

Detector

Gas detectors | VARIO, KEX

Installation manual



PUBLISHER

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1. INSTALLATION

Detector Oy offers installation, connection and cabling of gas monitoring equipment on a turnkey basis cost-effectively and with fast service response all over Finland.

1.1. Gas detectors

When choosing a place to install gas detectors, it should be considered that gas detectors require regular maintenance. If the location is high or difficult to access, any necessary work platforms should be built that allow for maintenance of the detectors. Gas detectors should not be installed, for example, next to a strong source of thermal radiation or in steam clouds.

The weight of the monitored gas determines the installation height at which the gas detector will be installed. If the potential location of the gas leak is known, gas detectors should be placed close to the leak site to ensure a quick response. The directions of airflow prevailing at the site shall be considered.

- When monitoring gases heavier than air, gas detectors must be placed close to the floor line, at a height of approx. 30–50 cm, leaving the necessary cleaning and maintenance space under the unit. If the location is prone to mechanical collisions, the device must be protected with collision protection.
- When monitoring lighter-than-air gases, gas detectors should be placed on the ceiling or ceiling line.
- With gases of similar weight as that of the air, installation is usually carried out at breathing height.
- When the gas detector is exposed to e.g. water or various splashes, this must be protected with a separate splash protection casing (see page 9).
- Depending on the location and model of the gas detector, the correct operation of the gas detector may require a separate heated protective housing (e.g. to reduce humidity or achieve the correct temperature).

When switching on gas detectors and changing connections, the monitoring system shall be de-energized in order to avoid possible equipment damage. Installations should take place at the final stage of the construction project, however, before gases or liquids are taken into use at the plant. Late installation is important to avoid damage to the system, for example, due to welding and painting work carried out in the area. The gas detector housing is installed so that the sensor part is facing down. This prevents dirt and moisture from accumulating in the detector. The wiring is brought standard from the side or below depending on detector type, only in forced cases from above. When the wiring comes from above, the cable gland should be carefully sealed.

The settling time required for gas detectors shall be considered before testing and commissioning. The settling time is 2-4 days or more, depending on the type of detector and the temperature of the target environment. During the settling time of the gas detector, alarms must be bypassed, i.e. switched off.

The electrochemical sensors used in gas detectors also deteriorate when the detector is not energized. For this reason, this type of equipment is not recommended to be stored unused. The lifespan of the sensors is no more than ~6 months if they are unused, after which they may no longer be usable. Gas detectors with electrochemical cells stored for a long time (more than 3 months) require recalibration.

To ensure the correct functionality of the gas detector, the detectors require regular maintenance and testing. Calibration of gas detectors should be carried out at least once a year and more often in demanding applications, for example 2–4 times a year. The most common certified test gases and equipment required for testing are available from Detector Oy. Detector Oy's experts are happy to advise you on the procedures for performing functional tests.

Only certified test gas, the concentration of which should not exceed the measurement range of the gas detector, and 50% of the LEL value of the gas, shall be used for calibration and testing of gas detectors. A value of 100 %LEL refers to the concentration of a gas in ambient air (e.g. 100 %LEL for methane corresponds to 5 % concentration (ISO standard) and 50 %LEL corresponds to 2.5 % concentration) at which it is possible for it to ignite due to an external factor such as a spark. Too high a gas concentration may damage the measuring element. Whenever the detector has been exposed to high concentrations, it is recommended that the detector function be verified and, if necessary, recalibrated. Ensure that the certified test gas can flow out of the test gas adapter and that no pressure is applied to the measuring element. The atmospheric pressure of the test gas shall not deviate by more than 10 % from normal atmospheric pressure. The test gas flow rate shall not exceed 2 l/min.

1.2. Cabling

Gas detectors are cabled to gas controllers as separate loops, e.g. JAMAK HF 2x(2+1)x0.5 mm² or equivalent cable can be used. The cabling of ATEX areas shall be carried out in accordance with the instructions of EN 60079-14. The number of wires is determined by the gas detector used. If there are risks of vandalism or mechanical stress on the cabling route, an armoured cable can be used.

The protective sheath of signal cables is grounded at one end only to prevent the formation of ground loops. If the housing body of the gas detector is not grounded, e.g. A separate insulation plate is connected to the bottom part of the gas detector, and the protective cabling sheath must also be connected to the connector inside the gas detector housing. When using old cabling, flawless operation of the equipment cannot be guaranteed.

The maximum length of cabling is determined by the type of gas detector used, the supply voltage and the cross-sectional area of the cable. For cabling distances of more than 300 metres, it is recommended that a formula be applied to calculate the maximum cable length. The formula applies to gas detectors manufactured by Detector Oy when the cross-sectional area of the conductor, the maximum permissible voltage drop, the specific resistance of the conductor material used and the current consumption of the detector are known.

$$\text{Cable [m]} = \frac{\text{Conductor area [mm}^2\text{]} * \text{Voltage drop [V]}}{2 * \text{Detector current [A]} * \text{Electrical resistivity } \left[\frac{\Omega}{\text{m}} * \text{mm}^2\right]}$$

Voltage drop: Subtract from the supply voltage the minimum operating voltage required by the gas detector, obtaining the maximum permissible voltage drop remaining in the cable.

Detector current: The device plate, calibration certificate or installation manual will indicate the power consumption in amperes.

Conductor area: Cable conductor area in square millimeters.

Electrical resistivity: The specific resistance of a conductor material equal to 0.0172 $\Omega/\text{m} * \text{mm}^2$ for copper.

The unit of cable length is formed to the meter. For example, with a voltage drop of 10 V, a cable with a cross-sectional area of 0.8 mm² and a detector load of 205 mA, the maximum cabling length is approximately 1100 metres.

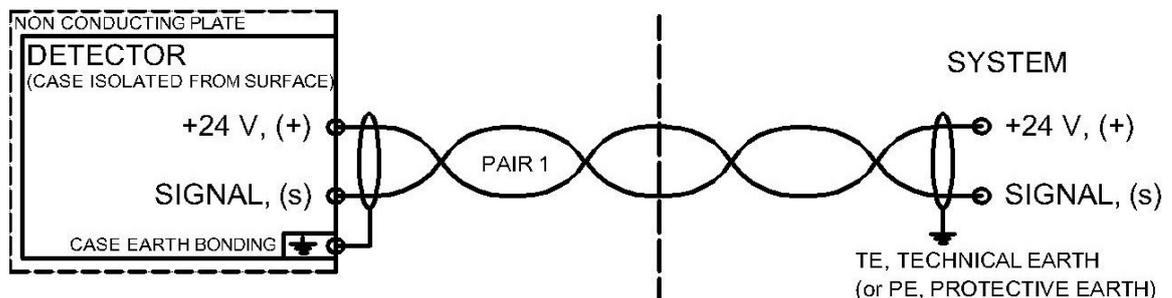


Figure 1. Recommended cabling for 2-wire connection.

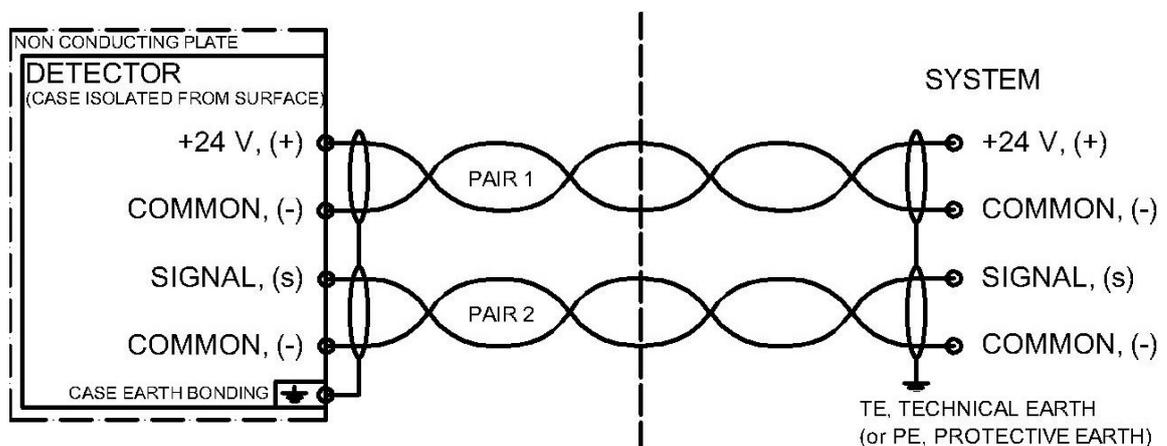


Figure 2. Recommended cabling for 3-wire connection

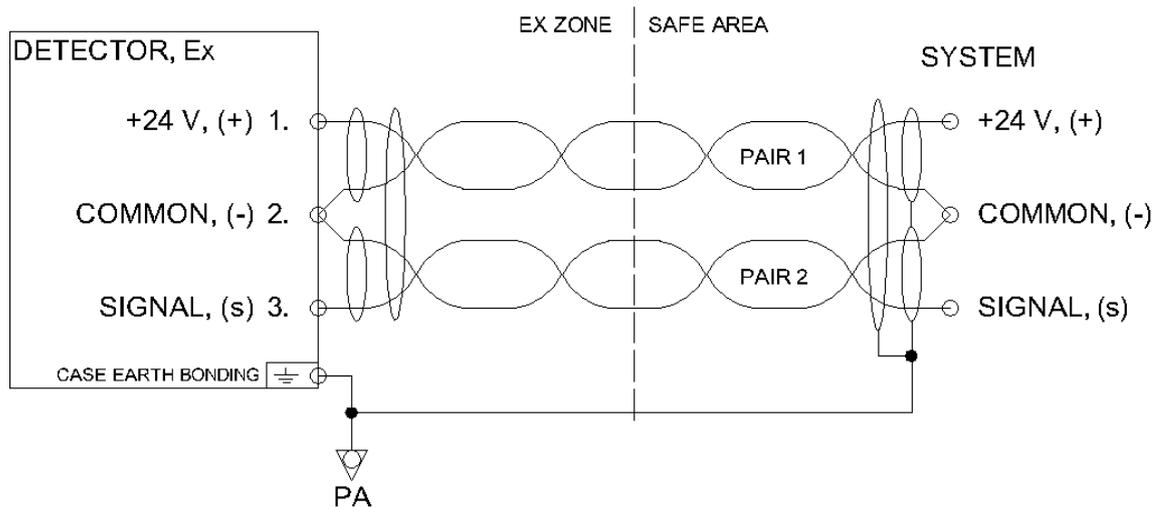


Figure 3. The 3-wire connection of KEX

The sensor, sensor cover, and electronics inside the housing change depending on the model and features of the product. Inside the bottom part of the case there is a connector for grounding the body. The sensorhead should be installed downwards so that it is not exposed to moisture/water that may occur. The nameplate on the housing must not be removed.

Stainless steel protective housing is also available for gas detectors (Figure 6). The protective housing can protect against rain/snow, prevent splashes from reaching the detector and protect the device from mechanical damage. Stainless steel protective housings are available in two sizes; small (H255 x W168 x D149 mm) for VARIO gas detectors and a large (H370 x W200 x D257 mm) for the KEX gas detector. As an accessory, it is also possible to purchase a pipe mounting kit that allows fastening of the protective housing to a pipe (50–120 mm diameter).

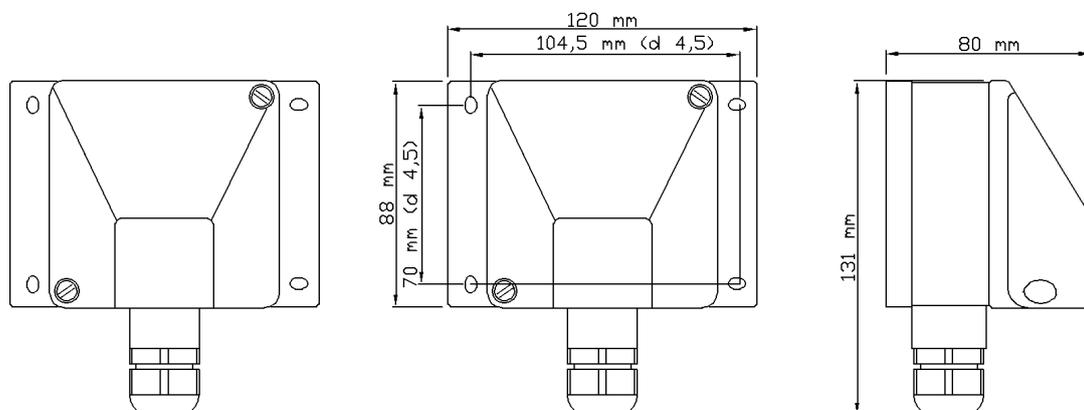


Figure 4. Gas detector casing dimensions and attachment holes

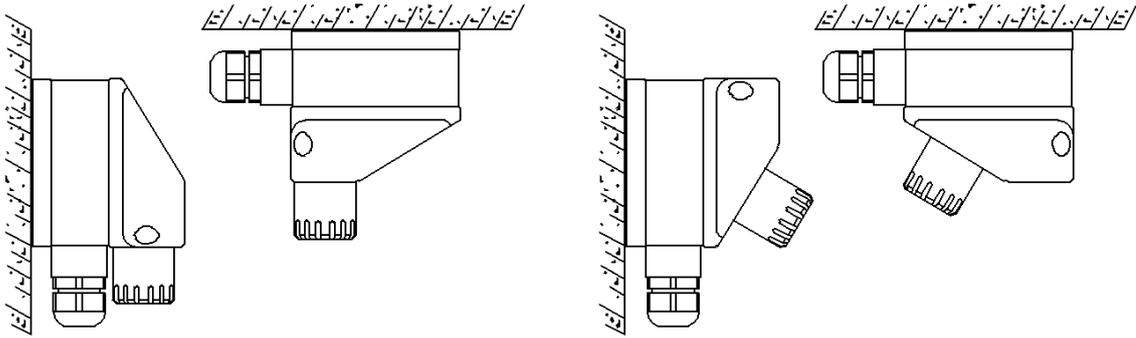


Figure 5. Installation position for ceiling and wall mounted versions. Sensor cover is pointing downwards.

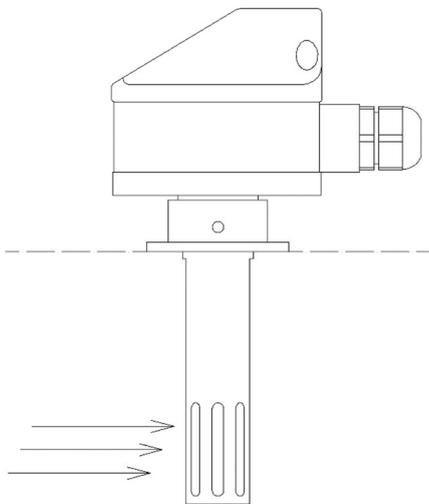


Figure 6. Duct mounted version includes 132 mm long probe and mounting ring.



Figure 7. Large stainless steel protective housing (H370 x W200 x D257 mm).

2. CHARACTERISTICS OF GAS DETECTORS

2.1. KEX gas detector

EX marking:

⊕ Ex II 2G Ex db IIC T6 Gb
EESF 19 ATEX 008X

For Zone 21 and 22:

⊕ Ex II 2G Ex db IIC T6 Gb
⊕ Ex II 2 D Ex tb IIIC T85 °C Db
EESF 19 ATEX 008X

Sensor element:

Catalytic

Output signal:

4... 20 mA, linear response

Operating voltage:

24 VDC ±20%, **regulated**

Power consumption:

120 mA (Max)

Cabling:

3-wire connection
Cable selection according to EN
60079-14 standard

T90 response time (typical):

according to IEC 60079-29-1

Temperature ranges:

Zone 1,2: KEX -40 to +65 °C
Zone: 21,22: KEX (D) -20 to +65 °C

Ambient humidity:

0... 95% RH, non-condensing

Protection class:

IP65

Weight:

< 2.5 kg

Please note:

The special condition of the certificate(X) relates to the operating temperature of the device. The permitted operating temperatures are listed above "**Temperature ranges**"

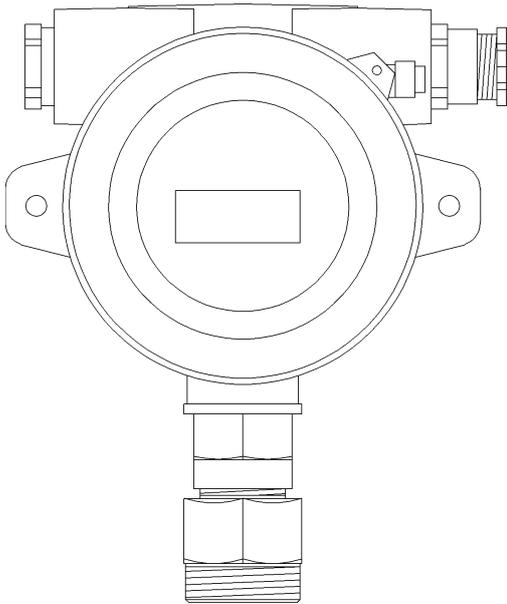


Figure 8. KEX gas detector general view.

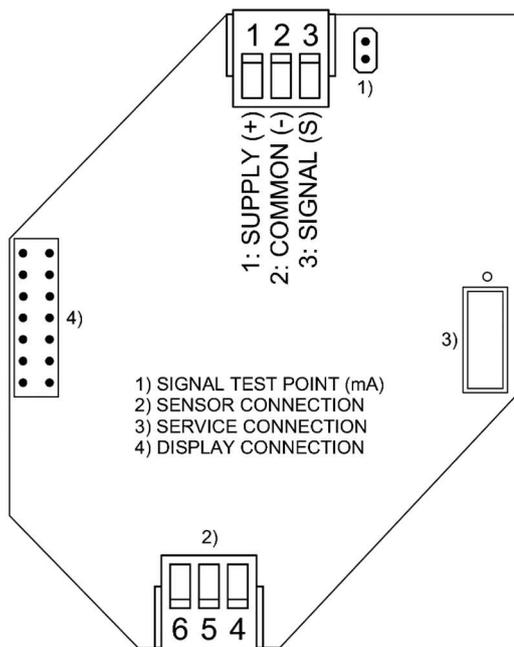


Figure 9. KEX terminal blocks on the circuit board.

NB! MAKE SURE THERE IS NO RISK OF EXPLOSION!

Check the working environment with portable gas detector of right Ex class before carrying out the connections.

Do not make any connections when circuits alive!

KEX gas detector;

- When the case cover is reattached to the bottom part, the locking screw of the cover part must be tightened, and the functionality of the lock must be checked.
- The housing body should be grounded to the potential equalization of the installation site. The potential equalization conductor must be at least 4 mm² (max 1 ohm).
- The maximum concentration of the test gas supplied to the catalytic sensor shall not exceed the measuring range or 50 % of the LEL.
- The probe/sensor part should be installed facing down. Incorrect installation can damage the device or distort the measurement

Note the following standards when installing KEX, servicing or using gas detectors in explosive atmospheres:

- EN 60079-0, Equipment – General requirements
- EN 60079-14, Electrical installations design, selection and erection
- EN 60079-17, Electrical installations inspections and maintenance
- EN 60079-19, Equipment repair, overhaul and reclamation
- EN 60079-29-1 and -2, Gas detectors

2.2. VARIO gas detector (ec)

Sensor Type:	Electrochemical
Output Signal:	4...20 mA, linear response
Operating Voltage:	see figures, regulated
Max. Power Consumption:	0.9 W
Cabling:	2-wire connection, e.g. JAMAK HF 2x(2+1)x0.5 mm ²
Typical Sensor Life in clean air:	Dependent on sensor type
Typical T90 Response:	Dependent on sensor type
Operating Temperature:	Dependent on sensor type
Operating Humidity:	O ₂ sensor 5...95% RH, for other sensors 15...90% RH, non-condensing
Degree of Protection:	IP54
Weight:	390 g

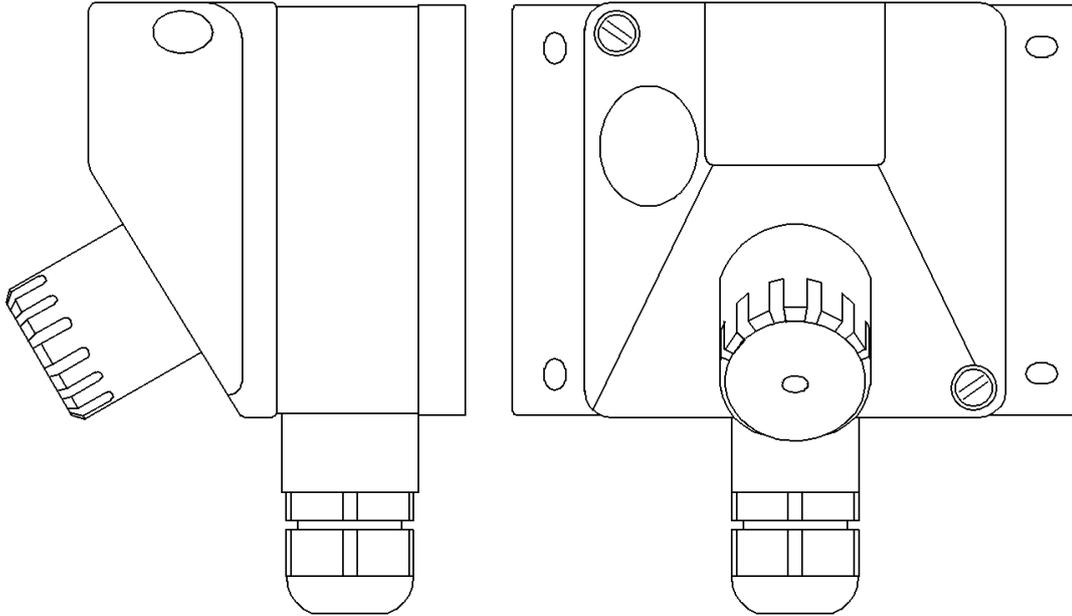
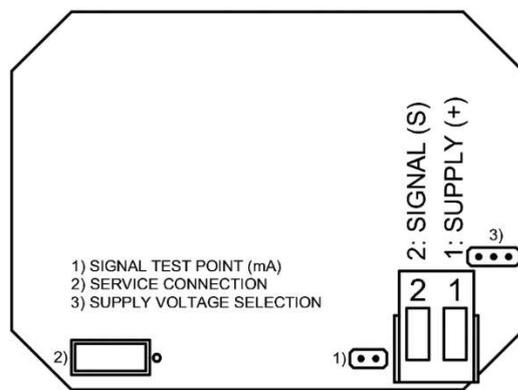


Figure 10. VARIO(ec) gas detector general view. The model and the size of the sensor protection depend on the type of the gas specific sensor. Duct mounted version(-d) is also available.



3) SUPPLY VOLTAGE SELECTION

- SUPPLY VOLTAGE LO 20-34 V
- SUPPLY VOLTAGE HI 24-40 V

Figure 11. VARIO(ec) connections and layout on the circuit board. The circuit board version depends on the target gas.

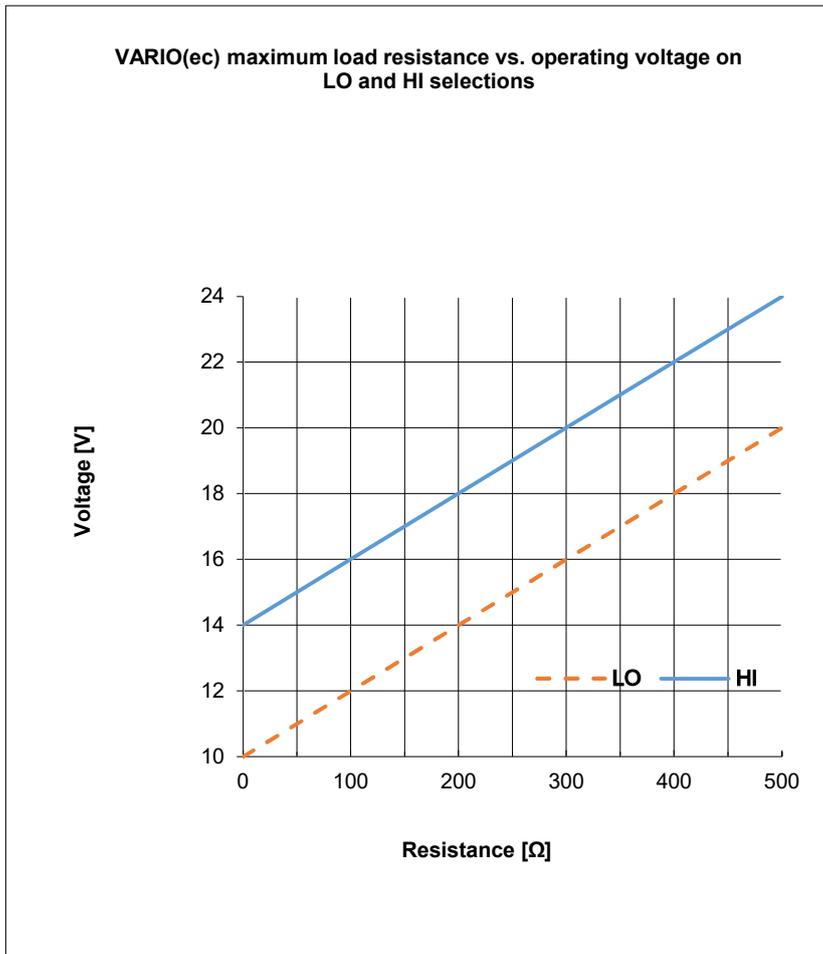


Figure 12. VARIO(ec) operating voltage and maximum load resistance.

2.3. VARIO gas detector (ec/m)

Sensor Type:	Electrochemical
Output Signal:	4...20 mA, linear response
Operating Voltage:	see figures, regulated
Max. Power Consumption:	0.9 W
Cabling:	2-wire connection, e.g. JAMAK HF 2x(2+1)x0.5 mm ²
Typical Sensor Life in clean air:	5 years
Typical T90 Response:	< 30 seconds
Operating Temperature:	-10...+50 °C, continuous -20...+50 °C, intermittent
Operating Humidity:	15...90% RH, non-condensing
Degree of Protection:	IP54
Weight:	400 g

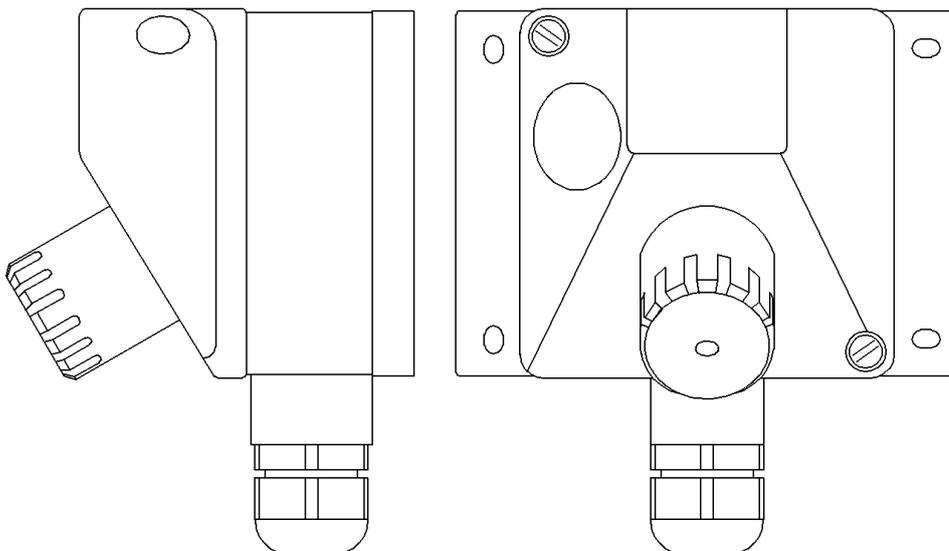
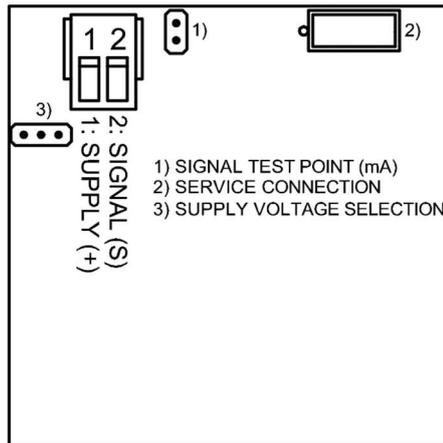


Figure 13. VARIO (ec/m) gas detector general view.



3) SUPPLY VOLTAGE SELECTION

-  SUPPLY VOLTAGE LO 20-34 V
-  SUPPLY VOLTAGE HI 24-40 V

Figure 14. VARIO (ec/m) connections and layout on the circuit board

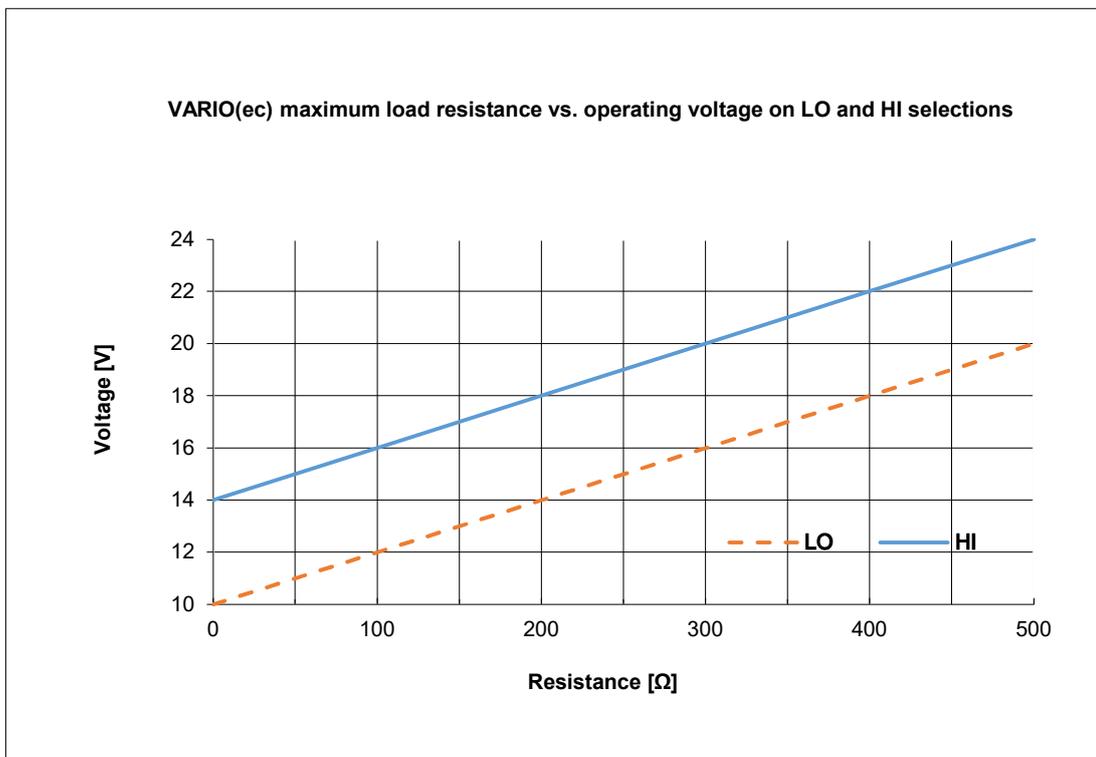


Figure 15. VARIO (ec/m) operating voltage and maximum load resistance.

2.4. VARIO gas detector (sc/r)

Sensor type:	Semiconductor
Output signal:	Linear (0)4...20mA or (0)2...10V. Relay 24 V / 1 A for resistive load. Built in buzzer..
Operating voltage:	10...36 VDC (when only relay output used), 18...36 VDC (when current output used) or 12...24 VAC
Max. Power Consumption:	4,0 W
Cabling:	3-wire connection, e.g. JAMAK HF 2x(2+1)x0.5 mm ²
Typical Sensor Life in clean air:	3 years
Operating Temperature:	Ammonia -30...+40°C, others - 20...+40°C (at reduced sensitivity - 30...+40°C)
Operating Humidity:	15...90% RH, non-condensing
Degree of Protection:	IP54
Weight:	410 g
LED indications:	<u>Green</u> : normal operating mode <u>Yellow</u> : sensor failure <u>Red</u> : alarm limit exceeded

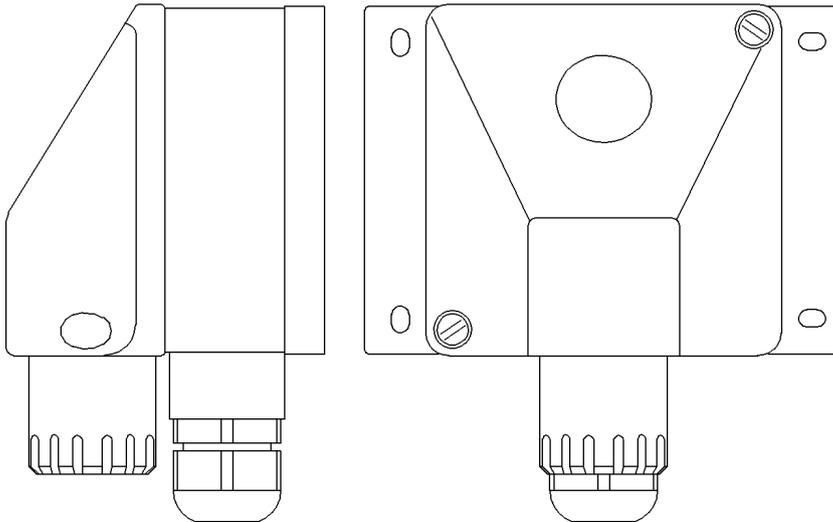


Figure 16. VARIO (sc/r/w) gas detector general view (-w, wall mounted).

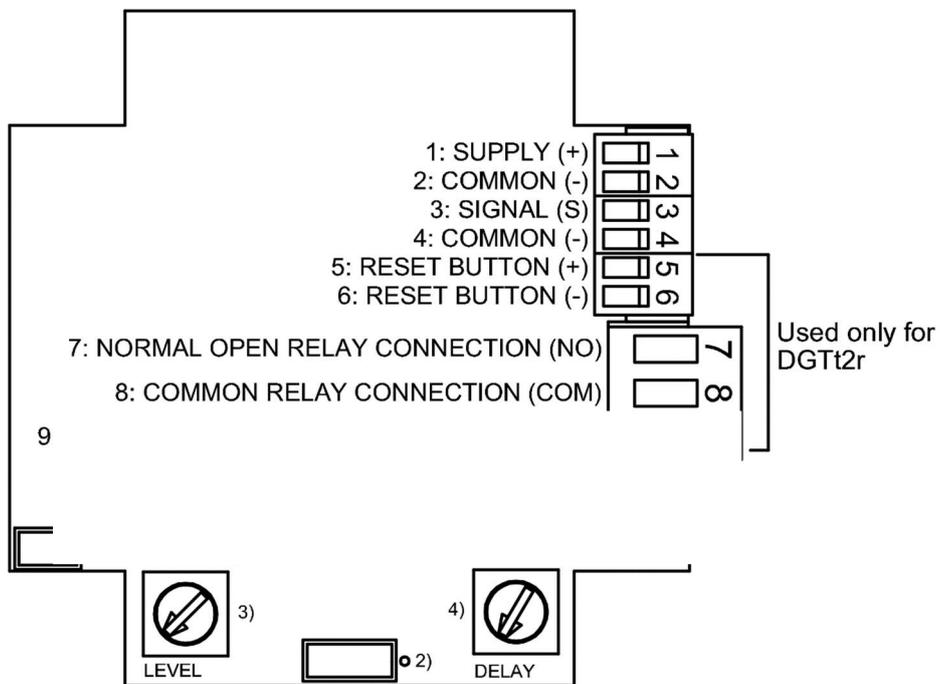


Figure 17. VARIO(sc/r) connections and layout on the circuit board.

VARIO(sc/r) available in 2 different versions:

Version 1: 7: NO, 8: COM, 9: NC. Relay changes state during an alarm

Version 2: 7: NC, 8: COM, 9: NO. Relay is energized in normal state. State is changed when alarm activates or detector supply voltage is lost.

DGTt2r DETECTOR ALARM AND DELAY SETTINGS	
ALARM LEVEL (% OF SIGNAL)	DELAY
1 = 10%	1 = 1 s
2 = 20%	2 = 3 s
3 = 30%	3 = 5 s
4 = 40%	4 = 10 s
5 = 50%	5 = 15 s
6 = 60%	6 = 30 s
7 = 70%	7 = 45 s
8 = 80%	8 = 60 s
9 = 90%	9 = 120 s
10 = 100%	10 = 180 s
11 = 110%	11 = 240 s

Figure 18. VARIO (sc/r) alarm and delay settings.

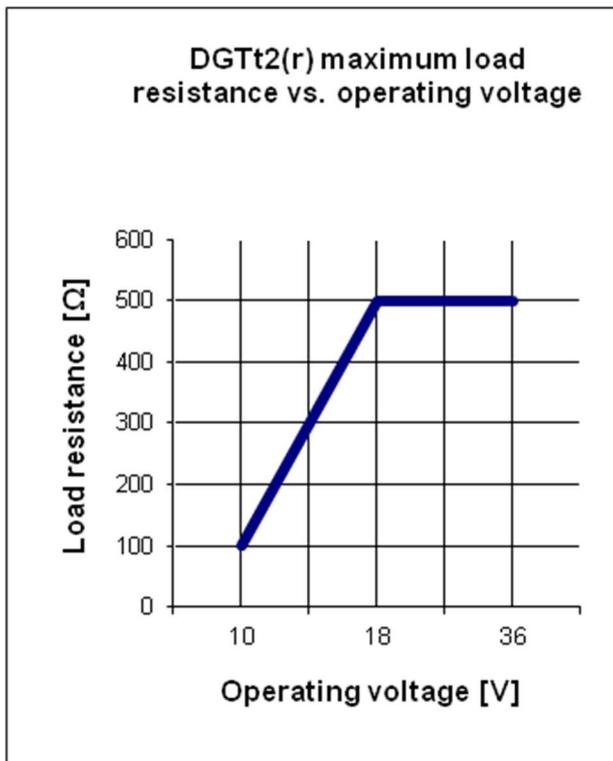
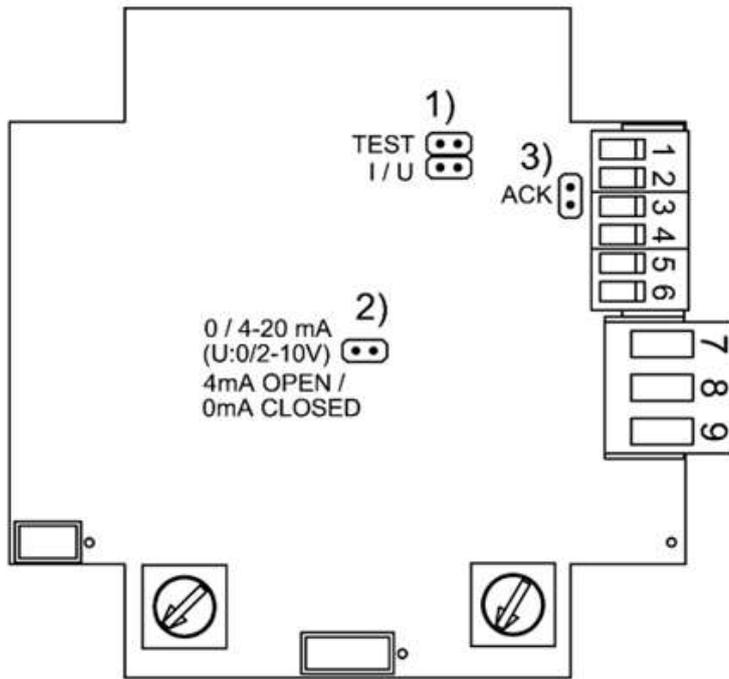


Figure 19. VARIO (sc/r) operating voltage and maximum load resistance



1) CURRENT OR VOLTAGE SIGNALS:

-  CURRENT SIGNAL
-  VOLTAGE SIGNAL
-  SIGNAL TEST POINT (mA)

2) CURRENT OR VOLTAGE SIGNAL MODE:

-  CURRENT SIGNAL: 4-20mA
VOLTAGE SIGNAL: 2-10V
-  CURRENT SIGNAL: 0-20mA
VOLTAGE SIGNAL: 0-10V

3) BUZZER SELECTION, DGTt2r ONLY:

-  BUZZER IN USE
-  BUZZER NOT IN USE

Figure 20. VARIO (sc/r) jumpers on the circuit board.

2.5. VARIO gas detector (cat)

Sensor type:	Catalytic
Output signal:	4... 20mA, linear response
Operating voltage:	24 VDC \pm 20%, regulated
Max. power consumption:	4.0 W
Cabling:	3-wire connection, eg. JAMAK HF 2x(2+1)x0,5 mm ²
Typical sensor life in clean air:	5 years
T90 response time (typical):	according to IEC 60079-29-1
Operating temperature:	-40...+65 °C
Operating humidity:	0... 95% RH, non-condensing
Degree of protection	IP54
Weight:	600 g
LED indications:	<u>Green:</u> normal operating mode <u>Yellow:</u> sensor failure <u>Red:</u> alarm limit exceeded
Note:	maximum concentration of the test gas supplied to the catalytic sensor should not exceed the measurement range or 50% of the LEL value. The probe/sensor part should be installed facing down.

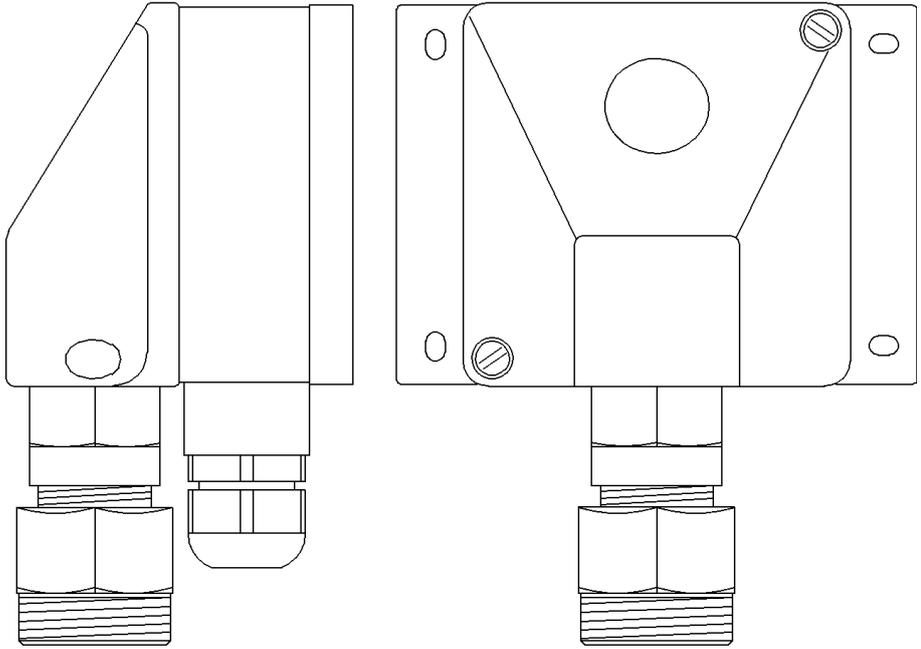


Figure 21. VARIO (cat) gas detector general view.

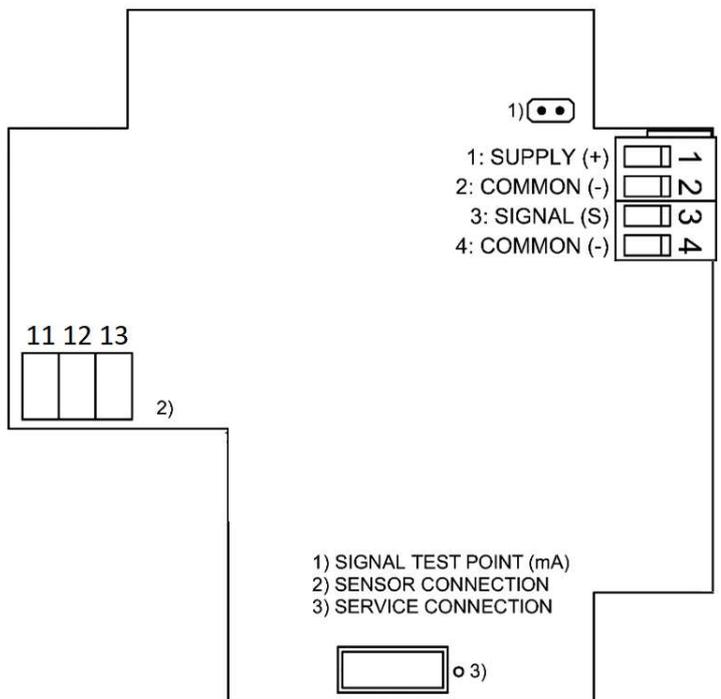


Figure 22. VARIO (cat) connections and layout on the circuit board.

3. MAINTENANCE AND RECYCLING

The gas detectors have been calibrated by Detector Oy before delivery. In addition to the installation instructions, the new equipment comes with inspection documents / calibration certificates.

To ensure a safe operating environment, continuously measuring gas detectors require, regardless of the manufacturer, regular maintenance and servicing to operate reliably. At the installation stage, it is a good idea to plan how the maintenance of the equipment will be arranged in the future.

Detector Ltd. maintenance serves in all matters related to the commissioning and maintenance of gas monitoring equipment. Carefully planned commissioning can ensure the proper functioning of gas monitoring equipment. Commissioning always includes user training on the use of gas monitoring equipment, functional inspection, reporting of results and observations, and a jointly prepared maintenance plan.

During the service visit, the gas monitoring system is inspected, calibrated and wear parts are replaced. As part of the system as a whole, the follow-up control of alarms will also be investigated and, if possible, their functionality will be tested. During the visit, the hazards and possible deficiencies in gas monitoring at the customer site are mapped out, and the observations are carefully reviewed with the customer. Finally, device-specific inspection documents are submitted, and recommendations are given for possible upgrade needs.

An end-of-life detector can be recycled with waste electrical and electronic equipment (WEEE). Do not dispose of detectors with household waste. Decommissioned gas monitoring equipment may also be delivered to the manufacturer for recycling. Detector Oy's experts are happy to tell you more about the maintenance and recycling of gas monitoring systems.

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