

OPERATION AND MAINTENANCE MANUAL  
FOR  
RIKEN COMBUSTIBLE GAS DETECTOR HEAD  
GD-D8 Series

- GD-D8-56
- GD-D8NC-59
- GD-D8NCS-52
- GD-D8·DC-11
- GD-D8·DC-13

Safety precautions

- Read and understand the instructions in this manual before operating this detector head.
- Keep manual accessible at all time.
- This detector head cannot be used for any other purpose than what is specified in this manual.
- Follow all the instructions in this manual.
- We do not assume indemnification for any accident or damage caused by the operation of this gas detector head, and our warranty is limited to the replacement of parts or our complete goods.
- Be sure to perform daily and 6 months regular inspections.
- If this detector head founds defective, contact authorized distributors, dealers and representative appointed by Riken Keiki Co., Ltd.



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## [CAUTIONS ON OPERATION]

This detector head is a part of gas alarm instrument to detect combustible gas in air. The gas alarm instrument is a safety instrument, not an analyzer nor measuring instrument to make quantitative and qualitative analysis or measurement.

Please understand following points and use this detector head correctly.

- 1 . This detector head may respond to other gas and vapors than the target gas.

Be care to alarm operation by interference.

It may fluctuate against the environmental (temperature, humidity, etc.) change around detector head.

2. Alarm level for gas alarm instrument shall be set within the performance of the instrument. If set below our standard alarm level, it may be caused to false alarm.

3. This is not a control equipment, but a safety instrument.

Use the alarm contact from gas alarm instrument only for external alarm light or buzzer.

And the analog output signal shall be used only for external indicator or recorder.

We do not assume indemnification for any accident or damage caused by other control purpose than the above.

4. The gas sensing filament of gas detection sensor to be used with this detector head is a porous sintered metal impregnated by oxidation catalyzer.

If silicone vapor, sulfurs, etc. adheres on the surface of catalyzer, gas sensing area will be narrow and the sensitivity will be drops drastically.

Do not use detector head under the existence of silicone vapor and sulfurs.

5. For maintenance, replacement of parts listed in this manual and adjustments are required.

Also every 6 months regular maintenance and gas calibration are required as this is a safety instrument.

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## Preface

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Thank you for purchasing our combustible gas detector head GD-D8series(hereinafter describes GD-D8).

This is a gas detector head to detect combustible gases leaked to atmosphere for the prevention of gas explosion.

This manual is a guidebook for use of the GD-D8. All persons who use this unit for the first time and who has ever used this unit are requested to read through the manual to understand the content before use.

This manual contains the following headings to ensure the safe and effective operation.



### **DANGER**

Means vital damage directly to the human life and body or properties due to contact with high voltage, etc.



### **WARNING**

Means vital damage to the human body or properties unless the operation or measures of this manual are observed.



### **CAUTION**

Means minor damage to the human body or properties unless the operation or measures of this manual are observed.



### **NOTE**

Means advice concerning handling and operation.

This detector head is used in combination with exclusive indicator/alarm unit one by one. Be sure to read operation manual for indicator/alarm unit.

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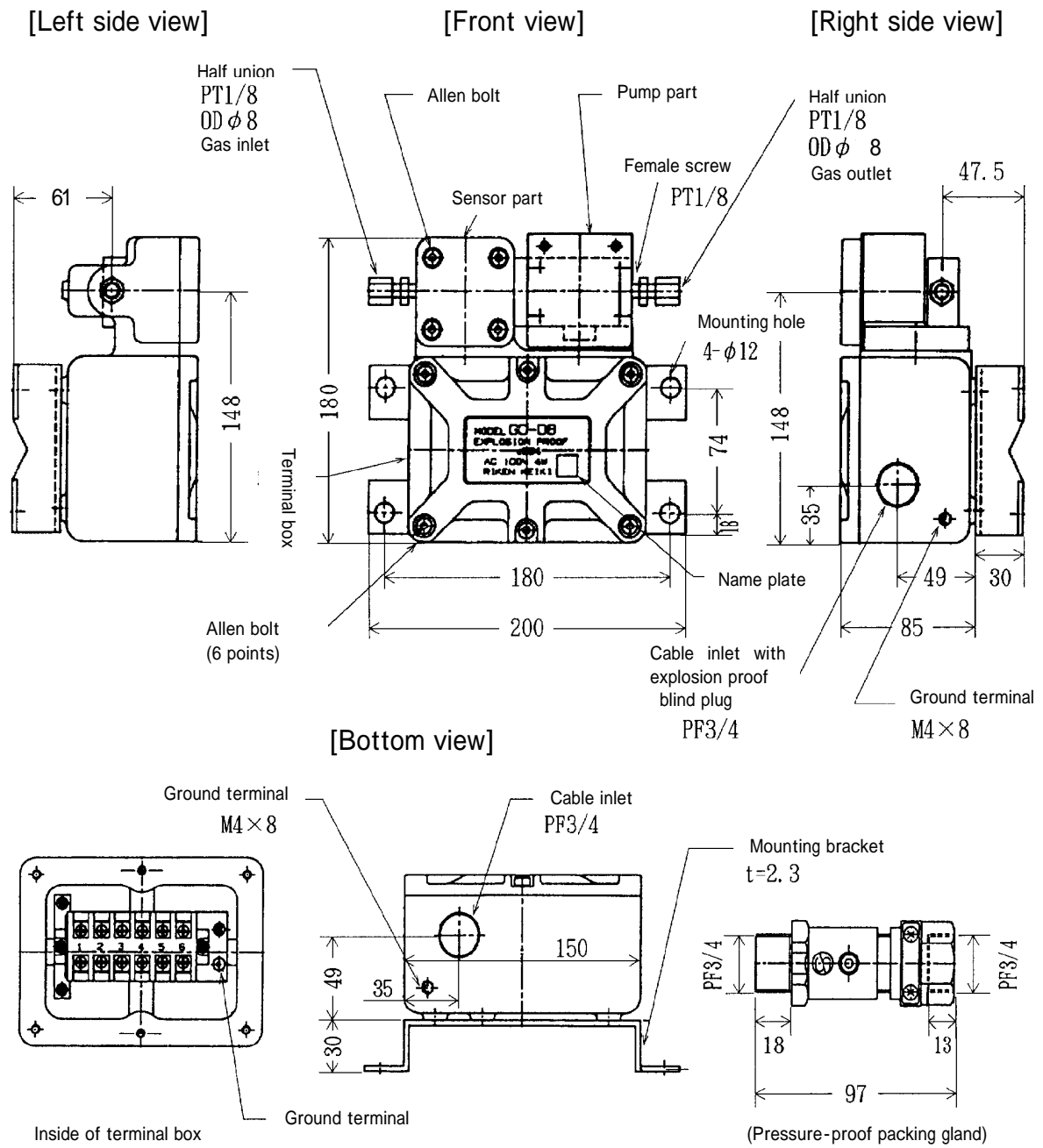
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1 . PRODUCT FUNCTIONS

Appearance and name of each part



Unit : mm

## 2 . HOW TO USE

### 2 - 1 For persons who use this detector head for the first time

Suction type combustible gas detector head GD-D8 is used in combination with indicator/alarm unit to show gas concentration and to give an alarm.

When combustible gas leakage is detected with this detector head, it transmits electric voltage in proportion to gas concentration to indicator/alarm unit.

The indicator/alarm unit shows gas concentration and gives an alarm if it exceeds preset alarm level.

This detector head may respond to other gas than objective gas. If it detects gas and indicator /alarm unit gives an alarm, please check whether it is caused by objective gas or not.

For the purpose of gas detection, it is important to check the operating conditions in daily base.

Refer to “4-1 Inspection frequency and items” for the checking of operating conditions.

### 2 - 2 Caution for installation and handling

Do not install it in the following places.

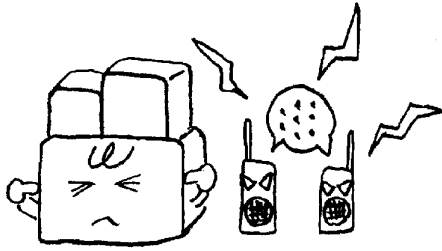


Place where the detector is splashed with water.

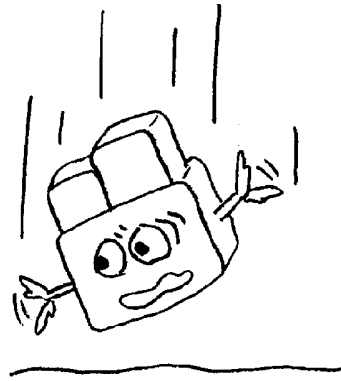
[ Use a drip-proof cover  
for outdoor installation. ]



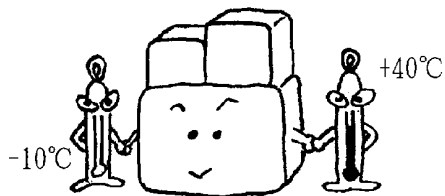
Place with vibration



Place with radio wave or noise



Place where the detector is dropped or exposed to strong impact readily.



Place where the temperature is below -10 or above +40 .

### WARNING

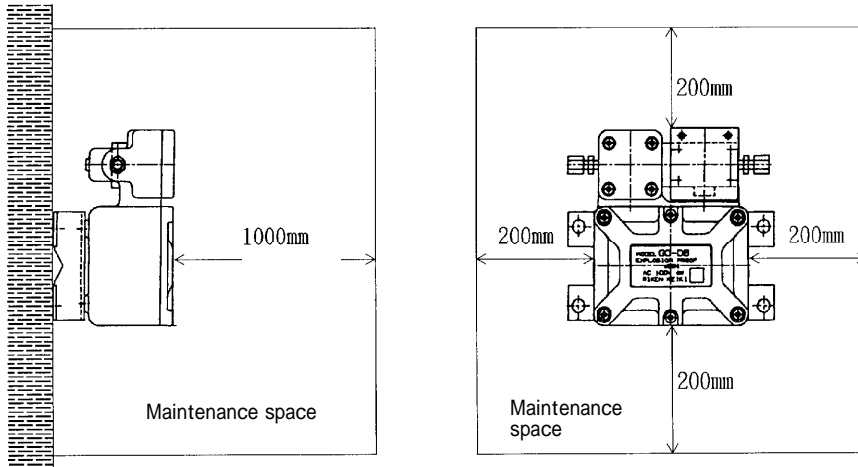
Do not install the detector head where silicone vapour, sulfurs or halogenated gases may exist. These substances react as a catalytic poisoning and make shorten the sensor life.

It is danger as you can not detect the gas normally, if the detector head is installed in such places. It may be possible to reduce its influence by adding filters, etc.

Consult our agent or Riken Keiki if detector head is installed under such environment.

### 2 - 3. Maintenance space

A certain maintenance space must be secured around the detector head, so that the maintenance staff can perform the safe and correct maintenance works. Pay due attention to secure this space during work plan and execution.



### 2 - 4. Installing the detector head

Installation and explosion proof wiring works of the detector head shall be done with following steps(1) ~ (5).

- (1) Mount the detector head to the firm surface like a wall, etc. with M10 bolts.  
When mounting it to 2B pipe, use an optional mounting bracket.(Refer to Fig 1 ~ 4 for installation.)
- (a) In case that the drip/weather proof cover is not used.

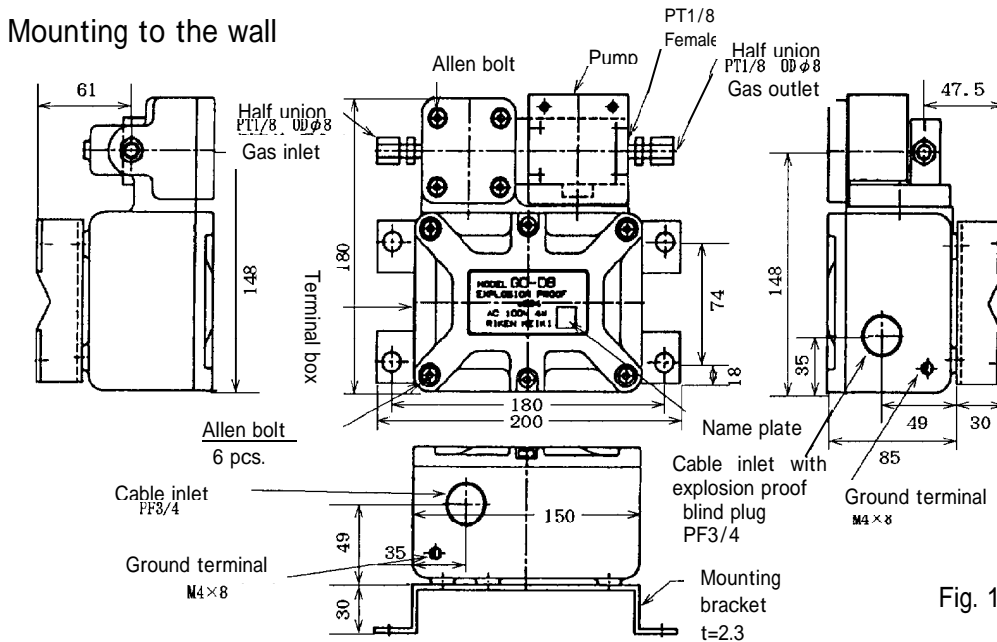


Fig. 1.

Mount the detector head to the wall after fixing it to the mounting bracket as shown the above.



Mounting to the 2B pipe

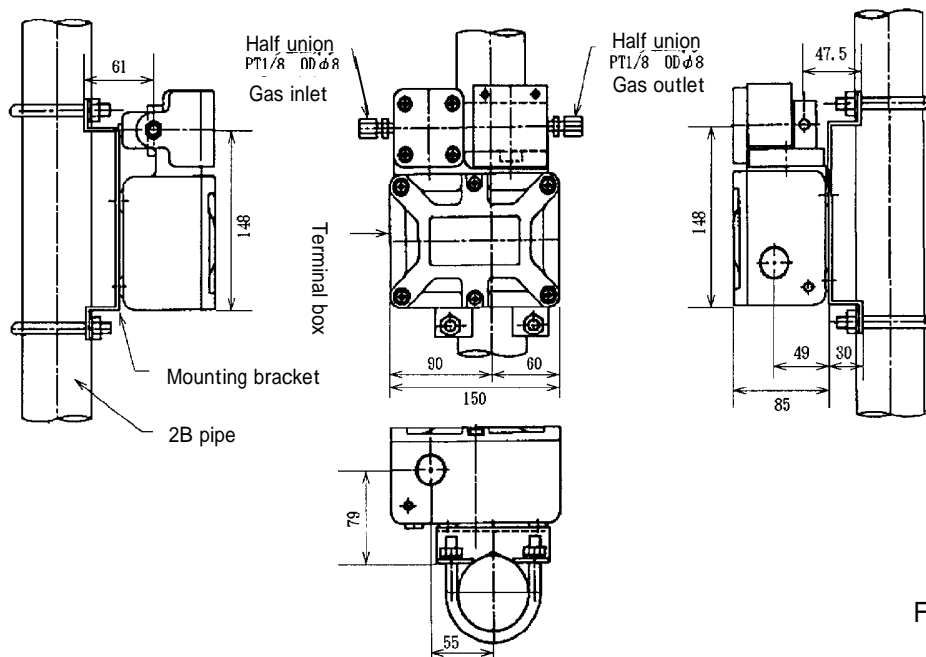


Fig. 2

Mount the detector head to 2B pipe after fixing it to the mounting bracket.

(b) In case that the optional drip/weather proof cover is used (See Fig. 3 & 4).

To mount the drip/weather proof cover, fix the base plate of the cover together with mounting bracket to the detector head with 4 bolts. Match a upper part of front cover to the hock of base plate and then, fix it with lock from front side.

Mounting to the wall

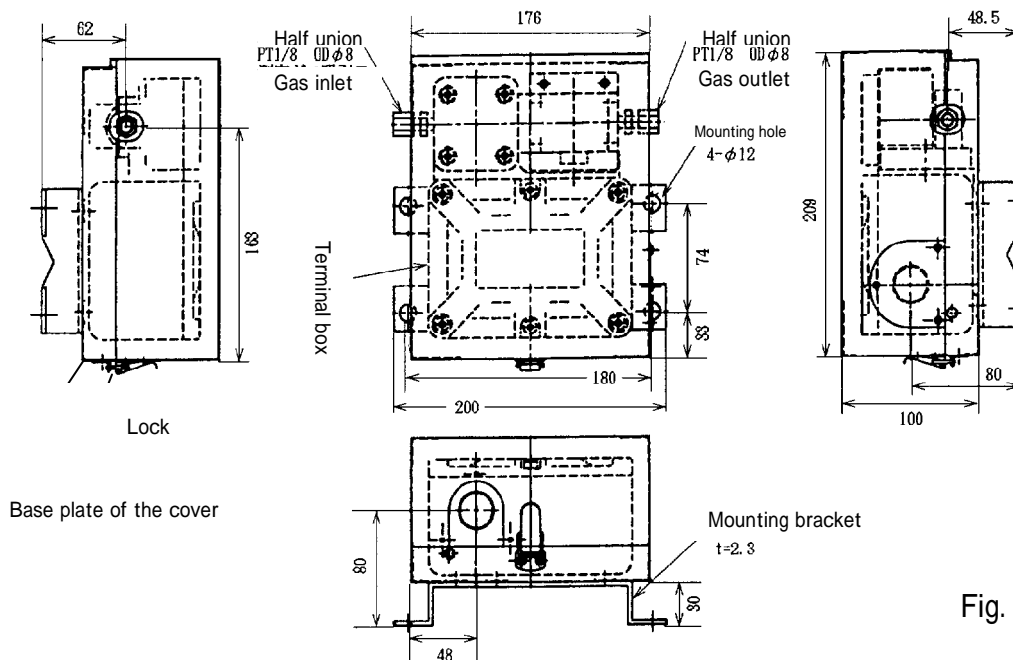


Fig. 3.

Mount the detector head to the wall after fixing it to the mounting bracket as shown the above.

Mounting to the 2B pipe

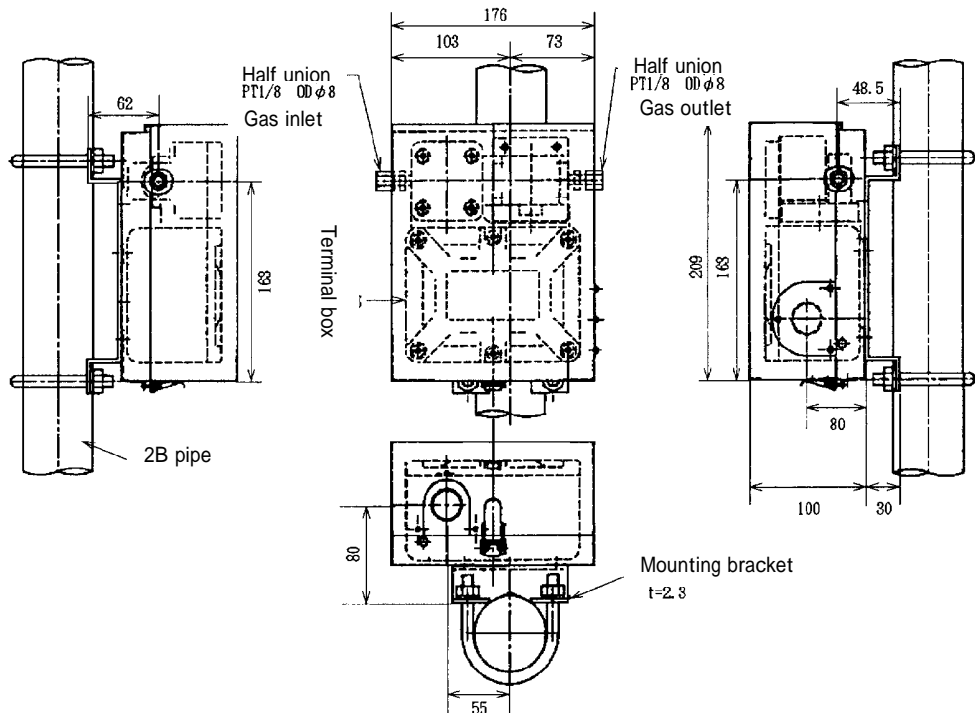


Fig. 4.

Mount the detector head to 2B pipe after fixing it to the mounting bracket.

- (2) Guide the cable through the Packing gland (Lower) Washer Packing Packing gland(Upper) in this order.  
 After that, lead the cable into the terminal box and attach crimp contact for 4 mm screw to the end of each conductor (6-core).

**CAUTION**

3 kinds of following washers and packings are supplied as standard accessories. Choose the appropriate one according to the size (Outer diameter) of cable.

Cable finish O.D.(mm)	Packing I.D.(mm)	Washer (mm)
15.0 ~ 15.9	16	17
14.0 ~ 14.9	15	
13.0 ~ 13.9	14	

(3) Example of steel conduit work for explosion proof construction.

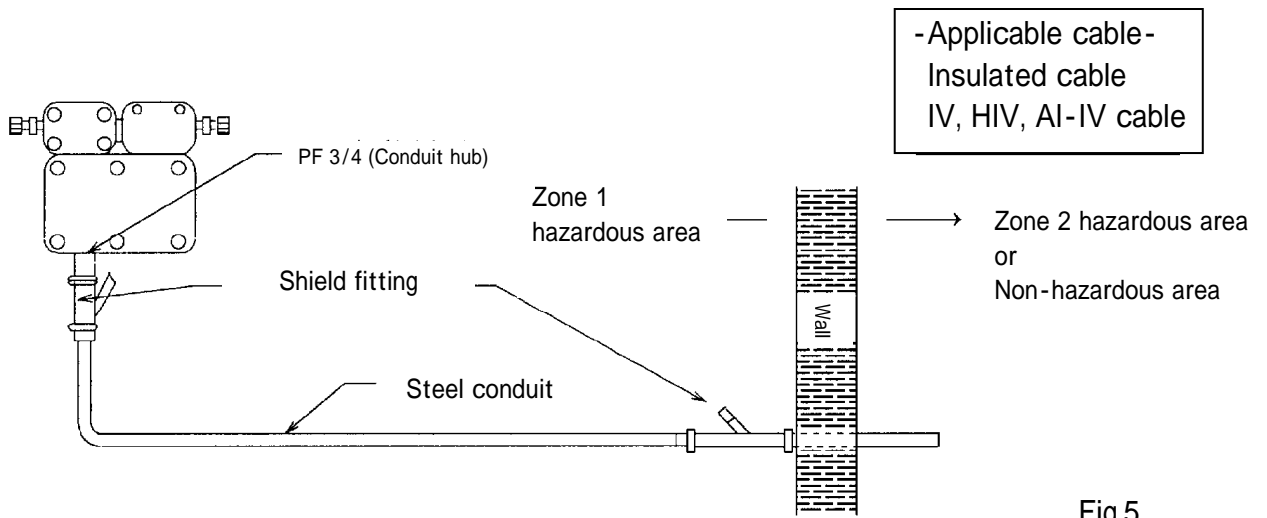


Fig.5

**\* NOTE**

Connect the cable between indicator/alarm unit and detector head with safe method on explosion proof structure.

(4) Remove the terminal box cover by loosening 6 pcs of allen bolts, and terminal strip for external connection will appear(see Fig.6).

Terminal numbers 1, 2, 3, 4, 5 and 6 from the left are marked on the terminal strip.

Terminals 1 and 2 are for power source to the pump and terminals 3 to 6 are input/output of the sensor. (See Fig.7)

Terminal box cover opened

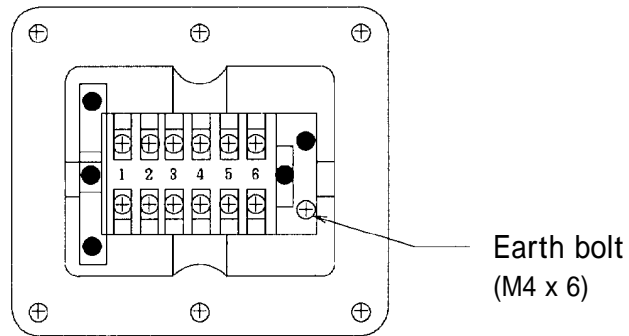
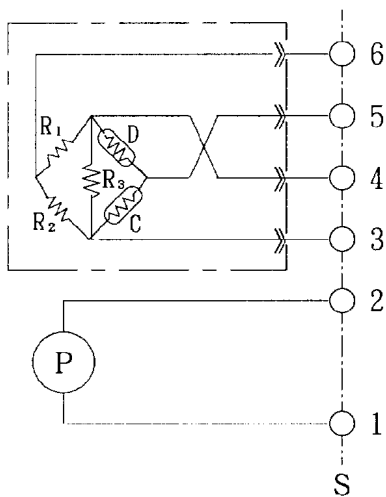


Fig. 6

Gas sensor



- R · R : Fixed resistor
- R : Regulating resistor for sensor current
- D : Detecting element
- C : Compensating element
- P : Sample drawing pump
- S : Terminal strip

Fig. 7

The screw of the terminal strip is 4mm.  
Then, be sure to use the crimp contact for M4.  
Refer to "2-6 Wiring" for terminal connections.



**WARNING**

When closing the lid of terminal box, do not enter foreign substance like metal into the terminal box. Remove foreign substances in terminal box since it is afraid to make trouble or to lose the explosion proof performance.

## 2 - 5. Piping works

After installing the detector head, carry out the piping works for gas sampling.  
Keep following cautional items when carrying out the piping works.

- (1) Use copper or SUS (stainless) pipe of O.D. 8-1t for piping.  
Recommend SUS pipe when corrosive gases would be always existed or organic solvent vapors are sampled.
- (2) Do not bend piping at right angle and carry out piping as straight as possible.  
Excessively high load may cause a burden on the suction pump and shortening the effective life of the pump.
- (3) Determine the suction side piping length considering the response time. When the gas is sampled from the piping end (gas detection point), the response time of the gas detection sensor itself + delay caused by the piping length becomes equivalent to the response time of detector head.
- (4) Be sure to connect gas inlet port at the tip of gas sampling point.
- (5) Do not sample the gas from the place where silicone vapor, chlorine(Cl<sub>2</sub>) or sulfurs are always existing. These substances make shorten the sensor life remarkably.
- (6) The length of piping for exhaust (gas outlet) side shall be decided according to the length of piping for sampling(inlet) side. The total length for sample side and exhaust side shall be within 30m.
- (7) Be sure to connect MC filter in front of gas inlet port of detector head.

## 2 - 6. Wiring

- (1) After completion of installation according to “2 - 4 Installing the detector head”, check that there is no error for installation and make wiring according to the following diagram.

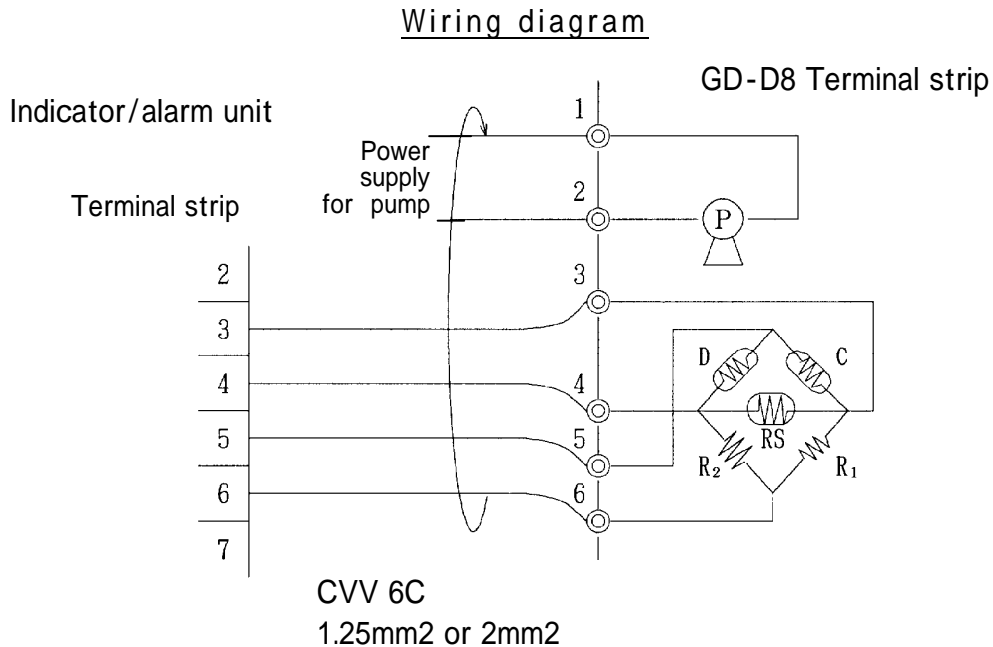


Fig. 8

- (2) Put the lid onto the terminal box and secure it by allen bolts (6pcs).



### WARNING

- When fix the lid, be sure to use the exclusive allen bolts supplied with detector head.
- Then, be sure to fix it by use of 6 pcs. allen bolts.
- When use other bolt, it will be far from the performance of explosion proof.



### WARNING

- After completion of wiring, confirm before putting power ON that there is no miswiring. If powered on in miswiring condition, the sensor will be broken and you cannot use anymore.

## 3 OPERATION METHOD

### 3 - 1 Start up

After putting power ON in indicator/alarm unit check that the indicator/alarm unit is working normally by referring operating instruction manual for indicator/alarm unit. Also, check that the sample flow of detector head is a designated flow rate.

### 3 - 2 Detection method

Continuous detection shall start after passing the initial clear time from putting ON the power in indicator/alarm unit.

## 4 . MAINTENANCE AND INSPECTION

The gas detector alarm is kept in continuous operation over a long period of time and must perform a vital role as a safety device. For this purpose, periodical inspection must be made. The High-pressure Gas Safety Act in Japan sets forth the obligation of periodical inspection of the gas detection instrument.

### 4 - 1 Inspection frequency and items

The inspection includes a daily inspection which a person in charge of control and operation of the gas detector instrument performs inspection before work once a day, and a monthly inspection carried out once a month, and periodical inspections conducted by the service personnel designated by manufacturer. The inspection items are confirmation of the sample flow rate on the detector head side and confirmation of lights, concentration indication and alarm function on the indicator alarm unit side. It is also necessary to carry out gas calibration at least every 6 months. The law in Japan sets forth that the unit must issue the alarm during the circuit inspection related to alarm while providing normal operation, at least, once a month.

Inspection point /item		Inspection item	
		Daily inspection	Monthly inspection
By eye	Power light	· Check if the power(pilot) light in indicator/alarm unit is ON	· Check if the power light is the appropriate brightness.
	Gas concentration indicator	· Check if the gas concentration reading in indicator/alarm unit is zero.	· Check if the gas concentration reading in indicator/alarm unit is zero.
	Status of detector head	· Check if the sample flow in sampling line is in normal	· Check if the filter in sampling line is not clogged.

By operation	Gas concentration indicator	/	· Check if the zero point in indicator/alarm unit is within a allowable range.
	Alarm function		· Check if the buzzer, alarm light and alarm contact work properly by pressing test switch in indicator/alarm unit.

Inspection point /item	Inspection item	
	Every 6 month inspection	Yearly inspection
By eye	· Same as daily and monthly inspections.	· Same as daily and monthly inspections.
By operation	· Gas calibration	· Replacement of sensor and gas calibration



### WARNING

This is a safety instrument and the inspection by every 6 months or more is mandatory to ensure the safety. If the unit is used continuously without inspection, the sensor sensitivity may change, resulting in failure of correct detection.

### \* NOTE

Be sure to inform sections concerned beforehand when performing the alarm test or gas calibration.  
For the equipment connected with output signal from indicator/alarm unit, perform them after disconnecting the output signal.

## 4 - 2 . Sensitivity adjustment(Calibration)

### (1) Adjusting the zero

Prepare following tools to perform zero and span adjustments.

- Small flat-blade screwdriver
- Gas sampling bag
- Calibration gas(standard gas)



Check with portable gas detector or equivalent that there is no gas around the inlet of gas sampling port and adjust the reading at 0(zero) with ZERO potentiometer in the indicator/alarm unit.

If the gas would exist around the inlet of gas sampling port, pack the fresh (gas free) air into the gas sampling bag and supply it to detector head for about 2 seconds and then, adjust zero.



### WARNING

Zero adjustment shall be done in a fresh air environment. If it is done in the presence of combustible gas, it is impossible to perform correct adjustment. When gas leaks actually, the reading shows lower and gets to danger.

#### (2) Adjusting the gas sensitivity (Calibration)

In advance, prepare the standard gas for calibration with known gas concentration (suitable concentrations is around 1/2 of full scale) in the gas sampling bag.

Turn the nut of half union at the outlet side of MC filter with flowmoniter counterclockwise with spanner (or wrench) and disconnect the piping.

Connect the gas sampling bag tubing to the piping disconnected the above (See Fig.9). The standard gas for calibration is introduced into the detector head automatically.

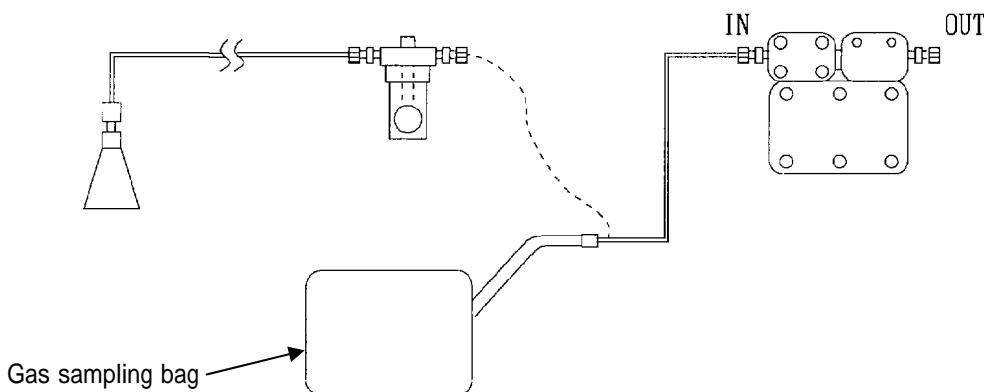


Fig. 9

When the calibration gas is being introduced into the detector head, the reading in the indicator/alarm unit goes up and gets stable after some decade seconds.

If the reading does not match the calibration gas concentration, adjust the reading in indicator/alarm unit to the calibration gas concentration with CAL potentiometer.

Disconnect the gas sampling bag from piping. Allow the fresh air to flow for about 30 seconds and verify a reading of zero.

If necessary, use the ZERO potentiometer in indicator/alarm unit to adjust the reading to zero.

If you could not adjust the reading by turning the CAL potentiometer at the maximum as the result of gas calibration, the sensor life is terminated.

Put OFF the power switch in indicator/alarm unit and then, replace the sensor with new one. See section 4-3 for sensor replacement.



### WARNING

Do not replace the sensor in power on condition. If replaced in electrified condition, it will have a possibility to be a source of ignition.

Be sure to put off the power for both sensor (indicator/alarm unit) and detector head pump.



### CAUTION

Confirm that the sensor to be replaced is the identical type with the one described in the label which is stucked to the detector head.

When the sensor is replaced, carry out the sensitivity adjustment (gas calibration).

### \* NOTE

Standard gas for calibration and gas sampling bag are option. Consult with us or our nearest agent if required.

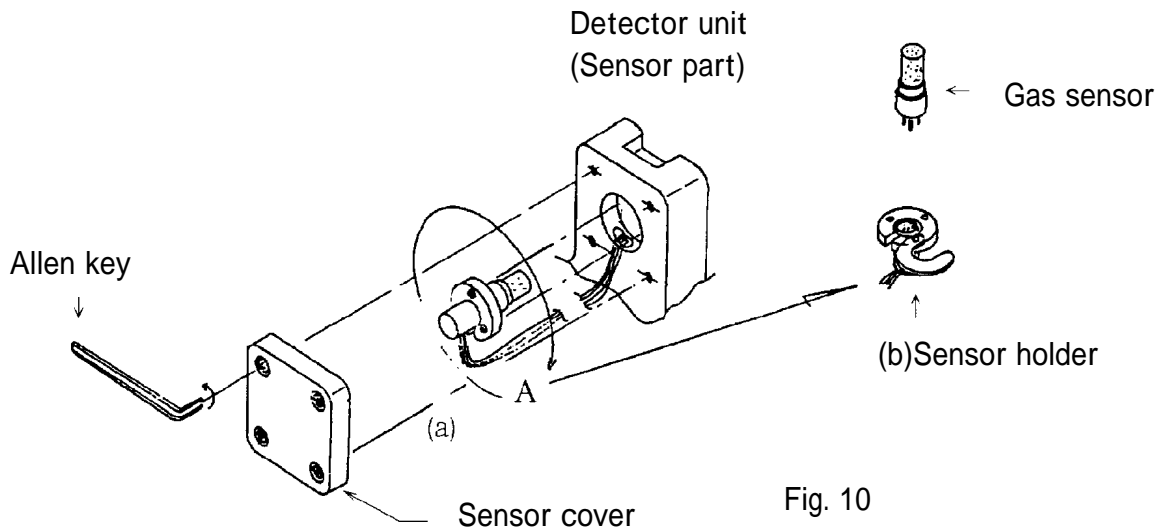
Replace the sensor around once in 1 ~ 3 years.

## 4 - 3 Replacing the gas sensor (See Fig.10 & 11)

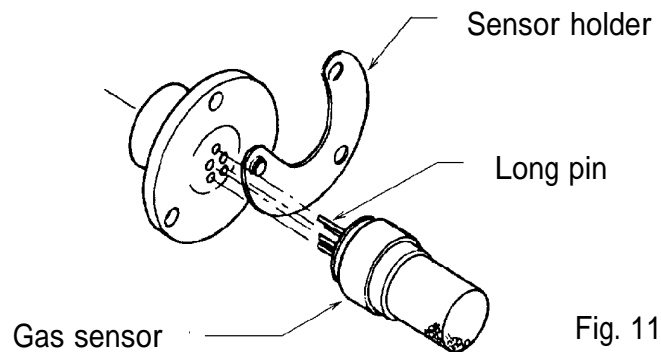
Carry out the replacement of gas sensor in accordance with the following procedures.

- (1) Turn power switches of indicator/alarm unit and pump for detector head to "OFF."
- (2) Loosen 4 pcs. of allen bolts and remove the detector unit cover (Allen bolts for detector unit cover are not dropped even if they are loosened)
- (3) Loosen 3 pcs. of small pan-head screws, pinch the connector cap (black resin part) and pull it to this side to draw out the sensor. (Pan-head screw are not dropped from sensor holder even if they are loosened).

- (4) Turn sensor holder clockwise to remove the sensor from sensor holder and pull out the sensor from the connector.



- (5) Prepare new sensor and confirm that one of five sensor pins is longer than four pins.



- (6) Install the sensor to the sensor holder removed in step(4) and fix it with 3 pcs. of small pan-head screws.  
 (7) Place the sensor cover onto the detector unit and tighten it with four allen screws.

**CAUTION**

When the sensor cover is placed to the detector unit, take care not pinch the lead wire of sensor connector between the sensor cover and detector unit.

- (8) After completion of sensor replacement, turn on power to the indicator/alarm unit. Place the indicator/alarm unit's power switch in the ON position and check the sensor voltage(bridge voltage to the sensor) in indicator/alarm unit.(Refer to the instruction manual for the indicator/alarm unit).

- (9) Allow the replacement gas sensor to warm up for about 10 minutes and calibrate the replaced gas sensor (detector head) as described in step “4-2 Sensitivity adjustment.”

**\* NOTE**

Be sure to carry out adjustments of sensor voltage, zero and gas sensitivity (calibration) when the sensor is replaced.  
Consult with us or our nearest agent if the sensor replacement is required.

#### 4 - 4 Replacing the pump (See Fig 12)

Carry out the replacement of pump in accordance with the following procedures.

- (1) Turn off power to the indicator/alarm unit.  
When the power to the pump is separated, turn off power to the pump.
- (2) Loosen 4 pcs. of small pan-head screws(M3x8, marked **a** in Fig. 12) for pump cover and remove the pump cover.
- (3) Loosen 4 pcs. of small pan-head screws (M4x8, marked **b** in Fig. 12) for pump unit and pull the pump unit to this side to remove it from the holder.  
In this time, the packing will also be removed together with pump unit.(When the packing is not transformed or damaged, it is recycled. So do not lose it).

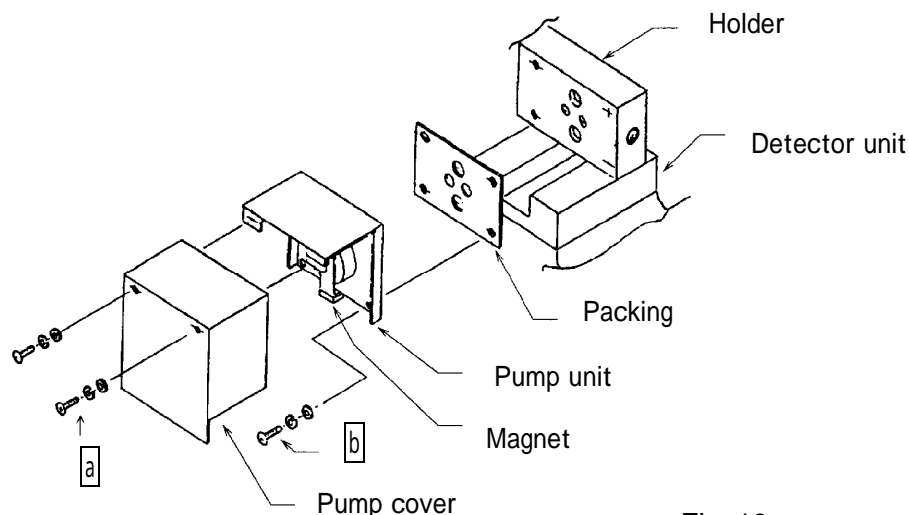


Fig. 12

- (4) Place the packing to the new pump and install the pump unit to the holder. In this time, keep a space between magnet of the pump unit and the detector head enclosure.  
If the magnet of the pump unit would contact with detector head enclosure, pump does not work correctly.

- (5) Tighten the pump unit with 4 pcs. of small pan-head screws(M4x8, marked **b** in Fig.12) and then, fix the pump cover with 2 pcs. of small pan-head screws(M3x8, marked **a** in Fig.12).
- (6) After completion of pump replacement, turn on power to the indicator/alarm unit. When the power to the pump is separated, turn on power to the pump.

#### 4 - 5 Replacing the filter etc.

Check in regular interval that the filter and so on are not clogged or dirty. If they are clogged or dirty, replace the filter cartridge in MC filter with flowmonitor and filter used on gas sampling system under the special sampling condition.

#### 4 - 6 Storage or treatment when not in use for a long time

- (1) Store the detector head built-in gas sensor in the place where to be free from the dust and water.
- (2) Storage condition  
 Temperature : 0 ~ 35  
 Humidity : 30 ~ 80%RH  
 Environment : Free from gas such as organic solvent and so on.

#### 4 - 7 Recommendable spare parts list

The recommendable spare parts for regular replacement are as follows.

	Name of parts	Check/inspection interval	Replacement interval (year)	Q ty/unit
1	Pump (w/o diaphragm)	6 months	1 ~ 3	1
2	Pump diaphragm	6 months	1 ~ 2	1
3	Packing (For holder)	1 year	8 ~ 10	1
4	Packing (For pump)	1 year	8 ~ 10	2
5	O-ring (For holder)	1 year	8 ~ 10	1
6	O-ring (For sensor)			1
7	O-ring (For sensor cover)	At the time of sensor replacement	8 ~ 10	1

- \* The above replacement interval is just an idea and it depends on operating conditions. It does not mean the warranty period.  
 The replacement interval also may vary by the result of regular maintenance.

## 5 . DEFINITION OF TERMS

Catalytic combustion method  
or  
New ceramic method

These terms are detection principles of the gas sensor to be built in the detector head.

Initial clear

The reading will be unstable for a few seconds after power on.  
This is a function to prevent an alarm.

Full scale

This is a maximum value in detection range.

% LEL

The abbreviation L.E.L. stands for Lower Explosive Limit of combustible gases or vapours, and represents the lowest concentration which can be ignited by source of ignition, hence the lowest concentration which can produce an explosion.  
The %LEL is the unit representing the lower explosive limit of the target combustible gas as 100%.

Calibration

This means to adjust the reading in indicator/alarm unit to the calibration gas value by use of standard gas.

## 6 . PRODUCT SPECIFICATIONS

### 6 - 1 Standard specifications

Model	GD-D8-56 *1 GD-D8NC-59 GD-D8NCS-52	GD-D8·DC-11	GD-D8·DC-13
Target gas	General combustible gas in air		
Structure	Explosion(Flame) proof d2G4 Approved by T11S *2 Approval No. T38169	Explosion(Flame) proof d BT4 Approved by T11S *2 Approval No. TC13918	
Detection principle	Catalytic combustion or new ceramic method		
Sample flow rate	Above 0.8 /min		
Operating conditions	- 10 ~ +40 , below 95%RH(Non-condensing)		
Applicable cable	CVV-6C or equivalent, 1.25mm <sup>2</sup> or 2.0mm <sup>2</sup>		
Cable leading method	Pressure-proof packing method PF3/4 Inner diameter of packing : 14(built-in), 15&16(accessories)		
Painting color	Melamin baking paint (Munsel No.N5)		
Power requirement for pump	100VAC 50/60Hz, approx 4VA	12VDC approx. 5W	24VDC approx. 5W
Dimensions	Approx. 150(W) × 180(H) × 85(D)mm (Excluding mounting bracket)		
Weight	Approx. 3.5 kg		

\*1 : Model designation will be changed depending on the standard of the sensor to be used.

\*2 : Technology Institution of Industrial Safety, Japan.

## 6 - 2 Detection principle (Catalytic combustion type)

Combustible gas detection occurs on the surface of oxidation catalyzer of the active element. Any combustible gas in the atmosphere is catalytically oxidized in combination with oxygen from the air, at the surface of the heated active element.

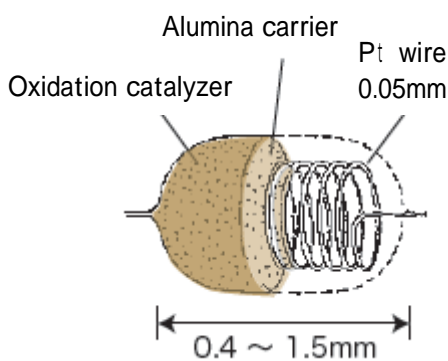
Supplementary heat due to this oxidation process increases the temperature of the active element, and hence its electrical resistance.

A similar but inactive element in the same environments is connected as an adjacent leg of a Wheatstone bridge, and the resistance change produces an electrical output proportional to gas concentration.

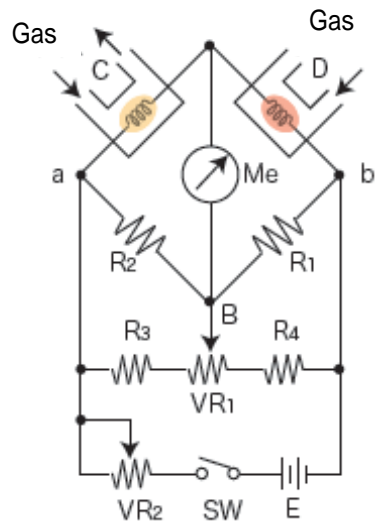
The bridge output is amplified and indicated as gas concentration.

The detection range is 0 to lower explosive limit of combustible gases. If high concentration gas above lower explosive limit would contact with detecting element, the sensor may be broken.

### Structure



### Principle circuit



- D : Detecting(active) element
- C : Compensating (inactive) element
- R1,R2,R3,R4 : Fixed resistor
- VR1,VR2 : Variable resistor
- SW : Switch
- E : Power source
- Me : Meter



### 6 - 3 Detection principle (New Ceramic type)

The new ceramic gas sensor is a kind of catalytic combustion sensors.

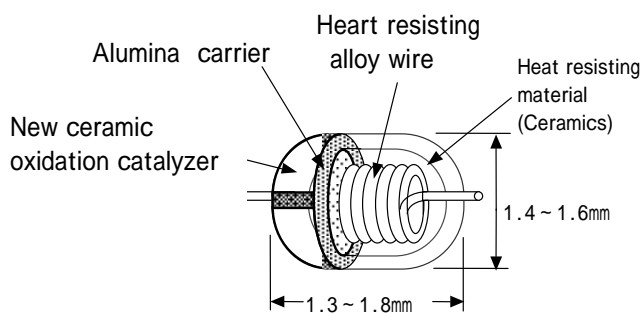
Combustible gas detection occurs on the surface of new ceramic type oxidation catalyzer of the active element. Any combustible gas in the atmosphere is catalytically oxidized in combination with oxygen from the air, at the surface of the heated active element.

Supplementary heat due to this oxidation process increases the temperature of the active element, and hence its electrical resistance.

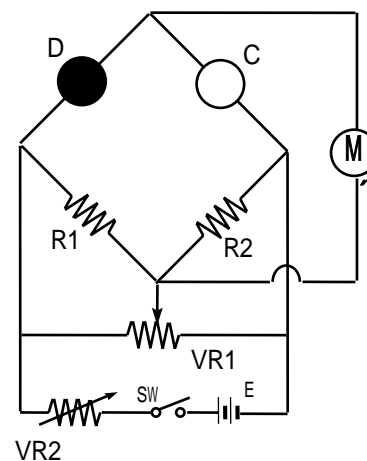
A similar but inactive element in the same environments is connected as an adjacent leg of a Wheatstone bridge, and the resistance change produces an electrical output proportional to gas concentration.

The bridge output is amplified and indicated as gas concentration.

#### Structure



#### Principle circuit



- D : Detecting(active) element
- C : Compensating (inactive) element
- R1,R2 : Fixed resistor
- VR1,VR2 : Variable resistor
- SW : Switch
- E : Power source
- M : Meter

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## 7. WARRANTY

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### RIKEN KEIKI STANDARD WARRANTY FOR FIXED GAS DETECTION INSTRUMENTS

RIKEN KEIKI CO., LTD. warrants gas alarm equipment manufactured and sold by us to be free from defects in materials and workmanship for a period of one year from date of shipment from RIKEN KEIKI CO., LTD. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, F.O.B. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis.

The alarm contact output specified in this system is provide for the use of buzzer and lamp to be communicated to the other external place than the system installed. But to secure the safety, there may be the case that the following interlocking performance shall be made by use of alarm contact output from customers.

1. Stop the gas supply.
2. Stop the action of system which uses gas.
3. Let the cervices exhaust fan operated.
4. Let stop the work of the staffs in the area by the auto paging system and escaped to the outside from there
5. Let the alarm transmitted to a remote place by auto communication system.
6. Let the alarm transmitted by the lamp and buzzer to this area and that area.
7. Others.

But, we do not assume the responsibility for the secondary damage, which may be generated by this interlocking action because it is not in our scope of recognition. Then, we cannot strike the sales contract or the manufacture in the scope to reimburse this secondary damage.

Warranty is voided by abuse including rough handling, mechanical damage, operation, alteration, or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement cost, local repair costs, transportation cost, or contingent expenses incurred without our prior approval.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed RIKEN KEIKI CO., LTD..

We do not assume the indemnification for any accident or damage caused by the operation of this gas monitor and our warranty is limited to the replacement of parts or our complete goods.