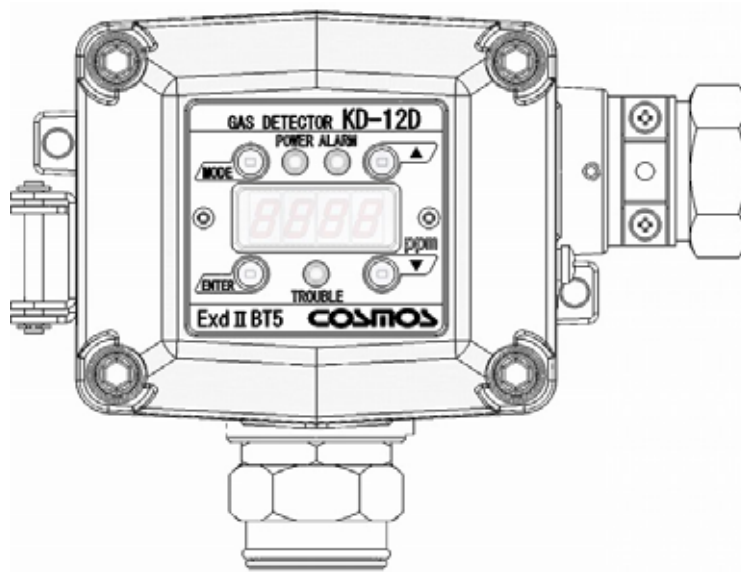


# Diffusion Type Toxic Gas Detector

## Model KD-12D

### Instruction Manual



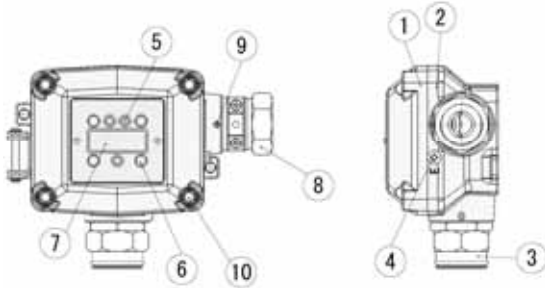
- Keep this instruction manual where it is readily accessible.
- Thoroughly read this instruction manual before using the equipment so it can be used safely and correctly.
- This manual provides information concerning standard specifications. If the specifications of your model are nonstandard, refer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

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

Instruction Manual No.  
GAE-035-00  
May 2010

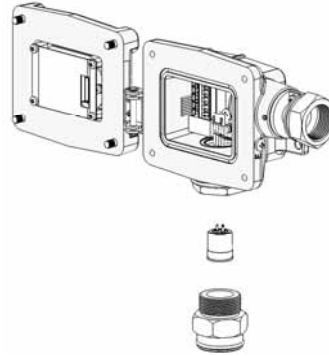
• **Nomenclature**

See pages 4 to 6.



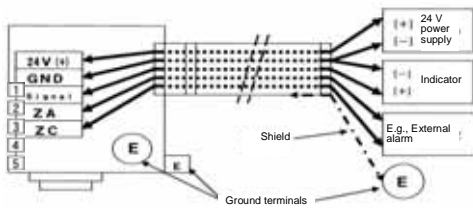
• **Replacement of Sensor Unit**

See pages 20 and 21.



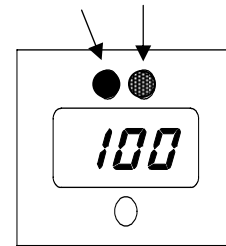
• **Wiring and Connecting Methods**

See pages 11 to 14.



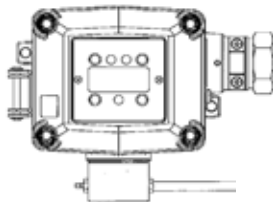
• **Display and Operation in Each Mode**

See page 17.



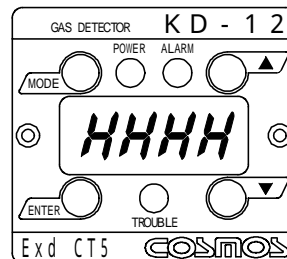
• **Maintenance Check and Operation Methods**

See pages 19 to 27.



• **Troubleshooting**

See page 28.



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# 1. Introduction




- Thank you for purchasing the KD-12D Diffusion Type Toxic Gas Detector.
- In order to ensure the correct and safe operation of this product, be sure to read this manual before use.
- The KD-12D Diffusion Type Toxic Gas Detector detects toxic gases such as carbon monoxide or hydrogen sulfide (carbon monoxide is also a combustible gas). It detects gas leakage at an early stage in gas production plants, gas depots, chemical plants, paint factories, and power plants, and outputs the gas concentration as an analog signal while displaying the gas concentration.

If the gas concentration reaches a preset alarm level, the red ALARM indicator will flash and turn ON an external contact output, thus helping to prevent carbon monoxide and hydrogen sulfide poisoning.

- 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.



### **DANGER**

- If an alarm occurs in this product, immediately take the necessary steps to prevent gas poisoning.
- If there is leakage from the sensor due to vibration or shock and the liquid gets on your hands or clothes, wash them immediately with clean water.  
If the liquid enters your eyes or ears, rinse them with large amounts of water as a first-aid measure, and then see a doctor.



### **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.



### **CAUTION**

- Licensed members should implement all necessary work for the product including wiring and installation in accordance with all applicable laws and regulations.
- 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.
- This product may detect other gases as well (such as hydrogen, NOX, SOX, or alcohol). Consider the measurement environment when using the product.
- If the sensor unit has not been turned ON for a long time, it may take some time for the sensor to stabilize. An alarm may occur in such a situation. Therefore, release the interlock as required before using the product.

### 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 (see note 1) 12- and 13-mm-dia. pressure-proof packing: 1 each Two 11-mm-dia. washers One C-clamp Two M5 screws Hexagon wrench (nominal dia. 2 and 4): 1 each (see note 2) Instruction Manual (see note 2) MJ-1 Magnetic Stick (see note 2)	Protective cover Horizontal type: KW-41 Vertical type: KW-42 PB-1 2B Pole Mounting Bracket GCP-09 Calibration Cap Z-001K Gas Calibration Kit 2 bulb hand pump Capillary for 2 bulb hand pump

- Note: 1. The standard product incorporates a built-in pressure-proof packing (12.5-mm dia.), washer (12-mm dia.), and B-clamp.
2. A hexagon wrench, Instruction Manual, and MJ-1 Magnetic Stick are provided for each order.

#### **WARNING**

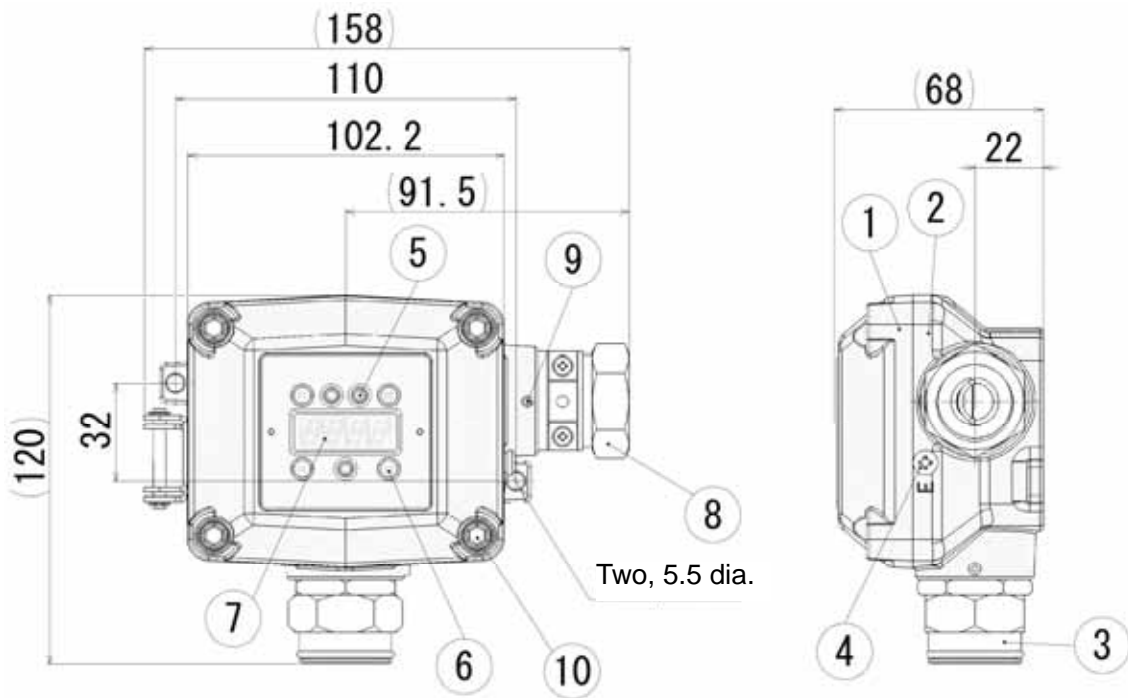
- Do not use the magnetic stick for any purposes other than the operation of this product.
- Do not bring magnetic objects other than the magnetic stick close to the product.
- Keep in mind that when the magnetic stick attracts magnetic objects, tools, iron pieces, etc., your hands may become pinched 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.

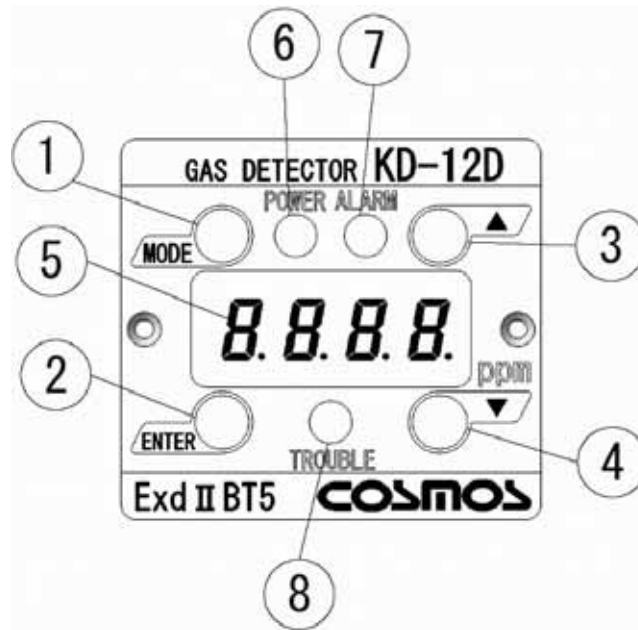
## 4. External Dimensions and Nomenclature

### 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 gland	Used to secure the cable. Compatible screw: G3/4
9	Bolt with hexagon socket	Used for securing the cable gland. Use a hexagon wrench with a nominal diameter of 2 mm.
10	Bolt with hexagon socket	Used for securing the casing cover. Use a hexagon wrench with a nominal diameter of 4 mm.

## 4-2. Display and Control Blocks



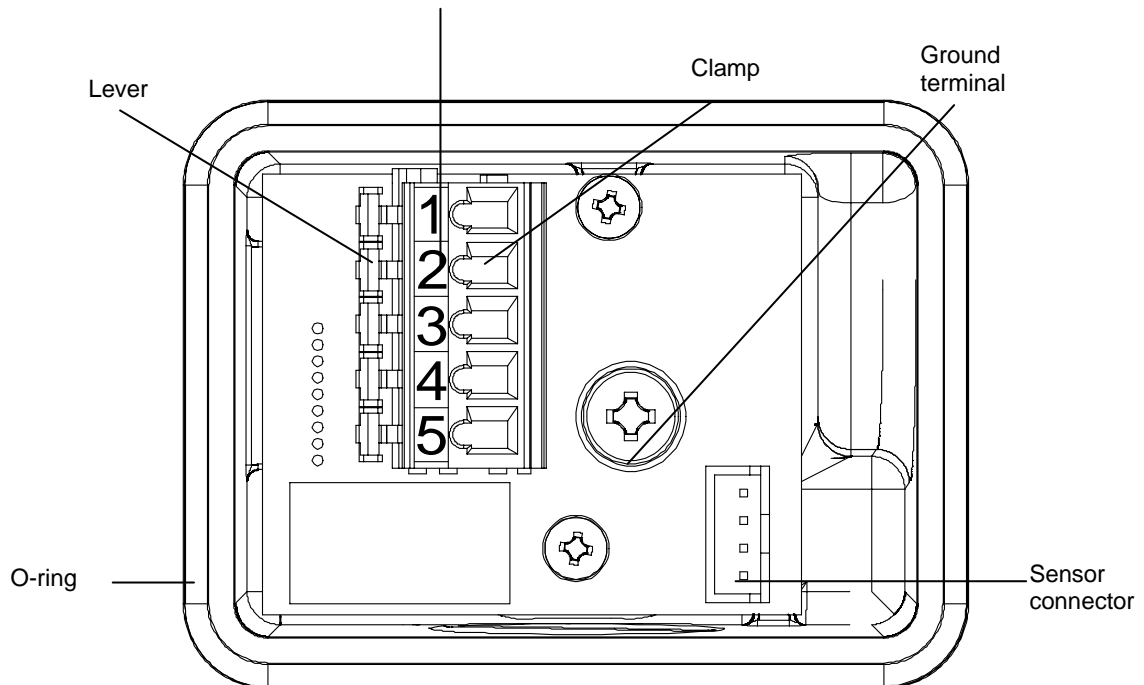
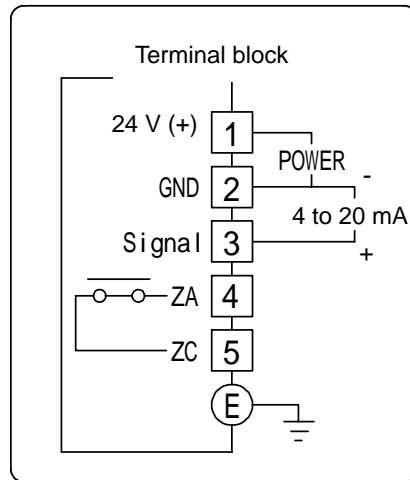
Magnetic switches (Insert the magnetic stick to operate the magnetic switches.)		
Number	Name	Description
1	MODE switch	Makes adjustments and settings or cancels the operation of the product.
2	ENTER switch	Enters settings or completes the control of the product.
3	UP switch	Makes adjustments and settings or increases set values and other values.
4	DOWN switch	Decreases set values and other values.

Number	Name	Description
5	Display block	Displays the concentration of gas 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 (negative) and analog signal (negative) common
3	Signal	4- to 20-mA analog signal (positive)
4	ZA	External contact
5	ZC	
E	Ground terminal	Used to ground the frame.

## 5. Installation

### 5-1. Installation Method



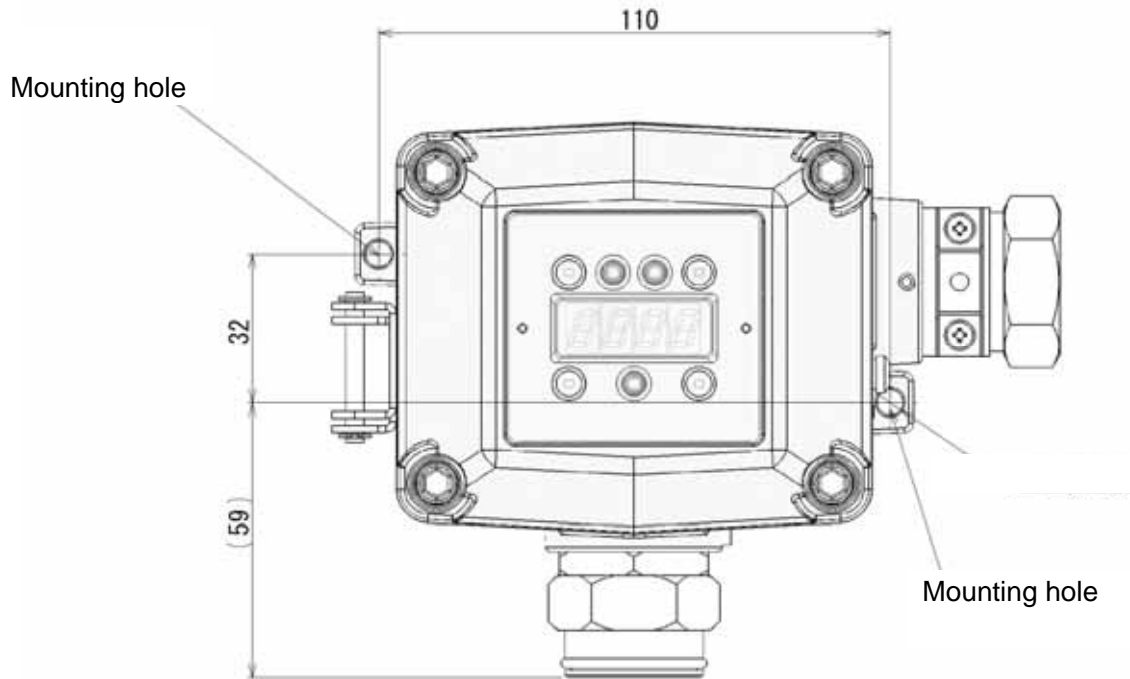
#### CAUTION

- 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 close to equipment that generates high frequencies or a magnetic field.
- Install the gas detector in places where it 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).
- The installing height of the gas detector has an important relation to the specific gravity of the target gas to be detected. Install the gas detector in accordance with required regulations.

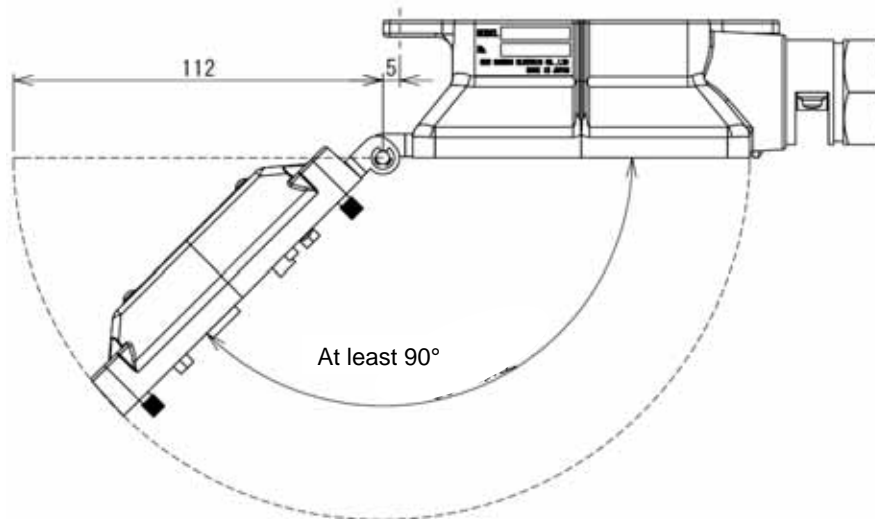
#### • Installing Height

Type of gas	Installing height	Remarks
Carbon monoxide (Gas almost the same as air in specific gravity)	75 to 150 cm above the floor. (Height to the sensor guard tip)	Decide the height by considering the specific gravity and mounting environment.
Hydrogen sulfide (Gas heavier than air)	A maximum of 10cm above the floor. (Height to the sensor guard tip)	Keep a space of approximately 7 cm from the sensor guard tip for ease of maintenance and inspection.

- 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.





When installing the gas detector, provide sufficient space to enable the casing cover to be opened to at least 90°.

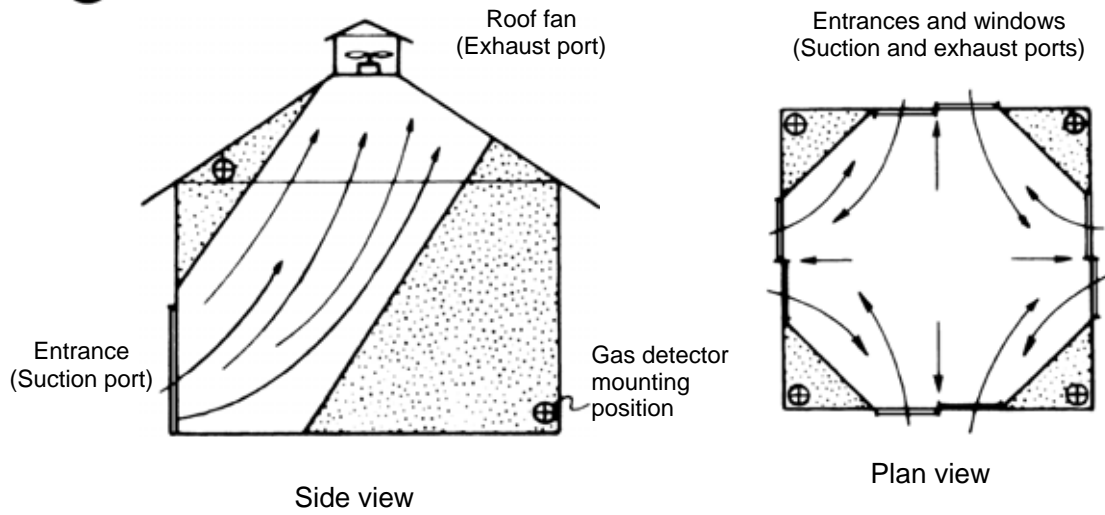


## 5-2. Examples of Installation Positions

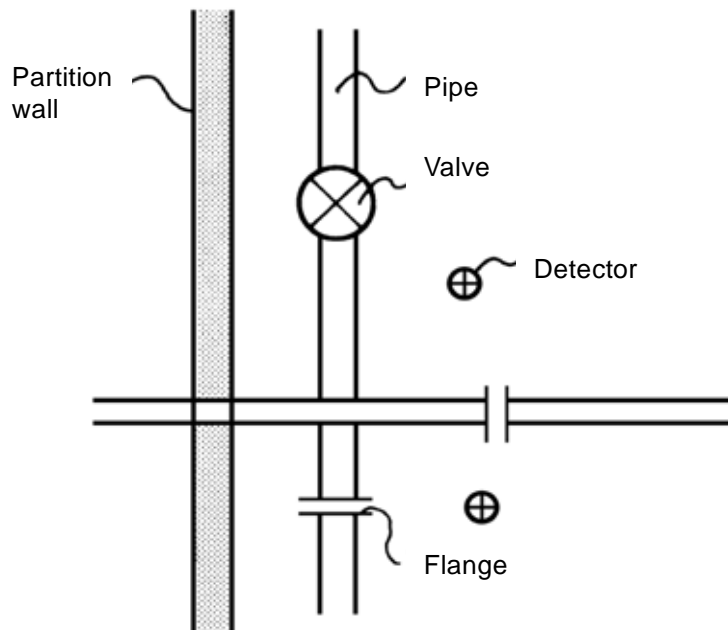
- Install the product in places where gas easily accumulates.

 Places where gas easily accumulates.

 Gas detector



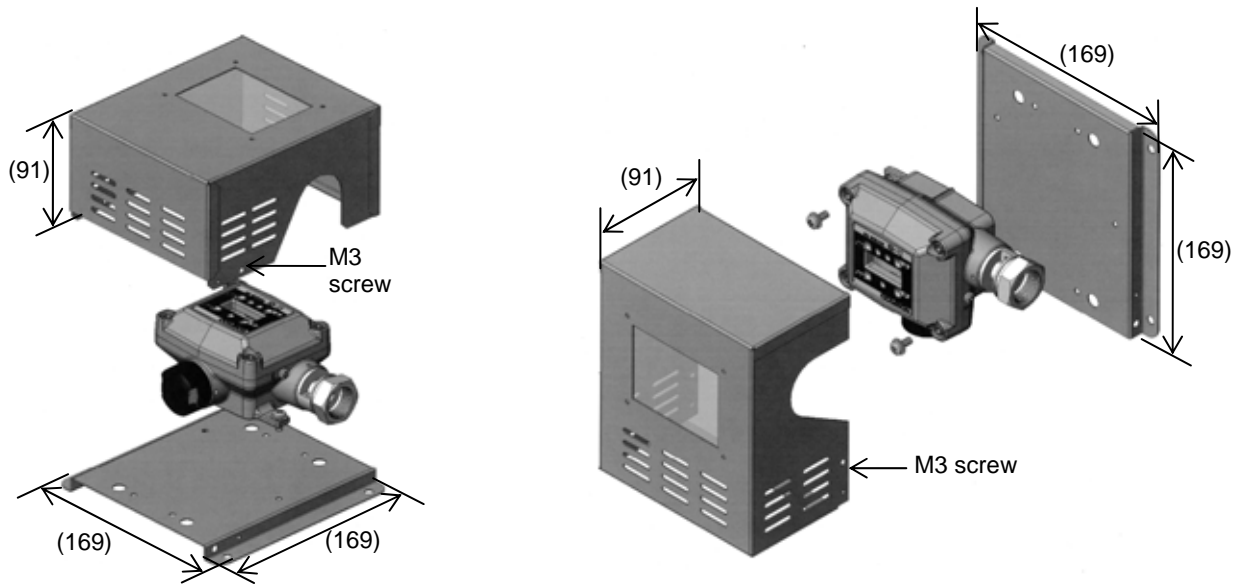
Example of Installation Position



Example of Outdoor Installation Position

### 5-3. Mounting of Optional items

- Protective Cover



Horizontal Type (KW-41)

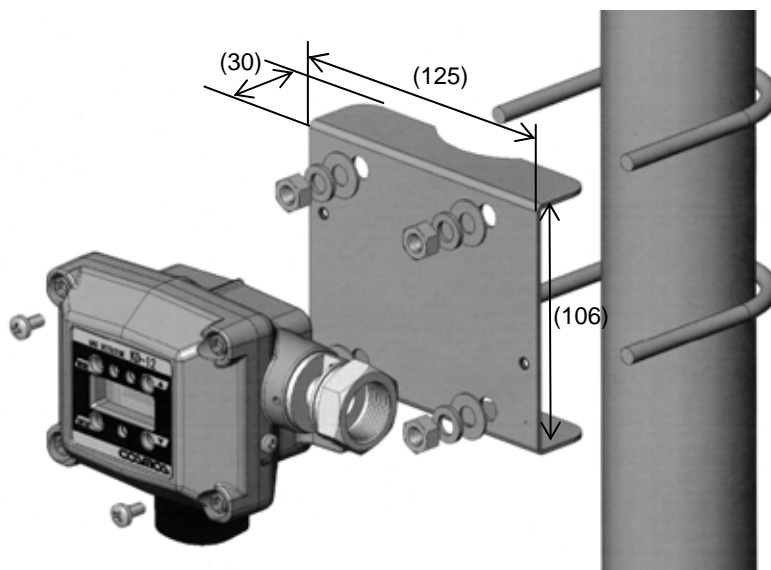
Vertical Type (KW-42)



### 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 hazardous places.



#### CAUTION

- Licensed members should implement all necessary work for the product including wiring and installation in accordance with all applicable laws, regulations and standard.

#### 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 maximum diameter of the cable conductor is 2.00 mm<sup>2</sup>.
- When using the explosion-proof packing lead-in method, refer to the following table and use a cable with the finished diameter matching the inner diameter of the packing. In order to prevent the spread of explosive gas or fire, securely tighten the cable gland.
- It is recommended not to connect two cables together. If it is unavoidable, however, connect them or branch them within the explosion-proof casing of the main unit.

Cable outer dia.	Packing	Washer	Clamp	Accessory or Optional item
	Inner dia.	Inner dia.		
10 to 10.4	11.5	11	C Clamp	Optional item
10.5	12	11		Accessory
11	12	12		
11.5	12.5	12	B Clamp	Built-in accessory
12	13	14		Accessory
12.5	13.5	14	A Clamp	Optional item
13	14	14		

\* A pressure-tight packing with a diameter of 12.5 mm, a washer with a diameter of 12 mm, and a B clamp, all of which correspond to a cable with a diameter of 11.5 mm, are built into the standard model.

\* Three pressure-resistant packings with diameters of 12 mm, 13 mm, and 13.5 mm, two washers with a diameter of 11 mm, two washers with a diameter of 14 mm, one A clamp, and one C clamp are provided with the standard model. These correspond to cables with diameters of 11 and 12 mm.

\* If the cable diameter is other than 10.5 or 12.5 mm, select the corresponding pressure-resistant packing, washer, and clamp from the above table, and order them from New Cosmos.

## 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.



### 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.

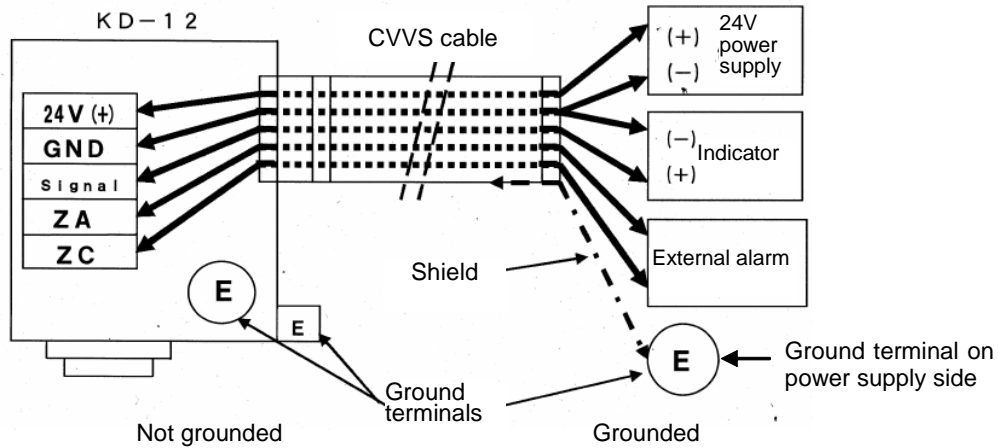
#### Connecting Power Supply and Signal Wires

- 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.

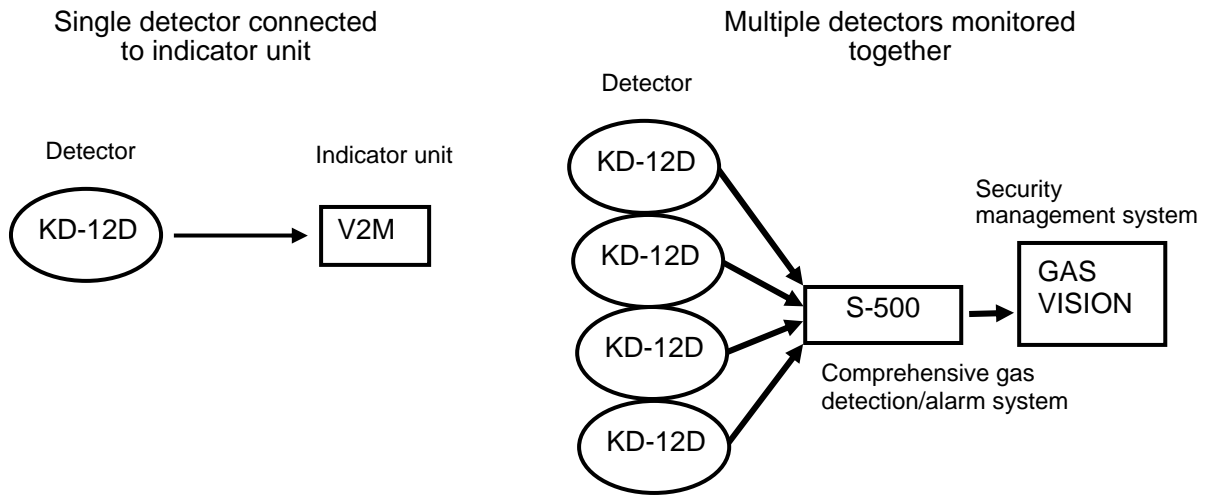
**MEMO**

- 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



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



### 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. (See the photograph below on the left.)
- (3) Remove the screws of the cable gland and insert the cable for wiring. (See the photograph below on the right.)
- (4) Tighten the screws on the cable gland and secure the cable.



- (5) Press the lever of the terminal block with a flat-blade screwdriver. (See the photograph below.)
- (6) The clamp will open. Insert the lead wire.
- (7) Connect the positive side of the power supply to the 24 V (+) terminal.
- (8) Connect the negative side of the power supply to the GND terminal.



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



### CAUTION

- When operating the lever on the terminal block, be sure that the flat-blade screwdriver does not slip off the lever. This may damage the sensor unit cords and circuit board.
- When operating the lever of the terminal block, do not apply force at an angle.
- When operating the lever of the terminal block, do not apply any force after the lever reaches the stop position.
- 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 Gas Leakage



### **DANGER**

- Without panicking, check that there is no fire around the product. Do not touch any electric switches under any conditions. Sparks from turning electric switches ON or OFF may cause ignition.



### **WARNING**

- If there is a gas leak 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.

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



### CAUTION

- Check that there is no gas around the product before starting the product.
- 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, the analog signal fixed at 4 mA will be output and the external contact will not operate.

- (1) When the power supply is turned ON, all of the status indicators (green, red, and yellow lamps) and the display block will light.



- (2) While the status indicators (green, red, and yellow lamps) are lit, the following will be displayed for approx. 1 second each.

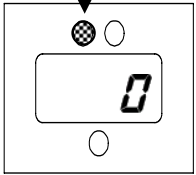
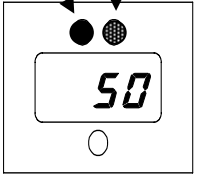
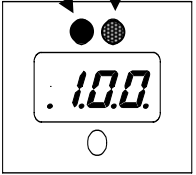
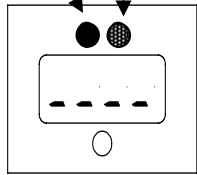
	Example
Software version number (of the main unit)	[ 123 ]
Full scale	[ 100 ]
Alarm set value	[ 25 ]

- (3) Then the POWER indicator (green lamp) will flash for approximately 2 minutes and 50 seconds.
- (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

- During the initial delay, operation cannot be performed with the magnetic stick.
- The initial delay lasts for approx. 3 minutes after the power supply is turned ON.
- If the sensor unit has not been turned ON for a long time, it may take some time for the sensor to stabilize. An alarm may occur in such a situation. Therefore, release the interlock as required before using the product.
- If necessary, turn ON the product for approximately one week, and make the zero adjustment and span adjustment. Refer to 11.3 Calibration Method for the adjustments.

## 9. Display and Operation in Each Mode

		In excess of alarm set value			
	At start-up (Initial delay)	Gas monitor mode	Test mode	Maintenance mode	
				Gas monitor mode	Test mode
Contents of display	<p>Green lamp flashes</p> 	<p>Green lamp is ON</p> <p>Red lamp flashes</p> 	<p>Green lamp is ON</p> <p>Red lamp flashes</p> 	<p>Red lamp flashes</p> <p>Green lamp is ON</p> 	
	<p>Gas concentration is displayed.</p>	<p>Gas concentration is displayed.</p>	<p>A full-scale test from -10% to 110% is possible.</p>	<p>[Gas concentration]</p> <p>Displayed alternately</p>	<p>[Test value]</p> <p>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.

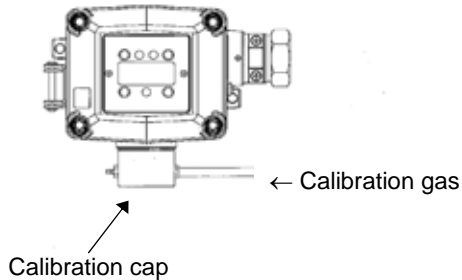
Screen display	Trouble indicator	Problem details	Probable cause	Remedy
E-24	Yellow lamp flashes	Power supply voltage drop error	The power supply voltage is low.	Check the power supply voltage.
LLLL	Yellow lamp flashes	Sensor error	The sensor or sensor connector may be disconnected.	Check that the sensor connector is securely connected.
			The sensor output may be low.	Make the zero adjustment while gas is not present in the air around the Detector.
E-6 E-7	Lamp is OFF	Zero-point adjustment error	There is gas in the ambient air.	After checking the ambient air, make the zero adjustment again.
E-4 E-5	Lamp is OFF	Span adjustment error	The gas concentration applied for adjustment is wrong.	After checking the type and concentration of gas, make a span adjustment again.
				If the type and concentration of gas is suitable, make span rough adjustment.

- If a screen other than the above is displayed, refer to 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.
	Minimum intervals of 2 to 3 months	Alarm operation check with real gas	Apply inspection gas to the gas detector and check the operation of the alarm. <ul style="list-style-type: none"> <li>• Use the calibration cap, apply inspection gas, and check the operation of the alarm.</li> </ul> 
		Condition around gas detector	Check that nothing interrupts the diffusion of gas around the gas detector.
Periodical inspection	At least once per year	Consult your local representative.	

- Use optional products to make actual gas inspections.

### Periodical Inspections

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

To operate the Detector efficiently, it is necessary to use actual gas and to carefully conduct inspection and calibration. It is highly recommended that you consider periodical inspections under a maintenance contact with your local representative.

## 11-2. Replacement of Sensor Unit

The warranty period of the sensor is 6 months, and its life expectancy is 1 year. Replace the sensor after the life expectancy has expired.

### **WARNING**

- Be sure to turn OFF the indicator unit or signal converter before replacing a sensor unit. Otherwise, they may become a source of ignition.
- Before turning ON the power supply to the Detector, make sure that the sensor and sensor connector are connected properly. Gas will not be detected unless the sensor and main unit are connected properly.

### **CAUTION**

- The setup data of the Detector may have to be re-written depending on the type of the sensor. Only your local representative's maintenance service members or personnel who have completed a maintenance seminar can replace the sensor unit.
- Be sure to handle the sensor unit with care. Do not drop or throw the sensor unit. Otherwise, the sensor wire may be disconnected or a sensor failure may result.
- 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.
- Make sure that no dirt or dust is trapped in the sintered wire mesh of the sensor casing, and install the sensor only after cleaning the wire mesh.
- 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.

### **MEMO**

- Return the used sensor unit to your local representative.
- Calibrate the sensor unit after replacing it.
- A sensor may take some time to stabilize after it is replaced. Turn ON the power supply until the sensor stabilizes, and then perform zero adjustment and span adjustment.
- Always adjust the gas concentration by performing the zero adjustment first, and then perform the span adjustment.
- If an error is displayed, refer to 10. Trouble Alarm.

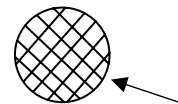
- (1) Turn OFF the power supply to the Detector.
- (2) Remove the sensor casing cover by rotating it in the direction of the arrow. (See the photograph below on the left.)
- (3) Pull down the sensor to remove it (See the photograph below on the right.)  
The filter and packing may remain inside the sensor casing cover. Remove them as well.



- (4) Remove the pins from the sensor to be used as replacement. (See the photograph below on the left.)
- (5) Place the filter and packing on the sensor. (See the photograph below on the right.)  
At this point, the mesh design on the surface of the filter must be towards the outside. There is no need to install a filter for a hydrogen sulfide sensor.



- (6) Connect the sensor to the main unit. (See the photograph Below on the left.)  
Be sure to check the sensor pins and the position of the holes in which the pins are inserted.
- (7) 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.





## 11-3. Calibration Method

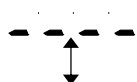
### ● Maintenance Mode



## 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 **0.0**.  
(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 **0.0**.
- (4) Press the ENTER switch of the main unit.



Gas concentration

- (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.

## ● Zero Adjustment

- The external contact may operate. Therefore, set the product to maintenance mode if needed.

### MEMO

Conduct the zero adjustment in a place where there is no ambient gas.

- (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 **0.000**.
- (4) Press the ENTER switch of the main unit.

(5)

**2.E.r.o.**

**0**

**Good**

- (6) When the above items are displayed, the zero adjustment is completed.
- (7) Upon completion of the zero adjustment, the product will automatically return to gas monitor mode.

- 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.

## ● Span Rough Adjustment

- Perform span rough adjustment if **E- 4** or **E- 5** is displayed.



### 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 equipment.
- (2) Sufficiently stabilize the gas.
- (3) 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.
- (4) The main unit displays **CAL.** first, and displays **0.0**.  
(The product is ready to work but nothing has been operated.)  
Example: After zero adjustment, **0.000** will be displayed.
- (5) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to **0.000**.
- (6) Press the ENTER switch of the main unit.
- (7) The main unit displays **Sr.** first, and displays the present gas concentration.
- (8) Press the UP or DOWN switch of the main unit with the magnetic stick, and adjust the display of the main unit close to the actual span gas concentration.
- (9) Press the ENTER switch.
- (10) The span rough adjustment is completed when **Good** is displayed.
- (11) On completion of the span rough adjustment, the product will automatically return to gas monitor mode.
- (12) Remove the gasbag.

#### MEMO

Precise adjustment is not performed only by span rough adjustment. Perform span fine-tuning after 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.

## ● Span Fine-tuning

### MEMO

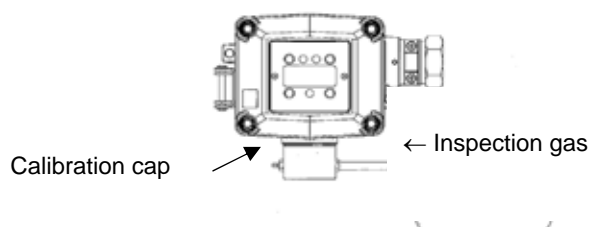
Be sure to conduct the zero adjustment before performing span fine-tuning.



## CAUTION

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

- (1) Apply calibration gas corresponding to the equipment.



- (2) Sufficiently stabilize the gas.
- (3) 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.
- (4) The main unit displays **CAL.** first, followed by **.0**.  
(The product has completed starting but nothing has been operated.)  
Example: After zero adjustment, **. . .!** will be displayed.
- (5) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to **. . .2**.
- (6) Press the ENTER switch of the main unit.
- (7) The main unit displays **S.F.** first, followed by the present gas concentration.
- (8) Press the UP or DOWN switch of the main unit with the magnetic stick, and adjust the display of the main unit to the actual span gas concentration.
- (9) Press the ENTER switch.
- (10) The span fine-tuning is completed when **Good** is displayed.
- (11) Upon completion of the span fine-tuning, the product will automatically return to gas monitor mode.
- (12) Remove the gasbag.

- Perform span rough adjustment if **E- 4** or **E- 5** is displayed.
- 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.

## ● 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 **CAL.** first, and displays **0.0**.  
(The product is ready to work but nothing has been operated.)  
Example: After zero adjustment, **0.1** will be displayed.
  - (3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to **4**.
  - (4) Press the ENTER switch of the main unit.



**F.S.d.P.**

**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 contact may operate while the product is in test mode. Before setting the product to test mode, set the product to maintenance mode or release the interlocks of the external devices if needed.

- (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, and displays **. . 0 .** (The product is ready to work but nothing has been operated.)  
Example: After zero adjustment, **. . . 1** will be displayed.
- (3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to **. . 10 .**



- (4) Press the ENTER switch of the main unit.

**L.E.S.L.**

Test value

- (5) When the above items are displayed, the test operation of the product in a concentration range from -10% to 110% of the full scale.  
(The test operation of the product is possible in a concentration range from -10 to 110 ppm if the full scale of the product is 100 ppm.)
- (6) Press the UP or DOWN switch of the main unit and set the desired calibration concentration. Then the test will start.  
If the setting is outside the operating range, **LLLL** or **HHHH** will be displayed.
- (7) To quit the test mode, press the ENTER or MODE switch.
- (8) When the test is finished with the ENTER switch pressed, the tested value will be saved.  
When the test is finished with the MODE switch, 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. 12 and 13 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. 22 Maintenance Mode
There is no alarm contact output.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 22 Maintenance mode
	Incorrect wiring connection.	Check and reconnect the wiring.	P. 12 and 13 Wiring and Connection
	The alarm point setting is wrong.	Check the alarm setting.	P. 26 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. 27 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 connector is disconnected.	Make sure that the sensor connector is connected properly.	P. 6 Names of terminal block connections
	The sensor output is low.	Conduct zero adjustment after checking that the air around the product is not contaminated with gas.	P. 23 Zero adjustment
No adjustment or setting is possible.	The product is operated during the initial delay time.	Operate the product after the 3-minutes initial delay time.	P. 16 Display at Start-up (Initial Delay)

## 13. Specifications

Corresponding sensor type	Electrochemical type
Sampling method	Diffusion type
Detection gas	CO (Carbon monoxide), H <sub>2</sub> S (Hydrogen sulfide)
Detection range	Depends on the specifications.
Gas concentration display	Four-digit digital LED display
Alarm set value	Depends on the specifications.
Alarm accuracy	±30% of alarm set value under identical conditions.
Alarm delay	Within 60 seconds with gas concentration that is 1.6 times as high as the level of alarm set concentration.
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 performance	Exd II BT5
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></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	24 VDC ±20%
Power consumption	1.2 W max.
Size	158 (W) x 120 (H) x 68 (D) mm (excluding protruding parts)
Weight	Approx. 1.3 kg
Mounting method	Wall mounting

The above specifications are subject to change without notice.

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



## 14. Warranty

New Cosmos Electric Company Limited (New Cosmos) offers the following as the sole and exclusive limited warranty available to the customer.

This warranty is in lieu of, and 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 and no other person or entity (the customer) 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 include consumables, such as fuses, filters, etc. Certain other accessories not specifically listed here may have different warranty periods.

After examination of an allegedly defective product returned to New Cosmos, with freight prepaid, should the product fail to conform to this warranty, the customer's only remedy and New Cosmos's only obligation shall be, at New Cosmos's sole option, replacement or repair of such non-conforming product or refund of the original purchase price of the non-conforming product. In no event will 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.

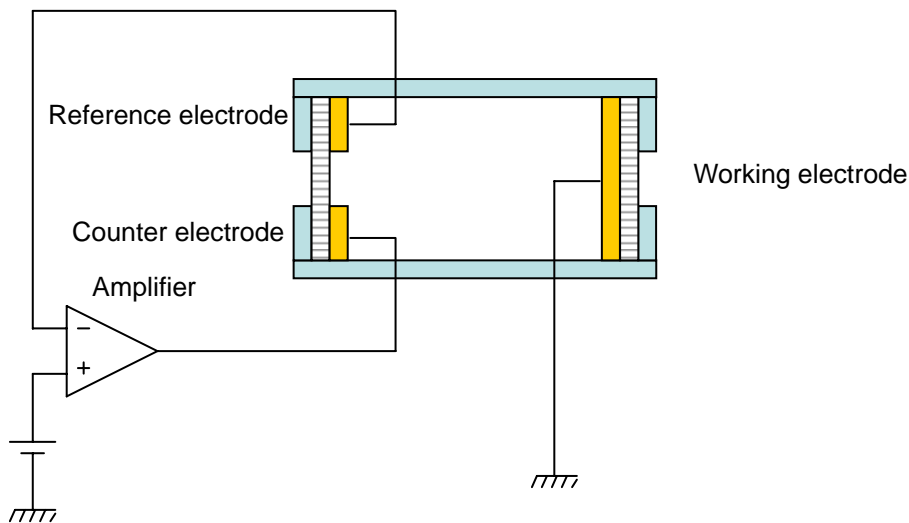
This warranty is valid only if the product is maintained and used in accordance with New Cosmos's instructions and/or recommendations. New Cosmos shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service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

## 15. Detection Principle

### Electrochemical cell

Electrochemical cell is a method of selectively performing only the electrolytic reaction of the target constituent gases, and then extracting and measuring the electrolytic current generated at that point. The gas sensor consists of electrodes, electrolyte solution, and a potentiostat. The electrodes consist of a catalyst deposited on a gas permeability film (gas can pass through this film, but the electrolysis solution cannot). The oxidation reaction occurs on the working electrode while the reduction reaction occurs on the counter electrode, and current flows to the external circuit. The gas concentration of carbon monoxide can be found by measuring the electric current generated at this time. To selectively cause a reaction in proportion to the gas concentration, the potential of the working electrode is detected by the reference electrode, and during the electrolytic reaction, this potential of the working electrode is maintained at a fixed value by the potentiostat circuit.

The electrolytic reaction of carbon monoxide is explained below:  
Working electrode:  $\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + 2\text{H}^+ + 2\text{e}^-$   
Counter electrode:  $\frac{1}{2}\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{O}$



## 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.
Temperature range:	Range of temperature where the equipment can perform its functions.
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.
TLV:	An acronym for threshold limit value (the allowable concentration). The limit of the concentration that does not cause harm to health even if a person works daily eight hours a day at a workplace where toxic gases are present in the air.

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

#### Manual Revision History

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GAE-035	May 2010	0

Additional copies of this Instruction Manual are available.  
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