PT3E-0410

RIKEN KEIKI

NDIR type gas detector

Model RI-2000W

Operating manual

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Precautions for use

This instrument is a toxic gas alarm and detector. Model RI-2000W is a safety device that is not made for quantitating or qualitative analysis and is not a concentration analyser.

Please read this manual carefully to become familiar to Model RI-2000W and use the instrument properly.

1. This instrument may be affected by interference gas or vapour. Please be aware of errors caused by interferences. Changes in the environment (temperature and humidity) may cause variation. Please adjust the zero point periodically (about once a month).

2. Do not use or attach this instrument where temperature changes severely (places where temperature vary over 10 degrees Celsius).

3. Please have the alarm points adjusted within the instruments performance range.

4. This instrument is a safety equipment and is not a control equipment. The output for the alarm signal is for the alarm lamp and buzzer, the analogue signal output is for reading device or external recording device. We do not offer compensation for other use mentioned above.

5. Contact us if you need to sample gas from a high humid condition, dusty or acid mist existing environment. Pre-treatment is needed in such case.

6. Periodic maintenance is required including periodic replacement of parts listed in this manual. Please have the instrument tested and calibrated by gas every 6 months according to law.

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1. Outline of model RI-2000W

1-1 Introduction

The model RI-2000W is a NDIR type fixed Nitrogen Dioxide (N_2O) gas detector. Please make sure that the gas monitors model you purchased and the model printed on the cover of this manual are the same.

This manual describes how to handle model RI-2000W (may be described as "this instrument" in this manual) and its specifications. Very important terms are written in this manual so please read this carefully, even if you have experience in gas monitoring. Keep this manual in an easily viewable location.

1-2 Purpose of use

This instrument is a Nitrogen Dioxide gas monitor that detects gas leakage by drawing in air by a pump and detects it by a NDIR (Non Dispersive Infrared) based method. The purpose of this instrument is to detect gas and alarm people when it detects a gas leak.

1-3 Definitions of warnings

To ensure safety in operating and effective usage, these signals are used in this manual:

⚠ DANGER

This warning means threats to lives or serious damage to human bodies and facilities are predicted in case of misuse.

⚠ WARNING

This signal means serious damage to human bodies or facilities are predicted in case of misuse.

⚠ CAUTION

This signal means that minor damage to human bodies or facilities are predicted in case of misuse.

✳ NOTE

This NOTE will show advice on operating.

2. Important information to ensure safety

2-1 Term of “Danger”

⚠ DANGER

・Model RI-2000W is not explosion-proof structured. Never use this instrument to detect gas above the Lower Explosive Level, or in hazardous environment.
Model RI-2000W may explode or cause fire if there is presence of flammable gas.

2-2 Terms of “Warning”

⚠ WARNING

・Please confirm the power supply voltage is within the rating before setting up this instrument. Voltage out of the rated range will cause false operation and damage the instrument.
・Please do not cut or pull off the wire connection to the protective earth inside or outside the instrument.
・Please check that there are no damage in the protective functions (earthing and fuses) before power-on operation. If you find anything suspicious, do not activate this instrument. It may cause an electrical shock or damage inside.
・Please use a rated (current and voltage) fuse and do not short the fuse holder. The use of improper fuses and shorts in the fuse holder will cause fire.
・Please turn the power off and stop the power supply of the instrument when replacing the fuse. If there is electricity supplied, it will cause an electrical shock.
・Never operate this instrument in hazardous environments. (Places where flammable, explosive gas and vapour exist.) This instrument may explode or cause fire in these conditions. It is very dangerous to use RI-2000W in such environment.
・Please make sure that the protective earth is steadily installed before connecting the instrument to external devices. If it is not installed steadily, it may operate incorrectly, cause electrical shocks and breakdown the instrument.
・It is a dangerous condition when concentrated gas above the alarm set point exists. Please take appropriate response on your discretion.

2-3 Terms of “Caution”

⚠ CAUTION

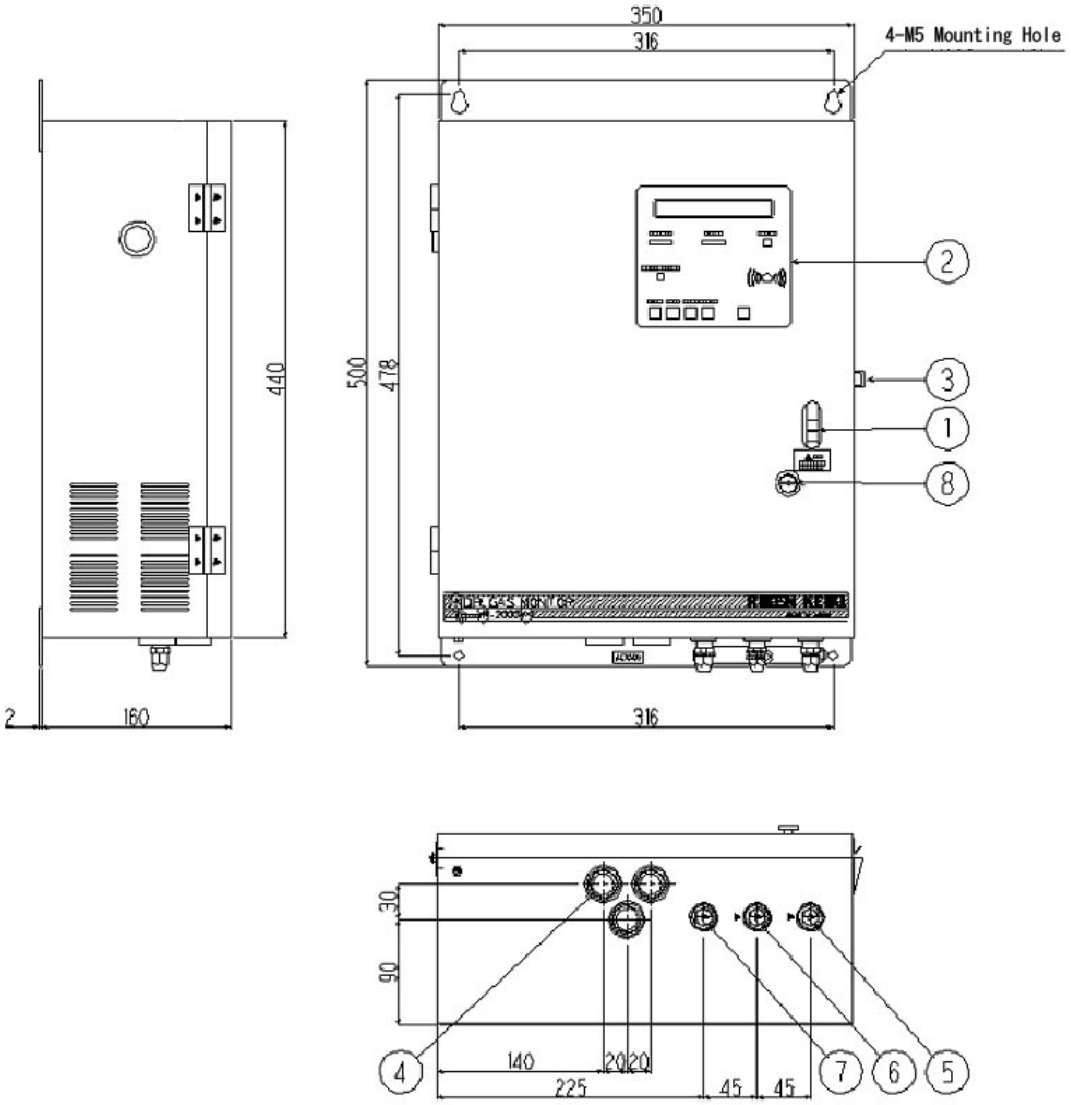
- Do not use walkie-talkies near the wiring or by the body of this instrument. The radio noise may affect the instruments reading. Please use radio wave emitting device away from RI-2000W where they won’t affect the reading.
- Please wait at least 5 seconds before restarting the instrument. If it is restarted within 5seconds from the instruments shut-down, RI-2000W might not operate properly.
- Please check if the ball in the flow meter is above the red line before using. If the ball is under the line, please adjust the flow rate.
- Make sure to attach a dust filter on the gas inlet before using RI-2000W. If the filter isn’t attached properly and dust get’s inside, it will cause false operation and damage the instrument.
- Please do not use this instruments output for controlling other devices. This instrument is not a control equipment. We do not accept using RI-2000W as a control device of any instruments.
- There are parts that generate high temperature inside this instrument. Please do not touch inside without care. It may cause burns and injuries.

3. Functions

3-1 Name and function of each part

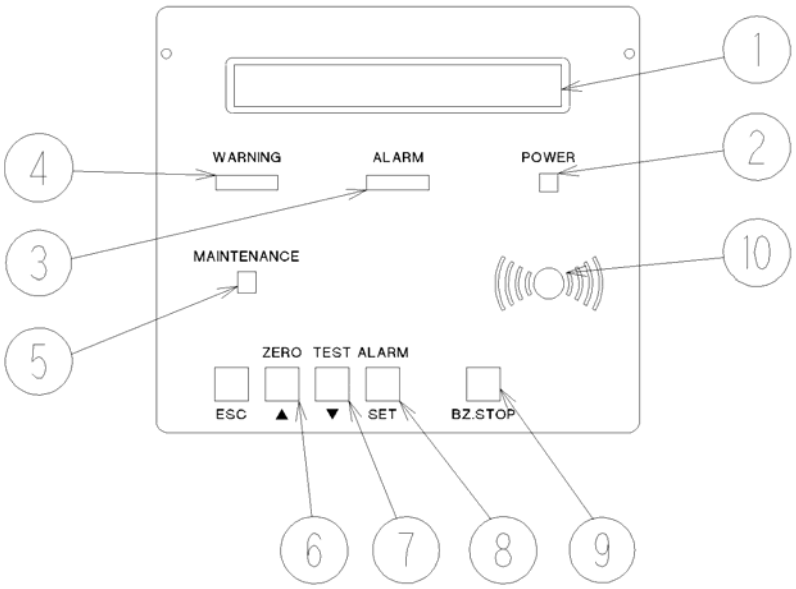
3-1-1 Dimension

① Flow monitor　　A window to confirm the flow rate of aspiration.
② Display　　Displays gas concentration readings and messages.
③ Lock　　A lock to keep the panel door closed.
④ Conductive wire port　　A port to let conductive wire inside the instrument.
⑤ Sample gas inlet　　A pipe connecting port for sample gas.
⑥ Zero gas inlet　　A pipe connecting port for zero gas.
⑦ Gas outlet　　A pipe connecting port for the exhaust outlet.
⑧ Flow rate adjuster　　A finger screw to adjust the flow rate.



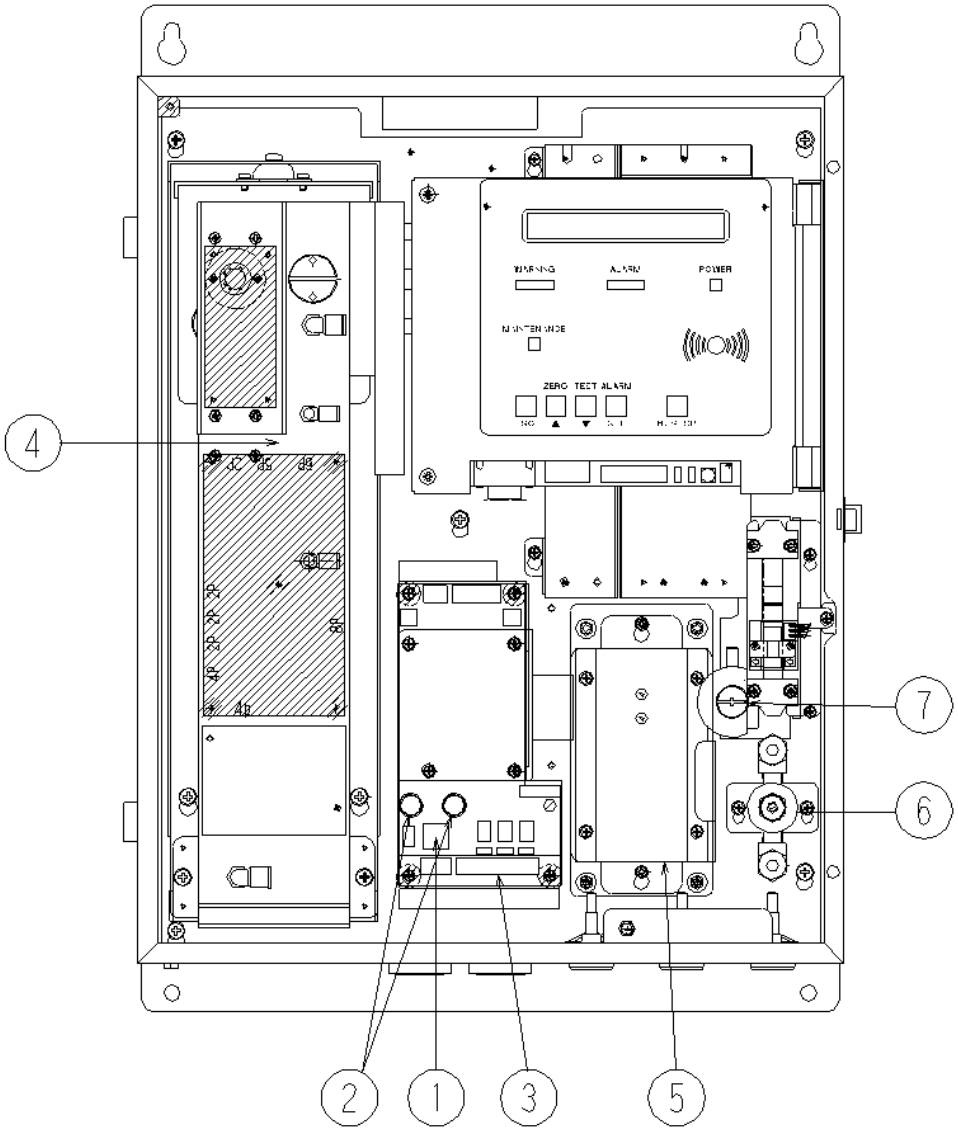
3-1-2 Display

① Liquid crystal display (LCD)	Displays gas concentration readings and messages.
② Power indication lamp	A lamp that keeps on when operating normally after the instrument is turned on. It flashes when there is any trouble in the instrument.
③ Alarm indication lamp	A lamp that will flash and indicate during the 2nd gas alarm. It will keep on after the BZ. STOP button is pressed.
④ Warning indication lamp	A lamp that will flash and indicate during the 1st gas alarm. It will keep on after the BZ. STOP button is pressed.
⑤ Maintenance indication lamp	A lamp that will flash during maintenance mode.
⑥ Zero/▲ button	A button used in zero, various adjustments and to ascent numbers.
⑦ Test/▼ button	A button used in the alarm test, various adjustments and to descent numbers.
⑧ Alarm/Set button	A button to refer the alarm set point and to confirm operations.
⑨ BZ.STOP button	A button to verify alarm conditions. It will stop the buzzer sound.
⑩ Buzzer	It will make a sound to alarm people.



3-1-3 Internal parts

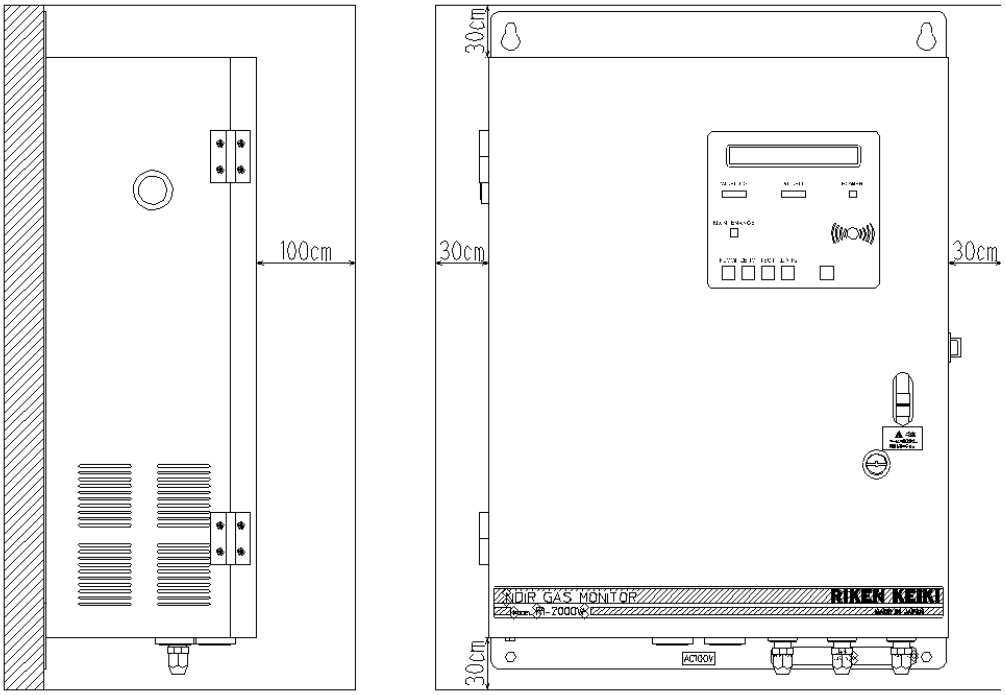
① Power switch	A switch to turn the instrument ON or OFF.
② Fuse	A fuse to protect the power supply system. rating: AC 125V 5A normal fuse
③ Terminal block	A terminal block to connect RI-2000W and external devices.
④ Detector	A NDIR type N_2O gas detector (Sensor).
⑤ Pump	A pump to aspirate gas.
⑥ 3-way solenoid valve	A valve to switch gas (zero gas and sampling gas) to aspirate.
⑦ Flow rate adjuster	A screw to adjust flow rate.



3-2 Installation diagram

Please save space for maintenance people to work safely and correctly when installing RI-2000W. RI-2000W requires maintenance and space for personnel is needed. Please remember to make space for personnel at the planning phase and in construction.

Install RI-2000W to a firm wall with M6 bolts upright as the drawing bellow.

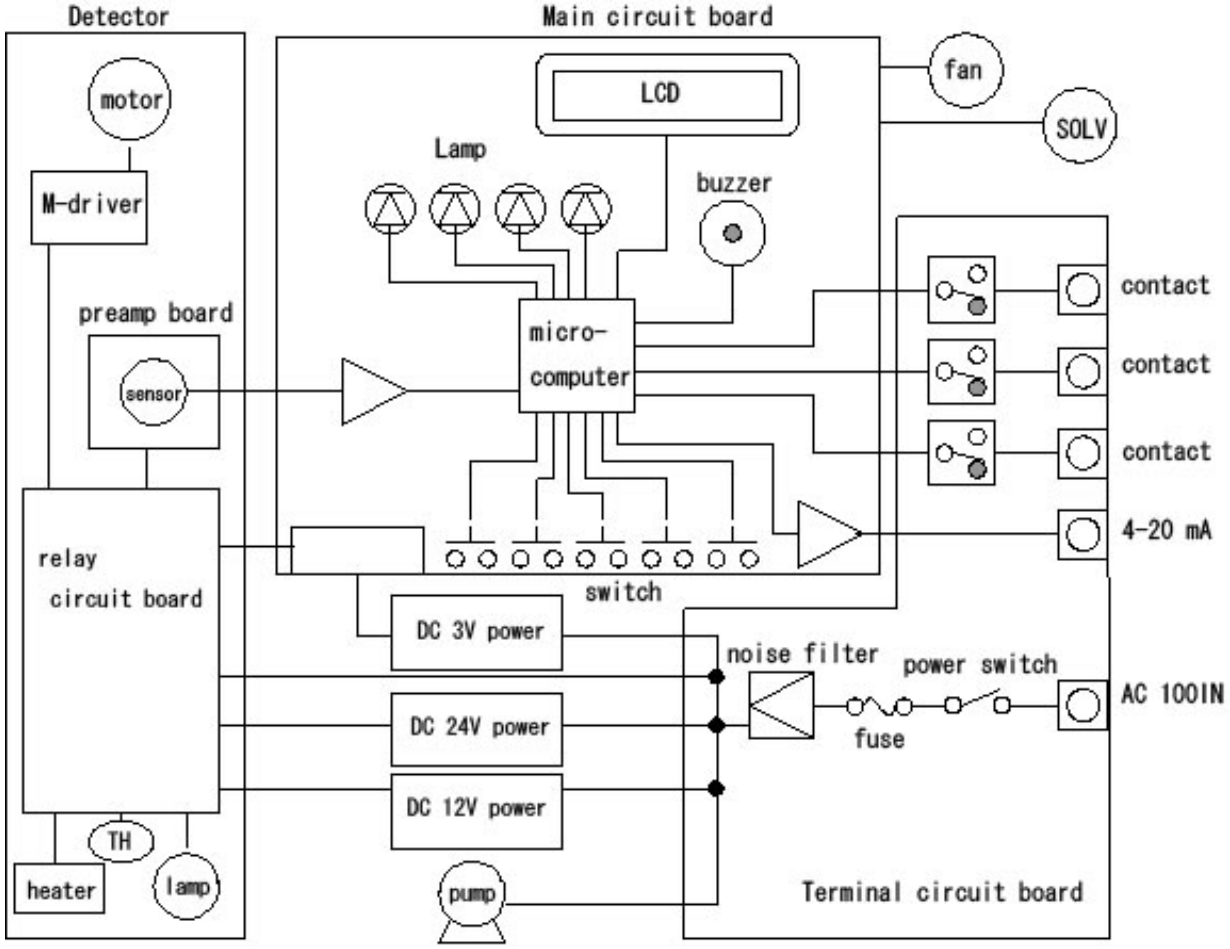


⚠ CAUTION

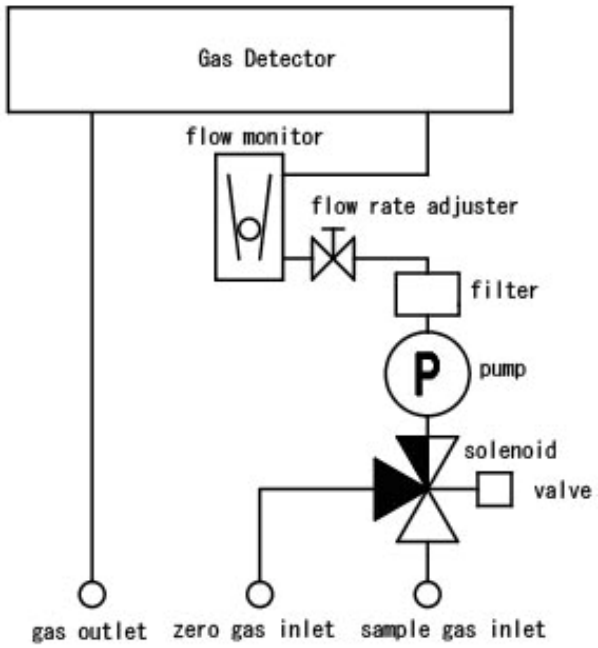
・Make sure that RI-2000W is installed steadily on the wall.
It may fall and cause injuries and damage on the instrument if it is not mounted properly.

3-3 Block diagram

3-3-1 Electric system



3-3-2 Piping system



4. Start up

4-1 At the beginning

Please follow all warnings and cautions, stated or implied, in this manual. Read this operation manual carefully even if you have handled RI-2000W or not. This instrument will be damaged and will not operate properly if they are not followed.

4-2 Installation location

Please install RI-2000W following the cautions bellow.

⚠ CAUTION

- Do not install this instrument outdoors.
  This instrument is made for indoor use. It cannot detect gas correctly, in fact the instrument may breakdown if it is installed outside.
- Please use dust filters to avoid dust being drawn in. This instrument is easily affected by dust. If you would like to draw gas from a dusty region, please use an additional MC filter (available accessory) with the standard accessory dust filter.
- Please stop the pump before changing the dust filter. If not, dust will be drawn in and it will cause false operation or damage the instrument.
- Do not Install this instrument where it will be subjected to direct sunlight and places where temperature changes suddenly. Please avoid installing this instrument where it is exposed to direct sunlight, near an air conditioners outlet and windy locations. The temperature inside RI-2000W will change rapidly and may cause internal condensation because the instrument cannot follow the change.
- Install this instrument where there are no vibration and impact shocks. This instrument is precision mechanical equipment that is consisted of delicate optical devices and electric parts. Please install RI-2000w on a vibration-free stable location.
- Please keep this instrument and it’s cables away from noise sources. Install this instrument away from high-frequency apparatus. Wire the cables of RI-2000W parallel to cables of high-frequency apparatus to avoid noise to come in from other cables or, do not let a noise source to get close to this instrument.
- Do not directly install this instrument where target (sample) gas pools. Sample gas with a sampling hose and make it drawn into the instrument.

⚠ CAUTION

・Please make a space wide enough for personnel to maintenance this instrument safely. Do not install this instrument where danger is predicted (example: near a high tension line). Periodical maintenance is needed.

・Please install this instrument where maintenance can be done. These places are NOT suitable installation locations: Inside big equipment and you have to shut down the apparatus for RI-2000W's maintenance. A place where you have to dismount a part of any apparatus to reach RI-2000W. Where things (wiring, storage racks) interfere opening the case of RI-2000W. Periodical maintenance is needed so please save enough space and passage way.

・Do not attach this instrument to any apparatus chassis that has not sufficient earthing. It may case false operation, electrical shocks and damage in RI-2000W if the earthing is not done well.

・In case of installing this instrument on a apparatus, please have the earthing work done correctly. It may case false operation, electrical shocks and damage in RI-2000W if the earthing is not done well.

4-3 Cautions in designing a system

⚠ CAUTION

・Please design your system reflected to the statements in this paragraph. Unstable power source and noise will cause false operation and false alarms of RI-2000W.

1. Use a stable power supply

False operations of the alarm contacts and output contacts may be expected when instantaneous blackouts occur and for a while the system is unstable after RI-2000W is started. Please use a backup power supply or take proper measures on the receiving end.

power supply voltage	AC 200V/ AC 220V（in terminal voltage）
Permissible time of instantaneous blackouts	Less than 10ms （RI-2000W will restart if the blackout exceeds 10ms） Please use an external uninterruptible power supply to ensure continuous work.
Others	Please do not share power supplies with high power loads and high frequency noise sources. Use line filters and separate this instrument from noise sources if needed.

2. Design considering radiating heat from RI-2000W

There is a ventilation fan on the top of the instrument. Please keep this part clear and do not block it with anything. If you are installing RI-2000W inside a closed instrumentation panel, please put on 2 fans on the top and the bottom to ventilate.

3. Lightning Surge Suppression

What is lightning surge?	There are problems related to lightning inside factories and plants in these cases: When the wiring is done outdoors, and when outdoor cables are lead inside and wired along side of indoor cables. If lightning is a huge electrical source, the cables are an antenna. Then instruments connected to the cables may be damaged due to high electricity. We cannot prevent growth of thunder clouds and strikes of lightning. You cannot avoid lightning surge completely by burying cables underground or laying cables inside a metal tube.
Lightning Surge Suppression	There are no complete ways to avoid damage from lightning but there are measures that can be taken. Please take appropriate measures according to the environment and the level of importance of your facilities. 1. Use fibre optics to send signals. 2. Use lightning arresters. In case lightning surge comes in a cable, the lightning arrester will protect central processor and instruments. For information about lightning arresters, please contact manufacturers.
Protective earthing	Surge noise does not only come from lightning. Please earth instruments to protect them from electrical noise.

4. Alarm contacts

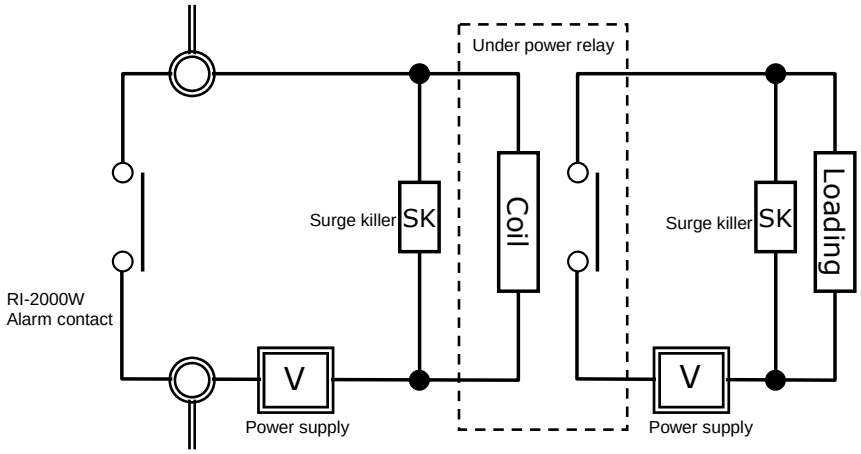
The alarm contacts of this instrument are intended for transferring signals to alarm buzzers and alarm beacons. Please do not use RI-2000W for controlling systems (example: to control isolation valves).

⚠ CAUTION

- The de-energized break contact (b contact) may be instantaneously opened when an exogenous shock is applied.
- Please take measurements against the instantaneous operations that happen when using the b contact as an alarm contact (optional). Example: make a 1 second delay in the receiving side of the b contact.

There may be negative effect to RI-2000W when the loading is controlled because of loading characteristics. Please take the measures below to stabilise operation and to protect the contacts in such case.

Please attach a surge absorber (a CR circuit, a spark killer or a diode if it is a DC relay) within the rating of on the relay coil with a under voltage relay directly.



＊ NOTE

There are cases which putting CR circuits on the contact's side are better. That depends on the loads condition, but you must confirm how the loading behaves before doing it. Please put CR circuits on the loading side of the relay as needed.

-The concept of inductive load on the alarm contact-

The stated specifications of RI-2000Ws alarm contact is based on the condition on resistance load. The failures below are prone to happen because of the occurrence of high electromotive force when inductive loads are connected.

- ・Lose relay functions due to welding on the relay.
- ・Any electric component may be broken if high voltage comes into the detector.
- ・Abnormal operation because of CPU runaway caused by huge noise.

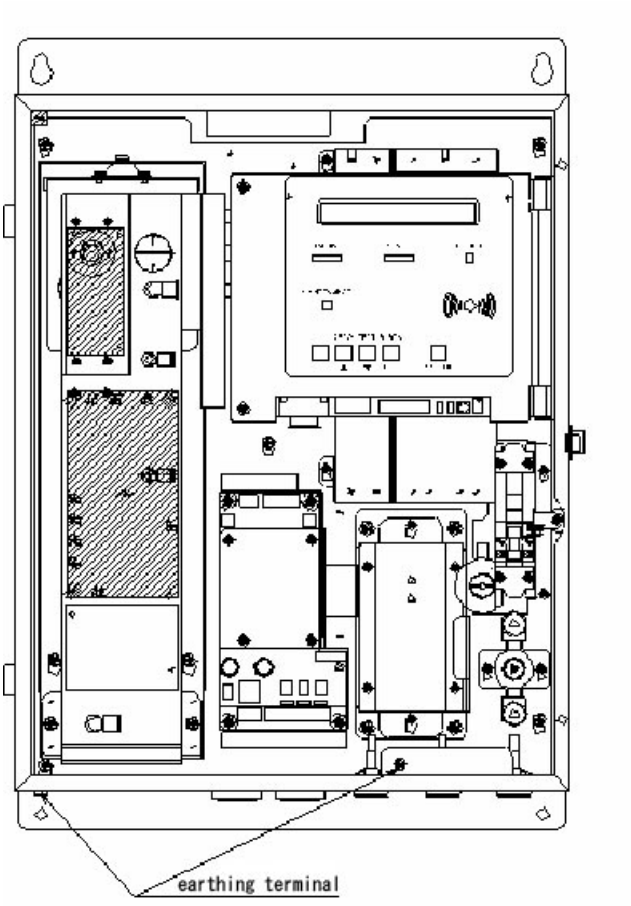
There are other unpredictable noise penetrations into the relay other than inductive load and the failures written above may happen.

⚠ CAUTION

- In principle, please do not connect inductive loads. Never use fluorescent lights or motors.
- Please connect external amplifiers if you have to use inductive loads.

4-4 Earthing

Please connect the internal or external port ⏚ to your earthing port. (less than 100 Ω,300V)



⚠ WARNING

- Please check the earthing and fuse before operating RI-2000W. If there are faults suspected, please do not start the instrument. If not, it may cause damage or electrical shocks.
- Make sure to have RI-2000W earthed and never let earthing wire to get close to the gas hose.
- Please earth within 100Ω earth resistance.

4-5 Cautions in wiring

CAUTION

・Please make sure not to cause damage in the electronic circuits inside, during power distribution work.
・Please handle the detector unit carefully. There is a risk of fall if you let the instrument stand on the floor and cause damage on the instrument.
・Do not lay down the power cable and signal cable with other power sources (e.g. Motor) cables.
・Make sure not to let the cable cores touch together if you are using twisted wire.

4-6 Suitable cables

CAUTION

・Use junction box if you are using a wire that cannot go through the cable port of RI-2000W.

4-6-1 Power cable

Please use relevant cables to CVVS 1.25 to 2.0 sq.

4-6-2 4-20mA signal/ contact signal line

Please use signal lines relevant to CVVS 1.25 to 2.0sq.

4-6-3 Terminal block specification

Condition

	3 p terminal block（power）	8 p terminal block（signal）
Length of stripped wire	approximately 7.0 mm	approximately 7.0 mm
Tightening torque	0.5 - 0.6 N・m	0.5 - 0.6 N・m
Suitable screwdriver	flathead screwdriver（less than 3mm width）	

Suitable ferrules

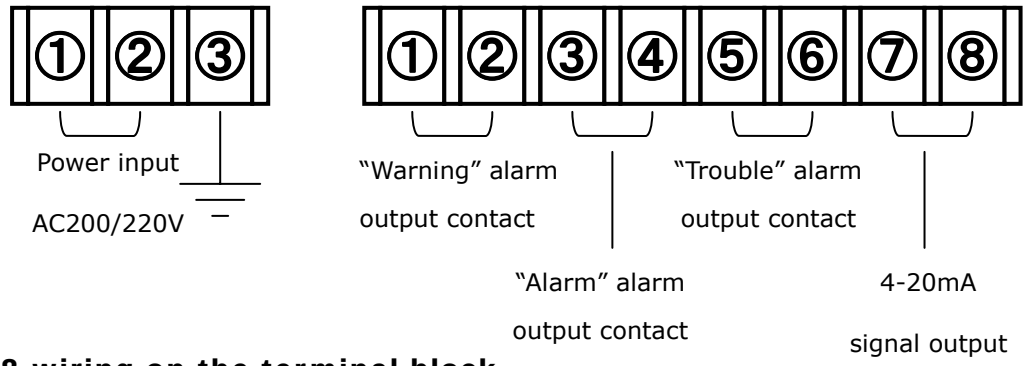
If you would like to use, the equipments below are suitable.

- Ferrules: Ai series of
- Crimp tool: CRIMPFOX UD 6 of Phoenix Contact GmbH & Co. KG

CAUTION

・Be sure to use the ferrules stated in this manual.

4-7 Terminal block diagram

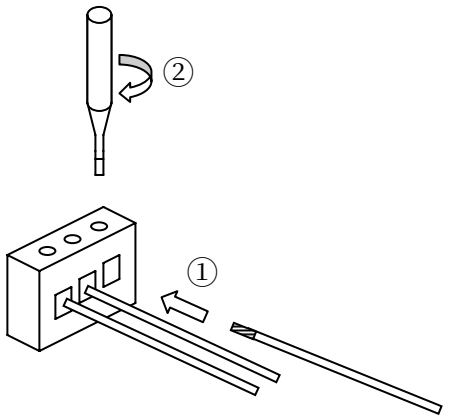


4-8 wiring on the terminal block

(1) Strip off 7mm of the wire coating.

(2) Insert the wire end and tighten the screw.

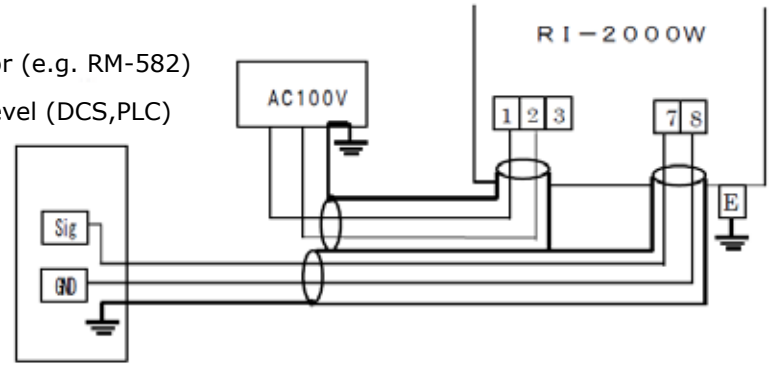
Please refer to 04-6-3.



4-9 Example of wiring cables

・Indicator (e.g. RM-582)

・upper level (DCS,PLC)



4-10 Warnings on tubing work

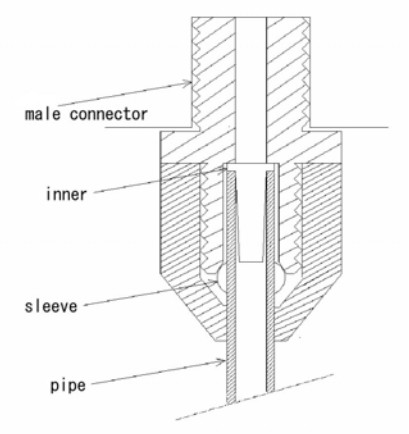
⚠ WARNING

・This instrument is made to sample gas under atmospheric pressure condition. It is dangerous to apply excessive pressure to the gas inlets (GAS IN and GAS OUT) because the tube may tare loose from the instrument and leak hazardous gas. Please use RI-2000W in normal pressure.

・Please connect an exhaust tube on the gas outlet that is on the bottom side of the instrument, and exhaust the sampled gas in a place that is known to be safe.

(1)About the sample gas inlet

The sample gas inlets connector size is a PT1/4 female thread. A propylene male connector is a standard accessory. The piping that matches is a φ6(0D)-φ4(1D) size Teflon tube.



CAUTION

- Please make sure put on the inner and sleeve when installing, pay attention to avoid gas leakage
- The tubes material and length depends on target gas. Please be careful in choosing material.

(2)About the zero gas inlet

The zero gas inlets connector size is a PT1/4 female thread. A propylene male connector is a standard accessory. The piping that matches is a φ6(0D)-φ4(1D) size Teflon tube. Please choose a sampling point where fresh dry air can be drawn in.

CAUTION

- Please make sure put on the inner and sleeve when installing, pay attention to avoid gas leakage
- Please do not choose a location as sampling point where interference gas may exist. The zero adjustment will not operate successfully if interferences exist. It will cause danger because the readings will degrade in case of a gas leak.
- Water in zero gas (fresh air) may cause dew condensation. Please install appropriate water removal equipment if the air is high humid. Exposure to water will cause damage and false operation of the instrument.

(3) About the external dust filter

The provided dust filters must be mounted on the sample gas inlet and on the zero gas inlets.

(4)About the tube material

There might be adsorptive or corrosive gas compounds in the sampled gas. Please be ware of those gases in choosing the tube/pipe material. Take appropriate measures if there is water vapour or other gas than the target gas in the sampling gas.

5 Operation Procedures

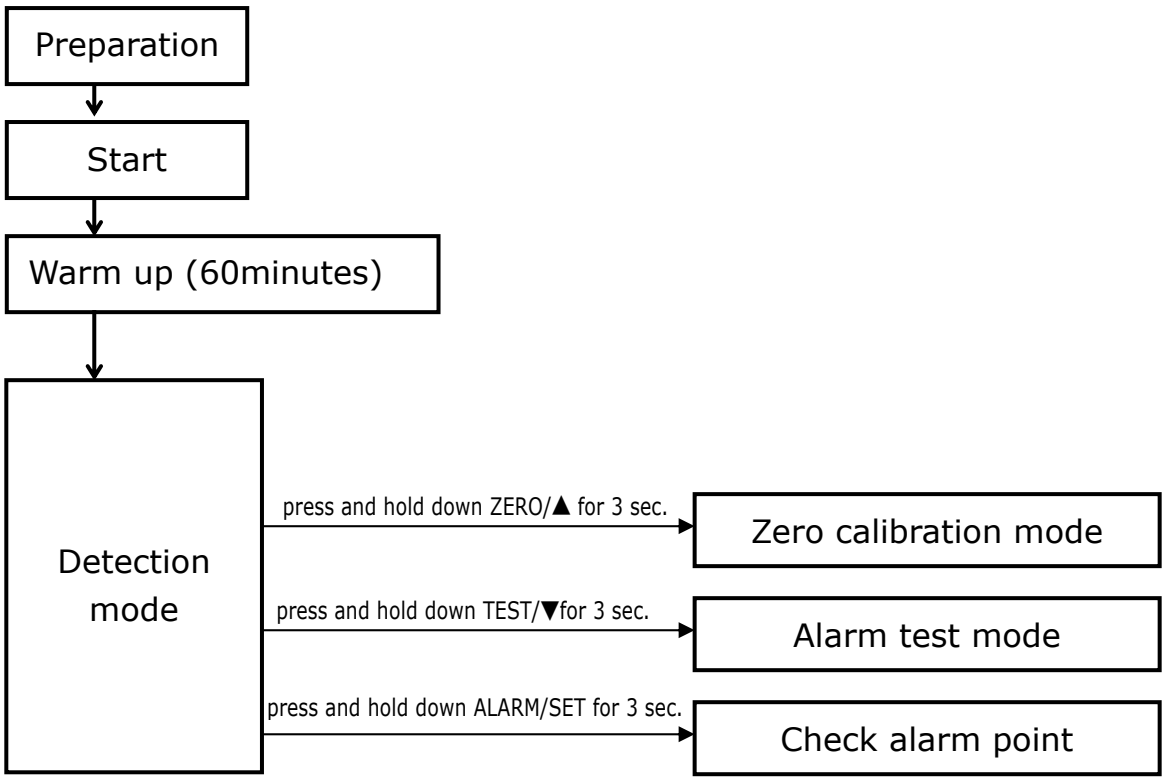
5-1 Preparation

Please confirm these things written below before starting the instrument. It will cause damage in the instrument or cause electrical shocks if there is a lack of preparation.

1. Is it earthed properly?
2. Is it the wiring done properly?
3. Is the power source within the rating?
4. Is the output contact not able to affect other instruments? The output contact may activate during the adjustment. Please make sure the output contact cannot effect on others.
5. Is the dust filter mounted?
6. Is the fuse within the rating? If not, it may cause fire.

5-2 Basic motion flow chart

Usually, please operate this instrument in "Detection mode".

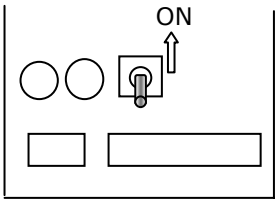


✳ NOTE

Please let RI-2000W to operate at least 4 hours warm up after it hasn't been used for a long time.

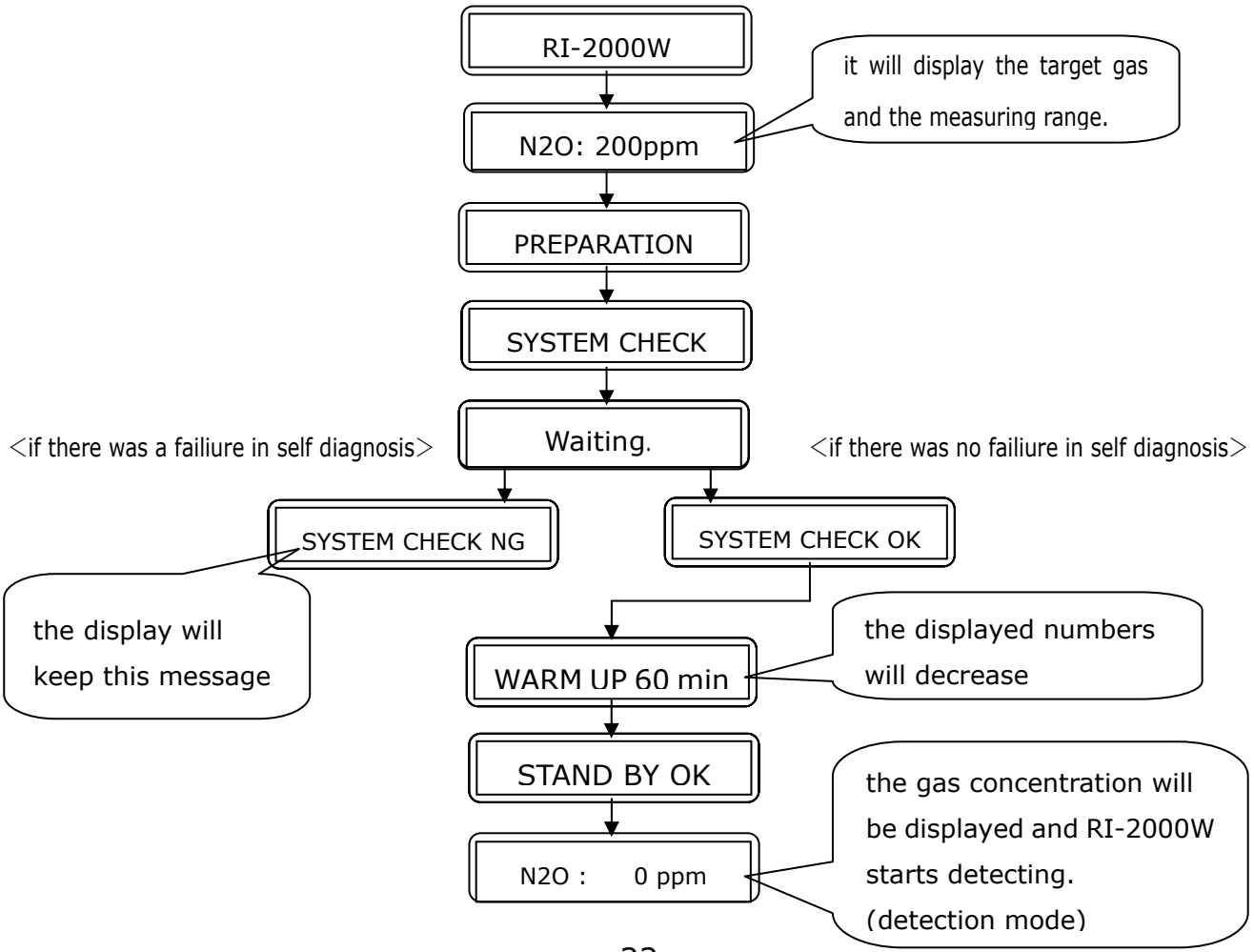
5-3 Starting

5-3-1 Starting the instrument



1. Open the panel door.
2. Switch the toggle switch up. The power lamp and pump will turn on, then the instrument will start warming up.
   - The switch is on the lower left terminal circuit board inside the panel
   - The instrument will turn on if the switch is turned upwards and will turn off if the switch is switched downwards.
3. Close the panel door.
4. Check the flow monitor and confirm if the ball inside is above the red line. If the ball is not above the red line, please adjust the flow rate with the flow rate adjuster.
5. The instrument will start detecting gas after it finishes warming up 60 minutes.

RI-2000W will go through these operations while warming up and preparing for detection. The indications on the display will be as below.



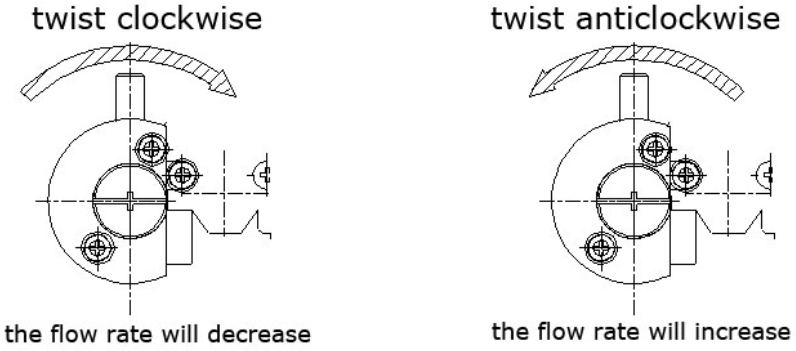
＊ NOTE

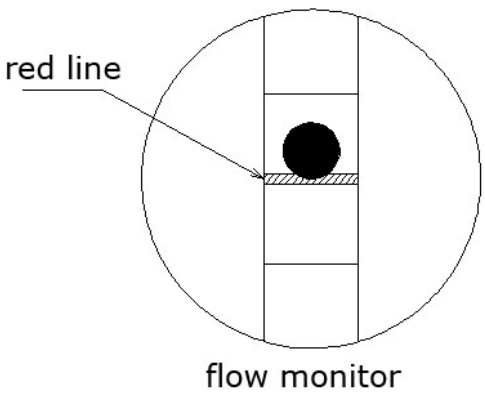
The operation of RI-2000W during warming up is the following:
1. It will check if the system works properly. (SYSTEM CHECK)
2. Provides output signal: 2.5mA
3. Interrupt alarm and trouble alarm signals.
   (The buzzer, lamp and contact will not work)

5-3-2 Adjusting the flow rate

The flow rate of air is adjustable by the flow rate adjuster on the front of the instrument. Please confirm the flow rate by the flow rate monitor that is on the front too. Keep the ball in sight and above the red line. The flow rate can be adjusted by RI-2000W itself, above 1.0 litre within the temperature range of it. If you have to draw gas from a distant place, please contact us.

1. Adjusting the flow rate of the sample gas.
   Check the flow rate in detection mode and adjust the ball above the red line if it is under the line. Twist the flow rate adjuster to adjust.
2. Adjusting the flow rate of the zero gas.





5-4 Operations during measuring mode

5-4-1 Display and lamps

The operating states are described by two indication devices.

1. LCD: Displays the gas concentration
2. LED lamps: Power lamp … power condition and trouble condition
   WARNING lamp … 1st gas alarm condition
   ALARM lamp … 2nd gas alarm condition
   MAINTENANCE lamp … maintenance condition

For convenience, the indicators will be described as bellow to explain the indications and operating condition.

LED symbols and its condition

○ : The LED is off ● : The LED is on ◎ : The LED is flashing

Short name of the LED

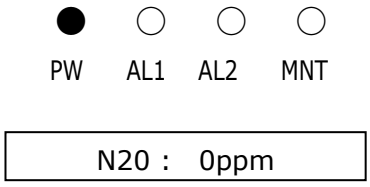
PW: POWER AL1: WARNING AL2: ALARM MNT: MAINTENANCE

＊ NOTE
The symbols and locations of the LED and LCD are different from the real RI-2000W.

These are some examples of the operating condition.

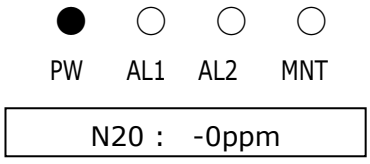
ZERO

Zero will be displayed as on the right if the gas concentration that has been observed is within the zero suppression set value.



MINUS

If the concentration goes below -20ppm, the indicator will display "-0 ppm"

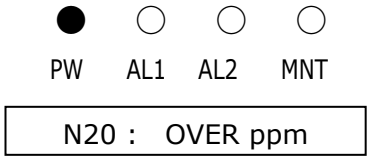


⚠ WARNING

・"-0 ppm" means the detector is not working properly. Please adjust the zero point.

Over scale

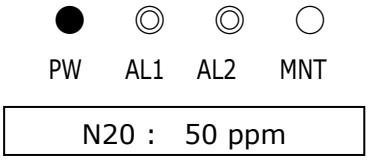
The display will indicate "OVER" if the concentration exceeds full scale.



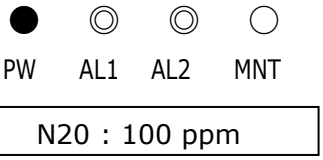
Gas alarm condition

Gas alarms will activate if the gas concentration exceeds the 1st or 2nd alarm set point. The gas concentration will be displayed and the LED indicators will flash.

(1st gas alarm)

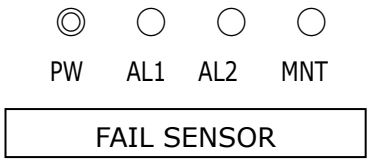


(2nd gas alarm)



Trouble

The power LED will flash if there is any trouble detected on the instrument. The matter will be displayed on the LCD.

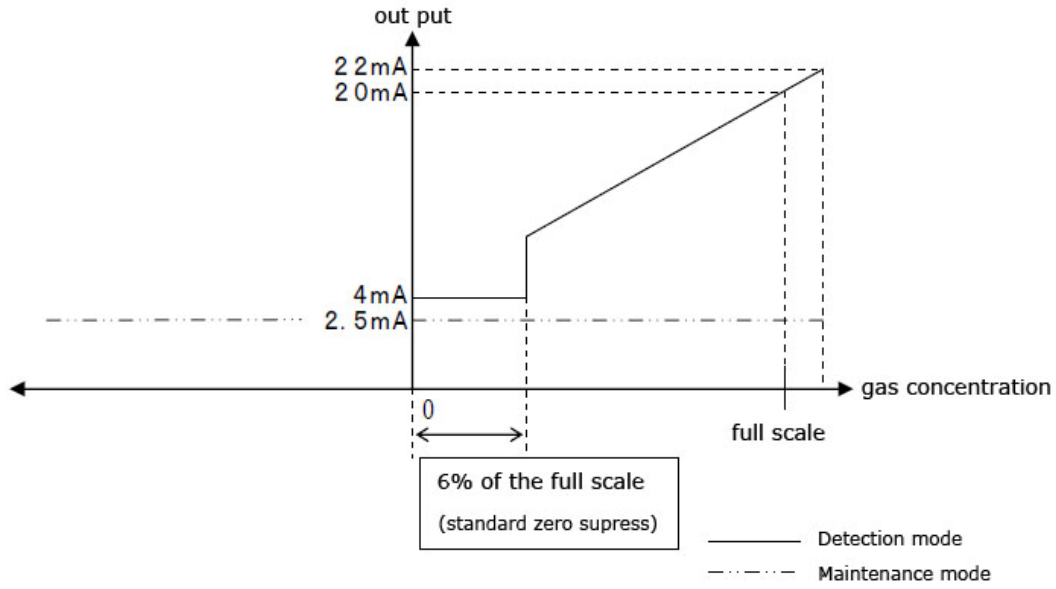


Messages on the LCD	Trouble that occurred
FAIL SYSTEM	there is a failure in the system
FAIL SENSOR	there is a failure on the sensor
FAIL ZERO	the zero point is abnormal

5-4-2 Output signals

1. Signal transmission system: 4-20mA (non-insulated, discharge energy)
2. Recommended transmission cable: equivalent of CVVS
3. Transmission distance: shorter than 1km
4. Connected load resistance: less than 300Ω
5. Level of signals in each condition
    1. Detection mode: 4 to 22 mA (depends on gas concentration)
    2. Gas Alarm: 4 to 22 mA (depends on gas concentration)
    3. Warm up: 2.5 mA
    4. Maintenance mode: 2.5 mA
    5. Alarm test mode: 4 to 22 mA (depends on gas concentration)
    6. Trouble alarm: 0.5 mA
    7. Point skip: 2.5 mA
6. Power discontinuity: 0 mA

The gas concentration and outputs are on the diagram below



⚠ WARNING

・The 4-20mA is adjusted before shipping.

・If adjustment is needed after it is installed, do not touch the instrument without any instructions of a trained personnel. Adjustments should be done by a service staff.

5-4-3　Automatic zero adjustment

RI-2000W will automatically adjust its zero point periodically(standard: every 7days) once it is turned on.

The operations that will be done are

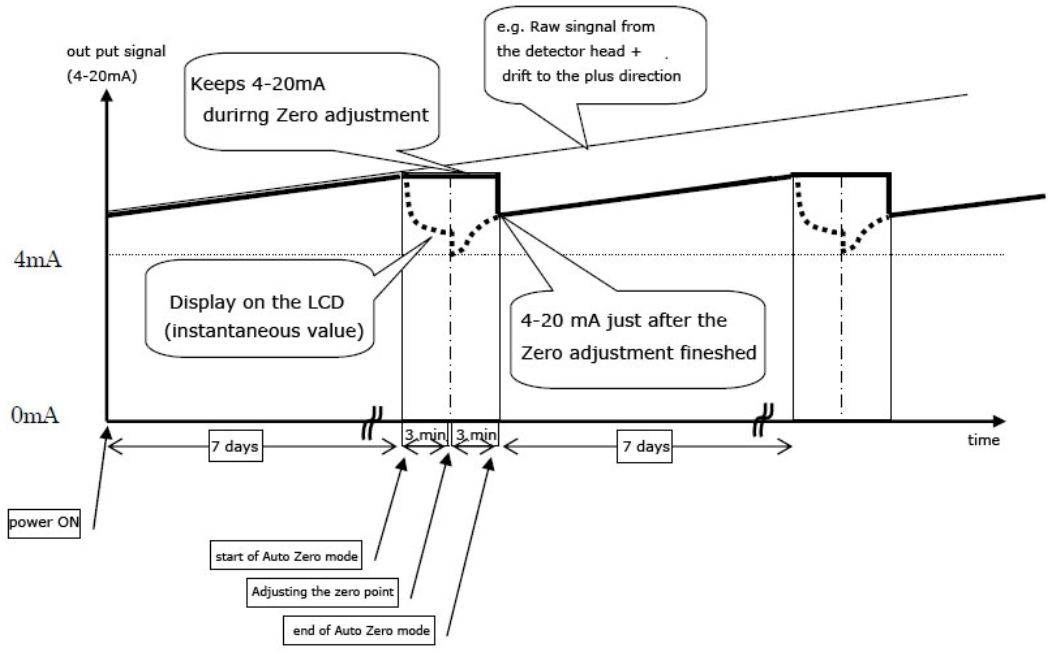
1. Seven days past since it was turned on
2. The 3 way solenoid activates and the gas aspiration will be switched to the zero gas inlet. (start of zero adjustment)
3. Zero adjustment will be done after 3minutes have passed.(zero adjustment)
4. After adjusting the zero point, the solenoid will switch the sample line to the sample gas inlet.
5. RI-2000W will go back to detection mode and monitor gas concentration after 3 minutes have passed. (End of zero adjustment)
6. Periodically operate zero adjustments.

＊ NOTE

・-2000Ws operation will be as the following during zero adjustment. (between 2 and 5 written above)

1. output signal (4-20mA): keeps the value just before the adjustment has started
2. LCD: will indicate operation of zero adjustment by flashing
3. key operation: not valid

・The zero adjusting period will depend on the environment and the length of tubes.



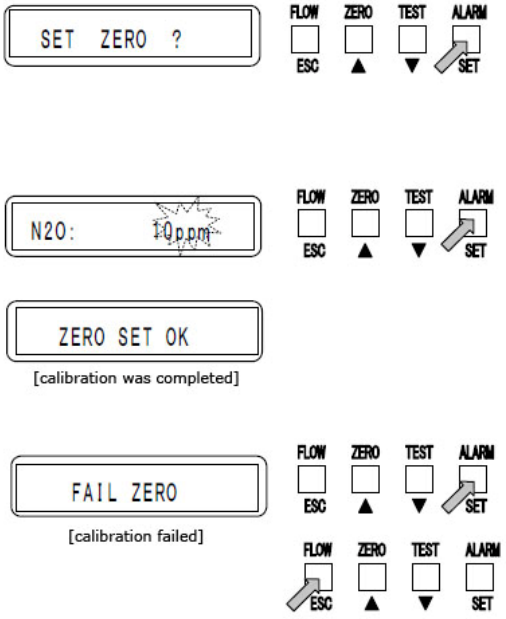
5-5 Maintenance and adjustments

5-5-1 Zero point adjustment

Please adjust the zero point periodically or in each case, by zero point adjusting mode(zero calibration mode). If the instrument was turned off for a long time, please adjust the zero point after running RI-2000W for 4 or 5 hours.

> ∗ NOTE
>
> In adjusting zero, please wait until the reading stabilises after drawing in zero calibration gas (zero gas for short).

Please follow these instructions



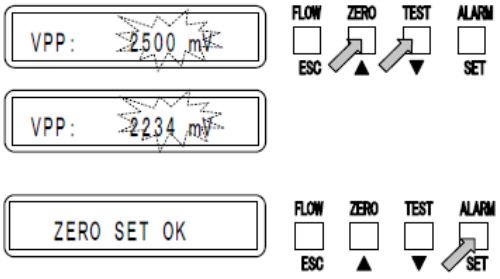
1. Press and hold down ZERO button for 3 seconds during detection mode. The LCD will display “HOLD ZERO KEY”.
   To interrupt, release your finger.
2. RI-2000W will enter zero calibration mode and will display “SET ZERO?”. Please confirm there is no interference gas and the air is fresh before pressing SET button.
3. The current gas concentration will be displayed. Press SET and the adjustment (calibration) will start.
4. The result will be displayed. “ZERO SET OK” will be displayed if the calibration has gone through without any problems.
   If there were problems and calibration had failed, “FAIL ZERO” will be displayed. Press ESC or SET in this case and go back to gas detection mode.

If “FAIL ZERO” is still on the screen after confirming there is no leakage in the instrument and tubing. and you have gone through the procedure above again, sensor trouble is predicted. Please contact us after turning off RI-2000W.

＊ NOTE

There may be large fluctuation in the zero point if the instrument has not been used for a long time or, on the instruments initial adjustment. In cases like this, the zero calibration mode will automatically change to sensor standardise mode.

Press ▲or ▼ and adjust the value to 2500±100mVpp.
Wait for 2or 3 minutes for the readings to stabiles.
Standardise and zero calibration will be done after pressing SET.



5-5-2 Alarm test

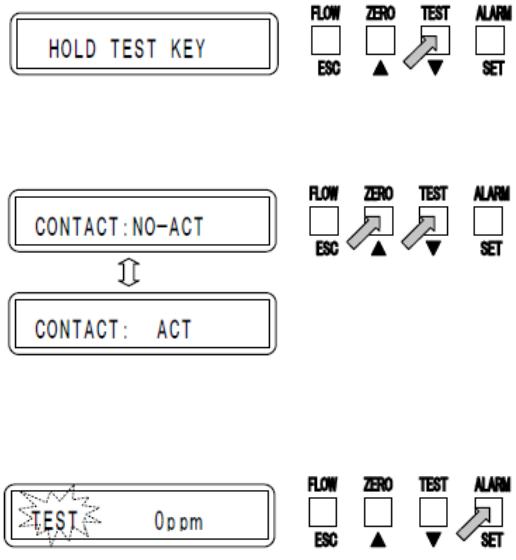
This test is done to confirm the transmission condition by outputting signals corresponding to gas concentration.

⚠ WARNING

・Please notice other departments linked to the alarm system before the test and make measures to avoid creating “emergencies”

Please follow these instructions

1. Press and hold down TEST button for 3 seconds during detection mode. The LCD will display “HOLD ZERO KEY”.
   To interrupt, release your finger.
2. RI-2000W will go into alarm test mode and “CONTACT: NO-ACT” will be displayed.
   Press ▲or ▼ to choose the contact operation.
   NO-ACT: the contact will not act
   ACT: the contact will act
3. Press SET to confirm the contact operation.
   Flashing “TEST” will be displayed on the LCD if “ACT” is chosen. If “NO-ACT” is chosen, “TEST” on the LCD will not flash.



4. Press ▲ and make the gas concentration on the LCD rise.
   The 1st alarm will operate after the alarm retardation time when the numbers exceed the 1st alarm set point.
   "WARNING" will flash on the LED after the alarm retardation time, the alarm contact will activate if "ACT" is selected.
   The 2nd alarm will operate after the alarm retardation time when the numbers exceed the 2nd alarm set point.
   "ALARM" will flash on the LED after the alarm retardation time, the alarm contact will activate if "ACT" is selected.

when the 1st alarm point is set to 50ppm

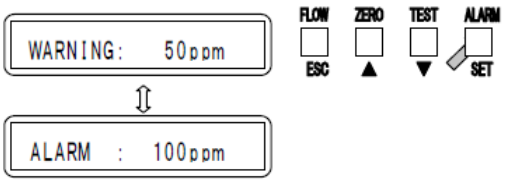
when the 2nd alarm point is sest to 100ppm

5. Press ▼ and decrease the value down to zero.
6. Press and hold down ESC for 3 seconds and go back to detection mode.

5-5-3 Confirming the alarm set point

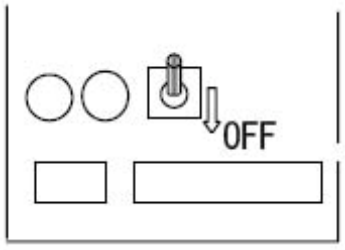
Please follow these instructions

1. Press ALARM during detection mode.
   The 1st and 2nd alarm set point will be displayed after each other while ALARM is pressed.
2. Release your finger from the button and go back to detection mode.



example: 1st alarm set point is 50ppm and the 2nd is 100 ppm.

5-6 Shutting down the instrument



1. Open the panel door.
2. Switch the toggle switch down.
   - The switch is on the lower left terminal circuit board inside the panel
   - The instrument will turn on if the switch is turned upwards and will turn off if the switch is switched downwards.
3. Close the door.
4. Stop the power supply (AC200/220V) after confirming the instrument is turned off.

⚠ WARNING

・Please confirm and take measures against external instruments linked with RI-2000W before turning it off. Improper shut down may cause false operation of external instruments.

・If using an energized alarm contact (optional service), please confirm and take measures against external instruments linked with RI-2000W before turning it off. The alarm contact will activate when RI-2000W is turned off and will cause false operation of external instruments.

・Clean inside the sample line by drawing in fresh air for a while if there were adsorptive or corrosive gas compounds in the sampled gas before shutting the instrument down. If it is not done, the gas will cause damage inside the instrument.

6 Alarms

6-1 Alarm types

RI-2000W has two types of alarms, a gas alarm and a trouble alarm.

Gas alarm: The alarm will activate when the gas concentration exceeds the preset gas level (alarm set point) .

Trouble alarm: An alarm to notice there is trouble (failure) in RI-2000W. The instrument will start from warm up phase when it recovers from trouble states. Please refer to "8. Abnormal conditions".

> ✳ NOTE
>
> ・The 1st and 2nd gas alarm points are factory set.
> ・Alarm retardation time is set to avoid false operation by noise.

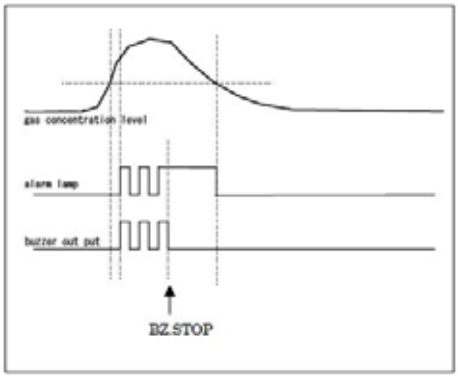
6-2 Operations of alarms

RI-2000W has two types of alarm operations, a latching and non-latching alarm.

Latching alarm (standard)

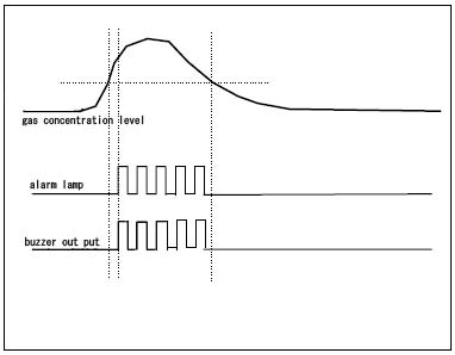
The alarm will keep in alarm operation once the instruments alarm activates even if the gas concentration becomes lower than the alarm set point.

The alarm message will stop flashing after you push BZ STOP button and the buzzer will stop too. The alarm contact will return after the instrument recognises the gas concentration is lower than the set point and the alarm indication will go off.



Non latching alarm (optional)

The alarm and buzzer will automatically deactivate when the gas concentration once gets lower than the alarm set point.



6-3 Gas alarm

6-3-1 Operations

RI-2000W will operate as the following when it detects gas concentration higher than the alarm set point.

1. Indications

LED lamps

WARNING lamp: will activate when the gas concentration exceeds the 1st alarm set point.

ALARM lamp: will activate when the gas concentration exceeds the 2nd alarm set point.

Messages on the LCD

The current gas concentration will be indicated on the display. The screen will indicate "OVER" when the gas concentration exceeds the detecting range.

Power lamp

The lamp will keep on while the instrument is on.

2. Output operations

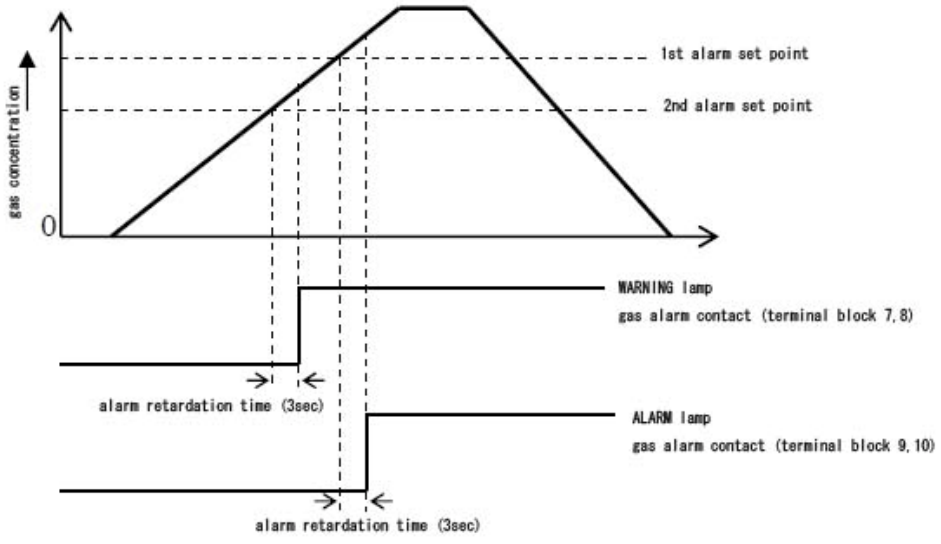
4-20mA output

Ratiometric current of electricity will be put out depending on the gas concentration. The maximum output is approximately 22mV (exceeds full range).

Gas alarm contact

The alarm contact will activate when the gas concentration exceeds the alarm set point. The operations it takes is latching or non-latching.

an example of the alarm pattern



6-3-2 Response to gas alarms

Dear customer, please consider and make rules what to do in case of gas alarm activities. Follow the rules and act promptly.

＊ NOTE

・The gas concentration level may be low when you confirm the condition, if the gas leakage is instantaneous. Or, if the alarm activity was caused by noise and/or incidental conditions.

Below is an example of action commonly done.

1. Confirm the reading on the LCD.
2. Evacuate people from the supervised area.
3. If the gas concentration level is still high, cut off the gas source/supply (close the gas cylinders valve) and confirm that the concentration level gets lower.
4. Wear protective equipments to avoid risks, there is possibility of gas left in the environment. Observe the gas concentration with a portable gas analyser.
5. Take measures after confirming there is no danger left.

6-3-3 False gas alarms

RI-2000W may activate gas alarms in some cases that are not caused by gas. These are some examples.

1. Interference gases
   Please ask your nearest agent about interferences.
2. Sensor’s deterioration with age
   Please check this instrument daily and adjust it if adjustment is needed.
3. Noise caused by peripheral equipment
   Please review the lines and installation site and add noise suppression parts if needed. Lightning may cause temporal noise. If you find evidence regarding the linkage of lightning, please add lightning suppression parts.

7. Routine maintenance

RI-2000W is an important equipment to prevent danger and assure your safety. Please have a routine maintenance check to maintain the performance and further enhance its credibility.

7-1 Frequency and items to be checked

7-1-1 Daily maintenance

Self-performed maintenance

1. Check the flow monitor

   Confirm if the ball is above the red line in the flow monitor. If it isn't above the line, please adjust the flow rate.

2. Check if the power lamp is on

   The power lamp should be on while the instrument is under operation.

3. Check the readings on the LCD

   The readings should be "0 ppm" if the gas inlet is installed in a gas-free environment. If it is not "0 ppm" please adjust the zero point (zero calibration) after confirming there is no target of interference gas near the gas inlet.

4. Check if there is any contamination on the filter or anything to block it

   Blockage of the outer dust filter is predicted if the flow ball will not go upwards in flow rate adjusting. Please replace the filter to a new one if the filter is blocked. If the ball will not move upwards even if the filer was changed, please check the sampling line. There may be cracks, bends or something blocking the tube.

7-1-2 Routine maintenance

Maintenance done by trained personnel will be

1. Checks written in 7-1-1
2. Cleaning
3. Calibration
4. Function checkout
5. Replace parts (refer to 7-6)
6. others

7-1-3 Contract for maintenance

We recommend making a nondisclosure contract of maintenance including gas calibration and adjustment in order to maintain stable operation. Please contact your nearest agent for details.

7-2 Adjustments

Please refer to 5-5 Maintenance and adjustments.

⚠ CAUTION

・Please contact your nearest agent and request service.

7-3 Parts and sensor replacement

⚠ CAUTION

・Please contact your nearest agent and request sensor and parts replacement.

7-4 Shutting down and removal

7-4-1 Shutting down the instrument

Please refer to 5-6 shutting down the instrument.

7-4-2 Removal

Please follow 4-2 Installation location when relocating RI-2000W. For the wiring, please follow 4-5 Cautions in wiring and 4-10 Warnings on pipe laying for the pipe arrangement.

⚠ CAUTION

・Gas calibration of RI-2000W is required after removal.
・Please contact your nearest agent and request service.

7-5 Storage

Please store RI-2000W in these conditions.

1. Temperature: within 5 to 35 ℃
2. Humidity: within 30 to 85 %RH
3. Environment: gas, vapour and solvent free

⚠ CAUTION

・Gas calibration of RI-2000W is required when you will start to use RI-2000W again.
・Please contact your nearest agent and request service.

7-6 Periodic replacement parts

Things listed below are parts that are recommended to be replaced periodically.

No.	name	Check in every	Replacing frequency (year)	amount
1	Pump（exclude diaphragm ）	6 months	1～3	1
2	Pump diaphragm	6 months	1～2	1
3	Inner tubes	6 months	1～3	1 set
4	Fan	6 months	1～2	1
5	Outer filter	6 months	0.5～1	1
6	Inner filter	6 months	2～3	1
7	Light source	6 months	2～3	1
8	Motor	1 year	2～3	1
9	O-ring on the flow meter	1 year	3～6	1
10	Gas filter cell	1 year	4～6	1
11	Flow meter	1 year	7～8	1
12	switching regulator	———	4～6	1
13	Photo sensor	———	4～6	1
14	Main board	———	7～8	1
15	Terminal board	———	7～8	1
16	Preamp board	———	7～8	1
17	Relay board	———	7～8	1
18	Solenoid	———	7～8	1
19	Fuse（5A）	———	8	2

＊ NOTE

・ The replacing frequencies above are indications and are not representing the length of warranty. The replacing frequencies may change if needed.

・Boards need to be replaced do to condenser deterioration.

8. Abnormal conditions

8-1 Fault signals

RI-2000W will provide a trouble (fault) alarm and operate as following when it detects trouble by self-diagnostics.

1. Indications: POWER lamp will flash
2. Output signals
    1. 4-20mA output: 0.5mA
    2. Fault signal contact: fault signal will be put out

Indication	Susceptible causes	What to do
FAIL SYSTEM	There is trouble in the system.	Reboot RI-2000W. Please contact your nearest agent if the system does not return.
FAIL SENSOR	The sensors connector may have been loosen or the sensor may has trouble.	Check the connections and please repair/reconnect them. Contact your nearest agent if you cannot find the failure part.
FAIL LAMP	The lamp's life has ended or there is trouble in the lamp.	Please contact your nearest agent if the system does not return.
FAIL HEATER	The heater's connector may have been loosen, has trouble or the life has ended.	Check the connections and please repair/reconnect them. Contact your nearest agent if you cannot find the failure part.
FAIL MOTOR	The motor's connector may have been loosen, has trouble or the life has ended.	Check the connections and please repair/reconnect them. Contact your nearest agent if you cannot find the failure part.
FAIL FAN	The fan's connector may have been loosen, has trouble or the life has ended.	Check the connections and please repair/reconnect them. Contact your nearest agent if you cannot find the failure part.
FAIL ZERO	Contamination in the sample is accumulated inside the instrument.	Adjust the zero point (zero calibration). Please contact your nearest agent if the instrument won't recover from trouble after calibration.
	Out of auto-zero tolerance.	Adjust the zero point (zero calibration). Please contact your nearest agent if the instrument won't recover from trouble after calibration.
	The environments temperature has changed too rapidly.	Please put something between RI-2000W and the heat source. The zero point will shift if there are heat sources near RI-2000W. (e.g. Sunlight, other instruments)
FAIL FLOW	Flow rate has gone low because of pump deterioration or, the line is blocked.	Adjust the flow rate.

8-2 Response to trouble signals

Please contact your nearest agent in case your find any trouble.

8-3 Trouble shooting

Please confirm these things first when troubles are suspected. If there are faults, please contact your nearest agent.

- Cable cut downs and shorts between instruments may be a cause. Please confirm peripheral device and cables also.
- There are cases that improper use or piping cause difficulties. Please check the whole system.
- Instantaneous blackouts or abnormal power supply may cause troubles. Please review your uninterruptible power supply system, line filters and isolated transformer.

1. The power lamp doesn't turn on. (Cannot turn on RI-2000W)
   - Is the power supply cable connected? →Connect the power cable.
   - Isn't there a short in the fuse? →Check why the short occurred and replace it.
   - Is the power voltage acceptable?
     →Please confirm the power voltage and supply power within the rating.
   - Is the power switch turned on? →Turn up the power switch.

2. The power lamp is flashing.
   Please refer to 8-1.

3. The gas concentration is rising.
   - Isn't the temperature changing rapidly?
     →Rapid rising of temperature may cause high readings.
   - Isn't the humidity changing rapidly?
     →Rapid change in humidity may cause high readings due to condensation.
   - Is there any change in the air pressure?
     →NDIR sensors are affected by air pressure.
   - Isn't there any noise?
     →Please refer to 4-3 and suppress noise.

4. "OVER ppm" is always on the display.
   - Isn't there any damage on the sensor cable?
     →Please check if there isn't any damage on the cable.
   - Is the sensor's connecter connected properly?
     →Please check the connector.
   - Isn't the detector contaminated?
     →NDIR cells are easily contaminated by water or dirt. Please keep the line clean and replace filters periodically.

5. RI-2000W operates abnormally.
   - Isn't there any surge noise?
     → Please reboot the instrument. Please contact your nearest agent if it occurs frequently.

6. I cannot zero calibrate (adjust the zero point).
   - Is it just after turning on RI-2000W?
     →RI-2000W needs at least an hour to warm up.
   - Is it fresh air?
     →Please use fresh clean air that does not contain any interferent gas or, use 100vol% nitrogen.
   - Isn't there any condensation?
     →Calibration cannot be done if there is condensation.

7. Gas calibration cannot be done.
   - Is the prepared gas appropriate? →Please prepare appropriate gas to calibrate.
   - The sensor may be deteriorated. →The sensor has to be replaced.

8. There is a time lag in detection.
   - Isn't the dust filter blocked? →Please replace the dust filter.
   - Isn't there a bend or block in the sampling pipe? →Repair the fault locations.
   - Is the instrument attached properly and firmly?
     →Please attach the instrument properly.

9. The fuse blows
   - Trouble in RI-2000W or power source faults is predicted.
     →Please find the trouble cause and location and take measures. Replace the fuse to a new normal fuse (125V 5A).

9. Words used in this manual

alarm delay time

time lag of the alarm to activate when test gas (concentration=alarm set points value ×1.6) is drawn in the instrument.

alarm retardation time

a function to suppress noise effects and false alarms.

calibration

An operation to adjust the detectors readings to actual gas.

dust filter

a filter to prevent dust entering the instrument.

flow monitor

a monitor that roughly indicates the flow rate of air. This instruments flow rate is over 1.0 litre/minute.

full scale

the maximum value of the detecting range.

gas adjustment

some times used as "gas calibration" or "calibration".

maintenance mode

a phase that cuts alarm signals to make maintenance easier.

point skip

a function to temporarily stop detecting and make maintenance easier.

ppm

a unit that stands for "parts per million".

warm up

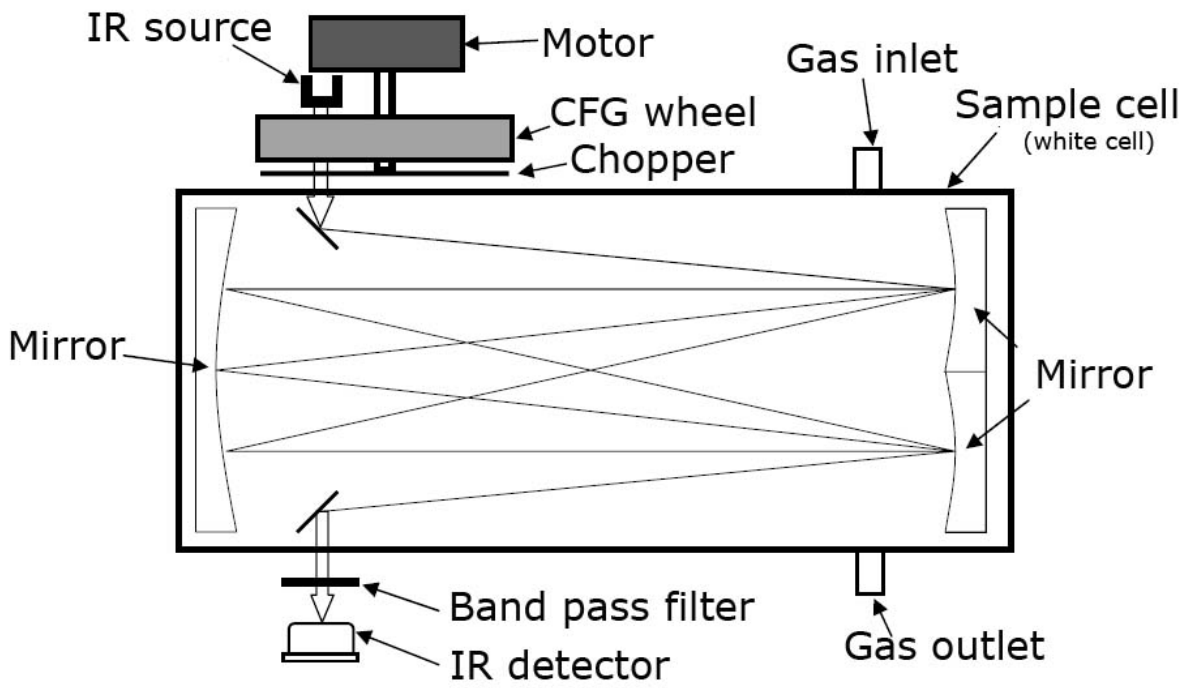
time for the instrument to prepare detecting. The instrument needs time to stabilise. False alarms may occur if the instrument is not stable.

zero suppression

a function to suppress interference and environmental noise effects.

10. Detecting principal

The detection method of RI-2000W is gas filter correlation. It is a part of NDIR (absorption of infrared radiation) based detecting, but it has better selectivity and stability than normal NDIR methods.
There is an inlet for gas to enter the sample cell (white cell) and an outlet to let the gas go out. IR light enters the cell and gas absorbs the beam, so the absorption rate and the gas concentration will correlate. The IR detector detects the IR light and will put it out as gas concentration. Light from the radiation source goes through a rotating gas filter wheel and enters the cell, goes out through the band pass filter and then, detected by the IR detector. The IR beam is optically folded inside the sample cell (white cell) by mirrors to stretch the light path and obtain effective absorption length. There are two compartments in the CFG wheel, one is filled with target gas and the other is filled with gas that does not interfere in the target gas. Light goes through this rotating cell alternately and crates beam to refer. The band pass filter only lets specific wavelength that is absorbed by the target gas. The detector will not detect any light that has different wavelength. Also, the detector will not detect gas that does not absorb IR rays.



11. Specifications

11-1 Standard specification

Model	: RI-2000W
Detecting principal	: Non-dispersive infrared absorption (NDIR)
Target gas	: Nitrous Oxide(N_20)
Detection range	: 0 to 200 ppm
Alarm accuracy	: Within 30% of the alarm set point (on a like-for-like basis)
Alarm delay time	: Within 30 seconds
Sampling method	: Automatic aspiration by a pump
Aspiration rate	: approximately 1.0 litre/ min
Gas inlet connector	: φ6(0D)-φ4(1D) size Teflon tube with a propylene male connector
Indications	: 16 digits (numbers and alphabets)
Concentration	: LCD 16 digits
Status	: LCD 16 digits and LED lamps

1. POWER lamp (Green)	・Normal condition	: Keeps on
	・Trouble condition	: Flashes
2.WARNING lamp (Yellow)	・Normal condition	: Off
	・1st gas alarm	: Flashes (Keeps on if BZ.STOP is pressed)
3.ALARM lamp (Red)	・Normal condition	: Off
	・2nd gas alarm	: Flashes (Keeps on if BZ.STOP is pressed)
4.MAINTENANCE lamp (Green)	・Detecting mode	: Off
	・Maintenance mode	: Flashes

transmission scheme	: 4-20mA (non-insulated, discharge energy)
load resistance	: below 300Ω
Output signal	: 4-20 mA
Warm up	: 2.5 mA
Maintenance	: 2.5 mA
Trouble (fault)	: 0.5 mA
Recommended cables	: CVVS relevant cables 1.25 to 2.0 sq

Gas alarm operations	: Latching (standard) or non-latching (optional)
Alarm set points	: 1st alarm "WARNING" : 50 ppm 2nd alarm "ALARM" : 100 ppm (Adjustable within 20 to 200ppm as an option)
Alarm indications	: WARNING (Yellow), ALARM (Red)
Alarm output contacts	: No-voltage relay A contact (standard) or B contact (optional)
contact capacity	: AC 125V 0.1mA to 0.3 A (load resistance)
Recommended cables	: CVVS relevant cables 1.25 to 2.0 sq
Warming up time	: 4hours (initial clear : 1 hour)
Zero suppression	: Within 6% of the full scale
Auto zero function	: Will aspirate zero calibration gas in set interval
Interval of operation	: every 7 days
Operation time	: 6 minutes

Trouble (fault) alarm

Self diagnosis	: System failure, Sensor Trouble, Zero point trouble, Lamp trouble, Motor trouble, Heater trouble, Low flow rate, Fan trouble
Indications	: Flashing POWER lamp and alphabetical indications
Alarm output contacts	: No-voltage relay A contact (standard) or B contact (optional)
contact capacity	: AC 125V 0.1mA to 0.3 A (load resistance)
Recommended cables	: CVVS relevant cables 1.25 to 2.0 sq

Power source

Power voltage	: AC 200V/ AC 220V 50/60 Hz
Power consumption	: 400V maximum
Recommended cables	: CVVS relevant cables 1.25 to 2.0 sq

Usage environment

Temperature	: 0 to 40 ℃
Humidity	: 30 to 90 % RH (no condensations)

Structure	: Wall mounted
Dimension	: 350(W)×440(H)×160(D)mm (without protrusion)
Weight	: approximately 17 kg
Colour	: Munsell colour system 2.5Y9/2

✳ NOTE

・ The specifications are subject to change without notice due to continual improvements.

11-2 Configuration

Standard configuration

- Main unit (RI-2000W)
- Operating manual
- Accessories　2 dust filters and 2 fuses