COSMOS

GAS DETECTOR UNIT

Model KD-2A and KD-3A
For Combustible Gases

INSTRUCTION MANUAL

IMPORTANT: Read Section 2 Safety Considerations carefully and understand it before installing or operating your KD-2A and KD-3A. Retain this instruction manual for reference.

Read and save this book

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1 INTRODUCTION

We thank you for purchasing the diffusion type COSMOS Gas Detector Unit for the detection of combustible and other gases or vapors. This diffusion type Gas Detector is a explosion proof cast metal construction with 2 compartments one housing the sensor and the other for the terminal block. Model KD-2A is a d2G4 explosion proof classification for conduit tube wiring, and Model KD-3A is a d3acG4 explosion proof classification for pressure tight flame proof wiring connection.

The KD-2A and KD-3A Gas Detector Units are employed with the "V" series Gas Monitor/Alarm and other systems for efficient detection of combustible gases and various other gases using the following sensors:

a) Catalytic combustion sensor
b) Hot-wire semiconductor sensor
c) Thermal conductivity sensor

2 PRINCIPLES

2.1 Catalytic Combustion Sensor

The sensor consists of a platinum coil coated with a catalytic that acts to allow the combustion. The generated rise in temperature due to the catalytic combustion increases the electrical resistance of the platinum coil.

This variation of resistance causes a deviation voltage on the Wheatstone bridge circuit, and by measuring this voltage it is possible to detect the lower explosive limit (LEL) of combustible gases.

2.2 Hot-wire Semiconductor Sensor

The sensor is a metal oxide semiconductor that absorbs the electron of combustible gases & etc., that is preheated by a platinum filament, and as the concentration of electron increases the heat conductivity of the semiconductor improves.

As a result, the temperature of the semiconductor drops, and the electrical resistance of the platinum filament decreases, this variation is detected as a deviation voltage on the Wheatstone bridge circuit, which is proportional to the gas concentration.

The feature of this sensor is the extremely high sensitivity for low concentration range, and most suitable for highly sensitive detection of combustible gases.

2.3 Thermal Conductivity Sensor

The detection surface of this sensor is a platinum coil coated with an inactive substance and sintered, that is preheated to 150°C, and by comparing the thermal diffusion of air, the thermal conductivity of gas shows a wide variation, causing a variation of temperature on the detection surface.

This variation of temperature shows good relation to the ratio of gas concentration, that is detected as the deviation voltage on a Wheatstone bridge circuit caused by change of electrical resistance on the platinum coil.

This method is limited to gases having difference of thermal conductivity compared to air, but the range from 0 to 100% in the high gas concentration range can be detected.

3 SAFETY CONSIDERATION

Before installing the Gas Detector Unit Model KD-2A or KD-3A, be sure to read and thoroughly understand the contents of this section.

3.1 Safety Regulations

The following safety regulations must be observed without fail:

Under no circumstances should the Gas Detection System be installed except by qualified personnel trained and experienced with explosion proof construction and by trained gas-detection personnel, and not until the accompanying instructions, labels and other literature have been carefully read and understood, and the other precautions followed.

Read and understand all applicable federal, state, and local health and safety laws and regulations including OSHA, and ensure that you are in complete compliance with said laws and regulations before installing or operating the Gas Detection System.

3.2 Safety Precautions

These Gas Detector Units (KD-2A, KD-3A) are precision devices. Execute care in handling and installation, paying special attention to the following:

1) The Gas Detector Unit should be installed in a location, free from vibration, electrical noises, corrosive gases, and avoid high humidity and temperature extremes.

2) Do not apply severe shock or mechanical impact to the Gas Detector Unit.

3) Do not open the cover of the Gas Detector Unit while electric power is turned ON, make sure to isolate the electric power before attempting to make any repairs or servicing.

4) Do not disassemble or alter components or electrical circuits.

3.3 General Warnings

The following is a list of all warnings which appears in this manual. Read all warnings to ensure safe and proper use of the Gas Detector Units.

It is most important to ensure the safety of the personnel and facility at all times from fire and explosion. Carefully read, understand and follow all warnings.

1. General Use

WARNING

- Install the Gas Detector Unit in a location free from vibration, electrical noises, corrosive gases, and avoid high humidity and temperature extremes.
- Do not disassemble or alter components or electrical circuits.
- Avoid severe shock and/or mechanical impact to the Gas Detector Unit.
- A metal rain protective housing should be used for outdoor installation.

2. Calibration

WARNING

- When zero or span adjustment is performed, the Gas Detector Unit must be in a clean air atmosphere. If zero or span adjustment is performed in air contaminated with combustible gas or other gases, the system employed will not give accurate readings.
- Do not install the Gas Detector Unit in an atmosphere contaminated with silicone compounds, as silicone could poison and/or impair the sensitivity of the sensor.

3. Explosion

WARNING

- Once the presence of combustible gases has been detected, take all appropriate precautions to avoid fire and explosion, including vacating the area if necessary.
- Put out all naked flame, and do not operate any electric switches that may cause sparks and lead to ignition of fire
- Locate the source of the gas leak and take prompt corrective measures.
- In case of fire, move away from the fire area and let it burn unless the leak can be stopped immediately without risk.

4. Sensor Poisoning

WARNING

- Do not install the Gas Detector Unit in an atmosphere contaminated with silicone compounds, as silicone could poison and/or impair the sensitivity of the sensor.

- Do not use silicone compounds for sealing materials, as the silicone could poison and/or impair the sensitivity of the sensor.

5. Wiring

WARNING

- The Flame/Explosion proof wiring must be installed only by a qualified electrician trained and experienced with flame/explosion proof construction and by trained gas-detection personnel. It must be in complete compliance with applicable government and local health and safety laws and regulations.

- To avoid electrical noises, the connecting wiring cables should not be laid near electric power lines, large capacity transformers or electric motors.

- Do not use bare-end wires for wiring connections, use wire finished with crimp lug and heat-shrink tubing at tip of cable wires for all connections.

- Before turning the power "ON", make sure that the electric cables between the Gas Detector Units and Gas Monitors are correctly connected.

6. Maintenance

WARNING

- The Gas Detector Unit is a Flame/Explosion proof construction and normally installed in a hazardous (explosive) area, for the purpose of replacement of sensor or repairs, it is necessary to isolate the electric power to avoid the danger of fire and/or explosion.

4 ENVIRONMENT

4.1 Operating Environment

The Gas Detector Unit (KD-2A) is designed to be explosion proof and suitable for installation in d2G4 hazardous location

The Gas Detector Unit model KD-3A is designed to be pressure tight flame proof, and suitable for installation in d3acG4 hazardous location.

d2G4	Explosion Class 2, ignition group 4
d3acG4	Explosion Class 3, Ignition group 4)

4.2 Installation Environment

The Gas Detector Units should be installed in a location where the operating temperatures is within the range of –10° to 40°C (14° to 104°F).

5 Unpacking

5 UNPACKING

The Gas Detector Unit is packed individually with standard accessories, make sure that all components ordered are included, for any missing or damaged items, please contact your authorized distributor or representative.

Standard accessories included with the Gas Detector Unit:

a) Hex wrench	1 set
b) Instruction Manual	1 copy

Optional accessories (to be ordered separately):

a) Rain protective housing, model KW11
b) Rain protective housing, model KW12
c) Rain protective cap, model KW-21

NOTE
Materials required for wiring (electric cables, conduit etc.,) hardware and sealing materials are not provided, and must be obtained separately by the user.

6 CONSTRUCTION

The Gas Detector Units (KD-2A & KD-3A) are designed to be explosion proof and are suitable for installation in hazardous environments.

Gas Detector Unit
(Diffusion type)

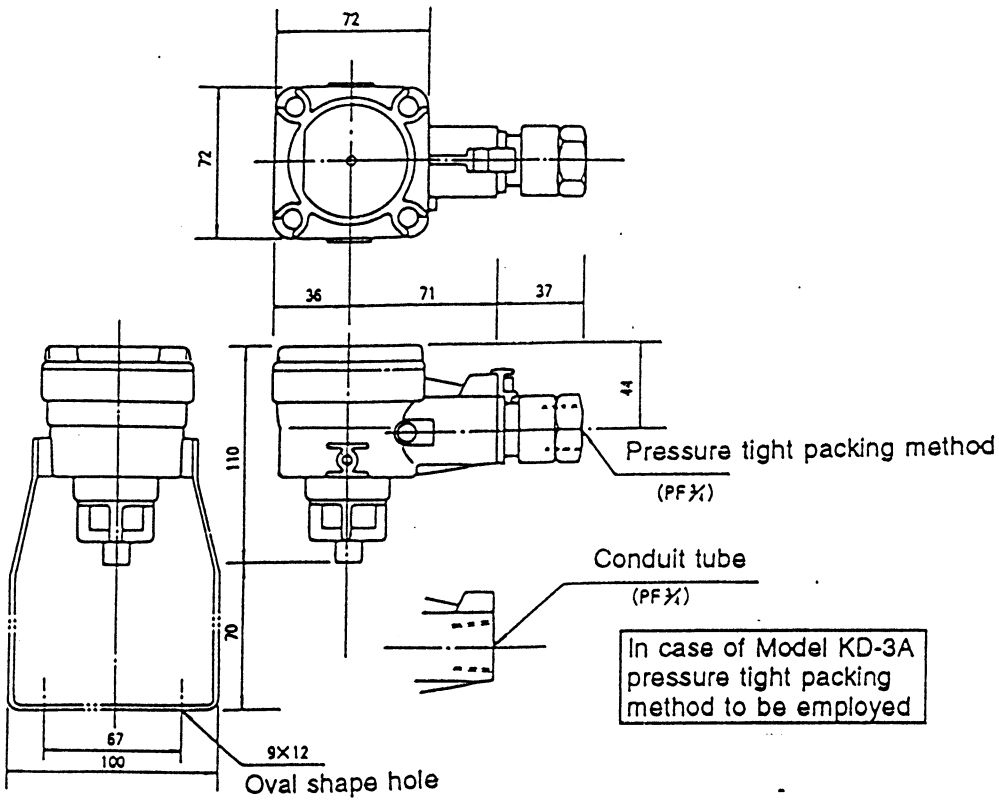

Figure 6-1

6 Construction

Figure 6-2 shows the packing materials used for the pressure tight explosion proof packing of the KD-3A Gas Detector Unit.

No.	Description	Qty	Remarks
1	Gas Detector Unit	1	Cast metal
2	Cover	1	Cast metal
3	"O" ring	1	
4	Packing gland	1	
5	Ring packing	1	
6	Flat washer	2	
7	M4-6 screw	2	BSBM (Ni)
8	Cable clamp	1	
9	Clamp seal	1	
10	Gland clamp	1	
11	M4-8 bolt	1	SUS (hex socket)
12	Spring washer	9	ø4
13	M5-16 bolt	4	SUS (hex socket)
14	Crimp lug	5	2-4S
15	Electric cable	1	4-conductor
16	M4-6 screw	6	BSBM (Ni)
17	Spring washer	4	ø5

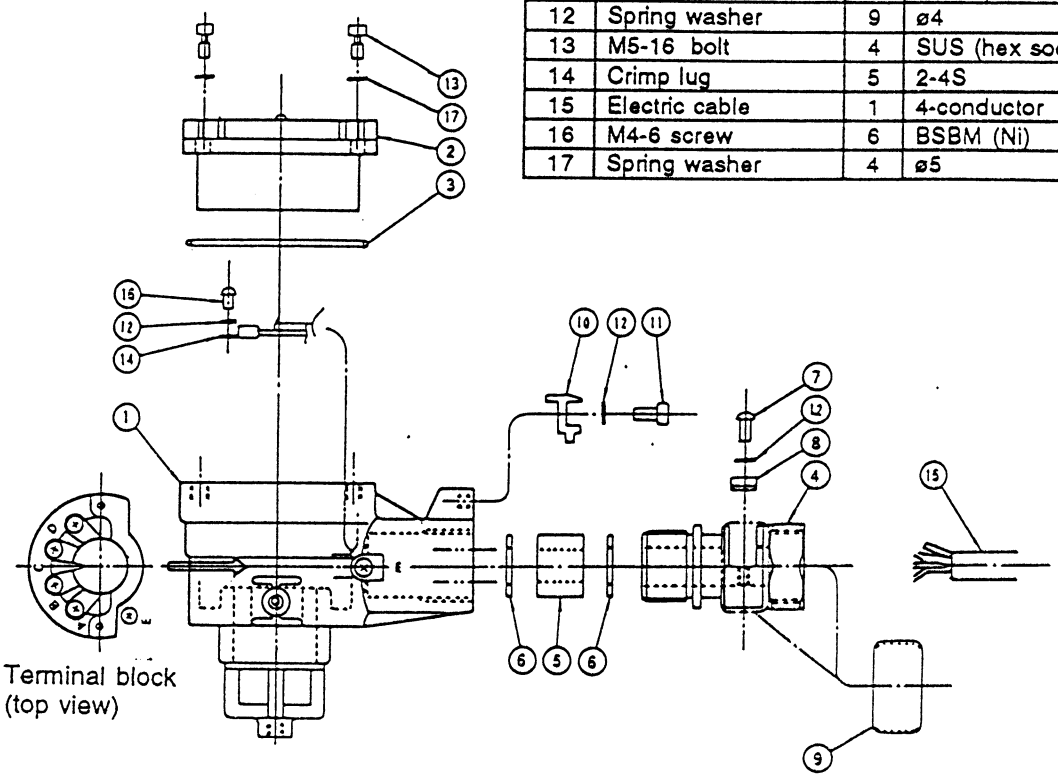

Figure 6-2

7 INSTALLATION

WARNING

- Install the Gas Detector Unit in a location free from vibration, electrical noises, corrosive gases, and avoid high humidity and temperature extremes.
- Do not disassemble or alter components or electrical circuits.
- Avoid severe shock and/or mechanical impact to Gas Detector Unit.
- A metal rain protective housing should be used for outdoor installation.
- Do not install the Gas Detector Unit in an atmosphere contaminated with silicone compounds, as silicone could poison and/or impair the sensitivity of the sensor.
- The Flame/Explosion proof wiring must be installed only by a qualified electrician trained and experienced with flame/explosion proof construction and by trained gas-detection personnel. It must be in complete compliance with applicable government and local health and safety laws and regulations.
- To avoid electrical noises, the connecting wiring cables should not be laid near electric power lines, large capacity transformers or electric motors.
- Do not use silicone compounds for sealing materials, as the silicone could poison and/or impair the sensitivity of the sensor.
- Before turning the power "ON", make sure that the electric cables between the Gas Detector Units and Gas Monitors are correctly connected.

7.1 Example of an Indoor Installation

The location of Gas Detector Units should be determined depending on the kind of gas to be detected, with consideration given to the specific gravity of gas and environment.

NOTE

- Install the Gas Detector Unit in a location where the gas to be detected is likely to accumulate, and where maintenance can be carried out efficiently.

Detected Gas	Height	Remarks
Gas heavier than air (LPG)	about 10cm above floor level	Install at least 7cm above floor level for maintenance purposes
Gas of specific gravity same as air (carbon monoxide)	Between 75~150cm above floor level	Special attention if required for the specific gravity and installation environment
Gas lighter than air (Methane and hydrogen)	Near the ceiling	To be installed in location for easy maintenance

Figure 7-1 shows an example of the Gas Detector Units location for indoor installation.

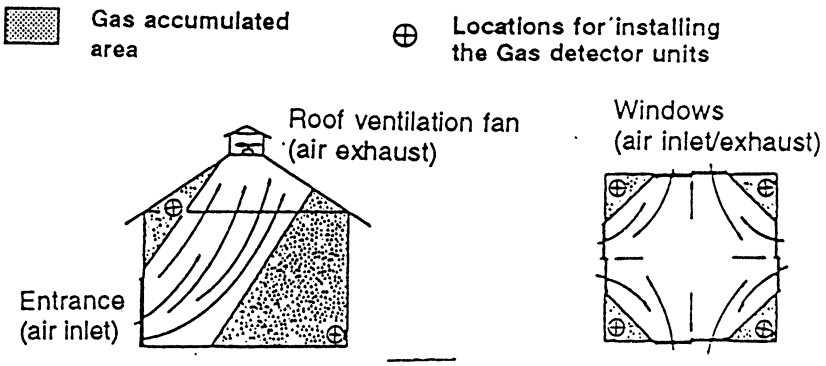

Figure 7-1

7.2 Example of outdoor installation of Gas Detector Unit

Figure 7-2 shows an example of outdoor installation in the vicinity of pipe lines.

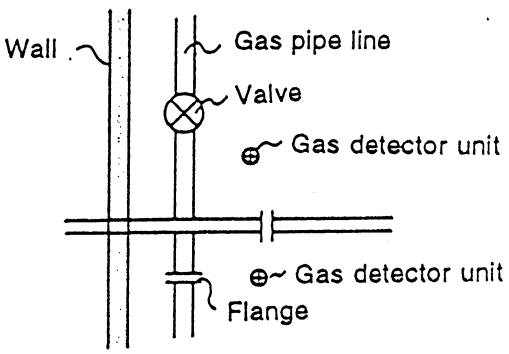

Figure 7-2

1) Figure 7-3 shows how the metal mounting arm of the Gas Detector Unit can be adjusted 90 degrees for installation in a suitable locations.

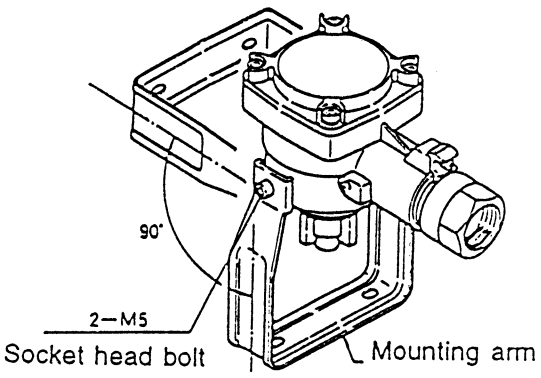

Figure 7-3

Loosen the 2-M5 (Socket head cap bolts) with a hex wrench, move the mount arm backward 90°, then tighten the bolts and install in an appropriate location.

NOTE:
The Gas Detector Unit should be installed in a location where maintenance and repairs can be sufficiently carried out..

2) Rain protective housing Model KW-11 and KW-12 (Optional items)

Figure 7-4 shows the Rain protective housing to protect Gas Detector Unit from rain and water, use the Rain protective housing Model KW-11 or KW-12 for outdoor installation. The Rain protective housings are optional items and should be ordered separately.

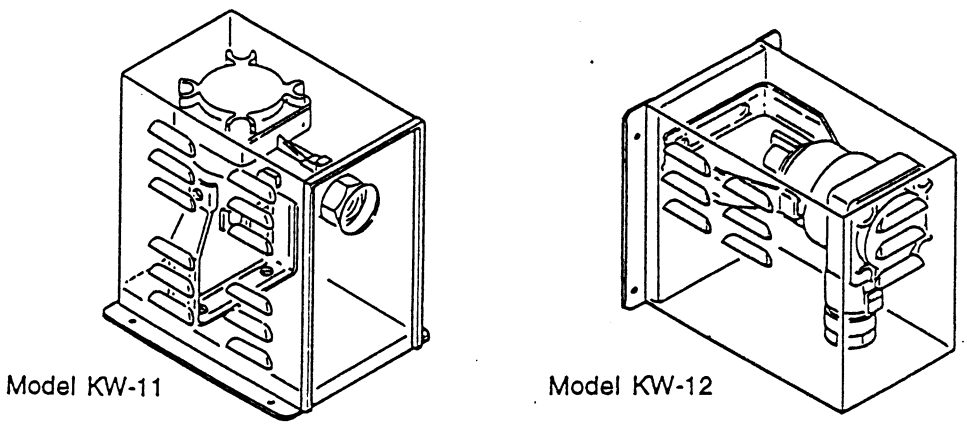

Figure 7-4

3) Rain protective cap

For the Gas Detector Unit installed in an outdoor location where the Rain protective housing can not be used. A Rain protective cap (KW-21) is available that can be attached to cover of the projected sensor portion. Refer to illustration of the Gas Detector Unit mounted on a metal pole.

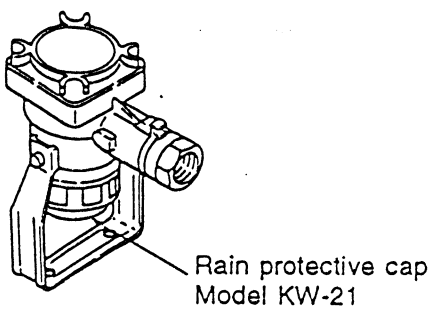

Figure 7-5

When the Gas protective cap is used, the Gas Detector unit must be installed with the cable inlet in a horizontal position as per above illustration.

7.3 Wiring Procedures

WARNING

- The Flame/Explosion proof wiring must be carried out only by a qualified electrician trained and experienced with flame/explosion proof construction and by trained gas-detection personnel. It must be in complete compliance with applicable government and local health and safety laws and regulations.

- To avoid electrical noises, the connecting wiring cables should not be laid near electric power lines, large capacity transformers or electric motors.

- Do not install the Gas Detector Unit in an atmosphere contaminated with silicone compounds, as silicone could poison and/or impair the sensitivity of the sensor.

- Do not use bare-end wires for wiring connections, use wire finished with crimp lug and heat-shrink tubing at tip of cable wires for all connections.

7.3.1 Applicable cables

600 volts vinyl insulated wire with stranded copper wire conductors having a cross-section area of 0.75 mm^2 to 2.0 mm^2.

The length of wiring must not exceed the following distance:

Conductor diameter	Length	
0.75 mm^2	max. 200m	(656 ft.)
1.25 mm^2	max. 600m	(1,968 ft.)
2.00 mm^2	max. 1000m	(3,280 ft.)

NOTE

The maximum permissible resistance for the wiring cable is 10Ω per conductor (one way).

7.3.2 Connections

Figure 7-5 shows the connections between the Gas Monitor unit and the Gas Detector Unit.

Make sure the wiring connections between the Gas Monitor units and the Gas Detector Units are correctly connected to the corresponding terminals. Wrong connections may damage the sensor.

It is recommended not to make interconnection between cables, when such connections are inevitable, it would necessary to establish an explosion proof terminal box for the connection of cables.

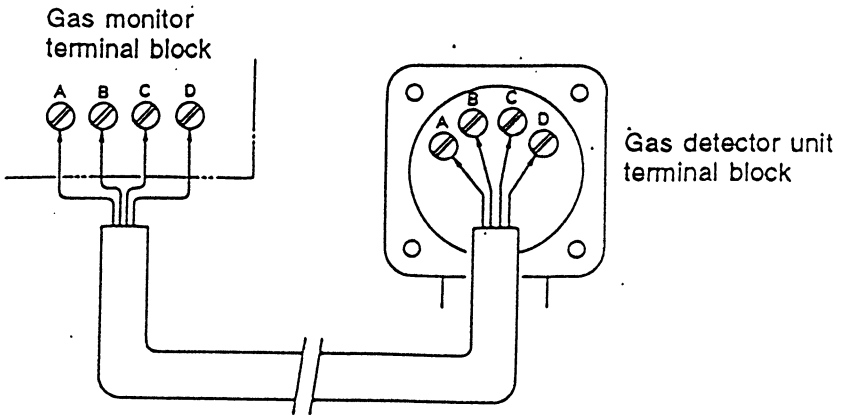

Figure 7-6

7.3.3 Example of Flame/Explosion proof wiring (KD-2A)

The KD-2A Gas Detector Unit is designed to be explosion proof of d2G4 classification.

Figure 7-7 shows an example of Flame/Explosion proof wiring. The KD-2A Gas Detector Unit is designed to accept the thick steel conduit to protect electrical cables from flame and/or explosion of combustible gases, and should use with sealed fittings to ensure flame proof wiring.

The COSMOS gas detection equipment's are provided with PF 3/4 female thread for conduit connections, flexible fitting and other fittings should be threaded with parallel threads, and must have at least 5 threads fully engaged, and securely tighten with a lock nut, then sealing compound to be applied to make a flame proof and watertight connections.

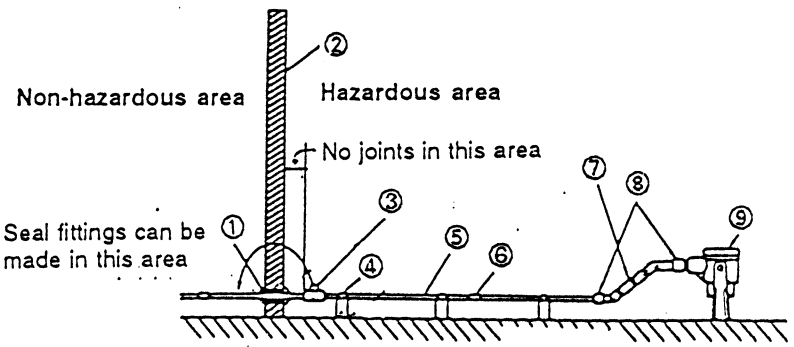

Figure 7-7

NOTE:

- Use an explosion proof and watertight flexible fitting for flexible piping.
- Rain and/or water entering the Gas Detector Unit could cause malfunction and other troubles.

7.3.4 Example of Pressure Tight Explosion Proof Wiring (KD-3A)

The Gas Detector Unit model KD-3A is supplied with necessary packing materials to provide a pressure tight packing for flame/explosion proof wiring of d3acG4 classification.

1) Figure 7-8 shows the various packing materials required for the pressure tight packing.(flame/explosion proof), refer to the table below for the applicable material size to match the outer diameter of the electric cable.

Cable O.D.	Ring packing	Washer
ø10~ø10.9	(hole) ø 11	(hole) ø 12
ø11~ø11.9	ø 12	ø 12
ø12~ø12.9	ø 13	ø 14
*ø13~ø13.9	ø 14	ø14
ø14~ø14.9	ø 15	ø15

All dimensions are mm.
* Standard size materials

2) The packing gland should be tighten securely to obtain a pressure tight fitting between the cable, and make sure that the packing gland is locked with the gland clamp and screw to prevent the packing gland from becoming loose.

2) The *standard size ring packing and washer to match the electric cable of ø13~13.9mm (outer diameter) is normally supplied when there is no specification of the size required.

3) When a conduit tube is connected to the pressure tight packing materials, a d3acG4 explosion proof classification can be maintained.

WARNING

- Before turning the power "ON", make sure that the electric cables between the Gas Detector Units and Gas Monitors are correctly connected.

8 MAINTENANCE

8.1 Routine Check

Make a visual routine check for the following at least once a month:

- For clogged sintered metal
- For corroded sintered metal
- For corroded Gas Detector Unit housing

8.2 Alarm Function (more than once a month)

Prepare a calibration gas mixture of 2 to 3 times the concentration of the preset alarm point and apply to the sensor to check whether alarm functions

8.3 Span Adjustment (more than once annually)

Prepare a calibration gas mixture of a known concentration and conduct a span adjustment. (Refer to Appendix 1 Preparation of calibration gas mixture and application.)

WARNING

- When zero or span adjustment is performed, the Gas Detector Unit must be in a clean air atmosphere. If zero or span adjustment is performed in air contaminated with combustible gas or other gases, the system employed will not give accurate readings.

8.4 Replacement of Sensor

1. Diffusion type Gas Detector Unit - Model KD-2A and KD-3A

WARNING

- The Gas Detector Unit is a Flame/Explosion proof construction and normally installed in a hazardous (explosive) area, for the purpose of replacement of sensor or repairs, it is necessary to isolate the electric power to avoid the danger of fire and/or explosion.

1) Construction

This KD-2A Gas Detector Unit is designed to be explosion proof, and suitable for installation in d2G4 (Explosion Class 2, Ignition Group G4) hazardous location. The KD-3A Gas Detector Unit is designed to be pressure tight (explosion proof) of d3acG4 classification.

Listed below is the illustration together with descriptions of components etc., proceed as following for the replacement of sensor and sinter metal.

(1) Diffusion type Gas Detector Unit

Replacement of sensor and sintered metal

No.	Description
1	Detector housing
2	Metal cover
3	Sintered metal
4	Terminal Sensor
5	Sensor
6	Sensor packing
7	Retaining plate
8	"O" ring
9	M5-16 bolt
10	Spring washer
11	Crimp lug
12	M2-16
13	Spring washer
14	M4-16

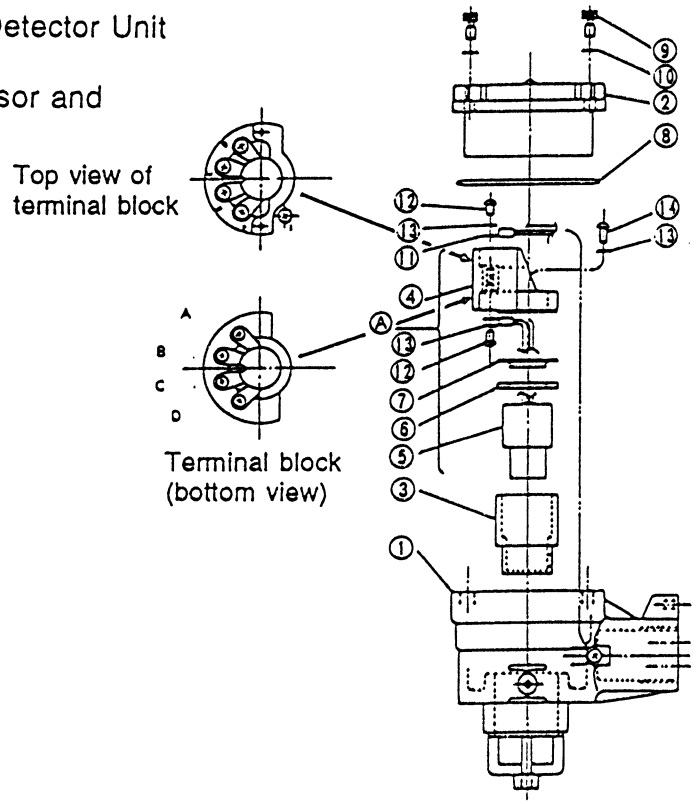

Figure 8-1

Catalytic combustion

Terminal	Wire color
A	Pink
B	Black
C	White
D	Green

Hot-wire sensor

Terminal	Wire color
A	Orange
B	Black
C	White
D	Green

Thermal conductivity

Terminal	Wire color
A	Brown
B	Black
C	White
D	Green

NOTE
All the hardware items (screws, bolts & etc.) including other packing materials ("O" rings & etc.) are of metric specifications, and special attention should be taken not to lose or misplace these articles, in case new supplies or replacement are not immediately available.

2) To open the cover of the Gas Detector Unit,
Use a hex wrench and unscrew the 4 hex socket head bolts (M5-16 SUS) and remove together with the spring washers, then take off the metal cover and "O" ring.

3) All electric lead wires of the sensor are color coded for simple connection to terminal block.

4) Unscrew the 2 machine screws from the terminal block, an lift out the terminal block together with sensor, sensor packing, and retaining plate.

5) Unscrew the 4 machine screws (M4-6) connecting the sensor lead wires to the terminal block and remove the sensor.

6) Take out the sintered metal (flame arrestor.)

2. Replacement of Sensor and Sintered Metal

The sintered metal may become dirty and clogged depending on the location of installation, environment and duration of use, and may require cleaning or replacement.

To clean the sintered metal do not use detergents or solvents, use compressed air to blow off accumulated materials, if the sintered metal can not be cleaned sufficiently, then it would be necessary to secure a new sintered metal for replacement.

A new sintered metal and sensor can be obtained from your authorized dealer.

1) Place the new sintered metal at the bottom of Gas Detector Unit.

2) Take a new sensor and run the lead wire through the sensor packing and retention plate, then connect to appropriate terminal.

The sensor is supplied with color coded lead wires to facilitate connection to the proper terminal position, please refer to the tables listed below for the correct connections with terminal block.

3) Attach the terminal block with 2 screws and washers, apply the screws hand tight and position the rubber packing and retaining plate properly before securely tightening

4) Place the "O" ring on the rim of Gas Detector Unit, set the metal cover in position, attach the hex socket head cap bolts with washer and use a hex wrench to tighten evenly and securely.

9 SPECIFICATIONS

Specifications	Model KD-2A	Model KD-3A
Operating temperature	Minus 10° to 40°C (14° to 104°F)	
Explosion proof grade	d2G4	d3acG4
Applicable conduit	G22	G22 w/pressure tight packing
Applicable cable	Stranded copper wire conductors (Circular cross-section with smooth surface) 4- conductor (600V vinyl insulated electric cable)	
Length of cable	Gas Monitor - Gas Detector Unit Size / Length 0.75mm² max. 200m (656 ft.) 1.25mm² max. 600m (1,968 ft.) 2.0mm² max. 1,000m (3,280 ft.)	
Finish (coating)	Munsell 5 YR 6/13	
Weight	Approximately 1.2 kg (2.6 lbs)	

Standard Accessories

Hex wrench	1 set
Instructions Manual	1 copy

Optional Accessories (to be ordered separately)

Rain protective housing, Model KW-11 (diffusion type)
Rain protective housing, Model KW-12
Rain protective cap, Model KW-21