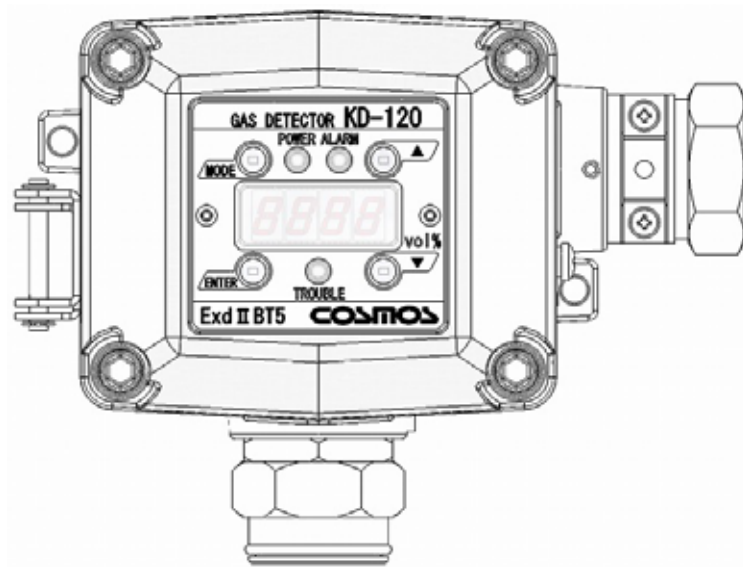


# Diffusion Oxygen Detector

## Model KD-120

### Instruction Manual



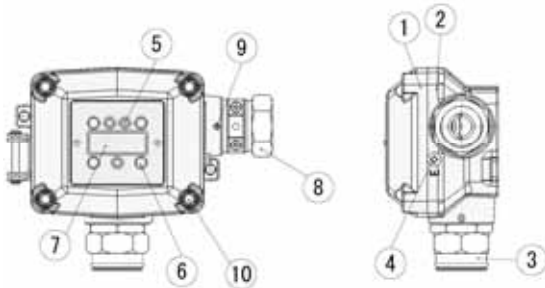
- Keep this instruction manual where it is readily accessible.
- Thoroughly read this instruction manual before using the equipment so it can be used safely and correctly.
- This manual provides information concerning standard specifications. If the specifications of your model are nonstandard, refer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

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

Instruction Manual No.  
GAE-036-00  
May 2010

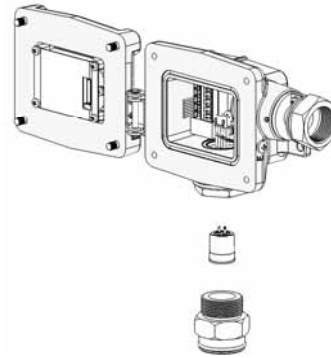
- **Nomenclature**

See pages 4 to 6.



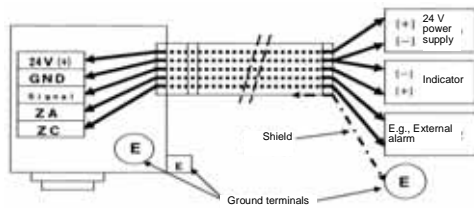
- **Replacement of Sensor Unit**

See pages 20 and 21.



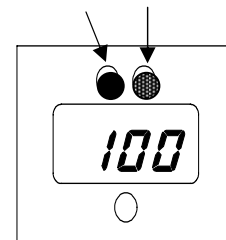
- **Wiring and Connecting Methods**

See pages 11 to 14.



- **Display and Operation in Each Mode**

See page 17.



- **Maintenance Check and Operation Methods**

See pages 18 to 25.

- **Troubleshooting**

See page 26.

# Table of Contents




1. Introduction .....	1
2. Precautions .....	2
3. Contents of Package .....	3
4. External Dimensions and Nomenclature .....	4
4-1. Main Unit .....	4
4-2. Display and Control Blocks .....	5
4-3. Terminal Block .....	6
5. Installation .....	7
5-1. Installation Method .....	7
5-2. Mounting of Optional Items .....	9
6. Wiring Method .....	10
6-1. Wiring Work .....	10
6-2. Wiring and Connection .....	11
7. Precautions before Use .....	14
7-1. Oxygen Deficiency .....	14
8. Display at Start-up (Initial Delay) .....	15
9. Display and Operation in Each Mode .....	16
10. Trouble Alarm .....	17
11. Maintenance Check and Operation Method .....	18
11-1. Daily Inspection and Periodical Inspection .....	18
11-2. Replacement of Sensor Unit .....	19
11-3. Calibration Method .....	21
Maintenance Mode .....	21
Span Rough Adjustment .....	22
21.0 vol% Adjustment .....	23
Full-scale and Alarm Set Value Display .....	24
Test Mode .....	25
12. Troubleshooting .....	26
13. Specifications .....	27
14. Warranty .....	28
15. Detection Principle .....	29
16. Glossary .....	30

# 1. Introduction

- Thank you for purchasing the KD-12O Diffusion Oxygen Detector.
- In order to ensure the correct and safe operation of this product, be sure to read this manual before use.
- The KD-12O Diffusion Oxygen Detector 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.



### **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.
- 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.
- Be sure to provide a protective cover (optional) if the product is installed outdoors.
- Use the product in accordance with applicable laws and regulations.

### 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 (see note 3) Horizontal type: KW-41 Vertical type: KW-42 PB-1 2B Pole Mounting Bracket (see note 3) GCP-09 Calibration Cap (see note 3) Z-001K Gas Calibration Kit (see note 3) 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.
3. The optional items are for use only by the KD-12.

#### **WARNING**

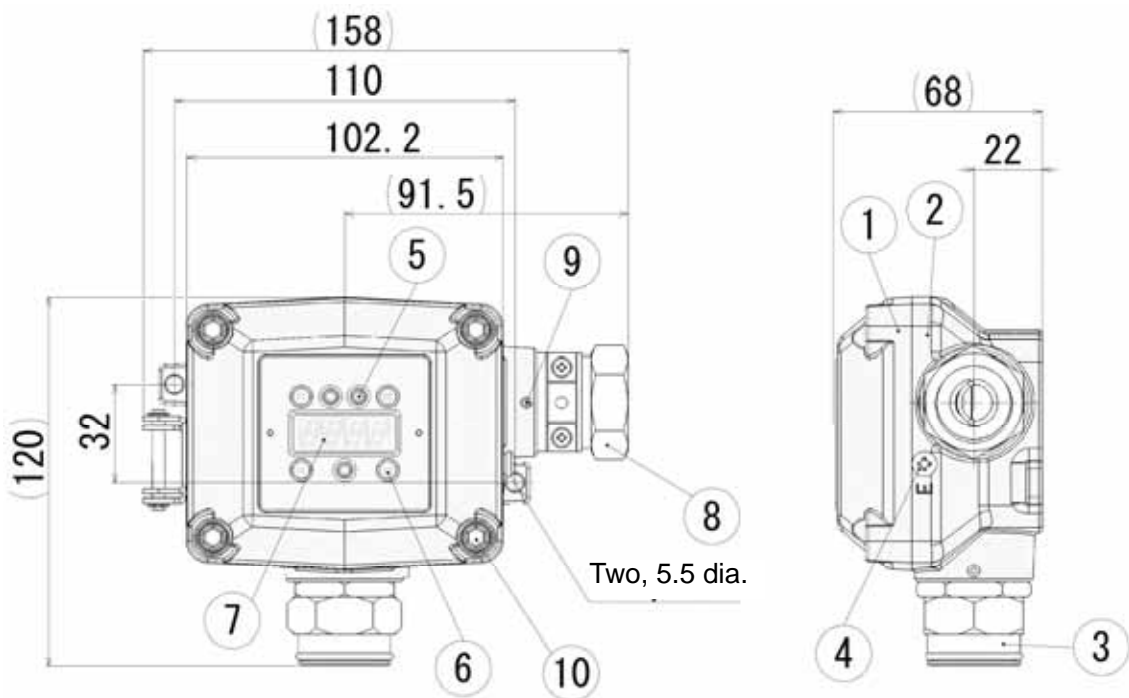
- Do not use the magnetic stick for any purposes other than the operation of this product.
- Keep in mind that when the magnetic stick attracts magnetic objects, tools, iron pieces, etc., your hands may become pinched and injured.
- Do not touch the magnet if you are allergic to metal, otherwise your 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.

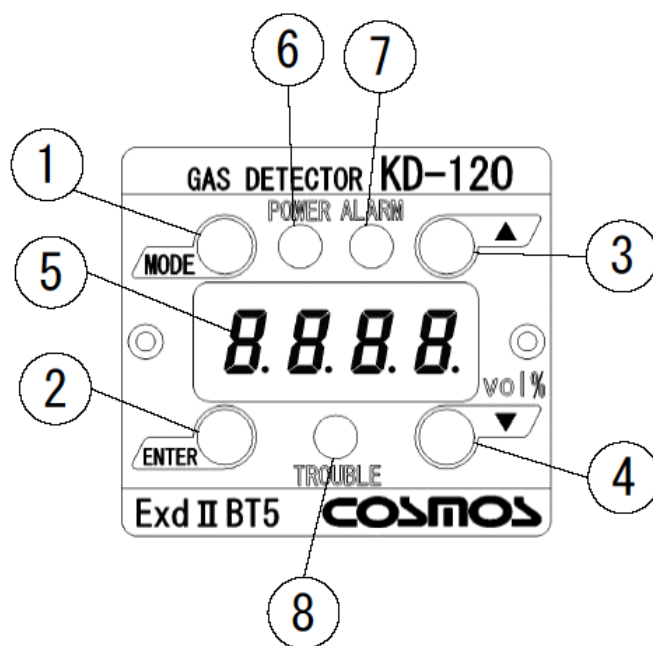
## 4. External Dimensions and Nomenclature

### 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.
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



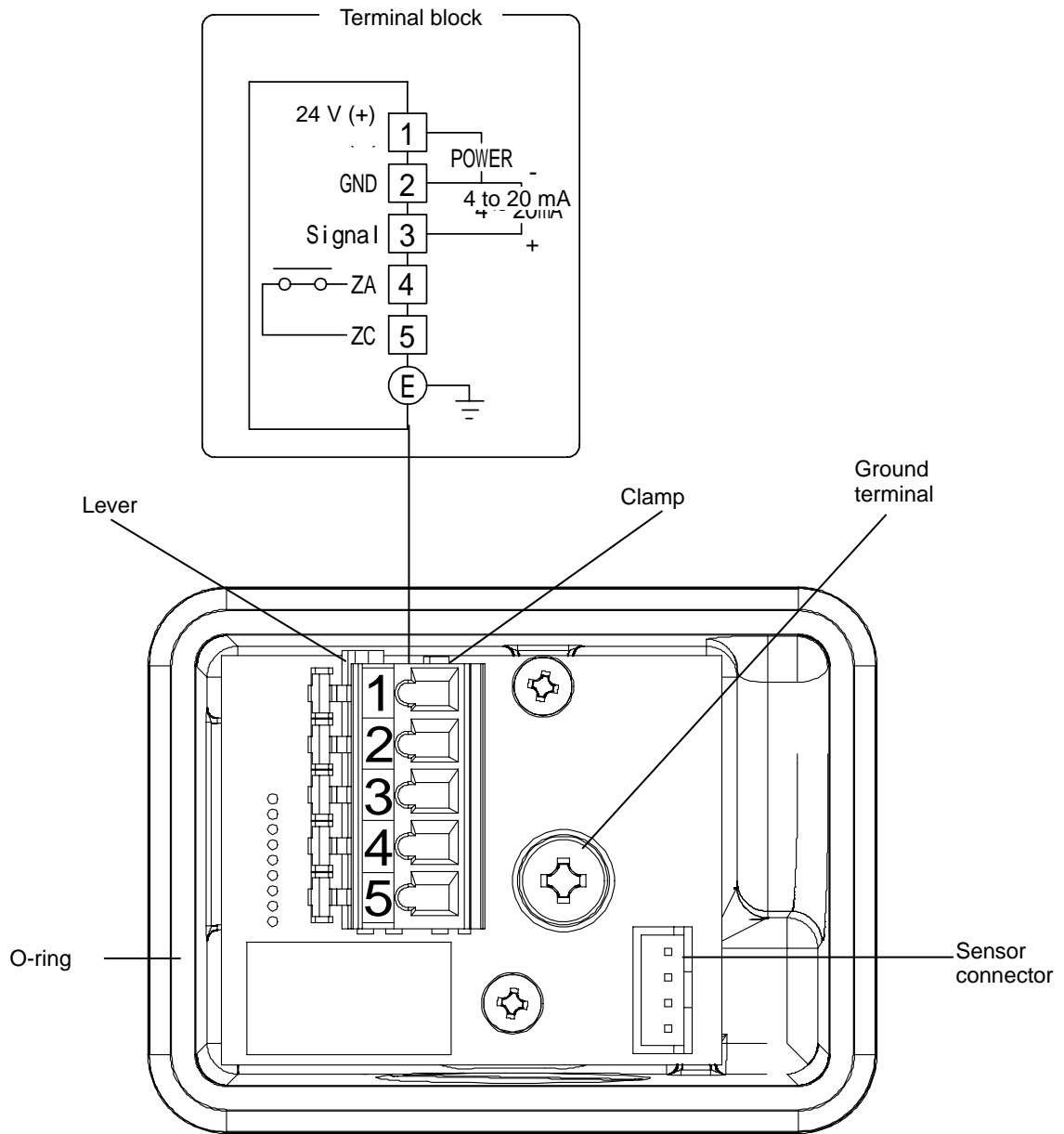
Magnetic switches (Insert the magnetic stick to operate the magnetic switches.)		
Number	Name	Description
1	MODE switch	Makes adjustments and settings or cancels the operation of the product.
2	ENTER switch	Enters settings or completes the control of the product.
3	UP switch	Makes adjustments and settings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

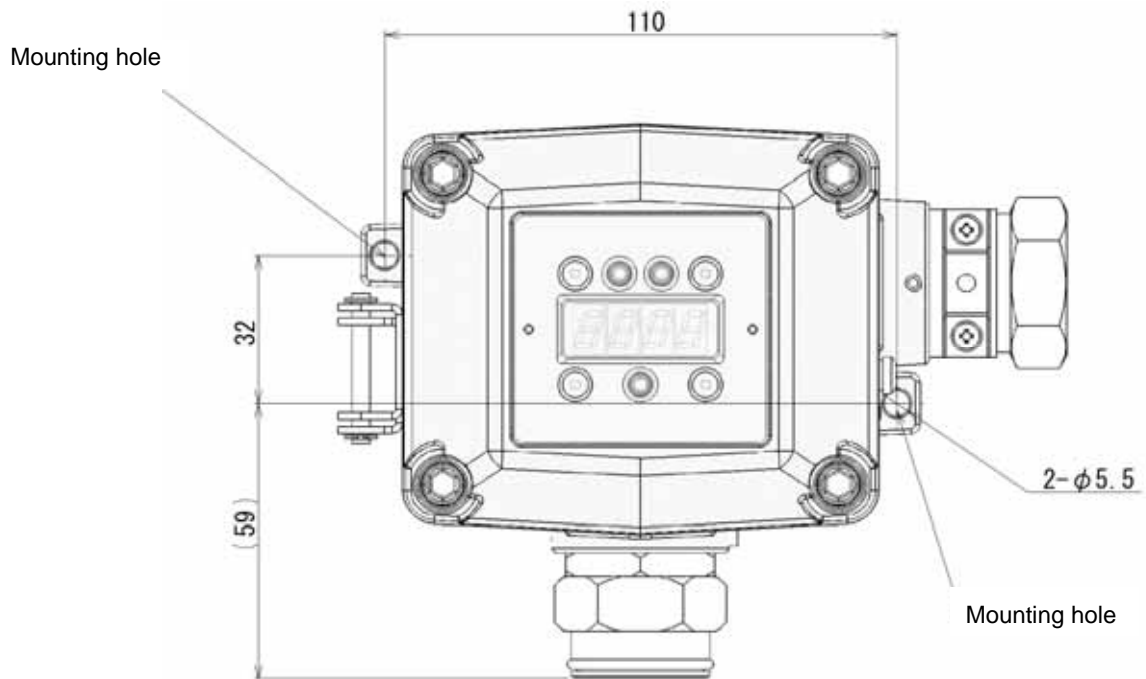
### 5-1. Installation Method



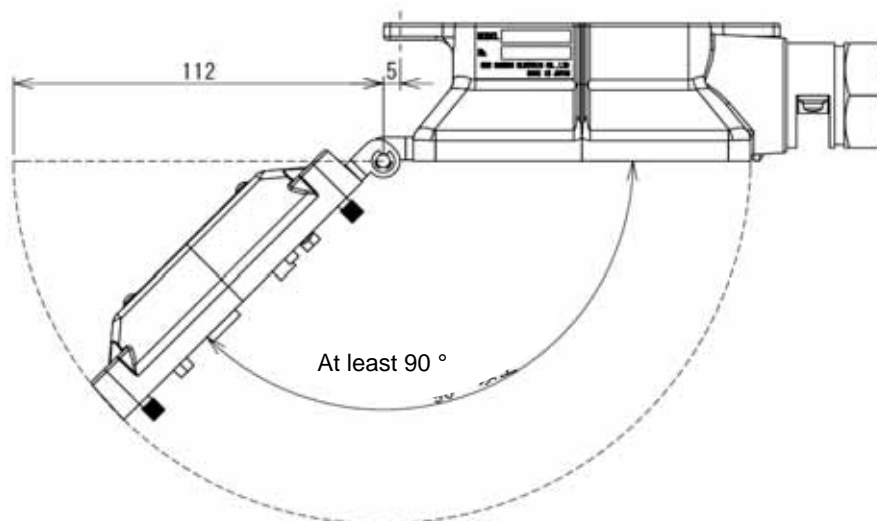
#### CAUTION

- Be careful not to damage the gas detector when installing it. Otherwise, the explosion-proof performance of the gas detector will be lost.
- When using the Detector to prevent oxygen deficiency (anoxia) in the surrounding air, mount the Detector at the same height as the head of the operator.
- Install the gas detector in places where it can be maintained and inspected with ease.
- Do not install the product in the following places.
  - Places where the ambient temperature exceeds the operating temperature range (0°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 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.

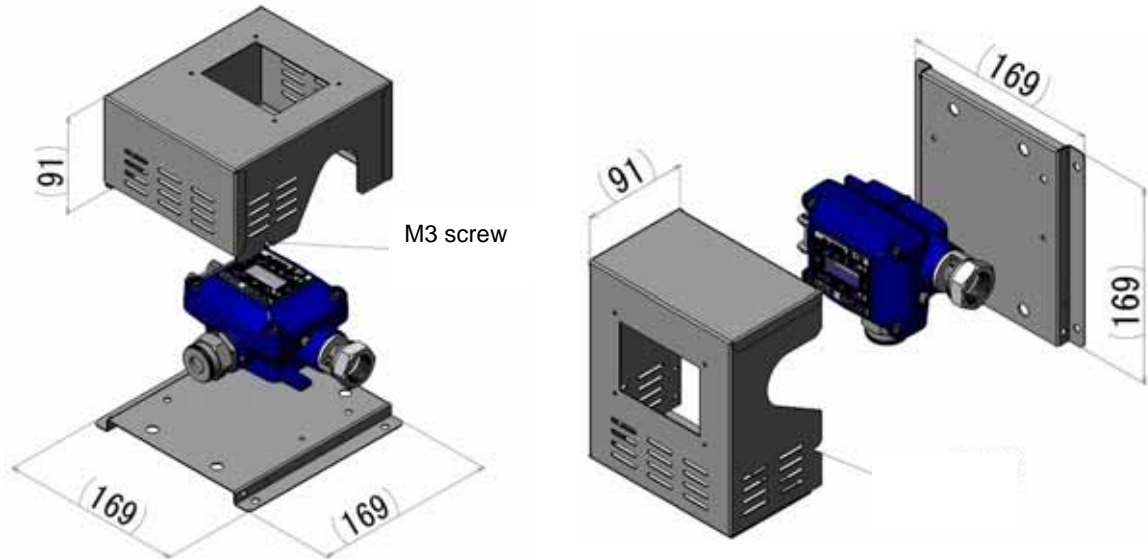


- The casing cover of the Detector must be opened to connect the wiring or replace the sensor unit. When installing the gas detector, provide sufficient space to enable the casing cover to be opened to at least 90° .



## 5-2. Mounting of Optional Items

- Protective Cover



Horizontal Type (KW-41)

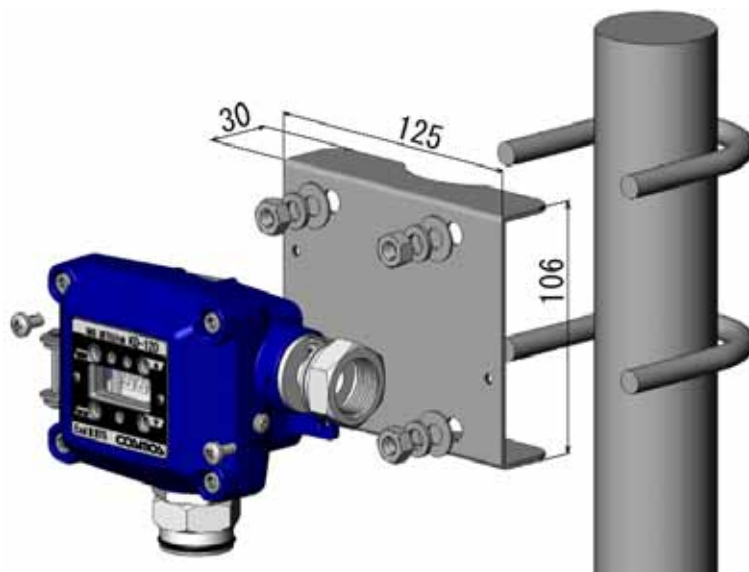
Vertical Type (KW-42)



### 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.		
10-10.4	11.5	11	C Clamp	Optional item
10.5	12	11		Accessory
11	12	12		Built-in accessory
11.5	12.5	12	B Clamp	Accessory
12	13	14		Accessory
12.5	13.5	14	A Clamp	Accessory
13	14	14		Optional item

\* 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.

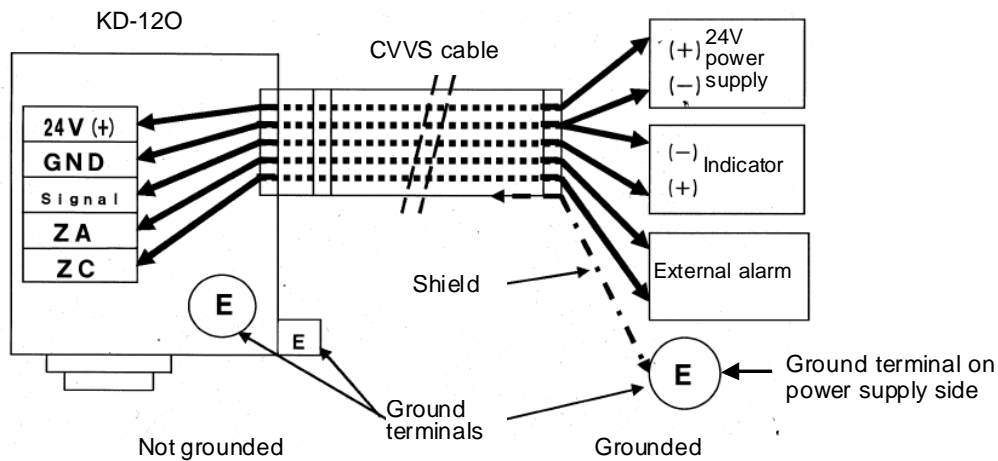
#### Connecting Power Supply and Signal Wires

- 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**

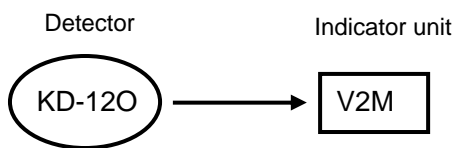
- If the main unit is grounded on the power supply side, do not connect a shielded cable to the ground terminal (E) in the gas detector, or otherwise two-point grounding will result.

Connection Example with Power Supply Side Grounded

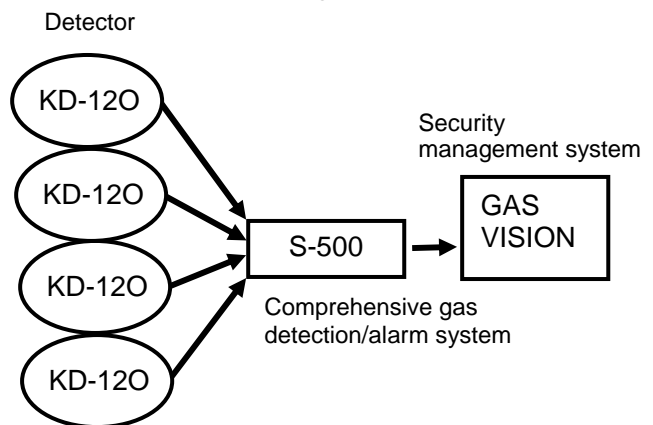


System Configuration Example

Single detector connected to indicator unit



Multiple detectors monitored together



- 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 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. When operating the lever on the terminal block, be sure that the flat-blade screwdriver does not slip off the lever.
- When operating the lever on the terminal block, be sure that the flat-blade screwdriver does not slip off the lever.
- 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.

### 7-1. 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

- Should an alarm occur, take the measures specified by your company for anoxia.

### MEMO

- If the gas detector is installed indoors, open the doors and windows to let in fresh air.
- Measure the oxygen concentration with a portable oxygen indicator, and enter the detection site only when the oxygen level is considered to be safe.

## 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 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.

Software version number (of the main unit)

Example

[ 1.23 ]

[ Full Scale ]

[ 21.0 ]

[ Alarm set value ]

[ 18.0 ]

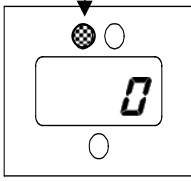
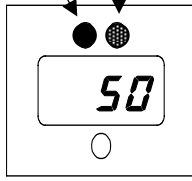
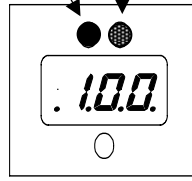
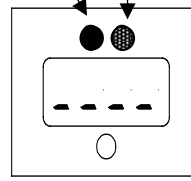
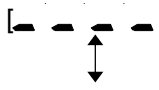
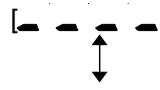
- 3) Then the POWER indicator (green lamp) will flash for approximately 2 minutes and 50 seconds.
- 4) When the POWER indicator (green lamp) stops flashing, start-up of the Detector has been completed and the Detector will be in gas monitor mode.

### MEMO

- The magnetic stick is not operable during the initial delay.
- The initial delay lasts approximately 10 seconds after the power is turned ON.

If necessary, turn ON the Detector for approximately 1 week, and make the zero adjustment and span adjustment. Refer to 11.3 Calibration Method for the adjustment procedures.

## 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>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 0% 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
<i>E-24</i>	Yellow lamp flashes	Power supply voltage drop error	The power supply voltage is low.	Check the power supply voltage.
<i>HHHH</i>	Yellow lamp flashes	Over full scale	The span adjustment may not be correct.	Make a span adjustment again.
<i>LLLL</i>	Yellow lamp flashes	Under zero point	The sensor or sensor connector is disconnected.	Make sure that the sensor and sensor connector are inserted properly.
			The sensor is connected backward.	See if the sensor is connected backward.
<i>E-4</i> <i>E-5</i>	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 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 on page 25.
		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 on page 23.
	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 on page 19 and 11-3. Calibration Method on page 21.

### Periodical Inspections

In order to maintain the reliability of the Detector, it is extremely important to replace and perform inspection of the oxygen sensor. The customer may replace the oxygen sensor, but New Cosmos recommends periodical replacements and inspections under a maintenance contract with your local representative.

## 11-2. Replacement of Sensor Unit



### 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.



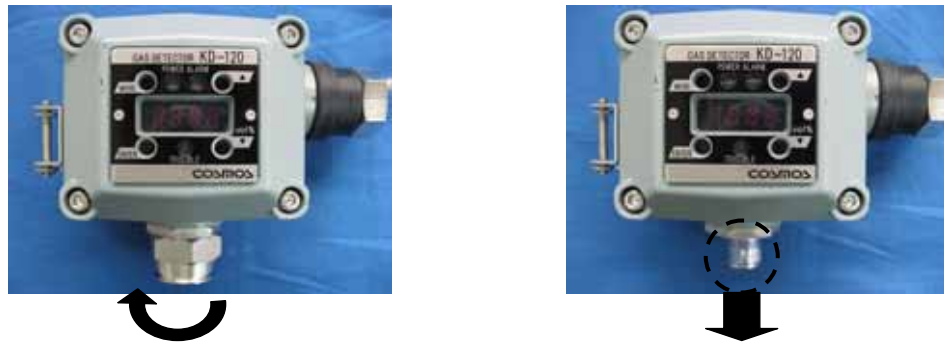
### CAUTION

- 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 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.
- 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.

### MEMO

- Return the used sensor to New Cosmos.
- 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 an error is displayed, refer to 10. Trouble Alarm.

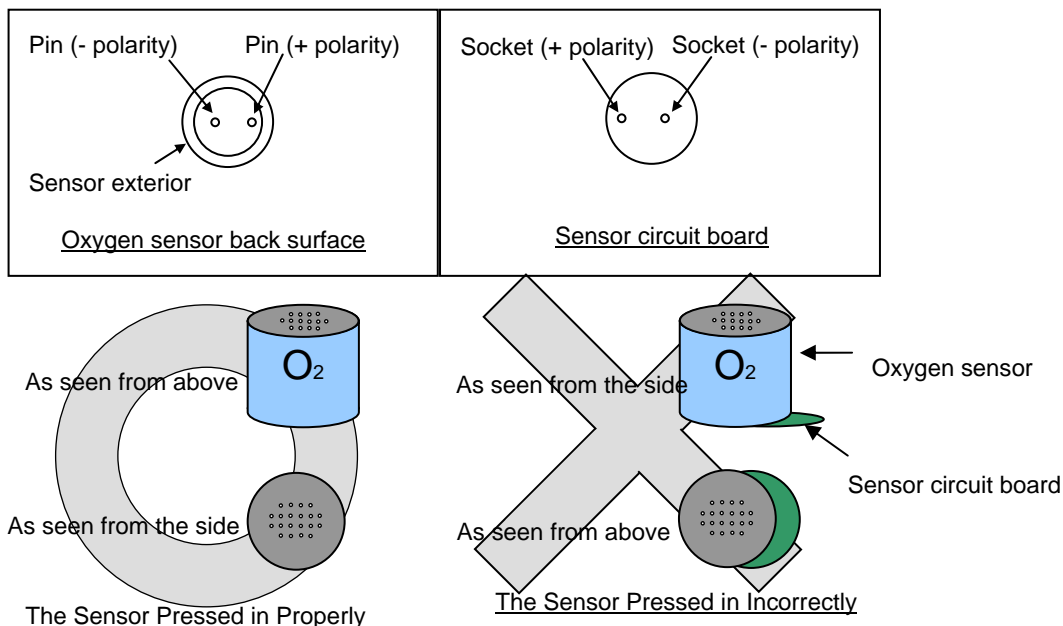
- 1) Turn OFF the power supply to the Detector.
- 2) Remove the sensor casing cover by rotating it in the direction of the arrow. (See the photograph below on the left.)
- 3) Pull down the sensor to remove it. (See the photograph below on the right.)



- 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

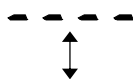
### Maintenance Mode



## 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 .**.
- (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.



## 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 [ *CAL.* ] first, followed by [ . . . 0 ]. (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 [ . . . 1 ].



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

[ *S.F.2.1* ]

[ Current displayed value ]

[ *Good* ]

[ *21.0* ]

- 7) 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 on the Detector first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
- 2) The Detector displays [ **CAL.** ] first, followed by [ . . . 0 ].  
(This procedure assumes that no operation has been performed after turning ON the power supply.)
- 3) Press the UP or DOWN switch on the Detector with the magnetic stick and adjust the value to [ . . . 4 ].
- 4) Press the ENTER switch on the Detector to start the operation.



- 5) When the operation starts, the following values are displayed, and the user can check the full-scale and alarm set values.

[ **F.S.d.P.** ]

[ **F.S.** . . ]

[ Full scale ]

[ **AL.** . . ]

[ Alarm set value ]

- 6) After the full-scale and alarm set values are displayed, the Detector 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 on page 3.

## 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 [ **CAL.** ] first, followed by [ **. . . 0.** ]. (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 [ **. . . 1.0.** ].
- 4) Press the ENTER switch on the Detector to start the operation.



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

[ **1.5.5.** ]

[ 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, [ **LLLL** ] or [ **HHHH** ] 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. 11 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. 21 Maintenance Mode
There is no alarm contact output.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 21 Maintenance mode
	Incorrect wiring connection.	Check and reconnect the wiring.	P. 12 Wiring and Connection
	The alarm point setting is wrong.	Check the alarm setting.	P. 24 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. 25 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. 15 Display at Start-up (Initial Delay)

## 13. Specifications

Principle of detection	Galvanic cell
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 performance	Exd II BT5
Degree of protection	IP65 (interior)
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: 0°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 116 (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.

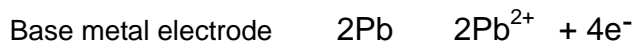
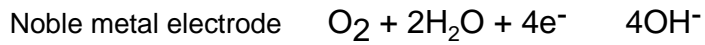
After examination of an allegedly defective product returned to New Cosmos, with freight prepaid, should the product fail to conform to this warranty, the customer's only remedy and New Cosmos's only obligation shall be, at New Cosmos's sole option, replacement or repair of such non-conforming product 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

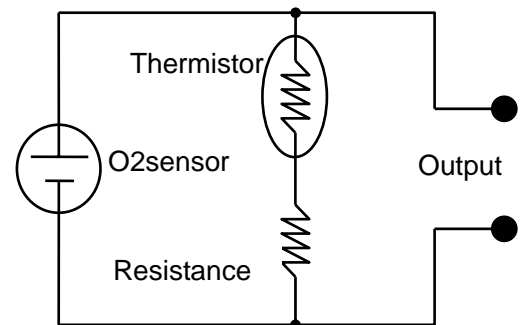
The galvanic cell sensor consists of noble metal (Pt, Ag) electrode, a base metal (Pb) electrode, and electrolyte. The noble metal electrode contacts the air through a Teflon membrane.

Since a potential difference is produced between the two electrodes, the following reaction occurs when a load resistor is connected:



As a result, a current proportional to the concentration of oxygen in the air flows from the noble metal electrode to the base metal electrode through an external circuit.

Since the current generated is dependent on temperature, a Thermistor is used to compensate for the atmospheric temperature changes.





## 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.)

#### Manual Revision History

Edition No.	Date	Revisions
GAE-036	May 2010	0

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

**Distributor:**

**Manufacturer:**

New Cosmos Electric Co., Ltd.  
2-5-4 Mitsuya-naka Yodogawa-ku  
Osaka 532-0036, Japan  
Phone 81-6-6309-1505  
Fax 81-6-6308-0371  
Email [e-info@new-cosmos.co.jp](mailto:e-info@new-cosmos.co.jp)  
<http://www.new-cosmos.co.jp>

