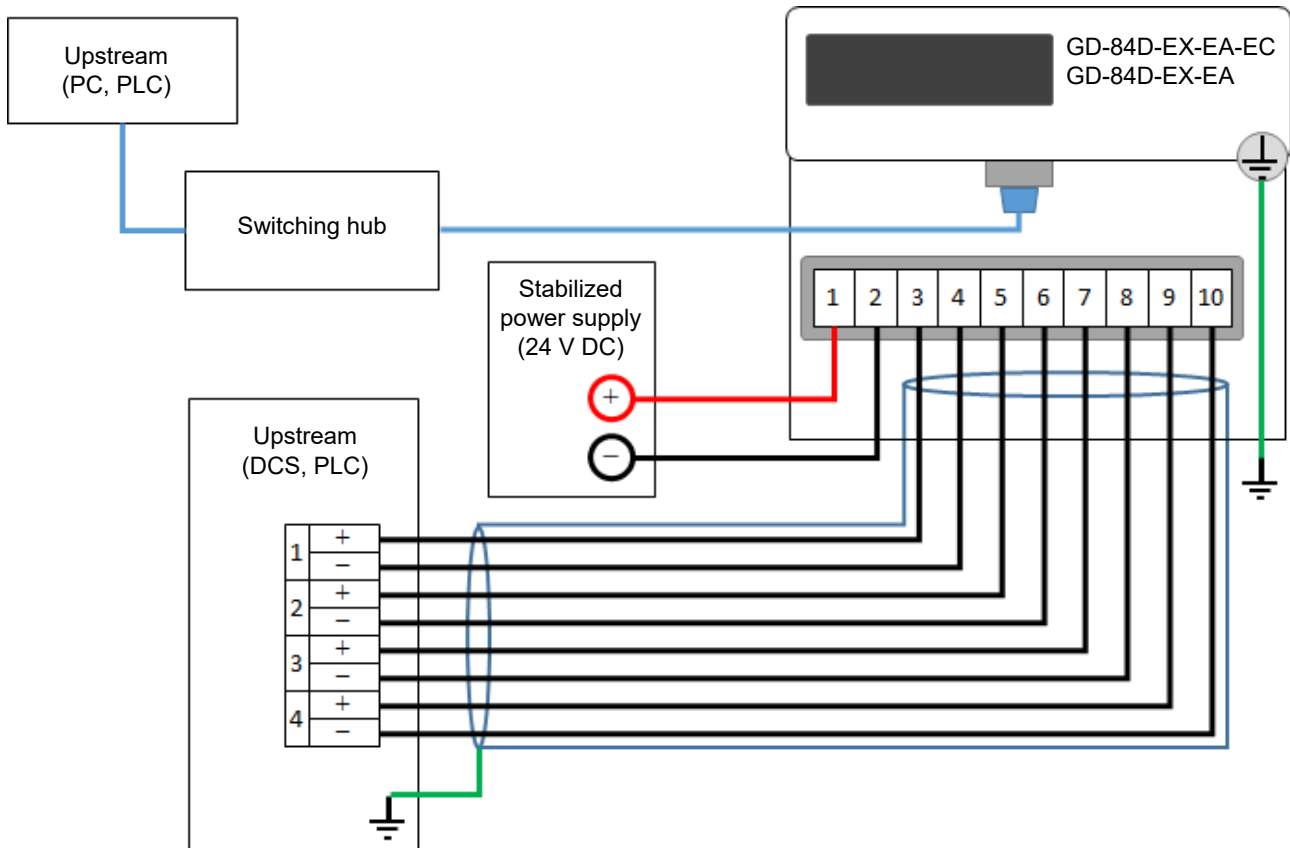
<Connection example: 4 - 20 mA models>



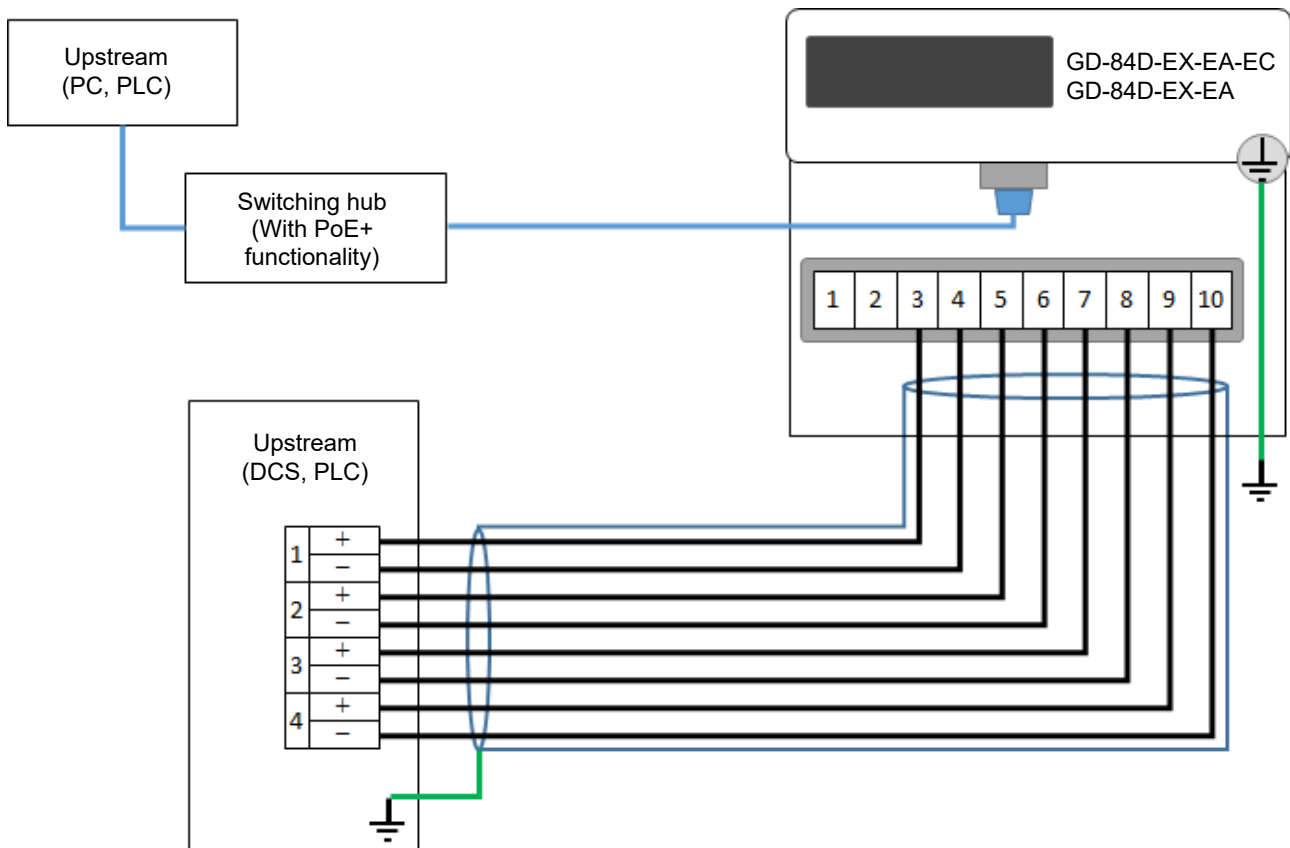
<Connection example: ET models>



<Connection example: EA models (24 V DC)>



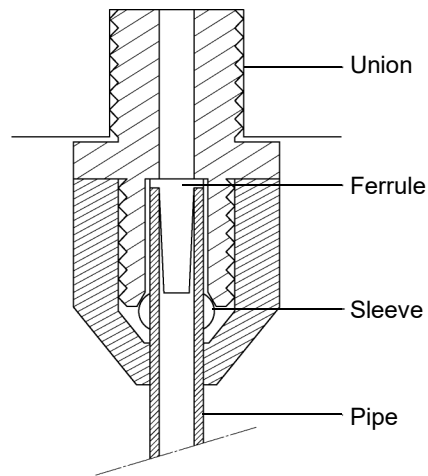
<Connection example: EA models (PoE+)>



* Avoid using 24 V DC power supply and PoE+ at the same time.

4-7 Pipe installation

Install the pipes for the sampling pipes (GAS IN, GAS OUT) as shown in the following diagram:
The supported piping is Teflon pipe of $\phi 6$ (OD) to $\phi 4$ (ID).



NOTE

- ▶ The sampling pipe openings (GAS IN, GAS OUT) for the unit feature Rc1/4 screw holes. On the standard product these are fitted with polypropylene unions. The material may differ depending on the gases used. State specific materials for the unions, if necessary.
- ▶ To prevent leaks, fit the supplied ferrules and sleeves when laying pipes.
- ▶ When pipes are cut, the cut surface may be narrower than the specified inner diameter. In this case, use a file or other implement to widen the inner diameter. Clean the pipe interior using compressed air or the like to blow off any remaining swarf before connecting to the product.
- ▶ Note that the sample gas may be highly absorptive or corrosive. Keep this point in mind when selecting piping materials.
- ▶ Within the specified range of operating temperatures, the suction flow rate for this product by itself is approximately 0.6 L/min. Please consult with us for more information on factors such as pipe length when samples are to be drawn from distant points.

WARNING

- Do not apply excessive pressure to the product's sampling pipe openings.
This product is designed to perform gas detection by drawing in gas at atmospheric pressure. Applying excessive pressure to the product's sampling pipe openings (GAS IN, GAS OUT) is hazardous. Doing so may cause the detection target gas to leak from the product.
- Discharge the gas exhausted after detection to a location determined to be safe by connecting an exhaust pipe to the detection target gas outlet (GAS OUT) located on the bottom of the main unit.

**CAUTION**

- Make the piping on the GAS IN side as short as possible.
The longer the piping on the GAS IN side, the more time it will take for the gas to arrive. Additionally, depending on the gas, the effects of absorption may increase, causing delays in response or readings showing reduced values.
 - Make sure no condensation occurs while installing the pipes.
High humidity in the sampling source area may result in condensation within the piping. For gases that become more corrosive when dissolved in water (e.g., highly acidic gases), consequences may include impaired capacity to detect gases and corrosive damage to internal parts.
 - Do not lay piping that includes U or V shaped angles. Keep this in mind when performing the installation work.
 - Choose the position of the sampling inlet for the sampling gas after carefully considering gas flow inside the sampling gas line, gas generation process, and other factors.
 - Be sure to fit the supplied dust filter at some point in the piping.
 - Please contact our sales department for more information on piping length and materials.
-

5

Usage Instructions

5-1 Preparations for startup

Perform the following checks before connecting the power supply.

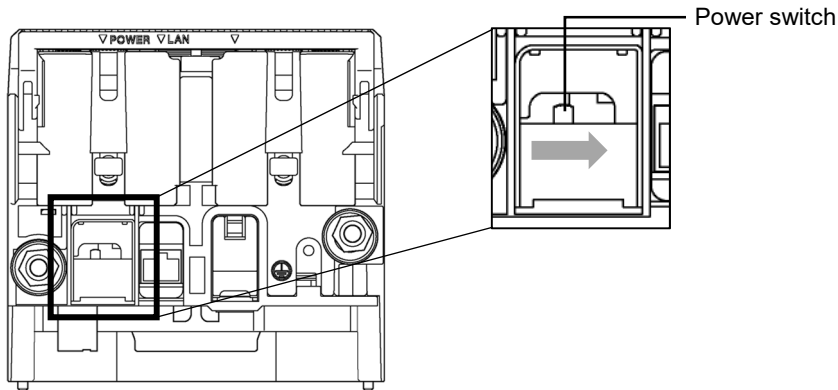
Failure to perform these checks may result in electric shock or damage to the product.

- Check to confirm the product is grounded.
- Check to confirm that the external wiring is connected correctly.
- Check to confirm that the power supply voltage is within the rated range.
- External contacts may activate while adjustment is underway.
Take precautions to prevent unwanted consequences due to activated contacts.
- Check to confirm that the connected piping is free of blockages and leaks.
Blockages in connected pipes will generate excessive pressure on the sensors, which can lead to malfunctions or failure. Depending on the sensor, blockages may also cause fluctuations in readings and false alarms.
- If a filter is required, confirm that the correct filter is fitted properly. Make sure the filter is suitable for the detection target gas.

5-2 Turning on the power

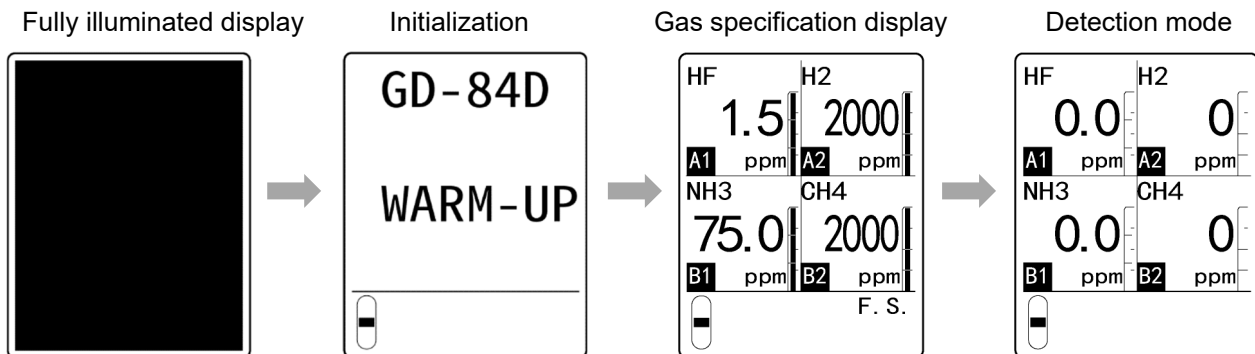
To start the product, turn on the power switch on the underside of the main unit.

Before turning on the power switch, confirm that the product is properly connected to an appropriate power source.



Initialization will take place after the power is turned on. This will take approximately 25 seconds. The process performs system checks and disables alarms, and performs other startup settings, then enters detection mode.

After the power is turned on, the LCD display changes automatically as shown below:



WARNING

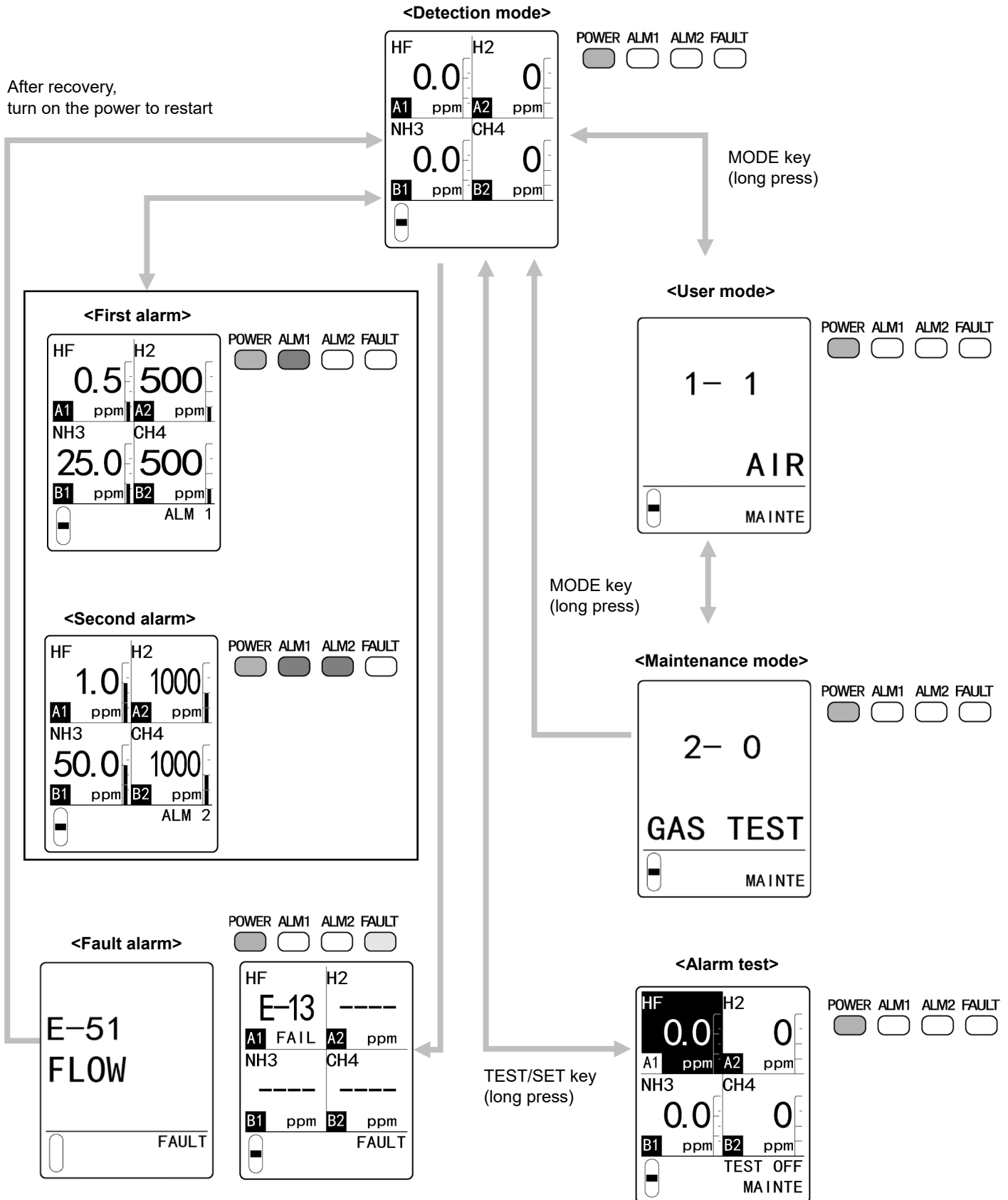
- For oxygen deficiency models, the gas specification display will indicate a value around [20.9] (vol%) when started in air. For models with alarms triggered by air output (0 - 5 vol%, etc.), an alarm may occur after starting. Be careful regarding this point.

**CAUTION**

- Never turn the power off during initialization. The sensor memory is read during initialization.
 - Depending on the sensor type, warmup may be required before startup or after replacing the sensor. Perform warmup for the required duration. (Refer to '11-2 Sensor specifications'.)
 - Alarm behavior and output signals will be unstable during warmup. To avoid problems, notify any departments that may be affected beforehand.
 - After the warmup is complete, verify that the flow display reading is the flow stipulated, then calibrate.
 - Depending on the conditions and how long the device was off, the reading may oscillate when the power is turned on. The reading should quickly stabilize at zero.
-

5-3 Basic operation flow

After power is turned on, pressing the keys on the product will have the following effects:
 The product normally operates in detection mode



**WARNING**

- When in an alarm state in detection mode, switching to user mode or maintenance mode will reset the alarm.
-

5-4 User mode

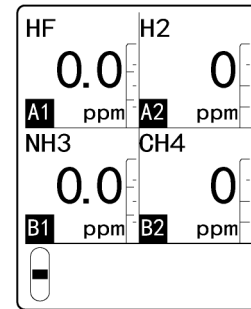
Switch to user mode to perform zero calibration and to check various settings.

5-4-1 User mode setting items

LCD display	Setting item	Details
1- 1 AIR	Air calibration	Perform air calibration.
1- 2 CONFIRM	Setting display	Displays the current values for the following settings: <ul style="list-style-type: none"> ▪ First alarm setpoint (ALM1) ▪ Second alarm setpoint (ALM2) ▪ Alarm delay time ▪ Zero suppression value ▪ Zero following settings ▪ Sensitivity correction settings
1- 3 FLOW	Total flow display	Displays the current flow.
1- 4 ADDRESS		Not used
1- 5 84D VER	Version display for main unit and terminal unit	Displays the version of the main unit and terminal unit.
1- 6 SEN VER	Version display for sensors	Displays the versions of sensor programs.
1- 7 NET VER	Version display for communication PCB	Displays the version of communication PCB programs.
1- 8 M MODE	To maintenance mode	Switches to maintenance mode.

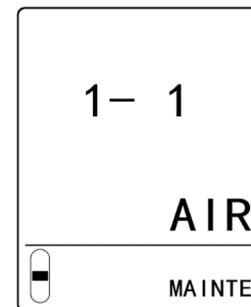
5-4-2 Switching to user mode

- 1 In detection mode, hold down the **MODE** key (about three seconds).



Switches to user mode.

After making the settings, hold down the **MODE** key for about three seconds in user mode to switch to detection mode.



WARNING

- Once the operations are complete, hold down the **MODE** key to return to detection mode. The product will not detect gases while in the adjustment/setting state. If left in user mode, the product will return to detection mode after 10 hours. Note that this is dangerous because no monitoring occurs during this time.

5-5 Performing air calibration (AIR)

Perform air calibration. This is required to ensure accurate measurement of gas concentrations. To perform air calibration, connect an air calibration gas to the product. Refer to '7-5-3 Connecting the calibration gas' for more information.

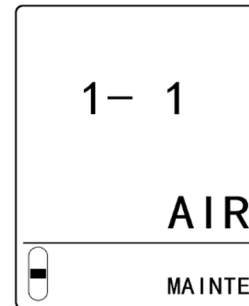


- Wait for the reading to stabilize after starting this product and before performing air calibration.

NOTE

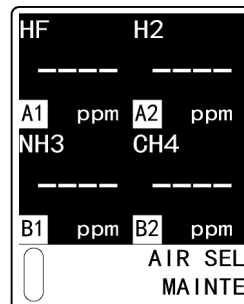
- ▶ On oxygen deficiency models, [1- 1 AIR] will be span adjustment. Introduce clean air to adjust to [20.9] (vol%). Refer to '7-5-2 Running span adjustment' for more information.

- In user mode, press the ▲ key or ▼ key to select [1- 1 AIR], then press the TEST/SET key.**

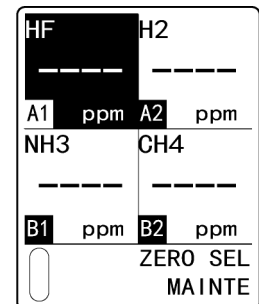


- Press the ▲ key or ▼ key to select the sensor to be air calibrated.**

Press the ▲ key or ▼ key to cycle through the following settings: [A1]⇌[A2]⇌[B1]⇌[B2]⇌Select all. [----] for the selected sensor blinks.



When all are selected



When [A1] is selected

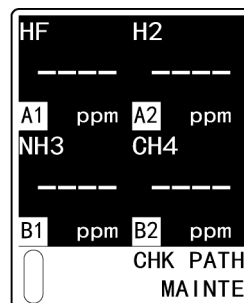
- Connect the calibration gas to this product.**

Connect the gas sampling bag for air calibration and the gas sampling bag for exhaust gas to the product. (Refer to '7-5-3 Connecting the calibration gas'.)

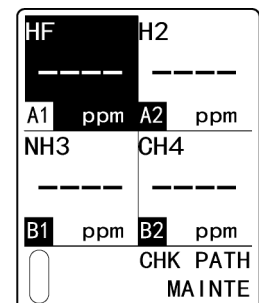
Before performing air calibration for each sensor, switch the flow passage in the chamber switching unit to match the selected sensor.

- Press the TEST/SET key to confirm the sensor to be calibrated.**

This step confirms that the selected sensor and the flow passage match.



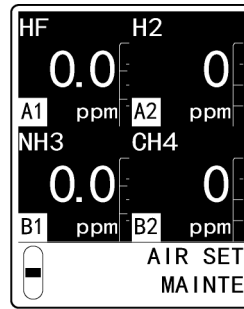
When all are selected



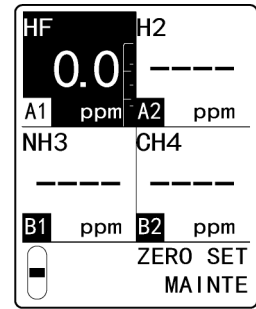
When [A1] is selected

5 Introduce the air calibration gas. Press the TEST/SET key when the readings stabilize.

Air calibration starts.



When all are selected



When [A1] is selected

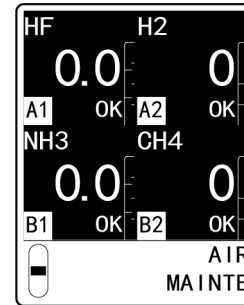
6 Check the air calibration results.

If air calibration is successful

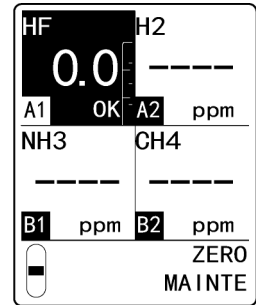
[OK] is displayed. The display returns to the display in step 2.

If air calibration failed

[NG] is displayed. The display returns to the display in step 2.



When all are selected



When [A1] is selected

7 Disconnect the calibration gas from this product.

When air calibration is complete, disconnect the gas sampling bag for air calibration and the gas sampling bag for the exhaust gas. (Refer to '7-5-4 Disconnecting the calibration gas'.)

After performing air calibration for each sensor, return the chamber switching unit to the [D] (detection mode) position.

8 Press the MODE key.

The display reverts to the [1- 1 AIR] display.

9 Hold down the MODE key for about three seconds to switch to detection mode.

NOTE

- ▶ The information displayed in the maintenance display section during air calibration will depend on the sensor selected.

5-6 Checking setting values (user mode)

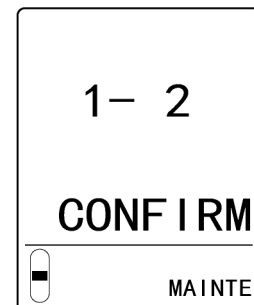
5-6-1 Checking the alarm setpoints (CONFIRM)

Display the first alarm setpoint, second alarm setpoint, alarm delay time, zero suppression value, zero following setting, and sensitivity correction settings.

NOTE

- ▶ The zero follower function ON/OFF display is displayed only for new ceramic sensors or for sensors based on the electrochemical detection principle.
- ▶ The sensitivity correction function ON/OFF display is displayed only for sensors based on the electrochemical detection principle.

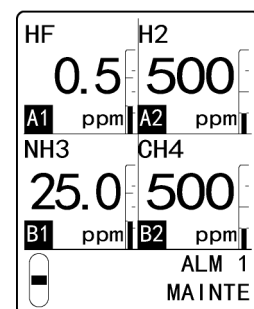
- 1 In user mode, press the ▲ key or ▼ key to select [1- 2 CONFIRM], then press the TEST/SET key.**



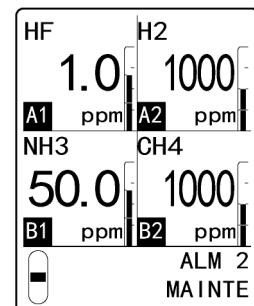
- 2 Check the different setting values.**

Press the ▲ key or ▼ key to view different settings.

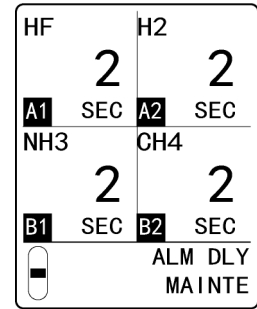
- First alarm setpoint display
Displays the first alarm setpoint.



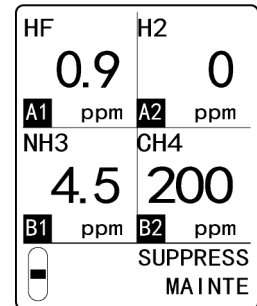
- Second alarm setpoint display
Displays the second alarm setpoint.



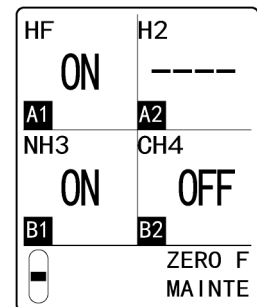
- Alarm delay time display
Displays the alarm delay time (in seconds).



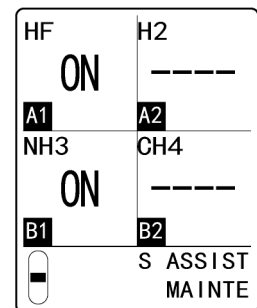
- Zero suppression value display
Displays the zero suppression value.



- Zero follower ON/OFF display
Displays the zero follower ON/OFF setting.
(Refer to '6-4-2 Zero follower function'.)



- Sensitivity correction ON/OFF display
Displays the sensitivity correction ON/OFF setting.
(Refer to '6-4-3 Sensitivity correction function'.)



Press the ▲ key to return to the first alarm setpoint display.

First alarm setpoint display

3 Press the MODE key.

The display reverts to the [1- 2 CONFIRM] display.

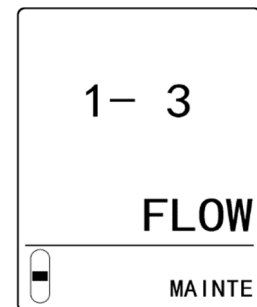
NOTE

- ▶ The first alarm setpoint, second alarm setpoint, and alarm delay time can be set in Environmental setting 1 in maintenance mode. (Refer to '7-9 Making changes in Environmental setting 1'.)
- ▶ The zero suppression value, zero follower ON/OFF setting, and sensitivity correction ON/OFF setting can be set in Environmental setting 2 in maintenance mode. (Refer to '7-10 Making changes in Environmental setting 2'.)

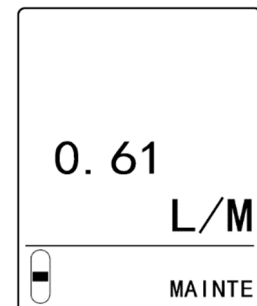
5-6-2 Checking flow values (FLOW)

Display the current flow value (L/min).

- 1 Press the ▲ key or ▼ key in user mode to select [1- 3 FLOW], then press the TEST/SET key.**



- 2 Check the current flow value (L/min).**
Displays the total value for flow passage A and flow passage B.

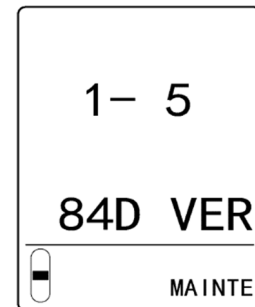


- 3 Press the MODE key.**
The display reverts to the [1- 3 FLOW] display.

5-6-3 Checking the version of the main unit (84D VER)

Display the ROM/SUM value for the main unit and the ROM/SUM value for the terminal unit.
The ROM/SUM value for the terminal unit is displayed only for 4 - 20 mA and EA models.

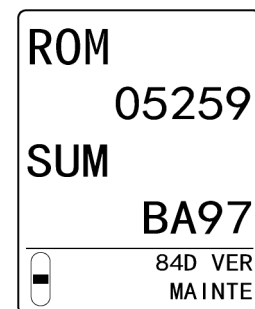
- 1 Press the **▲** key or **▼** key in user mode to select [1- 5 84D VER], then press the **TEST/SET** key.



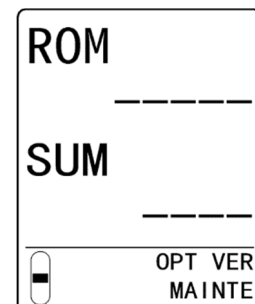
- 2 Check the **ROM/SUM** values.

Press the **▲** key or **▼** key to switch between viewing the ROM/SUM value for the main unit and the ROM/SUM value for the terminal unit.

- Display showing ROM/SUM value for main unit



- Display showing ROM/SUM value for terminal unit



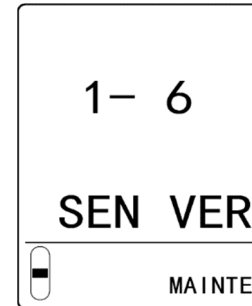
- 3 Press the **MODE** key.

The display reverts to the [1- 5 84D VER] display.

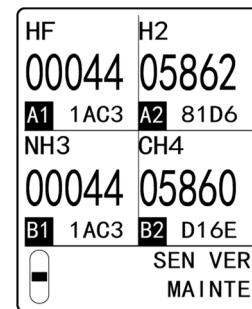
5-6-4 Checking the sensor versions (SEN VER)

Displays ROM/SUM values for the sensors currently fitted.

- 1 Press the ▲ key or ▼ key in user mode to select [1- 6 SEN VER], then press the TEST/SET key.



- 2 Check the sensor ROM/SUM values.



- 3 Press the MODE key.

The display reverts to the [1- 6 SEN VER] display.

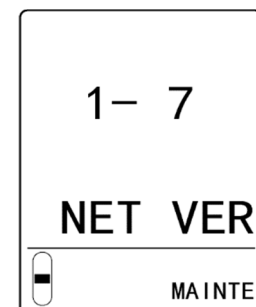
5-6-5 Checking the communication PCB version (NET VER)

ET

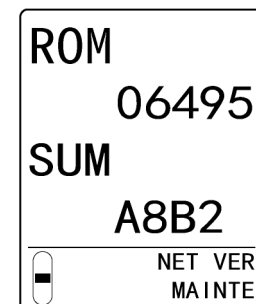
EA

Display the ROM/SUM value for the communication PCB currently connected.

- 1 Press the ▲ key or ▼ key in user mode to select [1- 7 NET VER], then press the TEST/SET key.



- 2 Check the communication PCB ROM/SUM value.

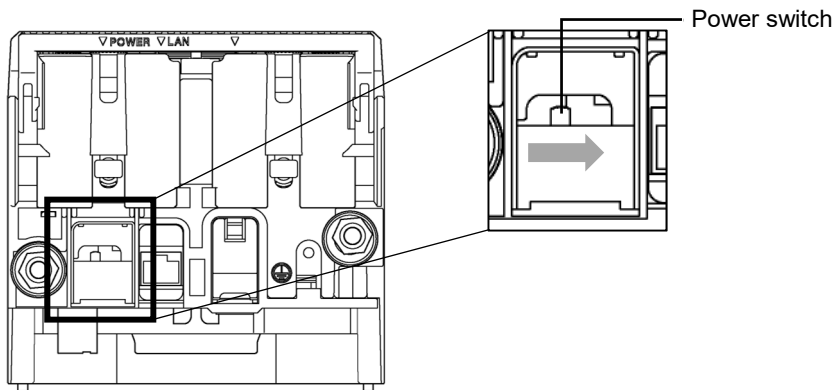


- 3 Press the MODE key.

The display reverts to the [1- 7 NET VER] display.

5-7 Shutting down

To turn off the product, turn the power switch on the underside of the main unit OFF in detection mode.



WARNING

- Shutting down the product may activate an alarm in the upstream (central) system.
- Shut down the product only after setting enabling INHIBIT in the upstream (central) system. Additionally, check the devices connected to the external output of this product and the external contact output terminals to determine whether you should turn off the power to those devices.
- If the alarm contacts are energized (optional), the contacts may respond/activate when the power for this product is turned off.
- If the detection target gas is highly adsorbent, allow plenty of fresh air to flow before turning the power off.

6

Alarm Activation

6-1 Gas (oxygen) alarm pattern

6-1-1 Alarm Activation

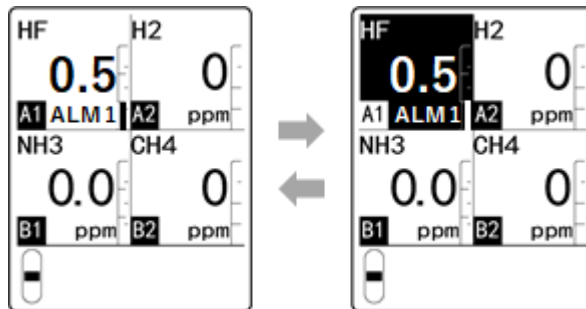
The product issues an alarm when the detected gas or oxygen concentration reaches or exceeds the alarm setpoint. (Auto reset or self-latching)

NOTE

- ▶ The alarm setpoints (first and second alarms) and alarm pattern (auto reset or self-latching) are set at the factory before shipping.
- ▶ An alarm delay (default setting: two seconds) is set to prevent accidental alarm activation. This should be canceled if not required. (Refer to '7-9-3 Alarm delay time setting (ALM DLY)'.)

<Gas concentration display>

The display at the sensor mounting position where the alarm is occurring blinks. (The first alarm flashes once every 2 seconds, the second alarm flashes once every 1 second)



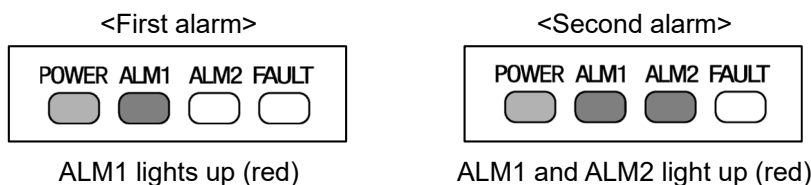
If the detection range is exceeded (full scale over), [OVER] will appear on the LCD.

<Power/alarm lamp display>

The alarms are two-step alarms. The alarm lamps light up when the corresponding alarm setpoint is reached or exceeded.

Alarm lamp (ALM1) and alarm lamp (ALM2) light up (red) as indicated below.

The power lamp (POWER) continues to light up (green).



6-1-2 Contact operation (auto reset)

4-20mA

EA

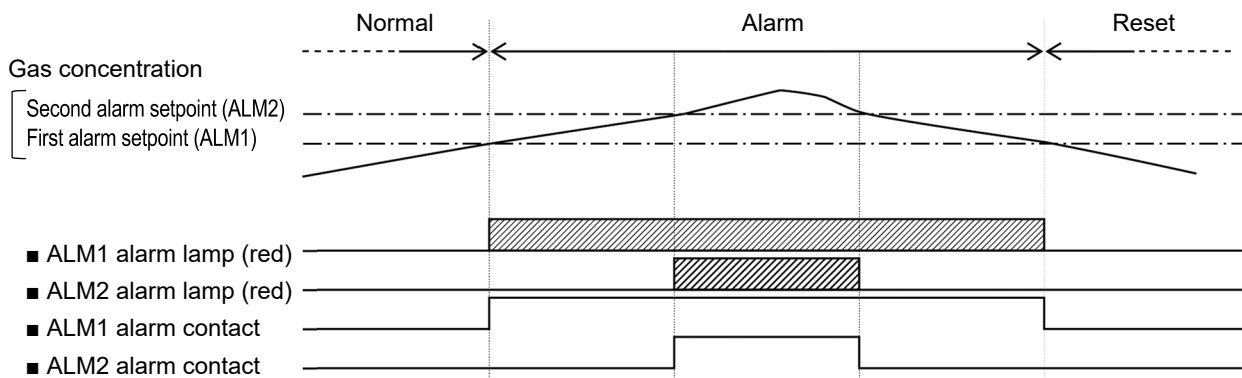
If the Gas alarm pattern setting is auto reset, the contacts will activate when the gas concentration reaches or exceeds the alarm setpoint.

The contact operation is automatically reset when the gas concentration falls below the alarm setpoint.

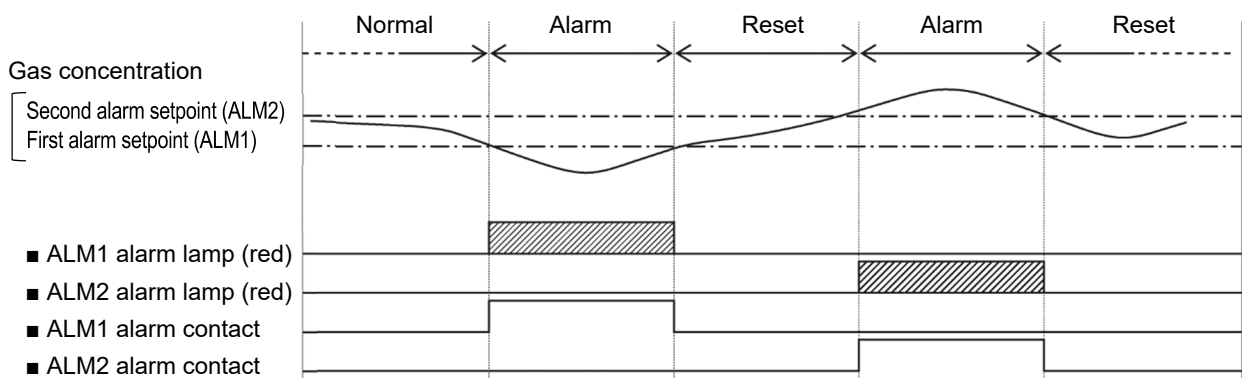
NOTE

▶ To cancel an alarm, press the MODE key, TEST/SET key, ▲ key, or ▼ key in detection mode.

<Alarm pattern (H-HH)>

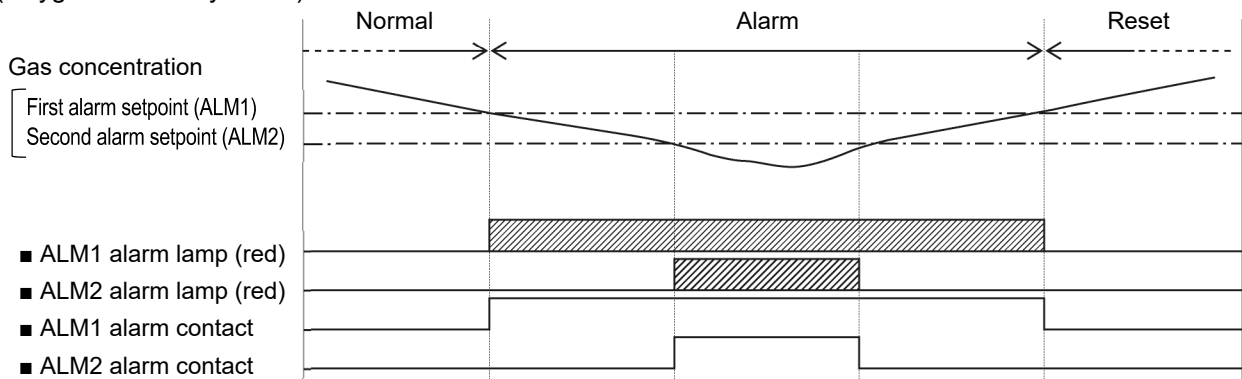


<Alarm pattern (L-H)>



<Alarm pattern (L-LL)>

(Oxygen deficiency alarm)



6-1-3 Contact operation (self-latching)

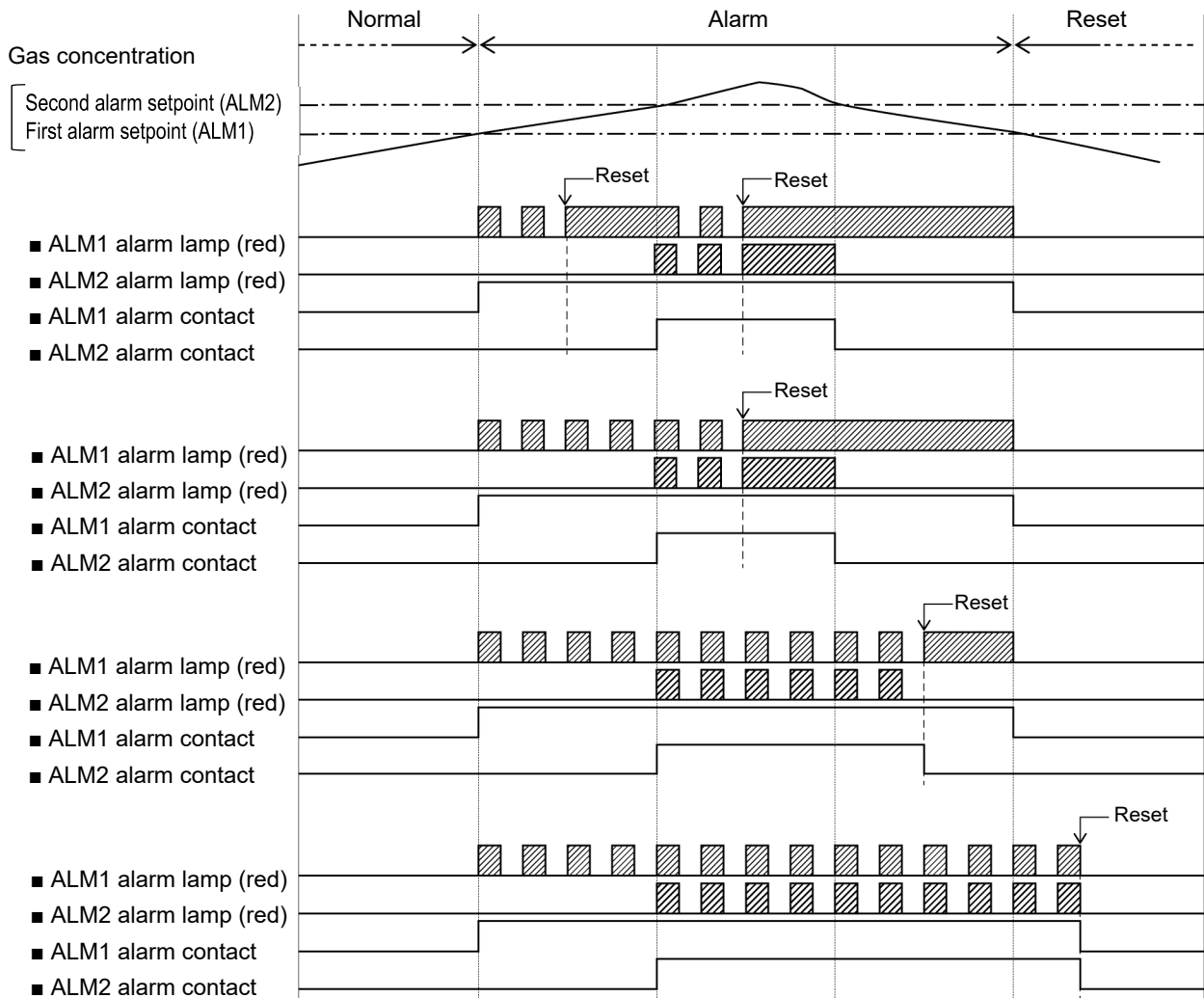
4-20mA EA

If the Gas alarm pattern setting is self-latching, the contacts will activate when the gas concentration reaches or exceeds the alarm setpoint.

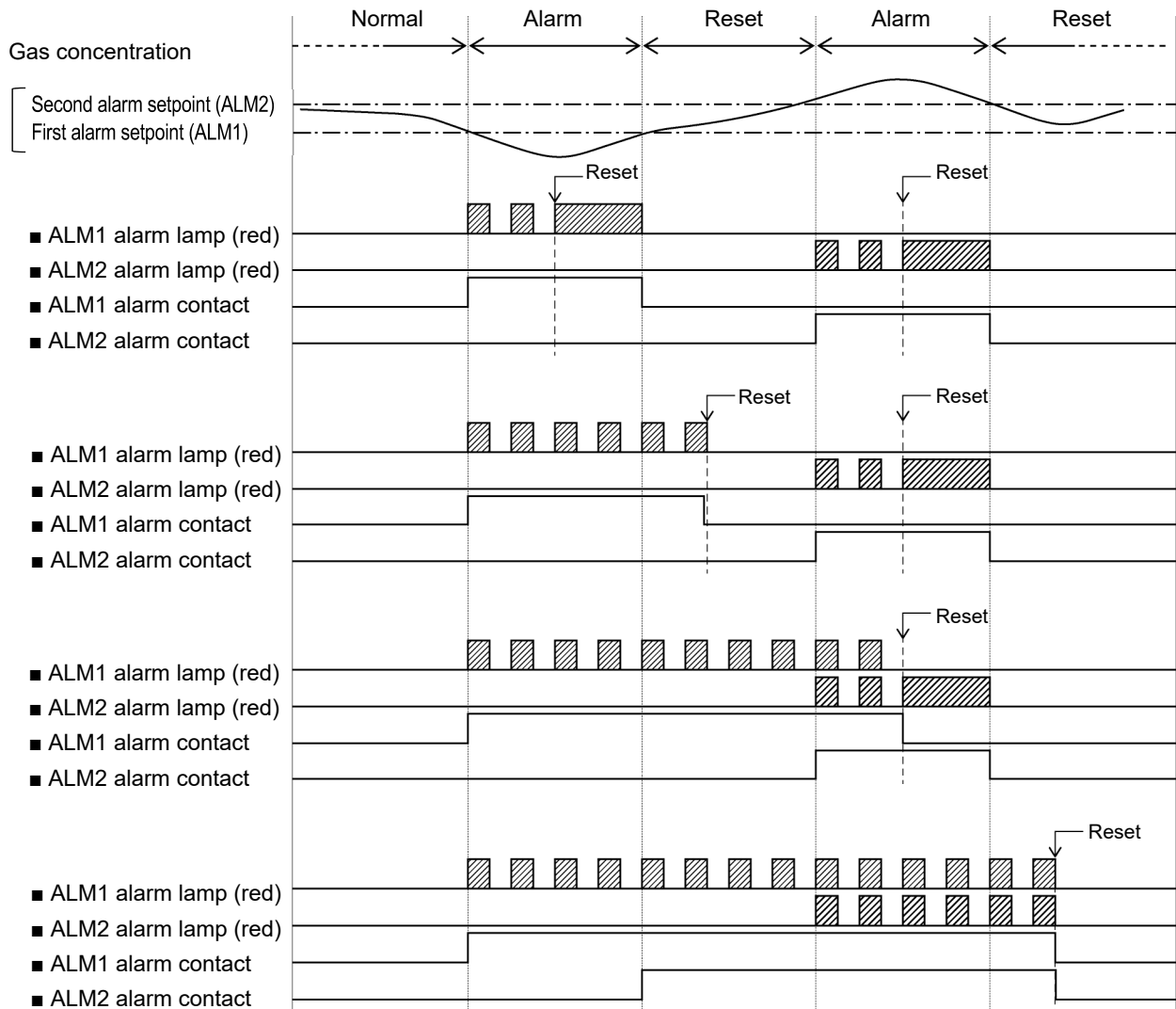
The contact operation is automatically reset when the gas concentration falls below the alarm setpoint after resetting.

The alarm lamps flash when an alarm occurs. The lamps stop flashing and remains constantly lit when reset. Then, the lamps go out when the gas concentration falls below the alarm setpoint.

<Alarm pattern (H-HH)>

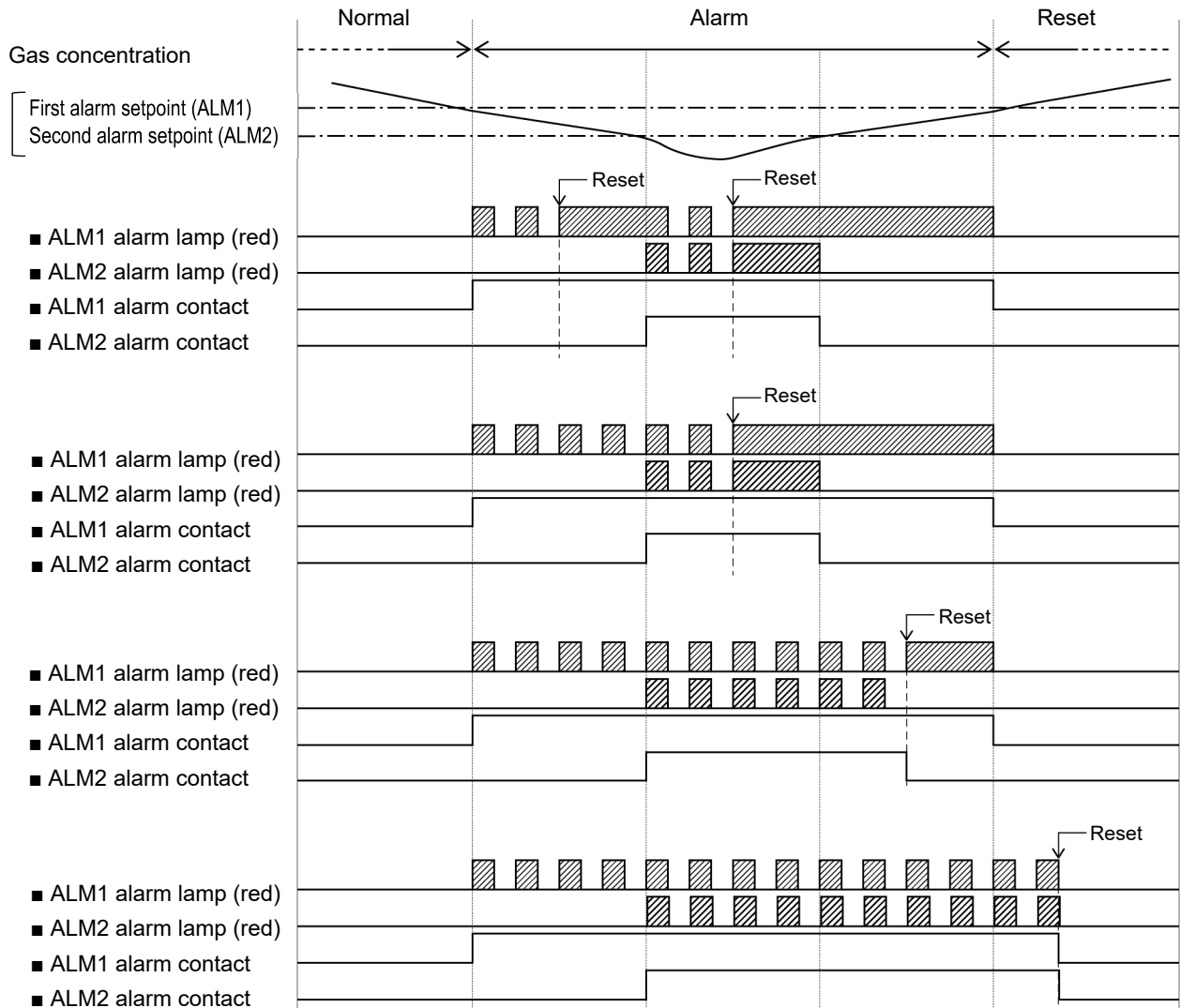


<Alarm pattern (L-H)>



<Alarm pattern (L-LL)>

(Oxygen deficiency alarm)



6-1-4 Response when a gas alarm is triggered

When a gas alarm is triggered, respond promptly in accordance with the user's management rules. In general, take the following actions:

Step 1 Check the product reading.



- In the case of momentary gas leaks, readings may already have dropped by the time the reading is checked. Additionally, readings may drop in the temporary alarm state for reasons other than gas alarms, such as noise and incidental conditions.

Step 2 Keep persons out of the monitored zone to ensure safety in accordance with your gas alarm control concentrations.

Step 3 If the gas concentration display remains unchanged, close the main valve for the gas in question and confirm that the concentration reading has dropped.

Step 4 Wear appropriate protective gear to safeguard against hazards involving residual gas and access the gas leakage location. Use a portable gas detector to check for residual gas.

Step 5 Once you have determined that no hazards are present, take the steps necessary to fix the gas leak.



- A full scale over state for extended periods may indicate sensor damage. Contact with high gas concentrations will damage the sensor. Contact our sales department.
- Depending on the type of gas detected, the sensor characteristics may be severely degraded. If the gas alarm is triggered, we recommend performing maintenance on all sensors fitted to this product to check their gas sensitivity.

6-2 Fault alarm patterns

Fault alarms are triggered if abnormalities are detected in the product or sensors.

When a fault alarm is triggered, the fault lamp (FAULT) lights up (yellow). The fault code will appear on the LCD.

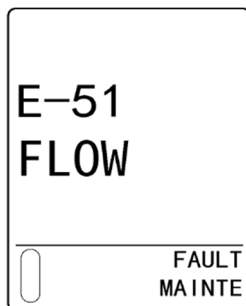
<LCD display>

When a sensor fault occurs, a fault code is displayed for each sensor.

If a main unit fault and sensor fault are detected at the same time, the main unit fault and sensor fault are displayed alternately.

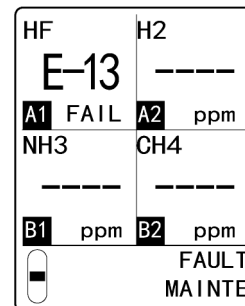
<Main unit fault>

(With a flow loss fault [E-51 FLOW])

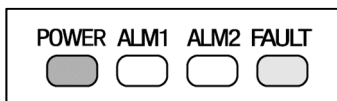


<Sensor fault>

(With a set potential fault [E-13])



<Power/fault lamp indications>



FAULT lights up (yellow)

NOTE

- ▶ Following fault recovery, initialization is performed and it restarts.
- ▶ Refer to '10. Troubleshooting' for more information on faults and appropriate response.
- ▶ If a fault alarm occurs, determine the cause and take appropriate action.
- ▶ If faults occur repeatedly, contact Riken Keiki immediately.
- ▶ The system enables fault alarm tests. (Refer to '7-9-4 Fault alarm tests (F TEST)').

6-3 External output operations

Communication method		4 - 20 mA	Ethernet
Signal transmission method		Analog transmission (non-insulated)	Ethernet (10BASE-T/100BASE-TX)
Transmission path		CVVS	Ethernet cable
Transmission distance		1 km or less	100 m or less (depending on system conditions)
Connected load resistance		300 Ω or less	-
1	Detection mode (No alarm)	<Normal> 4 - 20 mA (Concentration output) <With dummy sensor connected> 2.5 mA setting: 2.5 mA 4 mA, HOLD, 4 - 20 mA setting: 4 mA (depending on maintenance mode setting)	<ul style="list-style-type: none"> Concentration data
2	Detection mode (During a gas alarm)	<Normal> 4 - 20 mA (Concentration output) <With dummy sensor connected> 2.5 mA setting: 2.5 mA 4 mA, HOLD, 4 - 20 mA setting: 4 mA (depending on maintenance mode setting)	<ul style="list-style-type: none"> Concentration data Bit settings for various alarms
3	Initialization	2.5 mA setting: 2.5 mA 4 mA, HOLD, 4 - 20 mA setting: 4 mA* (depending on maintenance mode setting)	<ul style="list-style-type: none"> Initialization bit
4	Maintenance mode	2.5 mA setting: 2.5 mA 4.0 mA setting: 4.0 mA* HOLD setting: Maintain previous value 4 - 20 mA setting: 4 - 20 mA (Concentration output)	<ul style="list-style-type: none"> Concentration data Adjustment bit
5	Alarm test	Output ON setting: 4 - 20 mA (Concentration output) Output OFF setting: Maintain previous value	<ul style="list-style-type: none"> Concentration data Adjustment bit Test bit
6	Fault alarms	0.5 mA setting: 0.5 mA 21.5 mA setting: 21.5 mA Option setting: Setting possible 0.0 - 4.0 mA	<ul style="list-style-type: none"> Bit settings for various faults
7	INHIBIT	2.5 mA setting: 2.5 mA 4 mA, HOLD, 4 - 20 mA setting: 4 mA* (depending on maintenance mode setting)	<ul style="list-style-type: none"> Concentration data Adjustment bit INHIBIT
8	Power off	0 mA	<ul style="list-style-type: none"> Signal OFF

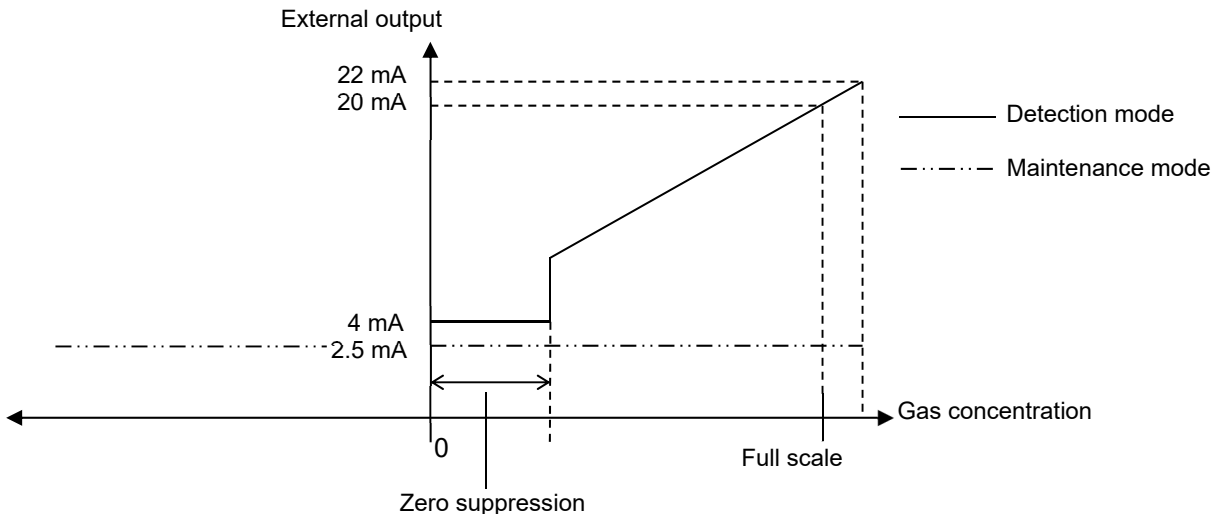
* Equivalent to air (20.9 vol% = 17.4 mA) when F.S. 25.0 vol% O₂ is measured
 Equivalent to air (21.0 vol% = 10.7 mA) when F.S. 50.0 vol% O₂ is measured
 (Alarm types: L-LL and L-H only)

<Analog transmission (4 - 20 mA)>

<Example of gas concentration and external output>

Maintenance output : 2.5 mA setting

Fault output : 0.5 mA setting

**NOTE**

- ▶ If the fault output is 21.5 mA, the upper limit will be 20.5 mA. In the option setting, the upper limit is 22 mA as is the case of 2.5 mA.

**CAUTION**

- 4 - 20 mA output setting has already been adjusted. Output will not exceed approximately 22 mA if an over scale occurs.
- If the INHIBIT function is enabled/active or during initialization, the output will be based on the 4 - 20 mA output setting (as in maintenance mode).
Be particularly careful while the product is starting and when changing the specifications.
- Make sure you have a good understanding of this behavior. If necessary, take the necessary steps on the receiver (e.g., put into skip state.) so that no false alarms occur.
- Outputs dependent on sensor settings will be updated after replacement of the sensor.

The following cases in particular require special care:

- Replacement when [C-02] is displayed : When replacing a sensor whose detection target gas is O₂ with a sensor for a gas other than O₂
- Replacement when [C-02] is displayed : When replacing a sensor whose detection target gas is other than O₂ with a sensor for O₂
- Replacement when changing the alarm type : Replacing L-LL type and L-H type sensors with H-HH type sensors

<GD-84D-EX-ET communication specifications (Ethernet)>

The following functions are provided through connections to external software using standard network protocols. Refer to the 'Gas Detector Head GD-84D-EX Series (Ethernet model) Communication Functions Operating Manual' for more information.

- Web function(s) (HTTP)
Use a web browser from a connected PC to view and change settings, execute calibration, and perform tests through the graphical user interface.
- Mail transmission function (SMTP)
Notifications are sent to the addresses registered on an external mail server if gas alarms or fault alarms are triggered.
- Time synchronization function (SNTP)
Time data is acquired from a time server to keep the time up to date.
- Modbus slave function (Modbus/TCP)
The product can function as a Modbus slave, returning settings with responses to read requests and modifying settings with write requests.
- Function for connecting to PLCs (FINS/MC)
The settings are sent to the PLCs and data provided so the PLCs can process with a ladder program. Loading from PLCs is also performed to enable modification of settings as well as calibrations and tests.

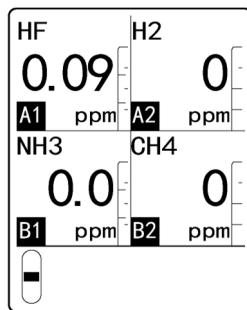
6-4 Various functions to ensure proper alarm activation

6-4-1 Zero suppression function

The sensors incorporated into the product are susceptible to fluctuations in ambient conditions (e.g., temperature and humidity characteristics) and interference gases (interference characteristics). These can affect readings. This means readings may fluctuate around zero levels even under normal conditions. The zero suppression function is designed to minimize the effects of these ambient fluctuations and interference gases around the zero level. Use this function to suppress fluctuations in readings of less than the preset value to give zero readings (or [20.9] (vol%) for oxygen).

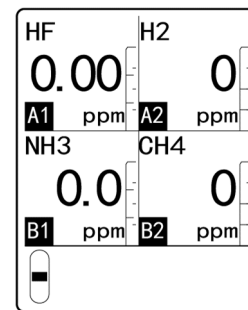
For example, HF readings will be indicated as follows:

<Zero suppression function disabled>



The reading fluctuates around zero.

<Zero suppression function enabled>



Displays zero up to the standard setting value (6 % F.S. (0.09 ppm))

NOTE

- ▶ The standard preset value for the zero suppression function differs depending on sensor specifications.
- ▶ This function is disabled in maintenance mode. Fluctuations in readings of less than the value set are displayed.
- ▶ When an oxygen deficiency alarm model sensor (ESF-X24P: 0 - 25 vol%) is fitted, the zero suppression function works on the atmosphere (20.9 vol%), which is the normal value. In this case, if readings fluctuate near 20.9 vol%, the reading displayed is [20.9] (vol%) (AIR suppression).



CAUTION

- The negative suppression value (below zero) is subject to suppression corresponding to 10 % of full scale. If the value below zero becomes 10 % of full-scale or larger, the reading will be displayed as [-0.0], and accurate gas detection will not be possible in this state. Perform zero calibration.

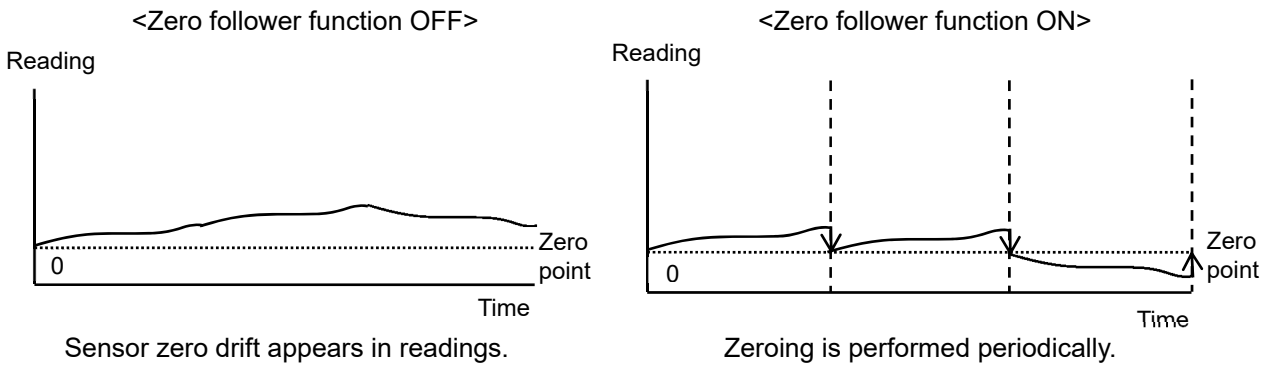
6-4-2 Zero follower function

Depending on sensor specifications, the sensors used in the product may suffer sensitivity degradation when used for extended periods.

The zero follower function is programmed processing designed to stabilize the zero point by correcting fluctuations in readings (zero drift) caused by the sensitivity variation over time of the zero point.

NOTE

- ▶ The zero follower function is available for the new ceramic sensors and sensors based on the electrochemical detection principle.
- ▶ The 24-hour zero follower function performs zero following only for the first 24 hours after the power is turned on.

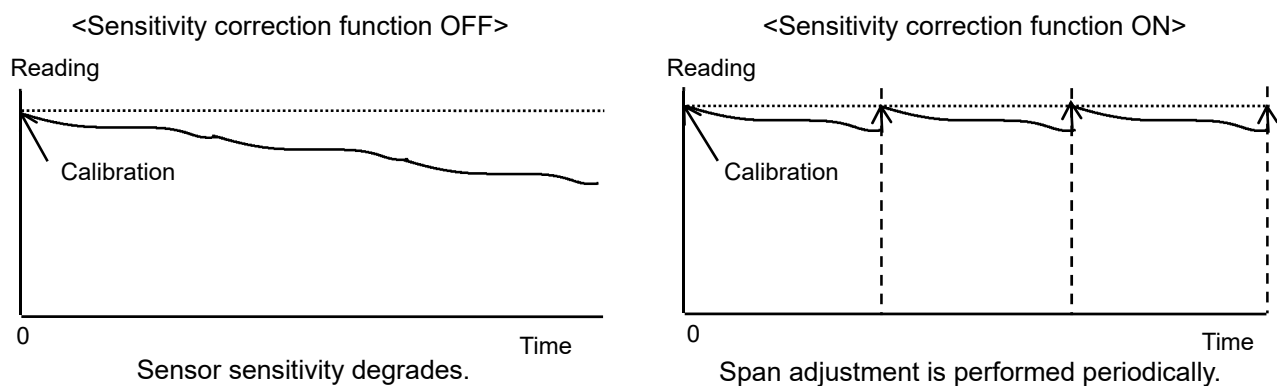


6-4-3 Sensitivity correction function

Depending on type, the electrochemical type sensor used in the product may suffer sensitivity degradation when used for extended periods. The sensitivity correction function is designed to compensate for (assist) gas sensitivity degradation accounting for variations in sensitivity over time. Span adjustment is performed according to programmed processing based on theoretically derived degradation trends.

NOTE

- ▶ The sensitivity correction function is available for sensors based on the electrochemical type detection principle.



CAUTION

- The sensitivity correction function is a support function. Fixed span adjustment is performed based on theoretically derived degradation trends. Span adjustment is not performed based on the individual sensitivity variations of each sensor.
- Corrections of individual sensors' sensitivity variations must be performed as periodic span adjustment using a calibration gas.

6-4-4 Calibration history, alarm trend history, and event history functions

History functions are available for both the device and for the sensors.

Contact our sales department if you want to use the calibration history, alarm trend history, or event history functions.

6-4-5 Automatic sensor recognition function

This product features a function that automatically recognizes the sensor after a sensor is replaced or if specifications change.

The following display warns against incorrect mounting if a sensor with a different serial number, detection principle, or specifications is mounted:

<When replaced with a sensor based on the same specifications>

The display indicates [C-01] if the sensor is replaced with a sensor of the same specifications (e.g., detection principle and model)—for example, upon periodic replacement.

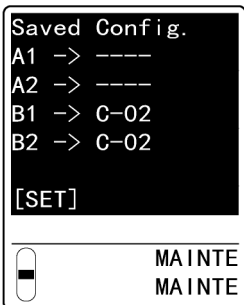
Press the TEST/SET key to recognize the sensor as a new sensor and to start up.

<When replaced with a sensor based on different specifications>

The display indicates [C-02] if the sensor is replaced with a sensor of different specifications (e.g., detection principle and model).

Press the TEST/SET key to recognize the sensor as a sensor with new specifications and to start up.

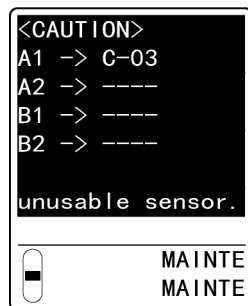
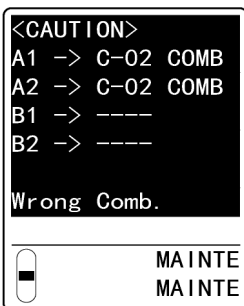
If you did not intend to change the specifications, the sensor may have been mounted by mistake. Check the sensor.



<If replacement couldn't be completed correctly>

If there is a problem with the sensor combination or if a sensor cannot be used, [C-03] or [C-04] will appear. The product will not return to detection mode.

Confirm the sensor combination (sequence) and contact our sales department.





CAUTION

- Confirming changes in sensor specifications (e.g., detection principal, sensor type, detection target gas, and detection range) when [C-02] is displayed will reflect the changes in gas detector specifications.

The following parameters (including alarm setpoints) will be reset to their initial values.

Change the parameters in maintenance mode if values other than the initial values are required.

- Alarm delay time
- Zero suppression value
- Alarm type

<Initial settings for each type of detection principle>

	NCF	SGF	SHF	ESF
Alarm delay time	2 seconds	2 seconds	2 seconds	2 seconds
Zero suppression value	F.S. 100 % LEL: 2 % F.S. Other: 10 % F.S.	10 % F.S.	10 % F.S.	6 % F.S.
Alarm type	H-HH	H-HH	H-HH	H-HH

- In maintenance mode, settings for external output remain unchanged from before the sensor replacement. Take particular note of this.
- When [C-02] appears, confirming with TEST/SET will start initialization at the same time the operation switches over. The initialization output also switches in conjunction.
- The oxygen deficiency alarm ESF models include three types of alarms: L-LL, L-H, and H-HH. The order of the alarm reverses when you change from L-LL or change to L-LL.
- For ET and EA models, before confirming changes in sensor specifications, the data from the sensor with different specifications will be output.

7

Maintenance

The product is an important safety and disaster-prevention device. Perform product maintenance at regular intervals to ensure performance and to improve disaster-prevention and safety reliability.

7-1 Maintenance intervals and maintenance items

Perform the following maintenance.

- Daily maintenance: Perform maintenance before commencing work.
- Monthly maintenance: Inspect the alarm circuit (alarm test) once a month.
- Regular maintenance: Perform maintenance at least once every six months to ensure adequate performance as a safety device.

Maintenance item	Maintenance details	Daily maintenance	Monthly maintenance	Regular maintenance
Power supply check	Check to confirm that the power LED lights up.	○	○	○
Concentration display check	Confirm that the concentration readout is zero ([20.9] (vol%) for oxygen). If the reading is offset, confirm that there is no interference gas in the vicinity and perform zero calibration (air calibration).	○	○	○
Flow check	Check the flow display and confirm the absence of any abnormalities.	○	○	○
Filter check	Check to confirm that the dust filters are not dirty or clogged.	○	○	○
Alarm test	Use the alarm test function to check the alarm circuit.		○	○
Calibration	Perform calibration using a calibration gas.			○
Gas alarm check	Check the gas alarm using a calibration gas.			○

<Maintenance service>

Riken Keiki provides services related to regular maintenance, including gas calibration, adjustments, and servicing.

Preparing a calibration gas requires dedicated equipment, including gas cylinders of the specified concentration and gas sampling bags. Our certified service engineers have expert knowledge of these dedicated tools and products.

Please take advantage of the Riken Keiki maintenance service to maintain safe use of the product.

The major maintenance items are as follows. Contact our sales department for more information.

Service	Service details
Power supply check	<ul style="list-style-type: none"> ▪ Check voltage of power source. ▪ Check to confirm that the power LED lights up. (Confirm that you can distinguish between the system power lamp (POWER), alarm lamps (ALM1, ALM2), and fault lamp (FAULT).) ▪ If a UPS (uninterruptible power system) is deployed, confirm operations with the UPS.
Concentration display check	<p>Using zero gas, confirm that the concentration reading is zero. Perform zero calibration (air calibration) if the reading is offset.</p> <p>For oxygen deficiency alarm models, introduce clean air and confirm that the concentration reading becomes [20.9] (vol%). Perform span adjustment if the reading is offset.</p>
Flow check	<p>Confirm the absence of abnormalities in the flow display.</p> <p>Use an external flowmeter to check the flow. Check to confirm that the flow display of this product is correct. Make flow adjustments if the flow is offset.</p>
Filter check	<p>Check to confirm the dust filters are neither dirty nor clogged.</p> <p>Replace the filter if clearly dirty or clogged.</p>
Alarm test	<p>Perform the alarm test function to inspect the alarm circuits.</p> <ul style="list-style-type: none"> ▪ Check the alarm lamps (check operations for both ALM1 and ALM2) ▪ Check external alarms (check buzzer and other external alarm operations)
Calibration	<p>Perform gas calibration with a calibration gas.</p>
Gas alarm check	<p>Check the gas alarm using a calibration gas.</p> <ul style="list-style-type: none"> ▪ Check alarms (confirm alarm activation when alarm setpoint is reached) ▪ Check delay time (check delay time until alarm activation) ▪ Check the alarm lamps (check operations for both ALM1 and ALM2) ▪ Check external alarms (check buzzer, reset signal, or other external alarm operations)
Product cleaning and repair (visual inspection)	<p>Check the product exterior, covers, and interior for dirt and damage, and clean and repair problem areas.</p> <p>Replace parts if cracked or damaged.</p>
Product operation check	<p>Operate the keys to check the behavior of various functions and the parameters.</p>
Consumable parts replacement	<p>Replace degraded components such as sensors, filters, and pumps.</p>

7-2 Performing alarm tests

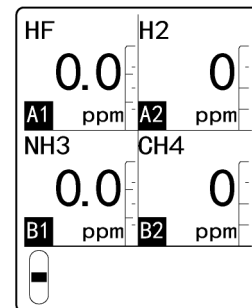
A signal is emitted that simulates a gas concentration, enabling checks of the alarm lamps and the status of signal transmissions to external devices.



- Before starting an alarm test, notify the related departments so that measures can be taken to ensure that problems do not arise due to external output signals or alarm contacts.
- When the alarm test is complete, hold down the TEST/SET key to return to the detection mode. The product will not detect gases while in the adjustment/setting state. If left in alarm test mode, the product will return to detection mode after 10 hours. Note that this is dangerous because no monitoring occurs during this time.

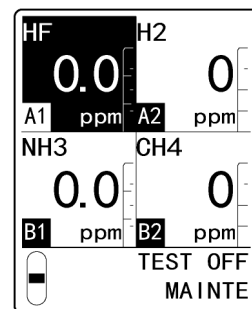
1 In detection mode, hold down the TEST/SET key for about 3 seconds.

Switches to alarm test mode.



2 Press the ▲ key or ▼ key to select the sensor for which the alarm test is to be performed.

Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]↔[A2]↔[B1]↔[B2]. The concentration for the selected sensor blinks.

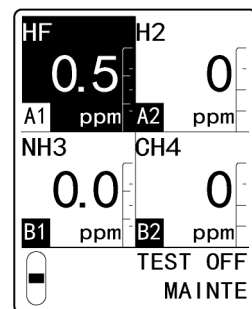


3 Press the TEST/SET key to confirm the sensor to be tested.

4 Press the ▲ key or ▼ key to set the concentration.

5 Check to confirm that an alarm is triggered.

The first alarm is triggered when the concentration reaches the first alarm setpoint. When the first alarm is triggered, the alarm lamp (ALM1) lights up (red). When [TEST ON], then the contact of the first alarm is activated.

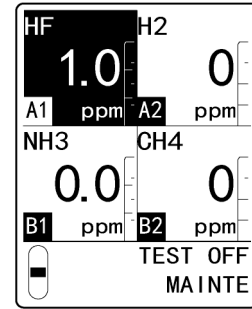
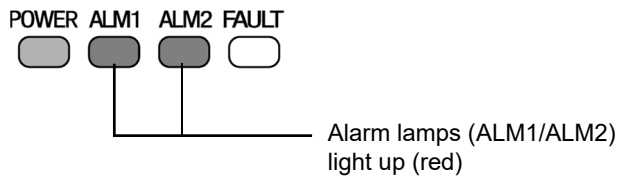


Alarm lamp (ALM1) lights up (red)

The second alarm is triggered when the concentration reaches the second alarm setpoint.

When the second alarm is triggered, alarm lamp (ALM1) and alarm lamp (ALM2) light up (red).

When [TEST ON], then the contact of the second alarm is activated.



6 Press the TEST/SET key to reset the reading.

7 Press the MODE key.

The display reverts to the display in step 2.

To continue making settings for other sensors, repeat steps 2 to 7.

8 Once the operation is complete, hold down the SET key for about 3 seconds to switch to detection mode.

NOTE

- ▶ Contacts will operate during alarm tests if [TEST ON] is displayed; they will not operate if [TEST OFF] displayed. Set whether there is contact operation during alarm tests in Environmental setting 2 in maintenance mode. (Refer to '7-10-4 Settings for contacts during alarm tests (TEST RLY)').
- ▶ Set whether there is external output during alarm tests in Environmental setting 2 in maintenance mode. (Refer to '7-10-5 Settings for external output during alarm tests (TEST4-20)').

7-3 Maintenance (regular maintenance) mode

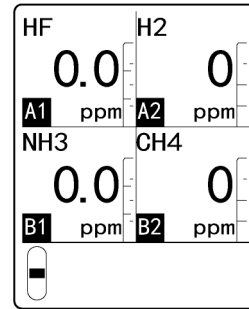
Switch to maintenance mode to perform zero calibration, make span adjustments, and to make various other settings.

7-3-1 Maintenance mode setting items

LCD display	Setting item	Details
2- 0 GAS TEST	Gas introduction test	Perform a gas introduction test.
2- 1 ZERO	Zero calibration	Perform zero calibration.
2- 2 SPAN	Span adjustment	Perform span adjustment.
2- 3 LAST CAL	Date last calibrated	Display the date on which calibration was last performed.
2- 4 E VOLT	Set potential	Display the set potential.
2- 5 DEF FLOW	Flow value correction	Correct the flow value so that the flow becomes 0.6 L/min \pm 10 % (0.54 - 0.66).
2- 6 FLOW	Flow display, flow adjustment	Adjust the pump and display the current flow.
2- 7 TEMP	Ambient temperatures	Display the current temperature in the installation environment.
2- 8 ----		Not used
2- 9 SETTING1	Environmental setting 1	Make settings for INHIBIT, alarm setpoints, etc. Perform fault tests and maintenance. (Refer to '7-9 Making changes in Environmental setting 1'.)
2-10 SETTING2	Environmental setting 2	Make settings for items such as alarm patterns, fault patterns, zero suppression values, date and time, and external output. (Refer to '7-10 Making changes in Environmental setting 2'.)
2-11 ----		Not used
2-12 FAULT		Not used
2-13 S SET	Sensor start setting	Set the date of first use for the sensor.
2-14 F MODE	To factory mode	Not used
2-15 RETURN	To user mode	Switches to user mode.

7-3-2 Switching to maintenance mode

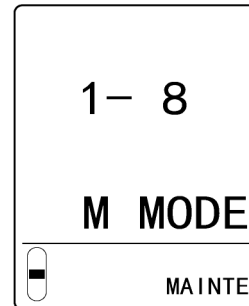
- 1 In detection mode, hold down the MODE key for about three seconds.



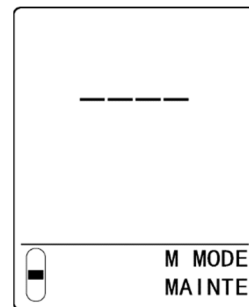
Switches to user mode.



- 2 Press the ▲ key or ▼ key to select [1- 8 M MODE], then press the TEST/SET key.

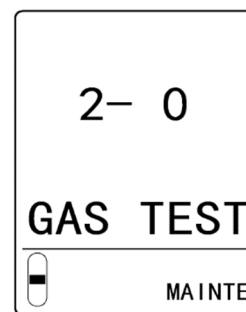


- 3 Hold down the TEST/SET key for about three seconds.



Switches to maintenance mode.

After making the settings, hold down the MODE key for about three seconds in maintenance mode to switch to detection mode.



WARNING

- Once you are done, hold down the MODE key in maintenance mode to return to detection mode. The product will not detect gases while in the adjustment/setting state. The product will revert to detection mode in 10 hours if left in maintenance mode. Exception: Due to the possibility that replacement tasks are underway, the device will not revert to detection mode if left in maintenance mode while setting environmental setting 1 is underway ([2- 9 SETTING1] >[SET-3 MAINTE]). This is dangerous because no monitoring occurs during this time. Keep this in mind.

NOTE

- ▶ If password setting is ON, a password must be entered to switch to maintenance mode.
 - ▶ The password is set beforehand by Riken Keiki. Please contact our sales department if you do not know the password.
 - ▶ Select [2-15 RETURN] in maintenance mode and press the TEST/SET key to switch to user mode.
-

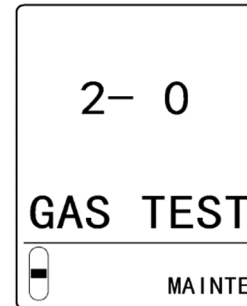
7-4 Performing a gas introduction test

Perform operational checks to confirm that the sensors react to the gases.

You can check the operation of the sensors without activating the contacts, external output(s), or alarms.

The gas introduction test can be performed separately for each sensor or for all sensors at the same time.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 0 GAS TEST], then press the TEST/SET key.

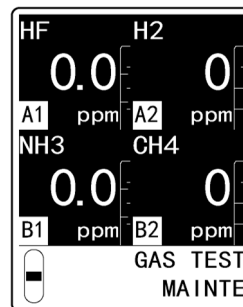


- 2 Switch the flow passage of the product to match the sensor for the gas introduction test.

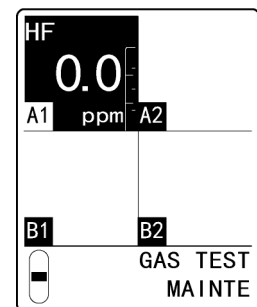
Before performing gas introduction tests for each sensor, switch the flow passage in the chamber switching unit to match the sensor. For more information on switching the flow passage of the chamber switching unit, refer to steps 1 to 4 in '<If calibration is to be performed for each sensor>' in '7-5-3 Connecting the calibration gas'.

Switching the flow passages is not necessary if the gas introduction test will be performed for all sensors.

- 3 Press the ▲ key or ▼ key to select the sensor for which the gas introduction test is to be performed. Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2]⇔Select all.



When all are selected



When [A1] is selected

- 4 Connect the gas sampling bag for the gas introduction test and the gas sampling bag for exhaust gas to the product, then introduce the gas.

For more information on connecting the gas sampling bag for the gas introduction test, refer to '7-5-3 Connecting the calibration gas'.

- 5 Confirm that the concentration is displayed for the selected sensor.

- 6 Disconnect the gas for the gas introduction test from this product.

Once the gas introduction test is complete, disconnect the gas sampling bag for the gas introduction test and the gas sampling bag for exhaust gas. (Refer to '7-5-4 Disconnecting the calibration gas'.)

After the gas introduction test separately for each sensor, return the chamber switching unit to the [D] (detection mode) position.

- 7 Press the MODE key.

The display reverts to the [2- 0 GAS TEST] display.

- 8 Hold down the MODE key for about three seconds to switch to detection mode.

NOTE

- ▶ When the gas introduction test is performed for each sensor, the concentration display will read [----] if the sensor and flow passage do not match. The pump will stop. If so, after switching the flow passage of the chamber switching unit, select another sensor in the screen of step 3, then reselect the sensor for which the gas introduction test is to be performed.

7-5 Performing calibration

Before performing calibration, prepare a gas sampling bag with the calibration gas and another gas sampling bag for the exhaust gas.

7-5-1 Running zero calibration

Correct zero calibration is required for accurate measurements of gas concentrations. Zero calibration is essential for accurate measurements. Zero calibration can be performed separately for each sensor or for all sensors at the same time.

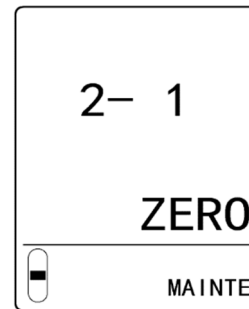
WARNING

- When zero calibration is performed in the atmosphere, check the atmosphere is free from contaminants before starting. Performing zero calibration in the presence of interference gases will mean calibration will not be performed correctly, and is a safety hazard in the event of an actual gas leak.

CAUTION

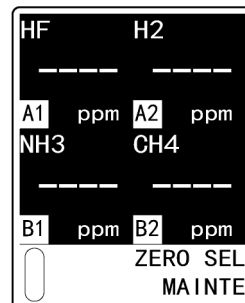
- To perform zero calibration, introduce the gas for zero calibration, then wait for the reading to stabilize.
- Perform zero calibration with the gas for zero calibration. If you introduce the wrong gas, depending on the sensor, indication accuracy and overall response may deteriorate.

1 In maintenance mode, press the ▲ key or ▼ key to select [2- 1 ZERO], then press the TEST/SET key.

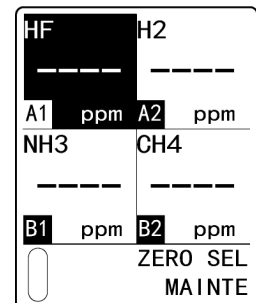


2 Press the ▲ key or ▼ key to select the sensor to be zero calibrated.

Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]↔[A2]↔[B1]↔[B2]↔Select all. [----] for the selected sensor blinks.



When all are selected



When [A1] is selected

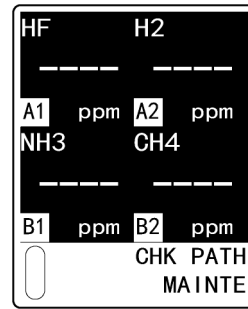
3 Connect the calibration gas to this product.

Connect the zero gas sampling bag and gas sampling bag for exhaust gas to the product. (Refer to '7-5-3 Connecting the calibration gas'.)

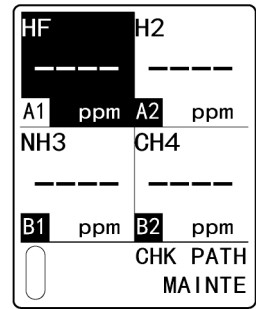
When performing zero calibration for each sensor, switch the flow passage in the chamber switching unit to the selected sensor.

4 Press the TEST/SET key to confirm the sensor to be calibrated.

This step confirms that the selected sensor and the flow passage match.



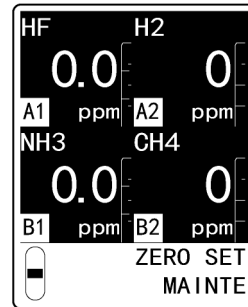
When all are selected



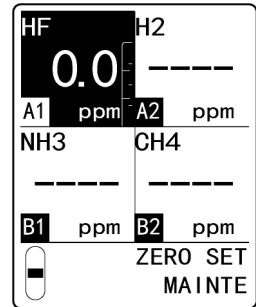
When [A1] is selected

5 Introduce the gas for zero calibration and press the TEST/SET key.

Zero calibration starts.



When all are selected

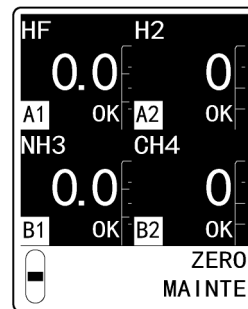


When [A1] is selected

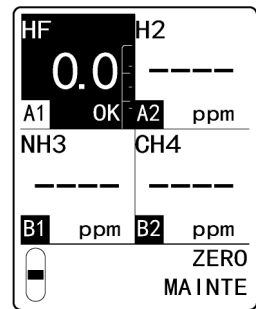
6 Check the zero calibration results.

If zero calibration is successful
[OK] is displayed. The display returns to the display in step 2.

If zero calibration failed
[NG] is displayed. The display returns to the display in step 2.



When all are selected



When [A1] is selected

7 Disconnect the calibration gas from this product.

When zero calibration is complete, disconnect the zero gas sampling bag and the gas sampling bag for exhaust gas. (Refer to '7-5-4 Disconnecting the calibration gas'.)

After performing zero calibration for each sensor, return the chamber switching unit to the [D] (detection mode) position.

8 Press the MODE key.

The display reverts to the [2- 1 ZERO] display.

9 Hold down the MODE key for about three seconds to switch to detection mode.

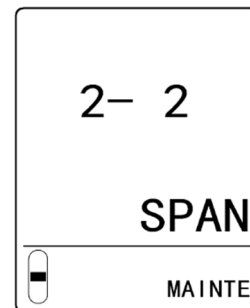
7-5-2 Running span adjustment

Perform span adjustment. This is required to ensure accurate measurements of gas concentrations. Perform span adjustment for each sensor.



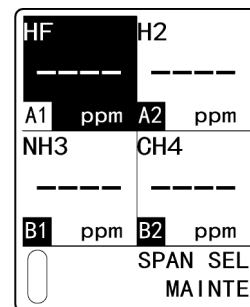
- To perform span adjustment, introduce the gas for span adjustment, then wait for the reading to stabilize.
- Perform span adjustment using the span adjustment gas. If you introduce the wrong gas, depending on the sensor, indication accuracy and overall response may deteriorate.
- After introducing the gas for span adjustment, supply air or gas for zero calibration and allow to stand for around five minutes.
Failure to allow enough time at this step may result in calibration problems, impaired indication accuracy in detection mode, and slower response.

1 In maintenance mode, press the ▲ key or ▼ key to select [2- 2 SPAN], then press the TEST/SET key.



2 Press the ▲ key or ▼ key to select the sensor for which span adjustment is to be performed.

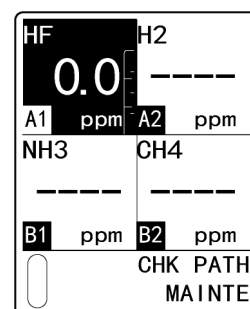
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇄[A2]⇄[B1]⇄[B2]. [---] for the selected sensor blinks.



3 Connect the calibration gas to this product.
Connect the gas sampling bag for span adjustment and the gas sampling bag for exhaust gas to the product. (Refer to '7-5-3 Connecting the calibration gas'.)
Switch the flow passage in the chamber switching unit to the selected sensor.

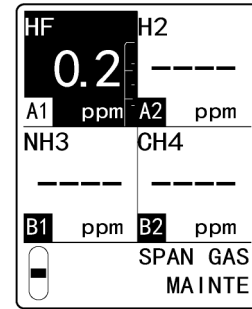
4 Press the TEST/SET key to confirm the sensor to be calibrated.

This step confirms that the selected sensor and the flow passage match.



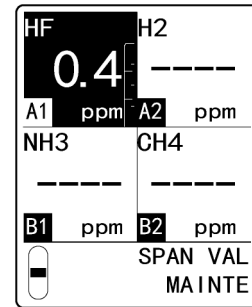
5 Introduce the gas for span adjustment, and press the TEST/SET key when the concentration stabilizes.

The TEST/SET key will not work if concentrations are less than 10 % of the full scale.



6 Press the ▲ key or ▼ key to match the introduced gas concentration.

For oxygen deficiency alarm models, adjust so that it becomes [20.9] (vol%).



7 Press the TEST/SET key.

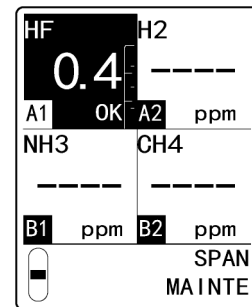
Span adjustment starts.

8 Check the span adjustment results.

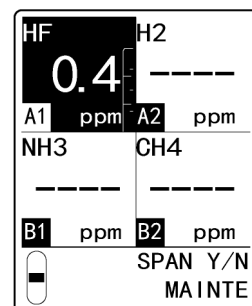
If span adjustment is successful
[OK] appears.

If span adjustment failed

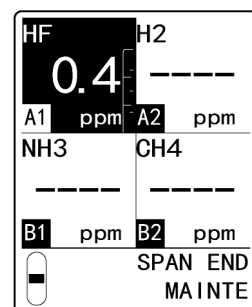
[NG] is displayed. The display returns to the display in step 2.



9 To record the results of span adjustment, press the TEST/SET key. Press the MODE key to skip recording.



Span adjustment ends and the display returns to the display in step 2.



10 Disconnect the calibration gas from this product.

When span adjustment is complete, disconnect the span gas sampling bag and the gas sampling bag for exhaust gas. (Refer to '7-5-4 Disconnecting the calibration gas'.)

Return the chamber switching unit to the [D] (detection mode) position.

11 Press the MODE key.

The display reverts to the [2- 2 SPAN] display.

12 Hold down the MODE key for about three seconds to switch to detection mode.

NOTE

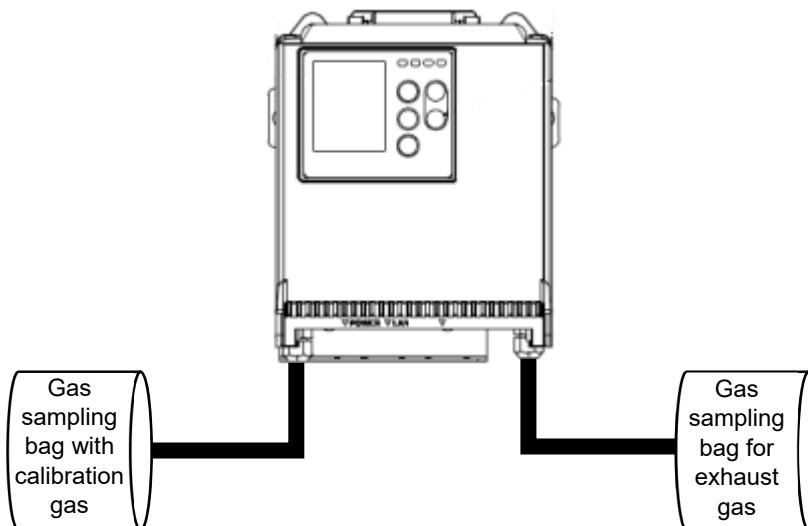
- ▶ Press the SHIFT key in step 2 to display the span adjustment margin for the selected sensor as you hold down the key. Restart to reset the displayed margin.
-

7-5-3 Connecting the calibration gas

With the pump stopped, connect the gas sampling bag with calibration gas and the gas sampling bag for exhaust gas to the product.

<If calibration is to be performed for all sensors>

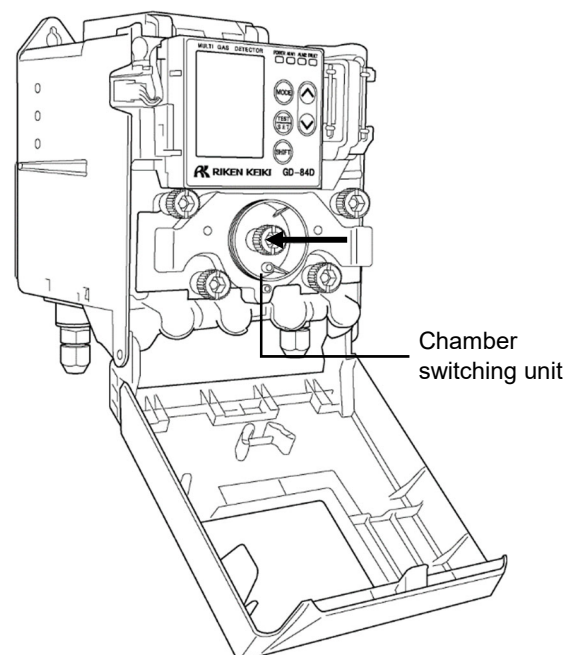
Connect the gas sampling bag with calibration gas to GAS IN on this product and connect the gas sampling bag for exhaust gas to GAS OUT.



<If calibration is to be performed for each sensor>

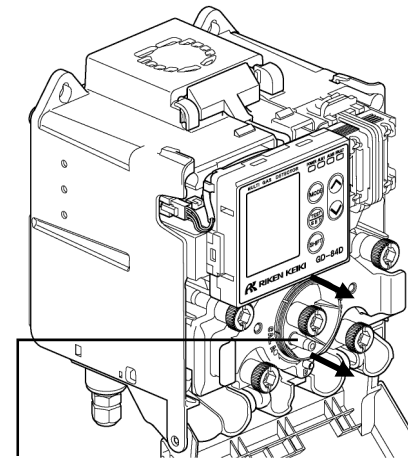
Switch the chamber switching unit of this product to the flow passage for the sensor to be calibrated. Connect the calibration gas.

- 1 **Pull the projection on the top of the main unit towards you to open the front cover.**
The front cover opens to approximately 120°. Push further down to open to 180°.
- 2 **Loosen the black knurled screw in the center of the chamber switching unit.**

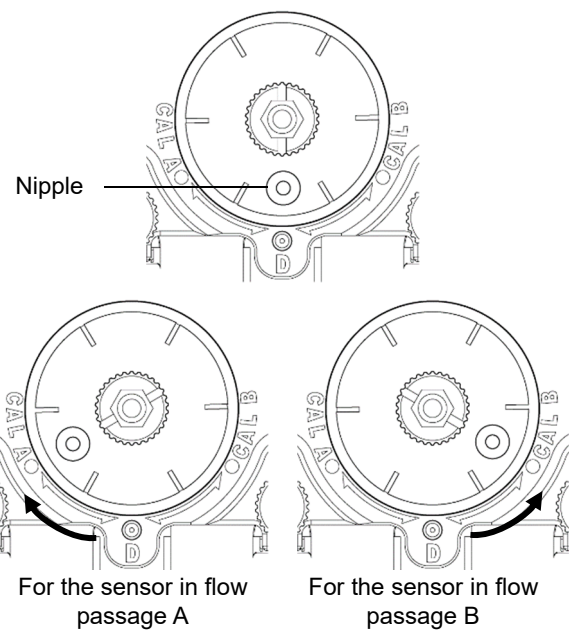


- 3 Pull the chamber switching unit towards you and turn to the left or right to place the nipple in the [CAL A] or [CAL B] position.**

When performing air calibration for the sensors in flow passage A ([A1], [A2]), turn to [CAL A]. When performing air calibration for the sensors in flow passage B ([B1], [B2]), turn to [CAL B].

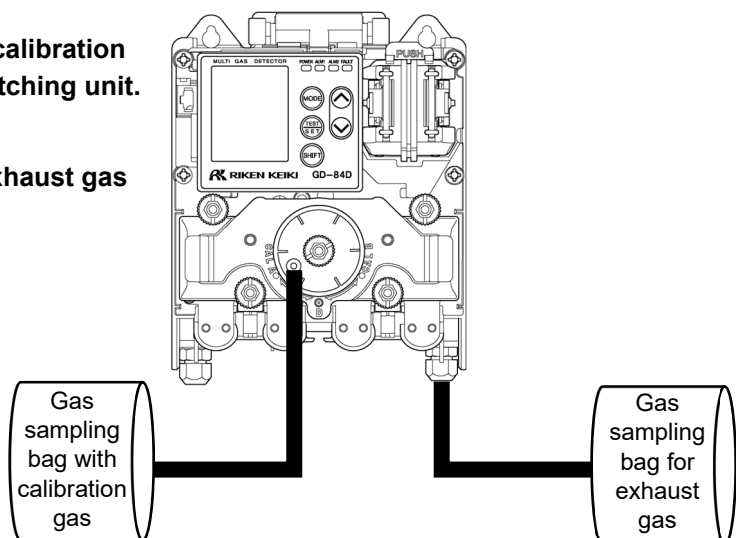


Nipple



Nipple

- 4 Tighten the black knurled screw while pressing in on the chamber switching unit.**
- 5 Connect the gas sampling bag with calibration gas to the nipple of the chamber switching unit.**
- 6 Connect the gas sampling bag for exhaust gas to GAS OUT on this product.**



* The illustration shows the side for flow passage A.

7-5-4 Disconnecting the calibration gas

<If calibration was performed for all sensors>

Disconnect the gas sampling bag with calibration gas and the gas sampling bag for exhaust gas from the product.

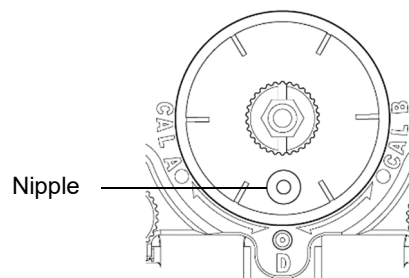
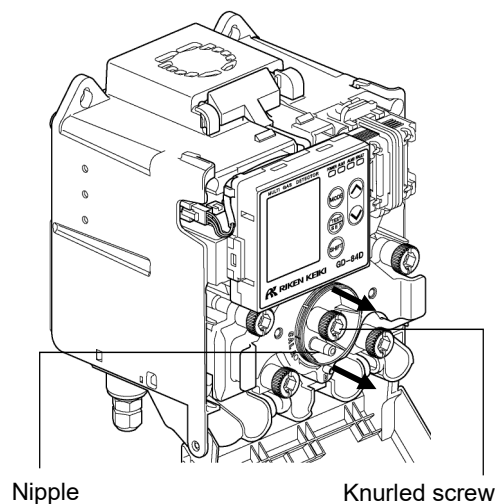
<If calibration was performed for each sensor>

Disconnect the gas sampling bag with calibration gas and the gas sampling bag for exhaust gas from the product, then return the chamber switching unit to the [D] (detection mode) position.

CAUTION

- Once calibration is finished, be sure to return the chamber switching unit to the [D] (detection mode) position. Detection cannot be performed properly if the chamber switching unit is not at the [D] (detection mode) position.

- 1 **Disconnect the gas sampling bag with calibration gas and the gas sampling bag for exhaust gas from the product.**
- 2 **Loosen the black knurled screw in the center of the chamber switching unit.**
- 3 **Pull the chamber switching unit towards you and turn to the left or right to place the nipple in the [D] (detection mode) position.**
- 4 **Tighten the black knurled screw while pressing in on the chamber switching unit.**



- 5 **Close the front cover on the main unit.**
Close the front cover firmly so that it clicks back into place.

CAUTION

- Be sure to return the chamber switching unit to the [D] (detection mode) position before closing the front cover.
Closing the front cover may damage the chamber if the chamber switching unit is not at the [D] (detection mode) position.

7-6 Adjusting the flow

The flow of this product is automatically adjusted by the automatic flow adjuster function to 0.6 L/min \pm 10 % (0.54 - 0.66).

Set the automatic flow adjuster function to OFF to adjust the flow manually.

NOTE

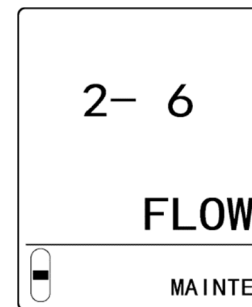
- ▶ Set the automatic flow adjuster function ON/OFF in Environmental setting 2. (Refer to '7-10-11 Flow automatic adjustment setting (AT FLOW)').

7-6-1 Checking the flow (FLOW)

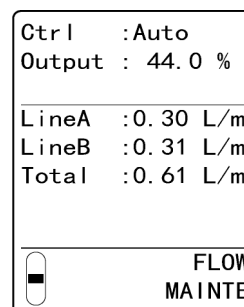
Display the current flow. The following information is displayed:

- Ctrl : Automatic flow adjuster function ON/OFF setting
(If the automatic flow adjuster function is ON, [Auto] is displayed; if OFF, [Manual] is displayed.)
- Output : The current output ratio
- LineA : Flow (L/min) in flow passage A
- LineB : Flow (L/min) in flow passage B
- Total : Total flow (L/min) (total of flow passage A and flow passage B)

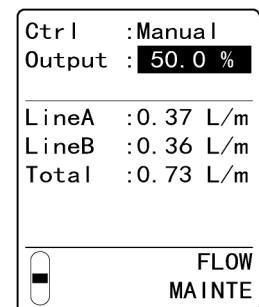
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 6 FLOW], then press the TEST/SET key.**



- 2 Check the flow.**



Flow automatic adjustment: ON



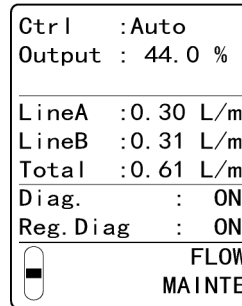
Flow automatic adjustment: OFF

- 3 Press the MODE key.**

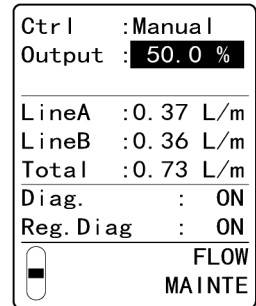
The display reverts to the [2- 6 FLOW] display.

NOTE

- ▶ Press the SHIFT key in step 2 while the flow is displayed to view the following information as you hold down the key.
- Diag. : Self-diagnostic function ON/OFF setting
- Reg.Diag. : Regular self-diagnostic ON/OFF setting



Flow automatic adjustment: ON

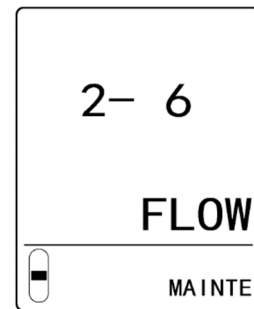


Flow automatic adjustment: OFF

7-6-2 Manually adjusting the flow (FLOW)

Set the automatic flow adjuster function to OFF to allow manual flow adjustment.

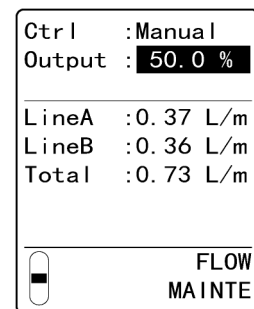
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 6 FLOW], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to increase or decrease the pump output so that the flow for [LineA] and [LineB] are each more than 0.28 L/min.

Pump output increases 0.5 % each time you press the ▲ key.

Pump output decreases 0.5 % each time you press the ▼ key.



- 3 Press the TEST/SET key.

The pump output is set. The display reverts to the [2- 6 FLOW] display.

NOTE

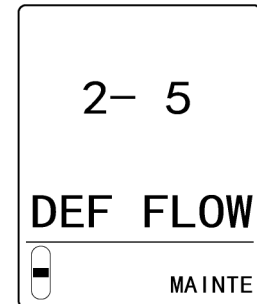
- ▶ Press the MODE key in step 3 to cancel the settings and return to the [2- 6 FLOW] display.

7-6-3 Correcting the flow value (DEF FLOW)

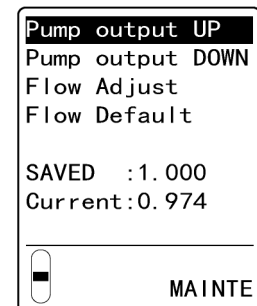
Due to aging deterioration of the flow sensor, inappropriate default settings for flow, etc., an error affecting the flow display may occur. In such cases, correct the flow display.

Flow value corrections are possible whether the automatic flow adjuster function is set to ON or OFF. Connect a flowmeter (one that can accurately indicate 0.6 L/min) to this product.

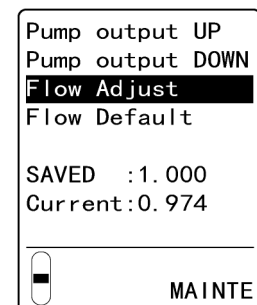
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 5 DEF FLOW], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [Pump output UP] or [Pump output DOWN], then press the TEST/SET key.
Select [Pump output UP] to increase pump output.
Select [Pump output DOWN] to decrease pump output.
Increase or decrease the output of the pump and adjust so that the connected flowmeter indicates 0.6 L/min ± 10 %.



- 3 Press the ▲ key or ▼ key to select [Flow Adjust], then press the TEST/SET key.



The flow value is corrected and the display returns to the [2- 5 DEF FLOW] display.

NOTE

- ▶ By selecting [Flow Default] and pressing the TEST/SET key, you can restore the default correction coefficient.
- ▶ Press the MODE key in step 3 to cancel the settings and return to the [2- 5 DEF FLOW] display.

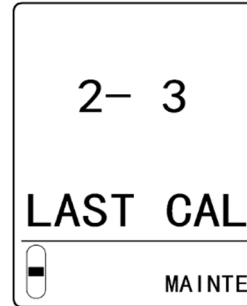
7-7 Checking setting values (maintenance mode)

7-7-1 Checking the date last calibrated (LAST CAL)

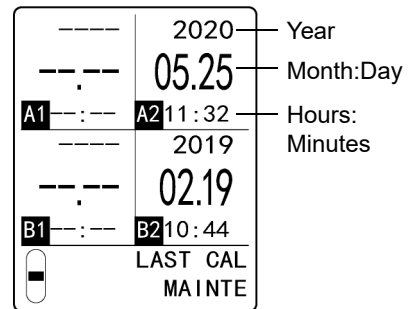
Display the date on which calibration was last performed for each sensor.

No date is displayed if calibration has not been performed since sensor manufacture.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 3 LAST CAL], then press the TEST/SET key.



- 2 Check the date last calibrated.

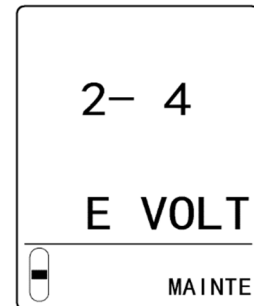


- 3 Press the MODE key.
The display reverts to the [2- 3 LAST CAL] display.

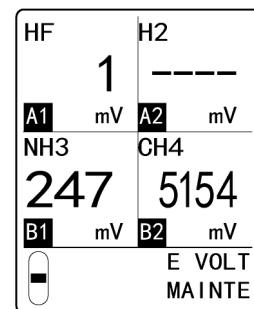
7-7-2 Checking the set potential (E VOLT)

This displays the set voltage of the electrochemical type sensor (ESF), or the element voltage of the semiconductor type sensor (SGF) or hot-wire type semiconductor sensor (SHF).

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 4 E VOLT], then press the TEST/SET key.



- 2 Check the set potential or element voltage.

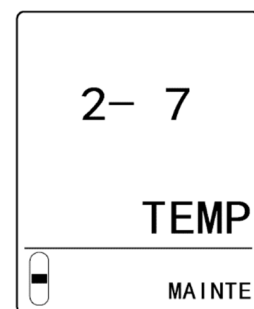


- 3 Press the MODE key.

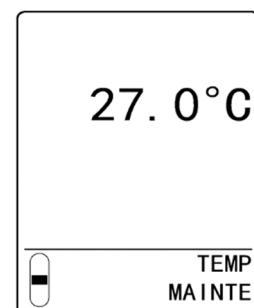
The display reverts to the [2- 4 E VOLT] display.

7-7-3 Checking the temperature of the detector (TEMP)

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 7 TEMP], then press the TEST/SET key.



- 2 Check the temperature of the detector.



- 3 Press the MODE key.

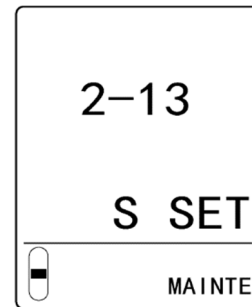
The display reverts to the [2- 7 TEMP] display.

7-8 Setting the initial date of sensor use (S SET)

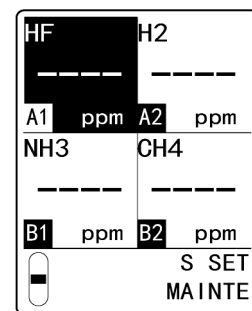
Set the date of first use for the sensor.

This setting becomes invalid when the sensor is replaced.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-13 S SET], then press the TEST/SET key.**

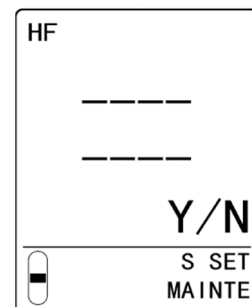


- 2 Press the ▲ key or ▼ key to select the sensor.**
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇄[A2]⇄[B1]⇄[B2].
The setting value for the selected sensor blinks.

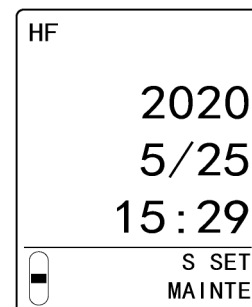


- 3 Press the TEST/SET key to confirm the sensor.**
If the setting for the initial date of sensor use is enabled, the screen for step 5 is displayed.

- 4 Press the TEST/SET key to enable the setting for the initial date of sensor use.**



- 5 Check the initial date of sensor use.**



- 6 Press the MODE key.**
The display reverts to the display in step 2.
To continue making settings for other sensors, repeat steps 2 to 6.

- 7 Press the MODE key after making the settings.**
The display reverts to the [2-13 S SET] display.

7-9 Making changes in Environmental setting 1

The following items can be set in Environmental setting 1:

LCD display	Setting item	Remarks
2- 9 SETTING1	Environmental setting 1	
SET- 0 INHIBIT	INHIBIT setting	
SET- 1 ALM P	ALARM SETTING	
SET- 2 ALM DLY	ALARM DELAY SETTING	
SET- 3 MAINTE	Maintenance	Refer to '8. Replacing and cleaning parts'.
SET- 4 F TEST	Fault test	
SET- 5 OPT ACT	TERMINAL UNIT SETTING	4-20mA EA

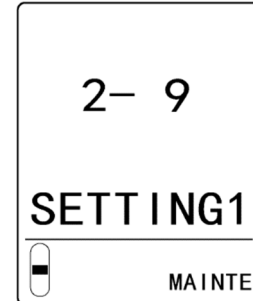
7-9-1 INHIBIT setting (INHIBIT)

Set ON/OFF for INHIBIT for each sensor.

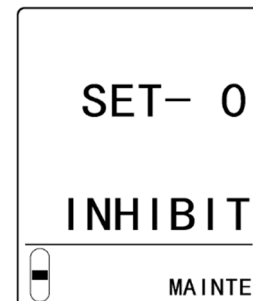
Set to ON to disable external alarm signal output even when gas concentrations exceed the alarm setpoints in detection mode. This setting is primarily used when testing and inspecting the product. When all of the sensors are set to ON, the fault alarms and cautions on the main unit also stop being issued.

The default setting is OFF.

- In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.**

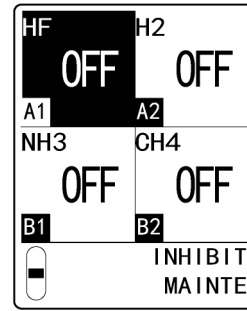


- Select [SET- 0 INHIBIT] and press the TEST/SET key.**



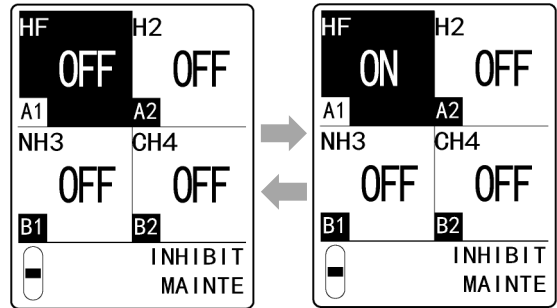
3 Press the ▲ key or ▼ key to select the sensor.

Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2]. The setting value for the selected sensor blinks.



4 Press the TEST/SET key to confirm the sensor.

5 Press the ▲ key or ▼ key to select [OFF] or [ON], then press the TEST/SET key.



The display reverts to the display in step 3. To continue making settings for other sensors, repeat steps 3 to 5.

6 Press the MODE key after making the settings.

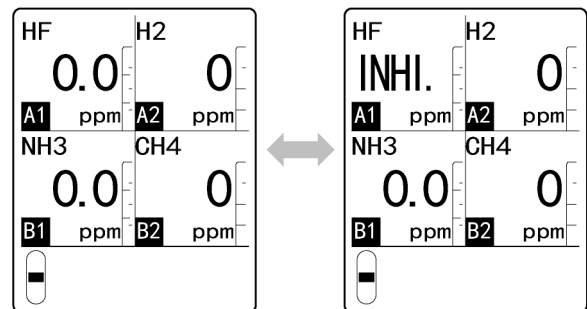
The display reverts to the [SET- 0 INHIBIT] display.

7 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

NOTE

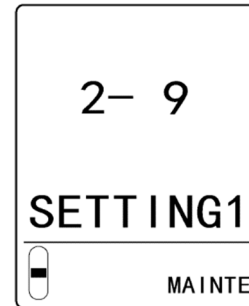
- ▶ For sensors for which the INHIBIT setting has been set to ON, when you switch to detection mode, the display alternates between the concentration display and [INHI.].



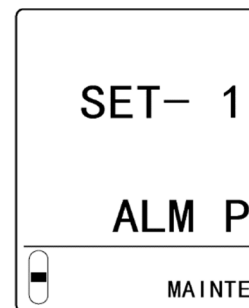
7-9-2 Alarm setpoints (ALM P)

Set the gas alarm setpoints (first alarm setpoint, second alarm setpoint) for each sensor.

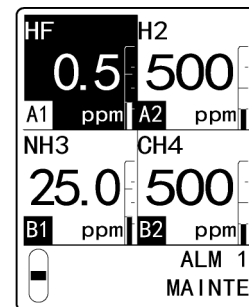
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 1 ALM P], then press the TEST/SET key.



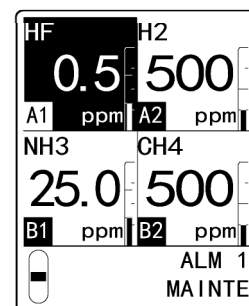
- 3 Press the ▲ key or ▼ key to select the sensor.
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
The setting value for the selected sensor blinks.



- 4 Press the TEST/SET key to confirm the sensor.

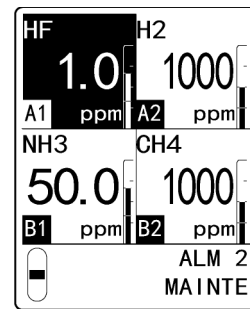
- 5 Press the ▲ key or ▼ key to set the alarm value for the first alarm setpoint, then press the TEST/SET key.

<First alarm setpoint setting>



- 6 Press the ▲ key or ▼ key to set the alarm value for the second alarm setpoint, then press the TEST/SET key.

<Second alarm setpoint setting>



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 6.

- 7 Press the MODE key after making the settings.

The display reverts to the [SET- 1 ALM P] display.

- 8 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

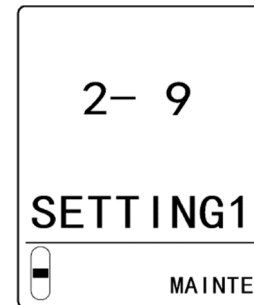
7-9-3 Alarm delay time setting (ALM DLY)

Set the alarm delay time for each sensor.

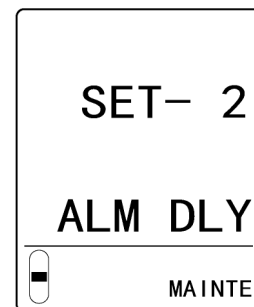
Set a time (0 - 60 seconds) to temporarily suspend activation to prevent false alarms caused by external noise.

The default setting is two seconds.

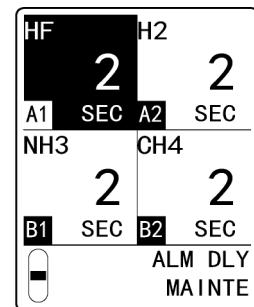
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 2 ALM DLY], then press the TEST/SET key.

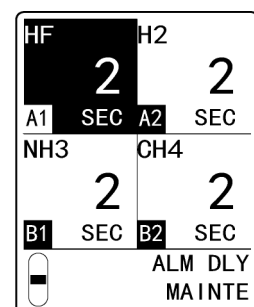


- 3 Press the ▲ key or ▼ key to select the sensor.
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇄[A2]⇄[B1]⇄[B2].
The setting value for the selected sensor blinks.



- 4 Press the TEST/SET key to confirm the sensor.

- 5 Press the ▲ key or ▼ key to set the alarm delay time, then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

6 Press the MODE key after making the settings.

The display reverts to the [SET- 2 ALM DLY] display.

7 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

7-9-4 Fault alarm tests (F TEST)

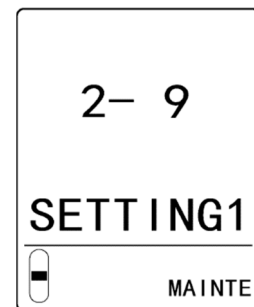
Perform fault alarm tests for each sensor.

This tests whether a fault alarm is triggered when a fault occurs with this product.

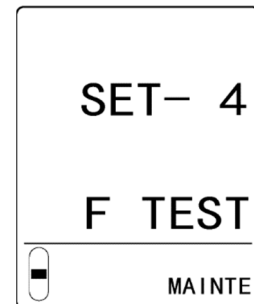


- When you perform fault alarm tests, depending on the setting, the fault contact may be activated even when in maintenance mode. Note this when performing this operation.
- The fault alarm test cannot be performed on sensors which have INHIBIT set to ON.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.**



- 2 Press the ▲ key or ▼ key to select [SET- 4 F TEST], then press the TEST/SET key.**

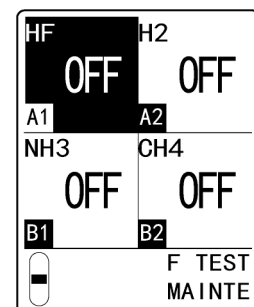


- 3 Press the ▲ key or ▼ key to select the sensor to be tested.**

Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].

The setting value for the selected sensor blinks.

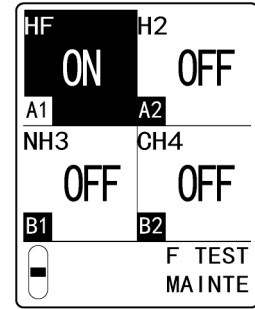
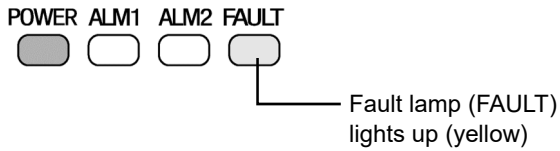
- 4 Press the TEST/SET key to confirm the sensor to be tested.**



- 5 Press the ▲ key or ▼ key to select [ON], then press the TEST/SET key.

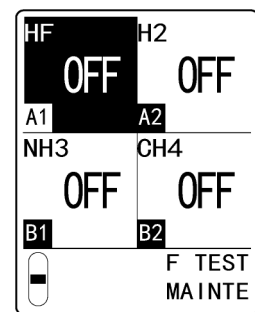
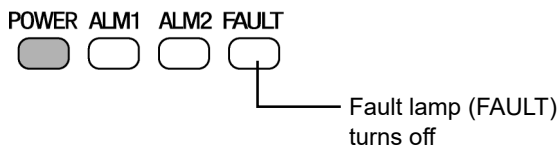
- 6 Check to confirm that a fault alarm is triggered, then press the TEST/SET key.

When the fault alarm is triggered, the fault lamp (FAULT) lights up (yellow).



- 7 Press the ▲ key or ▼ key to select [OFF], then press the TEST/SET key.

When the fault alarm is reset, the fault lamp (FAULT) turns off.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 7.

- 8 Press the MODE key after making the settings.

The display reverts to the [SET- 4 F TEST] display.

- 9 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

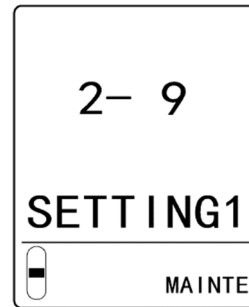
7-9-5 Terminal unit settings (OPT ACT)

4-20mA

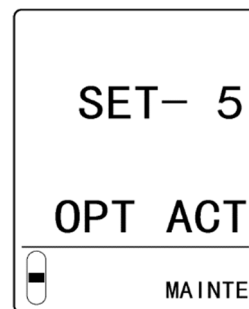
EA

Set whether to enable or disable the terminal unit.

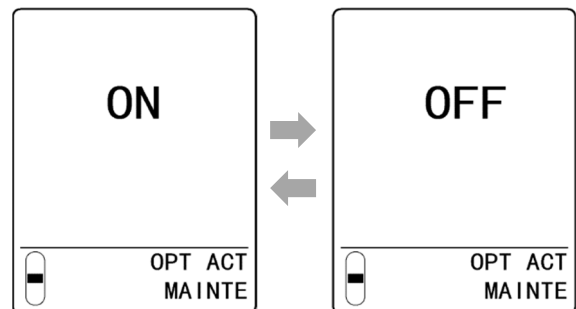
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 5 OPT ACT], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.
To enable the terminal unit, set to [ON] and to disable it, set to [OFF].



The display reverts to the [SET- 5 OPT ACT] display.

- 4 Press the MODE key.
The display reverts to the [2- 9 SETTING1] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET- 5 OPT ACT] display.

7-10 Making changes in Environmental setting 2

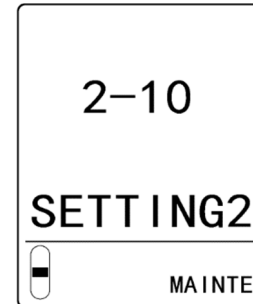
The following items can be set in Environmental setting 2:

LCD display	Setting item	Remarks
2-10 SETTING2	Environmental setting 2	
SET- 0 ADDRESS	Address setting	Not used
SET- 1 DAY TIME	Date/time setting	
SET- 2 SUPPRESS	Zero suppression value setting	
SET- 3 SUP TYPE	Zero suppression type setting	
SET- 4 TEST RLY	Settings for contacts during alarm tests	4-20mA EA
SET- 5 TEST4-20	External output during alarm tests	4-20mA EA
SET- 6 RLY PTRN	Energized/de-energized setting	4-20mA EA
SET- 7 ALM TYPE	Alarm type setting	
SET- 8 ALM PTRN	Alarm pattern setting	
SET- 9 AL LIMIT	Alarm value limiter setting	
SET-10 FLT PTRN	Fault pattern setting	
SET-11 AT FLOW	Flow automatic adjustment setting	
SET-12 ZERO F	Zero following setting	
SET-13 ZERO 24F	24-hour zero follower setting	
SET-14 S ASSIST	Sensitivity correction setting	
SET-15 MNT OUT	External output in maintenance mode setting	4-20mA EA
SET-16 MA 4-20	External output adjustment	4-20mA EA
SET-17 BK LIGHT	Backlight setting	
SET-18 ETHERNET	ETHERNET settings	ET EA
SET-19 PUMP CK	Pump drive level diagnostic settings	
SET-20 FLT RLY	Setting for the behavior of fault contacts when flow is low	4-20mA EA
SET-21 FLT OUT	External output during fault setting	4-20mA EA
SET-22 CAU DISP	Caution display setting	
SET-23 CAU OUT	Caution output setting	
SET-24 GAS NAME	Displayed gas name setting	
SET-25 CONTRAST	LCD contrast adjustment	

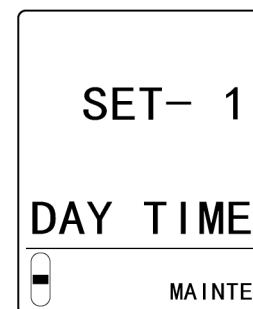
7-10-1 Date and time setting (DAY TIME)

Sets the date and time (year, month, date, hours, minutes) for the internal clock.

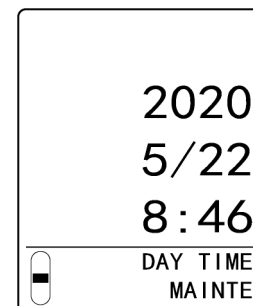
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



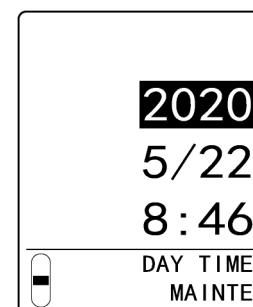
- 2 Press the ▲ key or ▼ key to select [SET- 1 DAY TIME], then press the TEST/SET key.



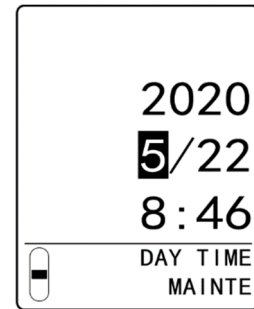
- 3 Press the TEST/SET key.



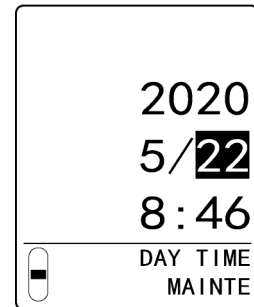
- 4 Press the ▲ key or ▼ key to set the last two digits of the year, then press the TEST/SET key.



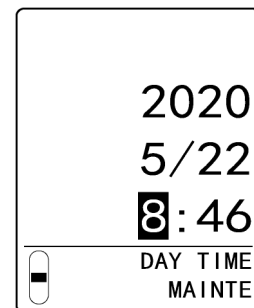
- 5 Press the ▲ key or ▼ key to set the month, then press the TEST/SET key.



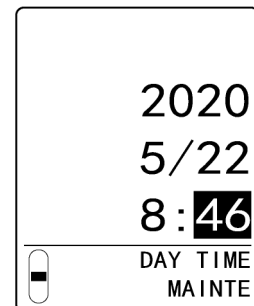
- 6 Press the ▲ key or ▼ key to set the day, then press the TEST/SET key.



- 7 Press the ▲ key or ▼ key to set the hour (24-hour clock display), then press the TEST/SET key.



- 8 Press the ▲ key or ▼ key to set the minutes, then press the TEST/SET key.



The date/time is set. The display reverts to the [SET- 1 DAY TIME] display.

- 9 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

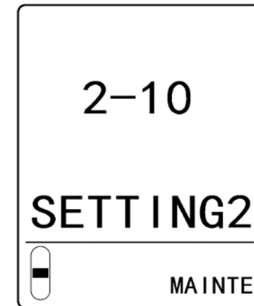
NOTE

- ▶ Press the MODE key in each of the date/time settings to revert to the previous setting.
- ▶ Press the MODE key in step 3 to cancel the date/time settings and return to the [SET- 1 DAY TIME] display.

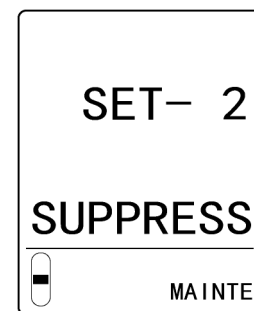
7-10-2 Zero suppression value setting (SUPPRESS)

Set the zero suppression value for each sensor.

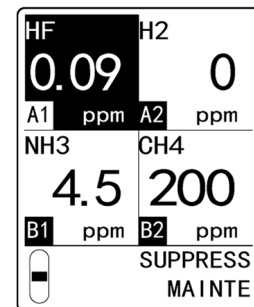
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 2 SUPPRESS], then press the TEST/SET key.

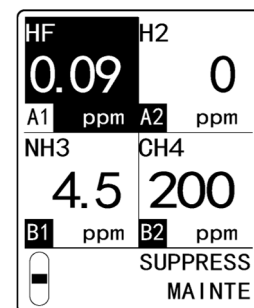


- 3 Press the ▲ key or ▼ key to select the sensor.
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇄[A2]⇄[B1]⇄[B2].
The setting value for the selected sensor blinks.



- 4 Press the TEST/SET key to confirm the sensor.

- 5 Press the ▲ key or ▼ key to select the zero suppression value, then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

6 Press the MODE key after making the settings.

The display reverts to the [SET- 2 SUPPRESS] display.

7 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

7-10-3 Zero suppression type setting (SUP TYPE)

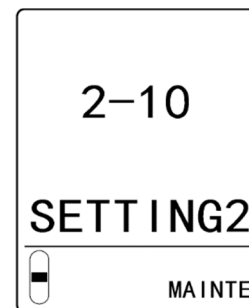
Set the zero suppression type for each sensor.

Select one of the following:

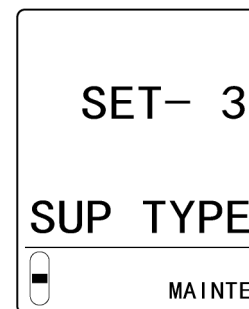
- CUT type ([CUT]): Values exceeding the zero suppression value are shown as is.
- SLOPE type ([SLOPE]): Values exceeding the zero suppression value are smoothed for display.

The default setting is CUT type ([CUT]).

1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



2 Press the ▲ key or ▼ key to select [SET- 3 SUP TYPE], then press the TEST/SET key.

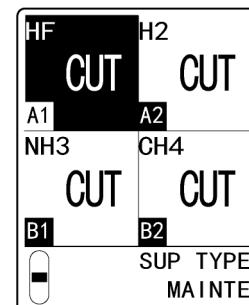


3 Press the ▲ key or ▼ key to select the sensor.

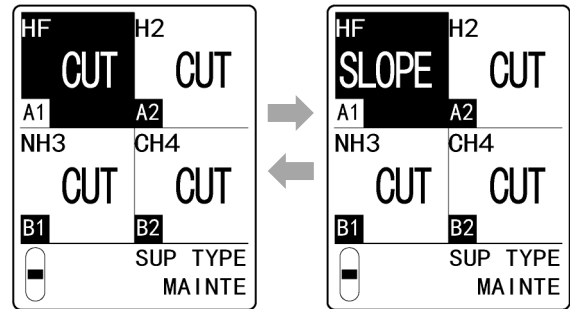
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].

The setting value for the selected sensor blinks.

4 Press the TEST/SET key to confirm the sensor.



- 5 Press the ▲ key or ▼ key to select [CUT] or [SLOPE], then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

- 6 Press the **MODE** key after making the settings.
The display reverts to the [SET- 3 SUP TYPE] display.

- 7 Press the **MODE** key.
The display reverts to the [2-10 SETTING2] display.

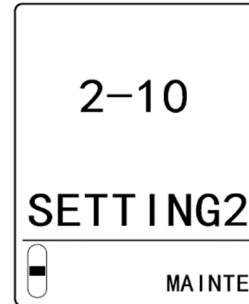
7-10-4 Settings for contacts during alarm tests (TEST RLY)

4-20mA

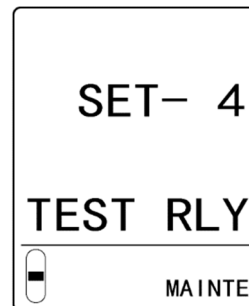
EA

Set the operation of contacts during alarm tests ON or OFF.
Set to ON to allow contacts to operate during alarm tests.
The default setting is OFF.

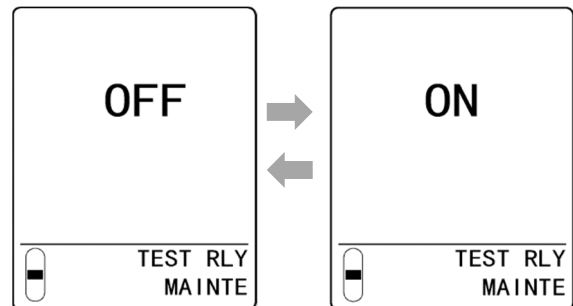
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 4 TEST RLY], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [OFF] or [ON], then press the TEST/SET key.



The display reverts to the [SET- 4 TEST RLY] display.

- 4 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

NOTE

▶ Press the MODE key in step 3 to cancel the settings and return to the [SET- 4 TEST RLY] display.

7-10-5 Settings for external output during alarm tests (TEST4-20)

4-20mA

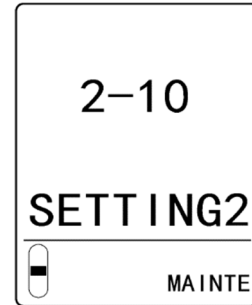
EA

Set the external output during alarm tests ON or OFF.

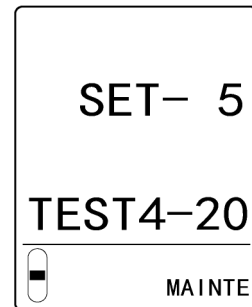
Set to ON to use external output (4 - 20 mA) during alarm tests.

When set to OFF, the output from immediately before the alarm test is maintained.

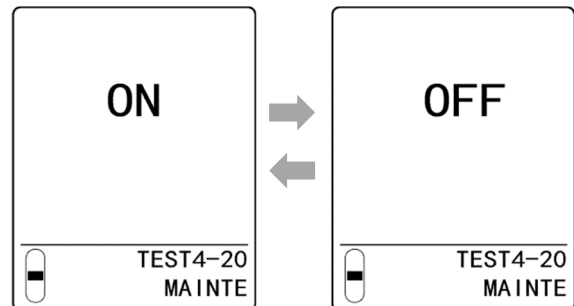
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 5 TEST4-20], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the [SET- 5 TEST4-20] display.

- 4 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET- 5 TEST4-20] display.

7-10-6 Energized/de-energized setting (RLY PTRN)

4-20mA

EA

Set energized/de-energized for the first alarm contact, second alarm contact, and fault alarm contact.
Set de-energized ([ND]) or energized ([NE]) for each contact.

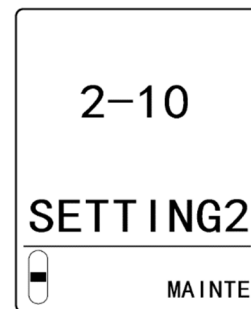
- If the setting is de-energized, the relay is energized at an alarm state. (De-energized in normal conditions)
 - With contact a, the setting is open under normal conditions and closed at an alarm state.
 - This behavior is reversed with contact b.
- If the setting is energized, the relay is energized under normal conditions. (De-energized at an alarm state)
 - When using contact a, it is closed in normal conditions and open at an alarm state. It is also open when supply of power is stopped.
 - This behavior is reversed with contact b.

The default setting is de-energized ([ND]) for each contact.

<Setting the alarm contacts>

Set the first alarm contact and the second alarm contact for each sensor.

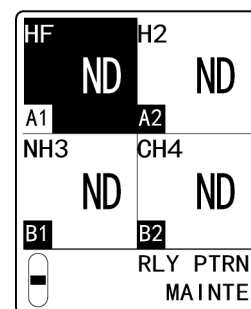
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.**



- 2 Press the ▲ key or ▼ key to select [SET- 6 RLY PTRN], then press the TEST/SET key.**

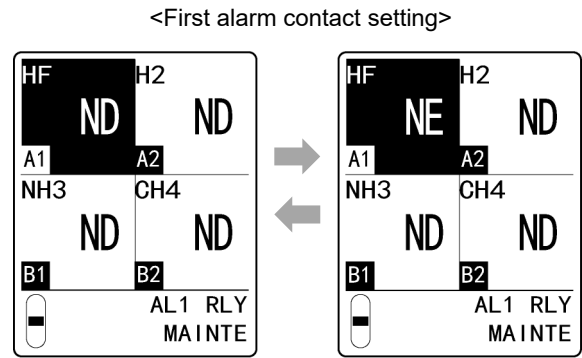


- 3 Press the ▲ key or ▼ key to select the sensor.**
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2]⇔[FLT RYL].
Select one of [A1], [A2], [B1], or [B2] here.
The setting value for the selected sensor blinks.

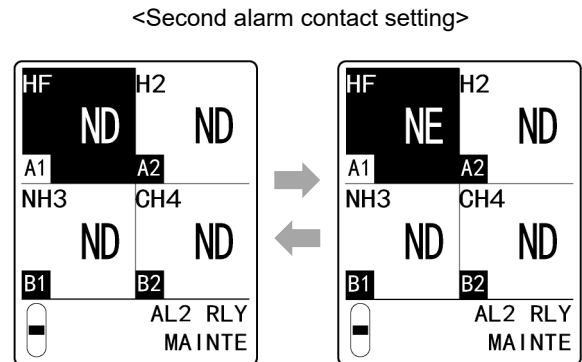


- 4 Press the TEST/SET key to confirm the sensor.**

- 5 Press the ▲ key or ▼ key to select [ND] or [NE], then press the TEST/SET key.



- 6 Press the ▲ key or ▼ key to select [ND] or [NE], then press the TEST/SET key.



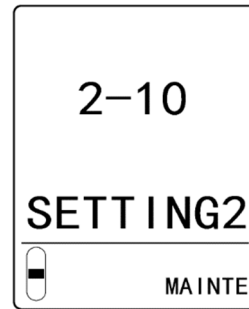
The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 6.

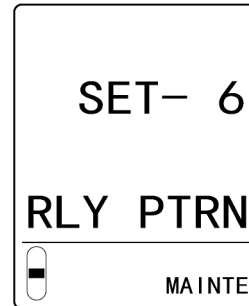
- 7 Press the MODE key after making the settings.
The display reverts to the [SET- 6 RLY PTRN] display.
- 8 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

<Setting the fault alarm contact>

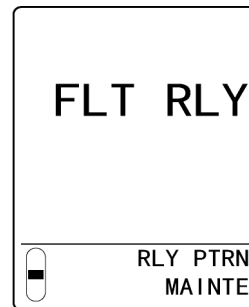
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



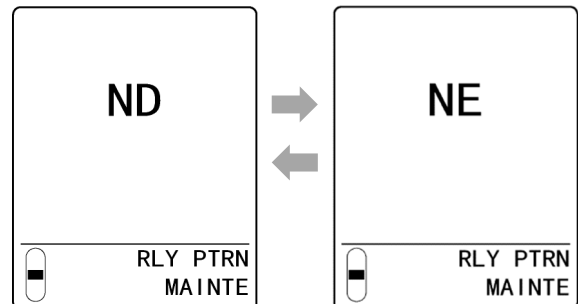
- 2 Select [SET- 6 RLY PTRN], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [FLT RLY], then press the TEST/SET key.



- 4 Press the ▲ key or ▼ key to select [ND] or [NE], then press the TEST/SET key.



The display reverts to the display in step 3.

- 5 Press the MODE key.
The display reverts to the [SET- 6 RLY PTRN] display.

- 6 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

7-10-7 Alarm type setting (ALM TYPE)

Set the alarm type for each sensor.

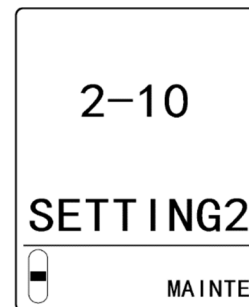
When an oxygen deficiency alarm model sensor is fitted, any of H-HH type, L-LL type, or L-H type can be set.

The default setting is H-HH type.

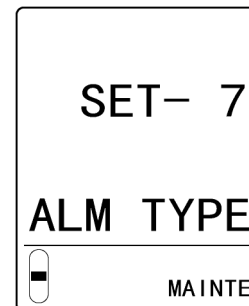
NOTE

- ▶ Several alarm type settings are possible for oxygen deficiency specification sensors. For other sensors, it will be H-HH type.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.**

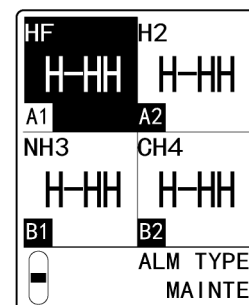


- 2 Press the ▲ key or ▼ key to select [SET- 7 ALM TYPE], then press the TEST/SET key.**

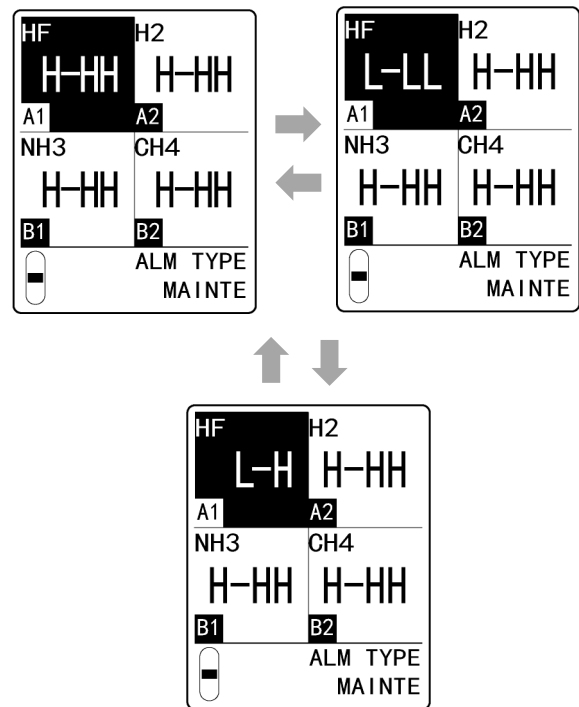


- 3 Press the ▲ key or ▼ key to select the sensor.**
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
The setting value for the selected sensor blinks.

- 4 Press the TEST/SET key to confirm the sensor.**



- 5 Press the ▲ key or ▼ key to select [H-HH], [L-LL], or [L-H], then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

- 6 Press the MODE key after making the settings.
The display reverts to the [SET- 7 ALM TYPE] display.
- 7 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

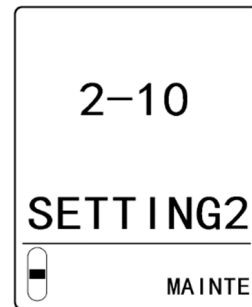
7-10-8 Alarm pattern setting (ALM PTRN)

Set the alarm patterns for the alarm setpoints.
Set to either auto-reset ([NL]) or self-latching ([L]).
The default setting is auto-reset ([NL]).

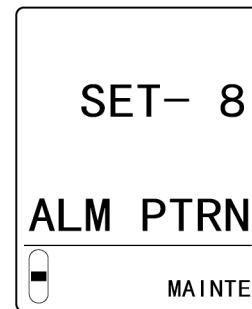
NOTE

- ▶ The alarm pattern settings will affect how the device behaves. For normal use, leave this setting unchanged.

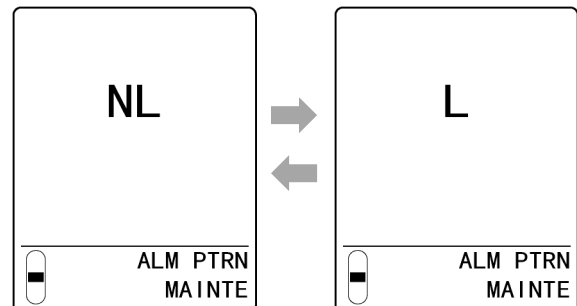
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 8 ALM PTRN], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [NL] or [L], then press the TEST/SET key.



The display reverts to the [SET- 8 ALM PTRN] display.

- 4 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET- 8 ALM PTRN] display.

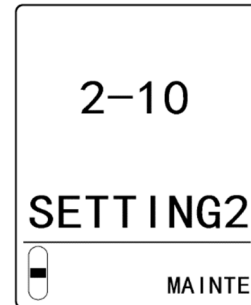
7-10-9 Alarm value limiter setting (AL LIMIT)

Set ON/OFF for the alarm point limiter.
The default setting is ON.

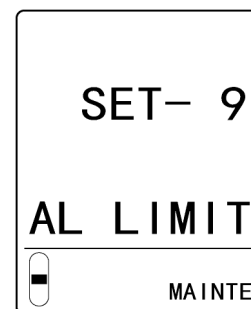
NOTE

- ▶ The alarm value limiter settings will affect how the device behaves. For normal use, leave this setting unchanged.

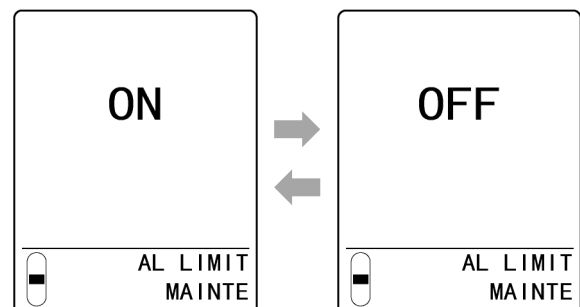
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 9 AL LIMIT], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the [SET- 9 AL LIMIT] display.

- 4 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET- 9 AL LIMIT] display.

7-10-10 Fault pattern setting (FLT PTRN)

Set the fault alarm pattern.

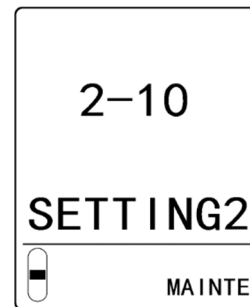
Set to either auto-reset ([NL]) or self-latching ([L]).

The default setting is auto-reset ([NL]).

NOTE

- ▶ The fault pattern settings will affect how the device behaves. For normal use, leave this setting unchanged.

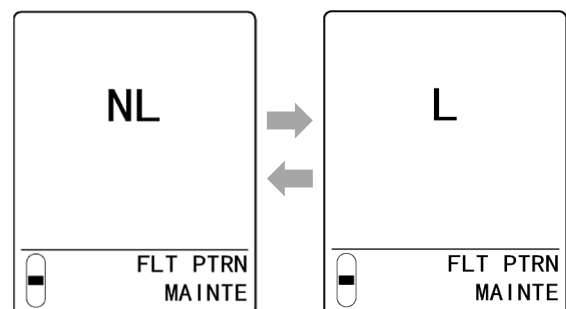
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-10 FLT PTRN], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [NL] or [L], then press the TEST/SET key.



The display reverts to the [SET-10 FLT PTRN] display.

- 4 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET-10 FLT PTRN] display.

7-10-11 Flow automatic adjustment setting (AT FLOW)

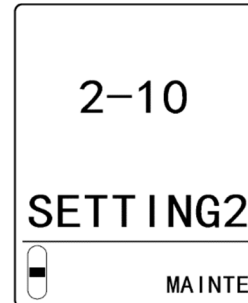
Set the automatic flow adjuster function ON/OFF.

The automatic flow adjuster function is enabled when set to ON.

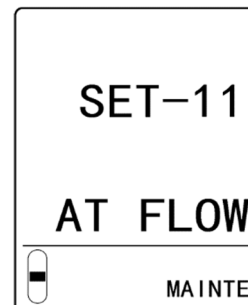
The automatic flow adjuster function is disabled when set to OFF to allow manual flow adjustments.

The default setting is ON.

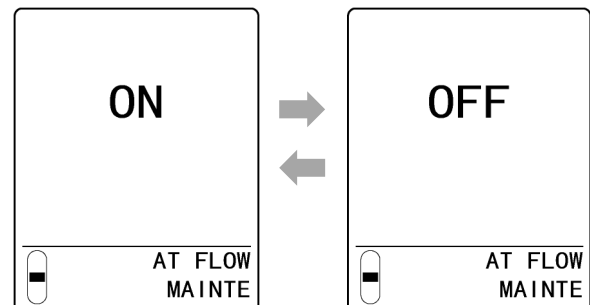
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-11 AT FLOW], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the [SET-11 AT FLOW] display.

- 4 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET-11 AT FLOW] display.

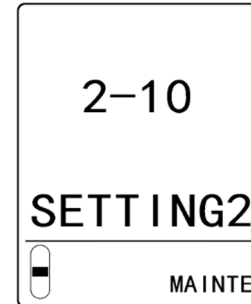
7-10-12 Zero follower setting (ZERO)

Set ON/OFF for the zero follower function for each sensor. (Refer to '6-4-2 Zero follower function'.)
The default setting is ON.

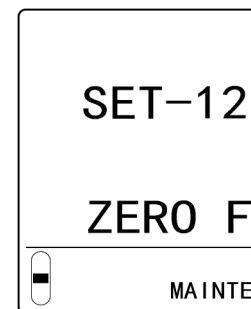
NOTE

- ▶ Zero follower settings are possible for new ceramic type and electrochemical type detection principle sensors.

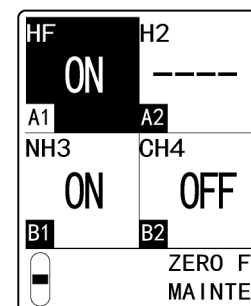
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.**



- 2 Press the ▲ key or ▼ key to select [SET-12 ZERO F], then press the TEST/SET key.**

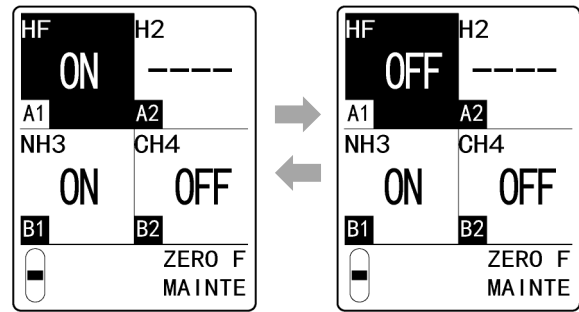


- 3 Press the ▲ key or ▼ key to select the sensor.**
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
The setting value for the selected sensor blinks.



- 4 Press the TEST/SET key to confirm the sensor.**

- 5 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

- 6 Press the MODE key after making the settings.

The display reverts to the [SET-12 ZERO F] display.

- 7 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

7-10-13 24-hour zero follower settings (ZERO 24F)

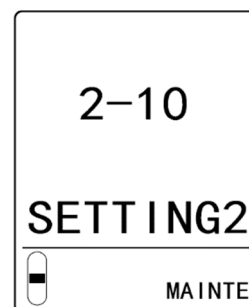
Set ON/OFF for the 24-hour zero follower function for each sensor. (Refer to '6-4-2 Zero follower function'.)

The default setting is ON.

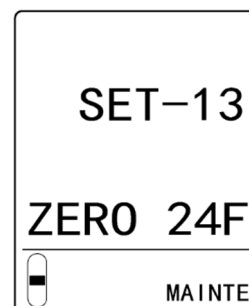
NOTE

- ▶ The 24-hour zero follower settings are possible for new ceramic type and electrochemical type detection principle sensors.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



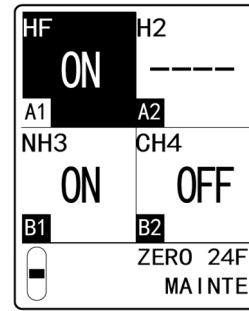
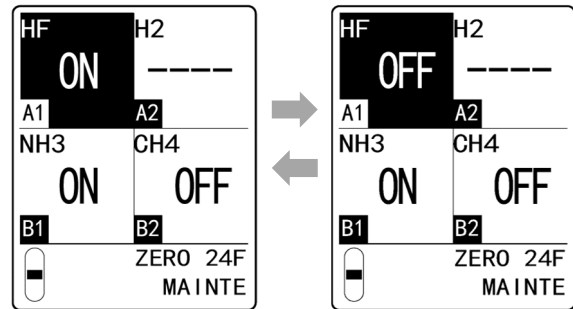
- 2 Press the ▲ key or ▼ key to select [SET-13 ZERO 24F], then press the TEST/SET key.



3 Press the ▲ key or ▼ key to select the sensor.

Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].

The setting value for the selected sensor blinks.

**4 Press the TEST/SET key to confirm the sensor.****5 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.**

The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

6 Press the MODE key after making the settings.

The display reverts to the [SET-13 ZERO 24F] display.

7 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

7-10-14 Sensitivity correction settings (S ASSIST)

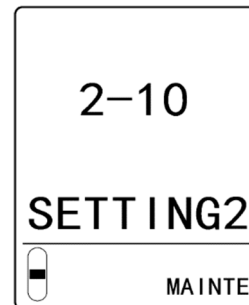
Set ON/OFF for the sensitivity correction function for each sensor. (Refer to '6-4-3 Sensitivity correction function'.)

The default setting is ON.

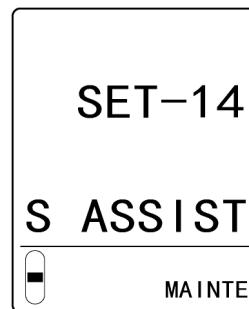
NOTE

- ▶ The sensitivity correction settings are possible for electrochemical type detection principle sensors.

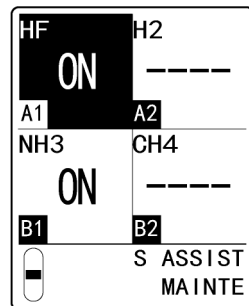
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-14 S ASSIST], then press the TEST/SET key.

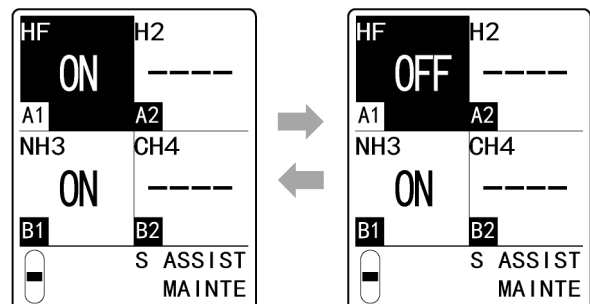


- 3 Press the ▲ key or ▼ key to select the sensor.
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
The setting value for the selected sensor blinks.



- 4 Press the TEST/SET key to confirm the sensor.

- 5 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

6 Press the MODE key after making the settings.

The display reverts to the [SET-14 S ASSIST] display.

7 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

7-10-15 External output in maintenance mode setting (MNT OUT)



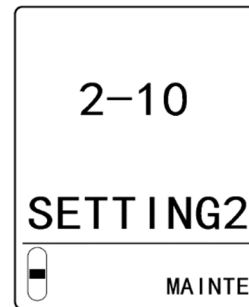
Make settings for external output in maintenance mode for each sensor.

Select one of the following:

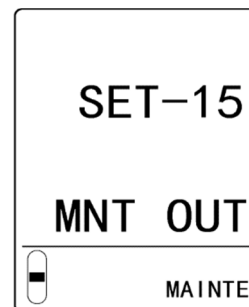
- 2.5 mA ([2.5]) : Set the external output value to 2.5 mA.
- 4 - 20 mA ([4-20]) : Set the external output value to 4 - 20 mA (linked to the display value).
- HOLD ([HOLD]) : Value from immediately prior to detection mode is held.
- 4.0 mA ([4.0]) : Set the external output value to 4.0 mA.

The default setting is 2.5 mA ([2.5]).

1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



2 Press the ▲ key or ▼ key to select [SET-15 MNT OUT], then press the TEST/SET key.

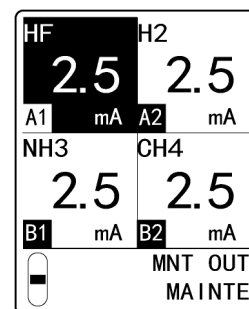


3 Press the ▲ key or ▼ key to select the sensor.

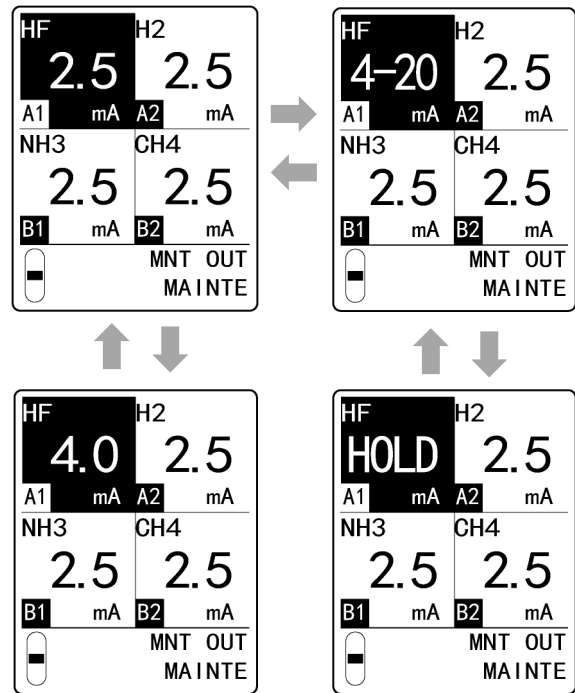
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].

The setting value for the selected sensor blinks.

4 Press the TEST/SET key to confirm the sensor.



- 5 Press the ▲ key or ▼ key to select [2.5], [4-20], [HOLD], or [4.0], then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 5.

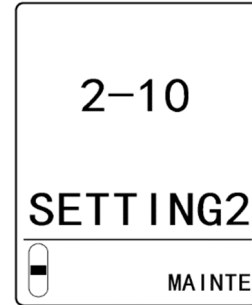
- 6 Press the MODE key after making the settings.
The display reverts to the [SET-15 MNT OUT] display.
- 7 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

7-10-16 External output adjustment (MA 4- 20)

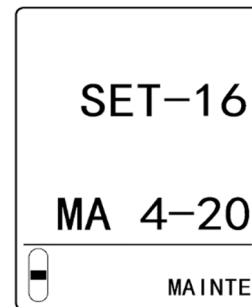
4-20mA EA

Adjust the external output of 4 mA and 20 mA for each sensor.
Connect the device signal cable to an ammeter.

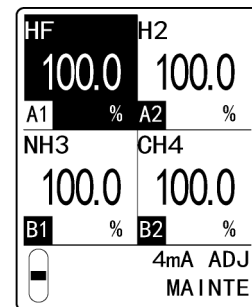
1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



2 Press the ▲ key or ▼ key to select [SET-16 MA 4-20], then press the TEST/SET key.



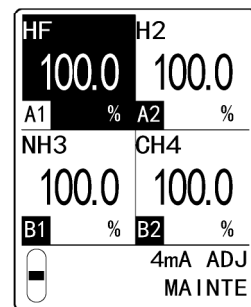
3 Press the ▲ key or ▼ key to select the sensor.
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
The setting value for the selected sensor blinks.



4 Press the TEST/SET key to confirm the sensor.

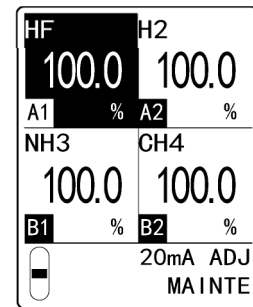
5 Press the ▲ key or ▼ key to adjust the output (%).
Confirm that the ammeter reading is 4 mA and press the TEST/SET key.

<4 mA adjustment>



- 6 Press the ▲ key or ▼ key to adjust the output (%).
Confirm that the ammeter reading is 20 mA and press the TEST/SET key.

<20 mA adjustment>



The display reverts to the display in step 3.

To continue making adjustments for other sensors, repeat steps 3 to 6.

- 7 Press the MODE key after making the settings.
The display reverts to the [SET-16 MA 4-20] display.
- 8 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

7-10-17 Backlight setting (BK LIGHT)

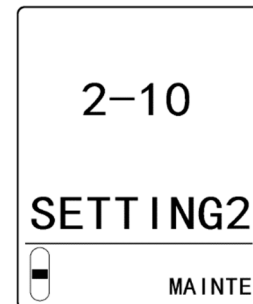
Set ON/SAVE for the LCD backlight.

The backlight will remain lit if this is set to ON.

When set to SAVE, the backlight will illuminate only in the event of an operation/event.

The default setting is ON.

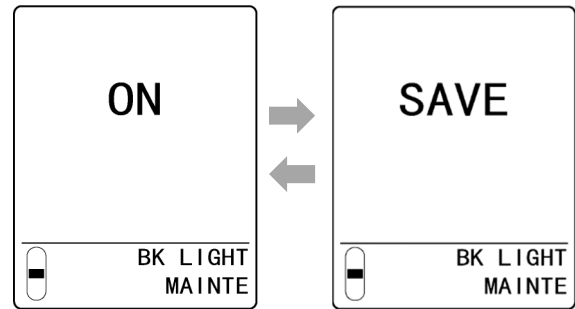
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-17 BK LIGHT], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [SAVE], then press the TEST/SET key.



The display reverts to the [SET-17 BK LIGHT] display.

- 4 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET-17 BK LIGHT] display.

7-10-18 ETHERNET settings (ETHERNET) **ET** **EA**

Make ETHERNET settings.

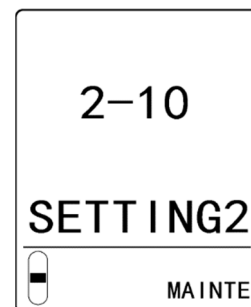
Make the following settings.

- [IP Address] : Set the IP address.
- [Subnet Mask] : Set the subnet mask.
- [Default Gateway] : Set the default gateway.
- [DHCP] : Set DHCP ON/OFF.
The IP address is acquired automatically from the DHCP server if [ON] is selected. [IP Address], [Subnet Mask], and [Default Gateway] settings are not used in this case.
- [PLC Mode] : Set the PLC mode.
- [PLC Area] : Set the PLC area.

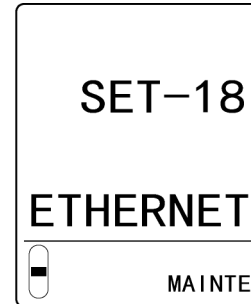
NOTE

- ▶ [MAC Address] is an identification number unique to the device. This setting cannot be changed.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



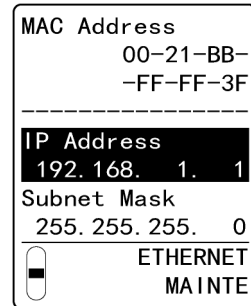
- 2 Press the ▲ key or ▼ key to select [SET-18 ETHERNET], then press the TEST/SET key.



- 3 Select [IP Address], then press the TEST/SET key.

- 4 Press the ▲ key or ▼ key to set the IP address, then press the TEST/SET key.

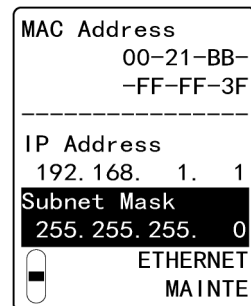
Repeat step 4 to set each of the numerals for the IP address.



- 5 Press the ▲ key or ▼ key to select [Subnet Mask], then press the TEST/SET key.

- 6 Press the ▲ key or ▼ key to set the subnet mask, then press the TEST/SET key.

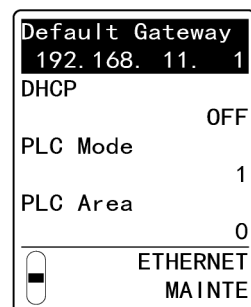
Repeat step 6 to set each of the numerals for the subnet mask.



- 7 Press the ▲ key or ▼ key to select [Default Gateway], then press the TEST/SET key.

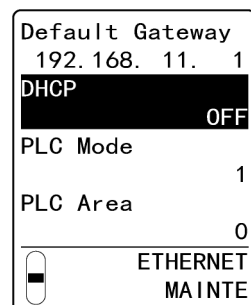
- 8 Press the ▲ key or ▼ key to set the default gateway, then press the TEST/SET key.

Repeat step 8 to set each of the numerals for the default gateway address.



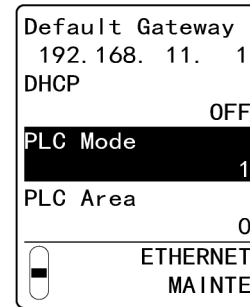
- 9 Press the ▲ key or ▼ key to select [DHCP], then press the TEST/SET key.

- 10 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



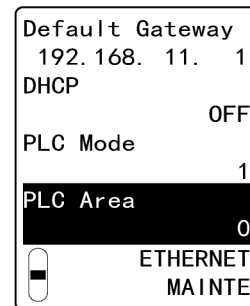
11 Press the ▲ key or ▼ key to select [PLC Mode], then press the TEST/SET key.

12 Press the ▲ key or ▼ key to set the PLC mode, then press the TEST/SET key.



13 Press the ▲ key or ▼ key to select [PLC Area], then press the TEST/SET key.

14 Press the ▲ key or ▼ key to set the PLC area, then press the TEST/SET key.



15 Press the MODE key.

The display reverts to the [SET-18 ETHERNET] display.

16 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in each of the ETHERNET settings to revert to the previous setting.
-

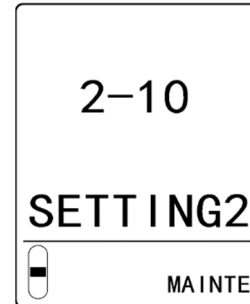
7-10-19 Pump drive level diagnostic settings (PUMP CK)

Set ON/OFF for pump drive level diagnostics.

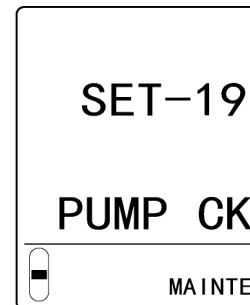
Set to ON to run periodic diagnostics on pump drive levels.

The default setting is ON.

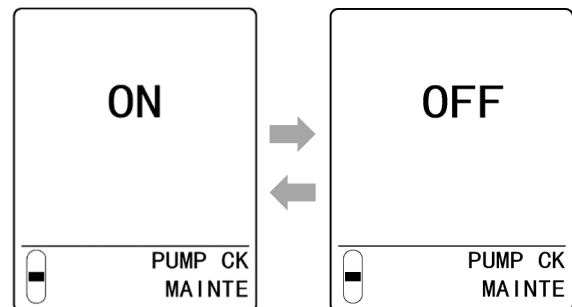
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-19 PUMP CK], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the [SET-19 PUMP CK] display.

- 4 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

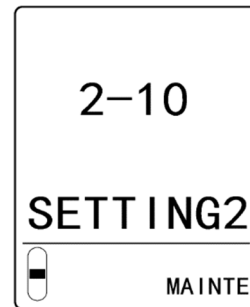
NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET-19 PUMP CK] display.

7-10-20 Setting for the behavior of fault contacts when flow is low (FLT RLY) **4-20mA** **EA**

Set the operation of fault contacts when flow is low ON or OFF.
When set to ON, fault contacts operate when the flow is low.
The default setting is ON.

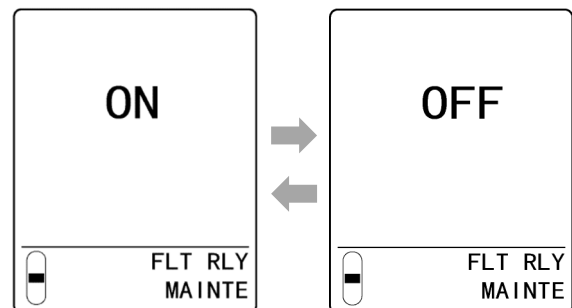
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-20 FLT RLY], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the [SET-20 FLT RLY] display.

- 4 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET-20 FLT RLY] display.

7-10-21 External output during fault setting (FLT OUT) 4-20mA EA

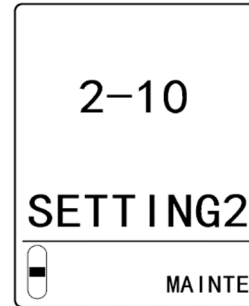
Set the external output when there is a fault for each sensor.

Select one of the following:

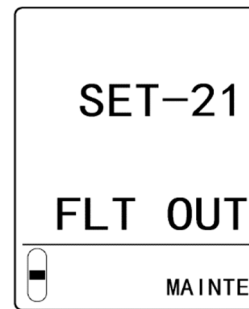
- 0.5 mA ([0.5]) : Set the external output value to 0.5 mA.
- 21.5 mA ([21.5]) : Set the external output value to 21.5 mA.
- OPT ([OPT]) : Set in the range between 0.0 mA and 4.0 mA. (digit: 0.1)

The default setting is 0.5 mA ([0.5]).

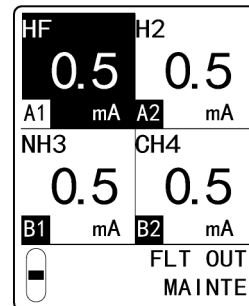
1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



2 Press the ▲ key or ▼ key to select [SET-21 FLT OUT], then press the TEST/SET key.



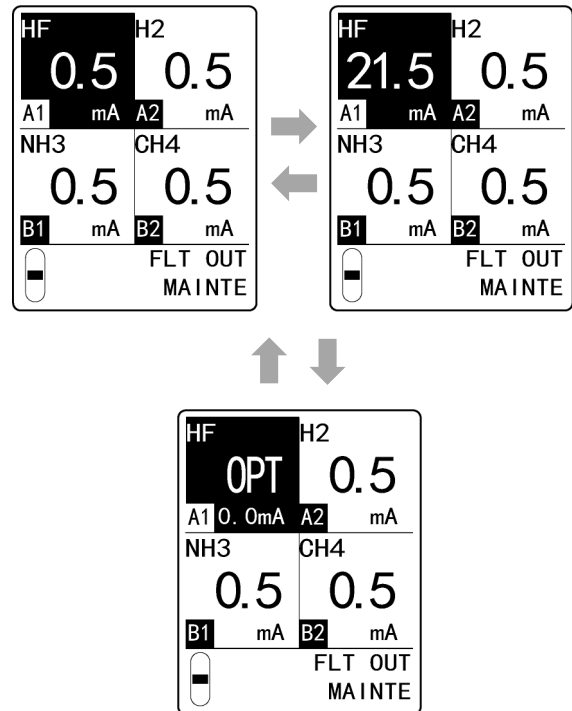
3 Press the ▲ key or ▼ key to select the sensor.
 Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
 The setting value for the selected sensor blinks.



4 Press the TEST/SET key to confirm the sensor.

5 Press the ▲ key or ▼ key to select [0.5], [21.5], or [OPT], then press the TEST/SET key.

If you select [OPT], press the ▲ key or ▼ key to set the external output value, then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other sensors, repeat steps 3 to 6.

6 Press the MODE key after making the settings.

The display reverts to the [SET-21 FLT OUT] display.

7 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

7-10-22 Caution display setting (CAU DISP)

Set whether to display cautions on the LCD.

Set ON/OFF for the following cautions:

For more information on each caution, refer to '10. Troubleshooting'.

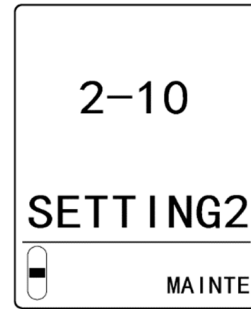
- E-8X (E-80, E-81, E-82)
- E- 9
- E- 6
- E-94
- E-5X (E-50, E-56, E-57, E-58, E-59)
- E-15
- E-83
- E-84
- E-98

The default settings are as follows:

EA models, ET models: All cautions are ON

4 - 20 mA models: [E- 6] is OFF, all others are ON

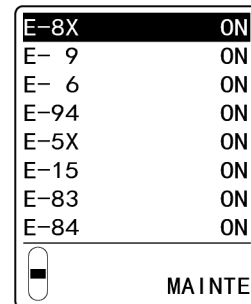
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



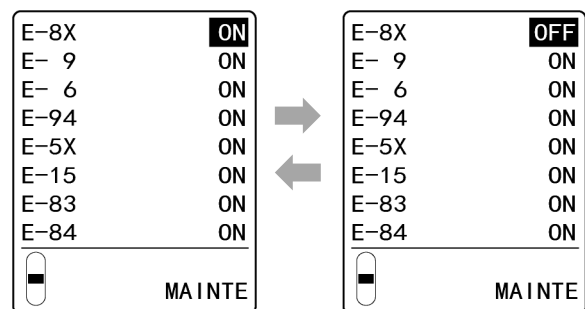
- 2 Press the ▲ key or ▼ key to select [SET-22 CAU DISP], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select the fault code, then press the TEST/SET key.



- 4 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the display in step 3.

To continue making settings for other fault codes, repeat steps 3 to 4.

- 5 Press the MODE key after making the settings.

The display reverts to the [SET-22 CAU DISP] display.

- 6 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

7-10-23 Caution output setting (CAU OUT)

Set whether to externally output cautions.

Set ON/OFF for the following cautions.

For more information on each caution, refer to '10. Troubleshooting'.

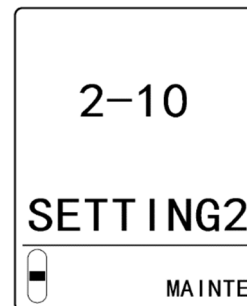
- E-8X (E-80, E-81, E-82)
- E- 9
- E- 6
- E-94
- E-5X (E-50, E-56, E-57, E-58, E-59)
- E-15
- E-83
- E-84
- E-98

The default settings are as follows:

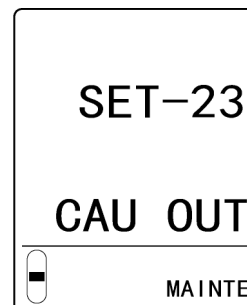
EA models, ET models: All cautions are ON

4 - 20 mA models: [E- 6] is OFF, all others are ON

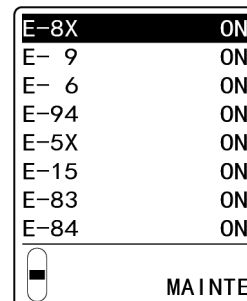
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



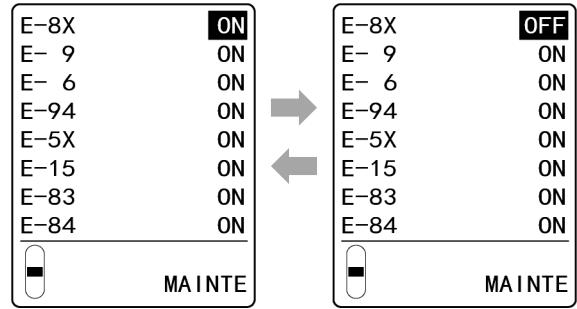
- 2 Press the ▲ key or ▼ key to select [SET-23 CAU OUT], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select the fault code, then press the TEST/SET key.



- 4 Press the ▲ key or ▼ key to select [ON] or [OFF], then press the TEST/SET key.



The display reverts to the display in step 3.
To continue making settings for other fault codes, repeat steps 3 to 4.

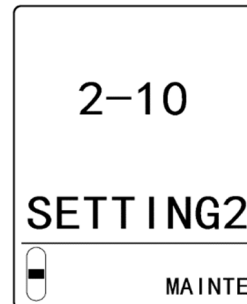
- 5 Press the MODE key after making the settings.
The display reverts to the [SET-23 CAU OUT] display.

- 6 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

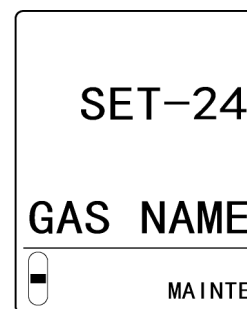
7-10-24 Displayed gas name setting (GAS NAME)

Set the gas name displayed on the LCD for each sensor.
Gas names can be up to eight characters in length.

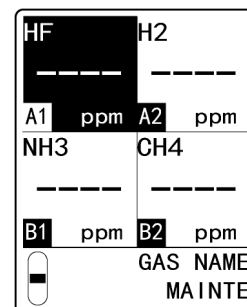
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-24 GAS NAME], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to select the sensor.
Press the ▲ key or ▼ key repeatedly to cycle through the following settings: [A1]⇔[A2]⇔[B1]⇔[B2].
[----] for the selected sensor blinks.



- 4 Press the TEST/SET key to confirm the sensor.

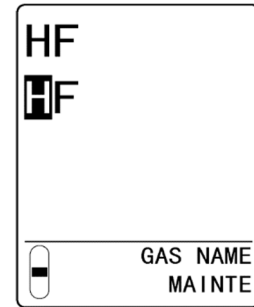
5 Press the TEST/ SET key or MODE key to move the cursor.

To move to the next character, press the TEST/SET key.
To move to the previous character, press the MODE key.

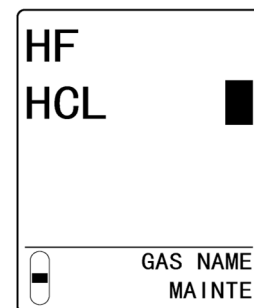
6 Press the ▲ key or ▼ key to select the character, then press the TEST/SET key.

Press the ▲ key or ▼ key repeatedly to cycle through character types: numbers (0 - 9), letters (A - Z), "-" (bar), and the space character.

Press the SHIFT key to switch between upper and lower case.



7 Repeat steps 5 and 6. Move the cursor to the end of line after making the settings, then press the TEST/SET key.



The display reverts to the display in step 3.

The display will also return to the display in step 3 after you move the cursor to the beginning of the line and press the MODE key.

To continue to set the gas names for other sensors, repeat steps 3 to 7.

8 Press the MODE key after making the settings.

The display reverts to the [SET-24 GAS NAME] display.

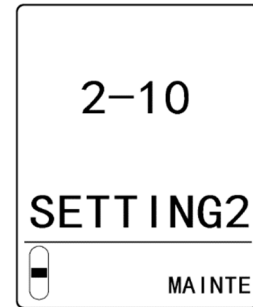
9 Press the MODE key.

The display reverts to the [2-10 SETTING2] display.

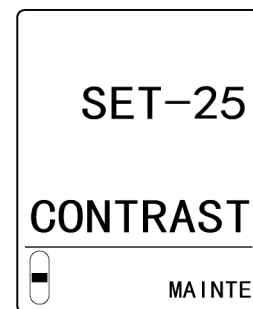
7-10-25 LCD contrast adjustment (CONTRAST)

Adjust the contrast of the LCD.

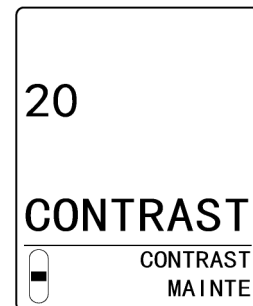
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2-10 SETTING2], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET-25 CONTRAST], then press the TEST/SET key.



- 3 Press the ▲ key or ▼ key to adjust contrast, then press the TEST/SET key.



The display reverts to the [SET-25 CONTRAST] display.

- 4 Press the MODE key.
The display reverts to the [2-10 SETTING2] display.

NOTE

- ▶ Press the MODE key in step 3 to cancel the settings and return to the [SET-25 CONTRAST] display.

8

Replacing and cleaning parts

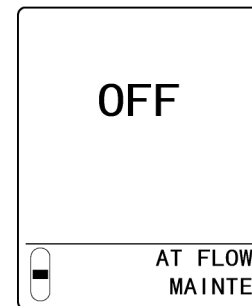
8-1 Replacing consumable parts

The sensors and dust filters are consumables.
Replace them when needed based on operating conditions.

8-1-1 Replacing sensors

If the main unit is running, stop the pump and fan before replacing the sensors.

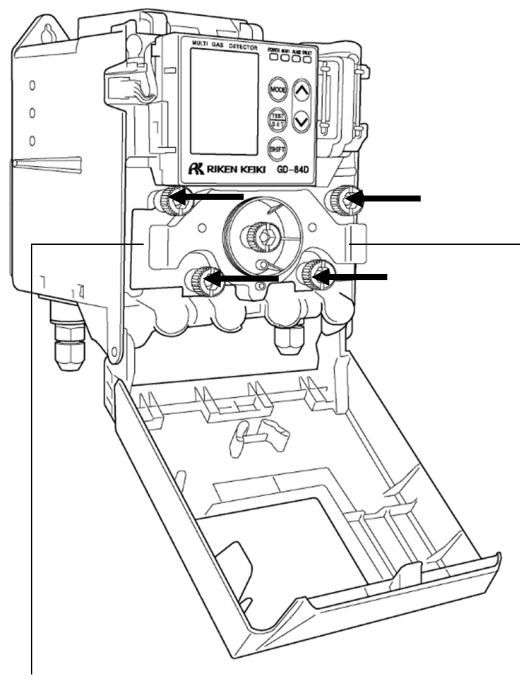
- 1 In maintenance mode , press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



- 2 Press the ▲ key or ▼ key to select [SET- 3 MAINTE], then press the TEST/SET key.
The pump and fan stop.



- 3 **Pull the projection on the top of the main unit towards you to open the front cover.**
The front cover opens to approximately 120°. Push further to open to 180°.
- 4 **Loosen the four white knurled screws on the chamber unit.**
- 5 **Grasp the projections on the left and right of the chamber unit. Pull towards you and lower to open.**



Chamber unit projection

Chamber unit projection

- 6 **Press the ▲ key or ▼ key to select the sensor to replace, then press the TEST/SET key.**
Multiple sensors can be selected.
Pressing the ▼ key with the [B2] sensor selected will initiate suction of all gases. Do not press the ▼ key while the [B2] sensor is selected until you have returned the chamber unit to its original position.

A1	: B248
	HF
A2	: SHF-8603
	H2
B1	: B242
	NH3
B2	: SGF-8581
	CH4
	MAINTE
	MAINTE



A1	: B248
	1.5 ppm
A2	: SHF-8603
	2000 ppm
B1	: B242
	75.0 ppm
B2	: SGF-8581
	2000 ppm
	MAINTE
	MAINTE

The following information is displayed, depending on the status of the selected sensor:

- [Not any]: Not connected
- [Dummy]: Dummy connection
- [C-01][C-02]: The sensor was replaced.
- [C-03][C-04]: Problem with sensor combination or the sensor is incompatible.
- [USED]: The sensor may be older than the one previously fitted.
- [COMB]: Problem with sensor combination

A1	: Not any
A2	: Dummy
	C-02
B1	: B242
	75.0 ppm
B2	: SGF-8581
	2000 ppm
	MAINTE
	MAINTE

7 Remove the sensor.

Remove the sensor fitted to the position selected in step 6.

The LEDs for sensors that can be removed will turn off.
Grasp the cylindrical part of the sensor and pull out.

8 Attach the new sensor.

Grasp the cylindrical part of the sensor. Match the face of the connector on the main unit and the connector on the sensor, then push in firmly to secure in place.

Avoid pressing on the top of the sensor while doing this.

Doing so may damage the sensor.

The LED lights up (green) to indicate the sensor is attached.

In the screen for step 6, confirm that there are no problems with the sensor replacement.

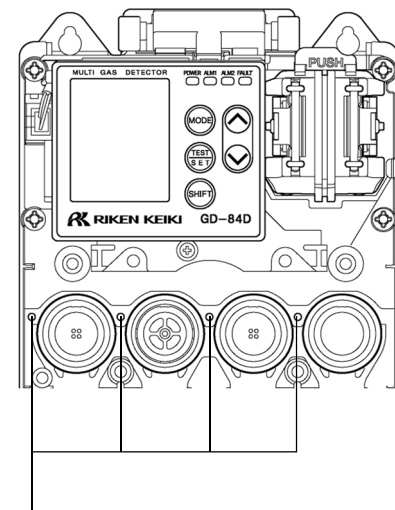
9 Return the chamber unit to its original position.**10 Tighten the four white knurled screws on the chamber unit.**

Tighten the knurled screws so that the chamber unit is secured in place.

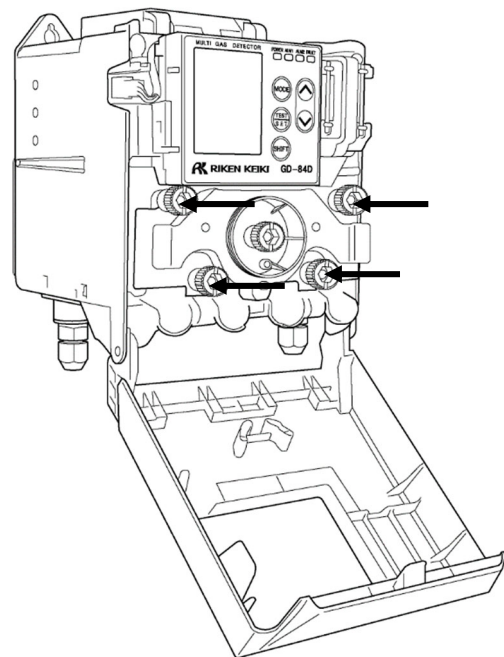
Gas leaks may result if the knurled screws are not tightened properly.

11 Close the front cover on the main unit.

Close the front cover firmly so that it clicks back into place.

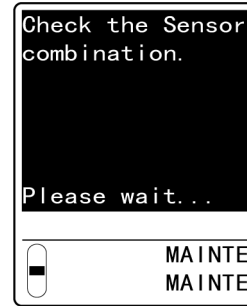
12 Select the [B2] sensor and press the ▼ key.

LED for confirming fitted status



A1	: B248 HF
A2	: SHF-8603 H2
B1	: B242 NH3
B2	: SGF-8581 CH4
	MAINTE
	MAINTE

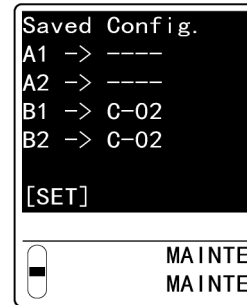
The pump and fan restart. The sensor reconnection and sensor combinations are confirmed.



13 Press the TEST/ SET key when the screen indicates sensor replacement is complete.

The display reverts to the [SET- 3 MAINTE] display.

If replacement was not completed properly, refer to '<If sensors couldn't be replaced correctly>' in this section.



14 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

CAUTION

- To attach the sensor to the main unit, match the face of the connector on the main unit and the connector on the sensor, then push in firmly to secure into place. Improper attachment may cause the sensor to fall out and damage the connector.
- Perform calibration (zero calibration, span adjustment) after sensor replacement.

NOTE

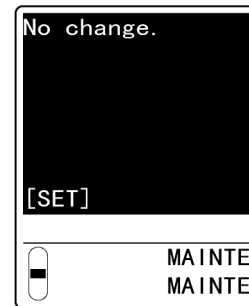
- ▶ Press the SHIFT key in the screen for selecting the sensor in step 6 to display information on the sensor just replaced.



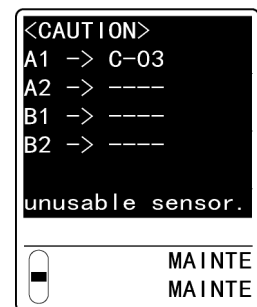
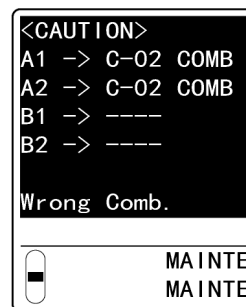
<If sensors couldn't be replaced correctly>

Depending on the problem, one of the following screens will appear if sensor replacement was unsuccessful:

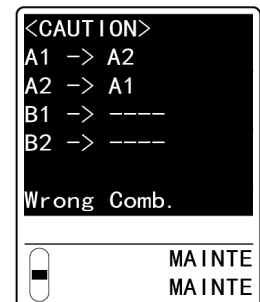
- If sensor was not replaced
Press the TEST/SET key so the display returns to the [SET- 3 MAINTE] display.
The pump and fan will restart.



- Problem with sensor combination or incompatible sensor
It is not possible to return to detection mode. Confirm the sensor combination (sequence) and contact our sales department.

**NOTE**

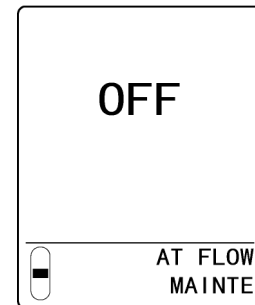
- ▶ If the screen indicates a problem with the sensor combination, press the SHIFT key to determine if you can fix the problem by swapping the sensors within the same flow passage. If this is possible, an example of sensor combinations will be displayed.



8-1-2 Dust filter replacement

Check to confirm that the dust filters are neither dirty nor clogged. Replace, if necessary.
If the main unit is running, stop the pump and fan before replacing the dust filter.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.**



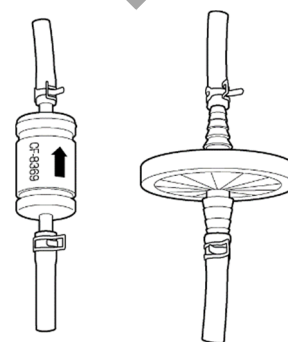
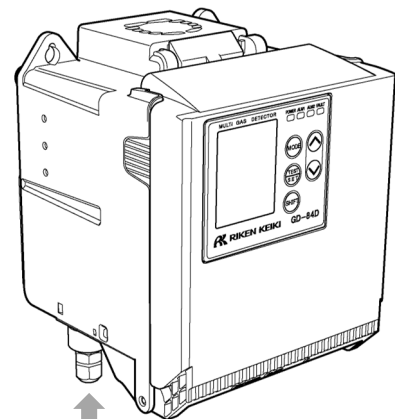
- 2 Press the ▲ key or ▼ key to select [SET- 3 MAINTE], then press the TEST/SET key.**
The pump and fan stop.



- 3 Remove the dust filter fitted to the GAS IN side of the main unit.**

The dust filter varies depending on the operating environment.

- 4 Fit a new dust filter to the GAS IN side of the main unit.**



- 5 Once replacement is complete, press the MODE key.**
The display returns to the [SET- 3 MAINTE] display. The pump and fan will restart.

- 6 Press the MODE key.**
The display reverts to the [2- 9 SETTING1] display.

8-2 Replacing periodic replacement parts

8-2-1 List of recommended periodic replacement parts

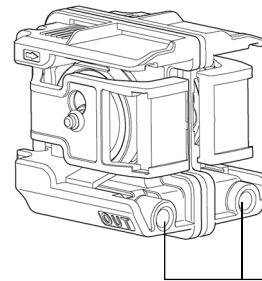
No.	Name	Check interval	Replacement interval	Quantity (piece/unit)
1	Pump unit	0.5 years	1 - 2 years	1
2	Flow sensor unit	1 year	5 years	1
3	Fan unit	0.5 years	2 - 4 years	1

8-2-2 Pump unit replacement

If the main unit is running, stop the pump and fan before replacing the pump unit.

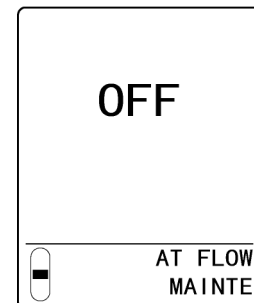
NOTE

- ▶ Before fitting the pump unit, confirm that the pump unit connections (flow passages) are free of dirt or other foreign matter. The grease applied to the connecting parts attracts dirt.



Connecting parts
(flow passages)

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



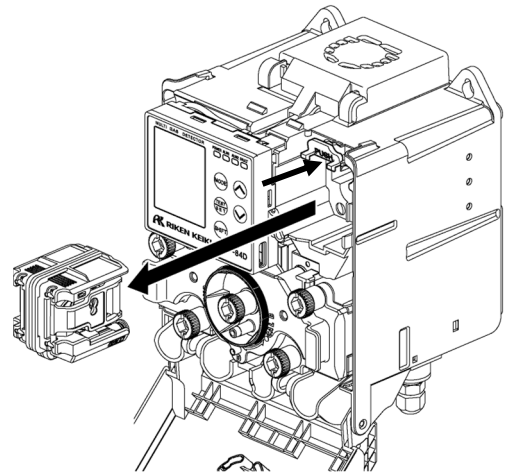
- 2 Press the ▲ key or ▼ key to select [SET- 3 MAINTE], then press the TEST/SET key.
The pump and fan stop.



- 3 Pull the projection on the top of the main unit towards you to open the front cover.**

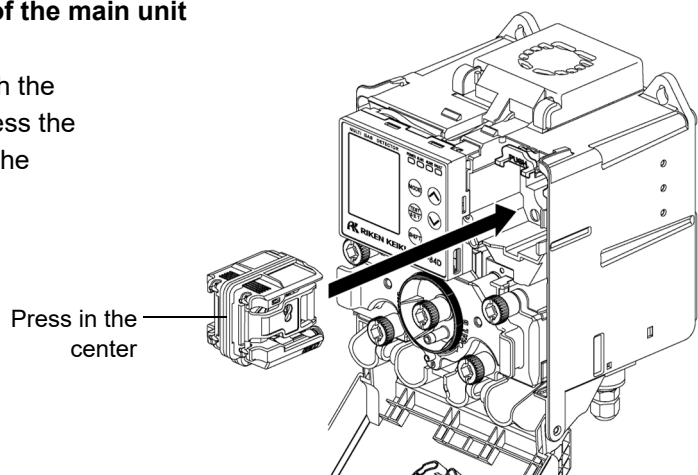
The front cover opens to approximately 120°. Push further to open to 180°.

- 4 Push in on the part indicated with “PUSH” on the top of the pump unit, then pull the pump unit forward.**



- 5 Match the new pump unit to the shape of the main unit and push into place.**

Match the projections on the pump unit with the grooves on the main unit, then push in. Press the center of the pump unit, pushing it so that the pump unit is secured properly.



- 6 Close the front cover on the main unit.**

Close the front cover firmly so that it clicks back into place.

- 7 Once replacement is complete, press the MODE key.**

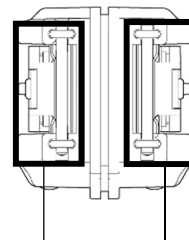
The display returns to the [SET- 3 MAINTE] display. The pump and fan will restart.

- 8 Press the MODE key.**

The display reverts to the [2- 9 SETTING1] display.

NOTE

- ▶ When pressing the pump unit into the main unit, do not press on the diaphragms on the sides of the pump unit.

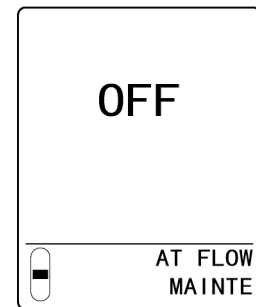


Do not press on these parts

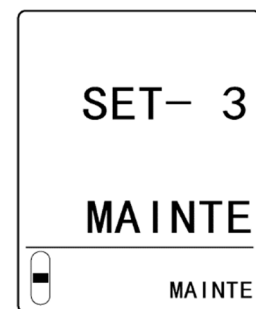
8-2-3 Flow sensor unit replacement

If the main unit is running, stop the pump and fan before replacing the flow sensor unit.

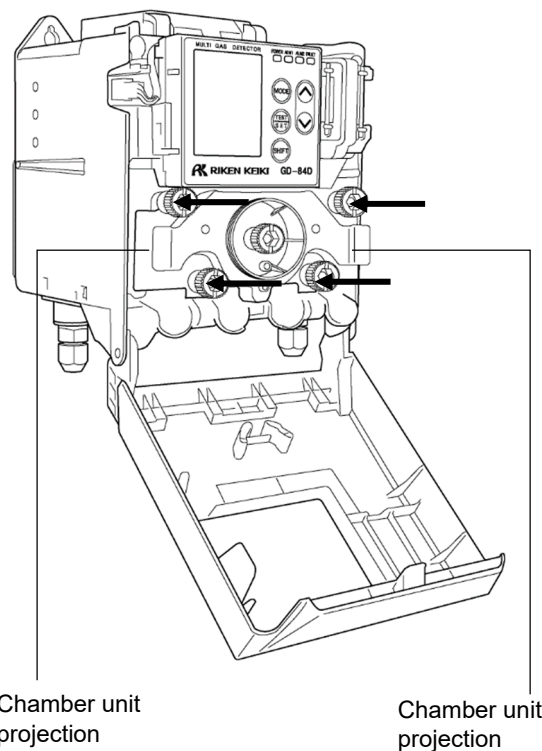
- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



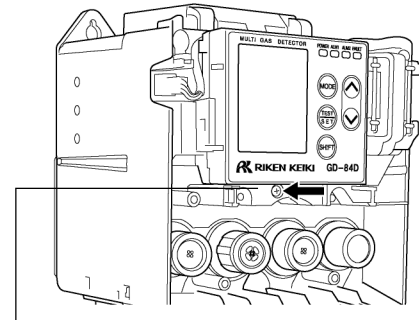
- 2 Press the ▲ key or ▼ key to select [SET- 3 MAINT], then press the TEST/SET key.
The pump and fan stop.



- 3 Pull the projection on the top of the main unit towards you to open the front cover.
The front cover opens to approximately 120°. Push further to open to 180°.
- 4 Loosen the four white knurled screws on the chamber unit.
- 5 Grasp the projections on the left and right of the chamber unit. Pull towards you and lower to open.

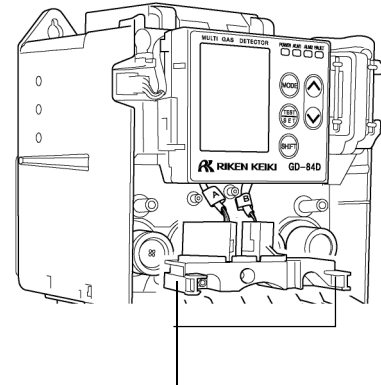


6 Unscrew the one screw securing the flow sensor unit.



Flow sensor unit

7 Grasp the projections on the left and right of the flow sensor unit and pull out.



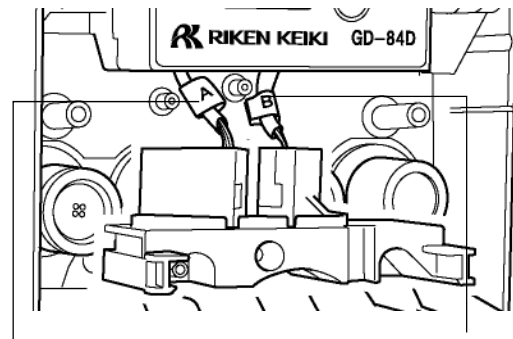
Flow sensor unit projections

8 Disconnect cable A and cable B connected to the two connectors on the flow sensor unit.

Pulling the cable with excessive force may break the cable. Do not use undue force.

9 Connect cable A and cable B to the two connectors on the new flow sensor unit.

Connect cable A to the A side on the flow sensor unit, and connect cable B to the B side. You can confirm the A side and B side of the flow sensor unit with the printed guide on top.



Cable A

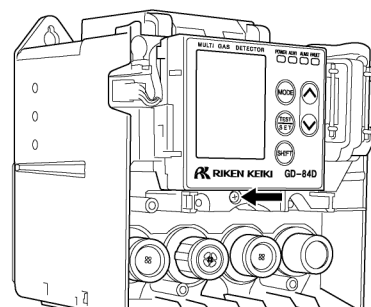
Cable B

10 Match the flow sensor unit to the shape of the main unit and push into place.

Fit to the main unit while taking care not to pinch the flow sensor unit cable.

11 Use one screw to secure the flow sensor unit.

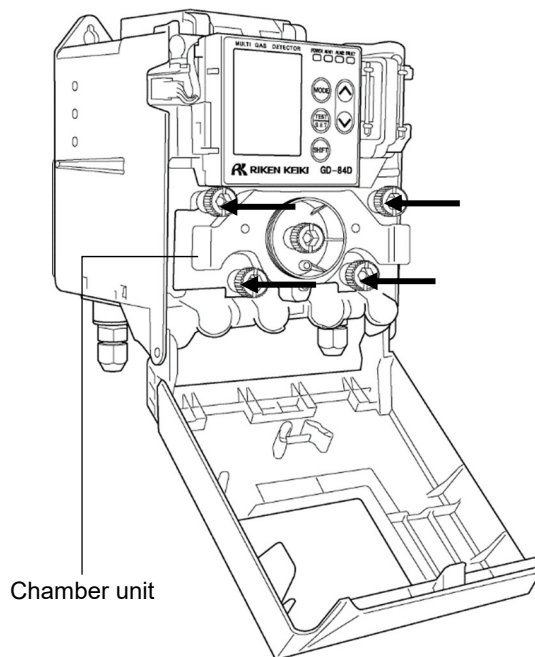
Confirm that the flow sensor unit is firmly secured. Gas leaks may result if it is not firmly secured.



12 Return the chamber unit to its original position.**13 Tighten the four white knurled screws on the chamber unit.**

Tighten the knurled screws so that the chamber unit is secured in place.

Gas leaks may result if the knurled screws are not tightened properly.

**14 Close the front cover on the main unit.**

Close the front cover firmly so that it clicks back into place.

15 Once replacement is complete, press the MODE key.

The display returns to the [SET- 3 MAINTE] display. The pump and fan will restart.

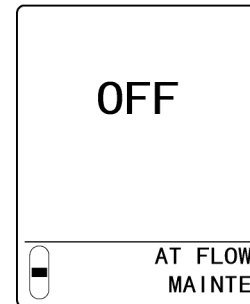
16 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

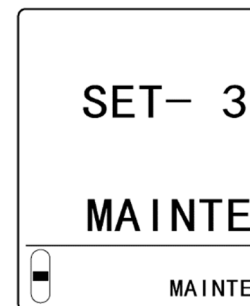
8-2-4 Fan unit replacement

If the main unit is running, stop the pump and fan before replacing the fan unit.

- 1 In maintenance mode, press the ▲ key or ▼ key to select [2- 9 SETTING1], then press the TEST/SET key.



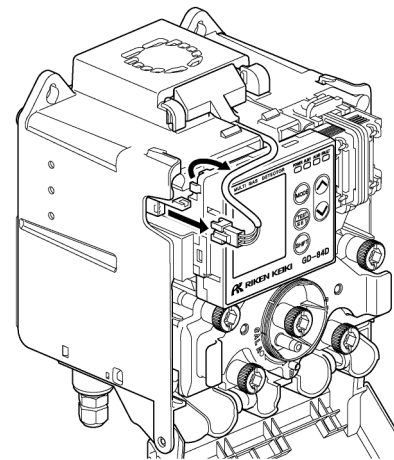
- 2 Press the ▲ key or ▼ key to select [SET- 3 MAINTE], then press the TEST/SET key.
The pump and fan stop.



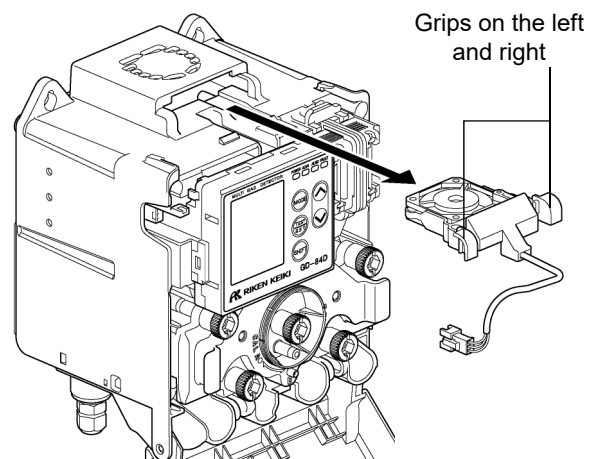
- 3 Pull the projection on the top of the main unit towards you to open the front cover.
The front cover opens to approximately 120°. Push further to open to 180°.

- 4 Disconnect the fan unit connector on the left side of the front of the main unit.

- 5 Pull the fan unit cable out of the groove in the main unit.

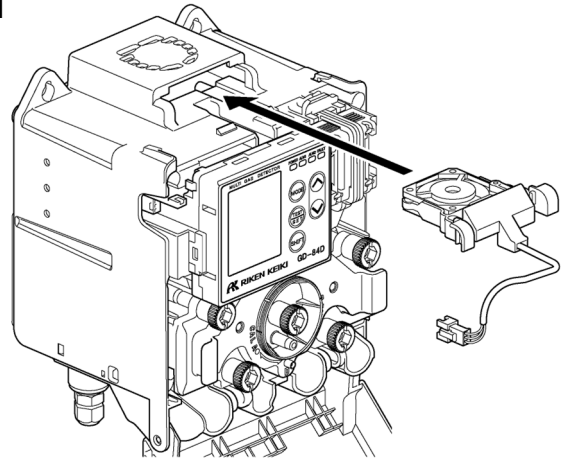


- 6 Grasp by the grips on the left and right of the fan unit and pull out.



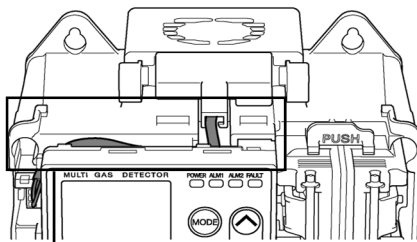
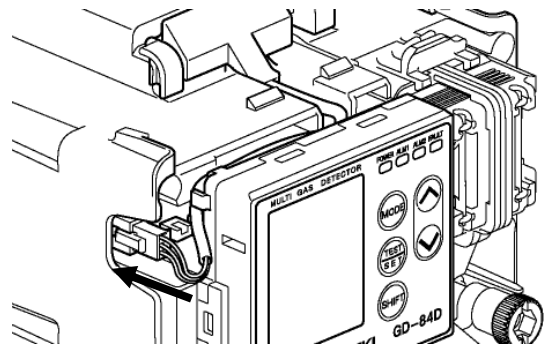
7 Match the fan unit to the shape of the main unit and push into place.

Grasp by the grips on the left and right of the fan unit and push in until it is secured to the main unit.



8 Insert the fan unit cable into the groove in the main unit.

Confirm that the cable for the fan unit does not project from the groove in the main unit when viewed from the front. Failure to insert the cable properly may result in disconnection.



Insert so that it does not project from the groove.

9 Connect the fan unit connector to the main unit.

10 Close the front cover on the main unit.

Close the front cover firmly so that it clicks back into place.

11 Once replacement is complete, press the MODE key.

The display returns to the [SET- 1 MAINTE] display and the pump and fan restart.

12 Press the MODE key.

The display reverts to the [2- 9 SETTING1] display.

8-3 Cleaning this product

Clean the product if it becomes excessively dirty.

- Always turn the power OFF before cleaning the product.
- Wipe off any dirt with a dry cloth.
Using water or organic solvents to clean the product may result in malfunctions.
- Use dry air to clean pipes. Pipes with extremely dirty interiors can affect gas detection.

9

Storage, Relocation, and Disposal

9-1 Procedures for storage or when not used for extended periods

The product must be stored under the following conditions:

- At normal temperature and humidity in a location not exposed to strong light (e.g., direct sunlight)
- In a location free of gases, solvents, and vapors

<Storage conditions (Sensor)>

Model	Storage limit (years)	Temperature (°C)		Humidity* (% RH)		Pressure (kPa)		Remarks
		Min	Max	Min	Max	Min	Max	
SGF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> • The sensor must be stored in the specified packing case. • Store in a location not exposed to direct sunlight. • Store in an environment free of corrosive gas, vibration, and dust. • Avoid condensation and moisture. • Store in an environment free of gases that may result in catalyst poisoning (e.g., silicone, chlorine, sulfur gases).
SHF	0.5	-10	40	0	90	80	120	
NCF	0.5	-10	40	0	90	80	120	
ESF	0.5	-10	40	0	90	80	120	

* Maximum humidity corresponds to an absolute humidity of 33 g/m³ (33.6 °C, 90 % RH).

9-2 Relocation or reuse

Before relocating the product, refer to '4-1 Installation precautions' and '4-4 Installing the main unit' for guidance on the relocation destination. Refer to '4-6 Wiring procedure' and '4-7 Pipe installation' for information on wiring and pipe installation.

Try to keep the unpowered period as brief as possible during the relocation.



CAUTION

- Gas calibration must be performed before restarting a product that has been relocated or previously stopped and stored. Contact our sales department for readjustments, including calibration.

9-3 Product disposal

- Used sensors must be returned to our sales department.
- Avoid direct contact with any fluid that leaks from the electrochemical type sensor (ESF). Place the unit into a plastic bag. Make sure the fluid cannot leak out.
If fluid leaks from the sensor in the detector head, turn the power OFF and immediately contact our sales department.
- Dispose of the the gas monitor as industrial waste (incombustible) in accordance with local regulations.
- The product contains internal batteries. In the EU, note that disposal of products with built-in batteries must comply with specific procedures. Contact your nearest sales office for advice.
- In the EU, the built-in battery must be disposed of appropriately if an electrochemical type sensor (ESF) incorporated into this product is discarded. Contact your nearest sales office for advice.

<Battery built into the electrochemical type sensor (ESF)>

Model	Type
CR1632	Lithium battery

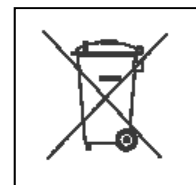


WARNING

- Never disassemble the sensor.
Electrochemical type sensors (ESF) contain electrolyte. Contact with electrolyte may result in skin inflammation. Contact with eyes may result in blindness. Contact with clothing may result in discoloration or damage to the fabric.
If contact occurs, rinse the area immediately with water.

NOTE

- ▶ Crossed-out recycle dustbin mark
This pictogram means batteries must be separated from ordinary waste and disposed of appropriately.
This pictogram is affixed to products containing batteries to which EU Battery Directive 2006/66/EC applies. These batteries must be disposed of as specified by the latest directive.



10

Troubleshooting

This troubleshooting section does not address causes of all problems that may occur with the product. It provides brief explanations to assist in determining the causes of common problems.

If you encounter symptoms not addressed here or if problems persist even after taking corrective action, contact our sales department.

10-1 Product abnormalities

<Power source related problems>

Symptom/Display	Cause	Corrective action
The power cannot be turned on.	The power switch is turned OFF	Turn the power switch ON.
	Power supply circuit abnormality/instantaneous interruption	Confirm the voltage for the 24 V DC power source. For PoE+ connections, check the function and specifications of the PoE power hub. Review your setup and assess the need for an uninterruptible power source, power line filter, or insulating transformers.
	Incorrect installation of main unit	When using 24 V DC to power the product, check to confirm that the terminal unit is connected correctly. If no improvement occurs, contact our sales department. If you are using a PoE+ connection, contact our sales department.
	Cable problems (damage, loose connections, short circuits)	Check the wiring for this product and for other devices in the vicinity.
Abnormal operation	Effects of sudden surge noise	Turn the power OFF and restart. If similar symptoms recur frequently, take appropriate measures to address the noise source.

<Sensor abnormalities>

If the category is "fault alarm", the fault lamp (FAULT) either lights or flashes.

Category	Symptom/Display (Fault code)	Cause	Corrective action
Fault Alarm	E-10 F-UNIT	The sensor is not connected or connected improperly.	Check to confirm that the sensor is properly attached and that the connector of the sensor is properly connected.
		There are problems with communicating with the sensor.	Replace with a new sensor.
	E-18 S ZERO	Zero drift due to changes in ambient conditions or deterioration exceeded the zero follower function range.	Perform zero calibration. Replace the sensor if this happens often even after zero calibration.
	E-11 SENSOR	There is a problem with the sensor.	Replace with a new sensor. Avoid handling with bare hands if you see signs of external damage. Handle carefully.
	E-12 CIRCUIT		
	E-13 S VOLT		
	E-14 S E-VOLT		
	E-15 S K-VOLT		
	E-16 S E-CUR		
	E-20 S ROM		
	E-21 S RAM		
	E-22 S MEMORY		
	E-23 S EXT-AD		
	E-27 S S-VOLT		
E-28 S TEMP			
E-29 S B-VOLT			
Warnings Display	E-80	The sensor has reached the end of its service life or is degraded; or the output device has reached the end of its service life.	Replace with a new sensor.
	E-81		
	E-82		
	E-83	The temperature exceeded the maximum temperature at which the sensor is designed to function.	Ambient temperatures may exceed specifications. Gas detection can still be performed in this state, but the sensor will degrade more quickly. If possible, use within the temperature range indicated in the specifications. Replace the sensor if this occurs frequently even at temperatures within specifications.
	C-15	A warning was triggered in the sensor.	Gas detection can still be performed in this state, but performance may be impaired. Replace the sensor as soon as possible.
E-84			

<Flow abnormalities>

If the category is "fault alarm", the fault lamp (FAULT) either lights or flashes.

Category	Symptom/Display (Fault code)	Cause	Corrective action
Fault Alarm	E-51 FLOW	The protective rubber caps are still attached.	Remove the protective rubber caps attached to GAS IN and GAS OUT.
		Pump failure	Replace the pump unit.
		Flow loss due to clogged dust filter	Replace the dust filter.
		Flow loss due to bent or blocked inlet or outlet tube.	Fix the problem.
		The sensor is not connected or connected improperly.	Check to confirm that the sensor is properly attached and that the sensor connector is connected properly.
	E-52 F SENS 1	Flow sensor wire breaks or faulty connection.	Contact our sales department.
E-53 F SENS 2			
Warnings Display	E-50 FLOW	Flow instability due to impaired pump performance	The pump (and pump performance) may be degraded. Gas detection can still be performed in this state. However, you should replace the pump unit as soon as possible.
		Flow instability due to clogged dust filter	Replace the dust filter.
		Flow instability due to bent or blocked inlet or outlet tube	Fix the problem.
	E-56 PATH	Improper installation of the chamber unit, knurled screws not tightened properly	Fasten the chamber unit properly.
		The chamber switching unit is not at the proper position.	Return the chamber switching unit to the [D] (detection mode) position.
		Blockage in one of the flow passages	Fix the problem.
	E-58 F SENS 1	An abnormality was discovered during routine flow sensor diagnostics.	The flow sensor performance may be degraded. Degradation of the flow sensor may result in false readings (i.e., the flow may be outside the stipulated range of 0.6 L/min ± 10% (0.54 - 0.66) even if the displayed flow is the stipulated value. It is still possible to detect gases as long as no other fault alarm such as flow loss occurs. Note that you must replace the flow sensor to clear this warning. Contact our sales department.
	E-59 F SENS 2		
	-	The difference between the flow measured on the main unit and the actual flow is beyond specifications. (0.6 L/m ± 10% (0.54 - 0.66))	Improper flow default setting

<System abnormality>

If the category is "fault alarm", the fault lamp (FAULT) either lights or flashes.

Category	Symptom/Display (Fault code)	Cause	Corrective action
Fault Alarm	E-99 B-VOLT	The power supply voltage is not within the specified range of values.	Check the voltage of the supplied power source.
	E-96 TERM	The terminal unit isn't connected.	Check the connections to the terminal unit. For the ET model, go to maintenance mode and set the terminal unit to OFF. (Refer to '7-9-5 Terminal unit settings (OPT ACT)').
		Communication problems between the main unit and the terminal unit	
		System error in terminal unit	Contact our sales department.
	E-90 ROM	Problems with ROM, RAM, or nonvolatile memory in the device	Contact our sales department.
	E-91 RAM		
	E-92 MEMORY		
Warnings Display	E- 6 COMM	Communication cable problems	Check the wiring for this product and for related devices. For 4 - 20 mA models, set the caution display and caution output [E-6] to OFF. (Refer to '7-10-22 Caution display setting (CAU DISP)' and '7-10-23 Caution output setting (CAU OUT)'). * The same measures are required if no LAN cable is used with an EA model.
		The communication between the main unit and the communication board is faulty	Contact our sales department. For 4 - 20 mA models, set the caution display and caution output [E- 6] to OFF. (Refer to '7-10-22 Caution display setting (CAU DISP)' and '7-10-23 Caution output setting (CAU OUT)').
		Effects of external noise	Turn the power OFF and restart. If similar symptoms recur frequently, take appropriate measures to address the noise source.
	E- 9 RTC	Clock abnormality in device	Set the date and time. Corrections may not work if the sensitivity correction function is enabled. (Refer to '7-10-1 Date and time setting (DAY TIME)'). Frequent occurrence of these symptoms may indicate a defective internal clock. Replace the internal clock. Contact our sales department.
	E-94 FLASH	Problem with device flash memory	Gas detection can still be performed in this state, but some internal data logging functions may not function properly. Contact our sales department.
E-98 FAN	Problem with device fan	High internal temperatures may reduce service life. Check to confirm that the connector for the fan unit is properly connected. Replace the fan unit, if necessary. If there is no improvement, contact our sales department.	

10-2 Reading abnormalities

Symptom	Cause	Corrective action
The reading rises (or drops) and remains unchanged.	Sensor drift	Perform zero calibration or air calibration.
	Presence of interference gases	It is difficult to completely eliminate the effects of interference gases such as solvents. Contact Riken Keiki for information on countermeasures, such as interference gas removal filters.
	Slow leakage	They may be a very small leakage (slow leakage) of the detection target gas. Leaving this unresolved may lead to hazardous conditions. Take the same action as for gas alarms.
	Environmental fluctuations	Perform zero calibration or air calibration. Galvanic cell types in particular are susceptible to the effects of atmospheric pressure. Zero calibration and air calibration must be performed.
A gas alarm is issued despite the absence of a gas leak or other abnormalities at the detection point.	Presence of interference gases	It is difficult to completely eliminate the effects of interference gases such as solvents. Contact Riken Keiki for information on countermeasures, such as interference gas removal filters.
	Effects of noise	Turn the power OFF and restart. If similar symptoms recur frequently, take appropriate measures to address the noise source.
	Sudden environmental changes	Reading alarms may be triggered by sudden changes in ambient conditions such as temperature. The product cannot be used if ambient conditions fluctuate rapidly and often. Take appropriate action to prevent such changes.
Slow response	Clogged dust filter	Replace the dust filter.
	Bent or blocked inlet or outlet tube	Fix the problem.
	There is condensation inside the inlet tube.	Fix the problem.
	The sensor sensitivity has degraded.	Replace with a new sensor.
Span adjustment is not possible.	The calibration gas concentration is inappropriate.	Prepare the correct calibration gas.
	The sensor sensitivity has degraded.	Replace with a new sensor.

11

Product Specifications

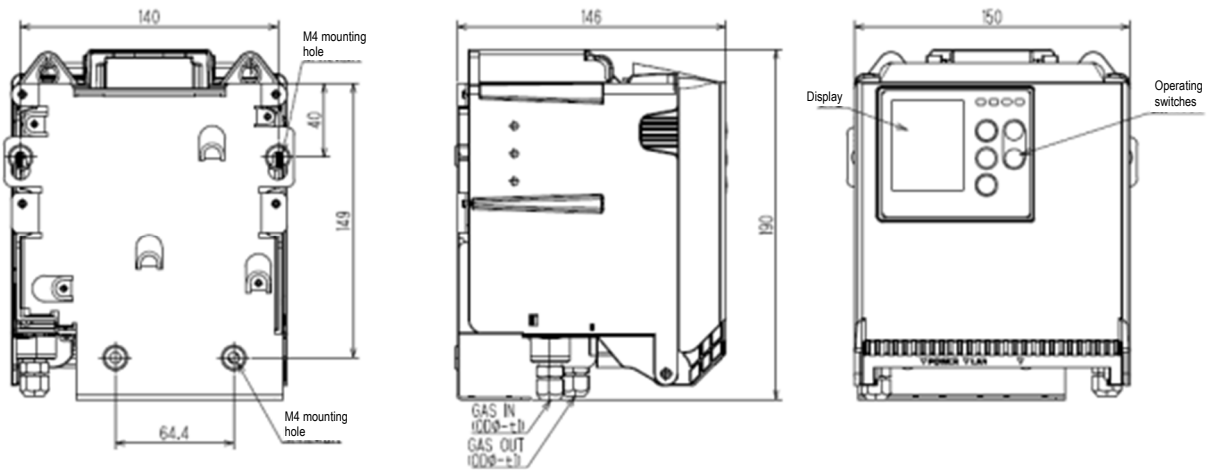
11-1 GD-84D-EX Specifications

11-1-1 GD-84D-EX-EC

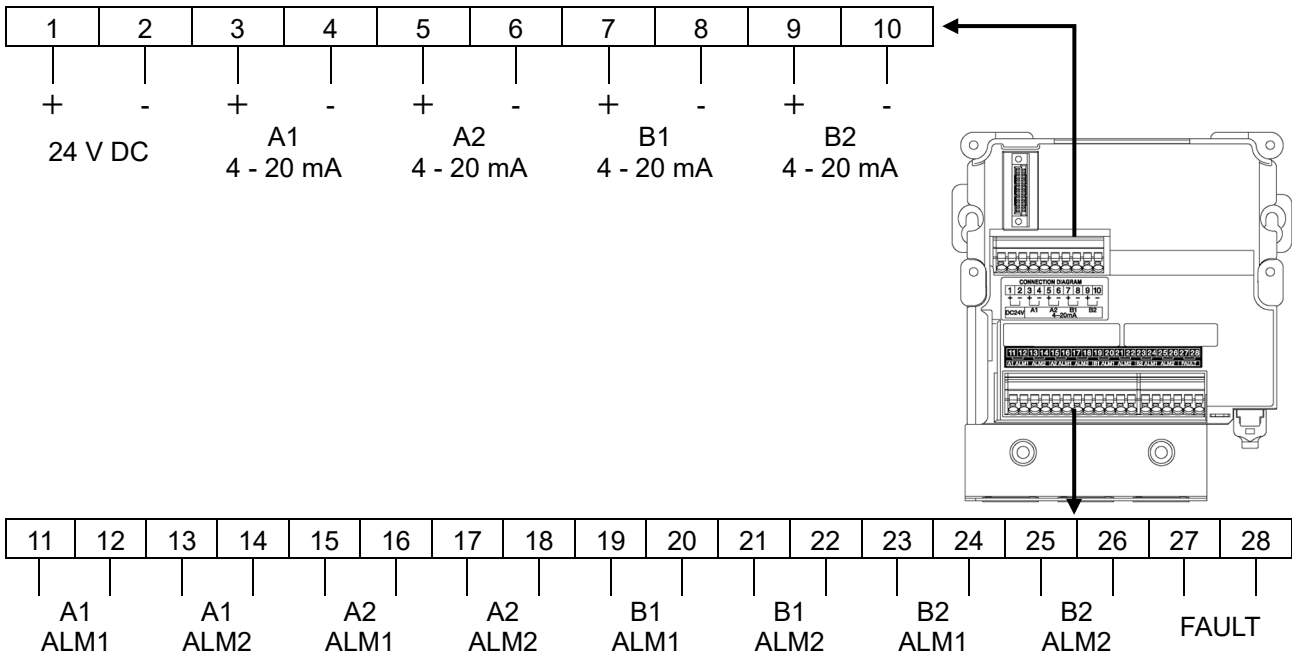
Detection principle	Electrochemical type
Detection target gas	Toxic gases, oxygen
Concentration display	Full-dot display
Detection range	Depends on detection target gas
Detection method	Pump suction type
Suction flow rate	Total flow rate: approx. 0.6 L/min
Alarm setpoints	Depends on detection target gas
Power supply indication	POWER LED lights up (green)
Display items	Gas name display, flow display, mode display, communication status display
Alarm accuracy (for identical conditions)	Within ± 30 % of alarm setpoint (depending on detection target gas)
Alarm delay time (for identical conditions)	Within 60 seconds after providing gas at 1.6 times the alarm setpoint (depending on detection target gas) (not including piping and communication delays)
Gas alarm type	Two-stage alarm (L-LL, L-H, or H-HH)
Gas alarm indications	First alarm: ALM1 LED lights up (red). Second alarm: ALM2 LED lights up (red).
Gas alarm pattern	Auto-reset or self-latching
Gas alarm contact	No-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Fault alarm/self-diagnosis	System abnormality, sensor abnormality, flow abnormality, temperature increase abnormality
Fault alarm indications	FAULT LED lights up (yellow)/information displayed
Fault alarm pattern	Auto-reset or self-latching
Fault alarm contacts	Overall fault contacts: no-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Contact capacity	24 V DC/0.5 A (resistance load)
Contact cable	CVV or equivalent cable (1.25 mm ² , maximum 18 core)
Transmission method	Analog transmission: two-wire analog transmission (4 - 20 mA DC, non-insulated, resistance load 300 Ω or less, including cable resistance)
Transmission cable	Analog transmission: CVVS or equivalent shielded cable (1.25 mm ² , maximum eight cores)
Functions	White backlight, alarm delay, suppression, zero follower, sensitivity correction, flow control, calibration history, alarm trend history, event history
Power cable	CVV or equivalent cable (1.25 mm ²), two-core
Power source	24 V DC ± 10 %
Power consumption	When 24 V DC is connected: approx. 2.5 W (maximum approx. 7 W)
Pipe connection openings	Rc1/4 (OD $\phi 6-1$ t half union for Teflon pipe <PP> supplied)
Initialization	Approx. 25 seconds

Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	20 – 90 % RH (No condensation; may depend on the sensors installed.)
Construction	Wall mounting type
External dimensions	Approx. 150 (W) × 190 (H) × 146 mm (D) (excluding projections)
Weight	Approximately 1.9 kg
Exterior color	Main unit: Black Front door: White

<Exterior drawings>



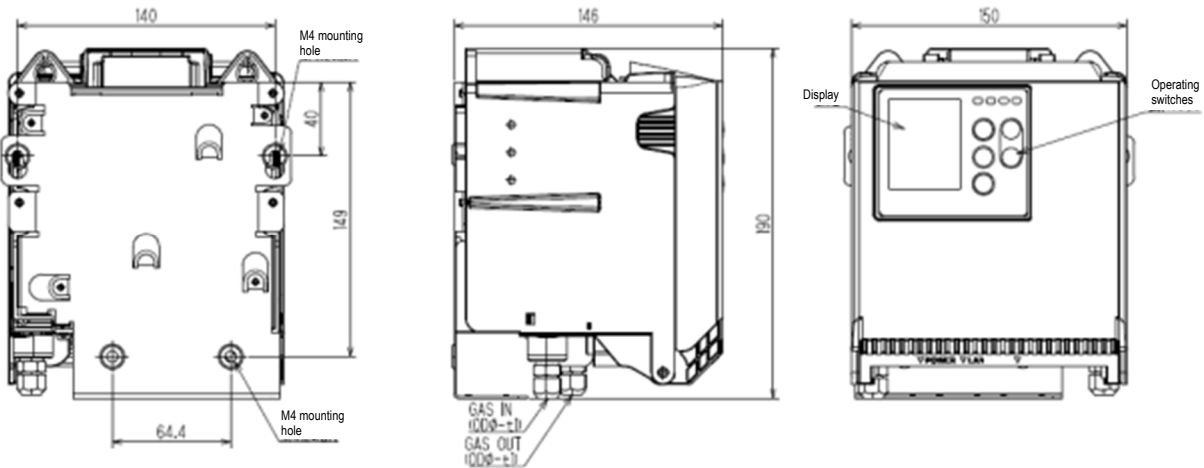
<Terminal plate>



11-1-2 GD-84D-EX

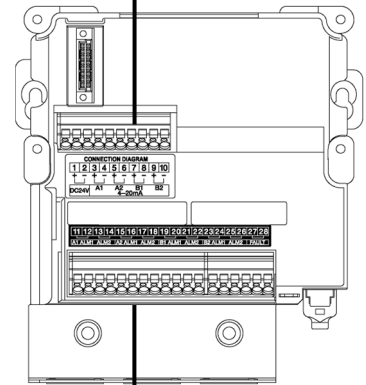
Detection principle	Electrochemical type, new ceramic type, semiconductor type, hot-wire semiconductor type
Detection target gas	Toxic gases, combustible gases, oxygen
Concentration display	Full-dot display
Detection range	Depends on detection target gas
Detection method	Pump suction type
Suction flow rate	Total flow rate: approx. 0.6 L/min
Alarm setpoints	Depends on detection target gas
Power supply indication	POWER LED lights up (green).
Display items	Gas name display, flow display, mode display, communication status display
Alarm accuracy (for identical conditions)	Within ± 30 % of alarm setpoint (depending on detection target gas and detection principle)
Alarm delay time (for identical conditions)	Within 60 seconds after providing gas at 1.6 times the alarm setpoint (depending on detection target gas and detection principle) (not including piping and communication delays)
Gas alarm type	Two-stage alarm (L-LL, L-H, or H-HH)
Gas alarm indications	First alarm: ALM1 LED lights up (red). Second alarm: ALM2 LED lights up (red).
Gas alarm pattern	Auto-reset or self-latching
Gas alarm contact	No-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Fault alarm/self-diagnosis	System abnormality, sensor abnormality, flow abnormality, fan disconnection abnormality, temperature increase abnormality
Fault alarm indications	FAULT LED lights up (yellow)/information displayed.
Fault alarm pattern	Auto-reset or self-latching
Fault alarm contacts	Overall fault contacts: no-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Contact capacity	24 V DC/0.5 A (resistance load)
Contact cable	CVV or equivalent cable (1.25 mm ² , maximum 18 core)
Transmission method	Analog transmission: two-wire analog transmission (4 - 20 mA DC, non-insulated, resistance load 300 Ω or less, including cable resistance)
Transmission cable	Analog transmission: CVVS or equivalent shielded cable (1.25 mm ² , maximum eight cores)
Functions	White backlight, alarm delay, suppression, zero follower, sensitivity correction, flow control, calibration history, alarm trend history, event history
Power cable	CVV or equivalent cable (1.25 mm ²), two-core
Power source	24 V DC \pm 10 %
Power consumption	When 24 V DC is connected: approx. 8 W (maximum approx. 14 W)
Pipe connection openings	Rc1/4 (OD ϕ 6-1 t half union for Teflon pipe <PP> supplied)
Initialization	Approx. 25 seconds
Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	20 – 90 % RH (No condensation; may depend on the sensors installed.)
Construction	Wall mounting type
External dimensions	Approx. 150 (W) \times 190 (H) \times 146 mm (D) (excluding projections)
Weight	Approximately 1.9 kg
Exterior color	Main unit: Black Front door: White

<Exterior drawings>



<Terminal plate>

1	2	3	4	5	6	7	8	9	10
+	-	+	-	+	-	+	-	+	-
24 V DC		A1 4 - 20 mA		A2 4 - 20 mA		B1 4 - 20 mA		B2 4 - 20 mA	

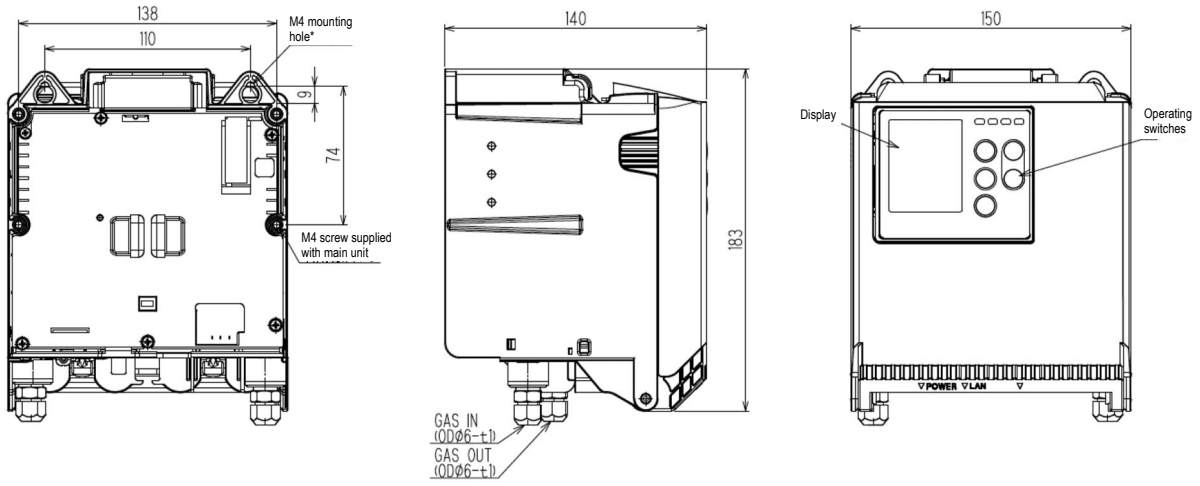


11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A1 ALM1	A1 ALM2	A2 ALM1	A2 ALM2	B1 ALM1	B1 ALM2	B2 ALM1	B2 ALM2	FAULT									

11-1-3 GD-84D-EX-ET-EC

Detection principle	Electrochemical type
Detection target gas	Toxic gases, oxygen
Concentration display	Full-dot display
Detection range	Depends on detection target gas
Detection method	Pump suction type
Suction flow rate	Total flow rate: approx. 0.6 L/min
Alarm setpoints	Depends on detection target gas
Power supply indication	POWER LED lights up (green)
Display items	Gas name display, flow display, mode display, communication status display
Alarm accuracy (for identical conditions)	Within ± 30 % of alarm setpoint (depending on detection target gas)
Alarm delay time (for identical conditions)	Within 60 seconds after providing gas at 1.6 times the alarm setpoint (depending on detection target gas) (not including piping and communication delays)
Gas alarm type	Two-stage alarm (L-LL, L-H, or H-HH)
Gas alarm indications	First alarm: ALM1 LED lights up (red). Second alarm: ALM2 LED lights up (red).
Gas alarm pattern	Auto-reset or self-latching
Gas alarm contact	-
Fault alarm/self-diagnosis	System abnormality, sensor abnormality, flow abnormality, communication abnormality, temperature increase abnormality
Fault alarm indications	FAULT LED lights up (yellow)/information displayed.
Fault alarm pattern	Auto-reset or self-latching
Fault alarm contacts	-
Contact capacity	-
Contact cable	-
Transmission method	Digital transmission: Ethernet (10BASE-T/100BASE-TX)
Transmission cable	Digital transmission: Cat5e or better Ethernet cable
Functions	White backlight, alarm delay, suppression, zero follower, sensitivity correction, flow control, calibration history, alarm trend history, event history
Power cable	Shared with digital transmission cable
Power source	PoE+ connection
Power consumption	When PoE+ is connected: approx. 3.5 W (maximum approx. 4.5 W)
Pipe connection openings	Rc1/4 (OD $\phi 6-1$ t half union for Teflon pipe <PP> supplied)
Initialization	Approx. 25 seconds
Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	20 – 90 % RH (No condensation; may depend on the sensors installed.)
Construction	Wall mounting type
External dimensions	Approx. 150 (W) \times 183 (H) \times 140 mm (D) (excluding projections)
Weight	Approximately 1.4 kg
Exterior color	Main unit: Black Front door: White

<Exterior drawings>

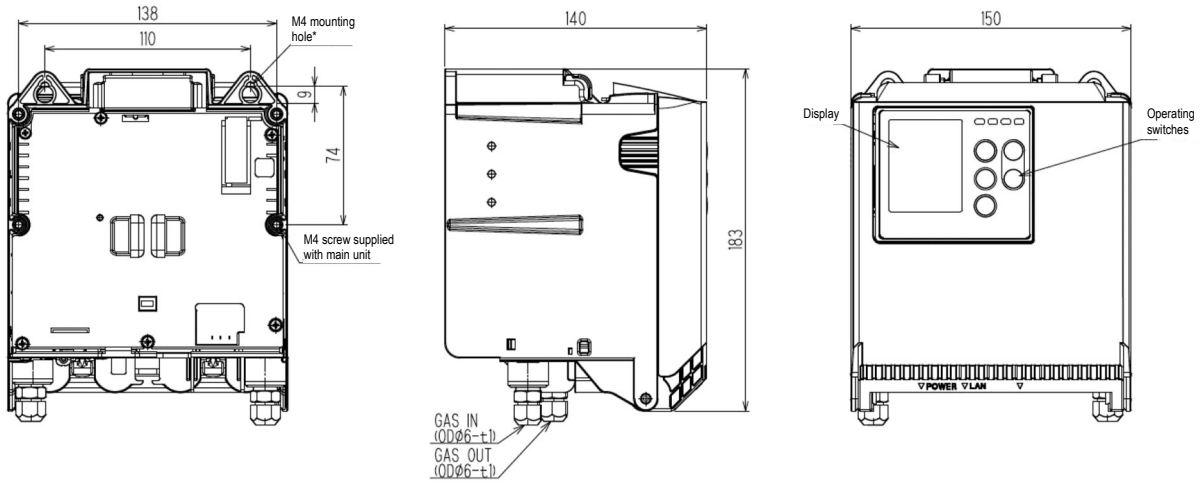


* An RJ-45 Ethernet connector is located on the underside of the main unit.

11-1-4 GD-84D-EX-ET

Detection principle	Electrochemical type, new ceramic type, semiconductor type, hot-wire semiconductor type
Detection target gas	Toxic gases, combustible gases, oxygen
Concentration display	Full-dot display
Detection range	Depends on detection target gas
Detection method	Pump suction type
Suction flow rate	Total flow rate: approx. 0.6 L/min
Alarm setpoints	Depends on detection target gas
Power supply indication	POWER LED lights up (green)
Display items	Gas name display, flow display, mode display, communication status display
Alarm accuracy (for identical conditions)	Within ± 30 % of alarm setpoint (depending on detection target gas and detection principle)
Alarm delay time (for identical conditions)	Within 60 seconds after providing gas at 1.6 times the alarm setpoint (depending on detection target gas and detection principle) (not including piping and communication delays)
Gas alarm type	Two-stage alarm (L-LL, L-H, or H-HH)
Gas alarm indications	First alarm: ALM1 LED lights up (red). Second alarm: ALM2 LED lights up (red).
Gas alarm pattern	Auto-reset or self-latching
Gas alarm contact	-
Fault alarm/self-diagnosis	System abnormality, sensor abnormality, flow abnormality, communication abnormality, fan disconnection abnormality, temperature increase abnormality
Fault alarm indications	FAULT LED lights up (yellow)/information displayed.
Fault alarm pattern	Auto-reset or self-latching
Fault alarm contacts	-
Contact capacity	-
Contact cable	-
Transmission method	Digital transmission: Ethernet (10BASE-T/100BASE-TX)
Transmission cable	Digital transmission: Cat5e or better Ethernet cable
Functions	White backlight, alarm delay, suppression, zero follower, sensitivity correction, flow control, calibration history, alarm trend history, event history
Power cable	Shared with digital transmission cable
Power source	PoE+ connection
Power consumption	When PoE+ is connected: approx. 9 W (maximum approx. 11 W)
Pipe connection openings	Rc1/4 (OD $\phi 6$ -1 t half union for Teflon pipe <PP> supplied)
Initialization	Approx. 25 seconds
Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	20 – 90 % RH (No condensation; may depend on the sensors installed.)
Construction	Wall mounting type
External dimensions	Approx. 150 (W) × 183 (H) × 140 mm (D) (excluding projections)
Weight	Approximately 1.4 kg
Exterior color	Main unit: Black Front door: White

<Exterior drawings>



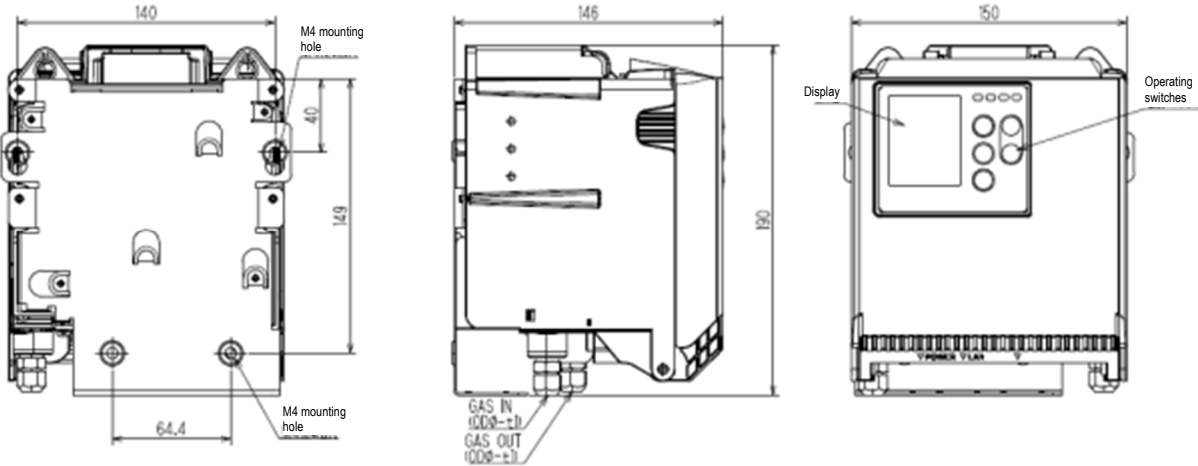
* An RJ-45 Ethernet connector is located on the underside of the main unit.

11-1-5 GD-84D-EX-EA-EC

Detection principle	Electrochemical type
Detection target gas	Toxic gases, oxygen
Concentration display	Full-dot display
Detection range	Depends on detection target gas.
Detection method	Pump suction type
Suction flow rate	Total flow rate: approx. 0.6 L/min
Alarm setpoints	Depends on detection target gas.
Power supply indication	POWER LED lights up (green)
Display items	Gas name display, flow display, mode display, communication status display
Alarm accuracy (for identical conditions)	Within ± 30 % of alarm setpoint (depending on detection target gas)
Alarm delay time (for identical conditions)	Within 60 seconds after providing gas at 1.6 times the alarm setpoint (depending on detection target gas) (not including piping and communication delays)
Gas alarm type	Two-stage alarm (L-LL, L-H, or H-HH)
Gas alarm indications	First alarm: ALM1 LED lights up (red). Second alarm: ALM2 LED lights up (red).
Gas alarm pattern	Auto-reset or self-latching
Gas alarm contact	No-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Fault alarm/self-diagnosis	System abnormality, sensor abnormality, flow abnormality, communication abnormality, temperature increase abnormality
Fault alarm indications	FAULT LED lights up (yellow)/information displayed.
Fault alarm pattern	Auto-reset or self-latching
Fault alarm contacts	Overall fault contacts: no-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Contact capacity	24 V DC/0.5 A (resistance load)
Contact cable	CVV or equivalent cable (1.25 mm ² , maximum 18 core)
Transmission method	Digital transmission: Ethernet (10BASE-T/100BASE-TX) Analog transmission: two-wire analog transmission (4 - 20 mA DC, non-insulated, resistance load 300 Ω or less, including cable resistance)
Transmission cable	Digital transmission: Cat5e or better Ethernet cable Analog transmission: CVVS or equivalent shielded cable (1.25 mm ² , maximum eight cores)
Functions	White backlight, alarm delay, suppression, zero follower, sensitivity correction, flow control, calibration history, alarm trend history, event history
Power cable	CVV or equivalent cable (1.25 mm ²), two-core (Shared with digital transmission cable when PoE+ connection is used)
Power source	24 V DC \pm 10 % or PoE+ connection
Power consumption	When 24 V DC is connected: approx. 3 W (maximum approx. 8 W) When PoE+ is connected approx. 4.5 W (maximum approx. 9.5 W)
Pipe connection openings	Rc1/4 (OD ϕ 6-1 t half union for Teflon pipe <PP> supplied)
Initialization	Approx. 25 seconds
Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	20 – 90 % RH (No condensation; may depend on the sensors installed.)
Construction	Wall mounting type
External dimensions	Approx. 150 (W) \times 190 (H) \times 146 mm (D) (excluding projections)

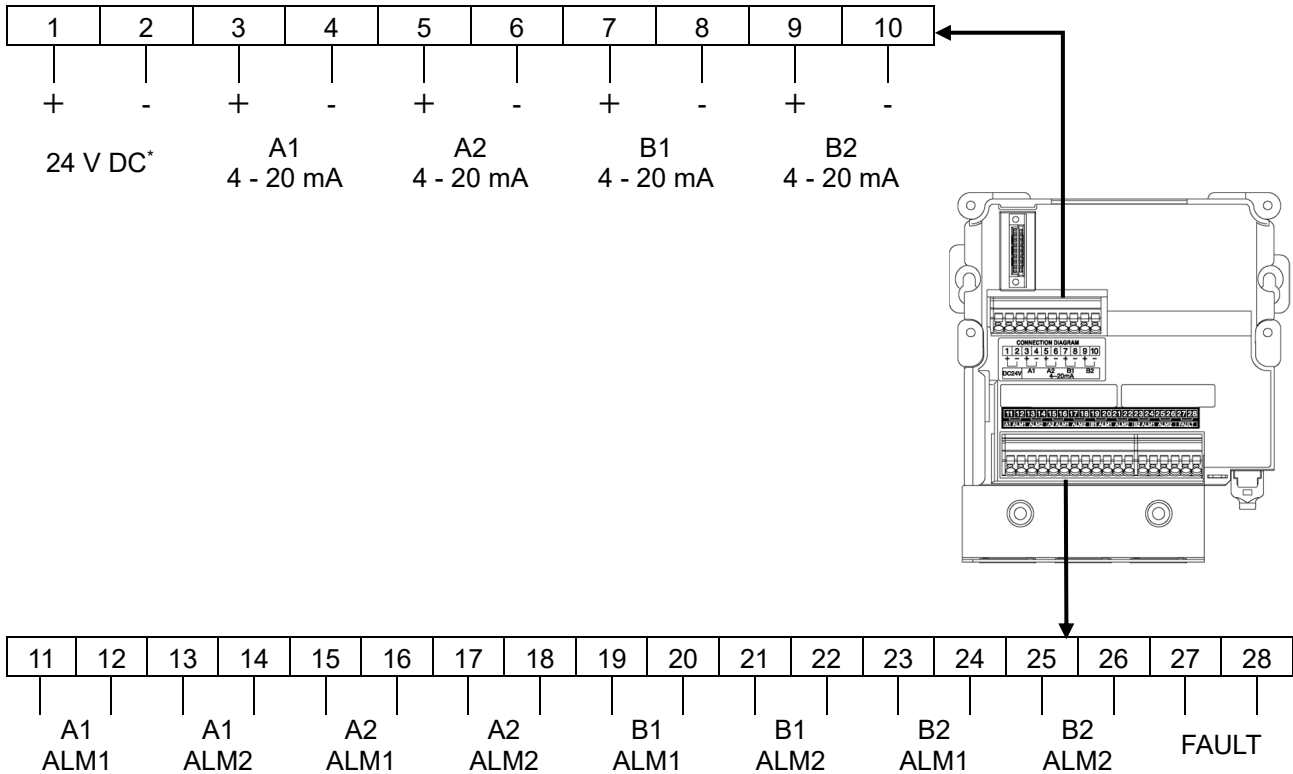
Weight	Approximately 1.9 kg
Exterior color	Main unit: Black Front door: White

<Exterior drawings>



* An RJ-45 Ethernet connector is located on the underside of the main unit.

<Terminal plate>



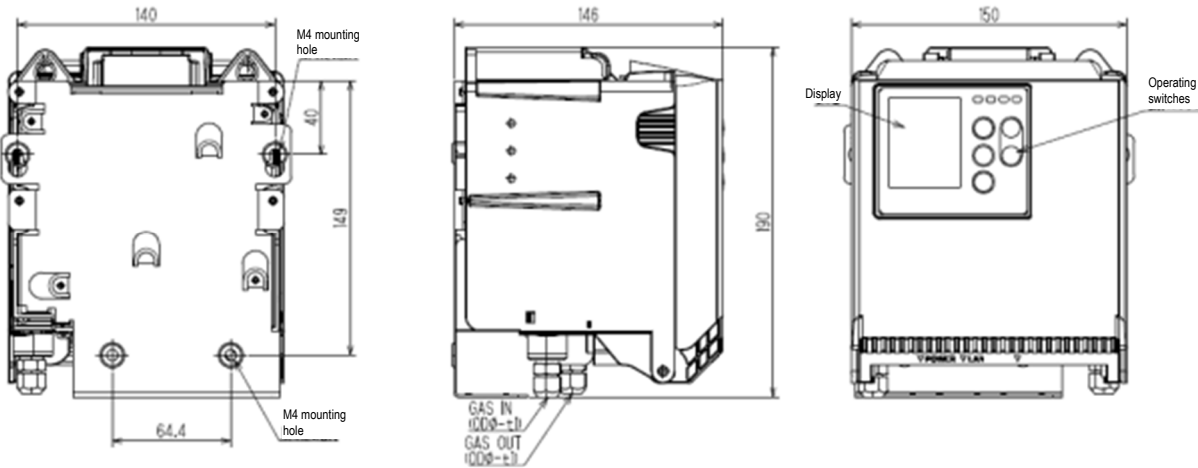
* With EA models, do not use 24 V DC terminals 1 and 2 when using the PoE+ connection. (Connection prohibited)

11-1-6 GD-84D-EX-EA

Detection principle	Electrochemical type, new ceramic type, semiconductor type, hot-wire semiconductor type
Detection target gas	Toxic gases, combustible gases, oxygen
Concentration display	Full-dot display
Detection range	Depends on detection target gas.
Detection method	Pump suction type
Suction flow rate	Total flow rate: approx. 0.6 L/min
Alarm setpoints	Depends on detection target gas.
Power supply indication	POWER LED lights up (green)
Display items	Gas name display, flow display, mode display, communication status display
Alarm accuracy (for identical conditions)	Within $\pm 30\%$ of alarm setpoint (depending on detection target gas and detection principle)
Alarm delay time (for identical conditions)	Within 60 seconds after providing gas at 1.6 times the alarm setpoint (depending on detection target gas and detection principle) (not including piping and communication delays)
Gas alarm type	Two-stage alarm (L-LL, L-H, or H-HH)
Gas alarm indications	First alarm: ALM1 LED lights up (red). Second alarm: ALM2 LED lights up (red).
Gas alarm pattern	Auto-reset or self-latching
Gas alarm contact	No-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Fault alarm/self-diagnosis	System abnormality, sensor abnormality, flow abnormality, communication abnormality, fan disconnection abnormality, temperature increase abnormality
Fault alarm indications	FAULT LED lights up (yellow)/information displayed.
Fault alarm pattern	Auto-reset or self-latching
Fault alarm contacts	Overall fault contacts: no-voltage contact 1a or 1b Always de-energized (energized in alarm state) or always energized (de-energized in alarm state)
Contact capacity	24 V DC/0.5 A (resistance load)
Contact cable	CVV or equivalent cable (1.25 mm ² , maximum 18 core)
Transmission method	Digital transmission: Ethernet (10BASE-T/100BASE-TX) Analog transmission: two-wire analog transmission (4 - 20 mA DC, non-insulated, resistance load 300 Ω or less, including cable resistance)
Transmission cable	Digital transmission: Cat5e or better Ethernet cable Analog transmission: CVVS or equivalent shielded cable (1.25 mm ² , maximum eight cores)
Functions	White backlight, alarm delay, suppression, zero follower, sensitivity correction, flow control, calibration history, alarm trend history, event history
Power cable	CVV or equivalent cable (1.25 mm ²), two-core (Shared with digital transmission cable when PoE+ connection is used)
Power source	24 V DC $\pm 10\%$ or PoE+ connection
Power consumption	When 24 V DC is connected: approx. 9 W (maximum approx. 15 W) When PoE+ is connected: approx. 11 W (maximum approx. 16 W)
Pipe connection openings	Rc1/4 (OD $\phi 6$ -1 t half union for Teflon pipe <PP> supplied)
Initialization	Approx. 25 seconds
Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	20 – 90 % RH (No condensation; may depend on the sensors installed.)
Construction	Wall mounting type
External dimensions	Approx. 150 (W) \times 190 (H) \times 146 mm (D) (excluding projections)

Weight	Approximately 1.9 kg
Exterior color	Main unit: Black Front door: White

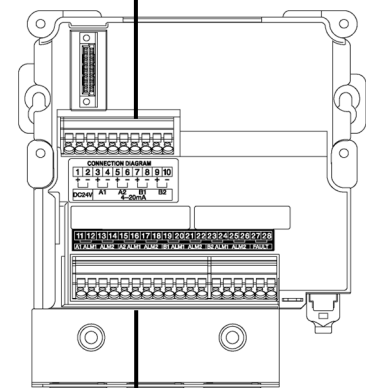
<Exterior drawings>



* An RJ-45 Ethernet connector is located on the underside of the main unit.

<Terminal plate>

1	2	3	4	5	6	7	8	9	10
+	-	+	-	+	-	+	-	+	-
24 V DC*		A1 4 - 20 mA		A2 4 - 20 mA		B1 4 - 20 mA		B2 4 - 20 mA	



11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A1 ALM1	A1 ALM2	A2 ALM1	A2 ALM2	B1 ALM1	B1 ALM2	B2 ALM1	B2 ALM2	FAULT									

* With EA models, do not use 24 V DC terminals 1 and 2 when using the PoE+ connection. (Connection prohibited)

11-2 Sensor specifications

11-2-1 Electrochemical type

Sensor model	ESF	
Detection target gas	Toxic gases ^{*1}	Oxygen
Detection range	Depends on detection target gas.	0 -25 vol%
Detection method	Pump suction type	
Alarm setpoints	Depends on detection target gas.	18 vol%(default)
Alarm accuracy (for identical conditions)	Within $\pm 30\%$ ^{*2}	Within $\pm 0.6\%$
Alarm delay time (for identical conditions)	Within 60 seconds ^{*3}	Within 10 seconds ^{*4}
Alarm type	Two-stage alarm (H-HH)	Two-stage alarm (L-LL, L-H)
Operating temperature range	-10 – 40 °C (no sudden changes)	
Operating humidity range	20 – 90 % RH (No condensation) (Specifications differ for certain gases.)	

*1 The range of operating temperatures and operating humidity may differ depending on the detection target gas.

*2 Indicates the precision against the alarm setpoint.

*3 When gas is provided at 1.6 times the alarm setpoint. (excluding piping and communication delays)

*4 This is the time required to reach the 18 vol% alarm point after supplying gas with a concentration of 10 to 11 vol% (excluding piping and communication delays)

NOTE

- ▶ Contact Riken Keiki for specifications and information on other sensors.
- ▶ The number of years of ESF sensor warranty depends on the sensor model. Please refer to the sensor specification sheet.

11-2-2 New ceramic type

Sensor model	NCF
Detection target gas	Combustible gas
Detection range	Depends on detection target gas.
Detection method	Pump suction type
Alarm setpoints	Depends on detection target gas.
Alarm accuracy (for identical conditions)	Within $\pm 25\%$ *1
Alarm delay time (for identical conditions)	Within 30 seconds *2
Alarm type	Two-stage alarm (H-HH)
Operating temperature range	-10 – 40 °C (no sudden changes)
Operating humidity range	Up to 95 % RH (no condensation)

*1 Indicates the precision against the alarm setpoint.

*2 When gas is provided at 1.6 times the alarm setpoint. (excluding piping and communication delays)

NOTE

- ▶ Install in a stable location within the specified operating temperature range and free of sudden temperature fluctuations.
- ▶ Sensor characteristics may degrade significantly in the presence of silicon gases (organic silicon gases), various types of halogen gases, sulfide gases, or acidic gases.
- ▶ When calibrating, allow the product to warm up for at least two hours in clean air before proceeding with zero calibration and span adjustment.
- ▶ For specifications of F.S. 5,000 ppm or less, variations in atmospheric temperature and humidity may cause the zero point to drift. If so, turn the zero follower function ON. However, we recommend using a sensor with a different detection principle. The zero follower function is not available if gases are always present.
- ▶ Readings may be affected by combustible gases other than the detection target gas.
- ▶ When oxygen concentrations fall, the readings may also fall.
- ▶ Some interference may occur in the presence of highly thermally conductive gases such as CO₂, Ar, and He in high concentrations as base gases.
- ▶ When low vapor pressure gases are detected by aspiration, the gas may condense when aspirated from warmer areas and detected in cooler areas, or blockages may occur in sintered alloy. Keep vapor pressure in mind when using the product.
- ▶ Indication accuracy may degrade in situations in which temperatures fluctuate significantly (± 40 °C or greater) above or below the ambient temperature in which zero calibration or span adjustment was performed. If this occurs, repeat the zero calibration or span adjustment.
- ▶ There may be fluctuations in readings if the product is subjected to strong impact or vibrations. If this occurs, perform zero calibration and span adjustment.
- ▶ The zero point may fluctuate if the sensor is in continuous contact with high-concentration gas of 100 % LEL or more for extended periods. If this occurs, perform zero calibration and span adjustment.
- ▶ The sensor may be hot during replacement. Be careful to avoid burns when replacing the sensor. If the sensor is hot, turn off the power and wait for it to cool.
- ▶ The tops of the sensors are covered with a Teflon film. Damage to this Teflon film may affect the performance of the sensor. Avoid applying excessive pressure or sharp objects to the Teflon film.
- ▶ When changing to an NCF sensor of different specifications, change the specifications of the detector with sensors other than NCF sensor fitted before fitting the NCF sensor with desired specifications.
- ▶ Regardless of the detection target gas, the warranty period for NCF sensors is 3 years.

11-2-3 Semiconductor type

Sensor model	SGF	
Detection target gas	Combustible gas	Toxic gas
Detection range	Depends on detection target gas.	
Detection method	Pump suction type	
Alarm setpoints	Depends on detection target gas.	
Alarm accuracy (for identical conditions)	Within $\pm 25\%$	Within $\pm 30\%$
Alarm delay time (for identical conditions)	Within 30 seconds	Within 60 seconds
Alarm type	Two-stage alarm (H-HH)	
Operating temperature range	-10 - 40 °C (no sudden changes)	
Operating humidity range	20 – 90 % RH (No condensation) (moisture content 37 °C 95 % RH or less)	

NOTE

- ▶ Sensor characteristics may degrade significantly in the presence of silicon gases (organic silicon gases), the various types of halogen gases, sulfide gases, or acidic gases.
- ▶ Select the calibration gas after accounting for typical humidity in the operating environment.
- ▶ When calibrating, allow a warmup time depending on the unpowered period in clean air before proceeding with the zero calibration and span adjustment. Refer to <Warmup time for semiconductor type sensors> below for warmup times.
- ▶ Readings may be affected by combustible gases other than the detection target gas.
- ▶ Readings may fluctuate in the presence of fluctuations (e.g., temperature and humidity) in the installation location.
- ▶ When oxygen concentrations fall, the readings may also fall.
- ▶ Some interference may occur in the presence of highly thermally conductive gases such as CO₂, Ar, and He in high concentrations as base gases.
- ▶ When low vapor pressure gases are detected by aspiration, the gas may condense when aspirated from warmer areas and detected in cooler areas, or blockages may occur in sintered alloy. Keep vapor pressure in mind when using the product.
- ▶ Indication accuracy may degrade in situations in which temperatures fluctuate significantly (± 40 °C or greater) above or below the ambient temperature in which zero calibration or span adjustment was performed. If this occurs, repeat zero calibration or span adjustment.
- ▶ There may be fluctuations in readings if the product receives strong shocks from outside or is subjected to vibrations. If this occurs, perform zero calibration and span adjustment.
- ▶ The zero point and readings may fluctuate if the sensor comes into contact with high-concentration gas that is full scale or higher. If this occurs, perform zero calibration and span adjustment.
- ▶ Readings may fall in environments where gas is continuously present.
- ▶ The sensor may be hot during replacement. Be careful to avoid burns when replacing the sensor. If the sensor is hot, turn off the power and wait for it to cool.
- ▶ There is a Teflon film on the top of the sensors. There may be an impact on the performance of the sensor if this Teflon film is damaged. Avoid applying excessive pressure or sharp objects to the Teflon film.
- ▶ Depending on the conditions and how long the device was off, the reading may oscillate when the power is turned on. The reading should quickly stabilize at zero.
- ▶ Regardless of the detection target gas, the warranty period for SGF sensors is 3 years.

<Warmup time for semiconductor type sensors>

Unpowered period	Warmup time	
	SGF-8581	Other SGF sensors
Within 10 minutes	2 hours or more	30 minutes or more
Within 1 hour	2 hours or more	2 hours or more
Within 24 hours	4 hours or more	4 hours or more
Within 72 hour	24 hours or more	24 hours or more
Within 10 days	2 days or more	2 days or more
Less than 1 month	7 days or more	7 days or more
1 month to less than 3 months	14 days or more	14 days or more
3 months or more	1 month or more	1 month or more

<Definition of combustible gas>

- All sensor models of %LEL (vol%) range and ppm range specifications are applicable to the following 12 gases.
Acetylene, isobutane, LPG, LNG, ethane, ethylene, hydrogen, town gases, butane, propane, propylene, and methane
- Sensors of the %LEL (vol%) range specification are applicable to other combustible gases.

<Definition of toxic gas>

- Regard gases not included on List A as toxic gases.

11-2-4 Hot-wire semiconductor type

Sensor model	SHF	
Detection target gas	Combustible gas	Toxic gas
Detection range	Depends on detection target gas.	
Detection method	Pump suction type	
Alarm setpoints	Depends on detection target gas.	
Alarm accuracy (for identical conditions)	Within $\pm 25\%$	Within $\pm 30\%$
Alarm delay time (for identical conditions)	Within 30 seconds	Within 60 seconds
Alarm type	Two-stage alarm (H-HH)	
Operating temperature range	-10 - 40 °C (no sudden changes)	
Operating humidity range	20 - 90 % RH (No condensation) (moisture content 37 °C 95 % RH or less)	

NOTE

- ▶ Sensor characteristics may degrade significantly in the presence of silicon gases (organic silicon gases), the various types of halogen gases, sulfide gases, or acidic gases.
- ▶ Select the calibration gas after accounting for typical humidity in the operating environment.
- ▶ When calibrating, allow a warmup time depending on the unpowered period in clean air before proceeding with the zero calibration and span adjustment. Refer to <Warmup time for hot-wire semiconductor type sensors> below for warmup times.
- ▶ Readings may be affected by combustible gases other than the detection target gas.
- ▶ Readings may fluctuate in the presence of fluctuations (e.g., temperature and humidity) in the installation location.
- ▶ When oxygen concentrations fall, the readings may also fall.
- ▶ Some interference may occur in the presence of highly thermally conductive gases such as CO₂, Ar, and He in high concentrations as base gases.
- ▶ When low vapor pressure gases are detected by aspiration, the gas may condense when aspirated from warmer areas and detected in cooler areas, or blockages may occur in sintered alloy. Keep vapor pressure in mind when using the product.
- ▶ Indication accuracy may degrade in situations in which temperatures fluctuate significantly (± 40 °C or greater) above or below the ambient temperature in which zero calibration or span adjustment was performed. If this occurs, repeat zero calibration or span adjustment.
- ▶ There may be fluctuations in readings if the product receives strong shocks from outside or is subjected to vibrations. If this occurs, perform zero calibration and span adjustment.
- ▶ The zero point may fluctuate if the sensor comes into contact with high-concentration gas continuously for extended periods. If this occurs, perform zero calibration and span adjustment.
- ▶ Readings may fall in environments where gas is continuously present.
- ▶ The sensor may be hot during replacement. Be careful to avoid burns when replacing the sensor. If the sensor is hot, turn off the power and wait for it to cool.
- ▶ Depending on the conditions and how long the device was off, the reading may oscillate when the power is turned on. The reading should quickly stabilize at zero.
- ▶ Regardless of the detection target gas, the warranty period for SHF sensors is 3 years.

<Warmup time for hot-wire semiconductor type sensors>

Unpowered period	Warmup time	
	SHF-8603	Other SHF sensors
Within 10 minutes	10 minutes or more	1 hours or more
Within 1 hour	30 minutes or more	2 hours or more
Within 24 hours	1 hour or more	4 hours or more
Within 72 hours	4 hours or more	24 hours or more
Within 10 days	2 days or more	2 days or more
Less than 1 month	7 days or more	7 days or more
1 month to less than 3 months	14 days or more	14 days or more
3 months or more	1 month or more	1 month or more

* Note that the warmup time for SHF-8603 differs from that for other SHF sensor.

<Definition of combustible gas>

- All sensor models of %LEL (vol%) range and ppm range specifications are applicable to the following 12 gases.
Acetylene, isobutane, LPG, LNG, ethane, ethylene, hydrogen, town gases, butane, propane, propylene, and methane
- Sensors of the %LEL (vol%) range specification are applicable to other combustible gases.

<Definition of toxic gas>

- Regard gases not included on List A as toxic gases.

12

Appendix

12-1 Detection principle

12-1-1 Electrochemical type

<Sensor overview>

This sensor type detects gas concentrations as current generated when the detection target gas is electrolyzed on electrodes maintained at constant potential. This is the most effective gas sensor for detecting toxic gas. Gases can be selectively detected by selecting a specific potential.

<Sensor structure and principle>

- Structure

The sensor consists of an electrode (working electrode) formed of a precious metal catalyst on a gas permeable membrane, a reference electrode, and a counter electrode, all enclosed in a plastic container filled with electrolyte solution.

- Principle

A potentiostat circuit is used to maintain constant potential between the working electrode and reference electrode. The detection target gas passes through the gas permeable membrane and undergoes electrolysis reaction on reaching the working electrode. A side reaction also occurs at the counter electrode so that the same amount of electric current flows through it as that produced at the working electrode.

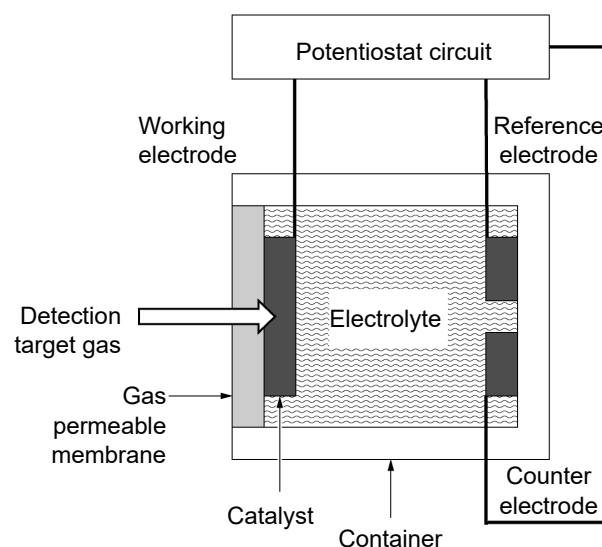
Example : In the case of hydrogen sulfide (H_2S), the following chemical reaction occurs:

Working electrode: $\text{H}_2\text{S} + 4\text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 8\text{H}^+ + 8\text{e}^-$ (e^- is an electron)

Counter electrode: $2\text{O}_2 + 8\text{H}^+ + 8\text{e}^- \rightarrow 4\text{H}_2\text{O}$

The current generated here is proportional to gas concentrations. Gas concentrations can be determined by measuring the current flowing through the working electrode.

<Structure diagram>



<Points to note when using the electrochemical type sensor>

In particular, note the following points when using the electrochemical type sensor:

1. The product may be subject to interference from solvent vapor or gases other than the target gas. Take care to avoid alarm activation due to interference. The product may also experience fluctuations due to environmental changes (e.g., in temperature or humidity) at the location where it is installed.
2. Set the alarm setpoint within the performance range of the device. In facilities subject to the High Pressure Gas Safety Act, when below the specified Riken Keiki standard alarm setpoint (maximum allowable concentration) may result in false alarms.
3. The product is a safety device. It is not a control device. Use the contact outputs on the product with external alarm lamps or buzzers. Use the analog signal output for indicators or external recorders. Riken Keiki rejects liability for malfunctions in cases in which this signal is used for any other controls.
4. The contact point of the gas detection sensor consists of a porous polymer membrane. Solvents may impair the water repellency of the membrane and result in leaking electrolyte. Avoid using solvents near the detector. If the use of solvents is unavoidable, place our recommended filter over areas like the gas detector inlet when using solvents and for about one hour thereafter.
5. Regular maintenance is essential, including periodic parts replacement and readjustments as described in this operating manual. The product is a safety device. We recommend regular maintenance and gas calibration every six months in accordance with regulations.

12-1-2 New ceramic type

<Sensor overview>

The device uses an ultrafine particle (new ceramic) oxidation catalyst to detect gas concentrations over a wide range, from low concentrations (ppm) up to the lower explosive limit (LEL). This revolutionary gas detection sensor was developed by Riken Keiki and designed specifically to detect combustible gases.

<Sensor structure and principle>

• Structure

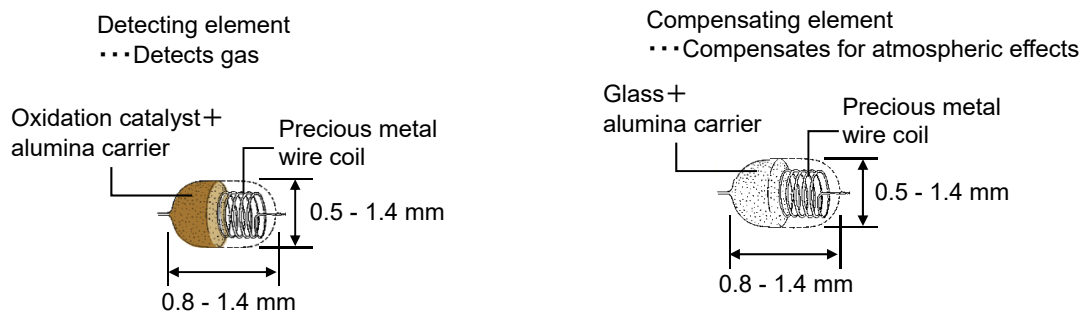
The new ceramic sensors consist of a detecting element and a compensating element. (Some sensors lack a compensating element.) The detecting element consists of an ultrafine particle oxidation catalyst (new ceramic) that reacts with combustible gases sintered on top of a precious metal coil. This undergoes a combustion reaction in the presence of the detection target gas.

The compensating element consists of a material inert to combustible gases sintered on top of a precious metal coil. This compensates for atmospheric effects.

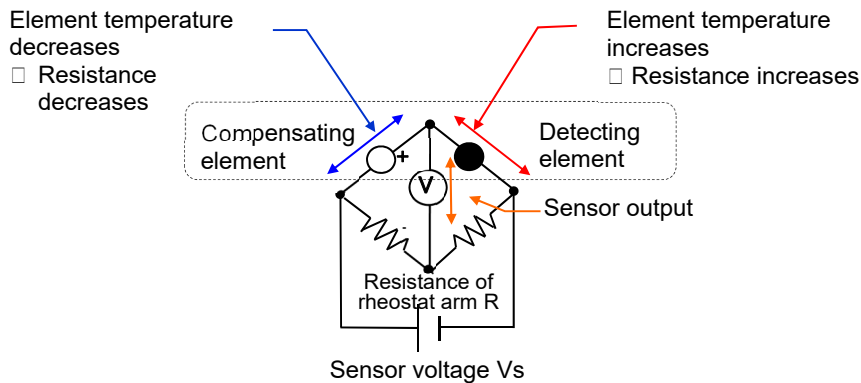
• Principles

When combustible gas burns on the surface of the detecting element heated to between 300 °C and 450 °C by the precious metal coil, this increases the temperature of the element. The resistance of the precious metal wire coil forming the element also varies in accordance with this temperature variation. The resistance variation is roughly proportional to gas concentration. This variation in resistance is thus extracted as a voltage using a bridge circuit and the gas concentration is worked out.

<Sensor element diagram>



<Bridge circuit>



<Points to note when using the new ceramic type sensor>

In particular, note the following points when using the new ceramic type sensor:

1. The product may be subject to interference from gases or vapors other than the target gas.
Take care to avoid alarm activation due to interference. The product may also experience fluctuations due to environmental changes (e.g., in temperature or humidity) at the location where it is installed.
2. The alarm setpoint should be set within the performance range of the device.
In facilities subject to the High Pressure Gas Safety Act, settings below the standard alarm setpoints specified by Riken Keiki may result in false alarms.
3. The product is a safety device. It is not a control device.
Use the alarm contact outputs on the product with external alarm lamps or buzzers. Use the analog signal output for indicators or external recorders. Riken Keiki rejects liability for malfunctions in cases in which this signal is used for any other controls.
4. The gas sensing parts in the gas detecting sensors of this product are metal-oxide porous sintered alloys impregnated with oxidation catalysts. The surface area of the gas sensing parts shrinks when silicone and sulfides attach to the surface of the sintered bodies, and this can cause a large drop in sensitivity.
For safety reasons, avoid using this product in environments containing even trace amounts of silicone or sulfides.
5. Regular maintenance is essential, including periodic parts replacement and readjustments as described in this operating manual. The product is a safety device. We recommend regular maintenance and gas calibration every six months in accordance with regulations.

12-1-3 Semiconductor type

<Sensor overview>

This method detects gas concentrations from variations in resistance that occur when a metal oxide semiconductor comes into contact with the detection target gas. This general-purpose gas detector sensor is ideal for detecting a wide range of gases, from toxic gases to combustible gases.

<Sensor structure and principle>

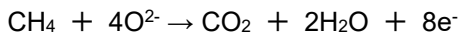
• Structure

The sensor consists of a metal oxide semiconductor (SnO₂) formed around a heater coil and alumina tube. The alumina tube has two gold electrodes at each end to measure semiconductor resistance.

• Principle

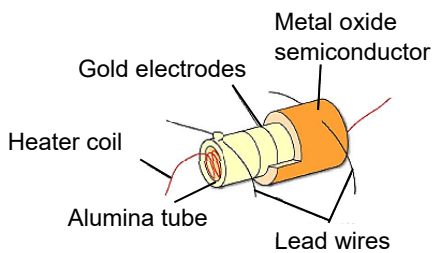
Oxygen from the atmosphere is adsorbed as O⁻ and O²⁻ to the surface of the metal oxide semiconductor heated to between 350 °C and 400 °C by the heater coil. The semiconductor maintains a constant resistance. If a methane or other such gas comes into contact with this surface and becomes chemically adsorbed, the oxygen is oxidized and released by the adsorbed O²⁻ ions.

The following chemical reaction occurs here at the sensor surface:

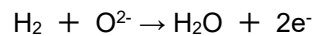
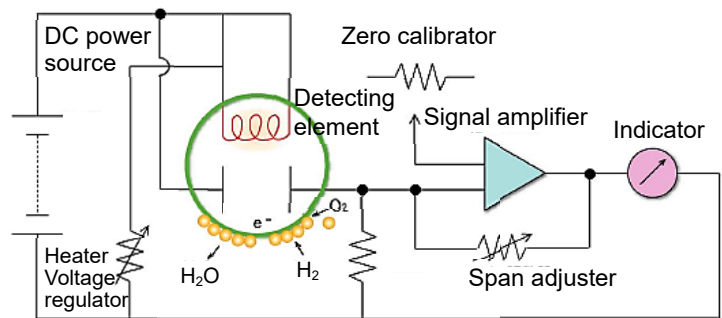


In other words, as methane gas is adsorbed to the sensor surface removing adsorbed oxygen, the increase in free electrons inside the sensor reduces the resistance. This variation in resistance can be measured and used to calculate the gas concentration.

<Sensor element diagram>



<Drive circuit>



<Points to note when using the semiconductor type sensor>

In particular, note the following points when using the semiconductor type sensor:

1. The product may be subject to interference from gases or vapors other than the target gas.
Take care to avoid alarm activation due to interference. The product may also experience fluctuations due to environmental changes (e.g., in temperature or humidity) at the location where it is installed.
2. The alarm setpoint should be set within the performance range of the device.
In facilities subject to the High Pressure Gas Safety Act, settings below the standard alarm setpoints specified by Riken Keiki may result in false alarms.
3. The product is a safety device. It is not a control device.
Use the alarm contact outputs on the product with external alarm lamps or buzzers. Use the analog signal output for indicators or external recorders. Riken Keiki rejects liability for malfunctions in cases in which this signal is used for any other controls.
4. The gas sensing parts in the gas detecting sensors of this product are metal-oxide porous sintered alloys. The surface area of the gas sensing parts shrinks when silicone and sulfides attach to the surface of the sintered bodies, and this can cause a large drop in sensitivity.
For safety reasons, avoid using this product in environments containing even trace amounts of silicone or sulfides.
5. Regular maintenance is essential, including periodic parts replacement and readjustments as described in this operating manual. The product is a safety device. We recommend regular maintenance and gas calibration every six months in accordance with regulations.

12-1-4 Hot wire semiconductor type

<Sensor overview>

This sensor type detects gas concentrations based on variations in the resistance of a platinum coil integrated with a metal oxide semiconductor whose resistance changes when it comes into contact with a gas. The high-sensitivity low-concentration detection gas sensor is configured simply as a detecting element of metal oxide semiconductor sintered around a platinum coil.

<Sensor structure and principle>

- Structure

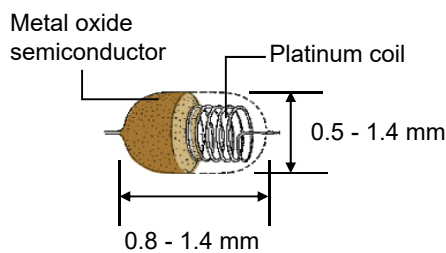
The sensor consists simply of a detecting element formed of a metal oxide semiconductor sintered around a platinum coil.

- Principle

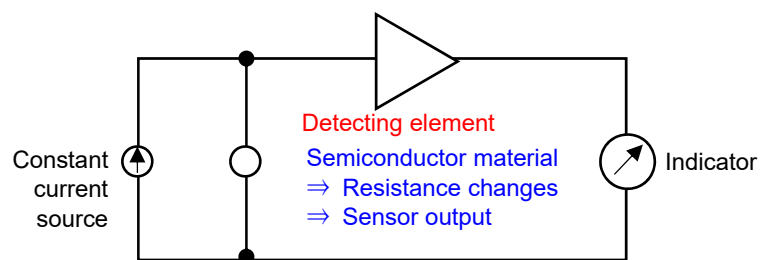
The resistance (R) of the detecting element is the combined resistance of the semiconductor resistance (R_S) and the platinum coil resistance (R_H).

The detecting element is heated to between 300 °C and 400 °C by the platinum coil and maintains constant resistance. If methane or another such gas comes into contact with the detecting element, oxygen adsorbed to the surface of the metal oxide semiconductor is released, increasing the number of free electrons inside the semiconductor and reducing the resistance of the semiconductor. This reduces the resistance of the entire detecting element. These variations in resistance are measured as a voltage and used to calculate gas concentrations.

<Detecting element diagram>



<Drive circuit>



<Points to note when using the hot wire semiconductor type sensor>

In particular, note the following points when using the hot wire semiconductor type sensor:

1. The product may be subject to interference from gases or vapors other than the target gas.
Take care to avoid alarm activation due to interference. The product may also experience fluctuations due to environmental changes (e.g., in temperature or humidity) at the location where it is installed.
2. The alarm setpoint should be set within the performance range of the device.
In facilities subject to the High Pressure Gas Safety Act, settings below the standard alarm setpoints specified by Riken Keiki may result in false alarms.
3. The product is a safety device. It is not a control device.
Use the alarm contact outputs on the product with external alarm lamps or buzzers. Use the analog signal output for indicators or external recorders. Riken Keiki rejects liability for malfunctions in cases in which this signal is used for any other controls.
4. The gas sensing parts in the gas detecting sensors of this product are metal-oxide porous sintered alloys. The surface area of the gas sensing parts will shrink when silicone and sulfides attach to the surface of the sintered bodies. This can impair sensitivity significantly.
For safety reasons, avoid using this product in environments containing even trace amounts of silicone or sulfides.
5. Regular maintenance is essential, including periodic parts replacement and readjustments as described in this operating manual. The product is a safety device. We recommend regular maintenance and gas calibration every six months in accordance with regulations.

12-2 Terminology

Term	Definition
Dust filter	Filter for removing dust We recommend fitting an external dust filter if the product will be used in dusty surroundings. Different filters are specified for different detection target gases. Contact our sales department.
vol%	Indicates gas concentrations in units of parts per hundred by volume.
ppm	Indicates gas concentration in units of parts per million by volume.
ppb	Indicates gas concentrations in units of parts per billion by volume.
%LEL	Unit in which the lower explosive limit (LEL) of the target combustible gas is set to 100
Calibration	Refers to an evaluation of the correlation between product readout values, display values, and setting values with actual values using calibration gas.
Maintenance mode	Mode for performing device maintenance During product maintenance, the alarm contacts are cut off, and the external output signal outputs a signal indicating the product is in maintenance mode. This enables the device to be isolated for maintenance.
Initialization	During the few seconds after turning on the power, the readings are unstable. This function cuts off alarm contacts during this time to prevent errors. The external output outputs a signal indicating the product is in initialization mode.
Zero suppression	This function makes fluctuations in ambient conditions and interference gas less noticeable.
Alarm delay time	This function temporarily suspends activation to prevent false alarms caused by external noise.
INHIBIT	This function temporarily stops gas detection functions during product maintenance, etc. This is also called "point skip," which has the same function.

Revision History

Issue	Revision details	Issue date
0	First issue (PT2-3041)	12/20/2022



EU-Declaration of Conformity

Document No.: 320CE22083



We, RIKEN KEIKI Co., Ltd. 2-7-6, Azusawa, Itabashi-ku, Tokyo, 174-8744 Japan declare under our sole responsibility that the following product conforms to all the relevant provisions.

Product Name: Gas Detector Head
Model: GD-84D, GD-84D-EC, GD-84D-EA,
GD-84D-EA-EC, GD-84D-ET, GD-84D-ET-EC,
GD-84D-EX, GD-84D-EX-EC, GD-84D-EX-ET,
GD-84D-EX-ET-EC, GD-84D-EX-EA,
GD-84D-EX-EA-EC

Council Directives		Applicable Standards
2014/30/EU	EMC Directive	EN 50270:2015
2011/65/EU ^[1]	RoHS Directive	EN IEC 63000:2018

^[1]Including substances added by Commission Delegated Directive (EU) 2015/863

Place: Tokyo, Japan

Date: Jun. 29, 2022

Takakura Toshiyuki
General manager
Quality Control Center



UK-Declaration of Conformity

Document No.: 320UK22055



We, RIKEN KEIKI Co., Ltd. 2-7-6, Azusawa, Itabashi-ku, Tokyo, 174-8744 Japan declare under our sole responsibility that the following product conforms to all the relevant provisions.

Product Name: Gas Detector Head
Model: GD-84D, GD-84D-EC, GD-84D-EA,
GD-84D-EA-EC, GD-84D-ET, GD-84D-ET-EC,
GD-84D-EX, GD-84D-EX-EC, GD-84D-EX-ET,
GD-84D-EX-ET-EC, GD-84D-EX-EA,
GD-84D-EX-EA-EC

Regulations	UK designated Standards
Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091)	BS EN 50270:2015
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (S.I. 2012/3032)	BS EN IEC 63000:2018

Place: Tokyo, Japan

Date: May. 27, 2022

Takakura Toshiyuki
General manager
Quality Control Center