



INSTRUMENTS

**GD-K71D Sample Draw
Detector Head
Operator's Manual**

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www.rkiinstruments.com

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1 . PRODUCT OUTLINE

1 - 1 . Preface

First of all, we wish to express our heartfelt thanks for your purchase of our intelligent gas detector GD-K71D.

This manual is just a guide book to operate our gas detector GD-K71D.

Your kind reading of this manual is requested not only for first user but for already experienced staff.

1 - 2 . Application for use

This is a fixed type toxic gas detector to be used in semiconductor manufacturing factories, etc. Toxic gas leaked into ambient air is sampled with internal pump and is detected with electrochemical sensor. Detection results(Gas concentrations) are displayed with 4-digit LED indicator.

The GD-K71D transmits gas concentration signals with 4 ~ 20mADC to upper system.

This detector provides 2 relay outputs for outer gas alarm.

1 - 3 . Identification of each signal word



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury or serious damage to the product.
This signal word is to be limited to the most extreme situation.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury on the human body or object.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or some damage on the human body or objects. It may also be used to alert against unsafe practices.



This means "ADVICE" at operation.

2. IMPORTANT INSTRUCTION FOR THE SAFETY

2 - 1 . Danger items



This is not an explosion proof detector.
Never to detect high concentration gas beyond their lower explosive limit.

2 - 2 . Warning items



Power source

Before turning the power on, check that the supplied voltage is within the specified voltage.
Then, turn the power on

Necessity of grounding

Do not cut the wire for protective ground both inside and outside of instrument. Or, do not disconnect the connection of the ground terminals.

Defect of protective function

Before starting the operation, check if any defect is not found on the protective grounding.
If there is any defect on the protective functions such as protective grounding or fuse, do not start the operation.

Fuse

To protect the instrument from fire, use the specifically rated fuse. When replacing the fuse, turn off the power inside of the panel, and the power source as well. Do not use fuse that is not specified, or do not make a short-circuit inside of the fuse holder.

Operation in gas

Do not operate the instrument in a atmosphere of combustible gases, explosive gases or steam. It is very dangerous to operate the instrument under such circumstances.

External connections

After making the protective grounding, start connecting the instrument to detecting object and other external control circuit.

Treatment of lithium battery

Do not recharge, disassemble, heating above 100 °C or burn the battery since it would ignite, explode or start to burn.

Treatment of sensor

Do not disassemble the sensor, since there is an electrolyte inside.
If your finger touches the electrolyte, wash your finger with water immediately.

 **WARNING****Treatment at gas alarming**

It is very dangerous if the instrument detects the gas exceeded the alarm points. Take any treatment based on your judgment at that time.

2 - 3 . Caution items **CAUTION**

Do not use a walky-talky around the instrument.

The indication might be affected by the electromagnetic wave generated by the walky-talky if it is used near the instrument. When the walky-talky is used, be away enough from the instrument not to affect.

Take at least 5 seconds interval when re-turning the power on.

Normal operation cannot be performed if the power is re-turned on within 5 seconds.

Confirm the float of the flowmonitor is within two red bars.

If the float gets below the lower red bar, the correct gas detection cannot be performed. Adjust the flow rate.

Equip a dust filter to the outside of the detector if it is used in a dusty place.

The dust filter depends on a measuring gas. Consult our sales agents.

Take care not to drop the cover when taking it out.

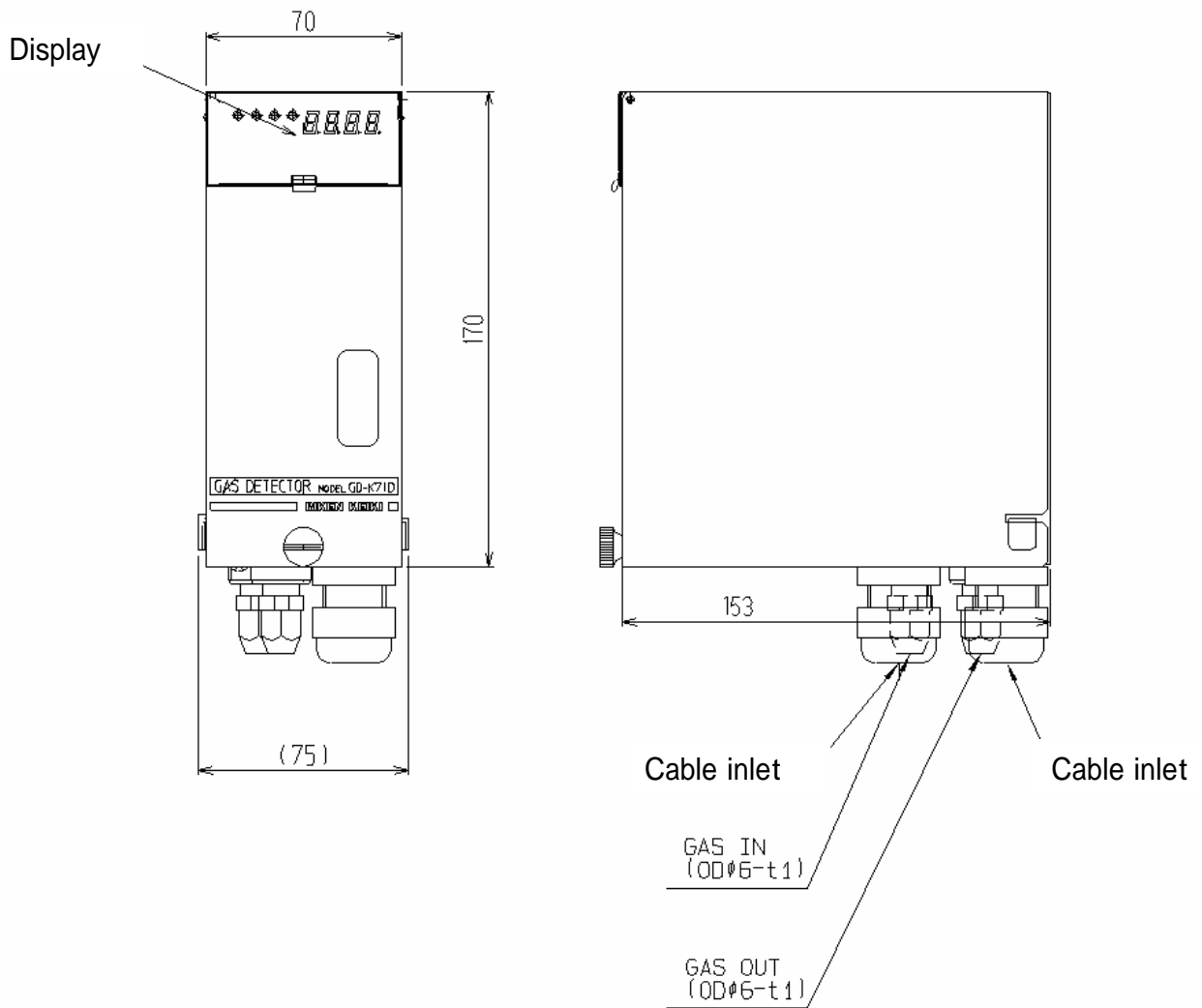
Dropping the cover might cause a serious injure. Take care.

Do not control other equipment by using outputs of this detector.

This is not a control equipment. It is prohibited to control other equipment by using outputs of this detector.

3 . PRODUCT FUNCTION

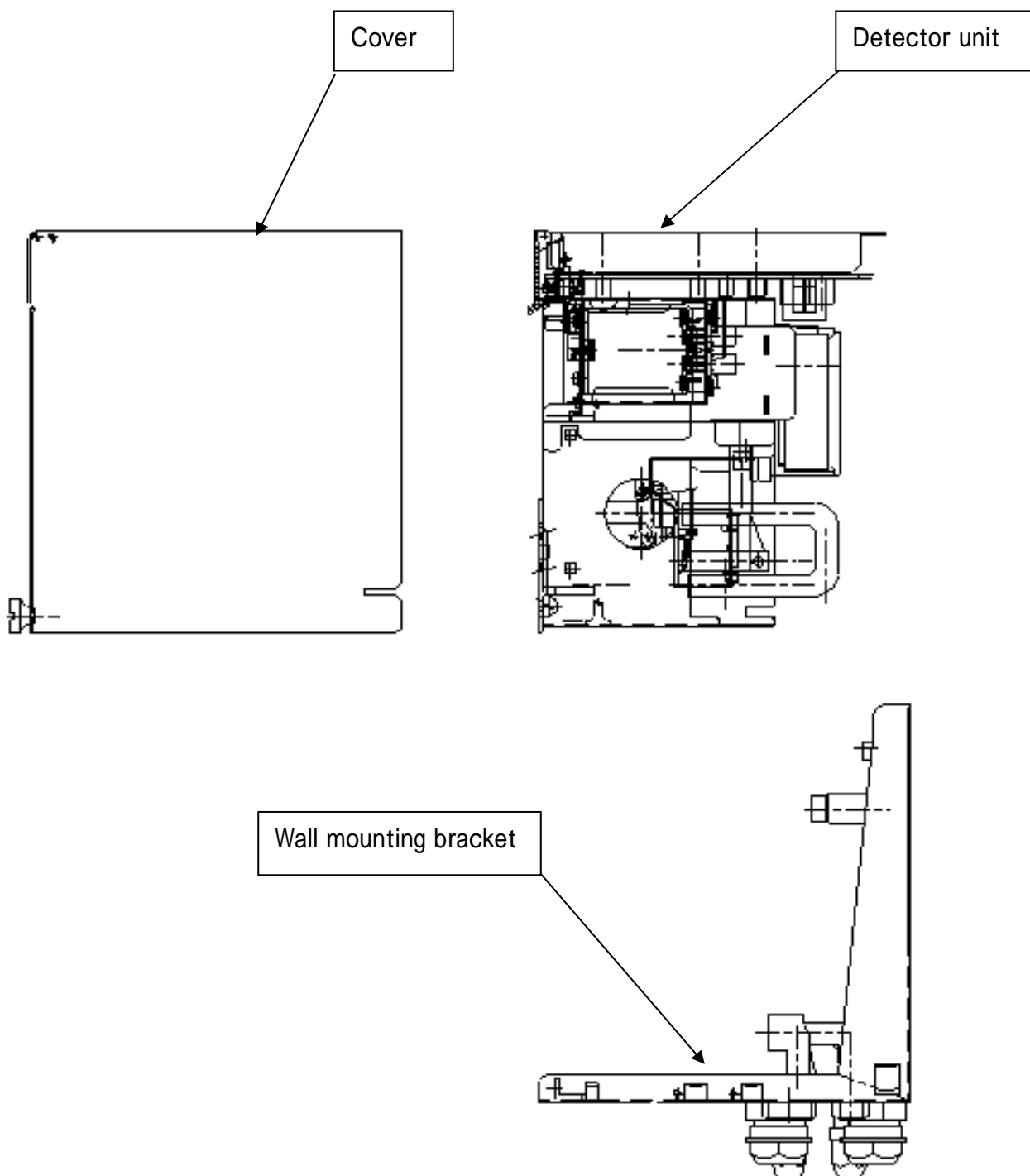
3 - 1 . External drawing



3 - 2 . Product composition

3 - 2 - 1 . Major components

This detector is composed of the following units.



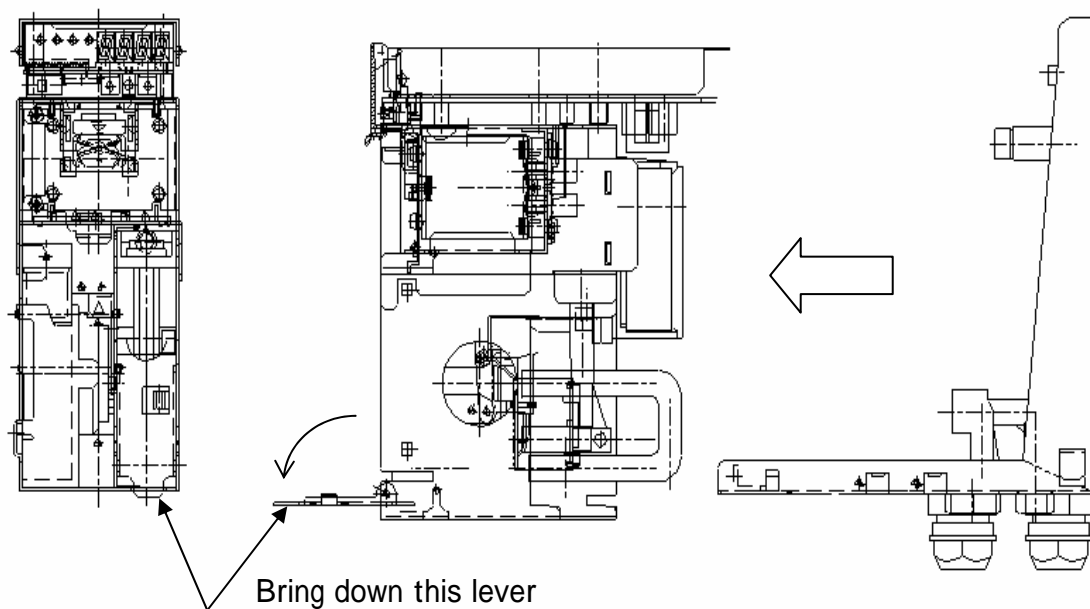
3 - 2 - 2 . Unit detaching

After taking the cover out, procedure to detach the detector unit from the wall mounting bracket is as follows.

- 1 . Bring down the lever at the lower part of detector unit.
- 2 . Remove the detector unit from the wall mounting bracket.

* NOTE

Perform the things above opposite to assemble the unit.
When the wiring is arranged, detach the detector unit first.



CAUTION

When the detector unit is being taking out, take care not to drop it.
If it drops, there might be some damages on yourselves and the instrument.

3 - 3 . Installation pitch

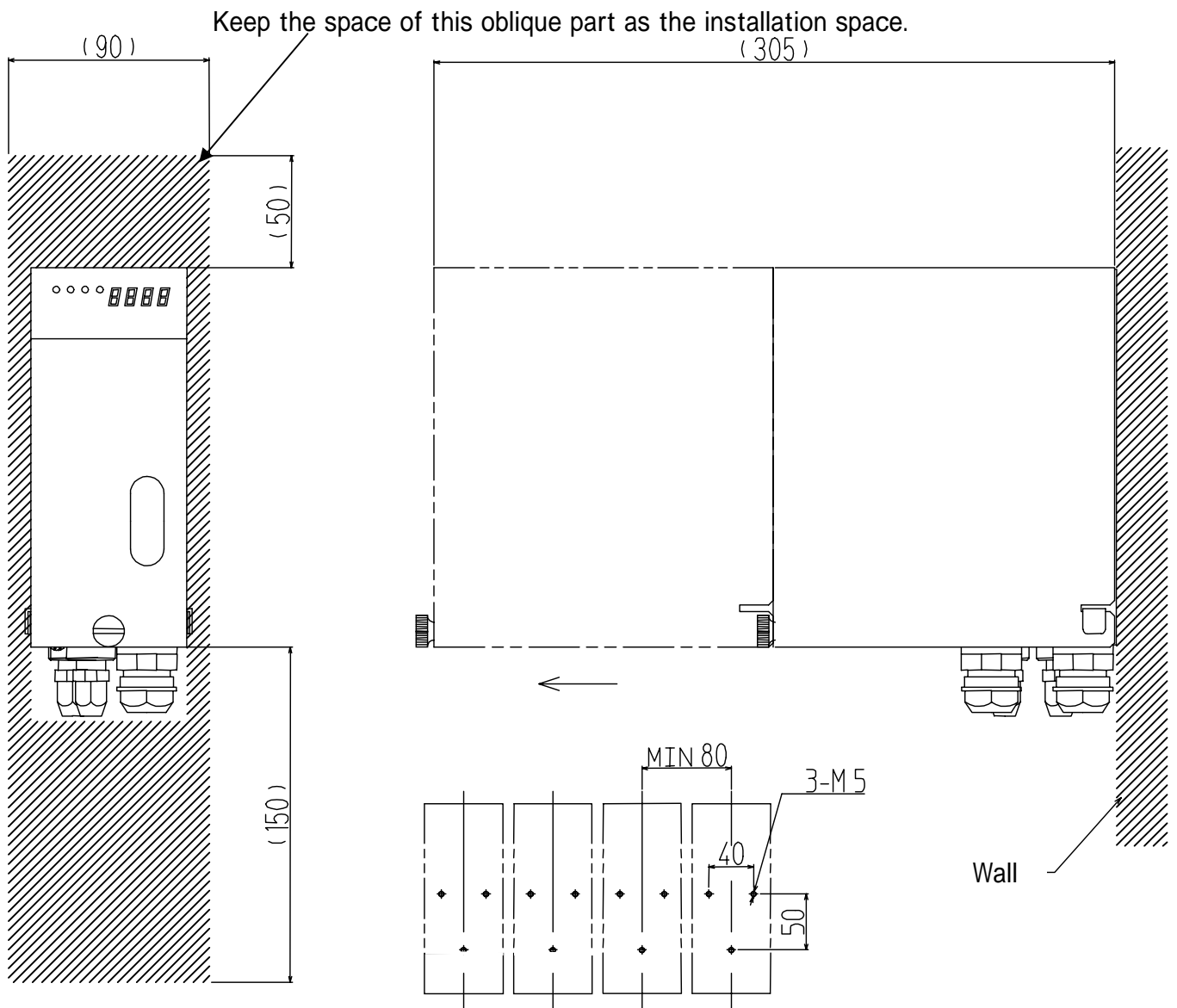


Fig. 1: Dimension of mounting pitch

- (1) Install the wall mounting bracket on the wall.
- (2) Put the detector unit on the wall mounting bracket.



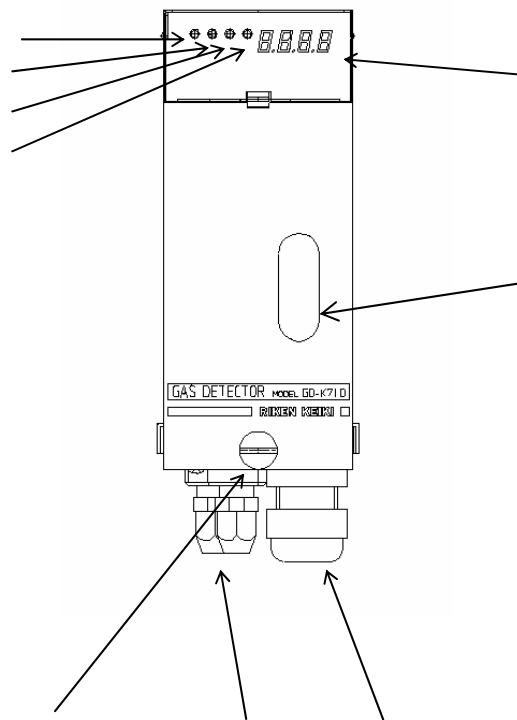
CAUTION

Confirm that the detector unit is surely fixed to the wall mounting bracket after finishing the job.

If it is not surely fixed, the detector unit might drop and cause injury or damage itself.

3 - 4 . Name of each part & functions

3 - 4 - 1 . Front view



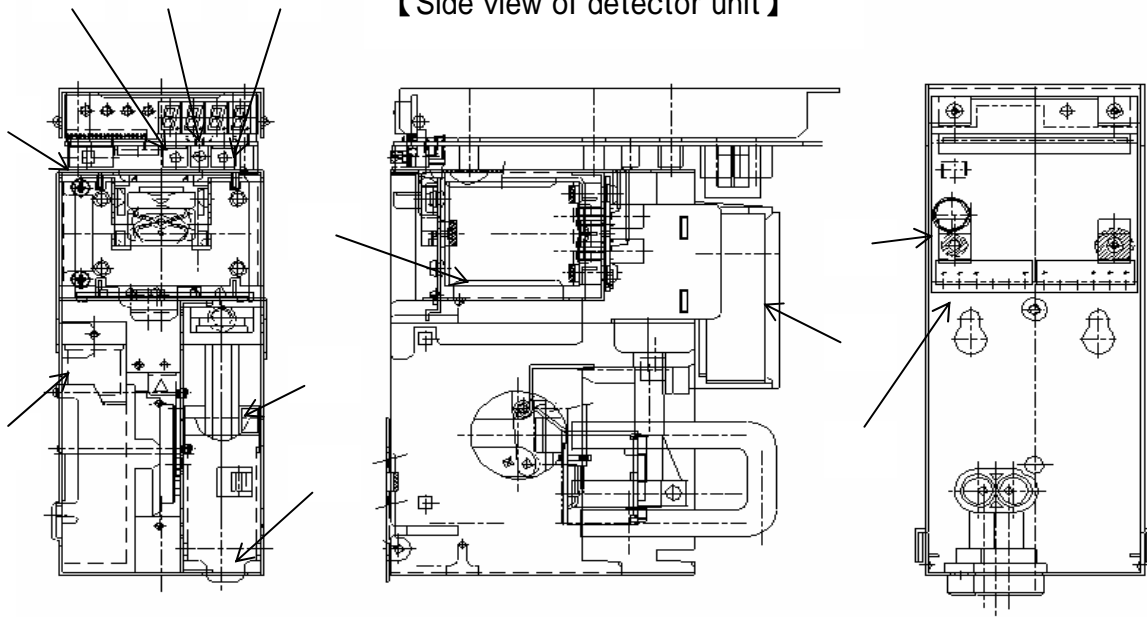
- LED indicator..... It indicates the gas concentration.(used at maintenance)
- PW/TR light(Green) For both the power and trouble.
Lighting : The power is on. Normal operation.
Flashing : Trouble
- ALM1 light(Yellow) It turns ON at (1st) gas alarming.
- ALM 2 light(Red) It turns ON at (2nd) gas alarming.
(ALARM 1 is also ON).
- SKIP light(Green) It turns ON during the skip mode.
(Detection being suspended).
It turns flashing at the maintenance mode.
- Flowmonitor For sample flow confirmation. The standard rate is 500mL/min.
- Knurling type screw..... It is used at opening/ closing the cover.
- Tubing for sampling GAS IN : Tubing for sample gas in.
GAS OUT: Tubing for sample gas out.
- Cable inlet For the power supply cable, output signal and relay output.

3 - 4 - 2 . Inside view

【Front view of detector unit】

【Front view of wall mounting unit】

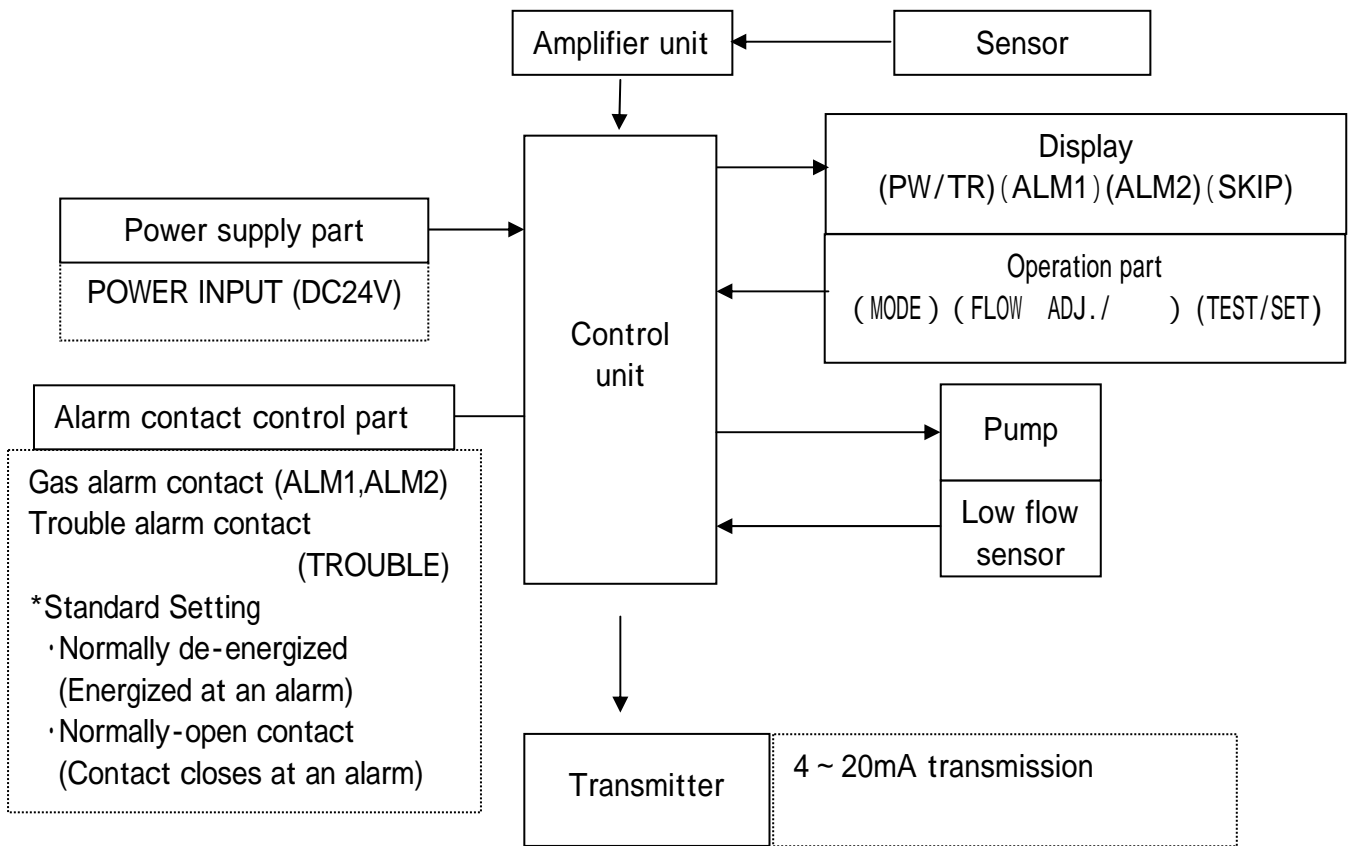
【Side view of detector unit】



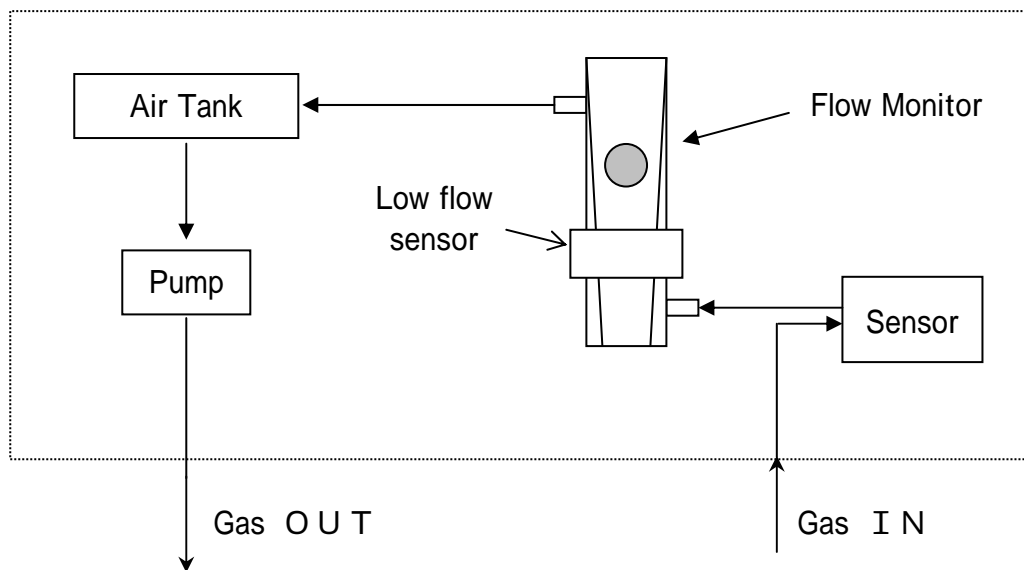
- | | |
|---------------------------------|--|
| Power switch (POWER) | ON/OFF switch for power supply(24VDC). |
| Fuse | Fuse for power |
| MODE switch (Grey)..... | Switch that changes from detection mode to maintenance mode and changes the mode back to the detection mode. |
| TEST/SET switch(Red)..... | Switch that turns the mode into the alarm testing mode, and sets the further mode during the maintenance mode. |
| FLOW ADJ./ switch | Switches that adjust the flow rate, looking at the flow monitor. Or, these are used to choose the items at the maintenance mode, to adjust the zero point, span point and to increase the indication at alarm testing. |
| Pump | To sample the detection gas. |
| Lithium battery | For back-up of the sensor. |
| Sensor | To detect the sampled gas |
| Detector unit removing lever... | Bring down this lever to remove the detector unit. |
| Terminal plate | To connect external cables |
| Flowmonitor | To confirm sample flow rate. |

3 - 5 . Block Diagram

3 - 5 - 1 . Electric diagram



3 - 5 - 2 . Tubing diagram



4 . HOW TO USE

4 - 1 . Before operation

Be sure to keep caution items of use not only for first user but for already experienced staff. If not keep these caution items, the unit may be defective and correct gas detection may not be performed.

4 - 2 . Installation place

CAUTION

Detection gas sampling from high dusty places.

- Use the designated dust filter to avoid adsorption of gas or influence caused by ambient dust.
- Stop the suction pump before replacing filter.
- Put the designated dust filter at the inlet of sample tubing if it is used other than clean room.

Do not install at places where direct sun drought or where the temperature is drastically changed.

Keep away the system from direct sun drought or where the temperature of the system is drastically changed.

Do not install it where vibration or shocks may take place.

The system consists of fine electronics parts.
Install them where to be stable not to crush or fall down.

Keep the system from the equipment which may generate the noise (Unit & cable).

Keep the system from the equipment which may give a high frequency in the surroundings and install it.

- Do not put the system jointly each.
- Do not wire the cable in parallel nor take access.

Do not install it where the detection gas is deposited around.

- Do not install and make gas detection at the place where the sample gas is deposited.
- In this case, extend the length of sampling hose etc. and sample the gas.

Do not install it where it is attended with danger at maintenance work

This detector requires regular maintenance.
Do not install the detector where it is attended with danger at maintenance work.

Do not install it where it is difficult to make maintenance

Do not install the detector at places where;

- * It is required to stop operation of the equipment where gas detector is installed at maintenance work.
- * It cannot make maintenance without taking off a part of equipment.
- * Casing cannot be removed by pipings, rack, etc.

Do not install it in an equipment that grounding construction is not enough.

Be sure to ground when install.

4 - 3 . Caution in the system engineering

CAUTION

Unstable power and noise may cause error of performance and alarm.
For the system to use this unit, it is required to make design based on this manual descriptions.

(1) Stable power used

While the system gets stable at power failure, the external output and alarm contact may be on and the care for it must be taken. In such case, use the standby battery or take an appropriate action in the receiver side.

Supply the following power to this unit .

Power voltage	DC 2.4V \pm 10 %
Power failure tolerance time	Approx 10msec. (For power failure of 10msec, it re-starts) To warrant the continuous operation, install the standby battery outside.
Others	Do not contact with power involving high power load and high frequency noise. According to requirement, use line filter and separate it from noise source.

(2) Designing to consider radiation

When install the closed self-standing control panel, mount the fans in the upper and lower part.

(3) Lightning measures

Lightning surge	There is the problem "Lightning". When make outdoor wiring of cable at factory or plants etc or when make a parallel wiring in the same duct with the cable in from outdoor even at the indoor wiring. If the lightning is a huge generation source, the cable is a reception antenna and there is the case that cable connecting instrument is broken. It is impossible to prevent the generation of lightning. If the cable should put in metal tube or laid in the underground, it is impossible to prevent the inductive lightning surge generating from the thunder.
Lightning measures	There is not the complete countermeasure for it but the following method can be considered. Make the suitable treatment accordingly. a) The transmission signal route is arranged for connection by the optical fiber cable etc. b) Countermeasure by the lightning arrester (Cable safety retainer). There is the way to install the lightning arrester just before the field apparatus and the central control station. Please contact with the manufacturer of lightning arrester in details.
Grounding	Surge noise shall be generated from the thunder lightning or except it. To protect detector from these cause, be sure to make grounding.

* In the lightning rod, there is the circuit to remove the surge voltage to be a cause of damage from field instruments.

By installing the lightning rod, the signal may be attenuated. When install the lightning rod, it is required to check the performance in advance.

(4) Alarm contact

- Alarm contacts shall be used only for external buzzer and alarm light, and do not use it for the controlling use (such as solenoid valve control etc).

**CAUTION** (FOR USE OF NORMALLY-CLOSED CONTACT)

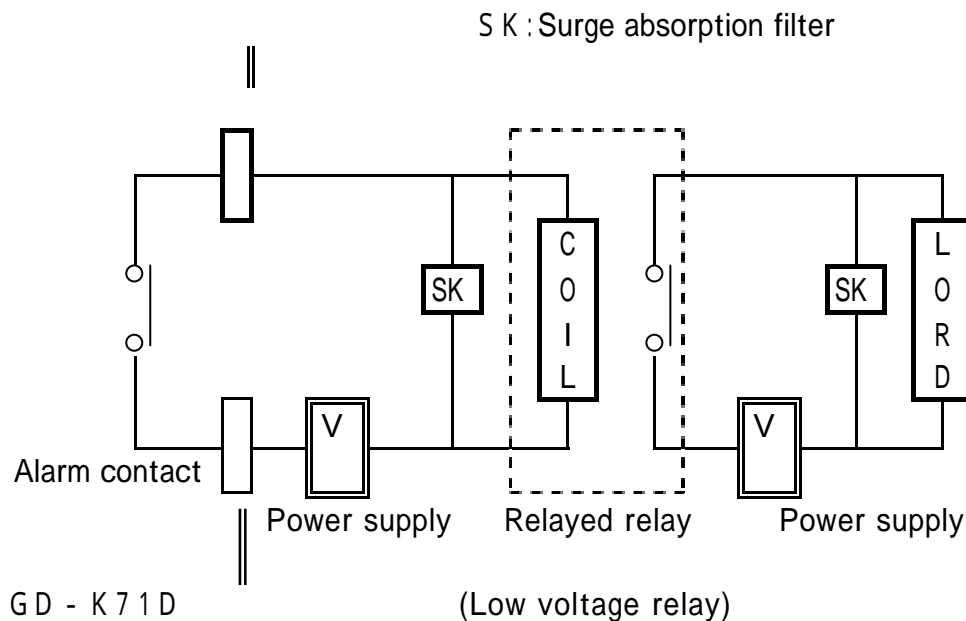
Normally-closed contact (Break contact) at de-energized condition may change to open contact in a moment due to physical shock.

Whenever alarm signals from gas detectors are used with normally-closed contact, please put delayed-circuit (for about one second) to receiver side of normally-closed contact to avoid such phenomenon.

When control the external load, the bad influence may be given to the system according to the load characteristics. In such case, the following countermeasure shall be taken to stabilize the action and protect the contact.

- Make relay(contact amplification) with the low voltage relay and operate by connecting CR circuit (Spark Killer: SK) (Diode etc for DC) suited for relay coil directly to relay.
- Add CR circuit to the load side of relay on the request.

Reference: By the condition of load, CR circuit may be better to install in the contact side but it is required to put in by checking the action of load.



- How to think alarm contacts against inductive load -

The spec for alarm contact of GD-K71D is described by the conditions of resistive load.

When use the inductive load for alarm contacts, the very high reverse electromotive voltage may be generated and the following trouble tends to be produced.

- Contact part of relay is melted adhesively and the contacts can not work.
- High voltage is put inside of detector unit and then, electrical parts may be damaged.
- As it is big noise, the trouble action may be taken by the reckless drive of CPU.
- Irrespective of inductive load, there is the possibility of unforeseeable noise instruction for contact.

Above trouble may be generated

⚠ CAUTION

- The inductive load shall not be used in principle (Do not use fluorescent lamp, motor, etc.).
- When use the inductive load, make the contact amplification outside, but the outside relay coil belong, use the relay driven by the low voltage (within AC100V) and it is protected by an appropriate surge killer.

* As the inductive load, there are following samples.

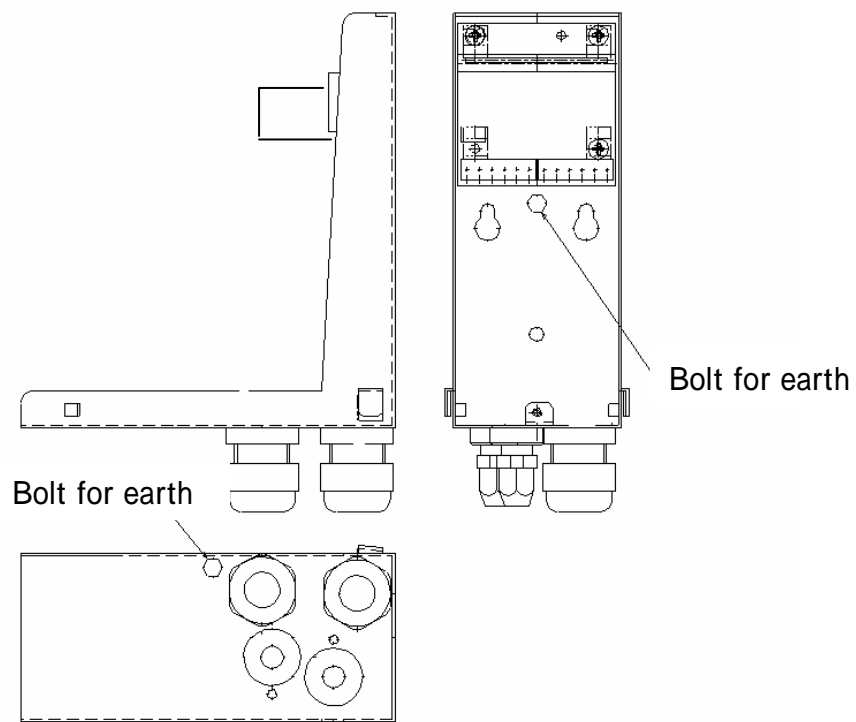
- Patlight * External relay * Buzzer * Siren * Fan * Fluorescent lamp * Motor etc.

4 - 4 . Grounding

Make grounding with inside or outside terminals marked **E**

**WARNING**

Be sure to make grounding before putting power ON.



Be sure to make grounding for safety purpose and to keep stable operation of this unit. Do not connect each wire with gas pipe. Make grounding corresponding to D-class grounding (Grounding resistance : below 100 ohms)

4 - 5 . Caution at wiring construction



CAUTION

- When make wiring construction, take care not to damage the internal electronics circuit.
- When handle the detector unit, put in at horizontal position. If put it vertically, it tends to fall back and damage the detector.
- For power cable, and signal cable, they should not be laid out with motive power cable such as motor etc.
- When use twisted cable, take care not to contact a part of core cable with other core cable.

4 - 6 . Applicable cable

4 - 6 - 1 . Power /Signal cable

[3-wire 4 ~ 20mA version]

Power & signal cable : Use CVVS 1.25sq. 3-core cable

[4-wire 4 ~ 20mA version]

Power cable : Use CVV 1.25sq, 2-core cable

Signal : Use CVVS 1.25sq, 2-core cable



CAUTION

Size of leading cable to GD-K71D is upto 1.25sq.

When use the cable exceeding 1.25sq., use the junction box etc.

4 - 6 - 2 . Relay output signal cable

Relay contact cable : Use VCTF 0.75sq., 6-core cable

4 - 6 - 3 . Specifications of terminal

Terminal specifications

Rated voltage : AC250V

Rated current : 13A

Connectable conditions

Cable : 0.14mm² ~ 1.5mm²

Length of naked wires : Approx 6mm

Screw clamp torque : 5 ~ 8kg.

Applicable screw driver : Minus screw driver(width below 3mm)

When use the bar terminal, the following can be used.

Bar terminal :Model AI series(Phoenix contact make)

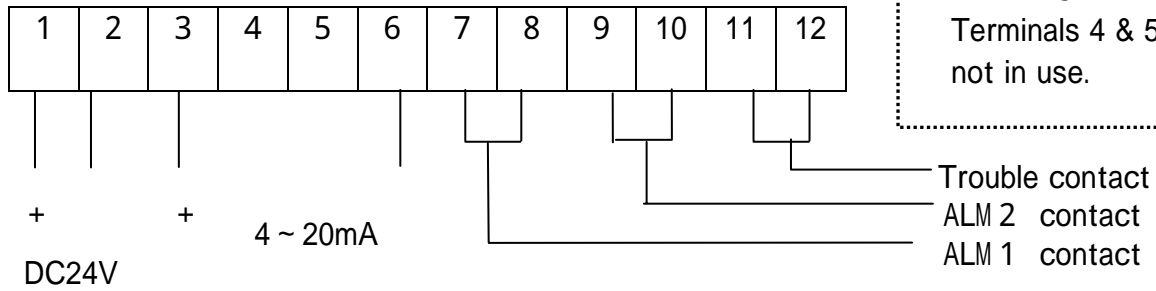
Terminal lug tool :Model CRIMPFOX UD 6(Phoenix contact make)



CAUTION

Be sure to use the exclusive bar terminal. When used with other make bar terminal than above, the function of this detector can not be warranted.

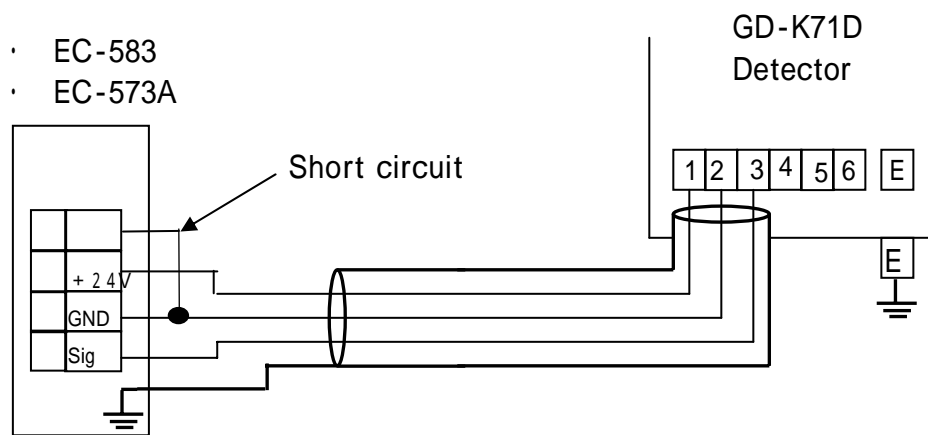
4 - 6 - 4 . Terminal plate



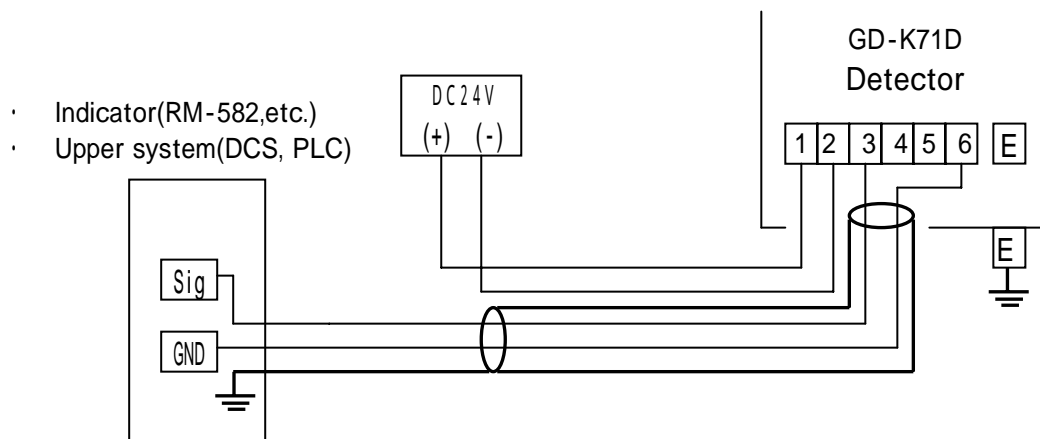
4 - 7 . Example of cable connection

4 - 7 - 1 . Connection with indicator/alarm unit

(EC-583, EC-573A): (3-wire type)



4 - 7 - 2 . Connection with indicator unit, DCS, PLC
(4-wire type)



*** NOTE**

In case of 4-wire type, power supply unit(DC24V) is required separately.

4 - 8 . Caution at piping construction



WARNING

This is designed to draw sample gas in air.

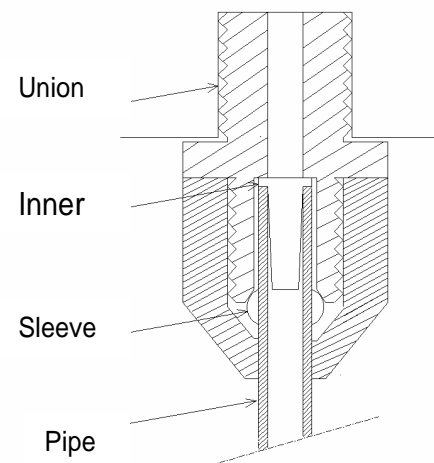
When the exceeding pressure is given to the sampling pipe(GAS IN, GAS OUT), the internal pipe is removed and it is dangerous by the leak of detection gas. Use it so that the excessive pressure cannot be given.

For exhaust gas, after detection, exhaust it to the safety zone by connecting the exhaust hose to GAS OUT on the bottom of detector.

(1) Piping port of detector

For this detector, PT 1/4 male screw thread is cut for sampling pipe port(GAS IN, GAS OUT) and polypropylenes union is provided. As this is deviated from the kind of gas used, specify it at the time.

This pipe used is 6(OD) - 4(ID) PTFE tube. When make piping, take care not to leak by putting accessory sleeve. The kind of piping material is different by kind of detection gas.



(2) Sample flow rate

The flow rate of this detector is above 500cc/min.

When suck from remove place, consult the nearest agent or RIKEN KEIKI.

(3) Piping material

For detection gas, there is strongly adsorptive gas and corrosive gas. By considering these points, this must be decided..



CAUTION

It is required to decide the connection tubing(length, material). Contact the nearest agent or RIKEN KEIKI for detail.

5. OPERATION METHOD

5 - 1 . Preparation before start up

Before marking power on, take care of the following. If do not keep this, there is the danger of electrical shock and damage of detector.

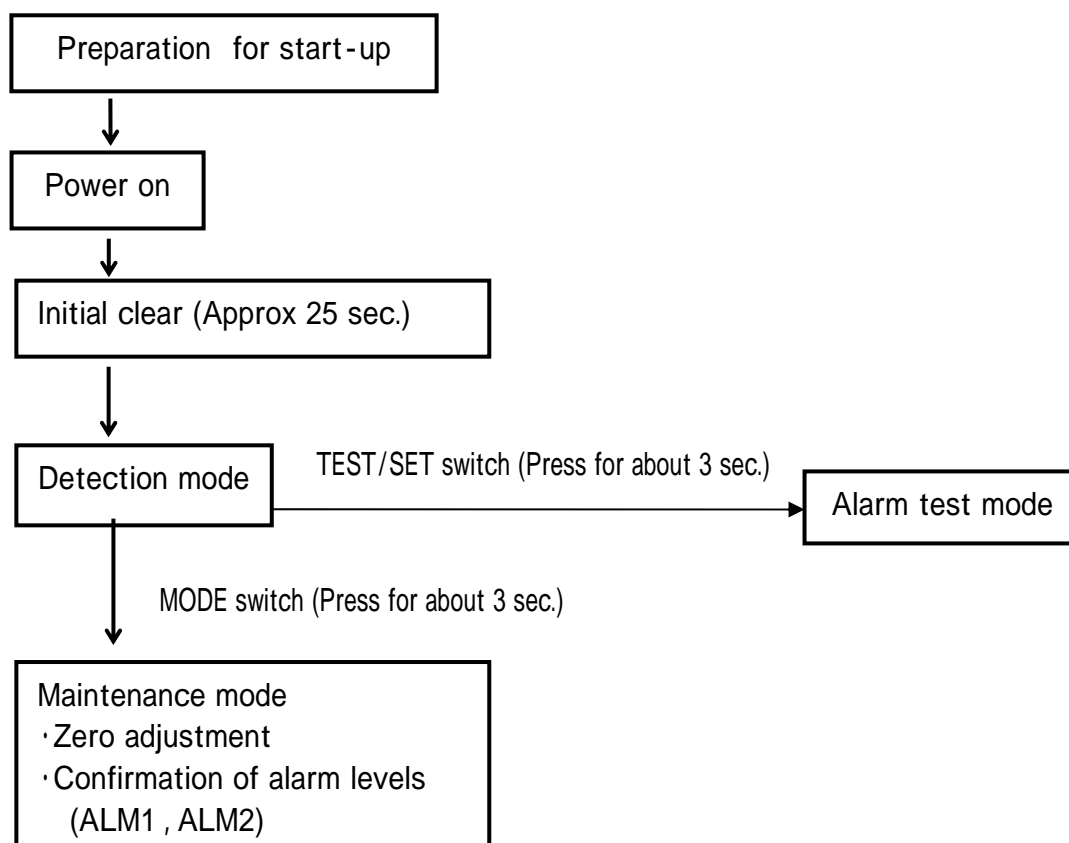
- (1) Make grounding.
- (2) Check that the wiring with outer unit is made correctly.
- (3) Check that the power voltage is within the rating.
- (4) During adjustment, there is the case to work alarm relay contact.
Arrange not to affect the outside even if the contact work.
- (5) Check that the dust filters are connected correctly or not.

⚠ CAUTION
Filters are designated by kind of detection gas.

- (6) For security purpose, check that it is a designated rated fuse or not.

5 - 2 . Basic performance flow

Normally this is used in detection mode after making power on.



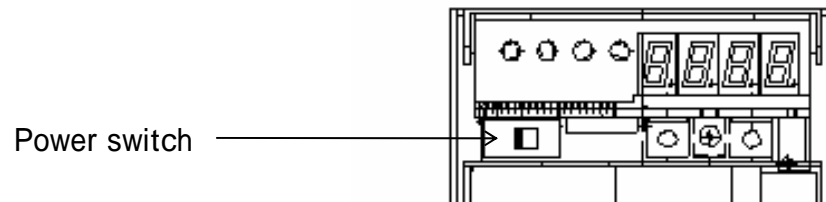
5 - 3 . Start up method

5 - 3 - 1 . Power on

Before making power on, check that this detector is connected correctly.

The position of power switch is located on the front panel(Open front window).

When turn the power switch ON/OFF to right, it gets "ON" and when turn to left, it gets "OFF".



* NOTE

Do not put OFF the power supply during initial clear. Data in sensor memory are reading out during initial clear. If put OFF the power, unstable actions may be happened after re-starting the power ON.

When make power switch "ON", the POWER light turns on and the pump start working after 15 seconds.

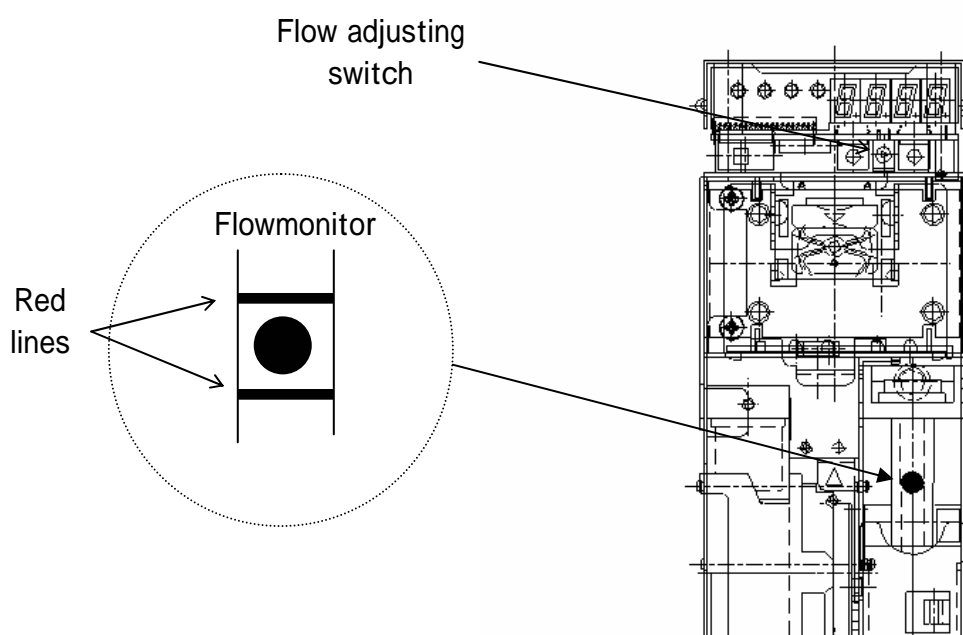
Initial clear (Approx 25 sec.)

- Detector system check
- External output : Approx 2.5mA
- Alarm, trouble action shut-off (Alarm light, contact)

5 - 3 - 2 . Flowmonitor(Sensor flow) adjustment

Check that the ball in glass pipe of the flowmonitor is within a two red lines..

When the ball is not within a two red lines, adjust it by turning the flow adjusting switch (FLOW ADJ/).



*** NOTE**

If put OFF the power within 1 hour after flow adjustment, adjusted flow rate cannot be memorized.
 To memorize the adjusted flow rate, do not put OFF the power within 1 hour after flow adjustment.

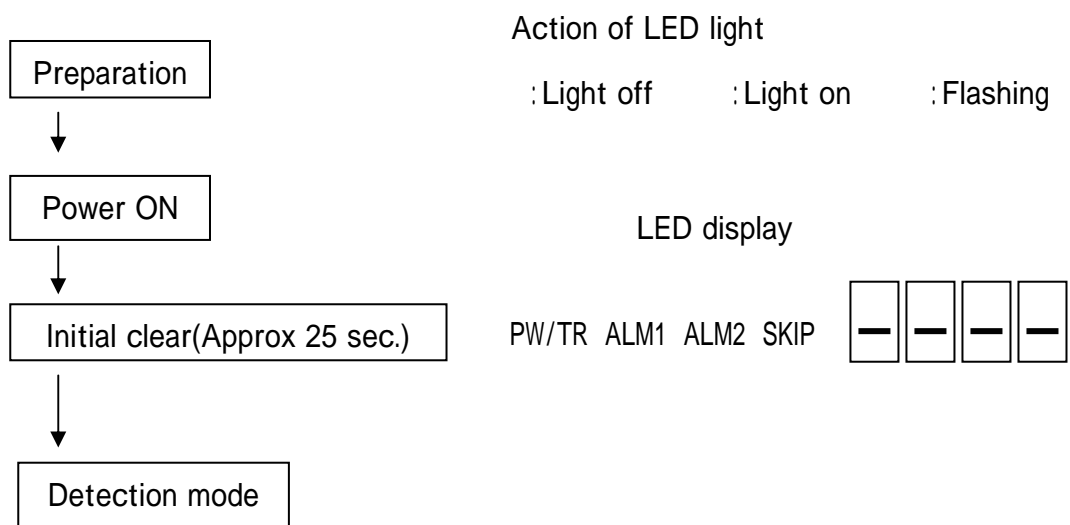
5 - 4 . Explanation of performance (Detection mode)

5 - 4 - 1 . Display action

There are following two kinds of displays.

- (1)LED display : Shows gas concentrations.
- (2)LED light : Shows power/trouble (PW/TR), 1st gas alarm (AL1), 2nd gas alarm (AL2) and skip(SKIP) condition.

*Contents of indications by LED light are different from the condition of the unit.



Only PW/TR light illuminates at detection mode and LED display shows detected gas concentration.



Gas alarm condition

When detect gas above AL1, AL2, it shows gas concentrations and AL1, AL2 alarm lights turn ON.



Zero suppression

During detection mode operation,
below +6% of full scale shows as "0".

PW/TR ALM1 ALM2 SKIP

0.00

During detection mode operation,
this shows actual reading from above
+6% of full scale.

PW/TR ALM1 ALM2 SKIP

0.06

The right 「-0.00」 is displayed when it
gets down to minus(-)side more than
10% of full scale.

PW/TR ALM1 ALM2 SKIP

-0.00

WARNING

When it shows 「-0.00」, the accurate gas reading is impossible and make zero adjustment.

Trouble condition

When any of trouble arises on detector,
content of trouble is shown.

PW/TR ALM1 ALM2 SKIP

E-05

(LED display) (Content of trouble)

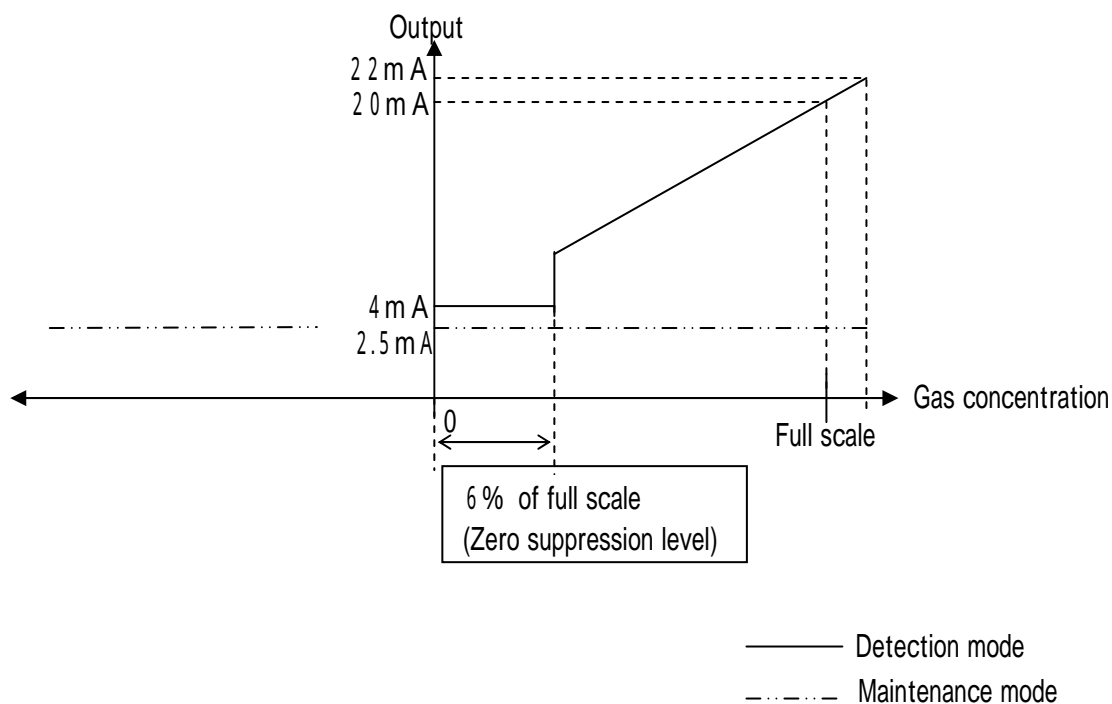
- E - 0 0 System trouble
- E - 0 1 Sensor disconnection or not yet connected.
- E - 0 4 Zero correction function trouble.
- E - 0 5 Low flow

5 - 4 - 2 . External output action

4 ~ 20mA output version

- (1)Signal transmission method : Electric current transmission (not isolated)
 (2)Transmission path : CVVS
 (3)Transmission distance : Below 1Km
 (4)Max loop load : 300 at 24VDC
 (5)Status signal levels
 Detection mode : 4 ~ 20mA(depends on gas concentration)
 Gas alarm : 4 ~ 20mA(depends on gas concentration)
 Initial clear : 2.5mA(Fix)
 Maintenance mode : 2.5mA(Fix)
 Alarm test : 4 ~ 20mA(depends on gas concentration)
 Trouble alarm : 0.5mA(Fix)
 Point skip : 2.5mA(Fix)
 (6)Power interruption : 0mA

Relations between gas concentration and output are shown below;



⚠ CAUTION

4 ~ 20mA output has been adjusted. Even if re-adjustment is required after installation, do not operate without our permission.

Please contact with our nearest agent or RIKEN KEIKI if it is required.

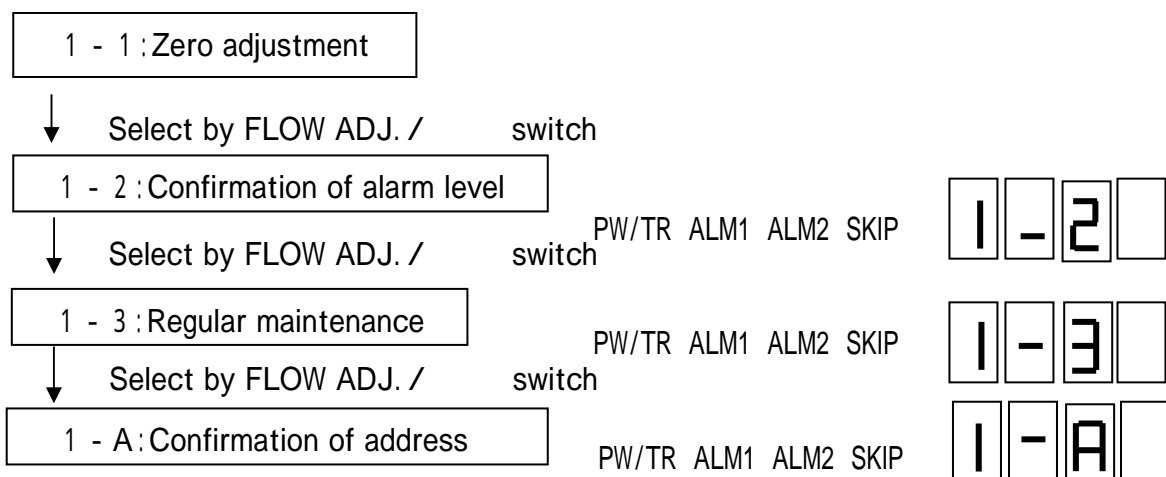
5 - 5 . Maintenance and adjustment

5 - 5 - 1 . Maintenance mode

When make each adjustment, make it on maintenance mode.



Content of menu



CAUTION

Do not operate 「1-3: Regular maintenance mode」 and 「1-A;Confirmation of address」 without our permission.
Please contact with our nearest agent or RIKEN KEIKI if it is required.



WARNING

When maintenance mode starts at gas alarm, alarm contact and external output signal(gas alarm signal) will be cancelled.

5 - 5 - 2 . Zero adjustment

This section is used to adjust zero level.

*** Note**

When make zero adjustment, supply fresh air to the detector head and adjust it after reading gets stable.

Press MODE switch for above 3 seconds, and the maintenance mode starts. (SKIP light flashes)

PW/TR	ALM1	ALM2	SKIP		-		
-------	------	------	------	--	---	--	--

Select "1-1" by FLOW ADJ. / switch and press TEST/SET switch to start zero adjusting mode. The zero suppression circuit is released and actual zero level is displayed.

PW/TR	ALM1	ALM2	SKIP		0	0	3
-------	------	------	------	--	---	---	---

Supply fresh air. Press TEST/SET switch after the reading gets stable, and the zero is adjusted. (LED flashes during adjustment).

PW/TR	ALM1	ALM2	SKIP		0	0	0
-------	------	------	------	--	---	---	---

*** Note**

The reading may slightly changes after zero adjustment. In such case, make fine adjustment with FLOW ADJ. / switch. After that, press. TEST/SET switch. Pressing TEST/SET switch, zero set is completed.

After completion of zero adjustment, press MODE switch to return the Menu.

PW/TR	ALM1	ALM2	SKIP		-		
-------	------	------	------	--	---	--	--

When return to detection mode, press MODE switch again for above 3 sec.

The SKIP light turns off to show detection mode

PW/TR	ALM1	ALM2	SKIP		0	0	0
-------	------	------	------	--	---	---	---



WARNING

After completion of adjustment, be sure to return detection mode(Only PW/TR light is ON) by pressing MODE switch.



CAUTION

When leave it alone on maintenance mode, this returns to detection mode automatically after 10 hours.

5 - 5 - 3 . Confirmation of alarm level

This is used to check alarm levels.

Press MODE switch for above 3 seconds,
and maintenance mode starts.

PW/TR ALM1 ALM2 SKIP

1 - 1

Select 「1-2」 with FLOW ADJ. /
switch.

PW/TR ALM1 ALM2 SKIP

1 - 2

Press TEST / SET switch to check
the 1st alarm level (ALM 1).

PW/TR ALM1 ALM2 SKIP

0.30

Press TEST / SET switch again to
check the 2nd alarm level (ALM 2).

PW/TR ALM1 ALM2 SKIP

0.60

To return detection mode, press
MODE switch for above 3 seconds.
SKIP light turns OFF which
shows detection mode.

PW/TR ALM1 ALM2 SKIP

0.00



WARNING

After completion of this operation, be sure to return detection mode(Only PW/TR light turns ON) by pressing MODE switch.



CAUTION

When leave it alone on maintenance mode, this returns detection mode automatically after 10 hours.

* Note

To change alarm levels, please contact with our nearest agent or RIKEN KEIKI.

5 - 5 - 4 . Alarm test

This section is used to confirm the transmission condition to the outer equipment by giving same gas concentration signal(gas concentration data) output.



WARNING

When make alarm test, (transmission test) announce it to respective department beforehand.

Carry it out after making proper treatment(External signal output, alarm contact).

Press SET switch for above 3 seconds to start alarm test mode. When it gets to alarm test mode, both SKIP light and display flash.

PW/TR ALM1 ALM2 SKIP

0.00

Increase the reading with FLOW ADJ/ switch. When it reaches the first alarm level, AL1 light turns on.

When it reaches the second alarm level, AL2 light turns on.

PW/TR ALM1 ALM2 SKIP

0.30

PW/TR ALM1 ALM2 SKIP

0.60

* Note

Alarm contact does not work during alarm test even if the reading reaches alarm level.

To confirm the operation of alarm contact, additional setting is required.

Please contact with our nearest agent or RIKEN KEIKI.

5 - 6 . How to finish operation

When finish this operation, turn off power switch of this unit and turn off the main power(DC24V).



WARNING

- When finish this operation, do it after making point skip with the upper system (Centralized system).
- When finish this operation, check the external output and function of outer equipment to be connected with external alarm contact. Then, judge whether power can be shut off or not.
- When alarm contact is set on energized condition(optional), alarm contact works when power supply(DC24V) to this unit is OFF.
In case of energized alarm contact, only power switch of this unit shall be put OFF.
- In case of detecting high adsorptive gases, turn off the power after making cleaning enough by fresh air.

6 . KINDS OF ALARM AND ITS FUNCTION

6 - 1 . Kinds of alarms

There are two kinds of gas alarm and trouble alarm.

Gas alarm : When the detection gas reaches to preset alarm level or exceeds it, this starts to function. (Non-latched mode)

* NOTE

Alarm levels are adjusted at 1/3(1st alarm) and 2/3 (2nd alarm) of full scale as standard.

To prevent error of performance, this is provided with 6 second alarm delay time.

* Trouble alarm : Trouble is detected in the detector and it gives an alarm as trouble alarm.

Except system trouble "E-00", it is non-latched. When return to normal from trouble condition, it starts again from the performance Initial clear after power on. [See "8. TREATMENT AT ABNORMAL CASE"]

6 - 2 . Gas alarm

6 - 2 - 1 . Gas alarm action

(1)Display

Gas concentration display

When exceed detection range, LED display shows " ".

Power light (POWER : Green)

It keeps continuous lighting.

Alarm light (ALM1 : Orange), (ALM2 : Red)

There are two alarm levels. When the reading goes to alarm preset level or exceeds it, this turns to on.

(2)External output

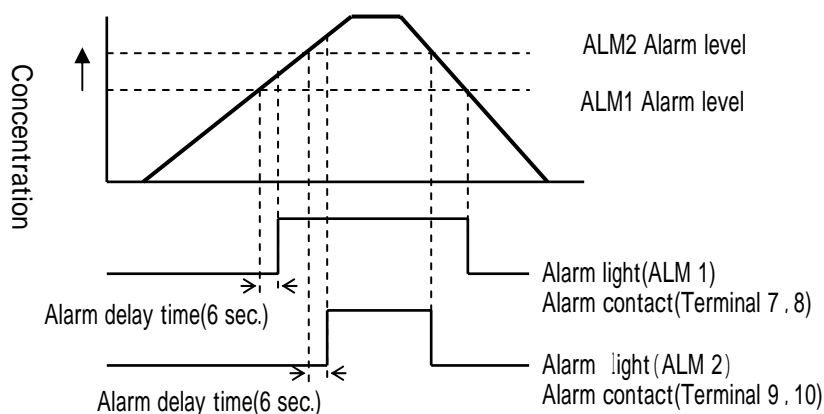
4 ~ 20mA output

Electric current in proportion to gas concentration is output. In case of over scale, the maximum output is approx 22mA

Alarm contact

When gas concentration reaches preset alarm level or exceeds it, the relay contact for outer alarm works.

Relay contact is a non-latched condition. It returns automatically when gas concentration decreases under preset alarm level.



6 - 2 - 2 . Counteraction at gas alarm

Reaction to leak gas

The counteraction at gas alarm shall follow to the client rule and immediate reaction shall be required.

Generally, the following action is taken.

Confirmation of indication value.

* NOTE

Instantaneous gas leak may get lower at confirmation time.

Except gas alarm, it gets alarm condition temporarily by noise or any other accidental conditions.

Based on gas alarm control concentration, it keeps the safety by keeping away people from the monitoring area.

When gas concentration display is continued, close the gas valve and confirm that gas concentration gets lower enough.

Suppose that the leak gas is to remain and provide yourself with protection attire and tool away from danger, go to the leak site and check the gas residual condition by portable gas detector.

After checking that there is no danger, the treatment for gas leak shall be taken.

6 - 2 - 3 . Gas alarm possibility except the case of gas detection

It may respond to interference gas

For interference gases, contact the nearest agent or Riken Keiki.

It may be caused by drifting due to the change of long time elapsed sensor

Check the reading by daily check and make calibration through authorized service agent whenever necessary.

It may be caused by the noise generated from spherical machine

Revision of installation location, wirings and the addition etc. of noise measure parts between instrument and detector shall be required. This specific measures shall differ from the condition of each site.

It may receive a temporarily noise such as by thunder lightning etc.

When the cause and effects are understood, the measure for surge according to the condition can be taken.

7 . MAINTENANCE CHECK

This is an important for security and safety. To maintain the security and enhance the reliability of safety, the regular maintenance check for it shall be absolutely necessary.

7 - 1 . Frequency of maintenance and check items.

7 - 1 - 1 . Daily check

This is the check items carried out by customer.

Check of flowmonitor

Check that the ball in flowmonitor of this unit is within two red lines.

Check of PW/TR light.

In normal operation, the light is at on condition.

Check of LED reading

Check that LED reading is zero "0".

If it is not "0", check that gas is free around gas sample point and adjust zero position in maintenance mode.

Check and replacement of dust filter

While this unit is working, ball in flowmonitor shall be positioned within two red lines. If it is below the lower part of red line, adjust it with FLOW ADJ/ switch to .

Even though it cannot move up, the filth of dust filter can be considered. Replace it with new one or check the flow path(clog, bend or crack of tubing).

7 - 1 - 2 . Regular maintenance check

The following items shall be checked at regular check.

Daily check

Cleaning of this unit

Adjustments

Function check

Parts replacement(Refer to 7-6 recommendable spare parts list)

Others

7 - 1 - 3 . Maintenance contract for regular check

To maintain the safety operation of the unit, it is recommended to keep the maintenance contract with service agent for regular maintenance, adjustment and overhaul etc including the gas sensitivity adjustment.

For the detail of maintenance contract, contact our nearest service agent or Riken Keiki.

7 - 2 . Calibration method(Calibration with gas, etc.)

Refer to 「5-5 Maintenance and adjustment」



CAUTION

For gas calibration, contact our nearest agent or Riken Keiki.

7 - 3 . Replacement of sensor and parts.



CAUTION

For replacement of sensors and parts etc, contact our nearest agent or Riken Keiki.

7 - 4 . Treatment when operation is stopped or its installation place is moved.

7 - 4 - 1 . Stopping the normal operation

Make the power switch off on the front side.

Make the power (DC24V) off at the supply side.

7 - 4 - 2 . Installation when move its place

When move its place, refer to “4-2. Installation place”. Then, for wiring construction, refer to “4-5. Caution at wiring construction”. When move its installation place, make shortest the power interruption time.



CAUTION

When move its installation place, be sure to make gas calibration. The re-adjustment work including gas calibration shall be requested to contact our nearest agent or Riken Keiki.

7 - 5 . Storage or treatment when not in use for a long time.

This detector shall be stored in the following environment condition.

Temperature : 0 ~ 40

Humidity : 30%RH ~ 85%RH(Non-condensing)

Environment condition : To be an environment where there is no generation of gas, solvent and vapor etc.



CAUTION

When it is not used for a long time, take care for the life of lithium battery used inside detector. Replacement interval is 3 years from the date of ex-work(Described in the sticker on the detector).

When use the detector again, be sure to make calibration.

Please contact with our nearest agent when intending to make re-adjustments including calibration, replacement of parts, etc.

7 - 6 . List of recommendable spare parts for regular maintenance

No.	Name of parts	Maintenance interval	Replacement Interval(year)	Q'ty/unit
1	Pump (without diaphragm)	6 months	1 ~ 3	1
2	Pump diaphragm	6 months	1 ~ 2	1
3	Pump holder	1year	3 ~ 6	1
4	Fuse	1 year	8	1
5	Main PCB	- - -	7 ~ 8	1
6	Sub PCB	- - -	9 ~ 10	1
7	Internal tubing (Rubber)	6 months	3 ~ 6	1
8	O-ring(Connection ports of sensor unit and chassis unit)	1 year	3 ~ 6	4
9	Lithium battery	- - -	3	1
10	Flowmonitor ass'y	1 year	7 ~ 8	1
11	O-ring (Flowmonitor part)	1 year	3 ~ 6	2
12	Dust filter (Outside use)	6 months	0.5 ~ 1	1

* Note

- * The above replacement interval is just a standard and it depends upon operating conditions. Also, this does not show a guarantee period.
Replacement interval changes according to the result of regular maintenance check..
- * PCB is caused by deterioration of capacitor, etc.
- * Use pre-adjusted PCB when it is required to replace.

8 . TREATMENT AT ABNORMAL CASE

8 - 1 . Trouble alarm

Flashing of PW/TR light

- When PW/TR light is flashing, it is the condition that the following trouble may be caused.
Research its cause and take an appropriate action.
- The output of detector at trouble shall be as follows.
Output from GD-K71D: 0.5mA(Fix)

LED display	Trouble content	Main cause
E-00	System trouble	Memory trouble in the detector
E-01	Abnormal of sensor connection	Connector contact failure, Sensor cable disconnection
E-04	Abnormal function for zero correction	Abnormality of sensor drift
E-05	Low flow	Filth of filter or deterioration of pump

8 - 2 . Counteraction at trouble alarm

When any trouble was found on this gas detector, contact our nearest agent or Riken Keiki.

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

8 - 3 . Before it is thought to be a trouble

It may be originated from disconnection and short circuit between units.

- Check the wirings including pherical equipment as well as this detector.

There is the case that operation of detector is not correct including piping work etc.

- Re-check the detection system and contact our nearest agent or Riken Keiki.

There is the case of electrical line trouble such as shut-off of power.

- This will be treated by the re-check of stand-by battery, power line filter, insulation transformer etc or those addition.

8 -4. Trouble Shooting

(1) PW/TR light is not ON. (Power is not supplied.)

<Cause and Treatment>

- Is it OK with power cable connection ?
Connect power cable.
- Is fuse disconnected ?
Search the cause of disconnection and replace it after making counter-measures.
- Is power voltage normal ?
Supply the rated power voltage.
- Is this power switch turned on ?
Make power switch ON.

(2) Abnormal performance

<Cause and Treatment>

- Sudden surge noise can be considered. When recover it, turn off the power and turn on the power again for re-start of operation. When such takes place often times, take an appropriate action for noise.

(3) No calibration available

<Cause and Treatment>

- Is the concentration of calibration gas correct ?
Prepare the appropriate calibration gas.
- There is the possibility for decreasing of sensor sensitivity.
The sensor replacement is required.

(4) PW/TR light flashing.

System Trouble "E-00"

<Cause and Treatment>

- Memory trouble inside of detector.
Contact our nearest agent or Riken Keiki.
- Sensor connection trouble "E-01"

<Cause and Treatment>

- Non-connection of sensor, contact failure of connector and disconnection of sensor cable.
Check "whether sensor is connected" or "the sensor cable connector is connected to the sensor or amplifier board."
If can not be recovered, contact our nearest agent or Riken Keiki.

Abnormal function for zero correction 「E-04」

- Zero correction was out of available range due to sensor drift.
Contact our nearest agent or RIKEN KEIKI.

Low flow trouble "E-05"

<Cause and Treatment>

- Drop of pump function
Even though the ball of flowmonitor can not be up the red line(lower red line) with FLOW ADJ/ switch, replace the pump with new one.
- Check that the detector unit is mounted firmly or the fixing screw of detector unit is fastened firmly.

- Due to the clog of dust filter, the pump can not suck.
Replace the dust filter with new one.
- The pipe at gas-inlet side or gas-outlet side is broken or clogged.
In this case, repair the defective part.

(5) Slow Response

<Cause and Treatment>

- Is the dust filter clogged ?
Replace the dust filter.
- Is the pipe at gas inlet side or gas outlet side broken or clogged ?
Repair or replace defective part.
- Check whether detector unit is firmly connected.

(5) Fuse disconnection

<Action>

- The detector does not operate at all.

<Cause and Treatment>

- The trouble of detector or trouble of external power source can be considered. Search this cause and after taking its measures, replace the fuse with the designated one.

* NOTE

The rating of this fuse for this detector is 125V 2A

9. DEFINITION OF TERMS

Flowmonitor

Gas sample flow rate supplied to the sensor is indicated. The standard flow rate of this detector is 500cc/min.

Low flow alarm

When the sample flow rate to the sensor is dropped, this is the function to give an alarm. PW/TR light flashes and "E-05" is shown on LCD.

External output signal

The external output signals of this detector head are as follows;

- Gas concentration signal output, status signal(working condition): Electric current signal
- Alarm contact output (1st, 2nd, trouble)

External dust filter

When use it at dusty atmospheric place, it is recommended to put on dust filter outside. The kind of filter is different by the detection gas. Please ask to our nearest agent.

Auto sensor keeper

The electrochemical sensor to be used with this detector requires an electric potential even if it is not in use. This is a function to supply electric potential to the sensor when it is not in use or power suspension.

PPM

This is the gas concentration showing a volume at a part per million.

Calibration

By using calibration gas etc, it seeks relations between instrument reading, display value or set value and true value.

Maintenance mode

When make maintenance of detector, cut off the alarm contact and the output of signal showing the maintenance mode condition is displayed on the external output signal.

By this, the maintenance is carried out independently on this detector.

Press MODE switch for above 3 seconds, and the maintenance mode starts.

Initial clear

The reading will be unstable for a few seconds after power on. In this moment to prevent the error of running, the alarm contact shall be cut off. Then, signal output showing initial clear condition is given on external output.

Zero suppression

This is the function to blur the environment change or the influence of interference gas.

Alarm delay time

To prevent the alarm error by noise intruded from the outside, this is the function to suspend the running temporarily.

Alarm response time

It is the time until the alarm is given when exposed to gas concentration of 1.6 times alarm preset level.(This does not involve the time when connect suction pipe outside)

Alarm response time for this detector is within 60 seconds.

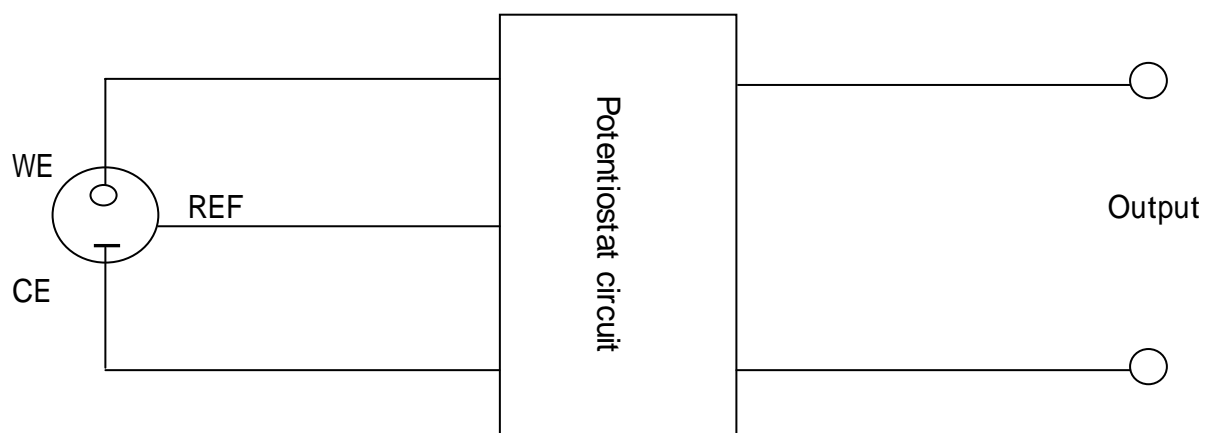
Point skip

For the convenience of maintenance etc, the function of gas detection is stopped temporarily.

10. DETECTION PRINCIPLE

This gas detector applies an electrochemical sensor. The sample gas is electrolyzed by the electrolyzed cell added with specific electric potential (bias voltage) and detected from the electrolyzed current generated at that time.

The electrochemical sensor is designed to keep the interface between electrode and electrolyte at a constant potential (Bias voltage) and is the method to electrolyze gas directly. Then as the gas has the bias voltage generating its own electrolyzation (Redox reaction) the bias voltage of sensor is determined by the redox potential.



WE : Working electrode
CE : Counter electrode
RE : Reference electrode

1 1 LIST OF PRODUCT SPECIFICATIONS

11 1. Specifications

Model	: GD-K71D
Transmission method	: Electric current transmission method, 3-wire(or 4-wire), 4 ~ 20mADC
Gas concentration signal	: 4 ~ 20mA(Linear upto 22mA)
Initial clear signal	: 2.5mA
Maintenance signal	: 2.5mA
Trouble signal	: 0.5mA, non-isolated (max. load : 300 at 24VDC)
Applicable sensor	: Electrochemical sensor
Detection gas	: Toxic gases(Semiconductor processing gases)
Detection range	: Depends on detection gas
Gas detection method	: Sample drawing method(with low flow alarm detection circuit)
Sample flow rate	: 500cc/min
External tubing	: 6- 4 PTFE tubing (Provided with P.P. coupling)
Gas alarm	: 2 levels(Non-latched mode)
Preset level	: 1st1/3 of full scale (adjustable) 2nd.....2/3 of full scale (adjustable)
Indication	: 1stYellow LED lighting : 2nd.....Red LED lighting
Relay output	: Dry contact, normally-open for both 1st and 2nd alarm, rated 0.25A at 125VAC/0.5A at 24VDC(Resistive load).
Alarm delay time	: Within 60sec(Time to get an alarm when exposed to gas concentration of 1.6times alarm level, excluding delay by external tubing).
Initial clear time	: 25 sec. after power ON.
Zero suppression level	: 6% of full scale
Self-diagnostic function	
Contents	: Low flow, system error, sensor disconnection, abnormal zero correction.
Trouble indication	: Flashing of POWER light, message of content.
Relay output	: Dry contact, normally-open, rated 0.25A at 125VAC/0.5A at 24VDC(Resistive load).
Display function	
Gas concentration	: 4 digit LED(7 segment)
Status	: LED light Power/trouble indication: PW/TR(continuous/flashing) · Normal.....Green/continuous · Trouble.....Green/flashing Gas alarm 1st: ALM1 light on (Orange) 2nd: ALM2 light on (Red) Normal.....Light off AlarmOrange, Red light on Maintenance: SKIP light flashing Function interruption : SKIP light on · OFF during measurement, ON at SKIP.

Setting	: By remote PC (Use exclusive cable)
Power source	
Required voltage	: 24VDC \pm 10%
Consumption	: Approx 10W
Applicable cable	: CVVS, 1.25mm ² , 3-core (*When power cable and signal cable are separated, use following cables)
	Power source : CVV 1.25mm ² , 2-core
	Signal : CVVS 1.25mm ² , 2-core
Operating condition	
Temperature	: 0 ~ 40
Humidity	: 30 ~ 85%R.H.(standard) (Consult with us other humidity).
Structure	: Box type, wall mounting type
Outer dimensions	: 70(W)X170(H)X153(D)mm
Weight	: Approx 2.0kg.

*** NOTE**

Specifications subject to change without notice for improvement

1 1 - 2 . Product composition

Standard compositions

- Gas detector GD-K71D
- Accessories.
 - Dust filter1 pce.
 - Gas inlet/outlet cap.....2 pcs.
 - Fuse.....Depends on ordered quantity

Q' ty/order	Fuse supplied
1 ~ 10 sets	1 pce
11 ~ 20 sets	2 pcs.
21 ~ 50 sets	3 pcs.
51 sets and above	5 pcs.

TYPICAL DETECTION GASES AND APPLICABLE FILTERS(EXAMPLE)

Detection gas	Chemical formula	Detection range	Preset alarm level (standard)	Applicable filter
Ammonia	NH ₃	0 ~ 75ppm	25 ppm	M
Antimony Pentachloride	SbCl ₅	HCl 0 ~ 15ppm	5 ppm	M
Arsenic Pentachloride	AsCl ₅	HCl 0 ~ 15ppm	5 ppm	M
Arsenic Pentafluoride	AsF ₅	HF 0 ~ 9ppm	3 ppm	M
Arsenic Trichloride	AsCl ₃	HCl 0 ~ 15ppm	5 ppm	M
Arsenic Trifluoride	AsF ₃	HF 0 ~ 9ppm	3 ppm	M
Arsine	AsH ₃	0 ~ 0.2ppm	0.05 ppm	M.B
Boron Tribromide	BBr ₃	HBr 0 ~ 9ppm	3 ppm	M
Boron Trichloride	BCl ₃	HCl 0 ~ 15ppm	5 ppm	M
Boron Trifluoride	BF ₃	HF 0 ~ 9ppm	3 ppm	M
Bromine	Br ₂	0 ~ 1ppm	0.2 ppm	M
Chlorine	Cl ₂	0 ~ 1.5ppm	0.5 ppm	M.B
Chlorine Trifluoride	ClF ₃	0 ~ 1ppm	0.2 ppm	M
		0 ~ 0.6ppm	0.1 ppm	M
Diborane	B ₂ H ₆	0 ~ 0.3ppm	0.1 ppm	M
Dichlorosilane	SiH ₂ Cl ₂	HCl 0 ~ 15ppm	5 ppm	M
Disilane	Si ₂ H ₆	0 ~ 15ppm	5 ppm	M.B
Fluorine	F ₂	0 ~ 3ppm	1 ppm	M
Germane	GeH ₄	0 ~ 0.8ppm	0.2 ppm	M.B
Germanium Tetrachloride	GeCl ₄	HCl 0 ~ 15ppm	5 ppm	M
Hydrogen Bromide	HBr	0 ~ 9ppm	3 ppm	M
Hydrogen Chloride	HCl	0 ~ 15ppm	5 ppm	M
Hydrogen Fluoride	HF	0 ~ 9ppm	3 ppm	M
Hydrogen Iodine	HI	0 ~ 5ppm	2 ppm	M
Hydrogen Selenide	H ₂ Se	0 ~ 0.2ppm	0.05 ppm	M.B
Iodine	I ₂	0 ~ 1ppm	0.3 ppm	M
Molybdenum Pentachloride	MOCl ₅	HCl 0 ~ 15ppm	5 ppm	M
Molybdenum Hexafluoride	MOF ₆	HF 0 ~ 9ppm	3 ppm	M
Nitrogen Dioxide	NO ₂	0 ~ 15ppm	5 ppm	M.B
		0 ~ 1ppm	0.3 ppm	M
Ozone	O ₃	0 ~ 0.6ppm	0.1 ppm	M
		0 ~ 1ppm	0.3 ppm	M
Phosphine	PH ₃	0 ~ 1ppm	0.3 ppm	M.B
Phosphorus Oxychloride	POCl ₃	HCl 0 ~ 15ppm	5 ppm	M
Phosphorus Pentachloride	PCl ₅	HCl 0 ~ 15ppm	5 ppm	M
Phosphorus Pentafluoride	PF ₅	HF 0 ~ 9ppm	3 ppm	M

Detection gas	Chemical formula	Detection range	Preset alarm level (standard)	Applicable filter
Phosphorus Trichloride	PCl ₃	HCl 0 ~ 15ppm	5 ppm	M
Phosphorus Trifluoride	PF ₃	0 ~ 10ppm	2 ppm	M
Silane	SiH ₄	0 ~ 15ppm	5 ppm	M.B
Silicone Tetrachloride	SiCl ₄	HCl 0 ~ 15ppm	5 ppm	M
Silicone Tetrafluoride	SiF ₄	HF 0 ~ 9ppm	3 ppm	M
Sulfur Tetrafluoride	SF ₄	HF 0 ~ 9ppm	3 ppm	M
Tantalum Fluoride	TaF ₅	HF 0 ~ 9ppm	3 ppm	M
Tin Tetrachloride	SnCl ₄	HCl 0 ~ 15ppm	5 ppm	M
Trichlorosilane	SiHCl ₃	HCl 0 ~ 15ppm	5 ppm	M
Tungsten Hexachloride	WCl ₆	HCl 0 ~ 15ppm	5 ppm	M
Tungsten Hexafluoride	WF ₆	HF 0 ~ 9ppm	3 ppm	M

*For gases not listed above, contact us or our nearest agent.

*M : Millipore type filter B : Balston type filter

*Gases which have "HCL(HF)" in the box of detection range are hydriized by moisture in air, and detected by becoming HCL(HF).

Product Warranty

RKI Instruments, Inc., warrants gas alarm equipment sold by us to be free from defects in materials, workmanship, and performance for a period of one year from date of shipment from RKI Instruments, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge. 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. Examples of such items are:

- a) Absorbent cartridges
- b) Pump diaphragms and valves
- c) Fuses
- d) Batteries
- e) Filter elements

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

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF RKI INSTRUMENTS, INC., INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RKI INSTRUMENTS, INC., BE LIABLE FOR INDIRECT, INCIDENTAL, OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold to users by authorized distributors, dealers, and representatives as appointed by RKI Instruments, Inc.

We do not assume 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.