Bionics Instrument Europe B.V.

Instruction Manual

Gas Detector KD-12E

- 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.

IDENTIFICATION

This document

Title KD-12E Instruction manual.
File name: KD-12E Instruction manual ENG rev. 1.00.docx
Original language: English

Document history

Revision	Date	Revision description	Originator
1.0.0	09-08-2013	Initial release (from v0.0.5).	BIE, Fons van Heese

Equipment

This document applies to:

Name of equipment: Diffusion Gas Detector
Model: KD-12E.

The manufacturer

The equipment is produced by:

Bionics Instrument Europe B.V.
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1 INTRODUCTION

- Thank you for purchasing the KD-12E 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 various types of gas including combustible gas. 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 pre-set 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.
- When working in hazardous areas, the safety of personnel and plant depends on complying with all relevant safety regulations. Assembly and maintenance staff working on installations therefore have a particular responsibility. The precondition for this is an accurate knowledge of the applicable regulations and provisions.

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.

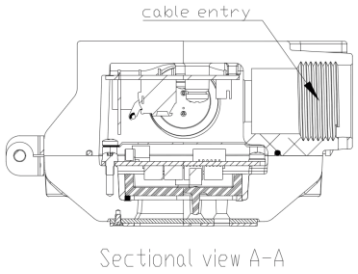
⚠ CAUTION

- 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.
- Wiring systems shall comply fully with applicable code of practice.
- The cable entry device shall be of ATEX certified in type of explosion protection flameproof enclosure ‘’d’’, suitable for the condition of use and correctly installed.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm^2.
- 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.
- Use the product in accordance with applicable laws and regulations.

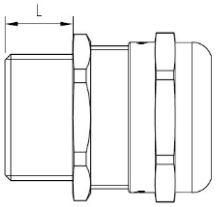
Special Condition for Safe Use

- ATEX certified cable glands according to EN 60079-0: 2012 and EN 60079-1: 2007 must be provided by end-user and used.
  Cable gland entry specification:

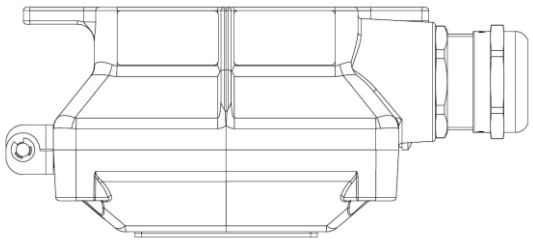
Thread:	G ¾ (= BSPP)
Pitch:	1.8114
Insertion length (mm):	11
Number of insertion threads:	6
Screw precision:	Class B



- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm^2.
- The equipment incorporates flameproof joints which have a maximum gap less than stated in the standard EN 60079-1:2007 to which it is certified. Contact manufacturer (see page 2) for information on the dimensions of the flameproof joints.
- The cable entry device shall be suitable to maintain IP65 rating.
- The cable entry device male thread length (L) shall be 15.0 mm minimum to maintain compliance with the requirements of clause 5.3 of EN-IEC 60079-1:2007.



Thread length specification



Final result

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 Bionics Instruments Europe representative if there should be any damage or missing items.

Accessories	Optional items
Detector head Hexagon wrench (nominal dia. 4): 1 each (see note 1) Instruction Manual (see note 1) MJ-1 Magnetic Stick (see note 1)	Gas calibration kit K-D. Calibration materials (K-I, KII, K-III, K-IV, K-V, K-VI, K-VII, K-VIII, K-XI). KD-12E calibration flow block.

Note:

1. A hexagon wrench, instruction manual, and MJ-1 magnetic stick are provided for each order.

⚠ WARNING

- Do not use the magnetic stick for any purposes other than the operation of this product.
- 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

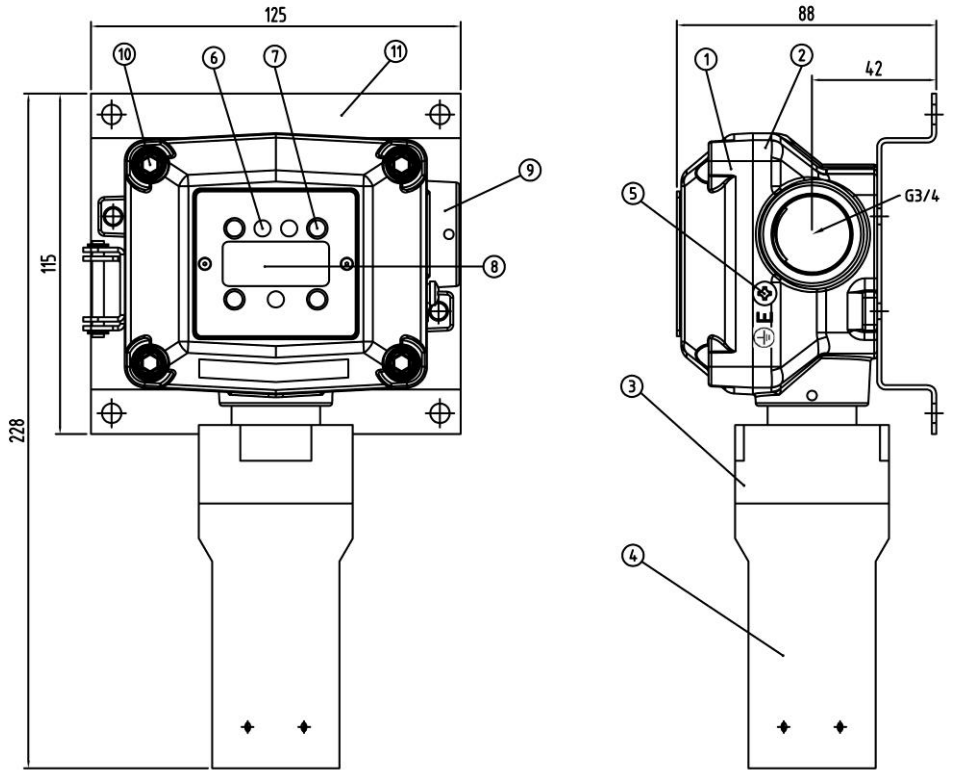


Figure 4-1: External dimensions and nomenclature.

Number	Name	Description
1	Casing cover	
2	Casing	
3	Sensor socket assembly	Incorporates a gas sensor.
4	Sensor protector	Protects the sensor unit.
5	Ground terminal	Used when grounding the frame. Suitable cable lug must be provided by end-user and used.
6	State display indicator	Indicates the power supply state (green), alarm state (red), and trouble state (yellow).
7	Control block	Insert the magnetic stick to control or set the product.
8	Display block	Displays the gas concentration and set values.
9	Cable entry	G3/4, pitch=1.81mm, Insertion length: 11mm, no. of insertion threads: 6. Separate ATEX certified cable glands according to EN 60079-0:2012 and EN 60079-1:2007 must be provided by end-user and used.
10	Bolt with hexagon socket	Used for securing the casing cover. Use a hexagon wrench with a nominal diameter of 4 mm.
11	Sensor mounting bracket	Screws must be provided by end-user.

4.1 Display and Control Blocks

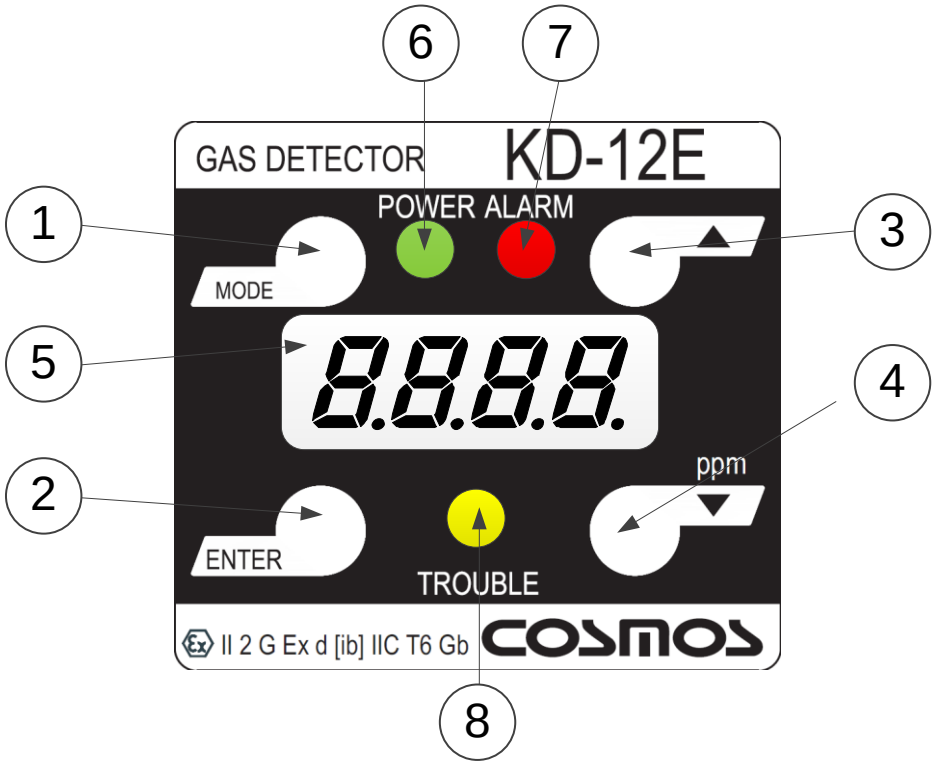


Figure 4-2: Display and control blocks.

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

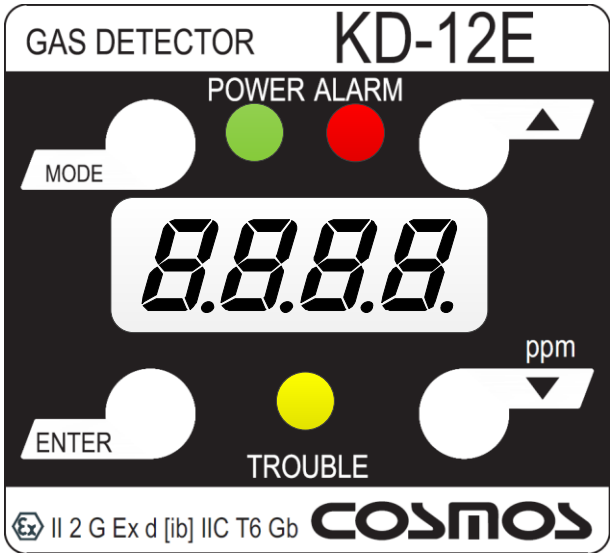
Number	Name	Description
5	Display block	Displays the concentration of gas and set values.

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

4.2 Marking

The plate and labels below are affixed to the enclosure of the detector. These markings applies to the detector overall assembly.

4.2.1 NAMEPLATE



Certification (ATEX)

Ex	:	The ATEX Directive uses a special logo in addition to the CE logo to show that the equipment is suitable for use in a flammable atmosphere.
2	:	Category 2 equipment intended for use in areas where explosive atmospheres are likely to occur (zone 1).
II	:	Non-mining electrical equipment group for potentially explosive atmospheres.
G	:	Intended for use in areas where GAS explosive atmospheres are likely to occur.
Ex d	:	Protection by flameproof enclosure “d”.
[ib]	:	Protection by intrinsic safety “ib”.
IIC	:	Subdivision of gases and vapours (IIC = Hydrogen, Ethine (acetylene) or Sulphide of carbon.
T6	:	Temperature class (maximum surface temperature = 85 °C)
Gb	:	Materials used in the construction of the enclosure contains, by mass, not more than 7,5 % in total of magnesium, titanium and zirconium.

4.2.2 WARNING LABEL

4.2.3 RATING LABEL

Ratings
Power supply: 50 mA max. at 18 to 30 VDC
Ambient temperature: -10°C ≤ Ta ≤ + 40°C
SEE INSTALLATION
INSTRUCTION DOCUMENT

Ta : Ambient temperature range according to the rated temperature class and the maximum surface temperature (Tamb = -10 °C to +40 °C for T6 and 85 °C).

4.2.4 SERIAL NUMBER LABEL

MODEL: KD-12E NO.: 70013210
DEKRA 13ATEX0022 X
Bionics Instrument Europe B.V.
Maxwellstraat 7
NL - 1704 SG - Heerhugowaard
CE 0344

Model : Device type identification (KD-12E).
No.: : Serial number (incl. year of production).
4th and 5th digit indicates year of production e.g. xxx13xxx indicates 2013.
DEKRA : ATEX certificate number (13ATEX0022 X). X it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
0344 : Notified body identification number (DEKRA = 0344).
CE The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EC directives.

4.3 Terminal Block

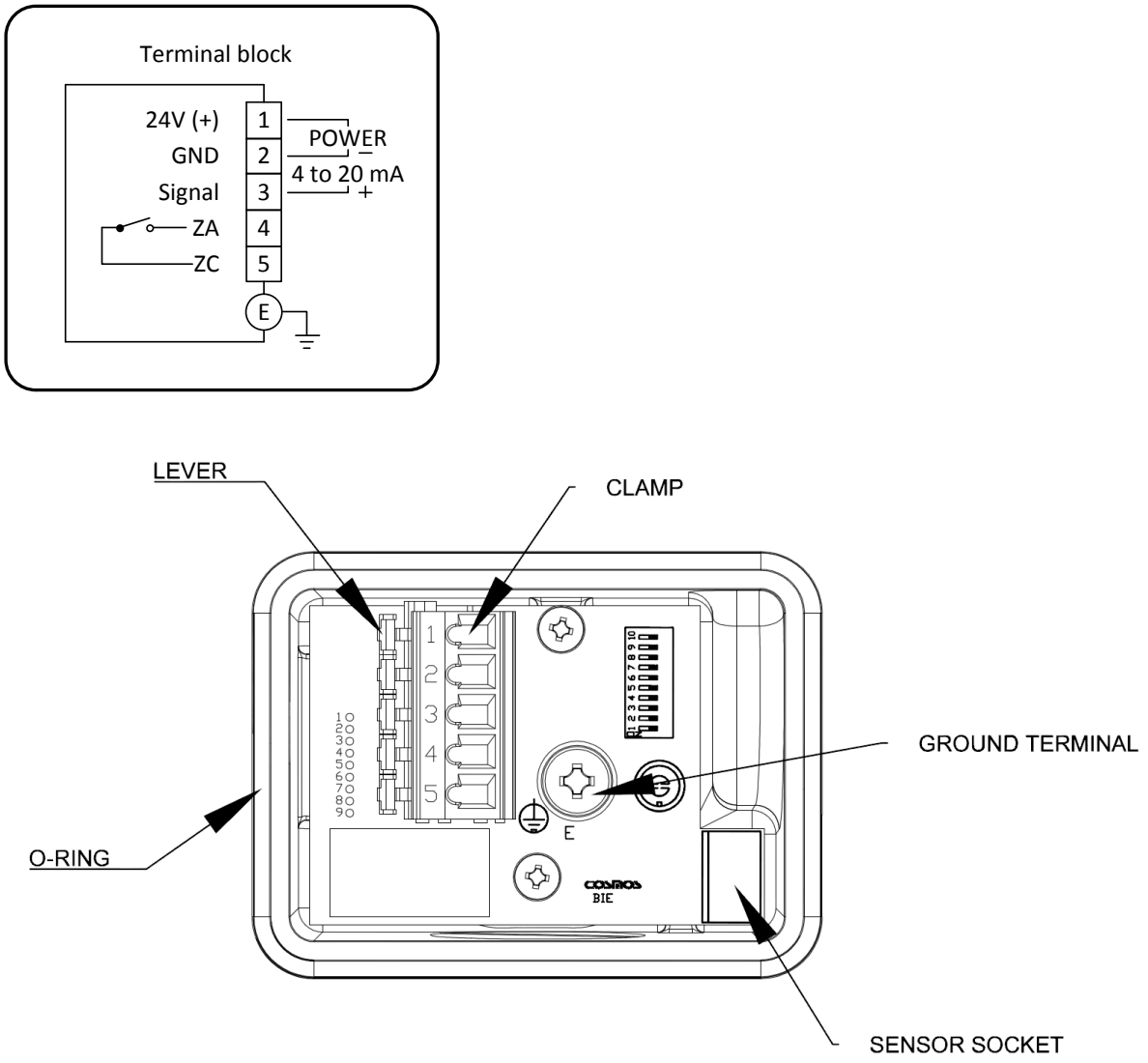


Figure 4-3: Terminal block.

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. By default normally open contact. On request normally closed.
5	ZC	
⏚	Ground terminal	Used to ground the frame. Suitable cable lug must be provided by end-user and used.

5 INSTALLATION AND WIRING

The following instructions apply[1]:

- Installation of the equipment shall be carried out by suitable trained personnel in accordance with the applicable code of practice (e.g. EN 60079-14).
- Inspection and maintenance of this equipment shall be carried out by suitable trained personnel in accordance with the applicable code of practice (e.g. EN 60079-17).
- Repair of this equipment shall be carried out by suitable trained personnel in accordance with the applicable code of practice (e.g. EN 60079-19).
- All signal and supply circuits may only be connected to circuits in which the voltage is limited in accordance with EN-IEC 60079-11: 2012 clause 8.7 shunt safety assemblies (Ui = 30V).
- Wiring systems, connected to terminal 1 – 5, shall comply fully with the relevant requirements of EN60079-14 for non-intrinsically safe signals.
- The cable entry device (a G¾ explosion proof cable gland) shall be of a certified flameproof, suitable for the conditions of use and correctly installed.
- ATEX certified cable glands according to EN 60079-0: 2012 and EN 60079-1: 2007 must be provided by end-user and used.
- With the use of conduit entry a sealing device shall be provided immediately on the entrance of the flameproof enclosure.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm^2.
- The cumulative inductance and capacitance of a sensor, and cable, may not exceed the maximum permitted by the limits of the “simple apparatus” clause ($\sum C < 40\ \eta F$ & $\sum L < 40 \mu H$ for 30V/101 mA).
- Installation, operation and maintenance of the detector shall be carried out following the instructions in this manual.

[1] Reference European ATEX Directive 94/9/EC, Annex II, 1.0.6.

5.1 Main unit installation

5.1.1 INSTALLATION METHOD

⚠ CAUTION

- Be careful not to damage the gas detector when installing it. Otherwise, the explosion-proof performance of the gas detector will be lost.
- Do not install the product in the following places.
  - Places where the ambient temperature exceeds the operating temperature range (-10 ^{o}C to 40 ^{o}C).
  - Places where condensation occurs.
  - Places where water is directly sprayed.
  - Places subject to corrosive gas.
  - Places close to equipment that generates high frequencies or a magnetic field.
- Install the gas detector in places where it can be maintained and inspected with ease.
- Install the gas detector in places free from vibration.
- Install the gas detector in places free from sudden temperature changes.
- Keep the gas detector free from impacts.
- 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.
- The cable entry device shall be of ATEX certified in type of explosion protection flameproof enclosure ‘’d’’, suitable for the condition of use and correctly installed.
- Fastener type M5 x 16 shall have a yield stress factor of min. 450 N/mm^2.

5.1.2 INSTALLING HEIGHT

Type of gas	Installing height	Remarks
Gas heavier than air (Example: LPG)	A maximum of 10 cm above the floor. (Height to the sensor guard tip)	Keep a space of approximately 7 cm from the sensor guard tip for ease of maintenance and inspection.
Gas almost the same as air in specific gravity (Example: Carbon monoxide)	75 to 150 cm above the floor. (Height to the sensor guard tip)	Decide the height by considering the specific gravity and mounting environment.
Gas lighter than air (Example: City gas and hydrogen)	Near the ceiling	Decide the height by considering arrangements for ease of maintenance (e.g., a scaffold).

Drill holes at the required distances (for details see fig. Figure 5-1: Detector mounting.) and fit the detector mounting plate with M6 bolts or equally sized screws to the wall. Screws supplied by end-user and suitable for wall.
Refer to *§ 205.2 Sensor installation* for installation recommendations for optional products.

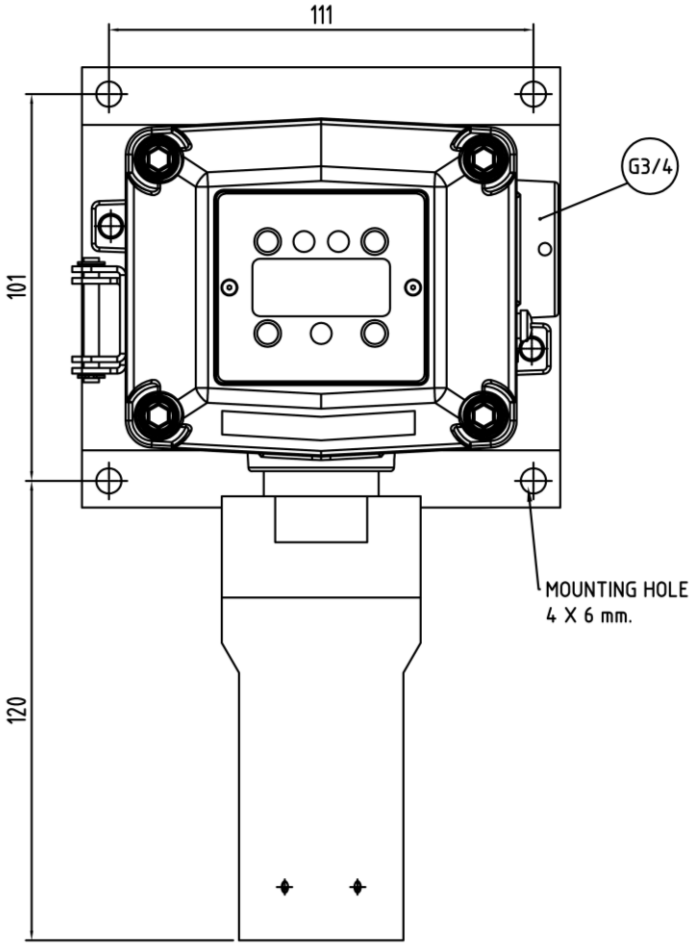


Figure 5-1: Detector mounting.

- It is necessary to open the casing cover at the time of wiring and replacing the sensor. Install the gas detector in places where the cover opening angle shall be more than 90 degree.

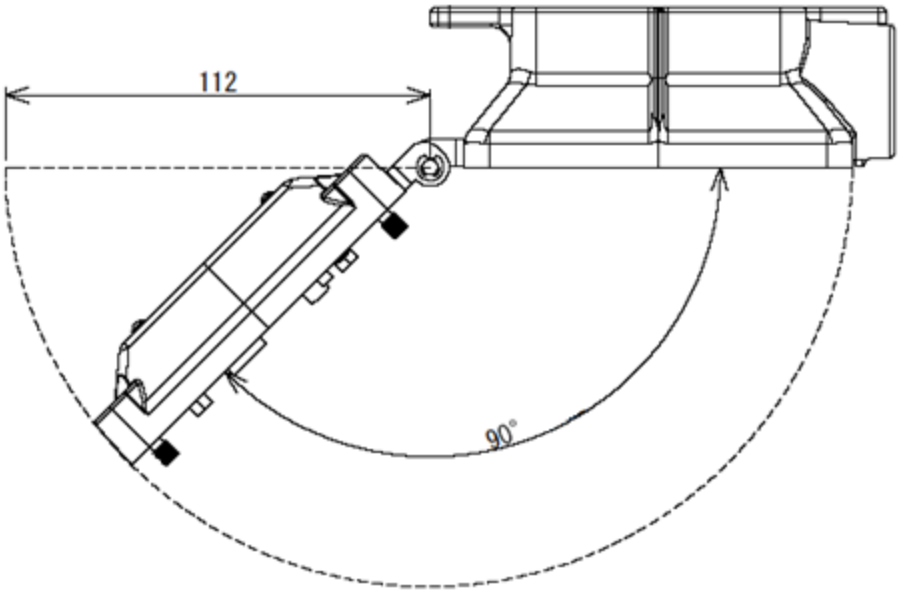


Figure 5-2: Cover opening angle.

5.1.3 EXAMPLES OF INSTALLATION POSITIONS

- Install the product in places where gas easily accumulates.

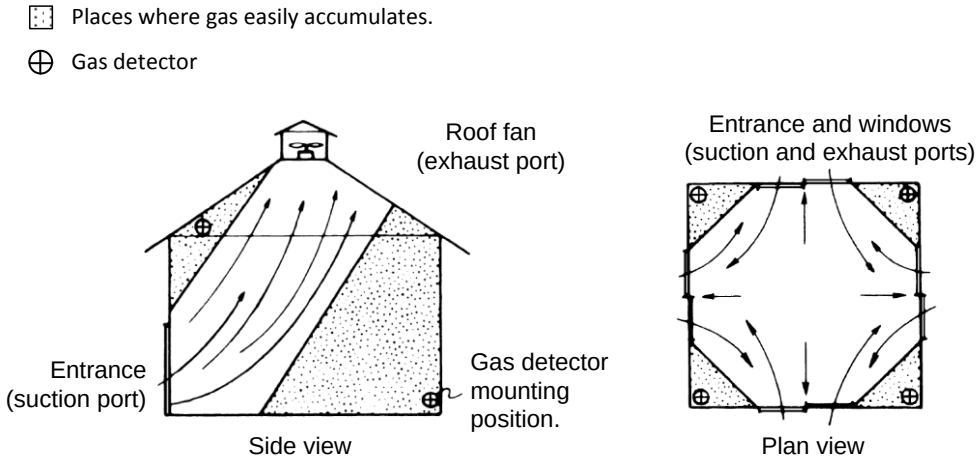


Figure 5-3: Example of installation position.

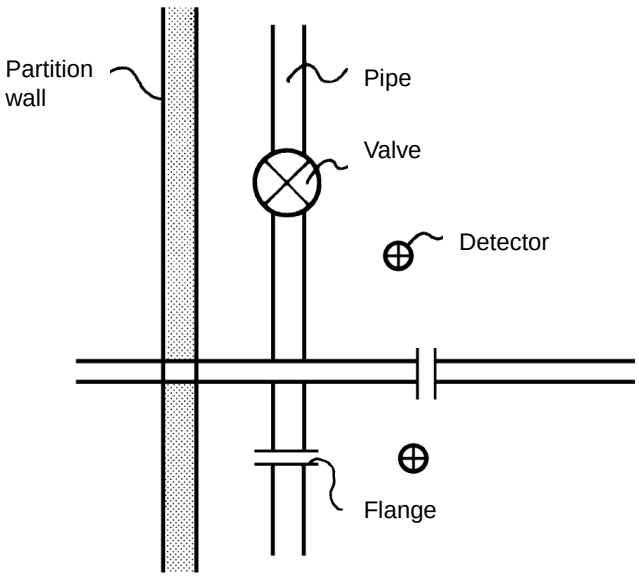


Figure 5-4: Example of outdoor installation position.

5.2 Sensor installation

5.2.1 GENERAL

The KD-12E can be fitted with the following plug-in type gas sensors:

- GS-xxxxDP sensor
- GS-xxxxDY sensor
- GS-xxxxBY sensor
- GS-xxxxELP sensor
- GS-xxxxEP sensor

5.2.1.1. BIAS voltage control provision

In order to optimize the sensor stabilization time when a new sensor is being installed, a BIAS voltage control provision is applied. The type of provision depends on the gas sensor's TG no's.

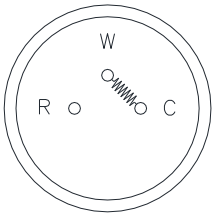


Figure 5-5: BIAS voltage control provision.

For most of the TG no's the gas sensor working electrode "W" is short-circuited with the gas sensor reference electrode "C" by means of a spring.

Note:
Keep the spring, as it is recommended to re-fit the spring in case the sensor needs to be transported or stored for a longer period.

For gas sensors with TG no's: 170/270/880/1560 and 1750 the "BIAS voltage control" is activated through a 1.5 Volts battery device. Make sure that in case you have to reconnect the device, the battery's voltage has not dropped under the required voltage level of 1.2 V.

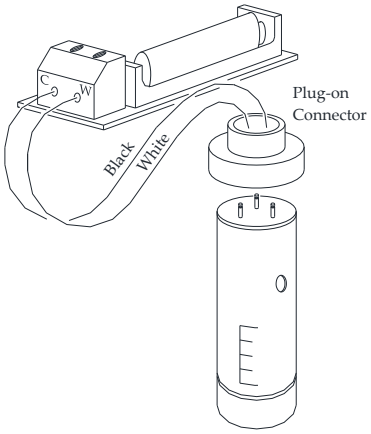


Figure 5-6: Battery BIAS voltage control provision.

5.2.2 MOUNTING OF THE GAS SENSOR TYPES DP, ELP OR EP

To install the DP- , ELP- or EP type gas sensor into the KD-12E body follow the following steps.

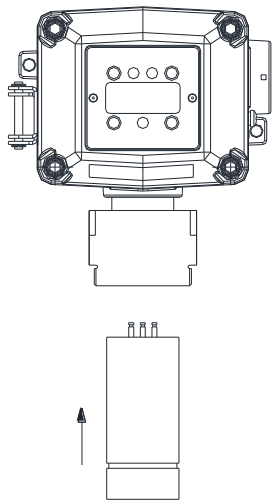


Figure 5-7: Mounting DP-, ELP- or EP type sensor.

- Remove the “BIAS voltage control” provision. See § 5.2.1.1 BIAS voltage control provision.
- Push the DP-, ELP- or EP type gas sensor gently upwards into the body until it snaps into the sensor socket.
- Mount the sensor protector by turning it clock-wise on the sensor body.

- To remove the gas sensor proceed in reverse order.

5.2.3 MOUNTING OF THE GAS SENSOR TYPES DY

To install the DY-type gas sensor into the KD-12E body follow the following steps.

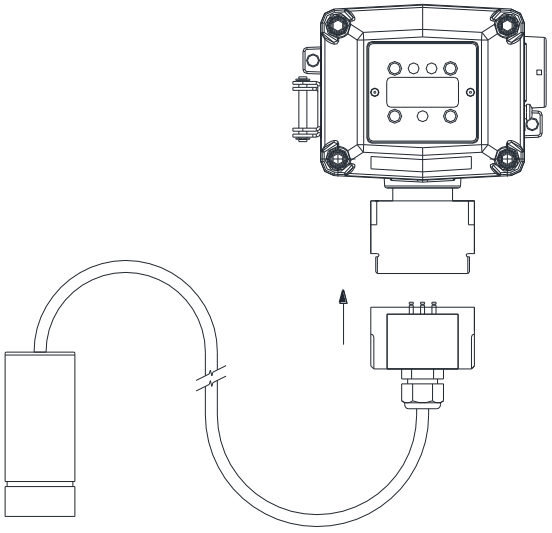


Figure 5-8: Mounting DY type sensor.

- Remove the “BIAS voltage control” provision. See *§ 5.2.1.1 BIAS voltage control provision*.
- Push the DY type gas sensor plug-in adapter gently upwards into the body until it snaps into the sensor socket.
- Mount the adapter protector by turning it clock-wise on the sensor body.

- To remove the gas sensor proceed in reverse order.

5.2.4 MOUNTING OF THE GAS SENSOR TYPES BY

To install the BY-type gas sensor into the KD-12E body follow the following steps.

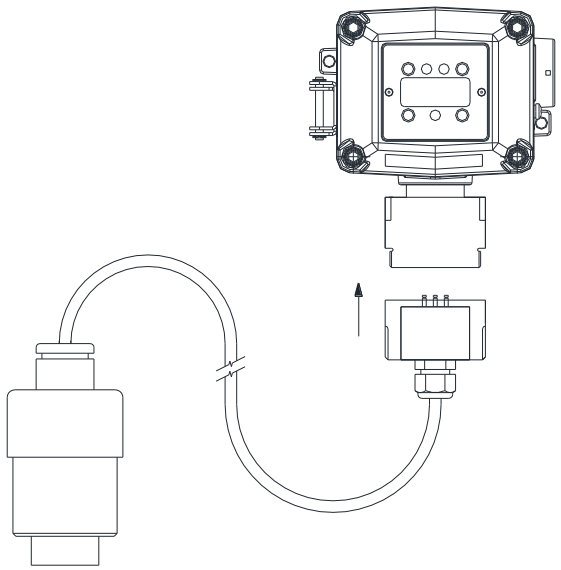


Figure 5-9: Mounting BY type sensor.

- Remove the “BIAS voltage control” provision.
  See § 5.2.1.1 BIAS voltage control provision.
- Push the BY type gas sensor plug-in adapter gently upwards into the body until it snaps into the sensor socket.
- Mount the adapter protector by turning it clock-wise on the sensor body.

- To remove the gas sensor proceed in reverse order.

5.2.5 MOUNTING OF THE GAS SENSOR TYPES DP, ELP OR EP INCL. REMOTE CABLE

To install the DP- , ELP- or EP type gas sensor into the KD-12E body follow the following steps.

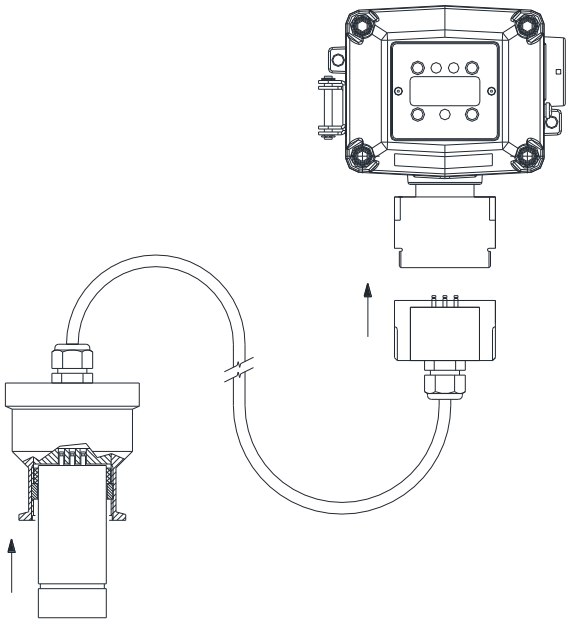


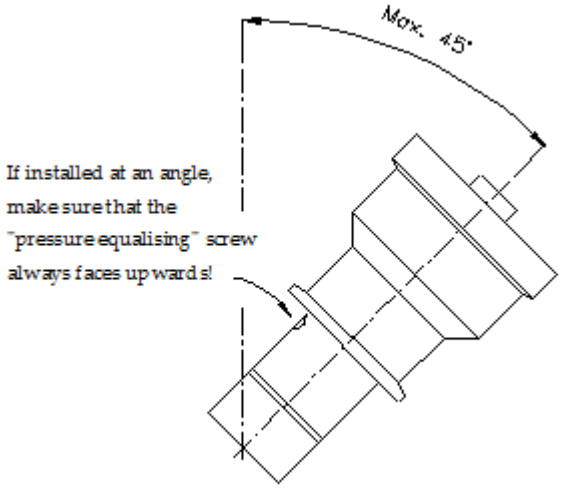
Figure 5-10: Mounting sensor incl. remote cable.

- Remove the “BIAS voltage control” provision.
  See § 5.2.1.1 BIAS voltage control provision.
- Push the gas sensor gently upwards into the remote body through the retaining ring and silicon locking ring, until it snaps into the body.

- Push the gas sensor plug-in adapter gently upwards into the detector body until it snaps into the socket.
- Mount the adapter protector by turning it clock-wise on the sensor body.
- Mount the sensor protector by turning it clock-wise on the sensor body.

- To remove the gas sensor proceed in reverse order.

The remote cable body can be installed as an environmental gas detector, whereby a choice can be made between wall- or ceiling– mounting the body or the gas detector may be duct-mounted for monitoring applications in exhaust systems.
The body should preferably be installed vertically. In case the body needs to be installed under an angle, please make sure that the body is never placed under an angle greater than 45° relative to a vertical position. This is to ensure that the main electrode is always in contact with a sufficient amount of electrolyte.
If the body is placed under an angle the ‘pressure stabilization screw’ should always face up-wards.



5.2.5.1. Wall-mounting of the remote unit

The set consists of two parts:

1. Mounting plate, see Figure 5-12.
2. Support ring, see Figure 5-11.

If not fitted already, fit the support ring with M4 bolts to the mounting plate. Drill holes at the required distances (for details see Figure 5-12) and fit the mounting plate with M6 bolts or equally sized screws to the wall. Place the unit into the support ring, see Figure 5-13.

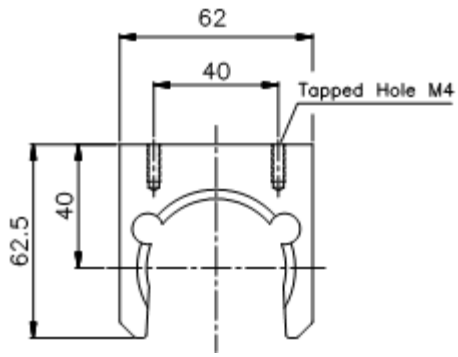


Figure 5-11: Support ring details

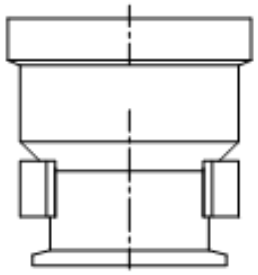


Figure 5-13: Support ring

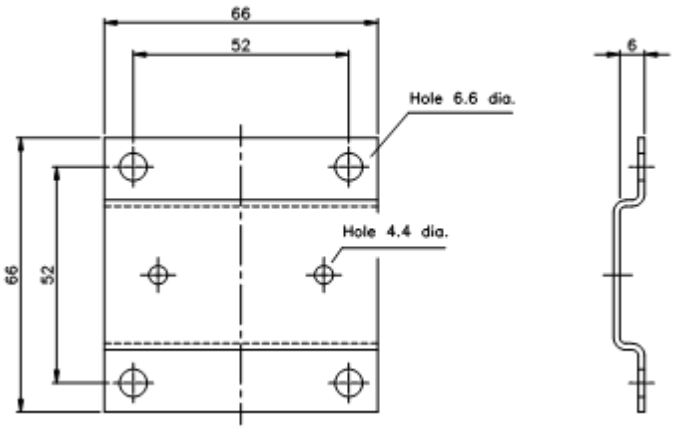


Figure 5-12: Mounting plate

5.2.5.2. Duct mounting of the remote unit in exhaust systems

The installation of a remote unit in an exhaust system requires a 40 mm diameter stub provided with a KF-40 type flange installed on the pipe- or duct-work in order to match the KF-40 type body of the remote unit.

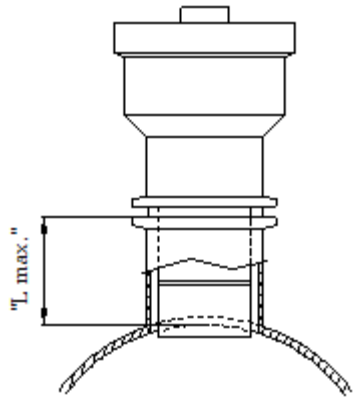


Figure 5-14: Duct mounting

To ensure that the sensor is sufficiently in contact with the flow of air/gas, the flange should have maximum depth “L max “ as illustrated (see Figure 5-14).

“L max” = Sensor length – 5 mm.

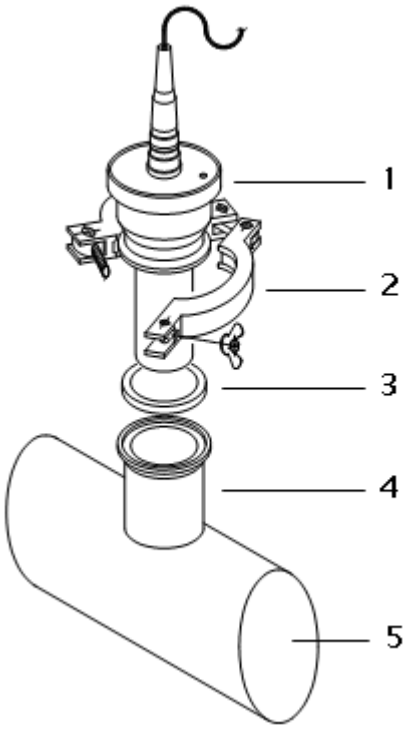


Figure 5-15: Duct mounting details

Duct mounting details:

Place the gasket (3) in the groove of the KF-40 type flange of the stub and then insert the remote unit.
After insertion of the remote unit into the stub secure the two flange parts with the clamping ring (see Figure 5-15).

1 – Remote unit.
2 – Clamping ring.
3 – Gasket (Centering ring with O- ring).
4 – KF-40 stub.
5 – Exhaust duct.

Recommended air flow in exhaust is 0.7 m/s.

5.3 Wiring Method

5.3.1 WIRING WORK

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

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

Cable Work

- Use a shielded cable, such as LiYCY-0, with a thickness of 0.75 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 maximum diameter of the cable conductor is 2.00 mm^2.

5.4 Wiring and Connection

⚠ WARNING

- Before opening the casing cover of the gas detector, be sure to turn off the product and all devices (e.g., indicator unit and signal converter) connected to the product.
- If the power is turned ON, the power supply may become a source of ignition.
- Be sure to ground the product to prevent electric shocks.

⚠ CAUTION

- Wire the connecting terminals correctly.
- Separate connection cables from power lines as far as possible.

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 LiYCY-0 (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 Ω or less.

MEMO

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

See *§ 13 Typical application circuit* for recommended wiring diagram.

5.4.1 TYPICAL CONNECTION PROCEDURE

- Prepare a power supply that can provide 24 V.
  (Do not turn on the power supply before wiring the main unit.)
- 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.
- Press the lever of the terminal block with a flat-blade screwdriver.
- The clamp will open. Insert the lead wire.
- Connect the positive side of the power supply to the 24 V(+) terminal.
- Connect the negative side of the power supply to the GND terminal.

Figure 5-16: Typical connection.

- The lead wire will be automatically secured when the screwdriver is lifted.
- Check that the power supply cords are securely connected to the terminals. This completes the power supply preparations.
- Wire the analog signal and external contact terminals, if required.
- Tighten the hexagon socket bolts (tightening torque: 0.8 – 2.4 Nm) 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 harness 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.

6 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.

7 DISPLAY AT START-UP (INITIAL DELAY)

⚠ CAUTION

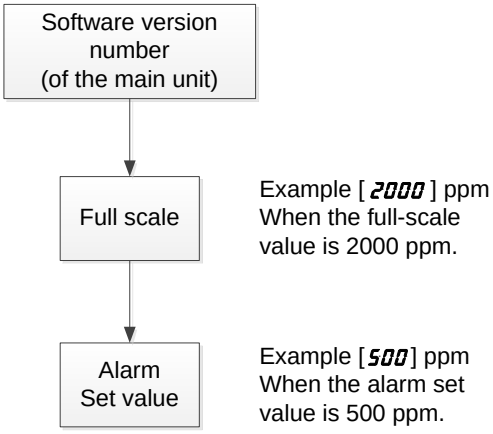
- Check that there is no gas around the product before starting the product.
- If the sensor output is not stable, the external contact point may operate after the initial delay. Release the interlock of the external equipment if necessary.
- During the initial delay, the analog signal fixed at 4 mA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

MEMO

- The magnetic stick is not operable during the initial delay.
- The initial delay lasts approximately 2 minutes and 50 seconds after the power is turned ON.
- When the power supply is turned ON, all of the indicator lamps (green, red, and yellow lamps) and the display block are lit.

Figure 7-1: Start-up display.

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



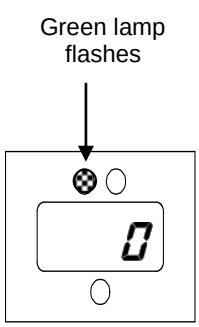
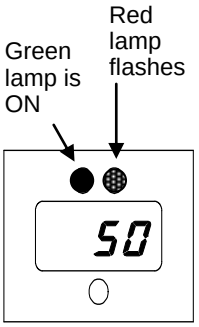
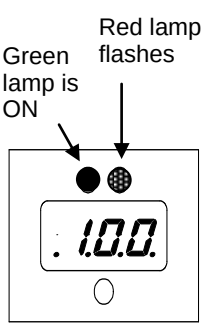
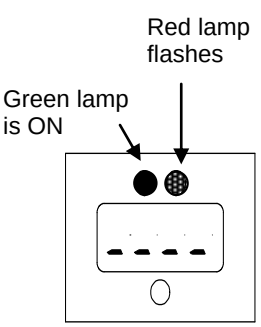
- Then the POWER indicator (green lamp) will be flashed for approximately 2 minutes and 50 seconds.
- When the POWER indicator (green lamp) is lit, the start-up of the main unit is completed and the main unit will be in gas monitor mode.

MEMO

- If the sensor unit has not been turned ON for a long time after the product is shipped from factory, it may take some time for the sensor output to stabilize.
- If needed, turn ON the product for approximately one week, and make the zero adjustment and span adjustment.

  Refer to *§ 12 Calibration for the adjustments.*

8 DISPLAY AND OPERATION IN EACH MODE

		In excess of alarm set value			
	At start-up (Initial delay)	Gas monitor mode	Test mode	Maintenance mode	
				Gas monitor mode	Test mode
Contents of display					
	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).

9 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.
E- 8 E- 9	Yellow lamp flashes	Sensor error	The sensor connector is disconnected or the sensor wire has broken.	Check that the sensor connector is securely connected. If a sensor connector failure or broken wire has possibly occurred, contact your local representative.
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 *§ 0*

10 GAS SENSOR MAINTENANCE

Regular preventive maintenance of the detection equipment ensures optimum safety. Upon request, Bionics Instrument can present a maintenance advice tailored to suit your installed gas detection system.

All maintenance, calibration and testing should be carried out by qualified personnel. Tailored training courses for your maintenance personnel are available upon request. We advise to carry out maintenance/calibration at least every six months (unless particular circumstances request for a shorter period, please ask Bionics Instrument to advise).

Maintenance activities comprises mainly:

- Replacing the disposable gas sensor types ELP or EP.
- Replacing or topping up the electrolyte, replacing the O-ring and membrane of the BY-, DY- and DP-type gas sensor.

Following these replacements the KD-12E unit requires “zero” and “span” calibration, see section *§ 12 Calibration method*.

10.1 Maintenance procedure for the GS-[…]DP/DY/BY type sensor

The following steps describe the replacement of electrolyte, membrane and “O” ring.

⚠ CAUTION

- When an alarm/control unit is attached to the KD-12E, please ensure that the alarm/control unit is set to “stand-by” mode before performing any maintenance or calibration.

1. Remove the gas sensor from the unit (for reference see § 5.2 Sensor installation.

2. Holding the gas sensor upside down, unscrew the membrane holder cap (see Figure 10-2 & Figure 10-3). Remove and dispose the O-ring and membrane.
   Allow the electrolyte to drain out. If the electrolyte does not drain readily, remove the adhesive membrane covering the vent plug’s pressure equalizing hole and unscrew the vent plug (see Figure 10-4 & Figure 10-5).

> ⚠ **CAUTION**
>
> - In addition to the normal O-ring, several types of gas sensors carry a thin silicon mini seal. This silicon seal should remain with the gas sensor and should under normal circumstances not be replaced.

3. After the electrolyte has been drained out, hold the sensor with the measuring electrode pointing upwards and inspect the electrode. If necessary clean the electrode with a clean soft tissue (see Figure 10-6).

4. To prevent contamination from the old electrolyte, rinse out the gas sensor interior twice with a small amount of fresh electrolyte (see Figure 10-7).

5. Hold the gas sensor with the electrode pointing upwards. Ensure that the new O-ring has the appropriate colour and that, if applicable, the silicon seal is in place (see Figure 10-8).

6. Place a drop of fresh electrolyte carefully on the measuring electrode (see Figure 10-9).

7. Place a new membrane onto the measuring electrode. Due to the hygroscopic behavior of the electrolyte, the membrane will easily stay in place (see Figure 10-10). Position the membrane holder and screw on the membrane holder cap, which should be firmly tightened (see Figure 10-11).

8. Holding the sensor with the membrane pointing downwards, pour fresh electrolyte from the dispenser bottle into the electrolyte supply opening until the electrolyte in the sensor reaches the ‘MAX’ level (see Figure 10-12). If necessary, wipe clean the electrolyte supply opening with dry paper tissue (see Figure 10-13).

9. Re-mount the vent plug (see Figure 10-14), cover the vent plug with a new adhesive membrane and gently shake the sensor to dislodge any air bubbles which may have formed around the electrode.

⚠ CAUTION

- The type of electrolyte and membrane to be used is indicated on the label of the gas sensor. The code EL-[….] indicates the electrolyte type and the code M-[….] indicates the membrane type.
  Depending on the type of sensor the O-ring's will either be white or black. When replacing the O-ring's please make sure to replace it with an O-ring of the same color.

We recommend the following time schedule for changing the electrolyte:

Every 12 months *	EL-160-1 EL-1555	EL-560-1 EL-2460	EL-860-1	EL-960-1	EL-1460-1	EL-1501
Every 6 months	EL-270-2 EL-3415 EL-4850	EL-370-2 EL-3460-1 EL-4960-1	EL-415 EL-3760-1	EL-660 EL-4070-7	EL-760-1 EL-4155	EL-3160 EL-4760-1
Every 3 months	EL-1905K					

Electrolyte is subject to evaporation. The degree of evaporation depends highly on the initial evaporation factor of the electrolyte and the circumstantial conditions, such as humidity and environmental temperature.
The level of the electrolyte in the gas sensor can be read from the scale on the gas sensor body (see Figure 10-1).

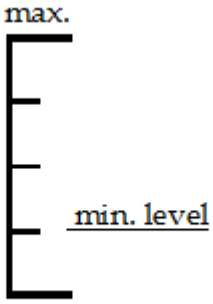


Figure 10-1: Elektrolyt level indicator.

Check this level at regular time intervals and top-up to max. in case the electrolyte level has dropped below one quarter of the scale. Topping up must be followed by a "zero" and "span" calibration (see section *§ 12 Calibration method*).

⚠ CAUTION

- The electrolyte is a non-toxic chemical substance. However, avoid contact with your eyes, skin or clothing. If such contact should occur, flush the affected area with water immediately. Bionics Instrument cannot be held responsible for accidents or injuries resulting from careless handling of the electrolyte.

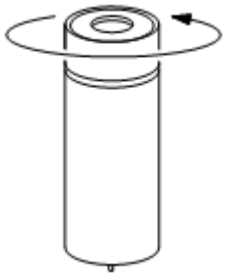


Figure 10-2: Removing cap

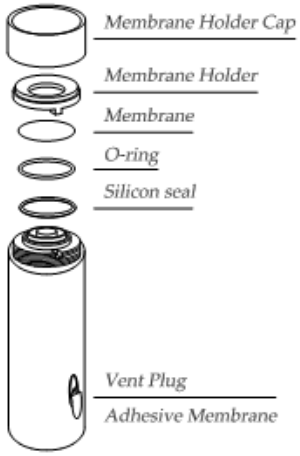


Figure 10-3: Removing parts

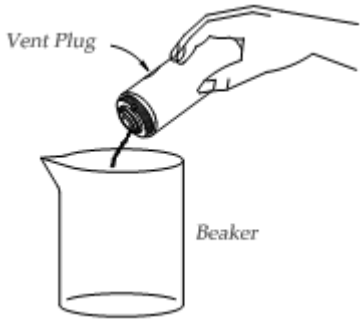


Figure 10-4: Electrolyte drain out

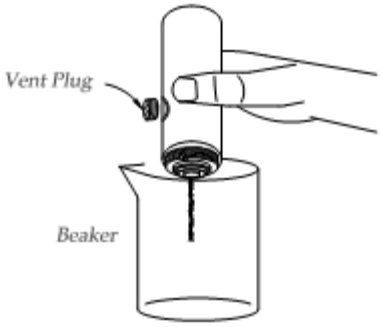


Figure 10-5: Unscrew vent plug

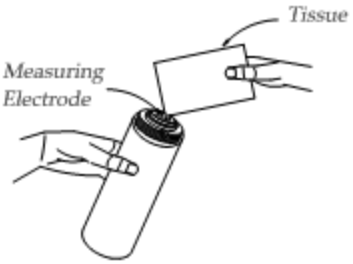


Figure 10-6: Clean electrode

Figure 10-7: Rinse interior

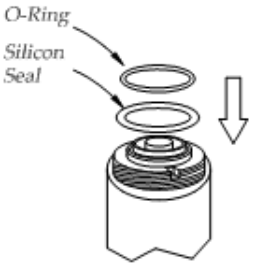


Figure 10-8: Silicon seal

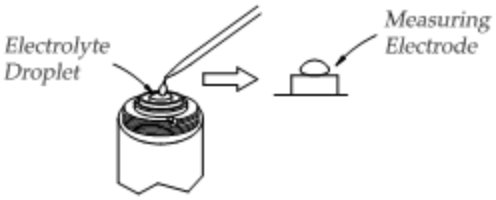


Figure 10-9: Drop of electrolyte

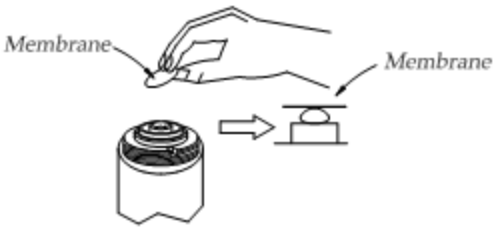


Figure 10-10: Place membrane

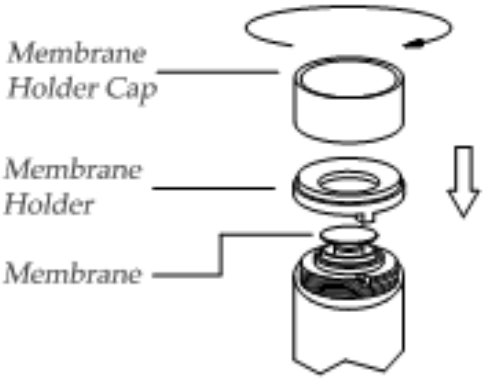


Figure 10-11: Screw cap

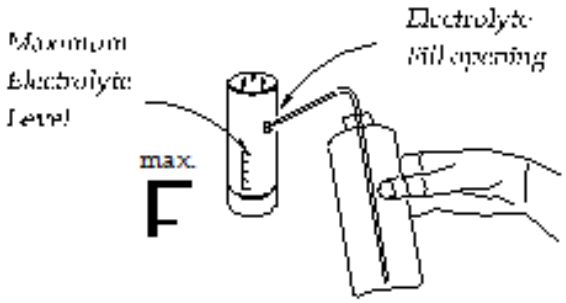


Figure 10-12: Refill electrolyte

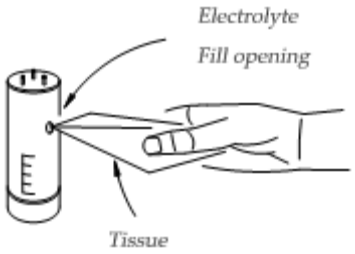


Figure 10-13: Dry opening

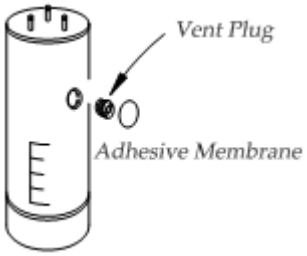


Figure 10-14: Re-mount vent plug

11 MAINTENANCE CHECK AND OPERATION METHODS

11.1 Daily inspection and periodical Inspection

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

	Frequency	Checking item	Contents of inspection
Daily inspection	At least once per month	Visual inspection	• The status of lamp (green POWER indicator) is lit. • The concentration display of the gas concentration indicator. • Corrosion of the main unit. • Corrosion of mounting screw. If a failure is found, replace the parts.
	Minimum intervals of 2 to 3 months	Alarm operation check with real gas	Apply inspection gas to the gas detector and check the operation of the alarm. • Use the calibration cap, apply inspection gas, and check the operation of the alarm.
		Condition around gas detector	Check that nothing interrupts the diffusion of gas around the gas detector.
Periodical inspection	At least twice per year	Consult your local representative.	

- Use optional products to make actual gas inspections.

Periodical Inspections

In order to maintain the reliability of the gas detection/alarm system, it is extremely important to conduct maintenance and inspections. Moreover, it is necessary to use actual gas (combustible gas or poisonous gas), to carefully conduct inspection and calibration. It is highly recommended that you consider periodical inspections under a maintenance contract with Bionics Instrument or your local representative.

12 CALIBRATION METHOD

12.1 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 cancelled by repeating the same operation (1 to 6), turning the product OFF, or waiting 8 hours.

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

Figure 12-1: Maintenance mode.

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 cancelled by repeating the same operation (1 to 6 above), turning the product OFF, or waiting for 8 hours.

12.2 Zero Adjustment

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

MEMO

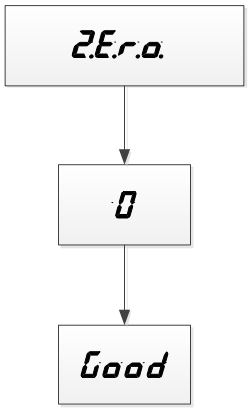
Conduct the zero adjustment in a place where there is no ambient gas.

1. While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
2. The main unit displays CAL. . first, followed by . . .0 .

Figure 12-2: Zero adjustment.

(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 . . .1.
4. Press the ENTER switch of the main unit.
5. The main unit displays sequentially:



6. When the above items are displayed, the zero adjustment is completed.
7. Upon completion of the zero adjustment, the product will automatically return to gas monitor mode.
   - If an error is displayed, refer to *§ 9 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*.

12.3 Span fine-tuning

MEMO

Be sure to conduct the zero adjustment before performing span fine-tuning. For details, refer to § 12.2 Zero Adjustment.

⚠ 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 Bionics Instrument maintenance service members or personnel who have completed a maintenance seminar can perform fine-tuning.

1. Apply calibration gas corresponding to the equipment.
2. Sufficiently stabilize the gas.
3. While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
4. The main unit displays CAL. . first, followed by . . 0. .
5. Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to . . 2. .
6. Press the ENTER switch of the main unit.
7. The main unit displays SF. . . first, followed by the present gas concentration.
8. Press the UP or DOWN switch of the main unit with the magnetic stick, and adjust the display of the main unit to the actual span gas concentration.
9. Press the ENTER switch.
10. The span fine-tuning is completed when Good is displayed.
11. Upon completion of the span fine-tuning, the product will automatically return to gas monitor mode.
12. Remove the gasbag.

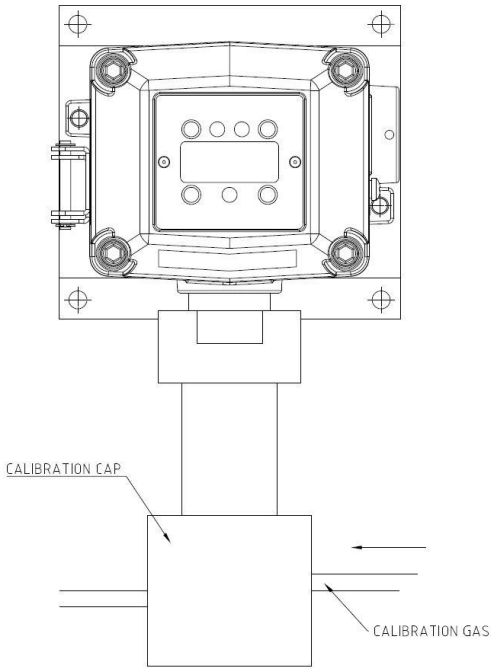


Figure 12-3: Calibration set-up

- Perform span rough adjustment if E- 4 or E- 5 is displayed.
- If an error is displayed, refer to § 9 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*.

12.4 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 Bionics Instrument 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
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.

- Perform span rough adjustment if E- 4 or E- 5 is displayed.
- If an error is displayed, refer to § 9 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*.

12.5 Full-scale and alarm set value display

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

1. While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
2. The main unit displays CAL. . first, and displays . . . 0.
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.

Figure 12-4: Full scale and alarm set value display.

F.S.d.P.
↓
F.S. . .
↓
Full scale
↓
AL. . .
↓
Alarm set value

5. When the above items are displayed in sequence and repeatedly, the user can check the full-scale and alarm set values.
6. After the full-scale and alarm set values are displayed, the product will automatically return to gas monitor mode.

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

12.6 Test mode

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

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

1. While in gas monitor mode, press the MODE switch of the main unit first. Then press the UP switch with the magnetic stick within approximately 2 seconds.
2. The main unit displays CAL. first, and displays 0.
3. Press the UP or DOWN switch of the main unit with the magnetic stick and adjust the value to 10.

Figure 12-5: Test mode, 10.

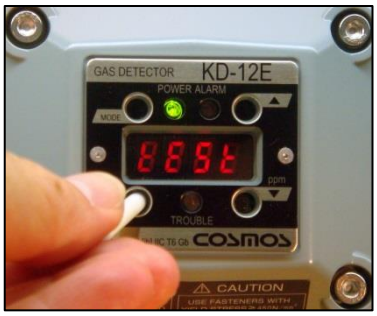


Figure 12-6: Test mode, TEST.

4. Press the ENTER switch of the main unit.

TEST.
↓
Test value

5. When the above items are displayed, the test operation of the product in a concentration ranges 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.

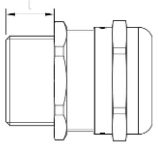
6. Press the UP or DOWN switch of the main unit and set the desired calibration concentration. Then the test will start. If the setting is outside the operating range, LLLL or HHHH will be displayed.
7. To quit the test mode, press the ENTER or MODE switch.
8. When the test is finished with the ENTER switch pressed, the tested value will be saved. When the test is finished with the MODE switch, the previously saved value will remain.

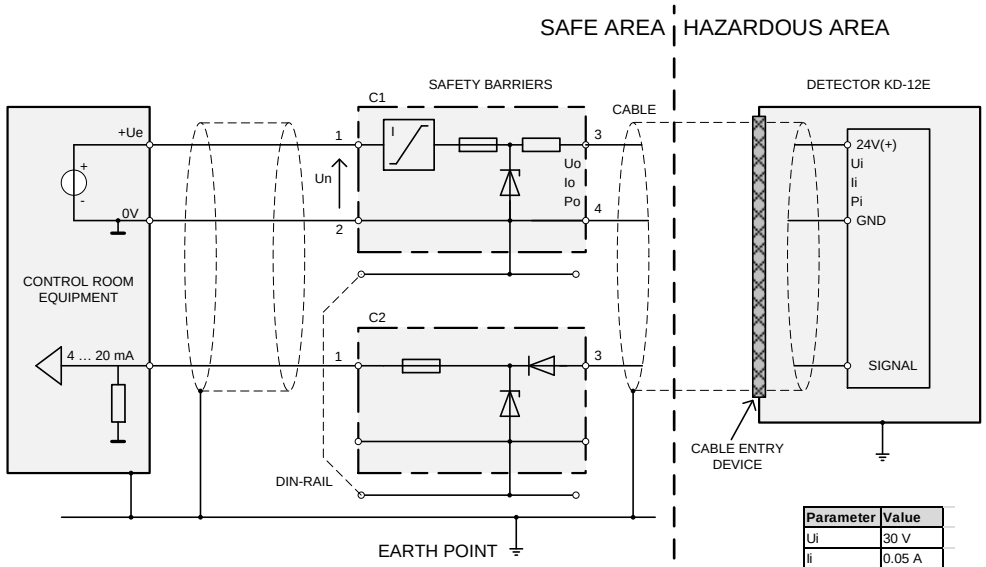
- Carefully handle and make settings with the magnetic stick because the magnet is very powerful. For details, refer to *§ 3 Contents of package*.

13 TYPICAL APPLICATION CIRCUIT

INSTALLING THE DETECTOR IN AREAS SUBJECT TO EXPLOSION HAZARDS OF ZONE 1.

- Installation of the equipment shall be carried out by suitable trained personnel in accordance with the applicable code of practice (e.g. EN 60079-14).
- Inspection and maintenance of this equipment shall be carried out by suitable trained personnel in accordance with the applicable code of practice (e.g. EN 60079-17).
- Repair of this equipment shall be carried out by suitable trained personnel in accordance with the applicable code of practice (e.g. EN 60079-19).
- Wiring systems, connected to terminal 1 – 5, shall comply fully with the relevant requirements of EN60079-14 for non-intrinsically safe signals.
- All signal and supply circuits may only be connected to circuits in which the voltage is limited in accordance with EN-IEC 60079-11: 2012 clause 8.7 shunt safety assemblies (Ui = 30 V).
- The cable entry device (a G¾ explosion proof cable gland) shall be of a certified flameproof, suitable for the conditions of use and correctly installed.
- With the use of conduit entry a sealing device shall be provided immediately on the entrance of the flameproof enclosure.
- Only safety barriers with the following characteristics may be used: Uo ≤ 30V.
- The following safety barriers are provided as examples only. Selected barriers must be acceptable to the authority and comply with the assigned entity parameters. When other barriers have been selected, care must taken that the voltages on the detector comply to the operating specifications.
- The cable entry device shall be suitable to maintain IP65 rating.
- The cable entry device male thread length (L) shall be 15.0 mm minimum to maintain compliance with the requirements of clause 5.3 of EN-IEC 60079-1:2007.





Parameter	Value
Ui	30 V
Ii	0.05 A
Pi	1.2 W

Ref.	Description	Manufacturer	Type
C1	Power supply safety barrier	Stahl	9001/01-280-280-101
C2	Signal safety barrier	Stahl	9001/03-280-000-101

14 DECLARATION OF CONFORMITY FOR CE MARKING

BIE A NEW COSMOS GROUP COMPANY

Declaration of Conformity for CE marking

We,

Bionics Instrument Europe B.V.
Maxwellstraat 7
NL-1704 SG Heerhugowaard
The Netherlands

declare under our sole responsibility that the product:

Product:	Gas Detection Unit
Type:	KD-12E
Equipment marking	Ex II 2 G Ex d [ib] IIC T6 Gb
EC-type examination	DEKRA Certification B.V Utrechtseweg 310 6812 AR Arnhem Netherlands Notified body number: 0344. Certificate Number: DEKRA 13ATEX0022 X

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

Number	Title	Date of issue
EN 60079-0	Explosive atmospheres – Part 0: Equipment - General requirements, (IEC 60079-0: 2011, 6th Edition).	2012
EN 60079-1	Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d" (IEC 60079-1: 2007, 6th Edition).	2007
EN 60079-11	Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i" (IEC 60079-11: 2006, 6th Edition).	2012
EN 50270	Electromagnetic compatibility: Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen. (NEN-EN 50270:2007). Type 2.	2006
EN 61000-6-4 (+ A1)	Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments.	2007 (2011)

Following the provision of council directive 2004/108/EC on the approximation of the laws of the member states relating to electromagnetic compatibility and directive 94/9/EC on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres.

The products specified above was tested conforming to the applicable rules under the most accurate measurement standards possible, and that all the necessary steps have been taken and are in force to assure that production units of the same product will continue to comply with the requirements.

Date of issue: August 2013.

Place of issue: Heerhugowaard, The Netherlands.

Paul J.K. van der Kruk
(General manager)

Gas Detection & Analysis

15 TROUBLE SHOOTING

- 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. 28 Wiring and Connection
The yellow lamp to indicate an error is flashed and the error code is displayed.	E-24 Low-voltage state	Check the power supply voltage.	
	E- 8 E- 9 The sensor unit is defective, the connector is disconnected, or the sensor wires are broken.	Check that the sensor connector is connected securely.	P. 28 Wiring and Connection
		If there is a possibility that the sensor is defective or sensor wires are broken, contact your local representative.	
The detected gas concentration and - - - - are flashing alternately.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 40 Maintenance Mode
There is no alarm contact output.	The product is in maintenance mode.	Return the product to gas monitor mode.	P. 40 Maintenance mode
	Incorrect wiring connection.	Check and reconnect the wiring.	P. 28 Wiring and Connection
	The alarm point setting is wrong.	Check the alarm setting.	P. 44 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. 45 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 output is low.	Conduct zero adjustment after checking that the air around the product is not contaminated with gas.	P. 41 Zero adjustment
No adjustment or setting is possible.	The product is operated during the initial delay time.	Operate the product after the 170-second initial delay time.	P . 30 Display at Start-up (Initial Delay)

16 SPECIFICATIONS

Model	KD-12E.	
Sensor type	GS-[….]DP/DY/BY/ELP\EP	
Detection principle	Electrochemical	
Sampling method	Diffusion type.	
Detection gas and measuring range	Depends on the request.	
Accuracy	+/- 5% (final accuracy is related to the calibration mixture)	
Gas concentration display	Four-digit digital LED display.	
Alarm set value	Fixed \ depends on the specifications.	
Alarm delay	Combustible gas	Within 30 seconds with gas concentration that is 1.6 times as high as the level of alarm set concentration.
	Toxic gas	Within 60 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 ALARM LED lamp flashes.
	Trouble alarm (sensor disconnection, sensor zero drop, power supply voltage error, or internal EEPROM communication error)	Trouble alarm (sensor disconnection, sensor zero drop, power supply voltage error, or internal EEPROM communication error) Yellow TROUBLE 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) • 1 potential free contact output, non-latching, normally open. Rated load: 0.5 A at 30 VDC (resistance load).	
Explosion-proof Class	Ⓔx II 2 G Ex d [ib] IIC T6 Gb	
Approval	EC-type examination certificate: DEKRA 13ATEX0022 X. CE mark: EMC (EN61000-6-4:2001, EN50270:2006 - Type 2) Performance testing: The measuring function of the KD-12E 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.	
Degree of protection	IP65 (Exterior).	
Applicable cable	• In the case of a 5-conductor cable (for power supply, gas concentration analog signal, and gas alarm contact): LiYCY-0 1.25 mm^2. • In the case of a 3-conductor cable (for power supply and gas concentration analog signal): LiYCY-0 2 mm^2.	
Operating temperature and humidity ranges	• Temperature: -10°C to +40°C. • Humidity 30% to 85%. (No radical temperature or humidity changes and no condensation).	
Power supply	24 VDC (18 to 30 VDC).	
Power consumption	1.2 W max.	
Size	125 (W) x 228 (H) x 88 (D) mm (excluding protruding parts)	
Weight	Approx. 2.7 kg.	
Mounting method	Wall mounting.	

17 WARRANTY

Bionics Instrument Europe BV (hereafter referred to as “Bionics”) 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.

Bionics warrants to the original purchaser (Customer) and no other person or entity that the gas detection product supplied by Bionics 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 Bionics, with freight prepaid, should it be found that the product fails to conform to this warranty, the Customer’s only remedy and Bionics’s only obligation shall be, at Bionics’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 Bionics 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 Bionics’s instructions and recommendations. Bionics 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.

18 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.
Pre-set alarm value:	A pre-set 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 pre-set alarm value and gas concentration when an alarm actually occurs or as the percentage of the difference compared to the pre-set alarm value.
Response time:	Time it takes from when the gas detector is exposed to a gas with a concentration higher (lower) than the pre-set 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.

19 BASIC CALIBRATION KIT K-D

Part #	90001		
Model	K-D		
Suitable for	Calibration of KD-12E		
Consists of	Item	Description	Part#
	1	Kitagawa sampling pump	10304
	2	Double bellows	10301
	3	PTFE tube, 1 meter.	10480
	4	Silicon tube, 1 meter.	10477
	5	Mini pump	10338
	6	Flow cap for KD-12E	11824
	7	Carrying case	11247

Note: This kit should be used in combination with a set of gas specific calibration materials. Sets K-I -> K-XI.

20 CALIBRATION MATERIALS K-[.]

Model	K-I[1]	K-II	K-III	K-IV	K-V	K-VI	K-VII	K-VIII	K-XI
Part#	90003	90004	9005	90006	90007	90008	90009	90010	900011
Gas to generate	PH_3	Cl_2	HCN	SO_2	H_2S	NH_3	HCl	HF	NO_2
Gas generation tube 10 pcs.	1 box	-	1 box	1 box	1 box	-	-	-	1 box
Gas generation liquid 10 ml	2 bottles	-	2 bottles	2 bottles	2 bottles	-	-	-	2 bottles
Soft paper towel 10 sheets	1 pack	-	1 pack	1 pack	1 pack	-	-	-	1 pack
Reagent I, 1 bottle		(50ml)				(30 g)	(50ml)	(50ml)	
Reagent II, 1 bottle		(50ml)				(30 g)	(30 g)	(30 g)	
Plastic bottle (100 ml)		1 bottle				1 bottle	1 bottle	1 bottle	
Gas detection tube 5, 10 or 20 pcs.	1 box (20)	1 box (10)	1 box (10)	1 box (10)	1 box (10)	1 box (10)	1 box (5)	1 box (10)	1 box (10)
Tedlar bag 10 litres	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.
Instruction manual	1 copy	1 copy	1 copy	1 copy	1 copy	1 copy	1 copy	1 copy	1 copy
Applicable system model name	TX-4000 TX-4800 TX-4900 TX-7000	TX-100 TX-800 TX-900 TX-1400 TX-1900 TX-3100 TX-3900 TX-4400 TX-4500[2]	TX-300	TX-500 TX-4500[3]	TX-200 TX-600 TX-1200 TX-1600 TX-2100 TX-2900 TX-3000 TX-3200 TX-4200	TX-2400 TX-2500	TX-40 TX-2200 TX-3400 TX-4300	TX-700 TX-3700 TX-4700	TX-1700 TX-4100 TX-4600

For all TG codes not listed above gas bottles are required and available on request.

The procedure to generate a certain calibration gas is described in the manual ‘Guide to Generating Calibration’ which is supplied with the calibration kit.

[1] The gas specific calibration materials should be used in combination with basic calibration kit K-D.
[2] Low range SF6 detection.
[3] High range SF6 detection.