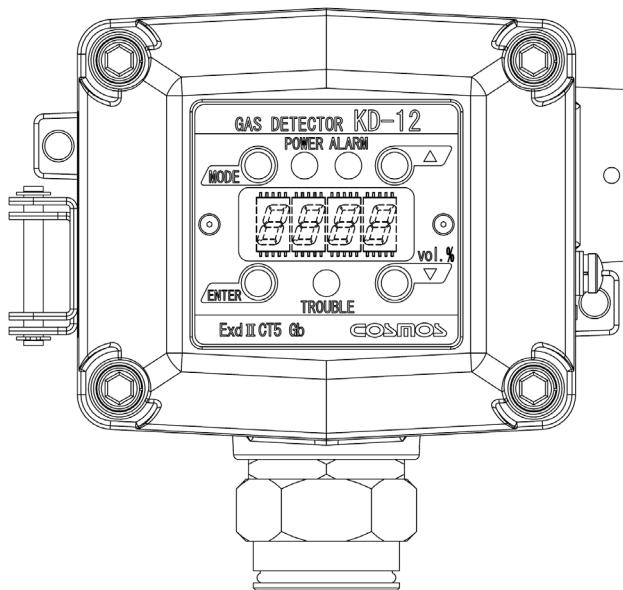


# Diffusion type Gas Detector

## Model KD-12

### Instruction Manual



- Keep this instruction manual where it is readily accessible.
- Thoroughly read this instruction manual before using the equipment so it can be used safely and correctly.
- This manual provides information concerning standard specifications. If the specifications of your model are nonstandard, refer to the delivery specifications.



New Cosmos Electric Co., Ltd.

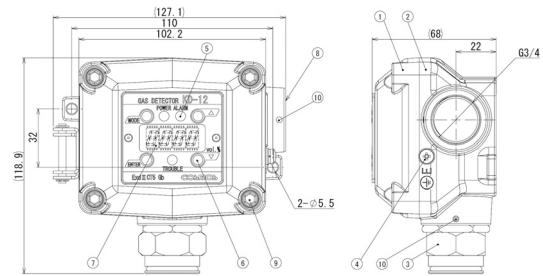
Instruction Manual No.

GAE-056-00

July 2014

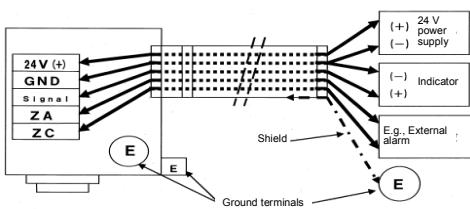
## • Nomenclature

See pages 5 to 7.



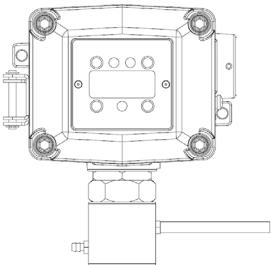
## • Wiring and Connecting Methods

See pages 13 to 16.



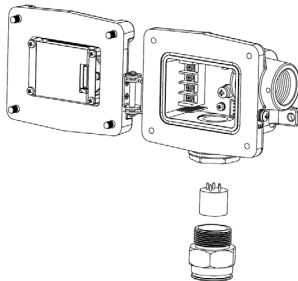
## • Maintenance Check and Operation Methods

See pages 21 to 28.



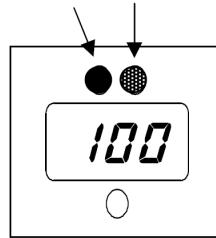
## • Replacement of Sensor Unit

See pages 22 and 23.



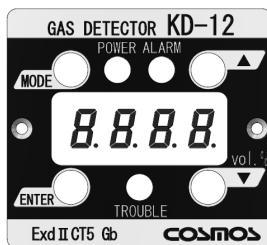
## • Display and Operation in Each Mode

See page 19.



## • Troubleshooting

See page 29.



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# 1. Introduction

- Thank you for purchasing the KD-12 Diffusion type Gas Detector.
- In order to ensure the correct and safe operation of this product, be sure to read this manual before use.
- This product detects oxygen leaks and oxygen deficiency in working environments of semiconductor manufacturing plants. It displays the oxygen concentration and also outputs an analog signal (4 to 20 mA DC) indicating the oxygen concentration to an external device. If a preset oxygen concentration is reached, the red alarm lamp and alarm relays will operate, making this Detector useful in monitoring oxygen concentrations.
- Maintenance and inspection are indispensable to the reliable performance of the Gas Detection/Alarm System. Be sure to perform the maintenance checks described in this manual.

## Explanation of Symbols

The following symbols are used to indicate and classify precautions in this manual.

 <b>DANGER</b>	Indicates information that, if not heeded, is likely to result in death or serious injury.
 <b>WARNING</b>	Indicates information that, if not heeded, could possibly result in death or serious injury.
 <b>CAUTION</b>	Indicates information that, if not heeded, could result in minor injury, or damage to the product.
 <b>MEMO</b>	Indicates advice on handling the product.

## 2. Precautions

- Read this manual completely and be sure you understand the information provided herein before attempting to use the product.
- Abide by all applicable laws and regulations when using this product.

### **WARNING**

- Be sure to ground the product to prevent electric shocks.
- If there is a gas leak alarm, take the necessary measures in accordance with your company's regulations.
- The cable entry device and blanking elements shall be of ATEX certified in type of explosion protection flameproof enclosure "d", suitable for the condition of use and correctly installed.
- Unused apertures shall be closed with suitable ATEX certified blanking elements.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm<sup>2</sup>.

### **CAUTION**

- All necessary work for the product including wiring and installation should be carried out by suitably trained personnel in accordance with applicable code of practice.
- Inspection, maintenance and repair of the equipment should be carried out by suitably trained personnel in accordance with applicable code of practice.
- Do not disassemble the product or modify the construction or electric circuits of the product. Otherwise, the explosion-proof construction of the product may be adversely affected.
- Be sure to provide a protective cover (optional) if the product is installed outdoors.
- Use the product in accordance with applicable laws and regulations.
- Due to the presence of high concentrations of SO<sub>2</sub> and Cl<sub>2</sub> gases, the sensor life may be reduced and the error margin may increase.
- Measurements performed when the atmospheric pressure of the measurement environment is different from standard atmospheric pressure (example, at a high altitude) do not show the correct value because of pressure dependence.

## **Special Condition for Safe Use**

- Use in ATEX hazardous area, ATEX certified cable glands according to EN 60079-0:2012 and EN 60079-1:2007 shall be provided by end-user.
- Use in IECEx hazardous area, IECEx certified cable glands according to IEC 60079-0:2011 and IEC60079-1:2007 shall be provided by end-user.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm<sup>2</sup>.
- Requirement of cable entry:
  - Thread size of cable entry .....G3/4 or PF3/4
  - Depth of engagement .....10.86mm
  - Threads engagement .....6
- The dimensions of flameproof joint between casing and casing cover of KD-12 flameproof housing are exceeding the minimum requirements stated EN/IEC60079-1. Please contact the manufacturer for inspection, repair and/or adjustments of this flameproof.

### 3. Contents of Package

- The product is provided with the following items. Make sure that none of these items is missing.
- Although the product is packed and shipped with the utmost care, contact your New Cosmos representative if there should be any damage or missing items.

Accessories	Optional items
Detector head Accessory set Two M5 screws: 2 pcs M4 x 4 hexagon socket head screw:1pc  Hexagon wrench (nominal dia. 4): 1 each (see note 1) Instruction Manual (see note 1) MJ-1 Magnetic Stick (see note 1)	Protective cover (see note 2) Horizontal type: KW-41 Vertical type: KW-42 PB-1 2B Pole Mounting Bracket (see note 2) GCP-09 Calibration Cap (see note 2) Z-001K Gas Calibration Kit 2 bulb hand pump Capillary for 2 bulb hand pump

Note: 1. A hexagon wrench, Instruction Manual, and MJ-1 Magnetic Stick are provided for each order.

2. The optional items are for use only with KD-12.

#### **WARNING**

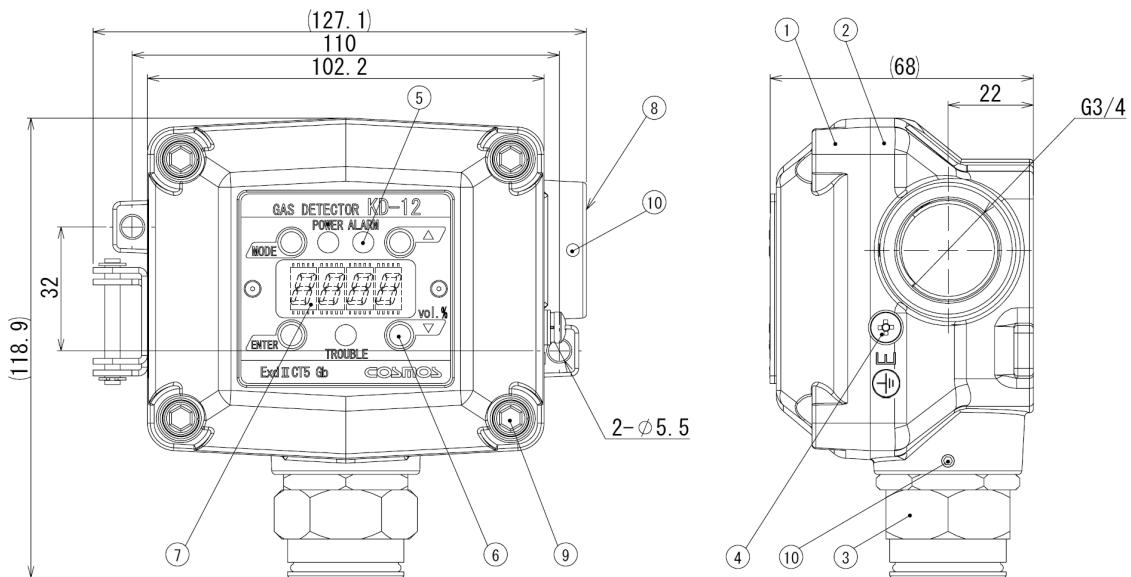
- Do not use the magnetic stick for any purposes other than the operation of this product.
- Keep any magnets away from the equipment except MJ-1 magnetic stick.
- Keep in mind that when the magnetic stick attracts magnetic objects, tools, iron pieces, etc., your hands may become pinched and injured.
- Do not touch the magnet if you are allergic to metal, otherwise your skin may become chapped or reddened.
- Generally speaking, magnets break easily and the corrosion of the magnet progresses from the fracture location. Fragments of the magnet may also get in your eyes or injure your skin.
- The components of the magnetic stick may melt into water. Do not drink water exposed to the magnetic stick.
- Keep the magnetic stick away from electronic medical devices, such as cardiac pacemakers, or the magnetic stick may obstruct the normal operation of the device.

#### **CAUTION**

- Keep the magnetic stick away from magnetic tapes, floppy disks, and prepaid cards. Otherwise, they may become magnetized and the information that they hold may be lost.
- Keep the magnetic stick away from high-precision devices, such as personal computers and watches. Otherwise, they may malfunction.

## 4. External Dimensions and Nomenclature

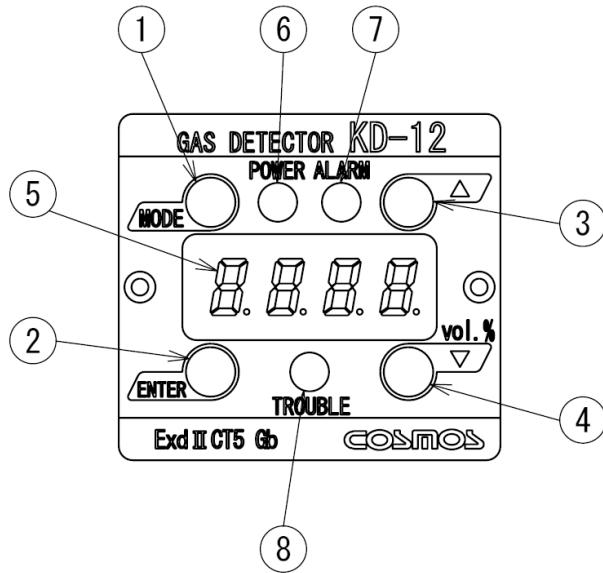
### 4-1. Main Unit



Number	Name	Description
1	Casing cover	
2	Casing	
3	Sensor unit	Incorporates a gas sensor.
4	Ground terminal	Used when grounding the frame.
5	State display indicator	Indicates the power supply state (green), alarm state (red), and trouble state (yellow).
6	Control block	Insert the magnetic stick to control or set the product.
7	Display block	Displays the gas concentration and set values.
8	Cable entry	PF3/4 or G3/4, pitch=1.81mm, Insertion length: 10.86mm, No. of insertion threads: 6. Certified cable glands <sup>*1</sup> must be provided by end user and used.
9	Hexagon socket head cap screw	Used for securing the Casing cover. Use a hexagon wrench with a nominal diameter of 4 mm.
10	Hexagon socket set screw	Used for securing the cable glands or sensor units. Use a hexagon wrench with a nominal diameter of 2 mm.

\*1: Used in ATEX hazardous, ATEX certified cable glands according to EN60079-0:2012 and EN60079-1:2007. Used in IECEx hazardous area, IECEx certified cable glands according to IEC60079-0:2011 and IEC60079-1:2007.

## 4-2. Display and Control Blocks



Magnetic switches  
(Insert the magnetic stick to operate the magnetic switches.)

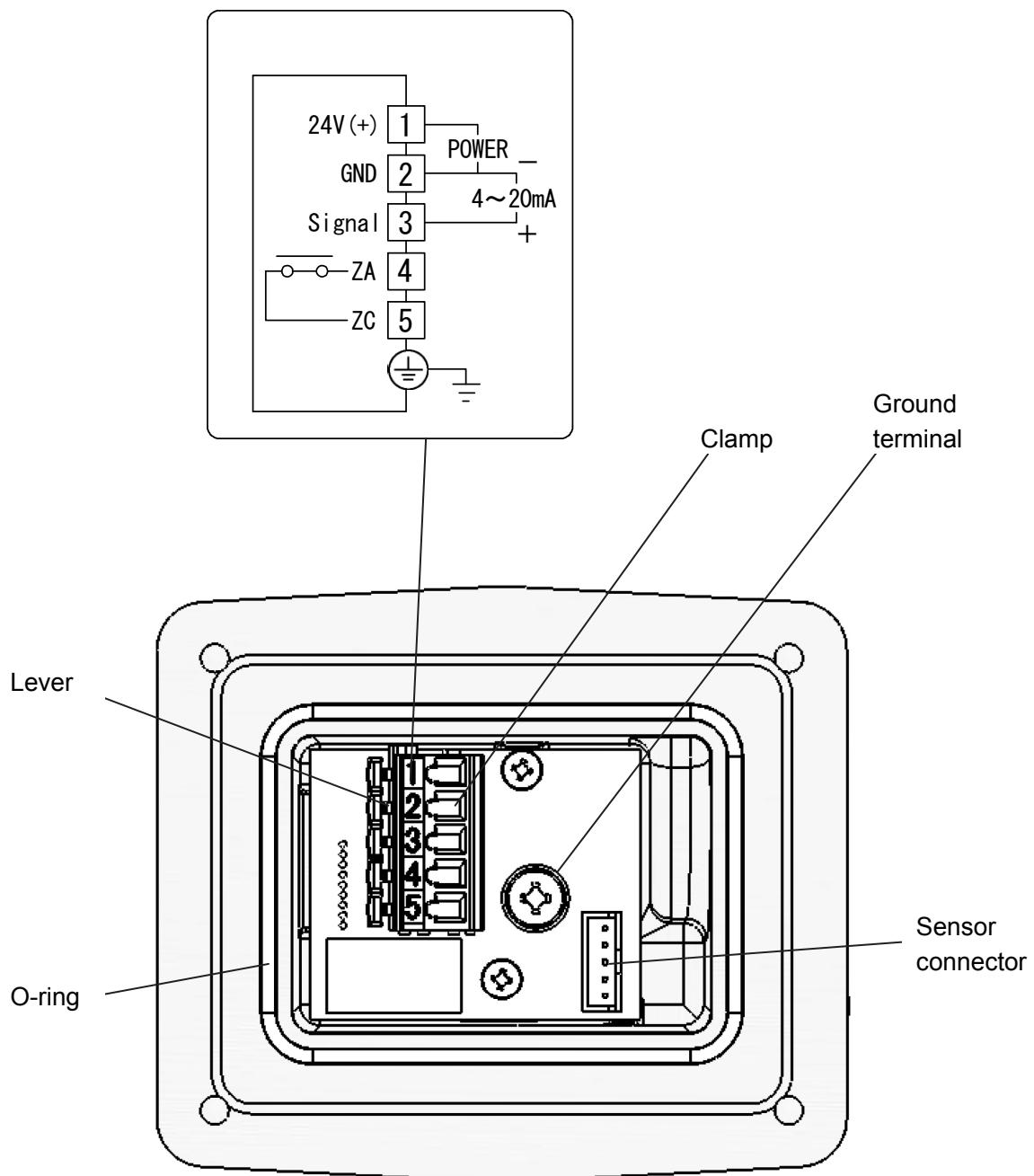
Number	Name	Description
1	MODE switch	Makes adjustments and settings or cancels the operation of the product.
2	ENTER switch	Enters settings or completes the control of the product.
3	▲switch	Makes adjustments and settings or increases set values and other values.
4	▼ switch	Decreases set values and other values.

Number	Name	Description
5	Display block	Displays the gas concentration and set values.

State display indicator

Number	Name	Description
6	POWER indicator	A green lamp to display the power supply state.
7	ALARM indicator	A red lamp to display the alarm state.
8	TROUBLE indicator	A yellow lamp to display the trouble state.

### 4-3. Terminal Block



Number	Name	Description
1	24 V (+)	Power supply voltage (positive)
2	GND	Power supply voltage (-) and analog signal (negative) common
3	Signal	4- to 20-mA (+) analog signal
4	ZA	External contact
5	ZC	
$\ominus$	Ground terminal	Used to ground the frame.

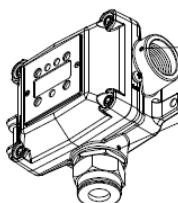
## 5. Installation

### 5-1. Installation Method

#### **WARNING**

- The cable entry device and blanking elements shall be of ATEX certified in type of explosion protection flameproof enclosure "d", suitable for the condition of use and correctly installed.
- Use in ATEX hazardous area, ATEX certified cable glands according to EN 60079-0:2012 and EN 60079-1:2007 shall be provided by end-user.
- Use in IECEx hazardous area, IECEx certified cable glands according to IEC 60079-0:2011 and IEC60079-1:2007 shall be provided by end-user.
- Unused apertures shall be closed with suitable ATEX certified blanking elements.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm<sup>2</sup>.
- The dimensions of flameproof joint between casing and casing cover of KD-12 flameproof housing are exceeding the minimum requirements stated EN/IEC60079-1. Please contact the manufacturer for inspection, repair and/or adjustments of this flameproof.
- Installation of cable gland and sensor:

-Casing to cable glands	-Casing to sensor
Thread size : PF3/4 or G3/4	Thread size : M27
Pitch : 1.81mm	Pitch : 1.5mm
Insertion length : 10.86mm	Insertion length : 8.25mm
Number of insertion threads : 6	Number of insertion : 5.5
- Shall lock the sensor unit and cable gland by the stainless steel socket head screw before use.



Look by the socket head set screw

Socket head set screw specifications  
Size:M4

Length for sensor unit: 3 or 4mm  
Length for cable gland: 3 or 4 or 5 or 6mm  
Material:Stainless steel

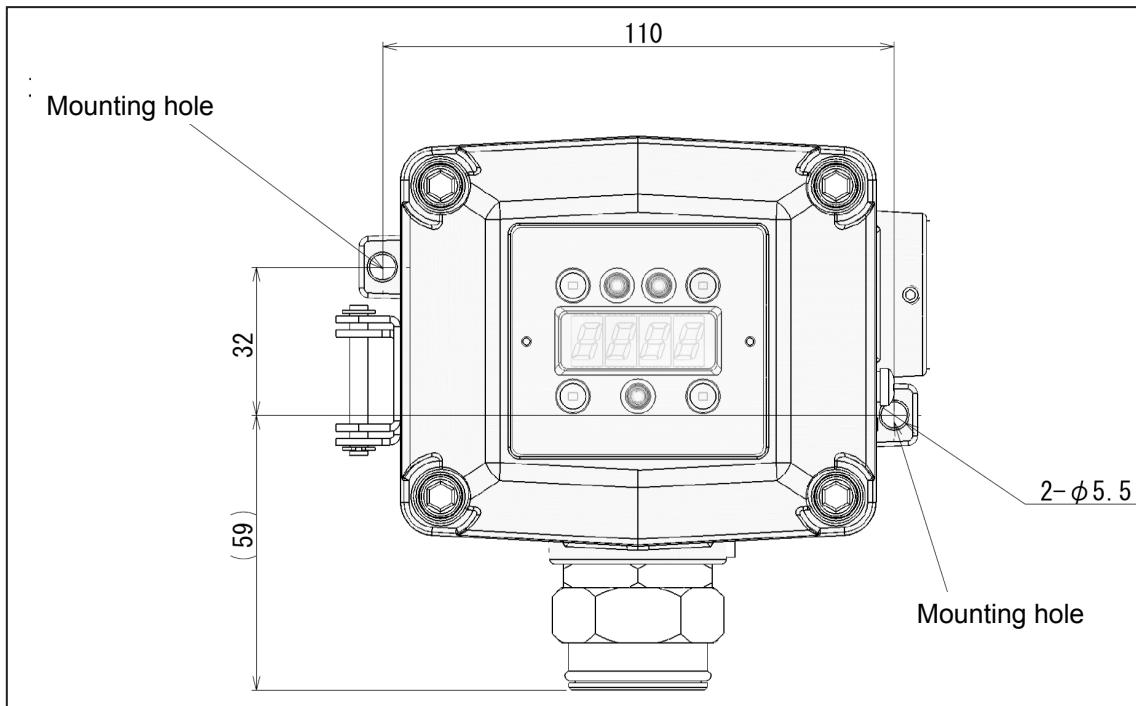
\* Top of socket head screw shall not be over the casing surface.



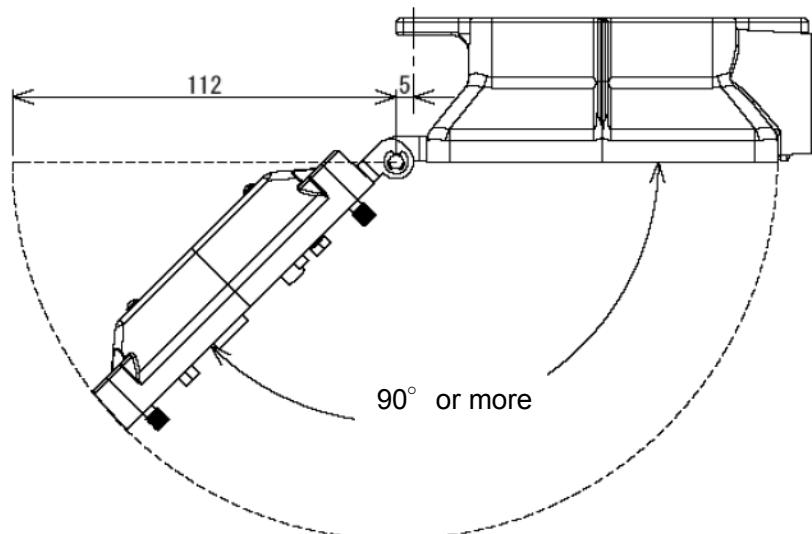
## CAUTION

- Be careful not to damage the gas detector when installing it. Otherwise, the explosion-proof performance of the gas detector will be lost.
- Do not install the product in the following places.
  - Places where the ambient temperature exceeds the operating temperature range (-10°C to 40°C).
  - Places where condensation occurs.
  - Places where water is directly sprayed.
  - Places subject to corrosive gas.
  - Places near to devices generating high frequency and magnetism.
- Install the gas detector in places where can be maintained and inspected with ease.
- Install the gas detector in places free from vibration.
- Install the gas detector in places free from sudden temperature changes.
- Keep the gas detector free from impacts.
- When installing the gas detector outdoors, be sure to install the protective cover (optional).
- Mount the gas detector at a height where maintenance inspection can be performed easily and considering the fact that oxygen deficiency (anoxia) occurs easily at a height of 75 to 150 cm from the floor.

- Mount the main unit to the wall with the M5 screws that are provided with the product. Be sure to install the protective cover (optional) when mounting the main unit outdoors. Mount the main unit with a 2B pole mounting bracket (optional) when mounting the main unit to a 2B pole. Refer to *5-3 Mounting of Options* for details of optional products.

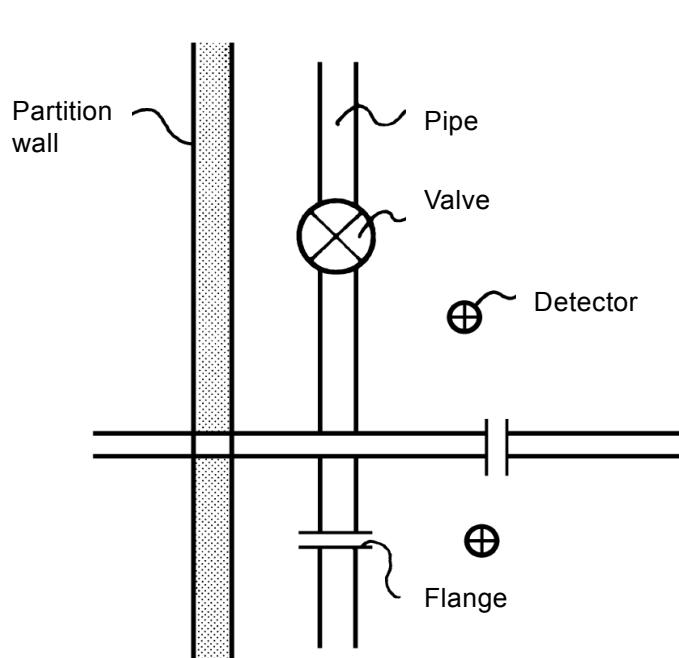
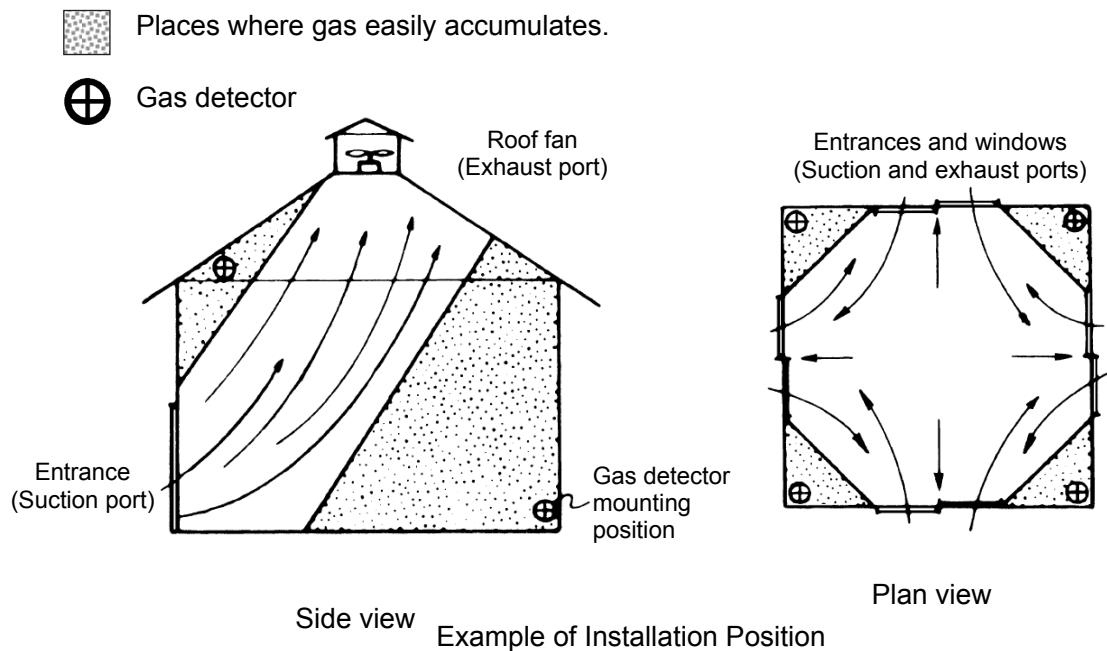


- The casing cover of the gas detector needs to be opened at the time of wiring. Therefore, when installing the gas detector, provide sufficient space to enable the casing cover to be opened to at least 90°.



## 5-2. Examples of Installation Positions

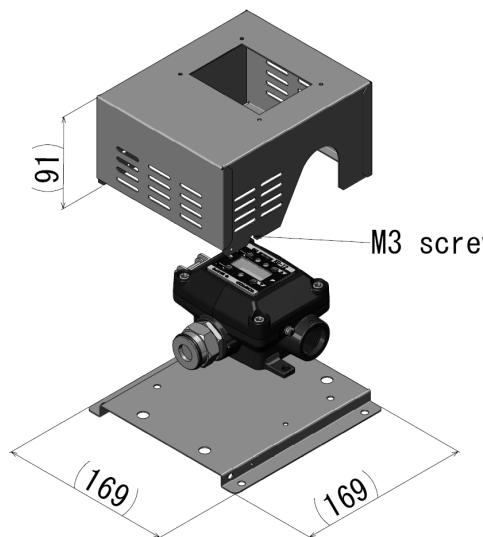
- Install the product in places where gas easily accumulates.



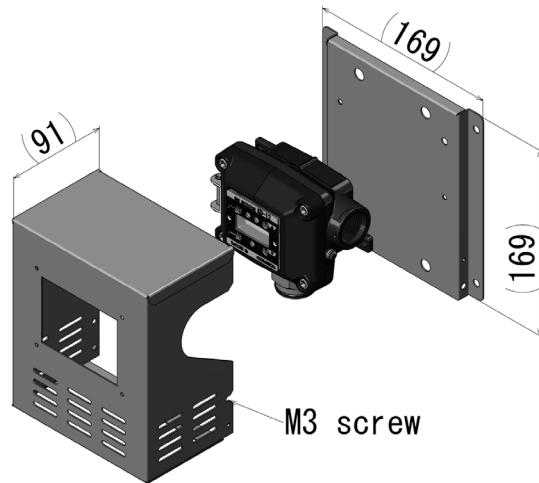
Example of Outdoor Installation Position

### 5-3. Mounting of Optional items

- Protective Cover



Horizontal Type (KW-41)



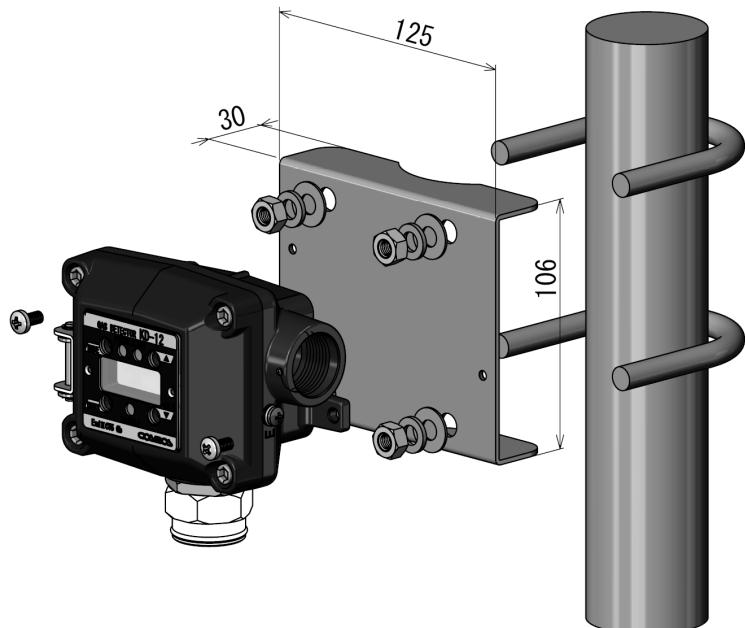
Vertical Type (KW-42)



#### CAUTION

- Secure the casing cover with M3 screws if strong winds are expected.

- 2B Pole Mounting Bracket



## 6. Wiring Method

### 6-1. Wiring Work

- Be sure to provide explosion-proof wiring if the product is to be used in a hazardous area.



#### **WARNING**

- The cable entry device and blanking elements shall be of ATEX certified in type of explosion protection flameproof enclosure "d", suitable for the condition of use and correctly installed.
- Unused apertures shall be closed with suitable ATEX certified blanking elements.



#### **CAUTION**

- All necessary work for the product including wiring and installation should be carried out by suitably trained personnel in accordance with applicable code of practice.
- Inspection, maintenance and repair of the equipment should be carried out by suitably trained personnel in accordance with applicable code of practice.

#### Cable Work

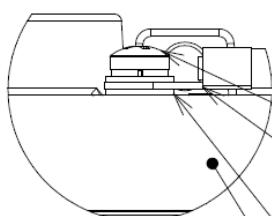
- Use a shielded cable, such as CVV-S with a thickness of 1.25 to 2.00 mm<sup>2</sup>. Lay all cables in protective tubes, such as metal conduits or carbon steel pipes, or other protective structure, such as a concrete duct.
- When using the external contact function of the product, which requires a five-conductor cable, make sure that the maximum diameter of the cable conductor is 1.25 mm<sup>2</sup>. When using only the analog signal function, which requires a three-conductor cable, without the external contact function, make sure that the diameter of the cable conductor is 12.5 mm<sup>2</sup> or 2.00 mm<sup>2</sup>.

## 6-2. Wiring and Connection



### WARNING

- Before opening the casing cover of the gas detector, be sure to turn off the product and all devices (e.g., indicator unit and signal converter) connected to the product.
- If the power is turned ON, the power supply may become a source of ignition.
- Be sure to ground the product to prevent electric shocks.
- Shall use a conductor which is at least M4 size by solderless, for external earthing.
- Shall place the stainless steel plain washer between casing and terminal.



Screw with captive washer  
Size:M4x8L  
Material:Stainless steel  
Washer type:Spring washer and Plain washer

Cable lug (minimum 4mm<sup>2</sup>)

Plain washer  
Size:Nominal diameter 4  
Material:Stainless steel

Casing



### CAUTION

- Wire the connecting terminals correctly.
- Separate connection cables from power lines as far as possible.
- When closing the casing cover, make sure that the power supply cords, harness, and O-ring are not caught in the casing cover.

#### Connecting Power Supply and Signal Wires

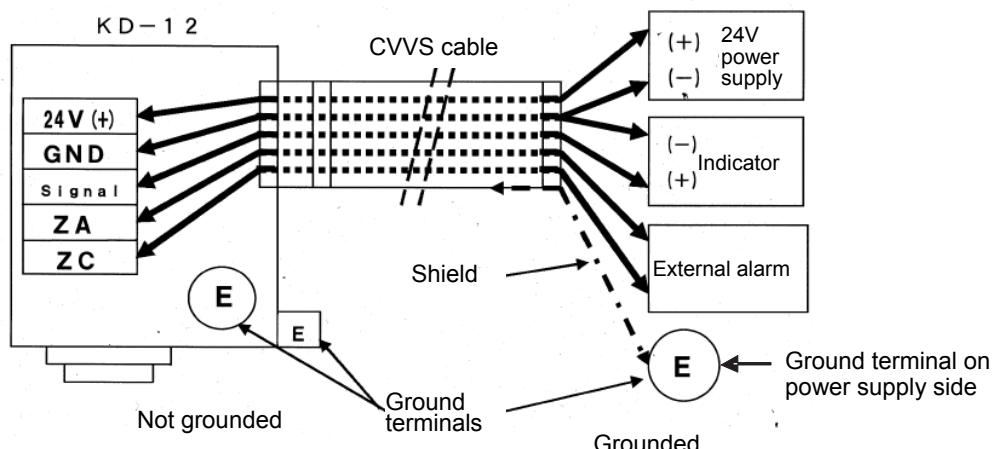
- Provide dedicated breakers, if needed, to lines that are connected to peripheral devices, such as indicator units and signal converters.
- Use a dedicated cable, such as CVV-S (with a thickness of 1.25 to 2.00 mm<sup>2</sup>).
- Make sure that the power supplied to the product is within the specified voltage range.
- Make sure that the load resistance of the signal line, including the resistance of the wire, is 300 ohm or less.

## 6-2. Wiring and Connection (Continued)

### MEMO

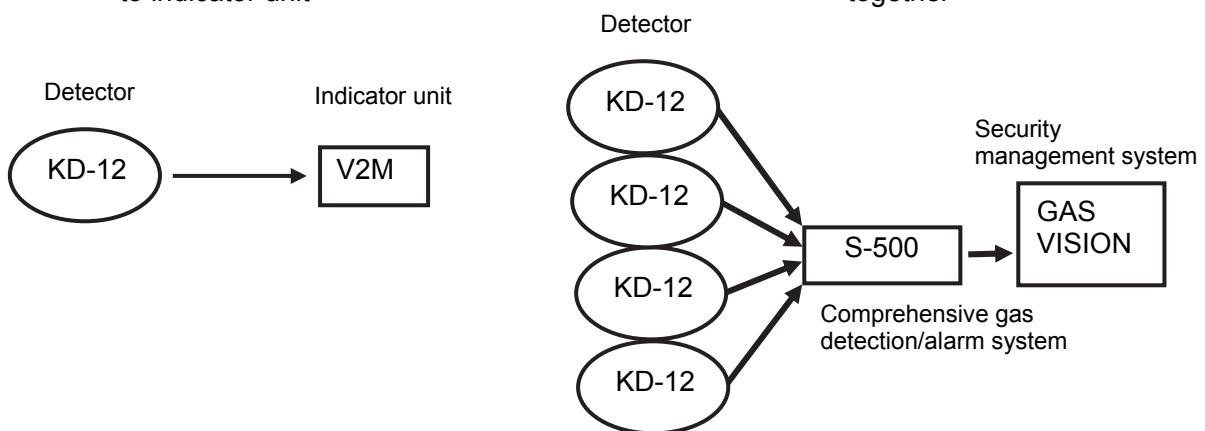
- If the main unit is grounded on the power supply side, do not connect a shielded cable to the ground terminal (E) in the gas detector, or otherwise two-point grounding will result.

Connection



Example with Power Supply Side Grounded

System Configuration Example  
Single detector connected to indicator unit      Multiple detectors monitored together

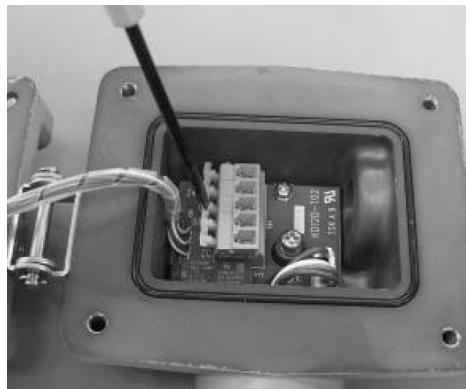


For details, refer to the Instruction Manual of each device.

## 6-2. Wiring and Connection (Continued)

### Typical Connection Procedure

- (1) Prepare a power supply that can provide 24 V.  
(Do not turn on the power supply before wiring the main unit.)
- (2) Loosen the hexagon socket bolts on the four corners of the main unit using the provided hexagon wrench with a nominal diameter of 4 mm, and open the casing cover of the main unit.
- (3) Press the lever of the terminal block with a flat-blade screwdriver.
- (4) The clamp will open. Insert the lead wire.
- (5) Connect the positive side of the power supply to the 24 V+ terminal.
- (6) Connect the negative side of the power supply to the GND terminal.



- (7) The lead wire will be automatically secured when the screwdriver is lifted.
- (8) Check that the power supply cords are securely connected to the terminals. This completes the power supply preparations.
- (9) Wire the analog signal and external contact terminals, if required.
- (10) Tighten the hexagon socket bolts (tightening torque: 0.8-2.4 N·m) on the four corners of the main unit and close the casing cover of the main unit.



### CAUTION

- When lowering the lever of the terminal block, be careful not to allow the flat-blade screwdriver to slip off of the lever. Otherwise, the flat-blade screwdriver may damage the sensor unit code or circuit board.
- When closing the casing cover, make sure that the power supply cord, harness, and O-ring are not caught by the casing cover.

## 7. Precautions before Use



### CAUTION

- Before turning ON any of the devices (e.g., indicator unit, signal converter) connected to the product, recheck that all of the connections are correct. Make sure that the gas detector and indicator unit or signal converter, in particular, are connected properly.

#### ● In Case of Oxygen Deficiency



### DANGER

- Always enter the detection site after making sure that it has approximately the same oxygen concentration as the atmosphere. If the concentration of oxygen is below 18.0 vol%, it may result in death due to anoxia.



### WARNING

- If there is a alarm, take the necessary measures specified by your company.
- If a gas leak occurs indoors, open the windows and doors to ventilate the room.
- Check the gas leakage location and promptly take the necessary measures.
- Measure the gas concentration with a portable gas detector and confirm the safety before entering the detection site.

## 8. Display at Start-up (Initial Delay)



### CAUTION

- If the sensor output is not stable, the external contact point may operate after the initial delay. Release the interlock of the external equipment if necessary.
- During the initial delay, there is a fixed output of the analog signal corresponding to the standard oxygen concentration 21.0 vol%. The external contact does not operate.

- (1) When the power supply is turned ON, all of the indicator lamps (green, red, and yellow lamps) and the display block are lit.



- (2) While the indicator lamps (green, red, and yellow lamps) are lit, the following items will be lit for approximately 1 second each.

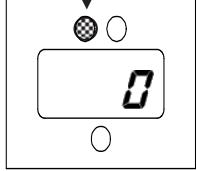
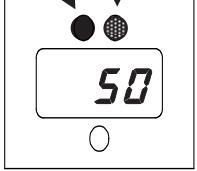
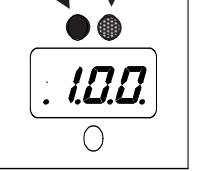
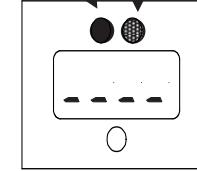
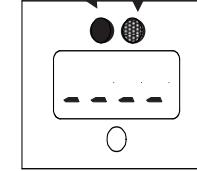
Software version number (of the main unit)	ex) <b>[ 123 ]</b>
Full scale	ex) <b>[ 100 ]</b>
Alarm set value	ex) <b>[ 25 ]</b>

- (3) Then the POWER indicator (green lamp) will be flashed for approximately 1 minute.  
(4) When the POWER indicator is lit, the start-up of the main unit is completed and the main unit will be in gas monitor mode.

#### MEMO

- The operation with the magnet stick is not available during the initial delay.
- The initial delay lasts for approx. 10 seconds after the power supply is turned ON.
- More than one minute after turning on the detector, make the zero adjustment and span adjustment. Refer to 11.3 Calibration Method for the adjustments.

## 9. Display and Operation in Each Mode

	At start-up (Initial delay)	In excess of alarm set value			
		Gas monitor mode	Test mode	Maintenance mode	
		Gas monitor mode		Test mode	
Contents of display	<p>Green lamp flashes</p>  <p>Gas concentration is displayed.</p>	<p>Red lamp flashes</p>  <p>Gas concentration is displayed.</p>	<p>Red lamp flashes</p>  <p>A full-scale test from 0% to 110% is possible.</p>	<p>Red lamp flashes</p>  <p>[Gas concentration] Displayed alternately</p>	<p>Red lamp flashes</p>  <p>[Test value] Displayed alternately</p>
Analog signal 4 to 20 mA	Fixed at 4 mA	Value that is proportional to the gas concentration is output	Test value is output	Value that is proportional to the gas concentration is output	Test value is output.
Contact operation	Does not operate (OFF).	Operates (ON).	Operates (ON).	Does not operate (OFF).	Does not operate (OFF).

## 10. Trouble Alarm

- The product has a self-inspection function, and the trouble alarm will operate if a problem occurs.
- The product will inform the user of the problem details with the display shown in the following table when the trouble alarm operates.
- When the trouble alarm is generated, the analog signal will be approximately 0.9 mA or below.

Screen display	Trouble indicator	Problem details	Probable cause	Remedy
<b>E-24</b>	Yellow lamp flashes	Power supply voltage drop error	The power supply voltage is low.	Check the power supply voltage.
<b>HHHH</b>	Yellow lamp flashes	Over full scale	The span adjustment may not be correct.	Make a span adjustment again.
<b>LLLL</b>	Yellow lamp flashes	Sensor Zero error	The sensor connector is disconnected or the sensor wire has broken.	Check that the sensor and the sensor connector are securely connected.
			The sensor output is low.	Make the zero point adjustment with the gas doesn't lie between air around the equipment.
<b>E- 4</b> <b>E- 5</b>	Lamp is OFF	Span adjustment error	The Detector may not have been surrounded with clean air during span adjustment.	After checking the environment around the Detector, make the 21.0 vol% adjustment again. If the Detector still cannot be adjusted, make the span rough adjustment.
			The life expectancy of the sensor may have expired.	Replace the sensor unit.

- If a screen other than the above is displayed, refer to the 12. Troubleshooting section. If the product does not reset to normal operation after taking the measures shown in the table or if the problem is not listed in the table, contact your local representative.
- If the product goes into any unintended mode during adjustment or setting, cease operating the product and contact your local representative..

## 11. Maintenance Check and Operation Method

### 11-1. Daily Inspection and Periodical Inspection

- Daily inspections are conducted by the user, while periodical inspections are conducted by your local representative.

	Frequency	Checking item	Contents of inspection
Daily inspection	At least once per month	Visual inspection	<ul style="list-style-type: none"><li>▪ The status of lamp (green POWER indicator) is lit.</li><li>▪ The concentration display of the gas concentration indicator.</li><li>▪ Clogging of sensor unit mesh.</li><li>▪ Corrosion of sensor unit mesh.</li><li>▪ Corrosion of the main unit.</li><li>▪ Corrosion of mounting screw.</li></ul> If a failure is found, replace the parts.
Periodical inspection	Once per month	Alarm operation test	Make sure that the alarm of the Detector is operating properly. For details about how to perform the alarm operation test, refer to Test Mode.
		21.0 vol% confirmation	Make sure that the displayed value in clean air is 21.0 vol%. If not, perform the span adjustment. For details about how to perform the span adjustment, refer to 21.0 vol% Adjustment.
	Once per year	Replace the Oxygen sensor unit	Replace the oxygen sensor, and then calibrate it. For details about how to replace and calibrate the sensor, refer to 11-2. Replacement of Sensor Unit and 11-3. Calibration Method.

### Periodical Inspections

In order to maintain the reliability of the gas detection/alarm system, it is extremely important to conduct maintenance and inspections.

It is highly recommended that you consider periodical inspections under a maintenance contract with your local representative.

## 11-2. Replacement of Sensor Unit

### **WARNING**

- Be sure to turn OFF the indicator unit, signal converter or main body equipment before replacing a sensor unit. Otherwise, they may become a source of ignition.
- Be sure that the sensor and the sensor connector have been firmly connected to the detector before the power is turned on. If the sensor and the detector are incorrectly connected, the detector cannot detect gas.
- The dimensions of flameproof joint between casing and casing cover of KD-12 flameproof housing are exceeding the minimum requirements stated EN/IEC60079-1. Please contact the manufacturer for inspection, repair and/or adjustments of this flameproof.

### **CAUTION**

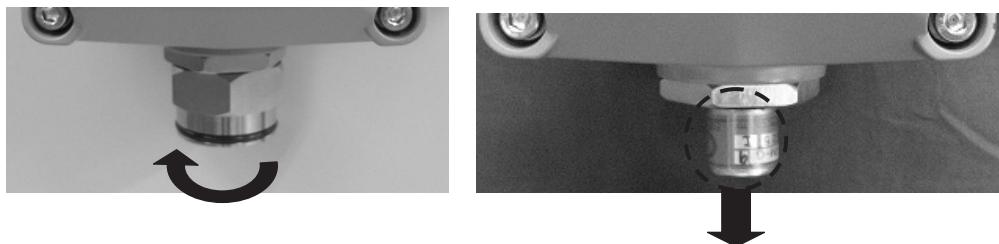
- Only your local representative's maintenance service members or personnel who have completed a maintenance seminar can replace the sensor unit.
- The external contact may operate when replacing the sensor unit if the sensor output is not stable. Release the interlocks of the external devices if needed.
- Replace the oxygen sensor (model: OS-3M-G) once a year.
- The effective storage period of oxygen sensors for replacement is one month from the time of manufacture. Be sure to use the sensors before the end of their usable period. (The year and month of manufacture are given on the oxygen sensor package.)
- The oxygen sensor has positive and negative polarity. Be sure to check the polarity when replacing the sensor.
- When setting the oxygen sensor, make sure that the sensor pins do not damage the sensor socket, which may result in a loose connection.
- Make sure that the mesh of the sensor casing is free of dirt or dust. Clean the mesh before installing the sensor casing to the detector.
- Handle the sensor with care. Do not drop or throw it. Dropping or throwing the sensor may cause liquid to leak or may result in malfunctioning.
- Be sure to handle the sensor unit with care. Do not drop or throw the sensor unit. Failure to do so may lead to broken wire or sensor failure.
- When removing or mounting the sensor unit, do not twist the harness of the sensor connector.
- When closing the casing cover, make sure that the power supply cord, harness, or O-ring is not caught by the casing cover.

### **MEMO**

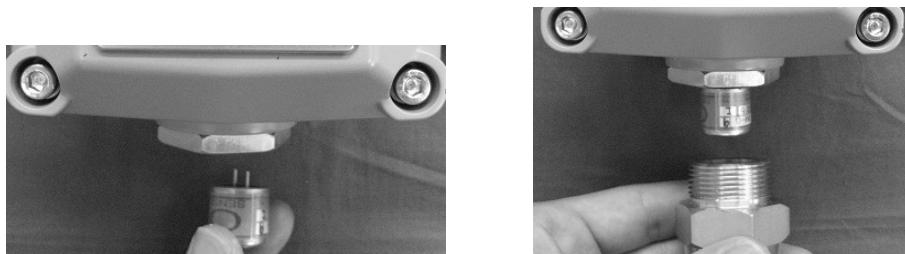
- Return the used sensor unit to your local representative.
- After replacing the sensor, stabilize the sensor by turning it ON for approx. 1 minute, and then perform the span adjustment.
- To adjust the gas concentration after replacing the sensor, always perform the span rough adjustment first, followed by the 21.0 vol% adjustment
- If any error is displayed, refer to 10. Trouble Alarm.

## 11-2. Replacement of Sensor Unit (Continued)

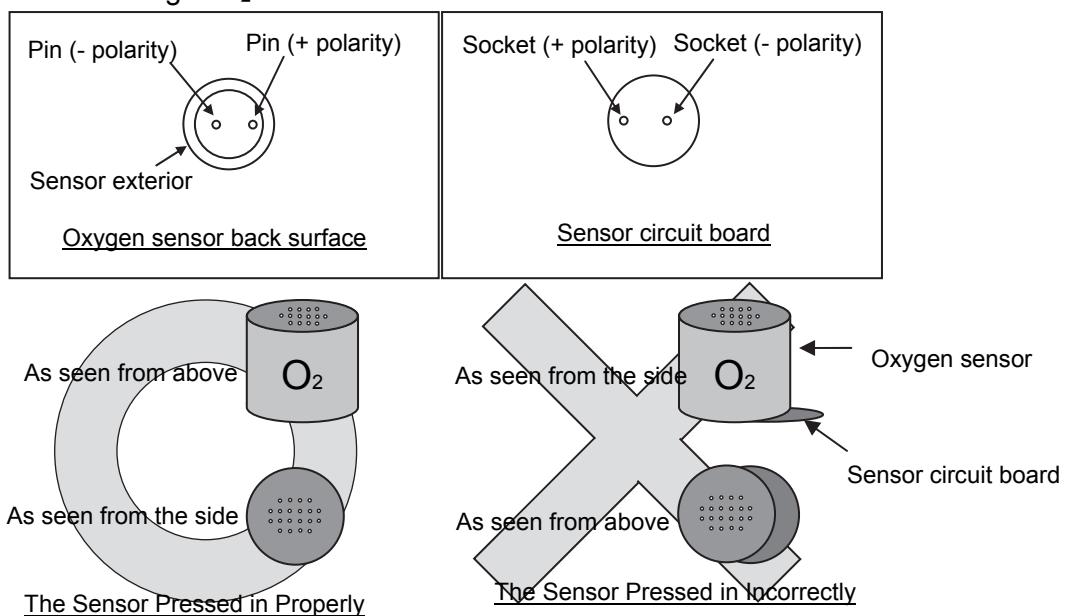
- 1) Turn OFF the power supply to the Detector.
- 2) Remove the sensor casing cover by rotating it in the direction of the arrow. (See the photograph below on the left.)
- 3) Pull down the sensor to remove it. (See the photograph below on the right.)



- 4) Connect the sensor. (See the photograph below on the left.)  
Insert the pins (+) (-) of the oxygen sensor to match the sockets (+) (-) of the sensor circuit board, and then press the sensor lightly. For details, see the following figures. Make sure that the pins of the oxygen sensor are straight with respect to the sockets of the sensor circuit board, and then push in the sensor.
- 5) Finally, close the sensor casing cover. (See the photograph below on the right.)  
Make sure that no dirt or dust is trapped in the sintered wire mesh of the sensor casing, and install the sensor after cleaning the wire mesh.



### 【Reference Figures】



### 11-3. Calibration Method

#### ● Maintenance Mode

#### CAUTION

- While in maintenance mode, the external contact does not operate when the concentration of gas reaches or exceeds the alarm set value. The product in maintenance mode maintains the current status while the display shows [ - - - - ]. This mode is canceled by repeating the same operation(1 to 4), turning the product OFF, or waiting 8 hours.

- (1) While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
- (2) The main unit displays **CAL** first, followed by **. . . 0**.  
(The product is ready to work but nothing has been operated.)
- (3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to **. . . 0**.



[ - - - - ]  
↓  
[Gas concentration]

- (4) Press the ENTER switch of the main unit.
- (5) When the above items are displayed alternately, the product has been set to maintenance mode.
- (6) Upon completion of this mode, the product will automatically return to gas monitor mode. **- - - -**
- (7) While **- - - -** is displayed, the maintenance mode is being executed.
- (8) This mode will be canceled by repeating the same operation (1 to 4 above), turning the product OFF, or waiting for 8 hours.

Carefully handle and make settings with the magnetic stick because the magnet is very powerful. For details, refer to 3. *Contents of Package*.

## ● Span Rough Adjustment

This adjustment mode is used after replacing the sensor or when adjustment cannot be performed with the 21.0 vol% adjustment.



### CAUTION

- The external contact may operate during span rough adjustment.  
Before performing span rough adjustment, set the product to maintenance mode or release the interlocks of the external devices if needed.
- Only your local representative's maintenance service members or personnel who have completed a maintenance seminar can perform span rough adjustment.

- 1) Apply calibration gas corresponding to the Detector.
- 2) Sufficiently stabilize the gas.
- 3) While in gas monitor mode, press the MODE switch on the Detector first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
- 4) Press the UP or DOWN switch on the Detector with the magnetic stick and adjust the value to [ . . . 7 ].
- 5) Press the ENTER switch on the Detector to start the operation.
- 6) The Detector displays [ *Sr. . .* ] first, and then displays the present gas concentration.
- 7) Press the UP or DOWN switch on the Detector with the magnetic stick, and adjust the display of the Detector to a value close to the actual span gas concentration. In the presence of atmospheric air, adjust the display to 21.0 vol%.
- 8) After adjusting the display on the Detector to a value close to the span gas concentration, press the ENTER switch on the Detector.
- 9) The span rough adjustment is completed when [ *Good* ] is displayed.
- 10) On completion of the span rough adjustment, the Detector will automatically return to gas monitor mode.

## MEMO

Precise adjustment is not performed by the span rough adjustment alone. Be sure to perform the 21.0 vol% adjustment after the span rough adjustment.

- If an error is displayed, refer to 10. Trouble Alarm.
- Carefully handle and make settings with the magnetic stick because the magnet is very powerful. For details, refer to 3. Contents of Package.

## ● 21.0 vol% Adjustment

• This span adjustment mode is used in atmospheric air during periodic inspection.

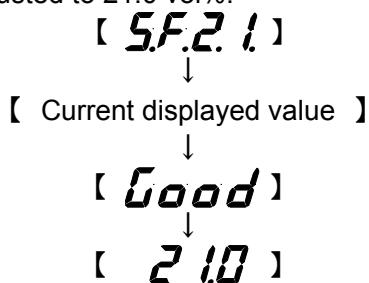
### ⚠ WARNING

- Always perform the 21.0 vol% adjustment in clean air. If you perform the 21.0 vol% adjustment in a gas atmosphere, the value of oxygen concentration output will be displayed incorrectly.

- 1) Make sure that the Detector is surrounded with clean air.
- 2) While in gas monitor mode, press the MODE switch on the Detector first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
- 3) The Detector displays **[ S.R.L. ]** first, followed by **[ . . . ]**. (This procedure assumes that no operation has been performed after turning ON the power supply.)
- 4) Press the UP or DOWN switch on the Detector with the magnetic stick and adjust the value to **[ . . . ]**.
- 5)



- 6) Press the ENTER switch on the Detector to start the operation.
- 7) When the operation starts, the following are displayed, and the Detector is automatically adjusted to 21.0 vol%.



- 8) On completion of the span rough adjustment, the Detector will automatically return to gas monitor mode.

## ● Full-scale and Alarm Set Value Display

- The full-scale and alarm set values are only displayed. They cannot be changed.
- (1) While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
  - (2) The main unit displays ***F.S.dP.*** first, and displays ***F.S. . .***.  
(The product is ready to work but nothing has been operated.)  
Example: After zero adjustment, ***F.S. . . 1*** will be displayed.
  - (3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to ***F.S. . . 4***.
  - (4) Press the ENTER switch of the main unit.



***F.S.dP.***

***F.S. . .***

Full scale

***AL. . .***

Alarm set value

- (5) When the above items are displayed in sequence and repeatedly, the user can check the full-scale and alarm set values.
  - (6) After the full-scale and alarm set values are displayed, the product will automatically return to gas monitor mode.
- Carefully handle and make settings with the magnetic stick because the magnet is very powerful. For details, refer to 3. *Contents of Package*.

## ● Test Mode

- Test values are adjusted and used for tests in this mode.



### CAUTION

- The external contacts may operate while the Detector is in test mode.  
Before changing the Detector to test mode, set the Detector to maintenance mode as required. Also, release interlocks with external devices as required.

- 1) While in gas monitor mode, press the MODE switch on the Detector first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
- 2) The Detector displays **[C.R.L.]** first, followed by **[. . .]**. (This procedure assumes that the startup process has been completed but no operation has been performed.)
- 3) Press the UP or DOWN switch on the Detector with the magnetic stick and adjust the value to **[. . 10.]**.
- 4) Press the ENTER switch on the Detector to start the operation.



- 5) When the operation starts, the following value is displayed.

**[L.E.S.T.]**



**[ Test value ]**

The test operation of the Detector can be performed in a concentration range from 0% to 110% of full scale. (The test operation of the Detector is possible in a concentration range from 0.0 vol% to 27.5 vol% if the full scale of the Detector is 25 vol%).

- 6) Press the UP or DOWN switch on the Detector and set the desired inspection concentration. The test will start. If the setting is outside the operating range, **[LLL]** or **[HHH]** will be displayed.
- 7) To end the test mode, press the ENTER or MODE switch. Text mode will be ended.
- 8) If the ENTER switch is pressed to end test mode, the test value will be saved. If the MODE switch is pressed to end test mode, the previously saved value will remain.

Carefully handle and make settings with the magnetic stick because the magnet is

- very powerful. For details, refer to 3. Contents of Package.

## 12. Troubleshooting

- Before requesting repairs, refer to the following table. Consult your New Cosmos representative if the product does not return to normal after taking the corresponding remedies shown below or if the defective condition is not found in the table.
- If the product goes into an unintended mode at the adjustment or setting stage, stop operating the product immediately and consult the system administrator.

Defective condition	Probable cause	Remedy	Reference page
The green power lamp is not lit.	Incorrect wiring connection.	Check and redo the wiring.	P. 15 Wiring and Connection
The yellow lamp to indicate an error is flashed and the error code is displayed.	<b>E - 24</b> Low-voltage state	Check the power supply voltage.	
The detected gas concentration and <b>-----</b> are flashing alternately.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 24 Maintenance Mode
There is no alarm contact output.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 24 Maintenance mode
	Incorrect wiring connection.	Check and reconnect the wiring.	P. 15 Wiring and Connection
	The alarm point setting is wrong.	Check the alarm setting.	P. 27 Full-scale and Alarm Set Display
The analog signal does not change.	The product is in test mode.	Return the product to gas monitor mode.	P. 28 Test mode
A value and <b>HHHH</b> are flashing alternately.	The sensor output is high.	The concentration of gas is in excess of the full scale. Check the ambient environment.	
A value and <b>LLLL</b> are flashing alternately.	The sensor and sensor connector are not inserted properly. The sensor is connected backward.	Make sure that the sensor and sensor connector are inserted properly.	
No adjustment or setting is possible.	The product is operated during the initial delay time.	Operate the product after the 30-seconds initial delay time.	P. 18 Display at Start-up (Initial Delay)

## 13. Specifications

Model	KD-12
Sampling method	Diffusion type
Detection gas	O <sub>2</sub> (Oxygen)
Detection range	0 to 25 vol%
Gas concentration display	Four-digit digital LED display
Alarm set value	18 vol%
Alarm accuracy	±1.0 vol% of the displayed value
Alarm delay	5 seconds or less to reach 18vol% by coming into contact with oxygen gas having a concentration of 10vol%. (at 20 +/- 2 °C)
Warning display	<ul style="list-style-type: none"> <li>• Gas alarm (one stage only): Red LED lamp flashes</li> <li>• Trouble alarm (sensor disconnection, sensor zero drop, power supply voltage error, or internal EEPROM communication error): Yellow LED lamp flashes</li> </ul>
External output	<p>Gas concentration analog signal</p> <ul style="list-style-type: none"> <li>• 4 to 20 mA DC (common to the negative side of power supply)</li> <li>• 0.9 mA DC or less at the time of Trouble alarm.</li> <li>• Make sure that the load resistance of the analog signal is less than 300 ohm including the wiring resistance.</li> </ul> <p>Gas alarm contact (one stage only)</p> <ul style="list-style-type: none"> <li>• 1a no-voltage contact output/Non-latching</li> <li>• Rated load: 0.5 A at 250 VAC or 0.5 A at 30 VDC (resistance load)</li> </ul>
Explosion-proof class	Ex d IIB T5 (Japan),  II 2 G Ex d IIC T5 Gb (Europe) Ex d IIC T5 Gb (IECEx)
Approval	<p>EC-type examination certificate : DEMKO 08 ATEX 143870 X (CE 0518  II 2 G Ex d IIC T5 Gb)</p> <p>EMC : EN61000-6-4:2001, EN50270:2006 - Type 2</p> <p><u>Performance testing</u> : The measuring function of the KD-12 gas detector for explosion protection, according to Annex II clause 1.5.5, 1.5.6 and 1.5.7 of the Directive 94/9/EC, is not covered in this certificate.</p> <p>IECEx : ULD 13.0001X (Ex d IIC T5 Gb)</p>
List of hazardous locations standard	EN 60079-0:2012, EN 60079-1:2007 IEC 60079-0:2011, IEC 60079-1:2007
Degree of protection	IP65 (Exterior)
Applicable cable	<p>Cable outer diameter (10 to 13 mm)</p> <ul style="list-style-type: none"> <li>• In the case of a 5-conductor cable (for power supply, gas concentration analog signal, and gas alarm contact): CVV-S 1.25 mm<sup>2</sup>.</li> <li>• In the case of a 3-conductor cable (for power supply and gas concentration analog signal) CVV-S 2 mm<sup>2</sup> or 1.25 mm<sup>2</sup></li> </ul>
Operating temperature and humidity ranges	<ul style="list-style-type: none"> <li>• Temperature: -10°C to 40°C</li> <li>• Humidity 30% to 85% RH (No radical temperature or humidity changes and no condensation)</li> </ul>

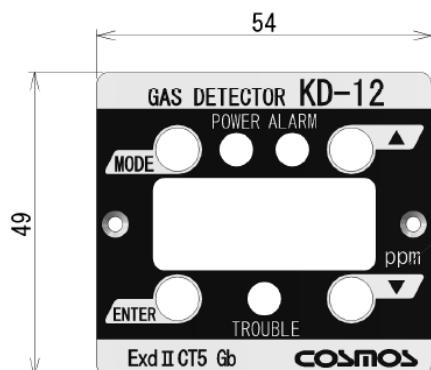
Power supply	24VDC (18 to 30 VDC)
Power consumption	3W max.
Size	158 (W) x 120 (H) x 68 (D) mm (excluding protruding parts)
Weight	Approx. 1.3kg
Mounting method	Wall mounting

The above specifications are subject to change without notice.

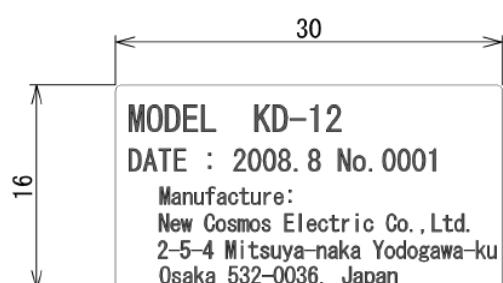
If your specifications are nonstandard, refer to the delivery specifications.

## 14. Markings of explosion-proof

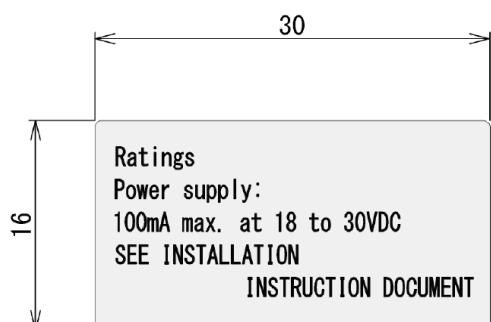
-Nameplate detail



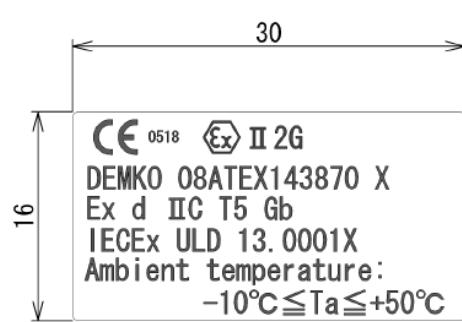
-Serial number label detail



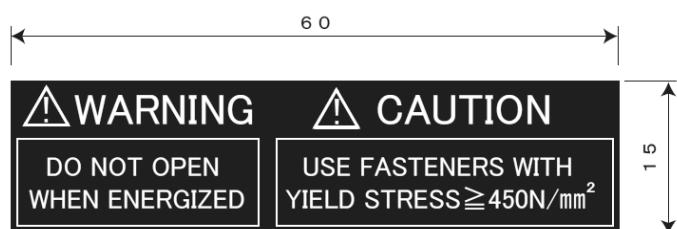
-Rated label detail



-Certificate label detail



-Warning label detail



-List of hazardous locations standard

EN 60079-0:2012

EN 60079-1:2007

IEC 60079-0:2011

IEC 60079-1:2007

## **15. Warranty**

New Cosmos Electric Company Limited (hereafter referred to as "New Cosmos") offers the following as the sole and exclusive limited warranty available to the Customer.

This warranty is in lieu of, and the Customer waives, all other warranties of any kind or nature, expressed or implied, including without limitation any warranty for merchantability or fitness for a particular purpose. The remedies set forth herein are exclusive.

New Cosmos warrants to the original purchaser (Customer) and no other person or entity that the gas detection product supplied by New Cosmos shall be free from defects in materials and workmanship for a period of one (1) year from the date of purchase. This warranty does not apply to consumables, including but not limited to fuses and filters. Certain other accessories not specifically listed here may have different warranty periods.

If after examination of an allegedly defective product returned to New Cosmos, with freight prepaid, should it be found that the product fails to conform to this warranty, the Customer's only remedy and New Cosmos's only obligation shall be, at New Cosmos's sole discretion, replacement or repair of the non-conforming product or refund of the original purchase price of the non-conforming product. In no event shall New Cosmos be liable for any other special, incidental, or consequential damages or losses of any kind whatsoever, including but not limited to loss of anticipated profits and any other loss caused by reason of non-operation of the product.

This warranty is valid only if the product is maintained and used in accordance with New Cosmos's instructions and recommendations. New Cosmos shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product.

## 16. Glossary

Detector:	A unit that detects gas concentration and converts it to electric signals.
Diffusion type:	A method to detect gas by utilizing convection and diffusion of gas.
Explosion proof construction:	A totally enclosed structure. When an explosive gas explodes in a container, the container can resist the pressure and prevent the ignition of explosive gases outside of it.
Gas to be detected:	Gas that is detected and indicated which sets off an alarm.
Detection range:	Range of gas's concentration that can be indicated and set off an alarm.
Operating temperature and humidity ranges:	The ranges of temperature and humidity within which performance and functionality can be maintained during usage of the Detector.
Maintenance and inspections:	Work to guarantee that the equipment perform its required functions.
Calibration gas:	Gas used to calibrate scales of the equipment.
Hazardous area:	An area in a plant or facility with a hazardous atmosphere where explosive gases may mix with air and explode or start a fire. An area where gas may be present.
Non hazardous area:	An area where electric equipment that has no potential to create a hazardous atmosphere.
Hazardous atmosphere:	Atmosphere within the explosive limit where explosive gas and air are mixed.

(Quoted from gas detection terms and detector tube gas meter terms used by the Industrial Gas Detector Alarm Association.)

# **MEMO**

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### **Manual Revision History**

<b>Edition No.</b>	<b>Date</b>	<b>Revision</b>
GAE-056-00	July 2014	0

Additional copies of this Instruction Manual are available.  
Contact the following address for ordering information.

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<http://www.new-cosmos.co.jp>



**New Cosmos Electric Co., Ltd.**