



PT3E-0203

## **Infrared Single Gas Monitor**

# **RI-257**

## **Operating Manual**

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## Operating Precautions

This monitor is a gas monitor that detects a gas in the air and triggers a gas alarm. The gas monitor is a safety unit, not an analyzer or densitometer which performs quantitative/qualitative analysis/measurement for gases. Please fully understand the following points before using it, so that it can be used properly.

1. This gas monitor may be interfered by gases other than the gas to be detected and vapors. Please note that the alarm may be triggered by interference. In addition, it may be fluctuated by environmental (temperature, humidity, etc.) changes in the installation site. Perform the zero adjustment regularly (approximately once a month).
2. Avoid using the gas monitor at the place where the temperature changes significantly (approx. 10 to 15°C).
3. The alarm must be set within a range where the performance of the gas monitor can be ensured.  
In facilities compliant with the High Pressure Gas Safety Act, an alarm setting below our standard alarm setpoint may trigger a false alarm.
4. This is a safety unit, not a control unit.  
The alarm contact output of the gas monitor must be used for an external alarm lamp/buzzer, while the analog signal output must be used for an indicator or external recorder. If these outputs are used to control other units, we shall not be responsible for any malfunctions.
5. Gas sampling from places where there are high humidity, dust or acid mist requires a sample pre-conditioner. Please contact RIKEN KEIKI.
6. For maintenance of the gas monitor, it must go through a regular maintenance, including replacement and adjustment of the regular replacement parts as specified in the operating manual. In addition, because this is a safety unit, it is recommended that a regular maintenance and a calibration are performed every six months in accordance with the regulations.

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# Outline of the Product

## 1-1. Preface




Thank you for choosing our wall mounting type infrared PFC gas monitor model "RI-257".  
Please check that the model number of the product you purchased is included in the specifications on this manual.

This manual explains how to use the gas monitor and its specifications.  
It contains information required for using the gas monitor properly. Not only the first-time users but also the users who have already used the product must read and understand the operating manual to enhance the knowledge and experience before using the alarm system.

## 1-2. Purpose of use

- The model RI-257 is a gas monitor for detecting mainly the leakage of fluorocarbon gases.
- The gas monitor is designed to detect a leaked gas in the air by the built-in infrared sensor.  
The concentrations of detected gases are displayed on the 16-digit LCD.
- The gas monitor outputs gas concentration in 4 to 20 mA external output signal.
- The gas monitor has two-step gas alarm contact and fault alarm contact (option).
- The built-in pump in the gas monitor draws a leaked gas to perform gas detection.

## 1-3. Definition of DANGER, WARNING, CAUTION and NOTE

 <b>DANGER</b>	Indicates that such action directly causes a serious damage on life, health or assets.
 <b>WARNING</b>	Indicates that non-compliance with the instructions in the operating manual causes a serious damage on health or assets.
 <b>CAUTION</b>	Indicates that non-compliance with the instructions in the operating manual causes a minor damage on health or assets.
<b>NOTE</b>	Indicates advice on handling.

# Important Notices on Safety

## 2-1. Danger cases



### DANGER

RI-257 is not an explosion-proof unit. Do not use the unit in place where combustible gases may exist.

## 2-2. Warning cases



### WARNING

- Power supply  
Before turning on the gas monitor, always check that the voltage is properly applied.
- Need of protective grounding  
Do not cut the grounding circuit inside or outside the gas monitor or disconnect the wire from the grounding terminal.
- Defects in protective functions  
Before starting the gas monitor, check the protective functions for defects. When seeming defects are found in the protective functions, such as protective grounding and fuses, do not start the gas monitor.
- Fuse  
To prevent fire, use a fuse with the specified ratings (current, voltage and type) for the gas monitor.  
Turn the POWER switch OFF and cut the mains power before replacing a fuse. Do not use an unspecified fuse or short-circuit the fuse holder.
- Operation in a gas  
Do not operate the gas monitor in a place where combustible/explosive gases or vapors are present. Operating the gas monitor in such an environment will lead to extreme dangers.
- External connection  
Before connecting the gas monitor to a detection target or external control circuit, securely connect it to a protective grounding circuit.
- Response to a gas alarm  
There are extreme dangers if a gas exceeding an alarm setpoint is detected. Take proper actions based on your judgment.

## 2-3. Precautions



### CAUTION

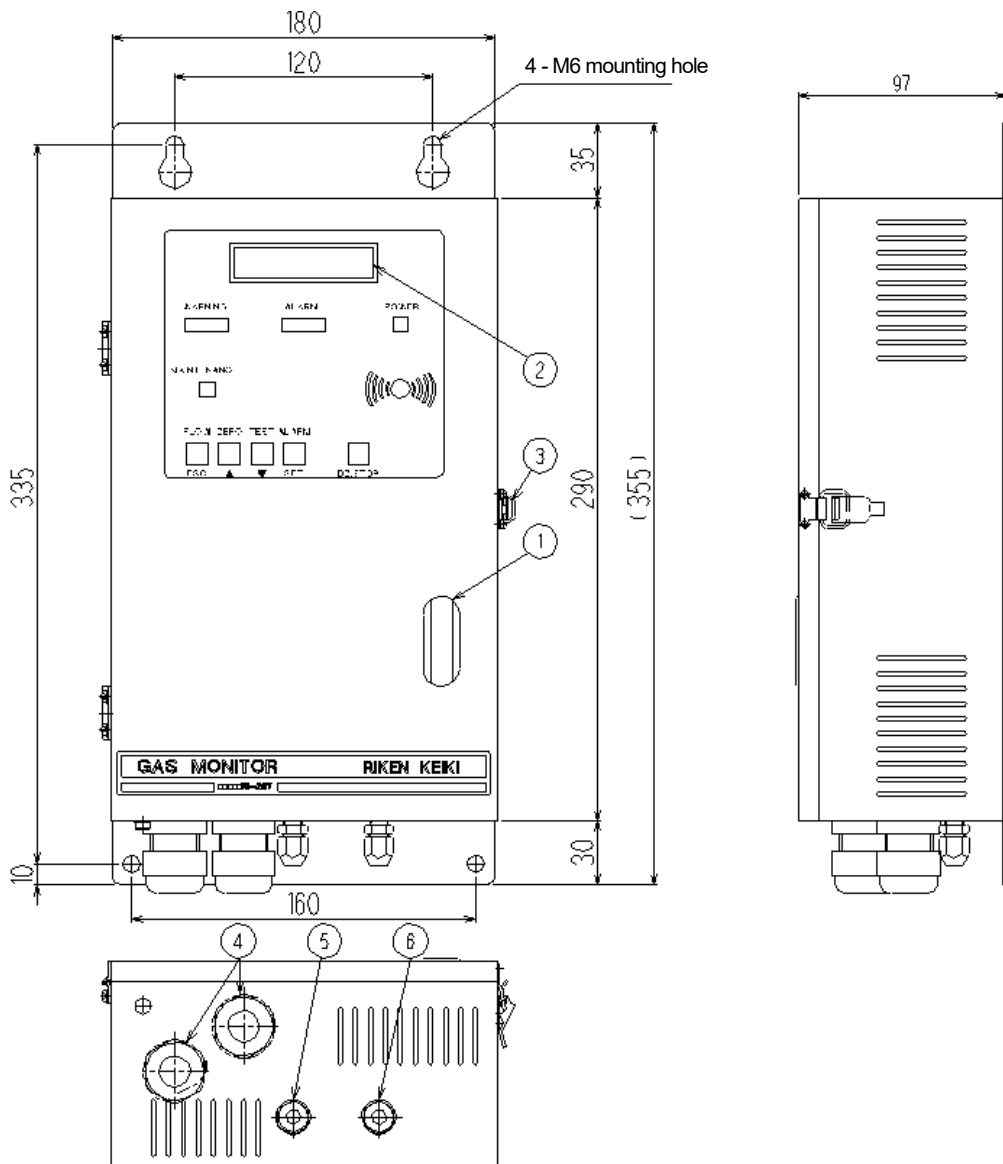
- Do not use a transceiver near the gas monitor.  
Radio wave from a transceiver etc. near the gas monitor or its cables may disturb indication reading. If a transceiver or other radio wave transmitting device is used, it must be used in a place where it disturbs nothing.
- To restart the gas monitor, you must wait 5 seconds or more before doing it.  
Restarting the gas monitor in less than 5 seconds may cause errors.
- Verify that the ball in the flow monitor is between two red lines before using the gas monitor.  
If the ball is below the lower red line, gas concentration cannot be detected correctly. Perform the flow adjustment.
- Be sure to attach the external dust filter before using the gas monitor.
- Do not use the external output of the gas monitor to control other units.  
This is not a control unit. It is not allowed to use the external output of the gas monitor to control other units.

# Product Functions

## 3-1. Names and functions for each part

### 3-1-1. Configuration

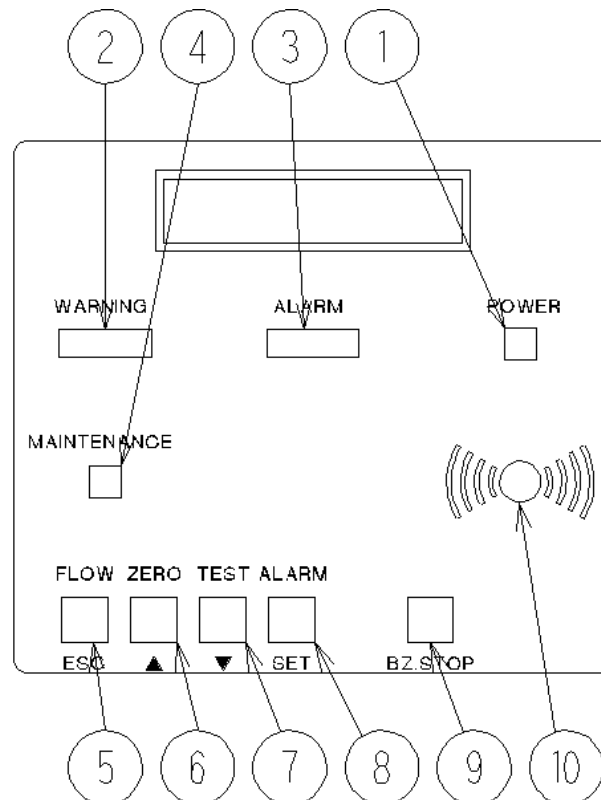
- (1) Flow monitor: Checks the flow rate.
- (2) LCD display: Displays detected gas concentration and messages.
- (3) Latch: Locks and opens the door.
- (4) Mount hole for external wiring: Leads in wiring for external connection.
- (5) Sample gas inlet: Sample gas inlet to the gas monitor.
- (6) Gas outlet: Outlet for exhausting the sampled gas.





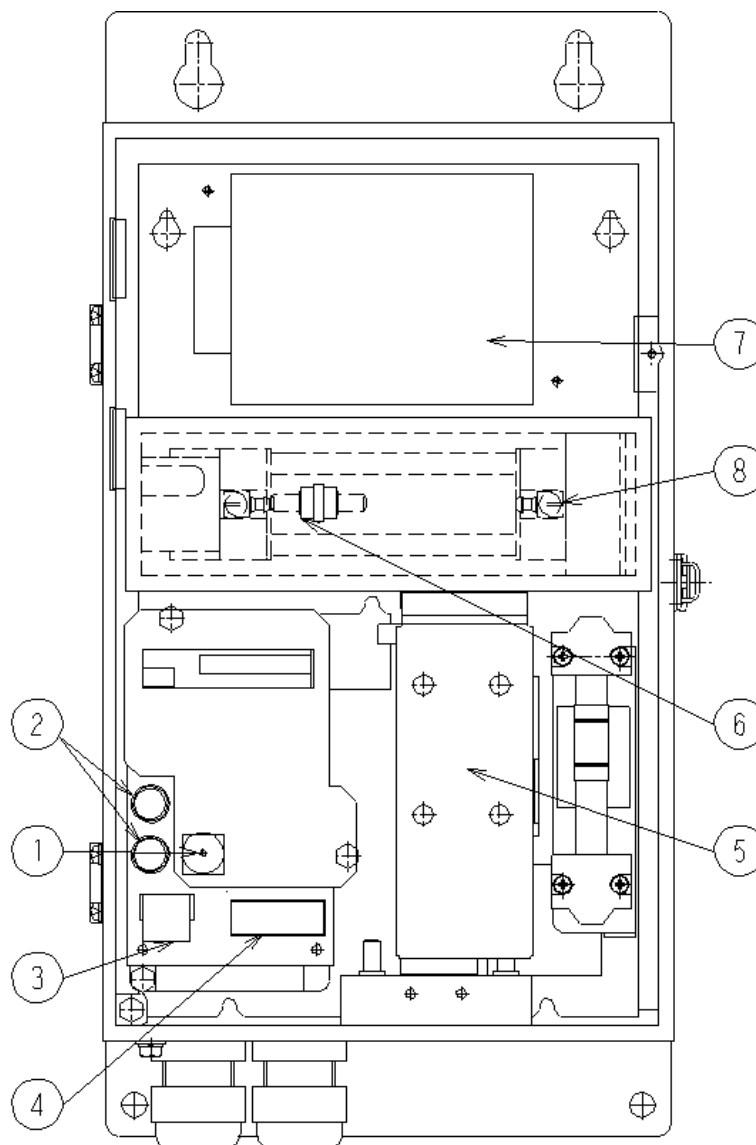
## 3-1-2. Panel

- (1) POWER display lamp: Lights up in normal working (power lamp) and blinks in trouble condition.
- (2) WARNING display lamp: Blinks at the first gas alarming, and lights up by pressing the BZ.STOP switch.
- (3) ALARM display lamp: Blinks at the second gas alarming, and lights up by pressing the BZ.STOP switch.
- (4) MAINTENANCE display lamp: Blinks in maintenance mode.
- (5) FLOW/ESC switch: Used to adjust the flow rate. It is also used to cancel the command in adjustment mode.
- (6) ZERO/▲ switch: Used for zero calibration. It is also used to increase numerical values in adjustment mode.
- (7) TEST/▼ switch: Used to perform an alarm test. It is also used to decrease numerical values in adjustment mode.
- (8) ALARM/SET switch: Used to check an alarm setpoint. It is also used to confirm operation in adjustment mode.
- (9) BZ.STOP switch: Used to stop the buzzer during an alarm activation.
- (10) Buzzer: Sounds during an alarm activation. In addition, the operation tone sounds.



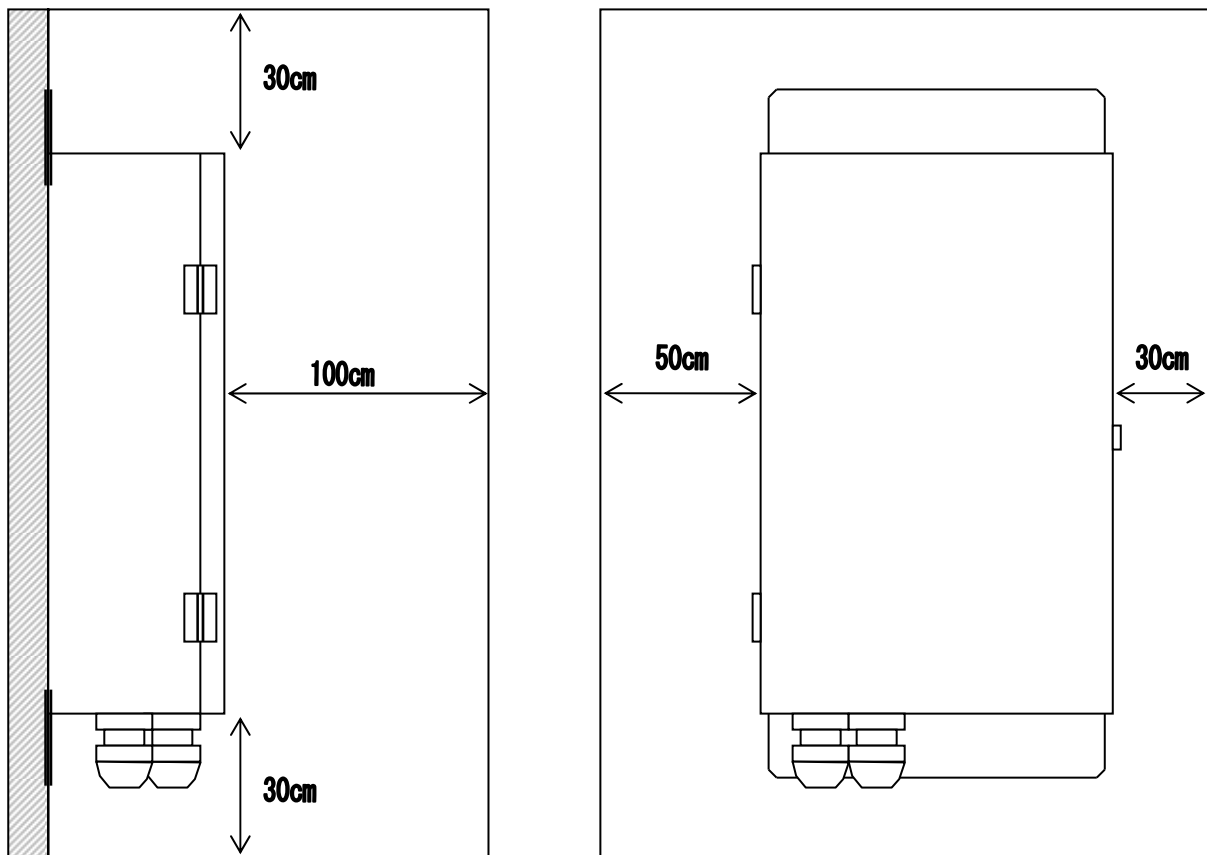
### 3-1-3. Configuration inside the unit

- (1) Power switch: Main power switch to power on/off
- (2) Fuse: Power supply fuse Rating: 125 VAC, 1 A(AC specification), 250 VAC / 125 VDC 1A(DC specification)
- (3) 3P terminal plate: Terminal plate for power supply connection
- (4) 8P terminal plate: Terminal plate for external output and contact connection
- (5) Pump: Pump for drawing gases
- (6) Protective filter: Dust filter for protection
- (7) Switching power supply: Drive power supply inside the gas monitor  
(DC specifications are not mounted)
- (8) Detector: Non-dispersive infrared type detector  
It is equipped with thermal buffer material (white).



## 3-2. Installation diagram

A certain maintenance space needs to be secured in advance to allow the maintenance personnel to safely and properly perform maintenance of the gas detector head function and performance. Be sure to secure this space during construction planning or installation.



When an installation place is selected, install the gas monitor in the place.

(1) Install the gas monitor to a firm surface such as wall using M6 bolts as shown in the figures above.



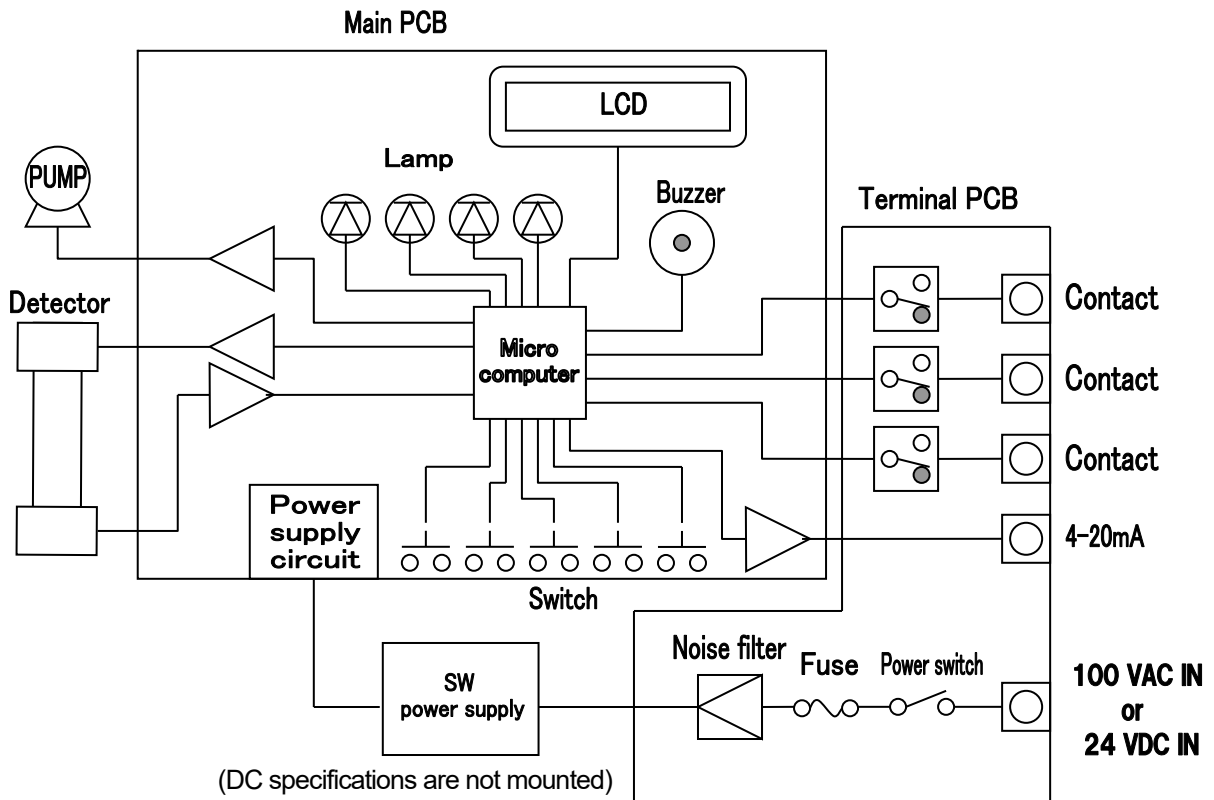
### CAUTION

Check that the gas monitor is mounted securely on the wall.

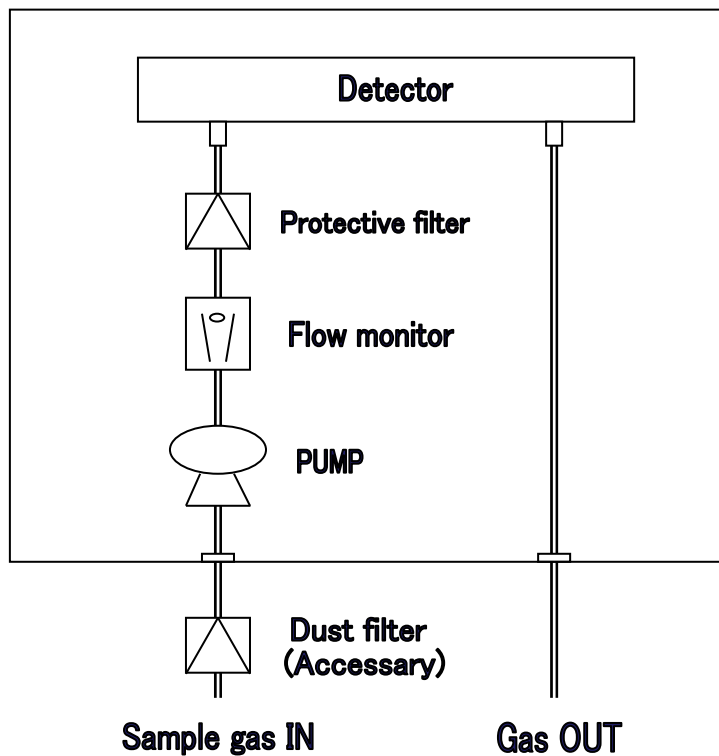
If the gas monitor is not securely installed, it might fall, causing an unexpected injury or a damage of the monitor.

### 3-3. Block diagram

#### 3-3-1. Electric diagram



#### 3-3-2. Tubing diagram



# How to Use

## 4-1. Before using the gas monitor

Not only the first-time users but also the users who have already used the gas monitor never fail to follow the operating precautions. Ignoring the precautions may damage the gas monitor, resulting in inaccurate gas detection.

## 4-2. Installation location



### CAUTION

**Drawing detectable gases from a place with a lot of dust.**

- The performance of the gas monitor is affected by dust. Therefore, attach the dust filter included in standard accessories before using the gas monitor.
- If a sampling gas contains a lot of dust, attach the MC filter included in optional accessories at the end of the gas collection tube as well as the dust filter included in standard accessories.
- Never fail to stop the pump drawing operation before replacing the dust filter.

**Do not install the gas monitor in a place exposed to direct sunlight or sudden changes in the temperature.**

Avoid a place where the gas monitor is exposed to direct sun light, being around the ventilation blower outlet and direct wind blow to prevent sudden temperature change in it. The gas monitor may not adjust to sudden changes in the temperature, such as condensation formed inside.

**Do not install the gas monitor in a place with vibrations or shocks.**

The gas monitor consists of sensitive electronic parts. It must be installed in a stable place free from vibrations or shocks.

**Keep the gas monitor (and its cables) away from noise source devices.**

When selecting installation points, avoid a place where high-frequency devices exist.

- Do not place the gas monitor next to a noise source device.
- Do not run cables in parallel or close to each other.

**Do not install the gas monitor in a place where detectable gases stay around.**

Do not install the alarm system and perform detection in a place where detectable gases remain. In this case, add extension sampling horse etc. and draw a gas.

**Do not install the gas monitor in a place with something dangerous including high voltage wires for maintenance work.**

Regular maintenance of the gas monitor must be performed. Do not install the gas monitor in a place where maintenance involves dangers.

**Do not install the gas monitor in a place where maintenance cannot be performed.**

Do not install the gas monitor in a place where the machinery must be stopped when maintenance is performed in its inside, where parts of the machinery must be removed to perform maintenance, or where the case cannot be removed because tubes or racks, etc. prevent access to it.

**Do not install the gas monitor in machinery which is not properly grounded.**

Before installing the alarm system in machinery, the machinery must be grounded properly.

## 4-3. Precautions for system designing



### CAUTION

An unstable power supply and noise may cause malfunctions or false alarms.  
The descriptions in this section must be reflected on the designing of a system using the gas monitor.

#### (1) Using a stable power supply

The external output and alarm contact of the gas monitor may be activated when the power is turned on, when momentary blackout occurs, or when the system is being stabilized. In such cases, use a UPS (uninterruptible power system), or take appropriate actions on the receiving side.

The gas monitor must be provided with the following power supply.

Power supply voltage	100 VAC $\pm 10\%$ (Terminal voltage of the gas monitor) or 24 VDC $\pm 10\%$ (Terminal voltage of the gas monitor)
Allowed time of momentary blackout	Approx. 10 msec. (To recover from the momentary blackout for 10 msec. or more, restart the gas monitor.) Install a UPS etc. on the outside of the gas monitor to ensure continuous operation and activation.
Others	Do not use it with a power supply of large power load or high-frequency noise. Use a line filter, etc. to avoid the noise source if necessary.

(3) Protection against lightning

<p>What is lightning surge?</p>	<p>If cables are installed outside the factory/plant, or if internal cables are installed in the same duct as the cables coming from outside the factory/plant, "lightning" will cause problems.          Because lightning acts as a large emission source while cables act as a receiving antenna, devices connected to the cables may be damaged.          Lightning cannot be prevented. Cables installed in a metal conduit or under the ground cannot be completely protected from inductive lightning surge caused by lightning.</p>
<p>Protection against lightning</p>	<p>Although complete elimination of disasters caused by lightning is impossible, the following protective measures can be taken.          Take appropriate measures in accordance with the importance of the facilities and the environment.</p> <ul style="list-style-type: none"> <li>• Connect the transmission signal route by using optical fiber.</li> <li>• Provide protection by a lightning arrester (cable arrester). Although inductive lightning surge can be transmitted through the cable, it is prevented by installing a lightning arrester before the field devices and central processing equipment.          For information on how to use a lightning arrester, please contact the manufacturer.</li> </ul>
<p>Grounding</p>	<p>In addition to lightning, there are more sources of surge noise. To protect units from these noise sources, the units must be grounded.</p>

(4) Alarm contact

The alarm contact of the gas monitor is used to transmit signals to activate an external buzzer, alarm lamp, etc. Do not use the gas monitor for controlling purpose (e.g., controlling the shutdown valve).



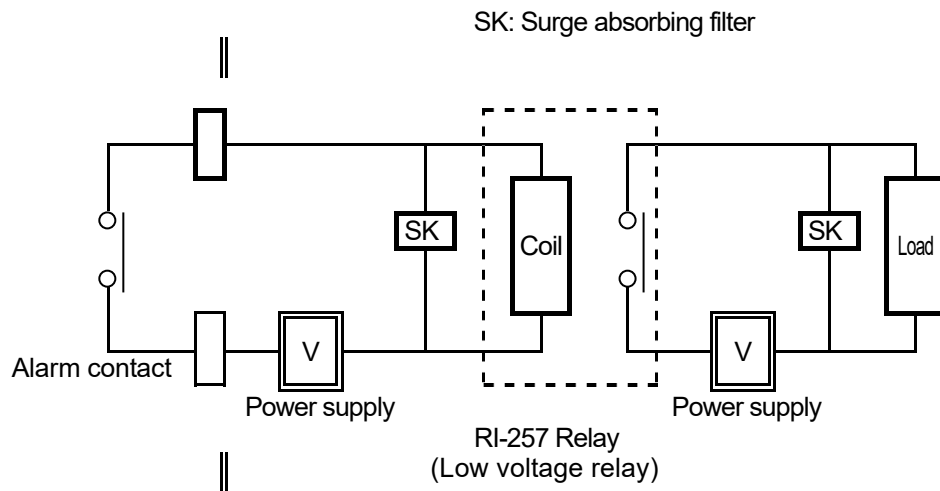
**CAUTION**

The "b" contact (break contact) under de-energized state may be opened momentarily by a physical shock, such as external force.  
 When the "b" contact (optional) is selected for the alarm contact, take appropriate actions to prepare for a momentary activation, for example, add signal delay operation (approximately one second) to the receiving side of the "b" contact.

When controlling external load, some load characteristics may adversely affect the gas monitor. In such case, take the following measures to stabilize the operation and protect the contact.

- Add a low voltage relay (contact amplification) to which the surge absorption part (CR circuit) (spark killer: SK) suitable for the relay coil rating (diode, etc. for DC) is directly connected.
- Add a CR circuit also to the loaded side of the relay as necessary.

Reference: It may be better to attach the CR circuit to the contact side for certain load conditions. However, it must be attached after checking the load operation.



- Understanding of alarm contact on inductive load -

The specifications for the RI-257 alarm contact are based on the resistance load conditions.

If inductive load is used at the alarm contact, the following errors may occur easily because very high counter electromotive voltage is generated.

- The relay contact melts and disables the contact activation.
- High voltage entered inside of the detector damages any number of electric parts.
- Resulted large noise makes CPU out of control and behave abnormally.
- Unexpected noise may enter the contact regardless of inductive load, thus posing a risk of above errors.



## CAUTION

- In principle, inductive load should not be used. (Never use it for a fluorescent lamp, motor, etc.)
- External contact amplification is required to use inductive load. However, because an external relay coil is also regarded as inductive load, use a relay operated at low voltage (up to 100 VAC) and protect with an appropriate surge killer.

\* Followings are examples of inductive load.

- Revolving light, external relay, buzzer, siren, fan, fluorescent lamp, motor, etc.



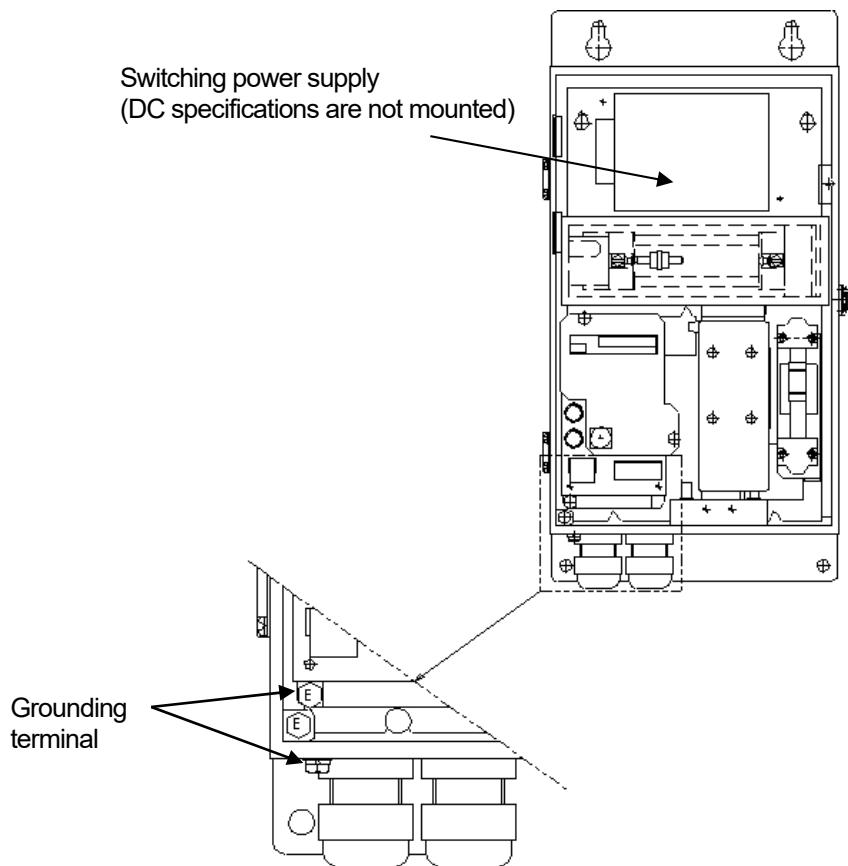
## 4-4. Grounding

Connect the gas monitor to your grounding terminal with the internal or external terminal E.



### WARNING

Before turning on the gas monitor, never fail to connect it to a grounding terminal.



For stable operation of the gas monitor and safety, it must be connected to a grounding terminal. Do not connect the grounding wire to a gas pipe. The grounding must be made as D type grounding (below 100  $\Omega$  of grounding resistance).

## 4-5. Precautions on wiring work



### CAUTION

- Be careful not to damage the internal electronic circuit when wiring.
- For the detector unit, placing it vertically may cause the unit to fall backward and to be damaged. Be careful not to fall the unit.
- The power cables and signal cables must not be installed together with the motor power cables etc.
- When stranded wires are used, prevent wires from contacting each other.

## 4-6. Compatible cable



### CAUTION

To connect a cable that cannot be brought into RI-257 due to its larger size, use a junction box etc.

### 4-6-1. Power cable

Power supply cable: Use CVVS 1.25 to 2.0 mm<sup>2</sup> cable.

### 4-6-2. 4 to 20 mA signal/contact signal cable

Signal cable (4 to 20 mA/contact): Use CVVS 1.25 mm<sup>2</sup> cable.

### 4-6-3. Specifications of terminal plate

#### Connection conditions

	3P terminal plate (For power supply)	8P terminal plate (For signal)
Bare wire length	Approx. 6.5 mm	Approx. 6 mm
Screw tightening torque	0.5 - 0.8 N·m	0.2 - 0.25 N·m
Compatible screwdriver	Flathead screwdriver (width 3 mm or less)	

#### Compatible bar terminal

For a bar terminal, the following items are available.

Bar terminal: Model AI series (manufactured by Phoenix Contact)

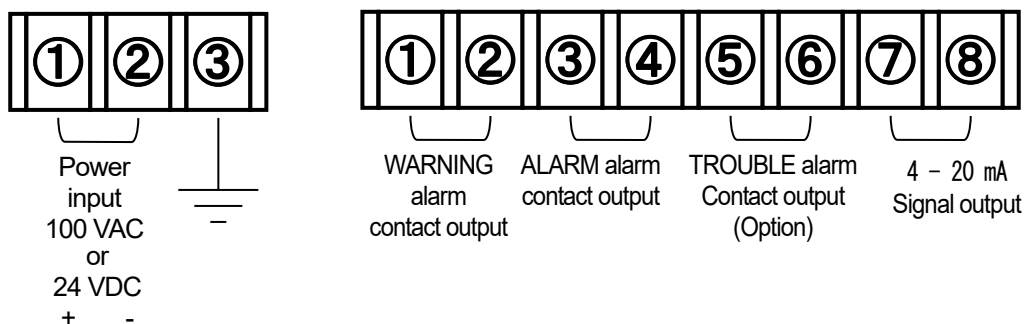
Crimping tool: Model CRIMPFOX UD 6 (manufactured by Phoenix Contact)



### CAUTION

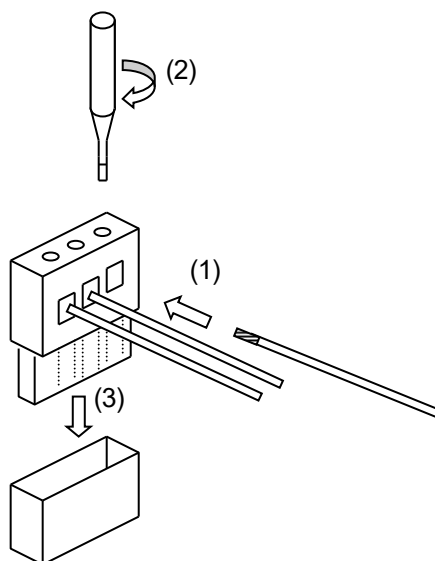
A bar terminal of the specified model must be used. Using other bar terminals invalidates the indemnification of the performance.

## 4-7. Figure of terminal plate



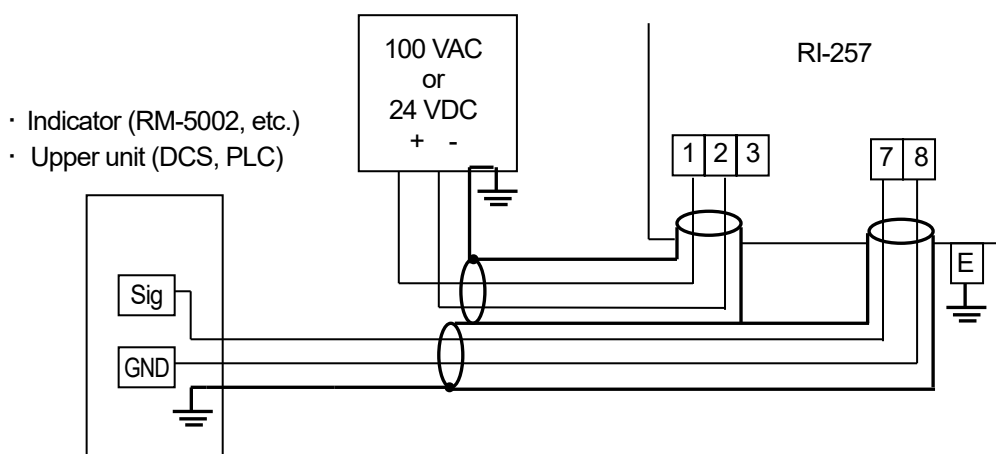
## 4-8. Wiring to terminal plate

- (1) Strip off the sheath at the end of the cable.  
For bare wire length, see the previous page.
- (2) Insert the wire to the plug on the terminal plate and tighten it securely using a flathead screwdriver.
- (3) After connecting all the cables to the plugs, connect the plugs to the base of the board.



## 4-9. Example of cable connection

- Example of connecting to indicator, DCS and PLC



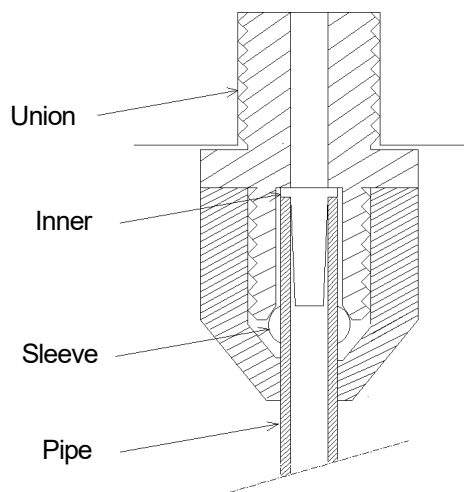
## 4-10. Precautions on tubing work



### WARNING

- The gas monitor is designed to draw gases under the atmospheric pressure. Applying excessive pressure to the sampling inlet/outlet (GAS IN, GAS OUT) of the gas monitor may cause the disconnection of internal tubes, etc. and hazards due to detected gas leakage. Be sure that excessive pressure is not applied to the gas monitor while used.
- Detected gases must be exhausted from the detected gas exhausting outlet (GAS OUT) at the bottom of the gas monitor to which an exhaust tube is connected, to a point regarded as a safe place.

- (1) Sampling inlet/outlet of the gas monitor
- The gas monitor has an Rc1/4 female thread inside of the sampling inlet/outlet (GAS IN, GAS OUT), to which "polypropylene" unions are normally attached.
- Because their material varies depending on the gas to be used, please specify the gas.
- The compatible tube is a Teflon tube of  $\Phi 6$  (OD) to  $\Phi 4$  (ID).
- The tube must be installed with the supplied ferrules and sleeves attached to prevent a leak.
- Type and length of tube materials to be used vary depending on the sample gas. Please contact RIKEN KEIKI.



- (2) Flow rate
- The flow rate of the gas monitor itself is 0.8 to 1.2 L/min under the operating temperatures.
  - When a gas is drawn from a distant point, please consult RIKEN KEIKI.
- (3) External dust filter
- Be sure to attach the attached external dust filter to the sampling inlet (GAS IN) to the gas monitor.
  - If a sampling gas contains a lot of dust, attach the MC filter included in optional accessories at the end of the gas collection tube.
- (4) Tube material
- Some sample gases have highly adsorptive or corrosive property. Select the tube material taking into account of these properties.
  - Check co-existing gases and moisture in the sample gas, and perform appropriate preconditioning.



### CAUTION

It is needed to decide the tubing (length, material, routing, with or without pre-conditioner, etc.). For more information, please contact RIKEN KEIKI.

# How to Operate

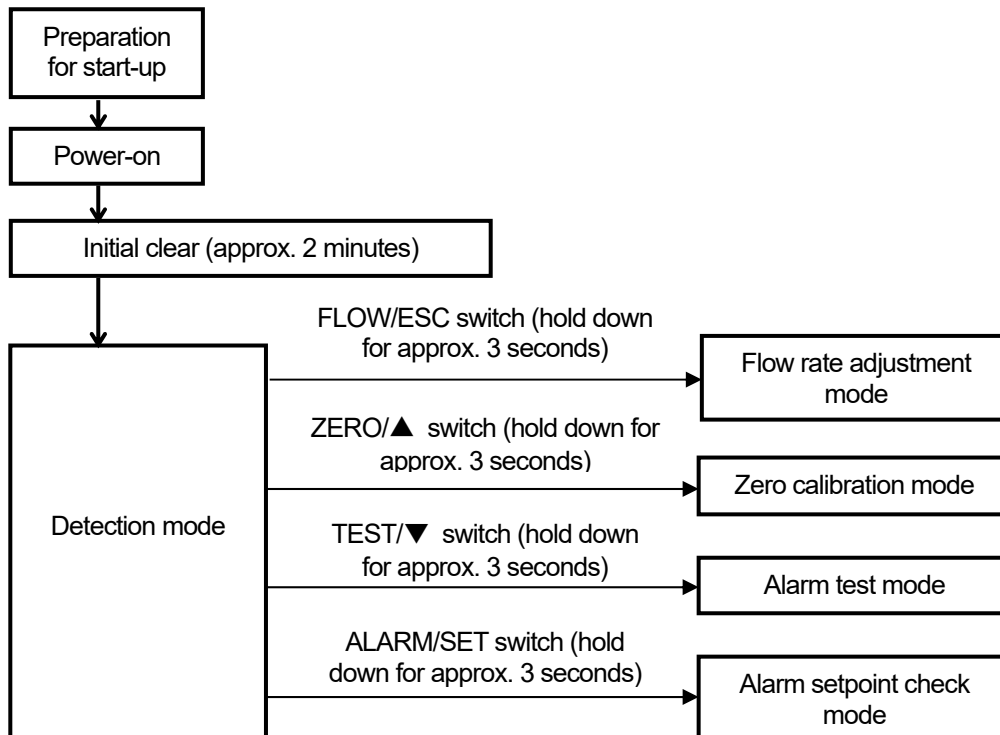
## 5-1. Preparation for start-up

Before connecting a power supply, read and understand the following precautions. Ignoring these precautions may cause an electric shock or damage the unit.

- (1) Connect the gas monitor to a grounding circuit.
- (2) Check that the external wiring is done properly.
- (3) Check that the power voltage is compliant with the specification.
- (4) Because the external contact may be activated during the adjustment, take measures to prevent an activated contact from having influences on external circuits.
- (5) Check that the dust filter is attached properly.
- (6) Make sure to use a fuse with the specified ratings to prevent fire.

## 5-2. Basic operating procedures

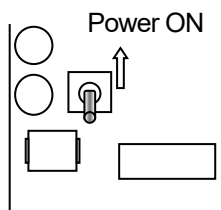
Normally, the detection mode is used for normal operations.



## 5-3. How to activate the gas monitor

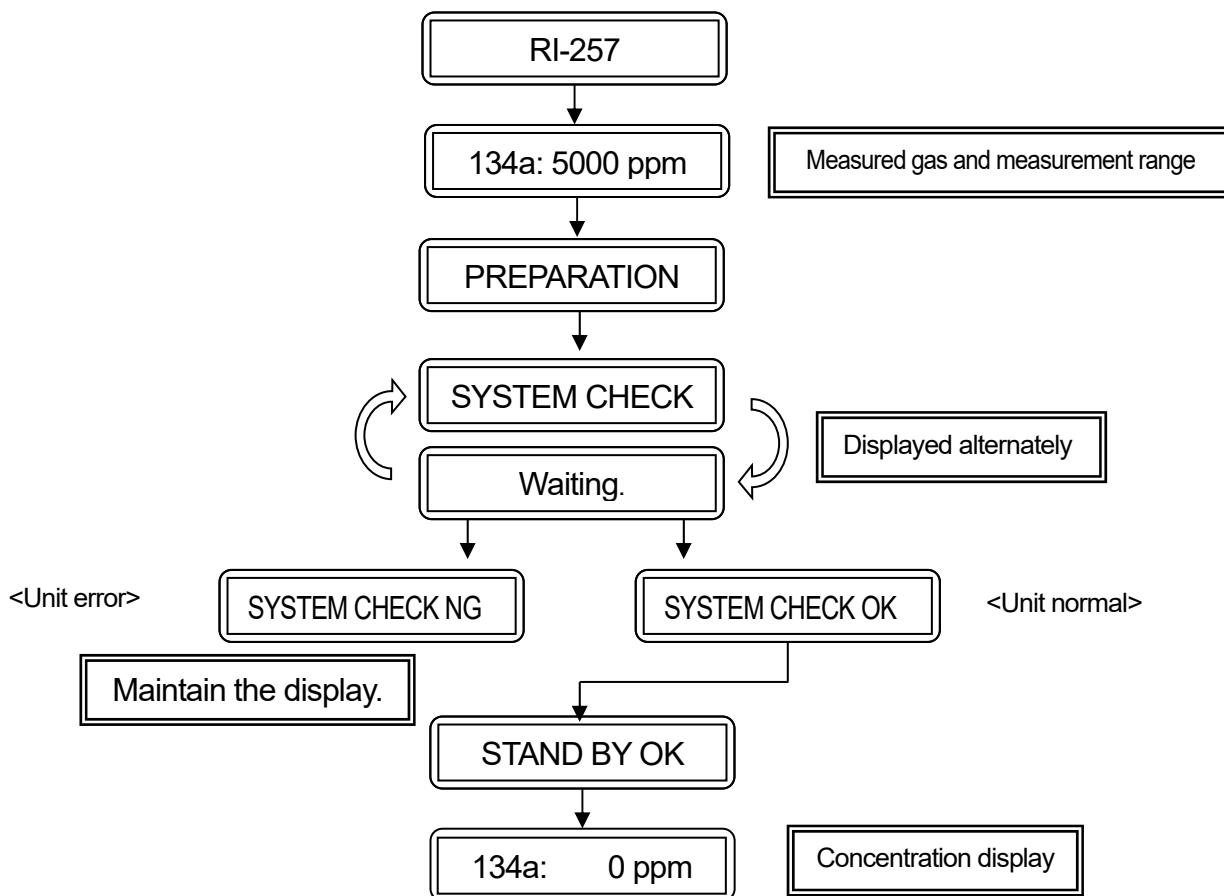
### 5-3-1. Power-on

- Before turning on the power switch, check that the gas monitor is installed properly.
- The power switch is on the PCB at the lower left inside the gas monitor.
- Move the power switch up to turn ON or down to turn OFF.
- Turn the power switch on and close the door.



- When the power switch is turned on, the POWER lamp lights up, and the pump starts operation approximately 15 seconds later.
- Initial clear (approx. 2 minutes)
  - System check of the unit
  - External output: Approx. 2.5 mA
  - Deactivation of alarms and troubles (lamps, contacts)
- Check that the ball in the glass column of the flow monitor on the gas monitor is between two red lines.
- If the ball is not between the red lines, perform adjustment in the flow adjustment mode in 5-3-2.

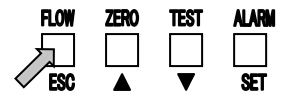
Initial clear (from power on to measurement start) time display details



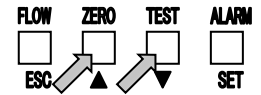
## 5-3-2. Adjusting flow rate

Adjust the flow rate in the flow adjustment mode.

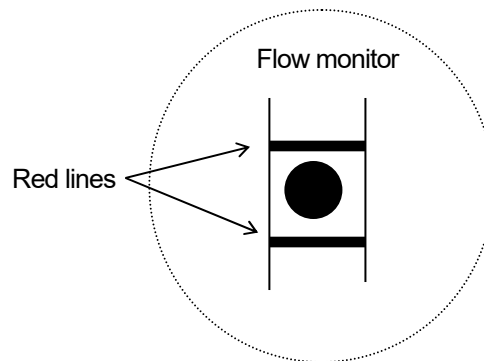
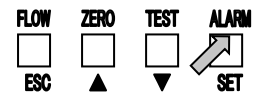
In warm up or the detection mode (Normal state), hold down the FLOW switch for approximately three seconds. If the switch is released halfway, the mode returns to the detection mode.



Press the SET switch. "FLOW" blinks. Adjust the flow rate using ▲ and ▼ switches.



After adjustment, press the SET switch to confirm the adjusted value and the mode returns to the detection mode.



## 5-4. Description of operation (detection mode)

### 5-4-1. Display operation

The alarm system uses the following two types of equipment to display operation status.

- (1) LCD display: Displays detected gas concentration, etc.
- (2) LED lamp: Displays status of power supply/failure (POWER), first gas alarm (WARNING), second gas alarm (ALARM) and maintenance (MAINTENANCE).

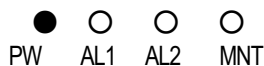
\* The LCD display and LED lamp function according to the unit status.

LED lamp operations  
 ○: Off ●: On ◎: Blinking

Abbreviated name of each LED lamp  
 PW:POWER AL1:WARNING AL2:ALARM  
 MNT:MAINTENANCE

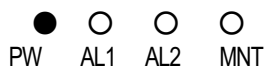
#### Zero suppression

When a value is less than the zero suppression setting value, zero is displayed.



134a: 0 ppm

When "-0 ppm" is displayed for the detected gas concentration, perform zero calibration because the zero point is negative.



134a: - 0 ppm

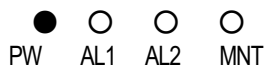


### WARNING

Because gas detection cannot be performed accurately if "-0 ppm" is displayed, perform zero adjustment.

#### Scale over

When the detected gas concentration exceeds the full scale level, LCD displays scale over.



134a: OVER

#### Gas Alarm State

When a gas beyond WARNING and ALARM levels is detected, the alarm lamps of WARNING and ALARM blink with the sampling gas concentration display.



134a: 4200 ppm



Fault status

If a fault occurs on the detector, the fault detail is displayed on the LCD.

⊙ ○ ○ ○  
PW AL1 AL2 MNT

FAIL SENSOR

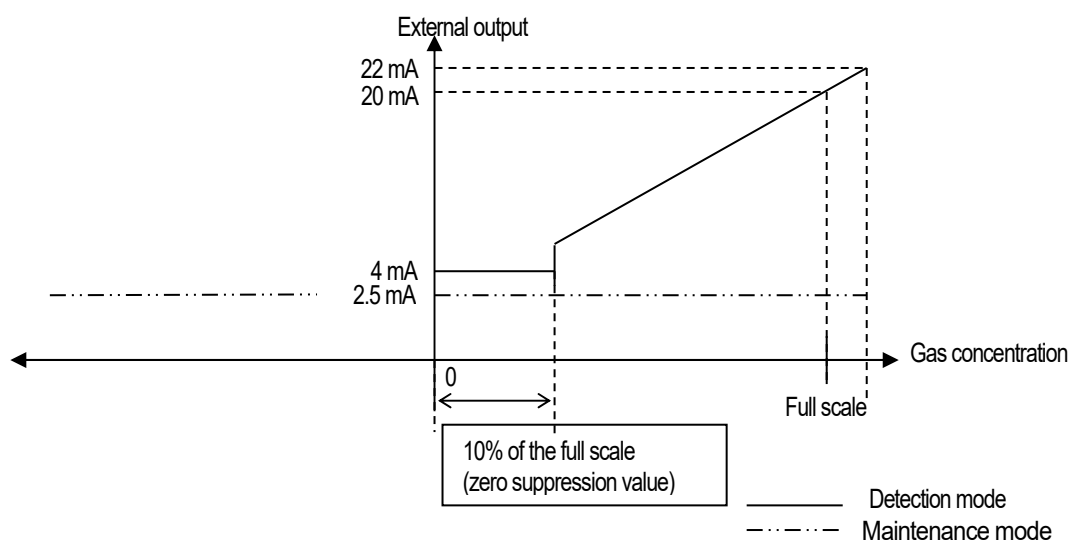
(LCD display) (Fault detail)  
FAIL SYSTEM: System failure  
FAIL SENSOR: Sensor failure  
FAIL ZERO: Zero point failure

## 5-4-2. External output operation

### 4 - 20 mA transmission

- (1) Signal transmission method: Electric current transmission (non-isolated)
- (2) Transmission path: CVVS
- (3) Transmission distance: 1 km or less
- (4) Connection load resistance: 300  $\Omega$  or less
- (5) Status signal level
  1. Detection mode: 4 - 22 mA (depends on the gas concentration)
  2. Gas alarm: 4 - 22 mA (depends on the gas concentration)
  3. Initial clear: 2.5 mA (fixed)
  4. Maintenance mode: 2.5 mA (fixed)
  5. Alarm test: 4 - 22 mA (depends on the gas concentration)
  6. Fault alarm: 0.5 mA (fixed)
  7. Inhibit: 2.5 mA (fixed)
- (6) Power Off: 0 mA

The following figure shows the relation between "gas concentration" and "external output".



### CAUTION

The 4 to 20 mA output is already adjusted. Do not attempt to perform readjustment after installation. It must be done by a qualified service engineer.

## 5-5. Maintenance and adjustment

### 5-5-1. Zero calibration

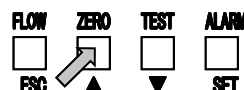
Calibrate the zero point in the zero calibration mode. For the gas monitor, perform zero calibration and do not need to perform span adjustment usually. When more accuracy is required or in regular maintenance, perform span adjustment.

#### NOTE

Before starting the zero adjustment, let the gas monitor draw the zero adjustment gas and wait until the reading is stabilized.

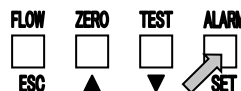
Hold down the ZERO switch for approximately three seconds in the detection mode (Normal state). If the switch is released halfway, the mode returns to the detection mode.

HOLD ZERO



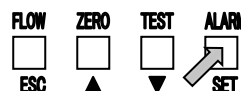
Check that the gas inlet for zero calibration gas is clean without other interference gases, and then press the SET switch.

SET ZERO ?



Display the current concentration value. Press the SET switch to perform calibration. (\*1)

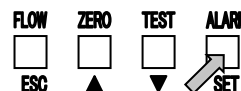
134a: 100 ppm



The calibration result is displayed. When the result shows that the calibration has not been successful, press the ESC or Set switch to return to the detection mode. Check the gas monitor, tubing, etc., and perform zero calibration again. If the problem persists, the gas sensor may fail. After turning off the power supply, please contact RIKEN KEIKI.

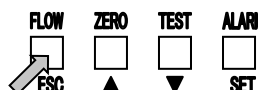
ZERO SET OK

[Calibration OK]



FAIL ZERO

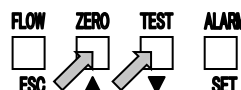
[Calibration NG]



\*1: For a totally new adjustment or when it has not been used for a long term, the zero point may have significantly changed. When the zero calibration is performed in that state, the mode automatically switches to the standardization mode for the detector.

Press either the ▲ or ▼ switch to display a value from 2950 to 3050. Wait for the display value to be stabilized after adjustment for a couple of minutes.

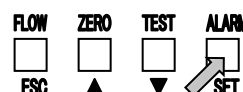
VPP: 2734 mV



VPP: 3000 mV

Press the SET switch to perform standardization and zero calibration.

ZERO SET OK



## 5-5-2. Alarm test

This is used to check the transmission status by outputting a signal equivalent to gas concentration to the external device. Whether to activate the alarm contact can be selected.

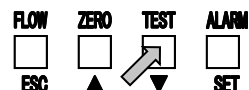


### WARNING

Before starting the alarm test (transmission test), provide a notification to the related sections so that they can prepare for false abnormalities (external output signals and alarm contact).

Hold down the TEST switch in the detection mode (Normal state) for approximately three seconds. If the switch is released halfway, the mode returns to the detection mode.

HOLD TEST KEY



Select whether to activate the alarm contact with the ▼/▲ switch.

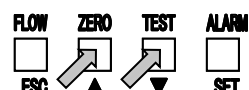
NO-ACT: Alarm contact is not activated.

ACT: Alarm contact is activated.

CONTACT: NO-ACT



CONTACT: ACT



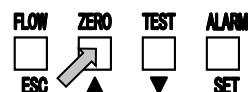
When a desired mode is displayed, press the SET switch. When "Activated" is selected, "TEST" blinks on the LCD screen.

TEST: 0 ppm



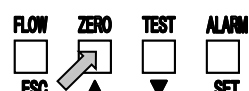
The first alarm activation is caused when the test level exceeds the first alarm point. (The WARNING lamp blinks when the alarm delay time has passed. The first alarm contact is activated when "Activated" is selected.)

TEST: 1800 ppm



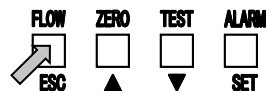
The second alarm activation is caused when the test level exceeds the second alarm point. (The ALARM lamp blinks when the alarm delay time has passed. The second alarm contact is also activated when "Activated" is selected.)

TEST: 3100 ppm



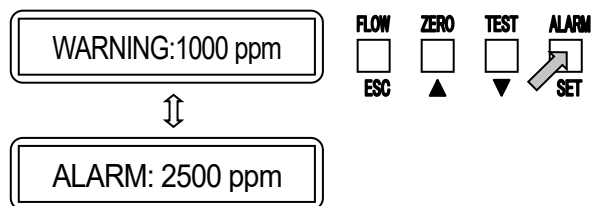
Hold down the ESC switch for approximately three seconds to return to the detection mode.

134a: 0 ppm



### 5-5-3. How to check alarm setpoint

While the ALARM switch is pressed in the detection mode (Normal state), WARNING and ALARM alarms are displayed alternately. LED lamp also blinks in accordance with LCD display.



When the ALARM switch is released, the mode returns to the detection mode.

### 5-6. How to exit

To turn off the gas monitor, turn off the POWER switch inside the detector unit, and then turn off the power supply (100 VAC or 24 VDC) to the gas monitor.



#### **WARNING**

Before turning off the gas monitor, inhibit on the upper (central) system must be activated.

Decide whether the power can be turned off by checking the operation of the external output and the devices connected to the external contact output terminal of the gas monitor before turning it off.

If the alarm contact is energized (option), it is activated when the gas monitor POWER switch is turned "OFF".

If the gas to be detected has an adsorptive property, the gas monitor must be cleaned thoroughly with fresh air before turning "OFF" the gas monitor.

# Alarm Type and Operation

## 6-1. Alarm type

The gas monitor has two types of alarms, gas alarm and fault alarm.

- (1) Gas alarm: Activated when the concentration of detected gas reaches or exceeds the alarm setpoint value.  
<Auto-Reset Operation>

### NOTE

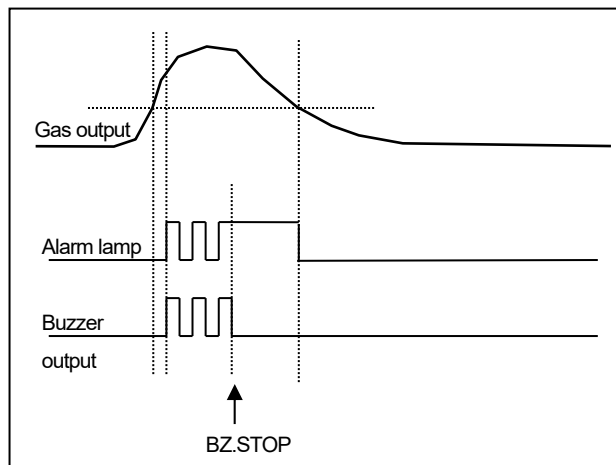
The alarm setpoint is set to the value for the first alarm or the second alarm depending on the gas specification. The alarm delay time of three seconds has been set in the gas monitor to prevent a false activation.

- (2) Fault alarm: Triggered when an abnormality is detected in the gas monitor.  
<<Auto-reset>> applies to the cases other than the system error "E-00".  
After the gas monitor is successfully returned from the fault, it restarts with the process normally performed right after it is turned on (initial clear). See "8. Measures for Abnormalities".

## 6-2. Type of alarm operation

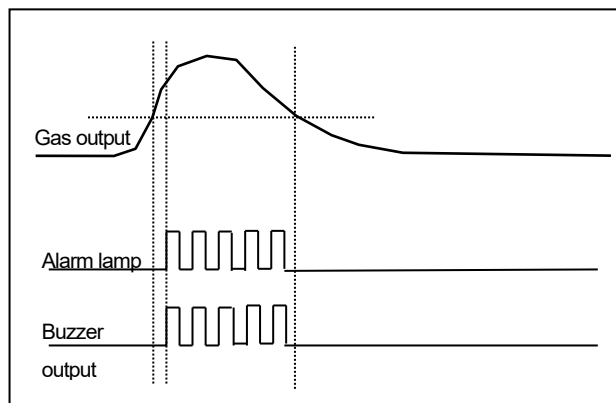
### Self-latching

When an alarm is triggered even if the detected gas concentration becomes below the alarm setpoint, the alarming continues. When the BZ.STOP switch is pressed, the alarm lamp changes from blinking to steady-one. Then, when the detected gas concentration becomes below the alarm setpoint, the alarm lamp turns off and the external contact is reset.



### Non latching (Auto-reset)

When the detected gas concentration is below the alarm setpoint after the alarm is triggered, status automatically returns to the normal state.



## 6-3. Gas alarm

### 6-3-1. Gas alarm pattern

#### (1) Display operation

##### 1. Gas concentration

When the concentration of gas exceeds the detection range, "OVER" (over scale) will be displayed.

##### 2. Power display lamp (POWER: Green)

This lights up continuously.

##### 3. Alarm display Lamp (ALM1: Orange), (ALM2: Red)

The alarm setpoint consists of two steps. Each of them lights up when the respective alarm setpoint is reached to or exceeded.

#### (2) External output operation

##### 1. 4 to 20 mA output

A current proportional to the gas concentration is output.

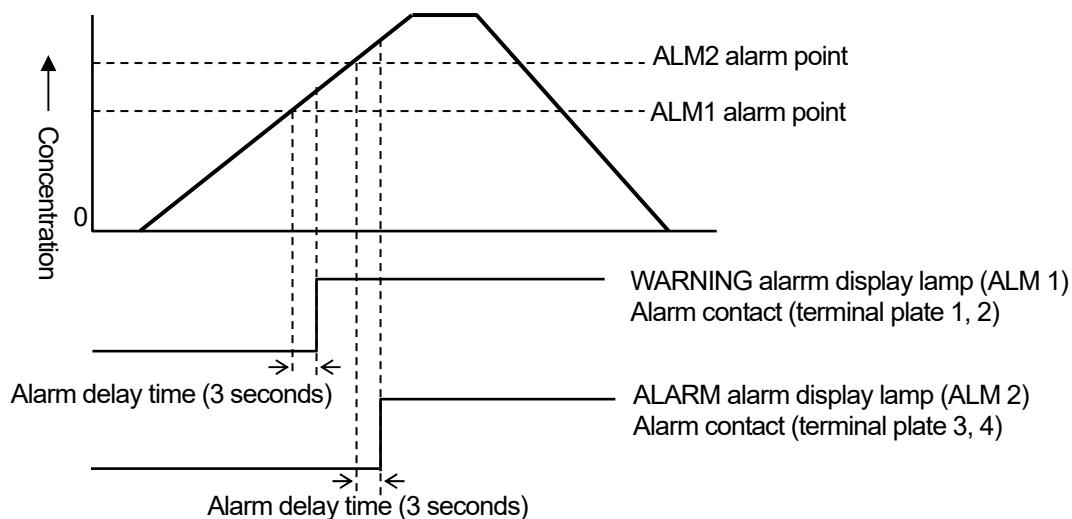
In case of over scale, an output will not exceed approximately 22 mA.

##### 2. Alarm contact

The contact is activated when the gas concentration reaches or exceeds the alarm setpoint.

Contact operation is self-latching.

"Alarm Pattern"



## 6-3-2. Response to gas alarm

### In case of responding to a leaked gas

When a gas alarm is triggered, take actions in accordance with your management rules of gas alarm. Normally, take the following actions.

- (1) Check the reading of the alarm system.

### NOTE

If a gas leak is momentary, the reading may already have dropped when you check it. In addition, when the alarm is triggered by noise or other incidental conditions other than a gas, the reading may have already dropped.

- (2) Based on your management rules of gas alarm, no one can be allowed to access the monitored zone to ensure safety.
- (3) If the Gas Concentration Display continues to be shown, close the main valve of the gas, and then check that the gas concentration reading is dropped.
- (4) Access the gas leak point, equipped with a protective gear to avoid dangers caused by possibly remaining gases, and check whether gases remain or not by using a portable gas monitor.
- (5) Check that the point is free from dangers, and take actions to fix the gas leak.

## 6-3-3. Gas alarms triggered by a factor unrelated to gas detection

### The alarm system may react to an interference gas.

Contact RIKEN KEIKI for interference gases.

### A drift caused by aging deterioration of the sensor may be a cause.

Check the reading at daily maintenance and perform calibration for the detector head as needed.

### Noise from peripheral devices may be a cause.

Actions such as relocation, rewiring and adding a noise suppression part can be taken. The action actually taken depends on the situation of each site.

Temporary noise from lightning, etc. may affect the alarm system. When a cause-and-effect relationship is found, a surge protection measure can be taken according to the situation.



# Maintenance

The gas monitor is an important instrument for the purpose of safety.

To maintain the performance of the gas detection/alarm system and improve the reliability of safety, perform a regular maintenance.

## 7-1. Maintenance intervals and items

### 7-1-1. Daily maintenance

Daily maintenance must be performed by the user:

1. Check of the flow monitor  
Check that the ball in the flow monitor is between two red lines when performing detection.  
If the ball is below the lower red line, perform flow adjustment using the FLOW switch on the gas monitor panel.
2. Check of the POWER lamp  
The lamp lights up at a normal state.
3. Check of the LCD reading  
Check that the LCD reading is "0".  
If not "0", check that no gas is around the gas inlet, enter the maintenance mode, and perform zero adjustment.
4. Dust filter replacement and inspection  
If the flow does not increase when flow adjustment is performed, the external dust filter may be clogged.  
Replace it with a new one or inspect the flow line (the tube may be clogged, crooked, cracked, etc.).

### 7-1-2. Regular maintenance

Regular maintenance includes:

1. Daily maintenance
2. Cleaning of the gas monitor
3. Calibration
4. Check of functions
5. Replacement parts: See "7-6. List of recommended regular replacement parts".
6. Others

### 7-1-3. Regular maintenance contract

- We recommend you to conclude a maintenance contract with us for regular maintenance including span adjustment, other adjustments, maintenance, etc. to ensure safe operation of the gas monitor.
- Please contact RIKEN KEIKI for more information on a maintenance contract.

## 7-2. Calibration method

See "5-5. Maintenance and adjustment".



### CAUTION

Request RIKEN KEIKI for calibration.

## 7-3. Sensor and part replacement procedure



### CAUTION

Request RIKEN KEIKI for replacement of sensor, part, etc.

## 7-4. Procedure for operation stop or relocation

### 7-4-1. Stopping normal operation

See "5-6. How to exit".

### 7-4-2. Relocation installation

When the gas monitor is relocated, select a new place in accordance with "4-2. Installation location".  
For information on wiring and tubing work, see "4-5. Precautions on wiring work" and "4-10. Precautions on tubing work".



### CAUTION

After performing relocation, never fail to perform calibration.  
For information on readjustment including calibration, please contact RIKEN KEIKI.

## 7-5. Procedures to store the gas monitor, leave it for a long time, and use it again

The gas monitor must be stored under the following environmental conditions.

1. Temperature: 5 to 35°C
2. Humidity: 30 to 85% RH
3. Environmental condition: Environment without gases, solvents, vapor, etc.



### CAUTION

When you use the gas monitor again, never fail to perform a calibration.  
For information on readjustment including calibration and part replacement, please contact RIKEN KEIKI.

## 7-6. List of recommended regular replacement parts

No.	Name	Maintenance intervals	Replacement intervals (year)	Quantity (pieces/unit)
1	Pump (diaphragm excluded)	6 months	1 - 3	1
2	Diaphragm	6 months	1 - 2	1
3	Pump holder	1 year	3 - 6	1
4	Detector head	6 months	(2 - 3)	1
5	Internal tubing (tube)	6 months	1 - 3	1 set
6	Switching regulator (DC specification is not mounted)	---	4 - 6	1
7	Main PCB	---	6 - 7	1
8	Terminal PCB	---	7 - 8	1
9	LCD	1 year	7 - 8	1
10	Fuse (1A)	---	8	2
11	Flow meter	1 year	7 - 8	1
12	Flow meter O-ring	1 year	3 - 6	1
13	Internal filter	6 months	2 - 3	1
14	External filter	6 months	6 months - 1 year	1

### NOTE

- The above replacement intervals are recommendation only. The intervals may change depending on the operating conditions. These intervals do not mean the warranty periods either.  
The result of the regular maintenance may determine when to replace the parts.
- PCB replacement is required due to deterioration of capacitor.
- Use an adjusted PCB.

# Measures for Abnormalities

## 8-1. Fault alarm

POWER lamp blinking

- When the POWER lamp is blinking, any of the following problems occurs.

Determine the causes and take appropriate actions.

- When a problem occurs, the detector output is as follows.

RI-257 (4 to 20 mA): 0.5 mA (fixed)

Display	Details	Action
FAIL SYSTEM	Activated when a failure occurs inside the gas monitor.	Cycle the power. If it cannot be recovered, please contact RIKEN KEIKI.
FAIL SENSOR	Activated when the sensor connector is detached or the sensor fails.	Inspect the connector cable and fix the defective parts. If the defective parts cannot be identified, please contact RIKEN KEIKI.
FAIL ZERO	May be displayed when a small amount of dust in the sample gas accumulates.	If the problem persists after zero adjustment, please contact RIKEN KEIKI.
	Ambient temperature changes suddenly.	When the gas monitor is exposed to direct sunlight, or devices etc. that generate high-temperature heat are around it, the zero point on the sensor may fluctuate. Put a shield or other objects to protect the detector from sudden temperature change.

## 8-2. Response to fault alarm

If the gas monitor is malfunctioning, please contact RIKEN KEIKI immediately.

If trouble should take place, we try best to search its cause and prevent recurrence.

## 8-3. When you suspect a failure

The trouble cause may be a break or short-circuit of wiring between the multi-display unit and other devices.

- Check the wiring of the gas monitor as well as that of related devices around it.

The detector including tubing may not be appropriately used.

- Recheck the detection system. In addition, please contact RIKEN KEIKI.

The power system may have problems such as momentary blackout.

- Measures such as checking or adding the UPS, power supply line filter and insulation transformer, etc. can work.

## 8-4. Troubleshooting

(1) The POWER lamp does not go on (The power cannot be turned ON).

<Causes and Actions>

- Is a power cable connected?  
Connect a power cable.
- Has the fuse blown?  
Find out why the fuse has blown and take appropriate actions before replacing it.
- Is the power voltage normal?  
Provide the rated voltage.
- Is the power switch turned ON?  
Turn "ON" the power switch.

(2) POWER lamp is blinking.

<Causes and Actions>

See "8-1. Fault alarm".

(3) Reading increases.

<Causes and Actions>

- Does the temperature change suddenly?  
Sudden temperature change due to direct sunlight etc. may cause the reading value to increase.
- Does the humidity change suddenly?  
Like temperature, sudden humidity change may cause the reading value to increase.
- Does the pressure change?  
An infrared detector is affected by atmospheric pressure.
- Is there disturbance by external noise?  
See "4-3. Precautions for system designing" or other chapters and reduce the external noise.

(4) Reading goes off scale.

<Causes and Actions>

- Is the sensor cable damaged?  
Check the damage of the sensor cable.
- Does the sensor connector have contact failure?  
Check the sensor connector connection.
- Is the inside of the detector dirty?  
For the infrared detector, reading is significantly affected if the cell in the detector is wet by water etc. or dirty.  
Perform filter maintenance frequently.
- Is there disturbance by external noise?  
See "4-3. Precautions for system designing" or other chapters and reduce the external noise.

(5) Abnormal operations

<Causes and Actions>

- A sudden surge noise can be the cause. To recover, turn OFF the detector head power and then turn it ON again to restart.
- If such a symptom is observed frequently, take appropriate measures to eliminate the noise.

(6) Zero calibration cannot be performed.

<Causes and Actions>

- Is it just after power on?  
Warm up is required for an hour or more before calibration can be available.
- Is calibration gas correct?  
Supply the fresh air or nitrogen gas without containing detectable gas and interference gas.
- Is condensation caused?  
Correct calibration cannot be performed with condensation.

(7) Span adjustment impossible

<Causes and Actions>

- Check that the calibration gas concentration is appropriate.  
Use the proper calibration gas.
- The sensor sensitivity may be deteriorated.  
The sensor needs to be replaced.

(8) Slow response

<Causes and Actions>

- Is the dust filter clogged?  
Replace the dust filter.
- Is the pipe at gas inlet side or gas outlet side broken or clogged?  
Take appropriate measure for defective parts.
- Check that the detector unit is attached properly. In addition, check that fixing screws for the detector unit are tightened securely.

(9) Blowing of fuse

<Phenomenon>

- The multi-display unit does not work.

<Causes and Actions>

- The cause can be either a failure of the gas monitor or a failure of the external power supply.  
Find out the cause, take appropriate action, and then replace the fuse with a specified spare part.

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**NOTE**

Fuses rated at 125 VAC/1 A (AC specification) and 250 VAC/125 VDC 1A (DC specification) can be used for the gas monitor.

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# Definition of Terms

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## Flow monitor

Flow rate indicator for sampling gas supplied to the sensor part  
The gas monitor flow rate is 0.8 to 1.2 L/min.

## External output signal

The gas monitor external output is as follows.

- Gas concentration signal output, status signal: Current output
- Alarm contact output (1st, 2nd, fault)

## External dust filter

Be sure to attach the external dust filter before using the gas monitor.

## Full scale

Maximum value of the detection range.

## ppm

Gas concentration indicated in the unit of one-millionth of the volume

## Calibration

Adjusts the readings to the calibration gas concentration value by using the calibration gas etc.

## Maintenance mode

When maintenance is performed on the gas monitor, the alarm contact is disconnected, and a signal to indicate the maintenance mode status is sent out to the external output signal.  
As a result, maintenance can be performed on a single unit of the gas monitor.

## Initial clear

The reading is unstable for dozens of seconds after the power is turned on. To prevent malfunctions for that period, the alarm contact is deactivated. In addition, a signal to indicate the initial clear status is sent out to the external output.

## Zero suppression

A function to cut off the influences of environmental changes, interference gases, etc.

## Alarm delay time

A function which temporarily suspends activation to prevent a false alarm caused by noise from its outside.

## Response time

The time to trigger an alarm after introducing a gas with the concentration 1.6 times higher than the alarm setpoint.

(The delay time in a tube for the case of connecting a drawing tube outside is excluded.)

The response time of the alarm system is 30 seconds at maximum.

## Inhibit

Temporarily suspends the gas detection function during maintenance, etc. of the unit.

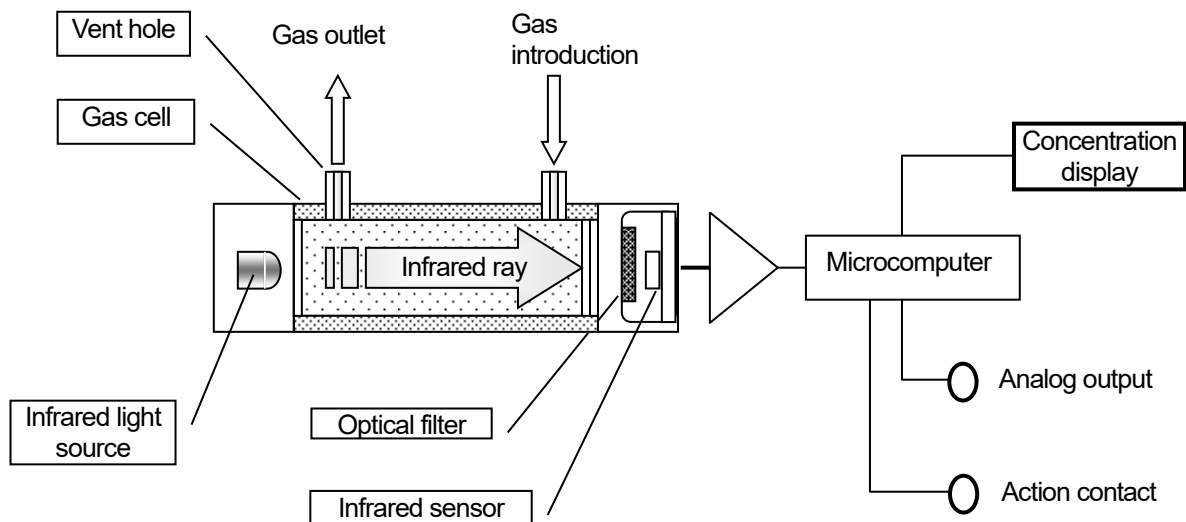
# Detection Principle

Model RI-257 applies Non-Dispersive Infrared Ray Absorption (NDIR) technique to detect target gas. The gas cell has two vent holes. The target gas enters into the gas cell from one and passes through the other.

When a detection target gas enters the cell, the infrared ray emitted from the light source will be absorbed into the gas, and the amount of infrared ray that reaches the infrared sensor will be reduced. The reduction amount is detected by the infrared sensor and it is output as a gas concentration.

An optical filter attached before the infrared sensor plays a role in transmitting only the wavelength of the infrared ray absorbed into a detection target gas. Therefore, the sensor has no sensitivity to a gas having different wavelength to absorb infrared rays from a detection target gas.

Moreover, it has no sensitivity to gases that do not absorb infrared rays, such as  $N_2$  and  $H_2$ .



Structure diagram



# List of product specifications

## 11-1. Standard specifications

Model	RI-257
Sensor detection principle Gas to be detected Detection range	Non-dispersive infrared method (NDIR) fluorocarbon gases, Solvent gases Depending on the detected gas
Detection method Flow rate External tubing system	Pump suction type 0.8 to 1.2 L/min Φ6 to Φ4 half-union for Teflon tube <PP> supplied (* Type and length of tube materials to be used vary depending on the detectable gas.)
Gas alarm Setpoint  Display Contact output Contact capacity Alarm delay time  Used cable	Two-step alarm: Self-latching WARNING (1st): Depending on the detectable gas ALARM (2nd): Depending on the detectable gas  16-digit LCD No-voltage contact 1a 125 VAC 0.1 mA to 0.5 A (Resistance load) 30 seconds or less (The time to trigger an alarm after introducing a gas with the concentration 1.6 times higher than the alarm setpoint.) CVVS   1.25 mm <sup>2</sup>
Transmission method  Load resistance Gas concentration signal Initial clear signal Maintenance signal Trouble signal Used cable	Current transmission method 4 to 20 mA (non-isolated, source current type) Below 300 Ω : 4 to 20 mA (linear output up to 22 mA) : 2.5 mA : 2.5 mA : 0.5 mA CVVS   1.25 mm <sup>2</sup> (within 1 km)
Display function Concentration display Status display	LCD display (16 digits) LCD display (16 digits) and LED lamp (1) POWER (Green) <ul style="list-style-type: none"> <li>• Normal: ON</li> <li>• Fault: Blinking</li> </ul> (2) WARNING (Yellow) <ul style="list-style-type: none"> <li>• Normal: OFF</li> <li>• 1st gas alarm: Blinking (Turned on by BZ.STOP)</li> </ul> (3) ALARM (Red) <ul style="list-style-type: none"> <li>• Normal: OFF</li> <li>• 2nd gas alarm: Blinking (Turned on by BZ.STOP)</li> <li>• Normal: OFF; Maintenance mode: Blinking</li> </ul> (4) MAINTENANCE (Green) <ul style="list-style-type: none"> <li>• Normal (Measurement): OFF</li> <li>• During maintenance: Blinking</li> <li>• Inhibit: ON</li> </ul>

Warm-up time	Approx. 1 hour (Initial clear time: Approx. 2 minutes)
Zero suppression	10% of the full scale
Self-diagnosis function Details	System abnormalities, sensor connection abnormalities, zero point abnormalities
Fault Display	POWER lamp blinking, detail display
Fault contact output	No-voltage contact 1a
Contact capacity	125 VAC 0.1 mA to 0.5 A (Resistance load)
Used cable	CVVS   1.25 mm <sup>2</sup>
Power supply	
Power supply voltage	100 VAC ±10% or 24 VDC ±10%
Power consumption	Max. 50 W
Used cable	CVVS   1.25 to 2.0 mm <sup>2</sup>
Operating environment	
Temperature	0 to +45°C
Humidity	30 to 90% RH (Non-condensing)
Structure	Wall mounting box type
External dimensions	180 (W) x 355 (H) x 97 (D) mm (projection portions excluded)
Weight	Approx. 3.8 kg (AC specification), Approx. 3.5 kg (DC specification)
Paint color	Munsell 2.5Y9/2

## NOTE

Specifications may be changed without prior notice for improvement.

## 11-2. Product Components

Standard composition

- Gas monitor (RI-257)
- Operating manual
- Accessories
- Dust filter..... 1
- Fuse ..... 2

Manual Log

Rev.	Amendment	Issue data
0	First issue	2017/12/27
1	P.39 Correction 「operating environment temperature」	2018/3/28
2	Addition of CD specification	2023/2/3
3	P.27 Correction 「Alarm pattern」	2024/8/6