

CO Sensor Device for Underground Parking Garage Ventilation System Model KS-7DU

Instruction Manual

- Keep this Instruction Manual available for quick reference when needed.
- Read this Instruction Manual and understand the information thoroughly before using.
- This Instruction Manual describes the standard specification. For the users' specification, see the separate delivery specifications.



NEW COSMOS ELECTRIC CO., LTD.

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1. Introduction

Thank you for purchasing the KS-7DU CO Sensor Device for Underground Parking Garage Ventilation System.


The KS-7DU CO Sensor Device for Underground Parking Garage Ventilation System is a sensor for carbon monoxide, which is toxic and combustible gas, as a sensor part of the ventilation system in underground parking garage in non-hazardous area.


It activates the contact system and analog signals (4-20mA DC) to send signals to the control panel when it reaches to the operating setting set value.


Read this Instruction Manual thoroughly before installing and using the CO Sensor Device for proper operation.

SYMBOLS

The following symbols are used for safety purposes.

 **DANGER** : Indicates hazardous situation that may result in serious injury or death, if not avoided.

 **WARNING** : Indicates potentially hazardous situation that may result in serious injury or death, if not avoided.

 **CAUTION** : Indicates potentially hazardous situation that may result in minor injury or physical damage, if not avoided.

NOTE : Indicates operational advices.

2. Precautions

Read the following instructions thoroughly for proper operation. Ensure to install and operate the CO Sensor Device in accordance with applicable laws and regulations.

WARNING

- This CO Sensor Device is not explosion-proof structure. Install in a non-hazardous location.
- Make sure to fix the cover with cover fixation screws, as it may not be able to detect properly.

CAUTION

- Do not disassemble, alter, or change the structure or electric circuits of the CO Sensor Device, as it may affect its performance.
- The CO Sensor Device is not drip-proof structure. Keep liquids away from the CO Sensor Device.
- Use the CO Sensor Device in accordance with applicable laws and regulations.
- By the sensor structure, the mounting position of the CO Sensor Device is specified. Make sure to install the CO Sensor Device in accordance with “5. *Installation Instructions*” on page 6.
- By the structure, when it is not stored accordance with the instructions on package, the sensor output may decrease temporarily for one week after installation. This phenomenon will be recovered to the normal output within one hour and then it will operate normally. (It may take 2 hours if the storage period is long.)
- For use of analog outputs of the CO Sensor Device to the concentration display of upper monitoring software, process the software of zero suppression. The analog output resolution of the CO Sensor Device is 250 to 400 (depending on the full scale setting). Because of the difference in resolution of upper monitoring software or difference in concentration digit, and changes in connected impedance, some errors may be observed in the concentration indicator. Set the error threshold to 1.0mA for analog output.

3. Contents in the Package and Options

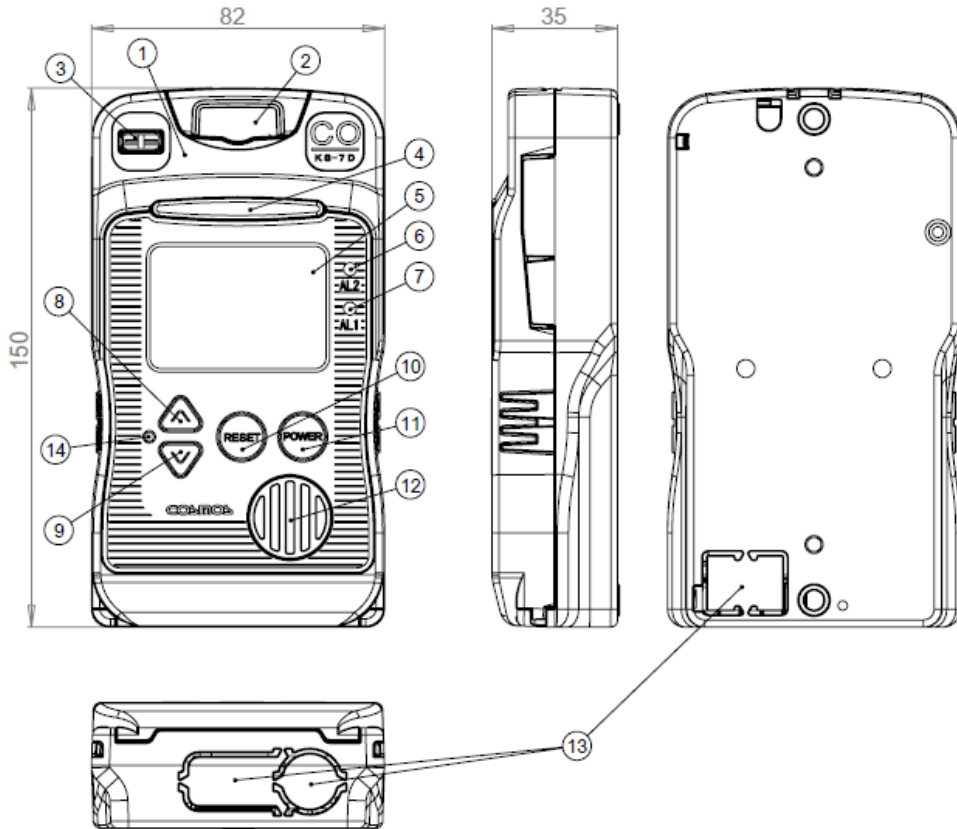
The following items are enclosed with the KS-7DU CO Sensor Device for Underground Parking Garage Ventilation System. Carefully check that all items listed below are included before use. If any items are broken or missing, contact your New Cosmos representative.

Standard Accessories

Items	Qty	Reference
CO Sensor Device	1	Model KS-7DU
Mounting Screw	2	M5 x 12 with spring washer, to mount the Sensor Device
Banding Band	1	To bundle the electric wire
Pin Terminal	9	For clamping connection to the terminal block
Insulation Cap	9	For electrical insulation by inserting to crimping terminal
Instruction Manual	1	
Installation Manual	1	(select review of instruction manual)
Inspection Report	1	

4. Dimensions, Part Names and Functions

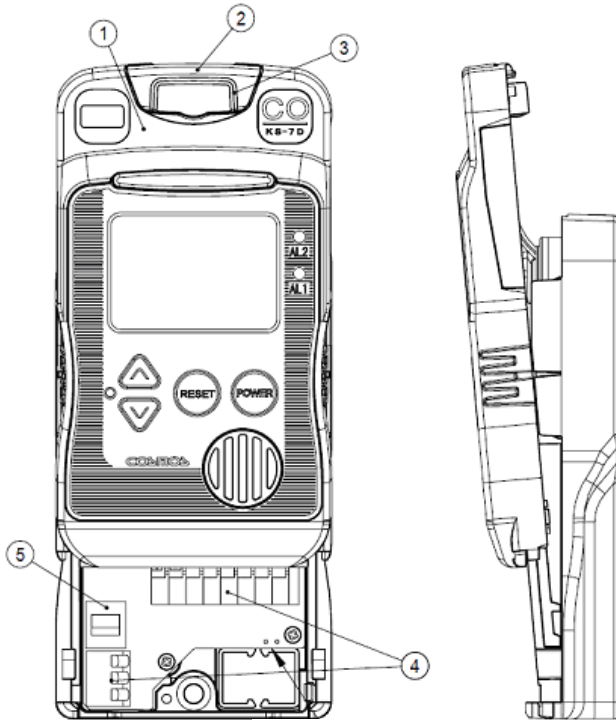
4-1. External Dimensions, Part Names and Functions



No.	Name	Function
1	Cover	Slide upward to operate the Main Power Switch and for external wiring. Keep the cover closed under normal use.
2	Screw Cover	Covering the mounting screws of the CO Sensor Device and fixation screws of cover. Keep open for installation and deinstallation, and close for normal operation.
3	Gas Detection Port	Detects gas by internal sensor module.
4	Status Lamp	N/A
5	LCD	Displays the carbon monoxide concentration and information.
6	2 nd Stage Alarm Lamp	N/A
7	1 st Stage Alarm Lamp	N/A
8	UP Switch	During normal operation, press to display upper limit peak value of Carbon Monoxide concentration after power activation on LCD. Also to use for setting by a combination of each switch.
9	DOWN Switch	Use for setting by a combination of each switch.
10	Reset Switch	During normal operation, press to display the full scale and set value for contact operation.
11	Power Switch	Press and hold to turn ON/OFF the power.

12	Buzzer Hole	To emit the operation notification sound.
13	Cable Inlet	Connect to external wiring. Use by cutting with nipper.
14	Maintenance Switch	Use for setting.

4-2. Part Names and Functions



No.	Name	Function
1	Cover	Slide upward to operate the Main Power Switch and for external wiring. Keep the cover closed under normal use.
2	Screw Cover	Covering the mounting screws of the CO Sensor Device or fixation screws of cover. Keep open for installation and deinstallation, and close for normal operation.
3	Cover Fixation Screw	To fix the cover (inside the screw cover)
4	Terminal Box	Connect with the external wiring.
5	Main Power Switch	Turn ON/OFF the Main Power Switch.

5. Installation Instructions

WARNING

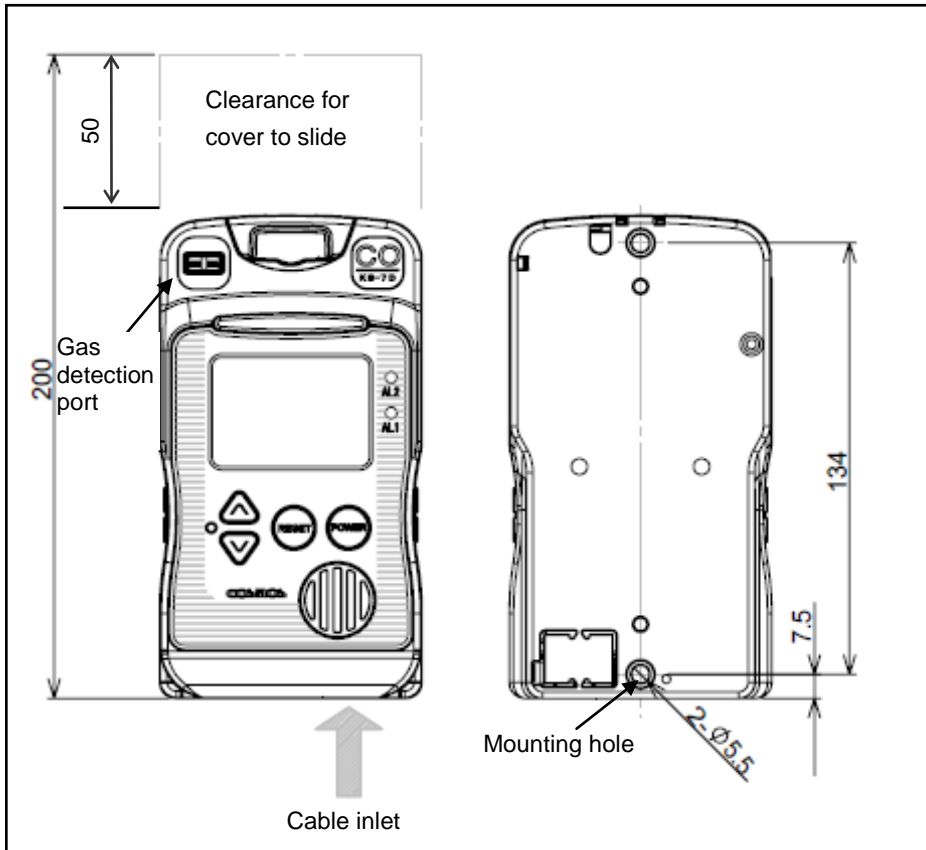
This CO Sensor Device is not explosion-proof structure.
Install in a non-hazardous location.

CAUTION

- Handle with care to avoid damaging the CO Sensor Device caused by dropping or hitting, as it may affect the detection performance.
- Do not install the CO Sensor Device in locations listed below.
 - Outdoor or places where it may be exposed to direct water.
 - Places where the ambient condition is out of the following range.
 - Temperature: between -5 and +40 degrees C (without rapid temperature changes)
 - Humidity: between 30 and 85% RH (non-condensing).
 - Places where corrosive gas may exist.
 - Places where it is susceptible to impact or vibration.
 - Places where high-frequency or magnetism is generated.
 - Places where electrical noise is generated.
- Install in a location where the maintenance can be performed easily.
- Installation position of sensor should be upward in a vertical direction. If it is installed upside-down or sideways, it may not detect properly.
- Installation height should be 150 cm from the floor to the gas detection port, in a places without obstruction to detect gas.
- Make sure to fix the cover with cover fixation screws, as it may not be able to detect properly.

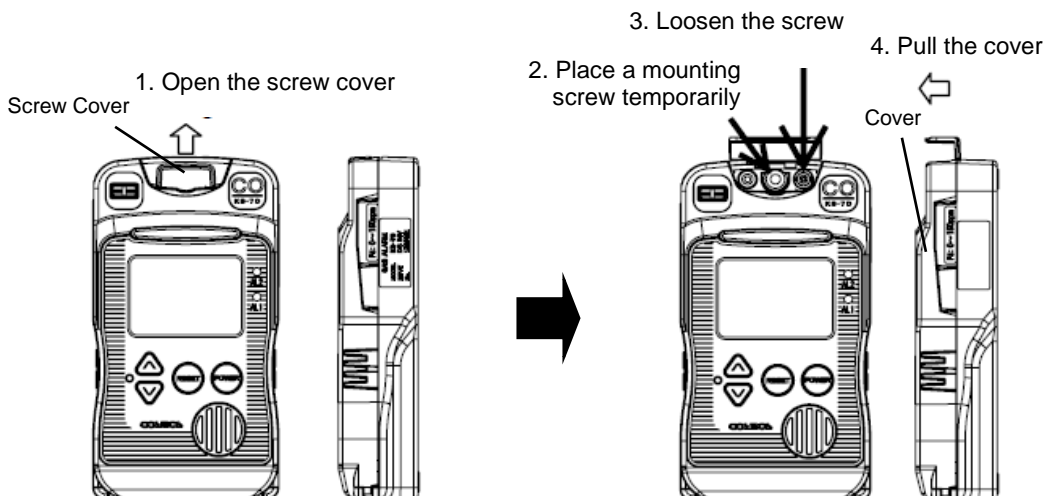
NOTE

- Leave a space at least 30 mm of clearance from side to side for replace.
- Leave a space at least 200 mm of clearance from the bottom and 50mm from the top for sliding the cover.
- Create a space for cabling under the CO Sensor Device.

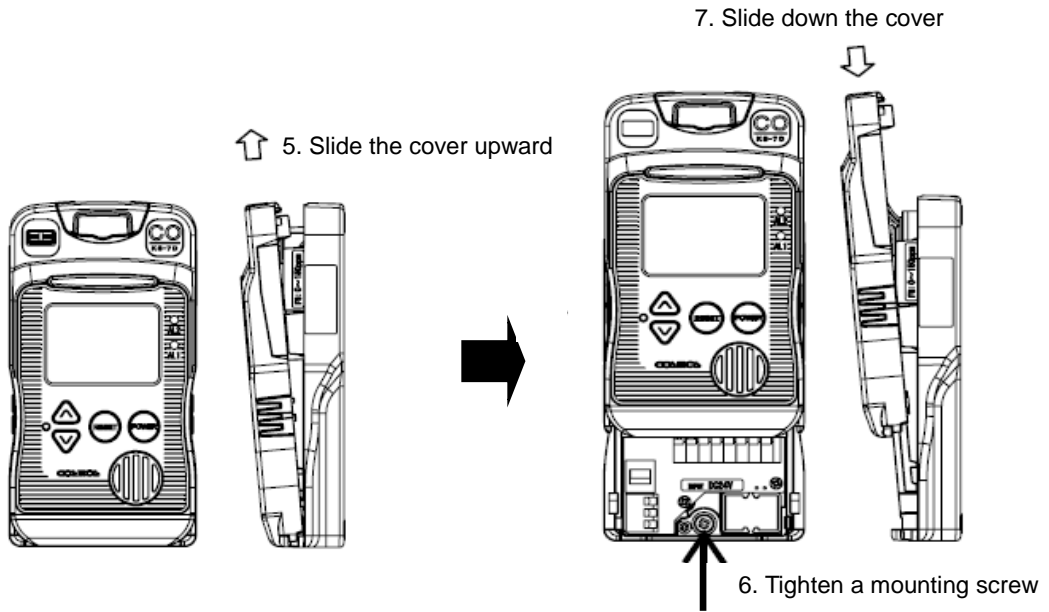


- Install the CO Sensor Device with M5 internal thread of mounting screws (2-point, pitch 134) according to the following procedure.

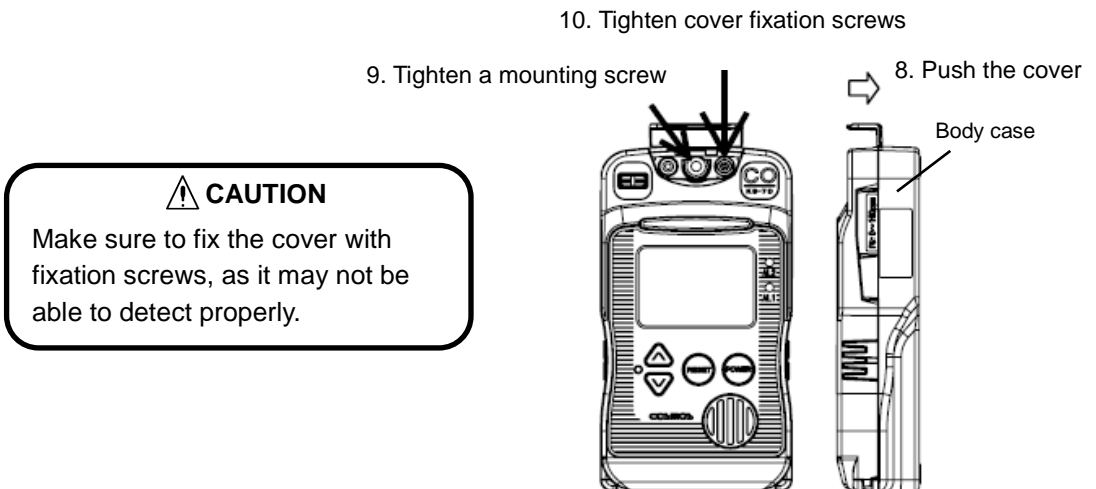
1. Open the screw cover
2. Place a provided mounting screw temporarily (Upper side)
3. Loosen the cover fixation screws
4. Pull the cover



5. Slide the cover upward (Open)
6. Tighten the provided mounting screw (Bottom side)
7. Slide down the cover (Close)



8. Push the cover to the body case
9. Tighten a provided mounting screw (Upper side)
10. Fix the cover with cover fixation screw
11. Close the screw cover



6. Wiring

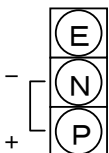
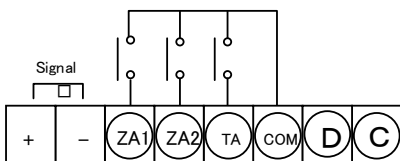
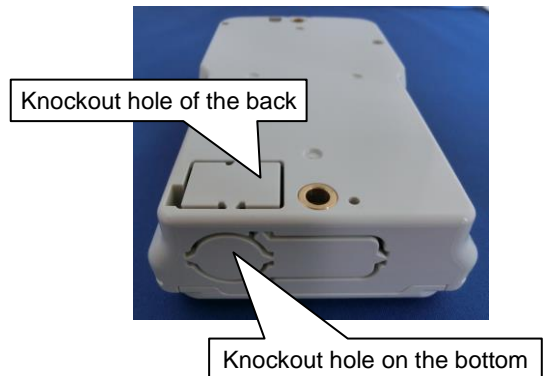
⚠ WARNING

- Make sure to turn OFF the power supply before starting the wiring work for electric shock prevention.
- Close the cover after the wiring to prevent electric shock.

⚠ CAUTION

- New Cosmos does not accept any liability whatsoever for any resulting damage for controlling the interlock by applying the Carbon Monoxide concentration output (analog output, alarm relay output).
- Pay attention to the terminal marking on terminal block for connection.
- Keep the connection cable away from the electrical power line.
- The analog output of the KS-7DU CO Sensor Device is not insulated from the power supply. When using the KS-7DU CO Sensor Device with other equipment, provide electrical insulation to prevent sneak current.

- The wiring slot is located by knockout hole on the back and bottom side. Cut and open the wiring slot with nipper.
- Use shielded cables (0.5 to 1.25 mm²) within 500m and outside diameter of 10.5mm or less.



24V DC		
P	+	Power Source 24V DC
N	-	
E	Earth ground	
Signal	+	Analog output 4 to 20mA DC
	-	
ZA1	1 st alarm contact (non-voltage 1a or 1b)	
ZA2	2 nd alarm contact (non-voltage 1a or 1b)	
TA	Malfunction contact (non-voltage 1a or 1b)	
COM	Common	
D	Non-use	
C		

6-1. Assembling of Pin Terminals and Insulation Caps

Recommended Parts

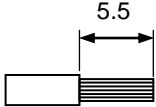
Names	Model (manufacturer)	Reference
Electric Cable	-	Shielded cable (0.5 to 1.25mm ²) 10.5mm or less in outer diameter
Pin Terminal	TC1.25-16 (NICHIFU)	Included with shipment (for twisted wire 0.25 to 1.65mm ²)
Insulation Cap	VC1.25 (NICHIFU)	Included with shipment
Crimp Tool	NH1 (NICHIFU)	Nominal size compatible terminal 1.25 for uninsulated terminal

Terminal Block (reference)

Use	Model (manufacturer)	Reference
Power Terminal Block	ML-1400-S1L-3P (SATO PARTS)	Fit diameter: 0.65mm to 1.6mm
External Output Cable	FFKDSA1/H1-5, 08-8 (PHOENIX CONTACT)	Fit diameter: 0.2mm to 1.5mm

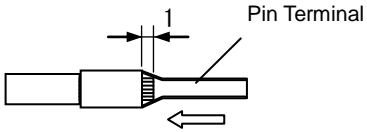
1. Wire Strip

The recommended dimension of the end of stripped wire for assembling pin terminal is 5.5mm.



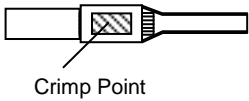
2. Pin Terminal

Attach the pin terminal to the stripped wire. Push until the core of stripped wire is viewed 1mm from the center of pin terminal.



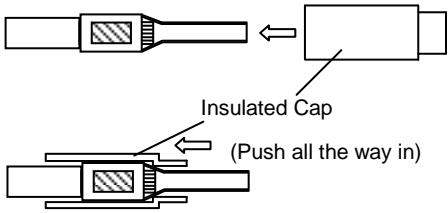
3. Pin Terminal Crimp

Crimp the center point of pin terminal.



4. Insulated Cap

Insert the insulated cap from the top of crimp pin terminal.

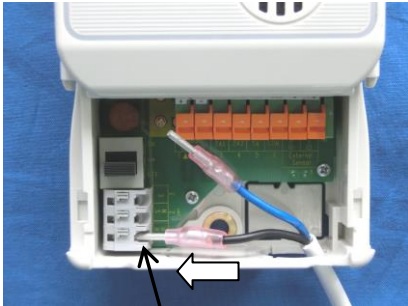


NOTE Insert the insulated cap all the way into the pin terminal, as it may cause disconnection due to the short length of insertion.

6-2. Connecting and Disconnecting to Terminal Block

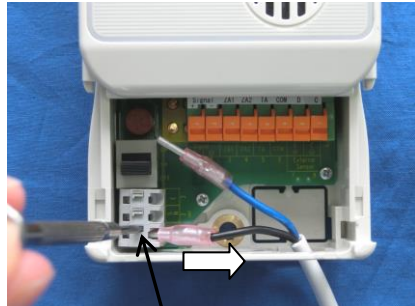
6-2-1. Terminal Block for Power Source

(To connect)



Insert the pin terminal to electric inlet hole.

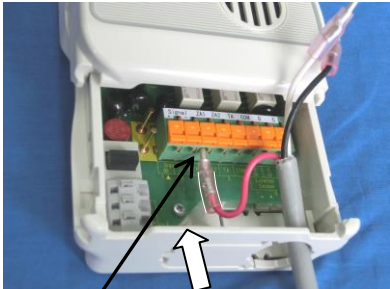
(To disconnect)



Press the release button with a precision screwdriver (recommended chip thickness: 2.6mm) and pull the pin terminal.

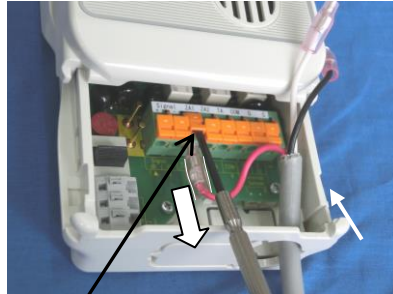
6-2-2. Terminal Block for External Output

(To connect)



Insert the pin terminal to electric inlet hole.

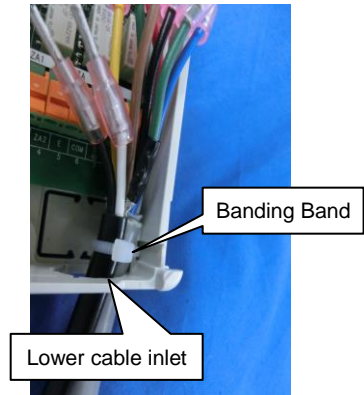
(To disconnect)



Press the release button with a precision screwdriver (recommended chip thickness: 3mm) and pull the pin terminal.

6-3. Banding Band

It has a place to thread a banding band near the cable inlet inside the case for bundling cables (see figure at right). At first, through the banding band, form a ring, through the cables in the circle before wiring, and bundle the cables at the end.



7. Operating Procedure

7-1. Before Use

⚠ WARNING

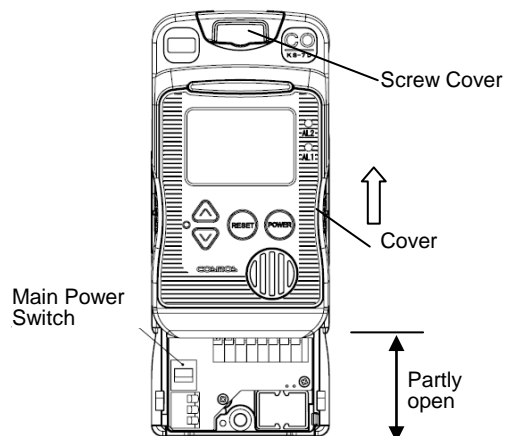
- Before supplying the power, confirm the power specification of the equipment and the power supply voltage.
 - 24V DC +/-10%

⚠ CAUTION

- Before turning ON the power, make sure all the connections of each part are correct, in reference to “6. Wiring” on page 9 or separate delivery specifications if it is provided.
- By the sensor structure, when a sensor is not stored accordance with the instructions on package, the sensor output may decrease temporarily for one week after installation. This phenomenon will be recovered to the normal output within one hour and then it will operate normally. (It may take 2 hours if the storage period is long.)
- Make sure there is no gas around (clean air) before use.
- If the sensor is not stabilized, the external contact may function after warm-up operation. Release the interlock of external device as needed.
- During the warm-up operation, the analog signal output will be fixed at 4 mA and the external contact does not function.

7-2. Operating Procedure

- 1) Follow the steps 1, 3, 4, 5 of “5. Installation Instructions” on page 6 to slide and open the cover partly.
 1. Open the screw cover.
 3. Loosen the cover fixation screws.
 4. Pull the cover.
 5. Slide the cover upward. (Open)
- 2) Turn ON the Main Power Switch (up).

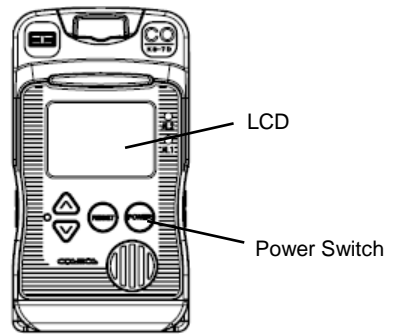


3) Follow the steps 7, 8, 10 of "5. Installation instructions" on page 6 to close the cover and screw on.

7. Slide down the cover. (Close)

8. Push the cover to the body case.

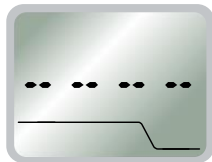
10. Fix the cover with cover fixation screw.



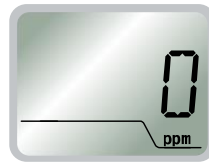
CAUTION

Make sure to fix the cover with cover fixation screws, as it may not be able to detect properly.

4) Press the Power Switch for 3 seconds. (pip, beep)
The status lamp flashes in green and "- - - -" is displayed on LCD to start warm-up operation (for 90 seconds).



Warm-up operation



Normal Operation

5) After the warm-up operation, the gas concentration displays on LCD and starts normal operation.

CAUTION

If the power is on and the carbon monoxide concentration indicates negative, turn off the power once, and turn on again after one hour (when the sensor is stabilized).

6) Conduct a contact operation test. (See "7-4-5. Contact Operation Test" on page 18.)

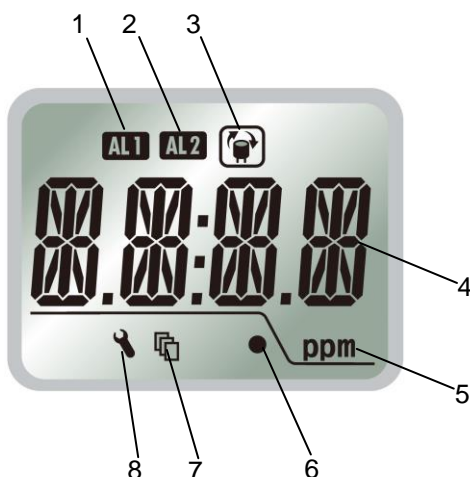
7) To turn OFF the power, press the Power Switch and Maintenance Switch for 3 seconds. Turn off the Main Power Switch after the operation is stopped and the LCD is turned off.

NOTE

To press the Maintenance Switch, use an unpointed thin stick such as a precision screwdriver.

7-3. Operation and Function

7-3-1. LCD



No.	Name	Description
1	AL1 Contact	Will be displayed during the AL1 contact operation
2	AL2 Contact	Will be displayed during the AL2 contact operation.
3	Sensor Replacement	Will be displayed to to notify the sensor replacement
4	Concentration/Information	Indicates the gas concentration, error, etc.
5	Concentration Unit	A unit of gas concentration
6	Clock Battery Level	Indicates the clock battery level is low
7	History	Indicates when the history is displayed
8	Maintenance Function	Indicates when the maintenance function is ON

7-3-2. Status of Normal Operation

The concentration will be displayed on the LCD in normal operation.

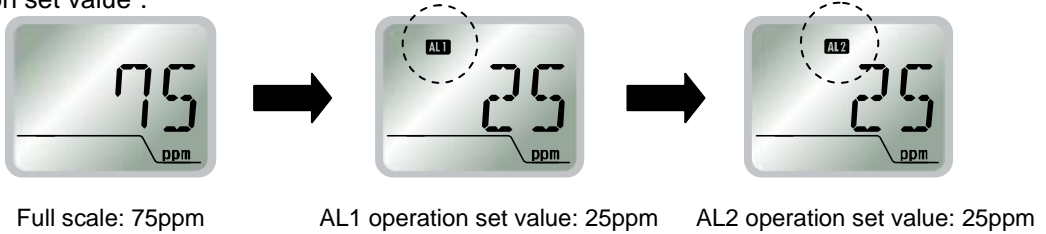
Switches

	Power Switch
	Reset Switch
	UP Switch
	DOWN Switch
	Maintenance Switch

7-3-3. Full Scale and Set Value

Press the Reset Switch. (Beep)

It will be displayed in order of “full scale concentration”, “AL1 operation set value”, and “AL2 operation set value”.



7-3-4. Displaying Peak Value and Reset

- Press the DOWN Switch (Beep). “The lowest peak value after power activation” and “PEAK” will be displayed alternately.



- To return to normal mode, press the Reset Switch (beep). After displaying “full scale and operation set value”, it returns to the gas concentration display.
- To reset the peak value, press the UP and DOWN Switches at the same time. The peak values are reset and it returns to the normal gas concentration display.

7-3-5. Performance of Gas Alarm

- When the carbon monoxide concentration reaches the operation set value, the contact output will be switched.

7-4. User Mode

NOTE

- In User Mode, the gas detection, contact output, and analog output will function the same way as in normal mode.
- Make sure to return to the normal mode after User Mode.

7-4-1. Operation of User Mode

- To enter user mode, press the Maintenance Switch (beep) when the power is ON. “1” (mode number) and “MT” (abbreviation) will be displayed alternately.



NOTE To press the Maintenance Switch, use an unpointed thin stick such as a precision screwdriver.

- To change the mode number, press the UP and DOWN Switches.
- To select the mode number displayed on LCD, press the Maintenance Switch. To return without selecting the mode, press the Reset Switch.
- To execute in each mode, press the Maintenance Switch for 3 seconds.
- To return to “Normal Mode”, press the Reset Switch for 5 seconds.

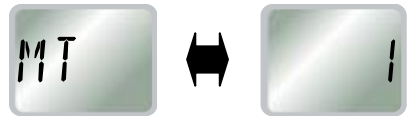
Mode	Mode No.	Abbreviation
Switching Maintenance Function ON/OFF	1	MT
Zero Adjustment	2	0.0 ppm
Span Adjustment	3	* * * ppm
Contact Operation Test	4	AL T
History Confirmation	5	AL H
Clock Setting	6	DATE

7-4-2. Switching the Maintenance Function ON and OFF [Mode Number 1]

⚠ WARNING

- When the maintenance function is ON, external contact and alarm sound will not function. Make sure to switch OFF the Maintenance Function for the normal operation.

- In user mode, select Mode Number "1".
"MT" and "1" (mode number 1) will be displayed alternately.



- Press the Maintenance Switch. (Beep)
"OFF" will flash.



- Press the UP Switch (beep).
"ON" will flash.



- Press the Maintenance Switch for 3 seconds (beep, beep, pi, pi) <Select>
Maintenance icon is displayed, and "1"
and "MT" will be displayed alternately.



NOTE

When the maintenance function remains ON and returns to the normal operation, maintenance icon will stay displaying and "concentration value" and "- - -" will be displayed alternately.



- To switch OFF the maintenance mode, follow the above 1 to 4 steps and change to "OFF" from "ON".
Confirm the maintenance icon is disappeared.

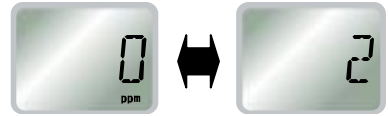


7-4-3. Zero Adjustment [Mode Number 2]

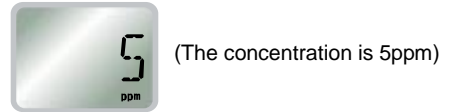
⚠ CAUTION

- Make sure there is no gas around (in clean air) before performing zero adjustment.
- If zero adjustment is not performed correctly, it can not detect properly.

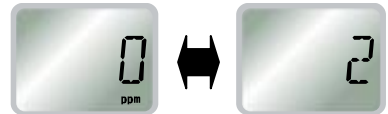
1) In user mode, press the UP Switch (beep) to select "Mode Number 2". "0ppm" and "2" (mode number) will be displayed alternately.



2) Press the Maintenance Switch (beep)
The current carbon monoxide concentration (ppm) will be displayed.



3) Confirm there is no gas around and press the Maintenance Switch for 3 seconds (beep, beep, pi). <Execute>
"2" (mode number) and "0ppm" will be displayed alternately, and zero adjustment is complete.



7-4-4. Span Adjustment [Mode Number 3]

CAUTION

- Contact your New Cosmos representative for span adjustment.
- Do not use this mode. It cannot detect properly with the wrong adjustment.

In user mode, press the UP Switch (beep) to select "Mode Number 3".

The span adjustment concentration (ppm) and "3" (mode number) will be displayed alternately.



(Span adjustment concentration is 75ppm)

7-4-5. Contact Operation Test [Mode Number 4]

- When the contact operation test is performed, the concentration of contact operation test will be displayed on the LCD, and appropriate analog output will activate for test.

NOTE If the maintenance function is ON, the external contact will not activate (analog output will activate).

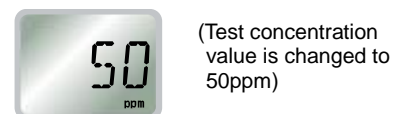
1) In user mode, press the UP Switch (beep) to select "Mode Number 4".
"AL T" and "4" (mode number) will be displayed alternately.



2) Press the Maintenance Switch. (Beep)
The current contact operation test concentration value (ppm) will be displayed.



3) Press the UP and DOWN Switches to change the contact operation test concentration value.



NOTE Increase and decrease concentration value with the UP and DOWN Switches. Keep pressing the switch to change value continuously.

4) Press the Maintenance Switch for 3 seconds. (Beep, bleep)
The contact operation test will be performed.

- 5) Press the Reset Switch (beep) to release the contact operation test and the current contact operation test concentration will be displayed.
(Press and hold the Reset Switch to return to normal mode without stopping test operation.)



(Test concentration is set to 50ppm)

- 6) To change the set value, repeat the procedure from 3) to 5).
- 7) Press the Reset Switch **for 5 seconds** to return to normal mode.

7-4-6. History Confirmation [Mode Number 5]

- Latest 10 histories will be displayed (automatically updated).
- The alarm history is displayed in order of alarm peak value (ppm), year/month/day/time of the start and end of alarm.
- Press the Reset Switch to return.

- 1) In user mode, press the UP Switch (beep) to select "Mode Number 5".
"AL H" and "5" (mode number) will be displayed alternately.



- 2) Press the Maintenance Switch (beep). The latest history number "H1" will be displayed. If there is no history, "INIT" will be displayed.



- 3) Press the UP Switch (beep) and select the history number from H1 to H10.



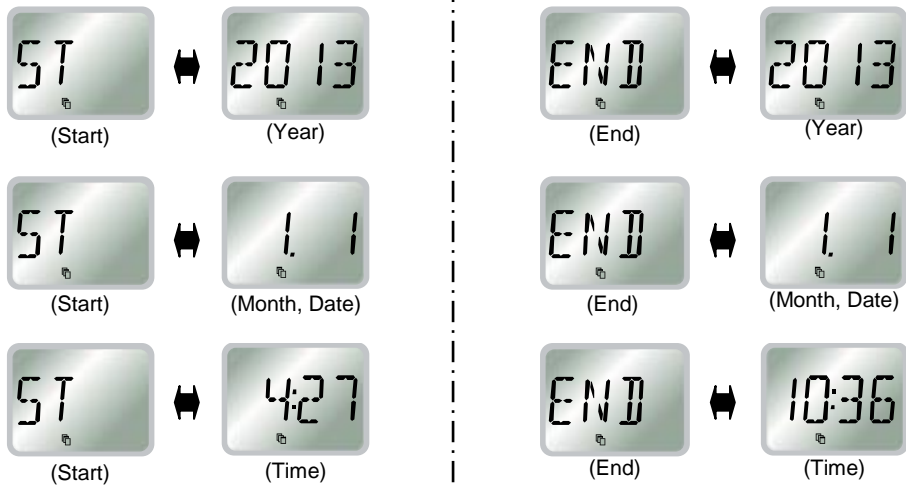
NOTE

- Each time the UP Switch is pressed, the display will switch in order of H1, H2 ... H10, INIT.
- To delete the history, select "INIT" and press the Maintenance Switch for 3 seconds. (pi, beep, pi, pi)

- 4) Press the Maintenance Switch (beep) to display the history mark, "AL" and "the peak value ppm of the selected number" alternately.



- 5) Each time the DOWN Switch is pressed, the display will switch in order of year, month/day, and time of the start and end of alarm.



- 6) Press the Reset Switch (beep) and the history number "H*" will be displayed.

To indicate the other history, repeat the procedure from 3) to 5).

- * To delete the alarm history, select "INIT" in procedure 3) and press the Maintenance Switch for 3 seconds. (Pi, beep, pi, pi) <Deleted>



7-4-7. Clock Setting [Mode Number 6]

Clock function is used for recording the history.

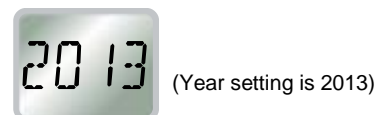
- 1) In user mode, press the UP Switch (beep) to select "Mode Number 6". "DATE" and "6" (mode number) will be displayed alternately.
- 2) Press the Maintenance Switch (beep). "YEAR" and "****" (year) will be displayed alternately.
- 3) Select the item to change with the UP Switch. The item and the current set value will be displayed.



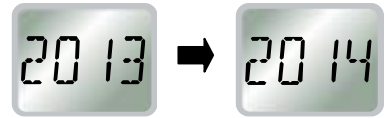
NOTE Each time the UP Switch is pressed, the display will switch in order of "YEAR", "MON" (month), "DAY", "HOUR" and "MIN" (minute).

<< When Select "YEAR" >>

- 4) Press the Maintenance Switch (beep). The current setting year will be displayed.



5) Change the setting with the UP and DOWN Switches.

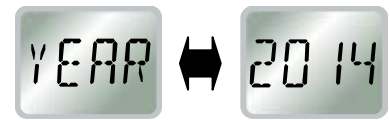


(Change to 2014 from 2013)

6) Press the Maintenance Switch for 3 seconds.

(Pi, beep, pi, pi)

“YEAR” and setting year will be displayed alternately.



(set to 2014)

7) To change the other items, repeat procedure from 3) to 6).

8) Press the Reset Switch for 5 seconds (pi, beep) to return to normal mode.



7-5. Maker Mode

WARNING

- A wrong setting may change specifications of the CO Sensor Device. Never operate other than the described in this instruction manual.
- The administrator should change the setting with responsibility.
- The CO Sensor Device does not work in maker mode. After the maker mode operation, make sure to turn off the power once, and restart in normal mode before use.

7-5-1. Shift to Maker Mode

When the power is OFF, keep pressing the UP and DOWN Switches and press the Power Switch for 3 seconds at the same time (beep, beep).

The following will be displayed and “775” will flash. <Shift to Maker Mode>



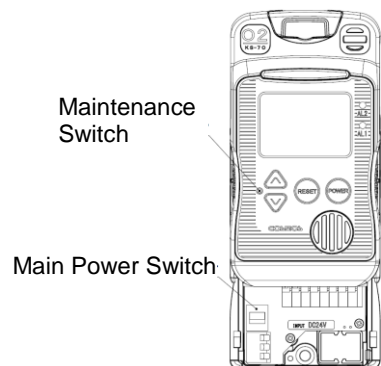
Software Version Number
(Ex. Version No. 1.00)



All segments of LCD
turn on



Password “775” flashes.
<Shift to Maker Mode>



7-5-2. Initialization of Cumulative Operation Time

The CO Sensor Device has a sensor replacement notification function (see “8-1. 5) Sensor Module Replacement” on page 26). It needs to initialize the cumulative operation time when the sensor module is replaced.

- 1) Shift to Maker Mode (flashing “775”).
Make sure to read from “7-5. Maker Mode” on page 22.



Password “775” flashing

- 2) Press the UP Switch twice to flash “777”.

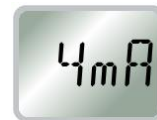
⚠ WARNING
Make sure “777” is displayed before move on to the next step. If the setting is incorrect, the specifications will be changed.



Password “777” flashing

- 3) Press the Maintenance Switch.
“4mA” will be indicated.

NOTE To press the Maintenance Switch, use an unpointed thin stick such as a precision screwdriver.






- 4) Press the UP Switch once.
The “cumulative operation time” (hexadecimal) will be indicated.

⚠ WARNING
Make sure the “cumulative operation time” is displayed before move on to the next step. If the setting is incorrect, the specifications will be changed.



Cumulative operation time (for 6 years)

NOTE Each time the UP Switch is pressed, the display switches.

Cumulative operation time

- 5) Press the Maintenance Switch for 3 seconds.
The “operation time” is initialized and the cumulative operation time will be “0”.

NOTE

If the cumulative operation time cannot be initialized, the buzzer will sound and the operation time will not be “0”. In this case, press the Maintenance Switch while pressing the Power Switch for 3 seconds to turn OFF the power, and start over again. If it still cannot be initialized, contact your New Cosmos representative for repair.



Cumulative operation time

- 6) Press the Maintenance Switch while pressing the Power Switch for 3 seconds to turn OFF the power to complete setting.

8. Maintenance Check

- The daily inspection should be performed by the user.
- The periodic inspection should be performed regularly once a month or once a year by the user or New Cosmos.

ATTENTION

Span adjustment of gas sensor is extremely important to ensure the reliability of the CO Sensor Device. We highly recommend periodic sensor adjustment.

8-1. Inspection Contents and Frequency

Inspection Contents	Start-up	Expanded/R elocation	Periodic Inspection		Daily Inspection
			Monthly	Every 2 Years	
1) Concentration Display	√	√			√
2) Contact Test	√	√	√		
3) Zero Adjustment ^{*1}	√	√	√		
4) Span Adjustment (gas calibration)				√	
5) Gas Sensor Replacement				√ (6-year ^{*2})	

*1: Make sure there is no gas around before performing zero adjustment.

*2: Replace a sensor after 6 years from the date of purchase. Contact your New Cosmos representative for sensor replacement.

- 1) Concentration Display
 - Confirm that the Carbon Monoxide concentration is displayed on LCD and the CO Sensor Device is operating properly.
- 2) Contact Operation Test
 - Refer to “7-4-5. *Contact Operation Test*” on page 18 and confirm the contact activates properly.
- 3) Zero Adjustment
 - Check the concentration display is indicating 0ppm without any gas around.
If it is not indicating 0 ppm, refer to “7-4-3. *Zero Adjustment*” on page 17 and perform zero adjustment.
- 4) Span Adjustment (Gas Calibration)
 - To maintain the gas sensor performance, conduct a span adjustment at least every two years.

CAUTION

- Contact your New Cosmos representative for span adjustment (fee-based).
- It cannot detect properly if the adjustment is wrong.

5) Gas Sensor Replacement

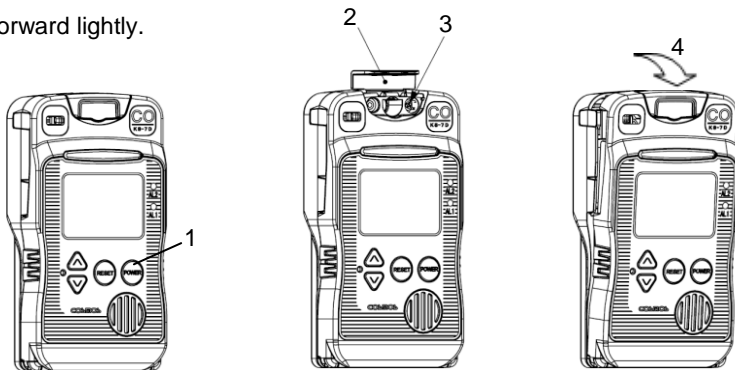
- The recommended replacement cycle is 6 years under the normal use condition. However, if any abnormality, such as the significantly decrease of sensor sensitivity, is confirmed by a periodic inspection, it needs to be replaced.

- NOTE**
- Even if it is not in use for a long period of time, replace a sensor within 6 years from the date of purchase. Contact your New Cosmos representative for sensor replacement (fee-based).
 - This device counts every one hour when the power is on. As the cumulative time reaches six years, "Sensor Replacement" will be displayed on LCD.

8-2. Clock Battery Replacement

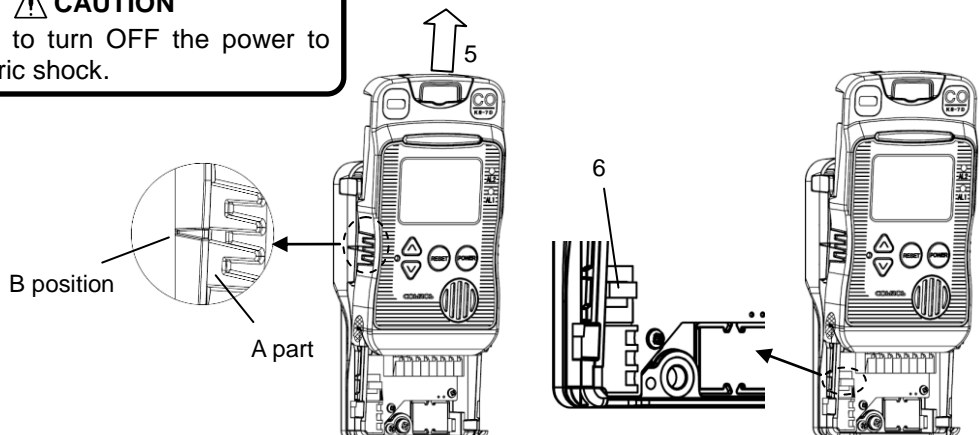
- CAUTION** ▪ Make sure to use "CR2032 lithium battery" for clock battery.

1. Press the Maintenance Switch while pressing the Power Switch for 3 seconds to turn OFF the power.
2. Open the Screw Cover.
3. Loosen the cover fixation screw. ** The screw does not come off.
4. Pull the cover forward lightly.



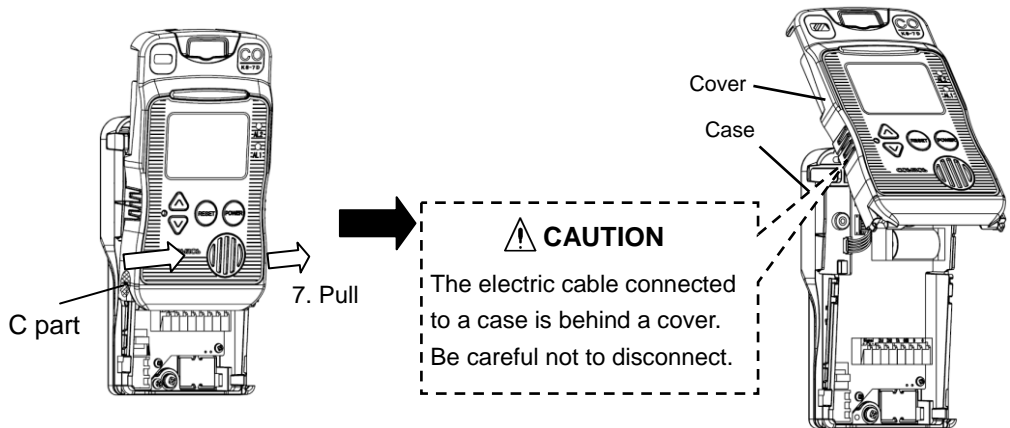
5. Hold the A part, and slide up to the B position. **Align the center of the A part with B position.
6. Turn OFF the main power.

- CAUTION**
Make sure to turn OFF the power to avoid electric shock.

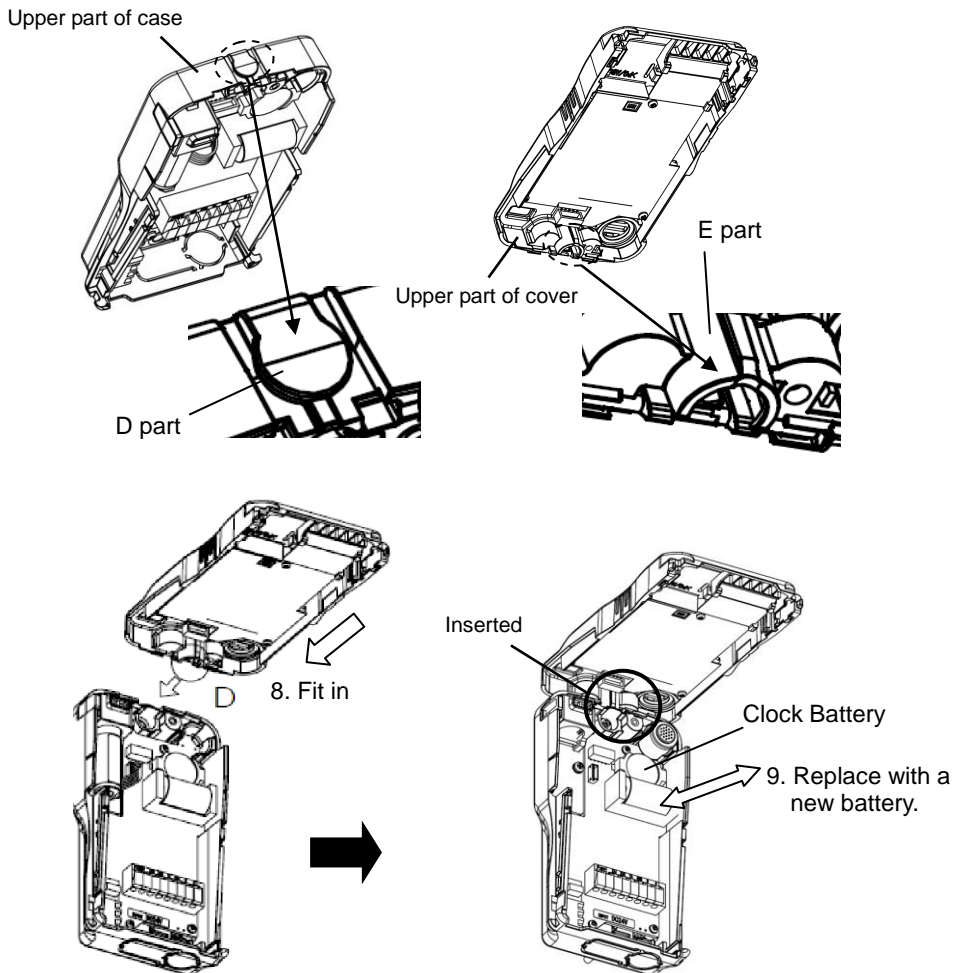


7. Hold the C part (both sides), and pull forward to detach from case.

CAUTION Cover and case are connected by an electric cable.



8. Place a cover at the top portion of case. (Fit the E part of cover into the D part of case.)



9. Replace with a new clock battery.



CAUTION

Observe proper polarity when installing battery.

10. Pull up the C part of cover from the case (reverse procedure of 8), and fit the A part of cover into the B position of case (refer to procedure 5).

11. Turn ON the main power.

12. Slide the A part of cover down to the bottom (reverse procedure of 5).

13. Press the cover to open the screw cover, and tighten the cover fixation screws.



CAUTION

Make sure to tighten the cover fixation screw after the cover is attached, as it may not be able to detect properly.

14. Close the Screw Cover.

9. Troubleshooting

Before requesting repairs, please check the following items.

Symptom	Cause	Solution	Reference
Nothing is displayed on LCD	Either of the Main Power Switch or Power Switch is OFF	Turn ON the Main Power Switch or Power Switch	7-2. Operating Procedure (page 13)
	Loose connection	Check the connection and reconnect terminals	6. Wiring (page 9)
	The power is not supplied	Provide a power supply	7-1. Before Use (page 13)
Maintenance icon is on LCD, and the concentration value and “_ _ _ _” are displaying alternately	Maintenance Function is left ON	Switch OFF the Maintenance Function	7-4-2. Switching the Maintenance Function ON and OFF (page 17)
Contact output does not operate	Maintenance Function is left ON	Switch OFF the Maintenance Function	7-4-2. Switching the Maintenance Function ON and OFF (page 17)
	Incomplete connection	Check the wiring and reconnect terminals	6. Wiring (page 9)
	Contact operation set value is incorrect	Check the contact operation set value	7-3-3. Full Scale and Set Value (page 16)
Sensor replacement icon is on LCD	Notifying the gas sensor replacement timing since the total cumulative time that power has been applied reaches 6 years.	Ask for a gas sensor replacement	8-1. 5) Gas Sensor Replacement (page 26)
<ul style="list-style-type: none"> ▪ “E-E1”, “E-E2” or “E-E3” is displayed on LCD ▪ Malfunction contact is activated ▪ Analog output is less than 0.9mA 	Internal Error	<p>Press the Maintenance Switch while pressing the Power Switch for 3 seconds to turn OFF the power, and then turn ON again after a few minutes.</p> <p>If it still does not work properly, contact your New Cosmos representative for repair.</p>	7-2. Operating Procedure (page 13)

Symptom	Cause	Solution	Reference
<ul style="list-style-type: none"> ▪ “E-S1” or “E-S3” is displayed on LCD ▪ Analog output is less than 0.9mA 	Sensor Error	<p>If “E-S3” is displayed within one week from the installation and it recovers within one hour, it will be able to operate normally. Otherwise, request for repair.</p>	2. Precautions (page 2)
Troubles other than the above symptoms	Possibility of microcomputer malfunction due to noise.	<p>Turn OFF the power, and then turn ON after a few minutes.</p> <p>If it still does not work properly, contact your New Cosmos representative for repair.</p>	7-2. Operating Procedure (page 13)

10. Specifications

Detection Principle	Electrochemical Cell
Sampling Method	Diffusion Type
Target Gas	Carbon Monoxide
Detection Range	0 to 75ppm (Service range: Full Scale to 1000ppm)
Gas Concentration Display	4-digit digital LCD, solution 1ppm (with backlight)
Operation Set Value	ON: 25ppm OFF: 10ppm
Accuracy *1	Within +/- 50% of operation set value
External Output	<ul style="list-style-type: none"> ▪ Contact Output Operation contact: 1a non-voltage contact x 2 (non-latching) Malfunction contact: 1a non-voltage contact (Rated load: 125V AC 0.5A, 30V DC 2A, resistance load) ▪ Gas concentration analog output *2: 4-20mA DC (in common with the negative of power source) (The current sensing resistor must be less than 300 ohms including interconnection resistance)
Explosion-proof	Non-explosion-proof
Other Functions	Maintenance function (deactivate contact output)
Applicable Cable	Shielded cable for control (0.5 to 1.25mm ² , less than 10.5mm in outside diameter)
Cable Length	Within 500mm
Operating Temperature/ Humidity Range	-5 to +40 degrees C (without rapid temperature change) 30 to 85%RH (non condensing)
Power Source	24V DC +/-10%
Power Consumption	24V DC: 1W at monitoring, 2W during operation
Dimensions	82 (W) x 150 (H) x 35 (D) mm (excluding protrusions)
Weight	Approx. 300g
Mounting Method	Wall mount type (indoor)
Body Color	DIC546 1/2

*1: Under the same measurement condition.

*2: Output of concentration in detection range.

11. 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.

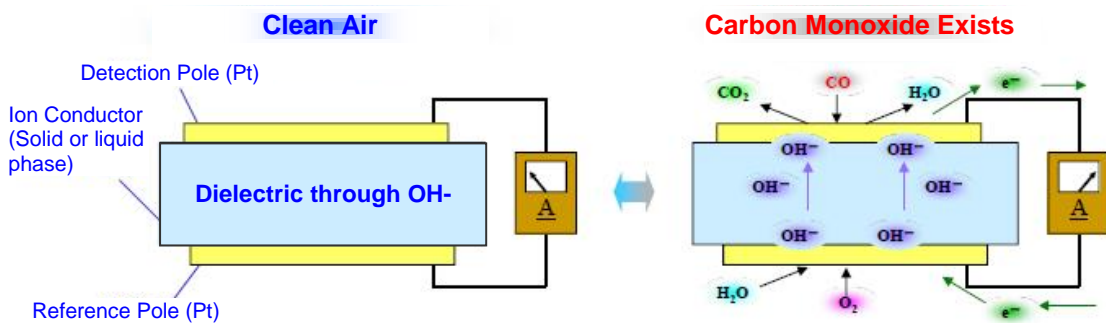
New Cosmos warrants to the original purchaser and no other person or entity (the customer) that the gas detection product supplied by New Cosmos shall be free from defects in materials and workmanship for a period of one (1) year from the date of purchase. This warranty does not include consumables, 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.

12. Detection Principle

- Electrochemical Cell

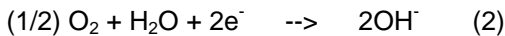


Sensor Element Configuration and Electrode Equation

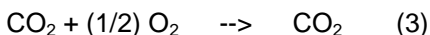
Sensor is made up of noble metal catalyzed detection pole, reference pole and ion conductor. When the CO exists, the reaction of equation (1) with water vapor in the air on catalyst will occur.



When connecting a detection pole electrically to a reaction pole, ion (OH^-) will be generated at detection pole, and reach the reference pole through the ion conductor. Electrons will be also generated at the same time and reach the reference pole through the external electric lead, and a reaction of equation (2) with oxygen in the air will occur at a reference pole.



Therefore, this gas sensor can be regarded as a battery of gas active material which is made up of the full cell reaction indicated in equation (3) which is composed of equation (1) and (2).



For using this as a gas sensor, connect a detection pole to a reference pole electrically and measure the short-circuit current.

13. Glossary

Gas Detector:	A unit that detects gas concentration and converts it to electric signals.
Diffusion Type:	A method that detects gas by utilizing gas convection and diffusion.
Target Gas:	A gas that is indicated and sets off an alarm when detected.
Detection Range:	Range of gas concentration that can be indicated and set off an alarm.
Service Range:	Range to indicate the value of outside the detection range as a guideline.
Operation Set Value:	A preset value for the contact operation when gas concentration reaches a certain level.
Accuracy:	Difference between the preset operation set value and gas concentration when it activates the contact or as the percentage of the difference compared to the operation set value.
Operating Temperature Range:	Range of temperatures where the equipment can perform its functions.
Maintenance and inspections:	Work that guarantees the equipment will perform its required functions.

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