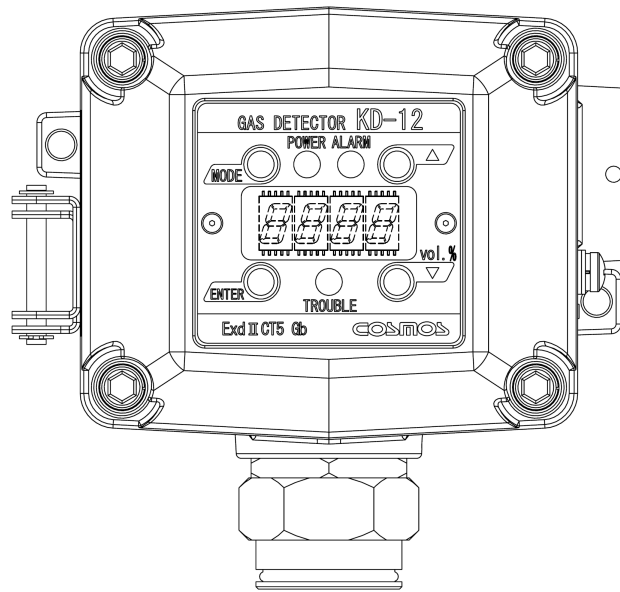# Diffusion type Gas Detector

Model KD-12

Instruction Manual

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

$C \in$
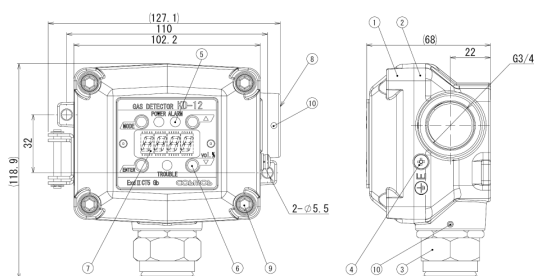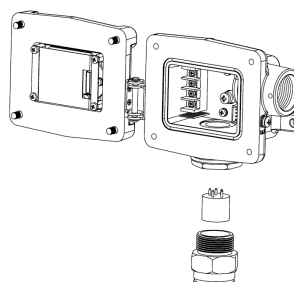
New Cosmos Electric Co., Ltd.

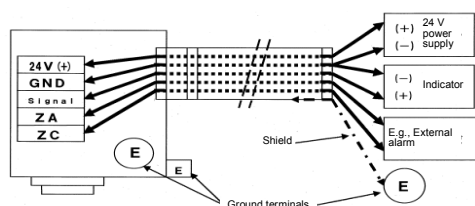## • Nomenclature

See pages 4 to 6.

• Replacement of Sensor Unit
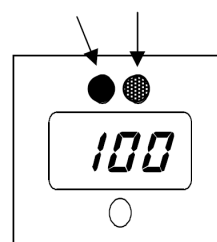
See pages 29 and 30.

• Wiring and Connecting Methods
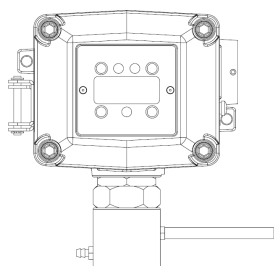
See pages 11 to 15.

• Display and Operation in Each Mode
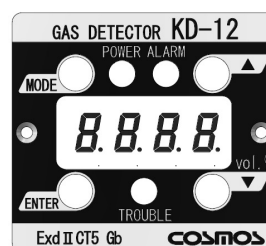
See page 18.

• Maintenance Check and Operation Methods

See pages 20 to 28.

• Troubleshooting

See page 31.

Table of Contents

1. Introduction

- Thank you for purchasing the KD-12 Diffusion type Gas Detector.

- In order to ensure the correct and safe operation of this product, be sure to read this manual before use.

- This product detects combustible gas, and CO2. The product detects gas leakage at an early stage in industrial facilities (e.g., gas production plants and depots, chemical plants, paint factories, and power plants), and outputs the gas concentration value in analog signal form while displaying the gas concentration value.
If the gas concentration reaches a preset alarm level, the red ALARM indicator will flash and turn ON an external contact output, thus helping to prevent disasters such as explosion accidents and fires.

- 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.

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

2. Precautions

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

⚠ WARNING

- Be sure to ground the product to prevent electric shocks.
- If there is a gas leak alarm, take the necessary measures in accordance with your company's regulations.
- The cable entry device and blanking elements shall be of ATEX certified in type of explosion protection flameproof enclosure ''d'', suitable for the condition of use and correctly installed.
- Unused apertures shall be closed with suitable ATEX certified blanking elements.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm2.

⚠ CAUTION

- All necessary work for the product including wiring and installation should be carried out by suitably trained personnel in accordance with applicable code of practice.
- Inspection, maintenance and repair of the equipment should be carried out by suitably trained personnel in accordance with applicable code of practice.
- Do not disassemble the product or modify the construction or electric circuits of the product. Otherwise, the explosion-proof construction of the product may be adversely affected.
- Do not install the product in places or near places where silicone sealant or gas is used. Otherwise, the performance of the product may be adversely affected.
- Be sure to provide a protective cover (optional) if the product is installed outdoors.
- Use the product in accordance with applicable laws and regulations.
- Hydrocarbon gas except the target gas might be detected, so consider the measurement environment.

Special Condition for Safe Use

- Use in ATEX hazardous area, ATEX certified cable glands according to EN 60079-0:2012 and EN 60079-1:2007 shall be provided by end-user.
- Use in IECEx hazardous area, IECEx certified cable glands according to IEC 60079-0:2011 and IEC60079-1:2007 shall be provided by end-user.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm2.
- Requirement of cable entry:

  Thread size of cable entry ………………….G3/4 or PF3/4

  Depth of engagement ………………..…...10.86mm

  Threads engagement ……………………….6
- The dimensions of flameproof joint between casing and casing cover of KD-12 flameproof housing are exceeding the minimum requirements stated EN/IEC60079-1. Please contact the manufacturer for inspection, repair and/or adjustments of this flameproof.

3. Contents of Package

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

Accessories	Optional items

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

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

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

⚠ WARNING

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

⚠ CAUTION

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

4. External Dimensions and Nomenclature

4-1. Main Unit
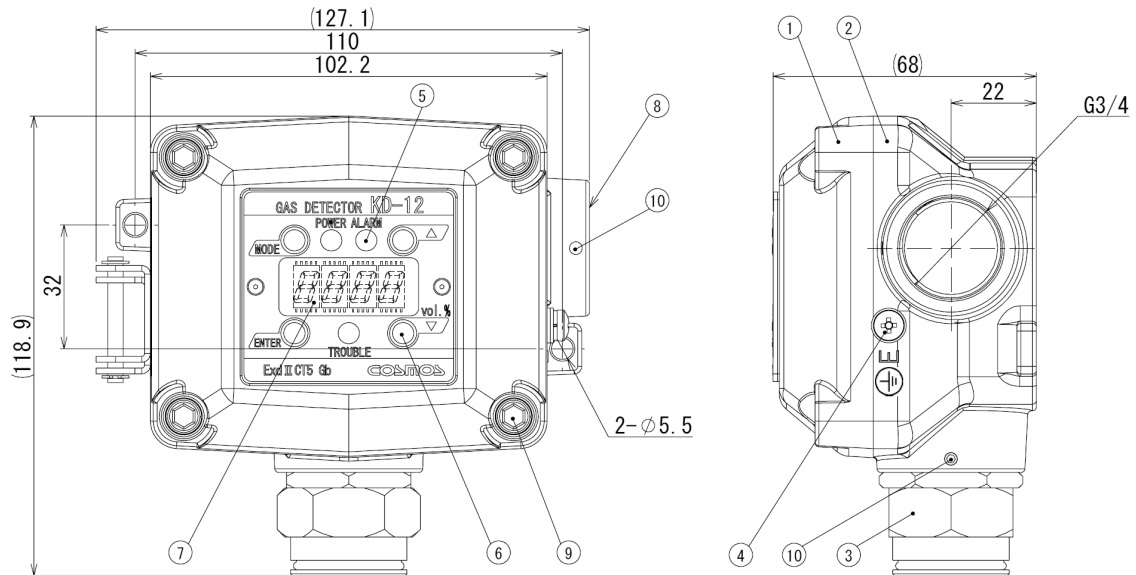
Number	Name	Description
1	Casing cover	
2	Casing	
3	Sensor unit	Incorporates a gas sensor.
4	Ground terminal	Used when grounding the frame.
5	State display indicator	Indicates the power supply state (green), alarm state (red), and trouble state (yellow).
6	Control block	Insert the magnetic stick to control or set the product.
7	Display block	Displays the gas concentration and set values.
8	Cable entry	PF3/4orG3/4, pitch=1.81mm, Insertion length: 10.86mm, No. of insertion threads: 6. Certified cable glands[1] must be provided by end user and used.
9	Hexagon socket head cap screw	Used for securing the Casing cover. Use a hexagon wrench with a nominal diameter of 4 mm.
10	Hexagon socket set screw	Used for securing the cable glands or sensor units. Use a hexagon wrench with a nominal diameter of 2 mm.

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

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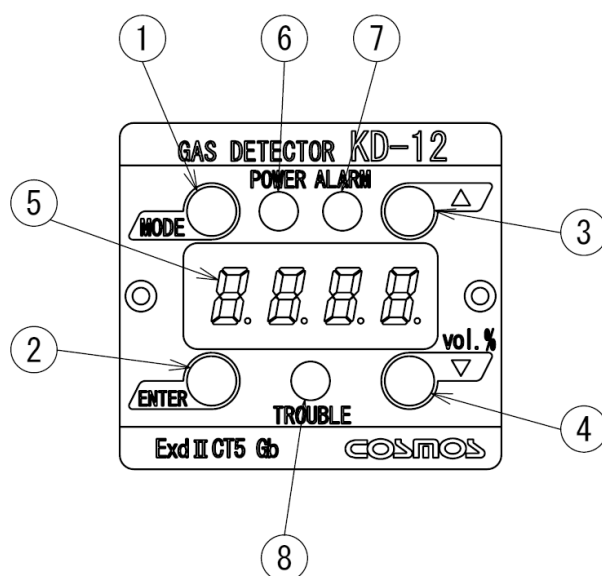
Magnetic switches (Insert the magnetic stick to operate the magnetic switches.)		
Number	Name	Description
1	MODE switch	Makes adjustments and settings or cancels the operation of the product.
2	ENTER switch	Enters settings or completes the control of the product.
3	▲switch	Makes adjustments and settings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

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

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

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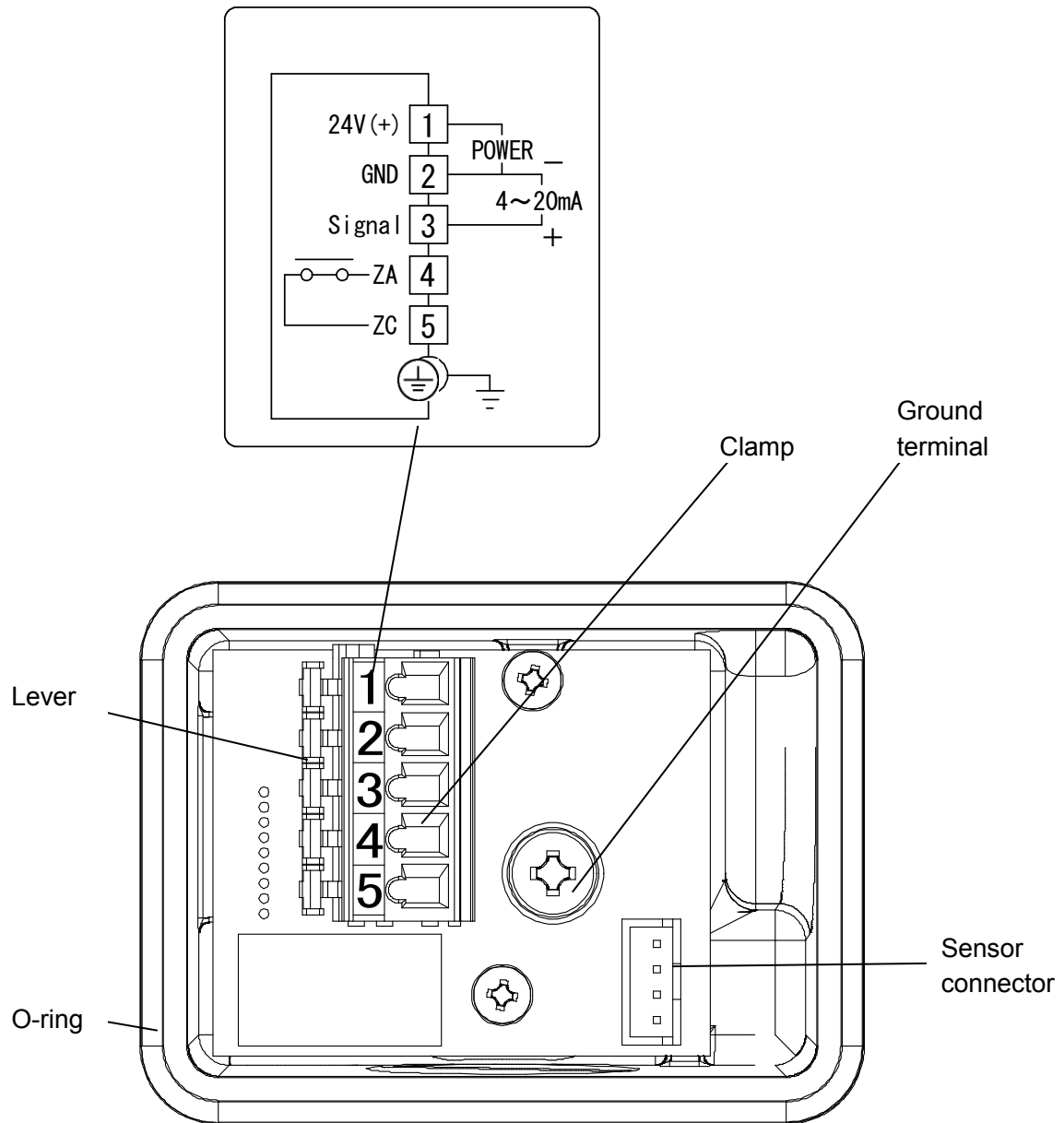
Number	Name	Description
1	24 V (+)	Power supply voltage (positive)
2	GND	Power supply voltage (-) and analog signal (negative) common
3	Signal	4- to 20-mA (+) analog signal
4	ZA	External contact
5	ZC	
⏚	Ground terminal	Used to ground the frame.

5. Installation

5-1. Installation Method

> ### ⚠ WARNING
>
> - The cable entry device and blanking elements shall be of ATEX certified in type of explosion protection flameproof enclosure ''d'', suitable for the condition of use and correctly installed.
> - Use in ATEX hazardous area, ATEX certified cable glands according to EN 60079-0:2012 and EN 60079-1:2007 shall be provided by end-user.
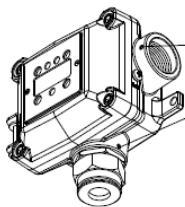> - Use in IECEx hazardous area, IECEx certified cable glands according to IEC 60079-0:2011 and IEC60079-1:2007 shall be provided by end-user.
> - Unused apertures shall be closed with suitable ATEX certified blanking elements.
> - Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm2.
> - The dimensions of flameproof joint between casing and casing cover of KD-12 flameproof housing are exceeding the minimum requirements stated EN/IEC60079-1. Please contact the manufacturer for inspection, repair and/or adjustments of this flameproof.
> - Installation of cable gland and sensor:
>
> | -Casing to cable glands | -Casing to sensor |
> | --- | --- |
> | Thread size : PF3/4 or G3/4 | Thread size : M27 |
> | Pitch : 1.81mm | Pitch : 1.5mm |
> | Insertion length : 10.86mm | Insertion length : 8.25mm |
> | Number of insertion threads : 6 | Number of insertion : 5.5 |
>
> - Shall lock the sensor unit and cable gland by the stainless steel socket head screw before use.
>
>
>
>   ```
>   Look by the socket head set screw
>
>   Socket head set screw specifications
>   Size:M4
>   Length for sensor unit: 3 or 4mm
>   Length for cable gland: 3 or 4 or 5 or 6mm
>   Material:Stainless steel
>   ```
>
> * Top of socket head screw shall not be over the casing surface.

⚠ CAUTION

- Be careful not to damage the gas detector when installing it. Otherwise, the explosion-proof performance of the gas detector will be lost.
- Do not install the product in the following places.
  - Places where the ambient temperature exceeds the operating temperature range ($-10°C$ to $50°C$).
  - Places where condensation occurs.
  - Places where water is directly sprayed.
  - Places subject to corrosive gas.
  - Places near to devices generating high frequency and magnetism.
  - Places where any hydrocarbon gases other than the target gas exist.
- Install the gas detector in places where can be maintained and inspected with ease.
- Install the gas detector in places free from vibration.
- Install the gas detector in places free from sudden temperature changes.
- Keep the gas detector free from impacts.
- When installing the gas detector outdoors, be sure to install the protective cover (optional).
- The installing height of the gas detector has an important relation to the specific gravity of the target gas to be detected. Install the gas detector in accordance with required regulations.

• Installing Height

Type of gas	Installing height	Remarks
Gas heavier than air (Example. LPG)	10 cm or less from the floor (Height to the sensor guard tip)	Keep a distance of approx. 7cm from the sensor guard tip for easy maintenance and inspection
Gas as heavy as air (Example: carbon monoxide)	75 to 150 cm from the floor (Height to the sensor guard tip)	Decide the height by considering the specific gravity of the target gas and mounting environment.
Gas lighter than air (Example: methane and hydrogen)	Near the ceiling	Decide the height by considering scaffold, etc. for easy maintenance.

- Mount the main unit to the wall with the M5 screws that are provided with the product. Be sure to install the protective cover (optional) when mounting the main unit outdoors. Mount the main unit with a 2B pole mounting bracket (optional) when mounting the main unit to a 2B pole. Refer to *5-3 Mounting of Options* for details of optional products.
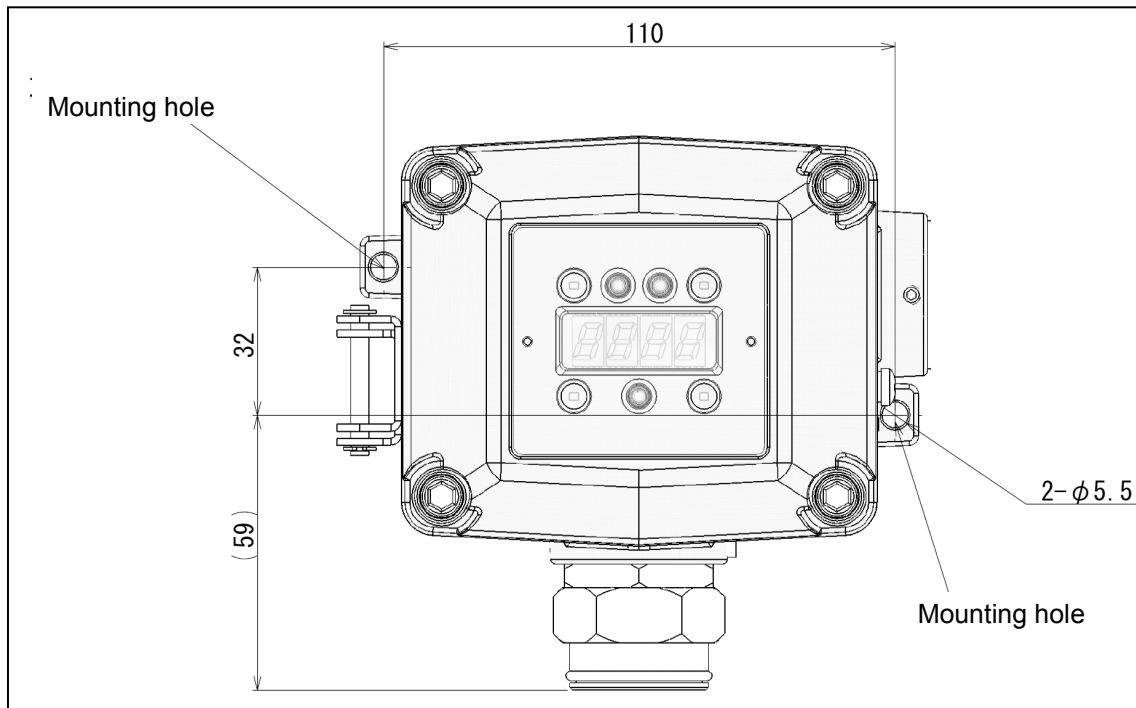
- The casing cover of the gas detector needs be opened at the time of wiring. Therefore, when installing the gas detector, provide sufficient space to enable the casing cover to be opened to at least 90°.
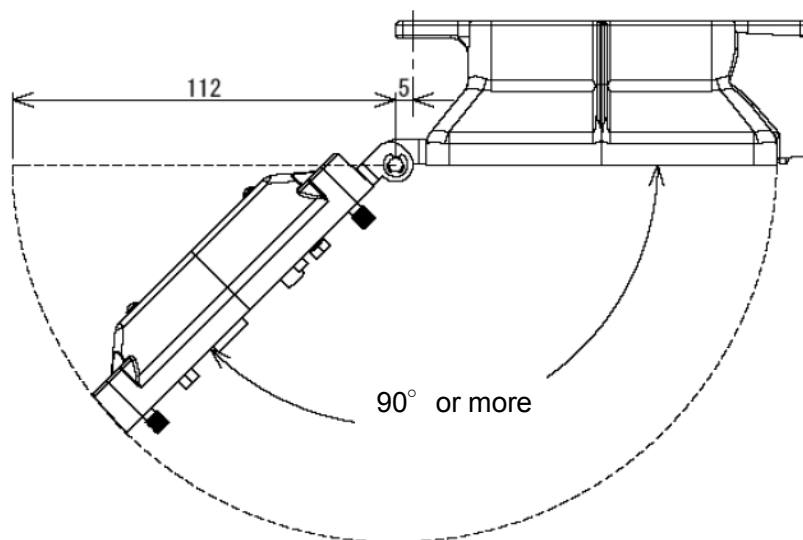
5-2. Examples of Installation Positions

• Install the product in places where gas easily accumulates.

▨ Places where gas easily accumulates.

⊕ Gas detector

Roof fan
(Exhaust port)

Entrances and windows
(Suction and exhaust ports)

Entrance
(Suction port)

Gas detector
mounting
position

Side view

Plan view

Example of Installation Position

Partition
wall

Pipe

Valve

Detector

Flange
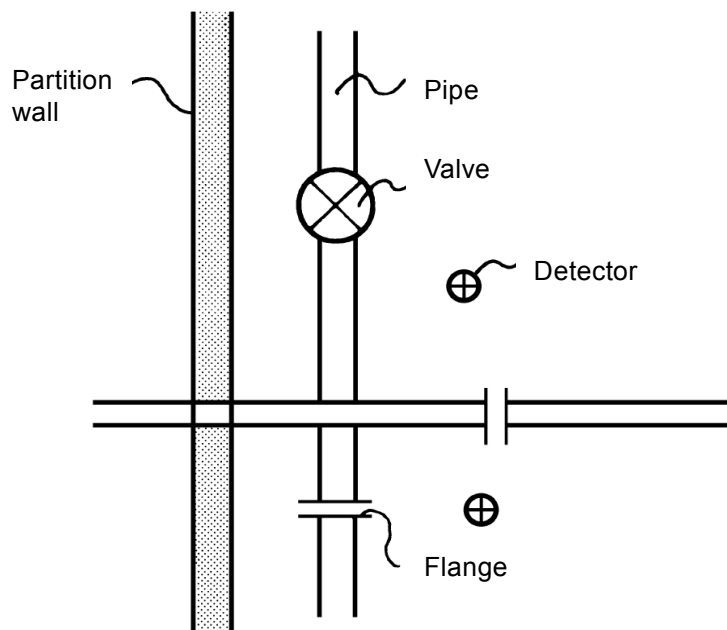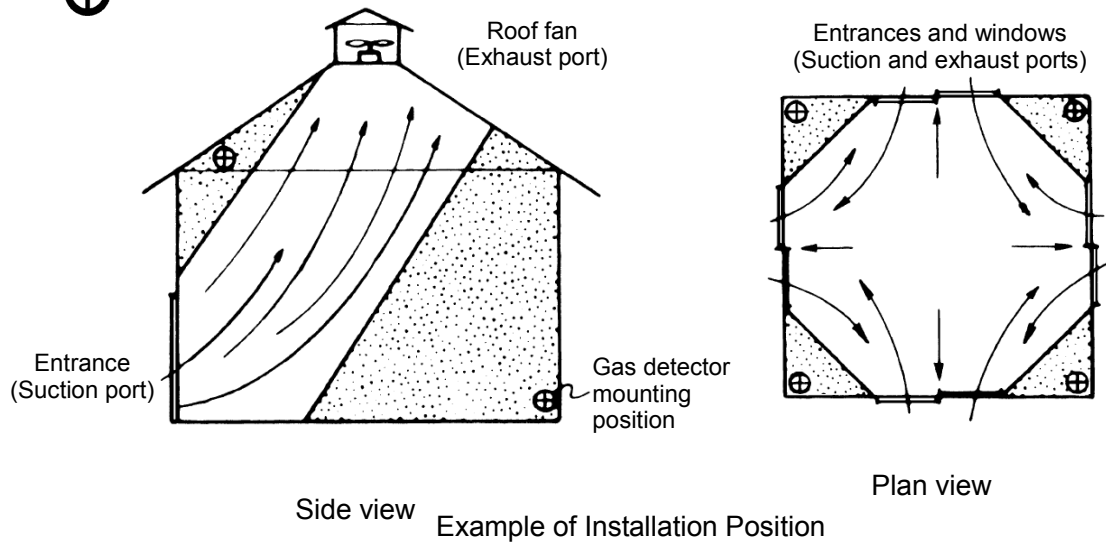
Example of Outdoor Installation Position

5-3. Mounting of Optional items

- Protective Cover
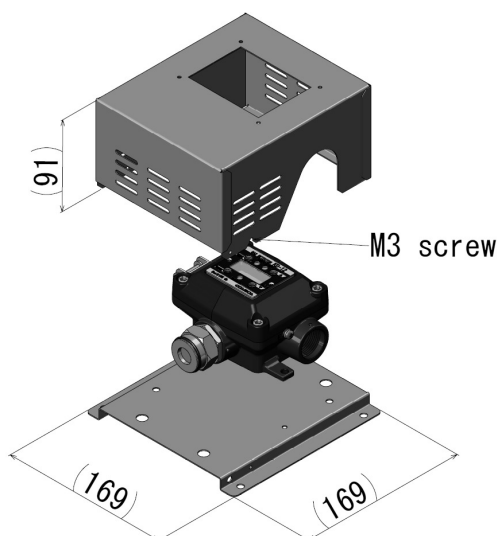
Horizontal Type (KW-41)　　　　　Vertical Type (KW-42)
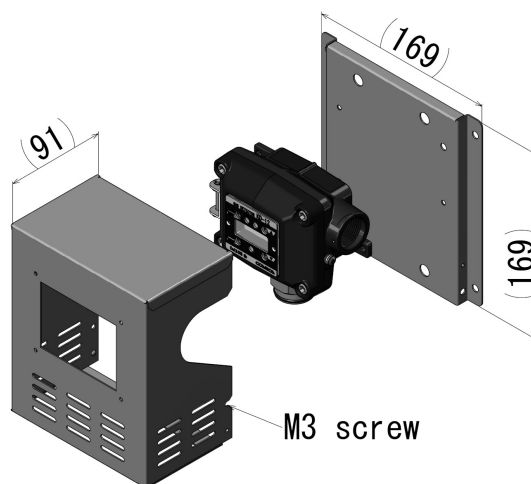
M3 screw

M3 screw

⚠ CAUTION

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

- 2B Pole Mounting Bracket
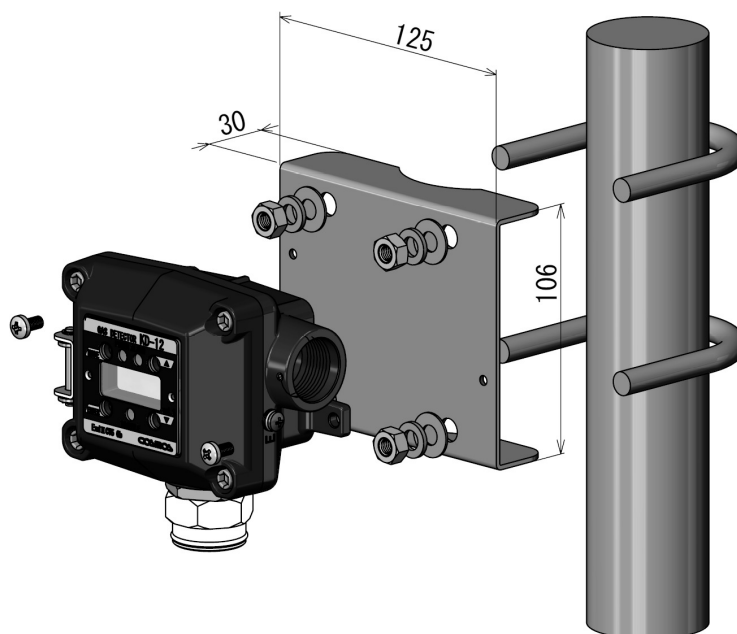
6. Wiring Method

6-1. Wiring Work

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

⚠ **WARNING**

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

⚠ **CAUTION**

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


Cable Work

- Use a shielded cable, such as CVV-S with a thickness of 1.25 to 2.00 mm^2. 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^2. When using only the analog signal function, which requires a three-conductor cable, without the external contact function, make sure that the diameter of the cable conductor is 12.5 mm^2 or 2.00 mm^2.

6-2. Wiring and Connection

⚠ **WARNING**

- Before opening the casing cover of the gas detector, be sure to turn off the product and all devices (e.g., indicator unit and signal converter) connected to the product.
- If the power is turned ON, the power supply may become a source of ignition.
- Be sure to ground the product to prevent electric shocks.
- Shall use a conductor which is at least M4 size by solderless, for external earthing.
- Shall place the stainless steel plain washer between casing and terminal.
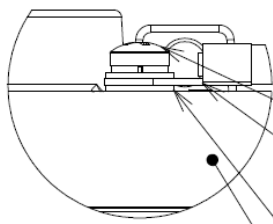
```
Screw with captive washer
Size:M4x8L
Material:Stainless steel
Washer type:Spring washer and Plain washer

Cable lug (minimum 4mm2)

Plain washer
Size:Norminal diameter 4
Material:Stainless steel

Casing
```

⚠ **CAUTION**

- Wire the connecting terminals correctly.
- Separate connection cables from power lines as far as possible.
  When closing the casing cover, make sure that the power supply cord, harness, and O-ring are not caught by 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^2).
- Make sure that the power supplied to the product is within the specified voltage range.
- Make sure that the load resistance of the signal line, including the resistance of the wire, is 300 ohm or less.

6-2. Wiring and Connection (Continued)

MEMO

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

Connection Example with Power Supply Side Grounded

System Configuration Example

Single detector connected to indicator unit

Multiple detectors monitored together
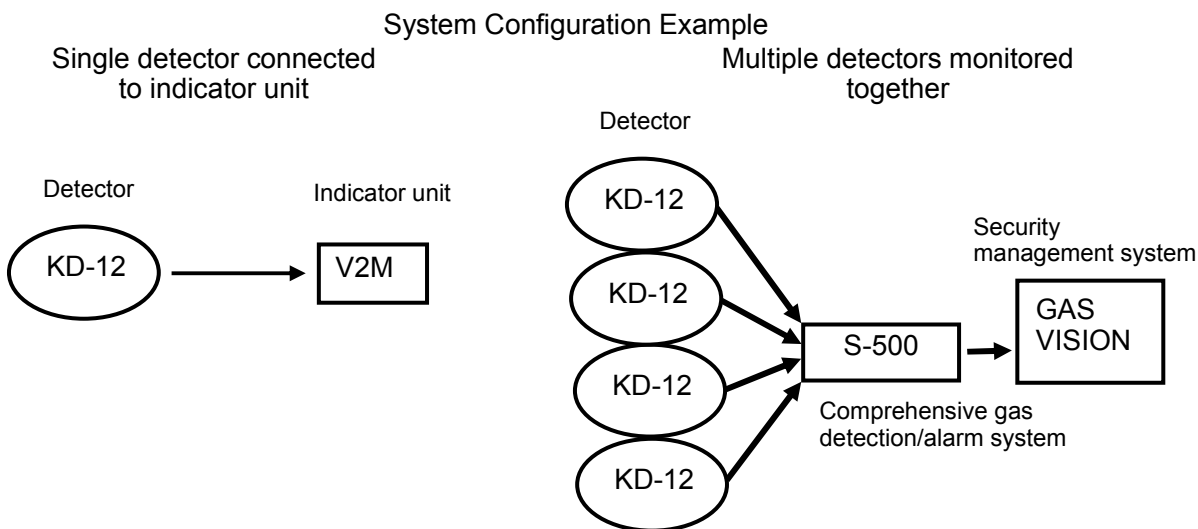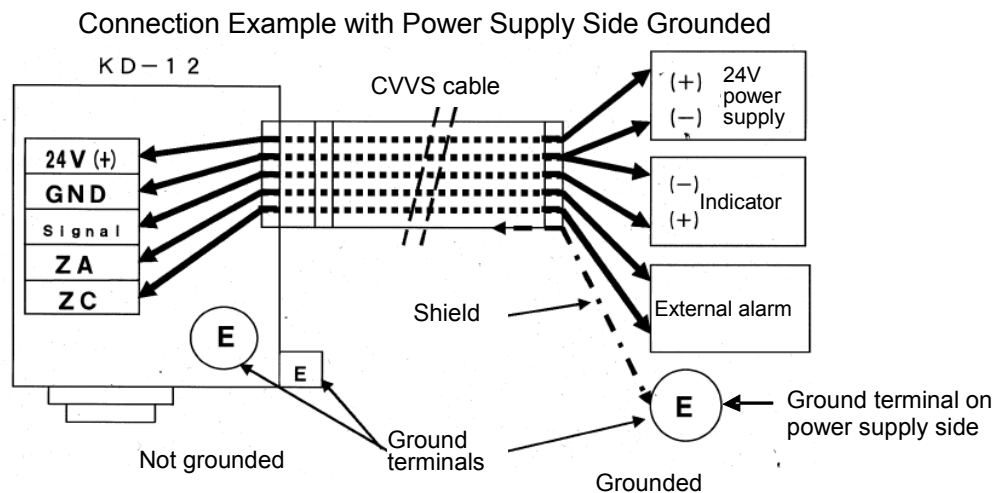
For details, refer to the Instruction Manual of each device.

6-2. Wiring and Connection (Continued)

Typical Connection Procedure

(1)   Prepare a power supply that can provide 24 V.
(Do not turn on the power supply before wiring the main unit.)

(2)   Loosen the hexagon socket bolts on the four corners of the main unit using the provided hexagon wrench with a nominal diameter of 4 mm, and open the casing cover of the main unit.

(3)   Press the lever of the terminal block with a flat-blade screwdriver.

(4)   The clamp will open. Insert the lead wire.

(5)   Connect the positive side of the power supply to the 24 V+ terminal.

(6)   Connect the negative side of the power supply to the GND terminal.
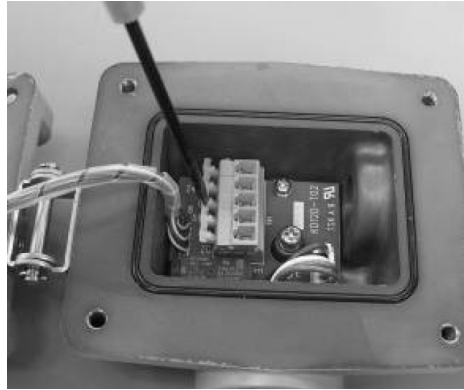
(7)   The lead wire will be automatically secured when the screwdriver is lifted.

(8)   Check that the power supply cords are securely connected to the terminals. This completes the power supply preparations.

(9)   Wire the analog signal and external contact terminals, if required.

(10) Tighten the hexagon socket bolts (tightening torque: 0.8-2.4 N·m) on the four corners of the main unit and close the casing cover of the main unit.

⚠ CAUTION

● When lowering the lever of the terminal block, be careful not to allow the flat-blade screwdriver to slip off of the lever. Otherwise, the flat-blade screwdriver may damage the sensor unit code or circuit board.

● When closing the casing cover, make sure that the power supply cord, harness, and O-ring are not caught by the casing cover.

7. Precautions before Use

⚠ CAUTION

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

● In Case of Gas Leakage

⚠ DANGER

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

⚠ WARNING

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

8. Display at Start-up (Initial Delay)

> ⚠ **CAUTION**
> - Check that there is no gas around the product before starting the product.
> - If the sensor output is not stable, the external contact point may operate after the initial delay. Release the interlock of the external equipment if necessary.
> - During the initial delay, the analog signal fixed at 4 mA will be output and the external contact will not operate.

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

(2)   While the indicator lamps (green, red, and yellow lamps) are lit, the following items will be lit for approximately 1 second each.
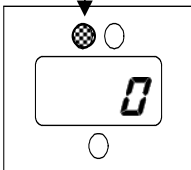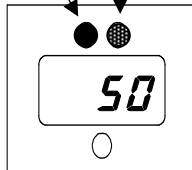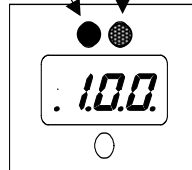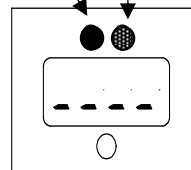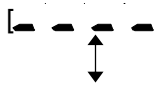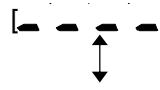
    Software version number (of the main unit)　　ex) 【 *1.23* 】
                          ↓
             Full scale　　　　　　　　　ex) 【 *100* 】
                          ↓
             Alarm set value　　　　　　　ex) 【 *25* 】

(3)   Then the POWER indicator (green lamp) will be flashed for approximately 1 minute.

(4)   When the POWER indicator is lit, the start-up of the main unit is completed and the main unit will be in gas monitor mode.

MEMO

- The operation with the magnet stick is not available during the initial delay.
- The initial delay lasts approximately one minute after the power is turned on.
- The indicated condensation value may change rapidly during the initial delay, but it is not a failure.
- If the sensor unit has not been used (energized) for a long period after shipped from factory, it may take some time for the sensor to stabilize. When the sensor unit is turned on after a long unused period, an alarm may be generated even when no gas exists. Therefore, deactivate the interlocks of the external devices before starting operation.
- More than one hour after turning on the detector, make the zero adjustment and span adjustment.Refer to 11.3 Calibration Method for the adjustments.

9. Display and Operation in Each Mode

| | At start-up (Initial delay) | In excess of alarm set value | | Maintenance mode | |
		Gas monitor mode	Test mode	Gas monitor mode	Test mode
Contents of display	Green lamp flashes **0**	Green lamp is ON / Red lamp flashes **50**	Green lamp is ON / Red lamp flashes **. 1.0.0.**	Green lamp is ON / Red lamp flashes **- - - -**	
	The value according to gas concentration is displayed. The value gradually approaches zero.	Gas concentration is displayed.	[Set concentration] A full-scale test from −10% to 110% is possible.	[- - - -] ↕ [Gas concentration] Displayed alternately	[- - - -] ↕ [Test value] Displayed alternately
Analog signal 4 to 20 mA	Fixed at 4 mA	Gas concentration value is output.	Test value is output	Gas concentration value is output.	Test value is output.
Contact operation	Does not operate (OFF).	Operates (ON).	Operates (ON).	Does not operate (OFF).	Does not operate (OFF).

10. Trouble Alarm

- The product has a self-inspection function, and the trouble alarm will operate if a problem occurs.
- The product will inform the user of the problem details with the display shown in the following table when the trouble alarm operates.
- When the trouble alarm is generated, the analog signal will be approximately 0.9 mA or below.
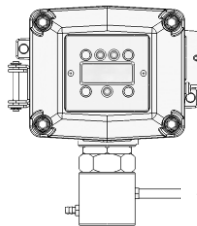
Screen display	Trouble indicator	Problem details	Probable cause	Remedy
E-24	Yellow lamp flashes	Power supply voltage drop error	The power supply voltage is low.	Check the power supply voltage.
LLLL	Yellow lamp flashes	Sensor Zero error	The sensor connector is disconnected or the sensor wire has broken.	Check that the sensor and the sensor connector are securely connected.
			The sensor output is low.	Make the zero point adjustment with the gas doesn't lie between air around the equipment.
E- 6 *E- 7*	Lamp is OFF	Zero-point adjustment error	There is gas in the ambient air.	After checking the ambient air, make the zero adjustment again.
E- 4 *E- 5*	Lamp is OFF	Span adjustment error	The gas concentration applied for adjustment is wrong.	After checking the type and concentration of gas, make a span adjustment again.
				If the type and concentration of gas is suitable, make span rough adjustment.

- If a screen other than the above is displayed, refer to the *12. Troubleshooting* section. If the product does not reset to normal operation after taking the measures shown in the table or if the problem is not listed in the table, contact your local representative.

- If the product goes into any unintended mode during adjustment or setting, cease operating the product and contact your local representative..

11.　Maintenance Check and Operation Method

11-1.　Daily Inspection and Periodical Inspection

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

	Frequency	Check item	Contents of inspection
Daily inspection	At least once a month	Visual inspection	• The status of lamp (green POWER indicator) is lit. • The concentration display of the gas concentration indicator. • Clogging of sensor unit mesh. • Corrosion of sensor unit mesh. • Corrosion of the main unit. • Corrosion of mounting screw. If a failure is found, replace the parts.
	At least once every 2 or 3 months	Alarm operation check with real gas	• Install the calibration cap, apply calibration gas (test gas), and check the operation. 　Refer to the manual of the calibration tool kit (optional) for a detailed check method. ← Calibration gas Calibration cap
		Condition around gas detector	• Check that nothing interrupts the diffusion of gas around the gas detector.
Periodical inspection	At least once a year		Consult your local representative.

- Use optional products to make actual gas inspections.

Periodical Inspections

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

Moreover, it is necessary to use actual gas (combustible gas), to carefully conduct inspection and calibration. It is highly recommended that you consider periodical inspections under a maintenance contract with your local representative.

11-2. Preparing Calibration Gas

- Calibration gas is used for actual gas inspection.

- The following example shows how to prepare 2.00 vol% (40%LEL) Methane as a reference gas.

With a standard gas cylinder

Gas bag

2.00vol% Methane air balance

Standard gas cylinder
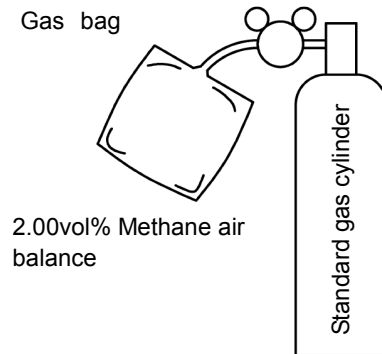
11-2.   Preparing Calibration Gas (Continued)

With no calibration gas cylinder

- Use the Gas Calibration Kit (optional) and a pure gas cylinder of methane at 99 vol% or more, and dilute the methane with air to produce 2.00 vol% (40%LEL) calibration gas.

> **Memo**   The calibration gas can be used to check the alarm function. Check the concentration using Gas Detector XP-3110 or a similar device before using the gas for calibration.

⚠ **DANGER**   ● Make sure that there are no flammables nearby when handling flammable gas with a concentration over LEL (lower explosive limit).

---

(1) Drawing raw gas

Connect a gas bag to a methane 99vol% cylinder and draw a little more than you actually need.

Bend back the hose and pinch with a pinch cock so the gas does not leak from the bag.

(2) Drawing a fixed amount of raw gas

Connect a 20ml syringe to a gasbag and draw 20.0ml of raw gas. (Draw a little more than you actually need then discharge the excess.)

(3) Transferring raw gas into a quantitative pump

Connect a syringe to the inlet of a quantitative pump then pull out the pump's piston. Raw gas in the syringe is sucked into the pump. Remove the syringe and pull the piston all the way out (100ml).

(4) Making diluted gas

Connect an empty gasbag to the outlet of the quantitative pump then push in the pump's piston.

Move the piston back and forth 9 times to add air in order to make diluted gas.
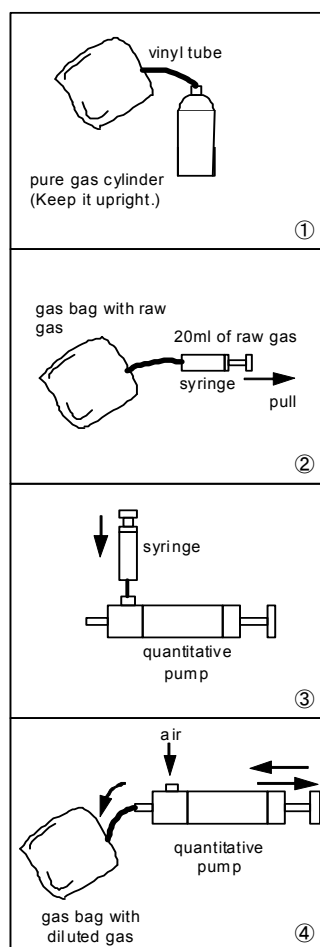
> **Memo**
>
> If you take 20.0ml of raw gas and move the quantitative pump's piston back and forth 10 times (a back-and-force motion: 100ml),
>
> $20.0ml/(100ml \times 10) = 0.0020$
>
> 0.2vol% diluted gas is made.
>
> Methane's lower explosive limit (LEL) is 2.0vol%.
>
> $0.2/5.0 \times 100 = 40.0$
>
> 40%LEL diluted gas is made.

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 *C.A.L.* first, followed by *. . .0* .
(The product is ready to work but nothing has been operated.)

(3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to *. . .0*.

[− − − −]
↕
[Gas concentration]

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

(5) When the above items are displayed alternately, the product has been set to maintenance mode.

(6) Upon completion of this mode, the product will automatically return to gas monitor mode.

(7) While − − − − is displayed, the maintenance mode is being executed.

(8) This mode will be canceled by repeating the same operation (1 to 4 above), turning the product OFF, or waiting for 8 hours.

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

● Zero Adjustment

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

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

(1) While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.

(2) The main unit displays *C.A.L.* 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.

(5)

2.E.r.o.

↓

0

↓

Good

When the above items are displayed, the zero adjustment is completed.

(6) Upon completion of the zero adjustment, the product will automatically return to gas monitor mode.

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

● Span Fine-tuning

MEMO

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

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

Apply calibration gas corresponding to the equipment.

Calibration cap

← Calibration gas
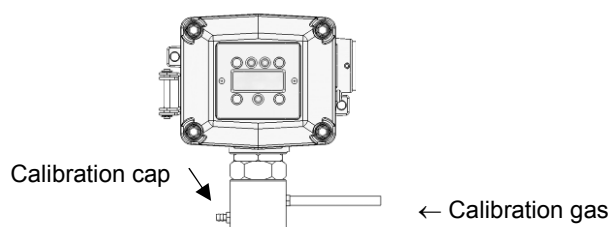
(7) Sufficiently stabilize the gas.

(8) 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.

(9) The main unit displays $C.A.L.$ first, followed by $.0.$.
(The product has completed starting but nothing has been operated.)
Example: After zero adjustment, 1 will be displayed.

(10) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to $.2.$.

(11) Press the ENTER switch of the main unit.

(12) The main unit displays $S.F.$ first, followed by the present gas concentration.

(13) Press the UP or DOWN switch of the main unit with the magnetic stick, and adjust the display of the main unit to the actual span gas concentration.

(14) Press the ENTER switch.

(15) The span fine-tuning is completed when $Good$ is displayed.

(16) Upon completion of the span fine-tuning, the product will automatically return to gas monitor mode.

(17) Remove the gasbag.

- Perform span rough adjustment if $E-4$ or $E-5$ is displayed.
- If an error is displayed, refer to *10. Trouble Alarm*.
- Carefully handle and make settings with the magnetic stick because the magnet is very powerful.   For details, refer to *3. Contents of Package*.

● Span Rough Adjustment

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

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

(1) Apply calibration gas corresponding to the equipment.

(2) Sufficiently stabilize the gas.

(3) While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.

(4) The main unit displays $CAL.$ first, and displays $.0$.
     (The product is ready to work but nothing has been operated.)
     Example: After zero adjustment, 1 will be displayed.

(5) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to $.7$.

(6) Press the ENTER switch of the main unit.

(7) The main unit displays $Sr.$ first, and displays the present gas concentration.

(8) Press the UP or DOWN switch of the main unit with the magnetic stick, and adjust the display of the main unit close to the actual span gas concentration.

(9) Press the ENTER switch.

(10) The span rough adjustment is completed when $Good$ is displayed.

(11) On completion of the span rough adjustment, the product will automatically return to gas monitor mode.

(12) Remove the gasbag.

MEMO

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

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

● Full-scale and Alarm Set Value Display

- The full-scale and alarm set values are only displayed. They cannot be changed.

(1) While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.

(2) The main unit displays $\mathit{C.A.L.}$. first, and displays $.\ .\ .0.$.
(The product is ready to work but nothing has been operated.)
Example: After zero adjustment, $.\ .\ .1$ will be displayed.

(3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to $.\ .\ .4.$.

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

$\mathit{F.S.d.P.}$

↓

$\mathit{F.S.\ .\ .}$

↓

Full scale

↓

$\mathit{A.L.\ .\ .}$

↓

Alarm set value

(5) When the above items are displayed in sequence and repeatedly, the user can check the full-scale and alarm set values.

(6) After the full-scale and alarm set values are displayed, the product will automatically return to gas monitor mode.

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

● Test Mode

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

⚠ CAUTION

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

---

(1) While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.

(2) The main unit displays $C.A.L.$ first, and displays 0 .
(The product is ready to work but nothing has been operated.)
Example: After zero adjustment, 1 will be displayed.

(3) Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to 10 .

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

$$t.E.S.t.$$
↓
Test value

(5) When the above items are displayed, the test operation of the product in a concentration range from −10% to 110% of the full scale.
The test operation of the product is possible in a concentration range from −200 to 2200 ppm if the full scale of the product is 2000 ppm.
The test operation of the product is possible in a concentration range from −10%LEL to 110%LEL if the full scale of the product is 100%LEL.

(6) Press the UP or DOWN switch of the main unit and set the desired calibration concentration. Then the test will start.
If the setting is outside the operating range, $LLLL$ or $HHHH$ will be displayed.

(7) To quit the test mode, press the ENTER or MODE switch.

(8) When the test is finished with the ENTER switch pressed, the tested value will be saved.
When the test is finished with the MODE switch, the previously saved value will remain.

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

11-4. Replacement of Sensor Unit

⚠ WARNING

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

⚠ CAUTION

- Only your local representative's maintenance service members or personnel who have completed a maintenance seminar can replace the sensor unit.
- The external contact may operate when replacing the sensor unit if the sensor output is not stable. Release the interlocks of the external devices if needed.
- Make sure that the mesh of the sensor casing is free of dirt or dust. Clean the mesh before installing the sensor casing to the detector.
- Be sure to handle the sensor unit with care. Do not drop or throw the sensor unit. Failure to do so may lead to broken wire or sensor failure.
- When removing or mounting the sensor unit, do not twist the harness of the sensor connector.
- When closing the casing cover, make sure that the power supply cord, harness, or O-ring is not caught by the casing cover.

MEMO
- Return the used sensor unit to your local representative.
- Calibrate the sensor unit after replacement.
- The sensor may need some time to stabilize after replacement. Energize the detector to allow the sensor to stabilize, then perform the zero adjustment and the span adjustment.
- To do calibration, always perform zero adjustment first, and then perform span adjustment.
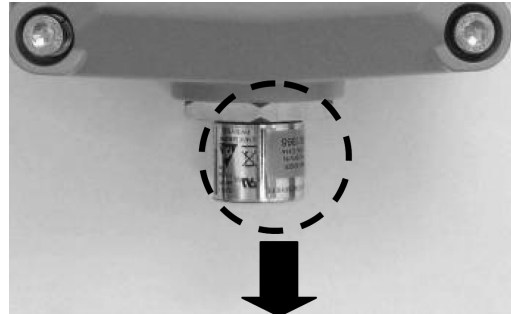- If any error is displayed, refer to 10. Trouble Alarm.

11-4. Replacement sensor unit (Continued)

(1)   Turn OFF the power supply connected to the product.

(2)   Rotate the sensor casing in the direction of the arrow and remove it.

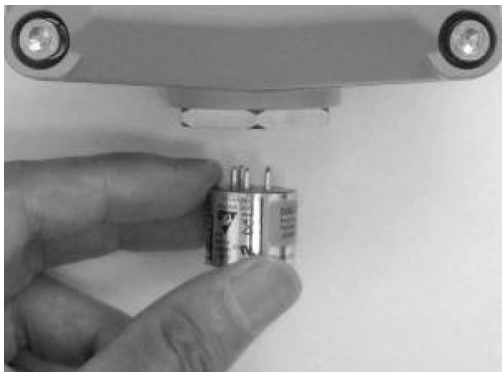(3)   Pull down and remove the sensor as shown in the photo below.
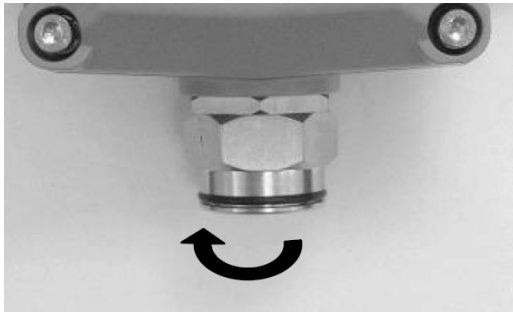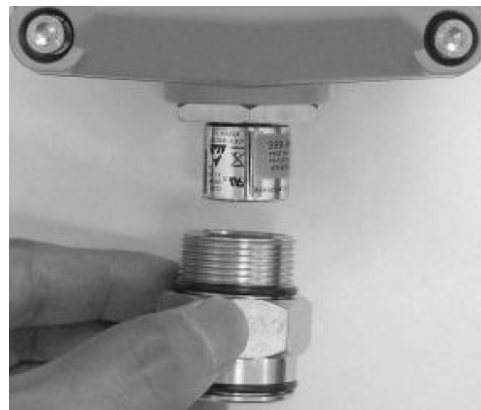

(2) Rotate the sensor casing

(3) Pull down the sensor

(4)   Insert the sensor to the main body while checking the positions of the pins and the holes.

(5)   Install the sensor casing. Make sure that that the mesh of the sensor casing is free of dirt or dust. Clean the mesh before installing the casing.

(4) Insert the sensor

(5) Install the sensor casing

MEMO

- Return the used sensor unit to your local representative.

12.   Troubleshooting

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

Defective condition	Probable cause	Remedy	Reference page
The green power lamp is not lit.	Incorrect wiring connection.	Check and redo the wiring.	P. 12 - 15 Wiring and Connection
The yellow LED lamp to indicate an error is flashed and the error code is displayed.	E-24 Low-voltage state	Check the power supply voltage.	
The detected gas concentration and $----$ are flashing alternately.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 23 Maintenance Mode
There is no alarm contact output.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 23 Maintenance mode
	Incorrect wiring connection.	Check and reconnect the wiring.	P. 12 - 15 Wiring and Connection
	The alarm point setting is wrong.	Check the alarm setting.	P. 27 Full-scale and Alarm Set Display
The analog signal does not change	The product is in test mode.	Return the product to gas monitor mode	P. 28 Test mode
A value and $HHHH$ 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 $LLLL$ are flashing alternately.	The sensor connector has come off.	Check the sensor connector is firmly connected.	P. 6 Name of terminal block joint
	The sensor output is low.	Conduct zero adjustment after checking that the air around the product is not contaminated with gas.	P. 24 Zero adjustment
No adjustment or setting is possible.	The product is operated during the initial delay time.	Operate the product after 1 minute initial delay time.	P. 17 Display at Start-up (Initial Delay)

13. Specifications

Model	KD-12
Sampling method	Diffusion type
Detection gas	Depends on the specifications
Detection range	Depends on the specifications.
Gas concentration display	Four-digit digital LED display
Alarm set value	Depends on the specifications.
Alarm accuracy	• ±25% of alarm set value under identical conditions.
Alarm delay	• Within 30 seconds with gas concentration that is 1.6 times as high as the level of alarm set concentration.
Warning display	• Gas alarm (one stage only): Red LED lamp flashes • Trouble alarm (sensor disconnection, sensor zero drop, power supply voltage error, or internal EEPROM communication error): Yellow LED lamp flashes
External output	Gas concentration analog signal • 4 to 20 mA DC (common to the negative side of power supply) • 0.9 mA DC or less at the time of Trouble alarm. • Make sure that the load resistance of the analog signal is less than 300 ohm including the wiring resistance. Gas alarm contact (one stage only) • 1a no-voltage contact output/Non-latching • Rated load: 0.5 A at 250 VAC or 0.5 A at 30 VDC (resistance load)
Explosion-proof class	Ex d IIB T5 (Japan), Ⓔx II 2 G Ex d IIC T5 Gb (Europe) Ex d IIC T5 Gb (IECEx)
Approval	EC-type examination certificate : DEMKO 08 ATEX 143870 X (CE 0518 Ⓔx II 2 G Ex d IIC T5 Gb) EMC : EN61000-6-4:2001, EN50270:2006 - Type 2 Performance testing : The measuring function of the KD-12 gas detector for explosion protection, according to Annex II clause 1.5.5, 1.5.6 and 1.5.7 of the Directive 94/9/EC, is not covered in this certificate. IECEx : ULD 13.0001X (Ex d IIC T5 Gb)
List of hazardous locations standard	EN 60079-0:2012, EN 60079-1:2007 IEC 60079-0:2011, IEC 60079-1:2007
Degree of protection	IP65 (Exterior)
Applicable cable	Cable outer diameter (10 to 13 mm) • In the case of a 5-conductor cable (for power supply, gas concentration analog signal, and gas alarm contact): CVV-S 1.25 mm^2. • In the case of a 3-conductor cable (for power supply and gas concentration analog signal) CVV-S 2 mm^2 or 1.25 mm^2
Operating temperature and humidity ranges	• Temperature: −10°C to 50°C • Humidity 10% to 90% RH (0 to 50°C). (No radical temperature or humidity changes and no condensation)

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

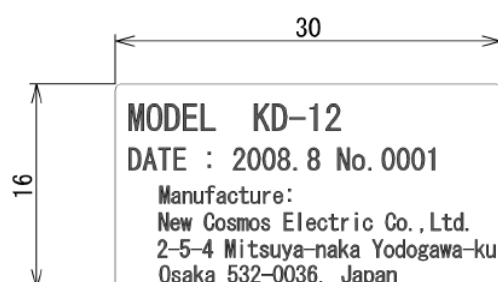The above specifications are subject to change without notice.
If your specifications are nonstandard, refer to the delivery specifications.
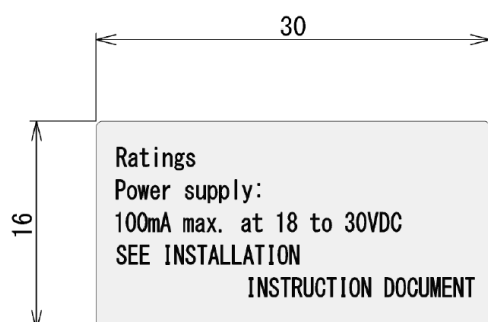
14.   Markings of explosion-proof

-Nameplate detail
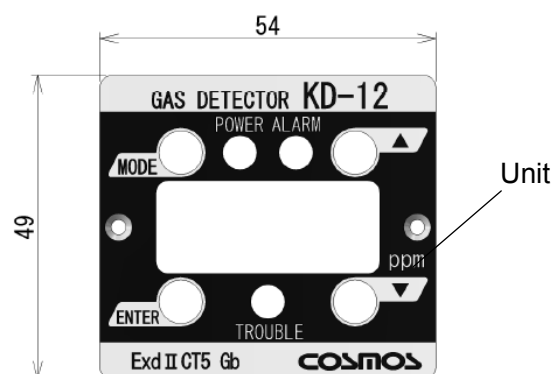
-Serial number label detail

-Rated label detail

-Certificate label detail

-Warning label detail

-List of hazardous locations standard

        EN 60079-0:2012

        EN 60079-1:2007

        IEC 60079-0:2011

        IEC 60079-1:2007

15.　Warranty

  New Cosmos Electric Company Limited (hereafter referred to as "New Cosmos") offers the following as the sole and exclusive limited warranty available to the Customer.
This warranty is in lieu of, and the Customer waives, all other warranties of any kind or nature, expressed or implied, including without limitation any warranty for merchantability or fitness for a particular purpose. The remedies set forth herein are exclusive.
New Cosmos warrants to the original purchaser (Customer) and no other person or entity that the gas detection product supplied by New Cosmos shall be free from defects in materials and workmanship for a period of one (1) year from the date of purchase. This warranty does not apply to consumables, including but not limited to fuses and filters. Certain other accessories not specifically listed here may have different warranty periods.
If after examination of an allegedly defective product returned to New Cosmos, with freight prepaid, should it be found that the product fails to conform to this warranty, the Customer's only remedy and New Cosmos's only obligation shall be, at New Cosmos's sole discretion, replacement or repair of the non-conforming product or refund of the original purchase price of the non-conforming product. In no event shall New Cosmos be liable for any other special, incidental, or consequential damages or losses of any kind whatsoever, including but not limited to loss of anticipated profits and any other loss caused by reason of non-operation of the product.
This warranty is valid only if the product is maintained and used in accordance with New Cosmos's instructions and recommendations. New Cosmos shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product.

16.　Life Expectancy

- The design period longevity under a general environmental condition of this container is about 5 years from purchase. The design life expectancy after the guaranteed term passes is not the one to guarantee this. It is only a guide when a prescribed gas is proofread and it uses it. It might be impossible to use between the proofreading and the proofreading schedule for the next term.

- The life of the Non-dispersive infrared sensor incorporated in the KD-12R is approximately five years after the date of purchase.
The sensor may not detect gas correctly with the lapse of approximately five years. Replace the sensor at intervals of approximately five years. The life of the sensor is specified on the condition that the sensor is serviced properly and that the sensor is not exposed to high-density gas or toxic gas. New Cosmos, however, does not guarantee the specified life of the sensor.

17. Glossary

Indicator / Alarm unit: A unit that receives signals from the gas detector and indicates gas concentration and alarms.

Detector: A unit that detects gas concentration and converts it to electric signals.

Backup power source device: A device that supplies power to the gas detector, indicator / alarm unit in order to maintain its performance during a power failure.

Flow meter: A meter to measure air flow in gas sampling pipe.

Gas collector: A gas collecting probe that enhances gas collection efficiency and blocks water and dust.

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.

Preset alarm value: A preset value for the alarm to go off when gas concentration reaches a certain value.

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.

Alarm accuracy: Difference between the preset alarm value and gas concentration when an alarm actually occurs or as the percentage of the difference compared to the preset alarm value.

Response time: Time it takes from when the gas detector is exposed to a gas with a concentration higher (lower) than the preset alarm value until an alarm goes off.

Temperature range: Range of temperature where the equipment can perform its functions.

Maintenance and inspections: Work to guarantee that the equipment perform its required functions.

Calibration gas: Gas used to calibrate scales of the equipment.

Peak hold: A function to constantly update and hold the peak value of input signals.

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.

LEL: Lower Explosive Limit.   The lowest concentration of flammable gas that will explode when mixed with air and ignited.

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

New Cosmos Electric Co., Ltd.