gazex®

Warsaw

USER MANUAL

CARBON MONOXIDE HOME DETECTORS

DK-22/E - FOR CARBON MONOXIDE

DK-24/E - FOR CARBON MONOXIDE AND NATURAL GAS

DK-25/E - FOR CARBON MONOXIDE AND PROPANE-BUTANE

edition 8DK22EU6a

BEFORE INSTALLATION, READ THE ENTIRE USER MANUAL !

To ensure safety during the installation and operation of the detector, it is mandatory to observe the recommendations and warnings in this User Manual marked with this symbol.

Proceed with the installation once you have fully understood this Manual !

This User Manual applies to all manufactured models of *DK-nn/E* detectors *(where nn is the code of the detected gas)*. To identify the model of a particular detector, read the designation shown on the detector's rating plate.

Carbon monoxide detectors must not be used as smoke detectors for fire protection. They do not detect smoke or fire. They are not intended for the detection of toxic gases other than carbon monoxide.

- The use of a carbon monoxide detector does not exempt the user from the obligation to maintain fuel-burning appliances in proper technical condition and to ensure the correct operation of ventilation and flue gas extraction systems.

- The DK-22/E *carbon monoxide* detector does not respond to hazardous concentrations of *combustible gases* (e.g. natural gas, propane-butane), which means that it cannot be used as an explosive gas detector.

- The risk of a gas explosion most often arises as a result of leaks in the gas installation or improper use of gas appliances. The use of a *combustible gas* detector does not exempt the User from carrying out regular inspections of the gas installation and complying with the operating requirements of gas appliances and applicable national regulations !

- A *combustible gas* detector calibrated for *natural gas* should not be used to detect *propane-butane* and vice versa.

This equipment may be used by children aged at least 8 years, by persons with reduced physical or mental capabilities, and by persons lacking experience and knowledge of the equipment, provided that they are supervised or instructed in the safe use of the equipment and understand the associated hazards. Children must not play with this equipment. Children must not carry out cleaning or maintenance of the equipment without supervision.

The detector should be installed by a competent person !

Before connecting the power supply, check the type of power supply specified on the detector's rating plate !

Due to the risk of electric shock, all installation work must be carried out with the power supply disconnected !

The detector in the ***230VAC*** power supply version is equipped with a mains lead (non-detachable) with a plug without a protective earth contact. It is recommended to cut off the plug and permanently connect the power lead to the electrical installation in a wall-mounted junction box.

Warning: IMPORTANT - The electrical circuit to which the detector is connected must be equipped with a disconnecting device for both poles of the grid power supply! A permanent power connection ensures that the detector will always operate under all circumstances, regardless of the current 'demand' for electrical sockets. The above connection may only be carried out by a competent person. The original power lead must not be replaced or its fixing altered; if it becomes damaged, its replacement must be arranged through the Manufacturer or an Authorised Service Centre.

1. INTENDED USE

The ***DK-nn/E*** home detector is intended for continuous monitoring of the presence of selected gases in residential and utility rooms exposed to emissions of these gases (see: Area of Application, below). Detection of a hazardous gas concentration is signalled by activation of the optical and acoustic alarm indication and the relevant alarm outputs are activated.

Detectors in the DK-*nn*.Z version are also intended for controlling a shut-off valve in a **GX-1 Active Gas Installation Safety System** or another signalling and shut-off system. In the event of an alarm condition, they generate a signal closing the gas valve, thereby cutting off the gas supply to the installation. In this way, the concept of automatic protection of rooms/buildings equipped with gas appliances is implemented.

This protection:

- ***is reliable*** (the valve can only be reopened manually = deliberately);
- ***does not depend on the speed of reaction or the correctness*** of actions taken by the installation user after a hazardous gas concentration has been detected;
- operates automatically, even in the ***absence*** of the user.

The following terms are used throughout this Manual:

DK or DK…– the designation refers to all DK-*nn*.X/E models, where *nn* denotes the code of the detected gas, nn = 22 - carbon monoxide (CO), 24 - carbon monoxide and methane, 25 - carbon monoxide and propane-butane;

X - denotes the version (see section 2.3), versions: _ (standard, without a letter), A, P, Z;

GAS – the designation refers to media: carbon monoxide, natural gas, propane-butane;

COMBUSTIBLE GAS – the designation refers to natural gas or a propane-butane mixture;

12 V VERSION – denotes a detector powered by 12 V DC voltage (applies to DK-*nn*.A/E versions);

230 V VERSION – denotes a detector powered by 230 VAC mains voltage (applies to DK-*nn/E*, DK-*nn*.P/E, DK-*nn*.Z/E versions).

AREA OF APPLICATION

- oil-fired or gas boiler rooms (with boilers without a flue gas spillage sensor);
- kitchens and bathrooms equipped with gas appliances, e.g. cookers, heaters, water heaters (with an open combustion chamber);
- rooms with a fireplace or with coal- or wood-fired stoves;
- rooms heated by portable propane-butane heaters;
- domestic garages (exhaust gas monitoring and LPG installation leak monitoring);
- solid fuel boiler rooms.

- A CARBON MONOXIDE DETECTOR MUST NOT BE USED AS A SMOKE DETECTOR FOR FIRE PROTECTION. IT DOES NOT DETECT SMOKE OR FIRE. IT IS NOT INTENDED FOR THE DETECTION OF TOXIC GASES OTHER THAN CARBON MONOXIDE.
- THE USE OF A CARBON MONOXIDE DETECTOR DOES NOT EXEMPT THE USER FROM THE OBLIGATION TO MAINTAIN FUEL-BURNING APPLIANCES (LISTED ABOVE) IN PROPER TECHNICAL CONDITION AND TO ENSURE THE CORRECT OPERATION OF VENTILATION AND FLUE GAS EXTRACTION SYSTEMS.
- THE DK-22/E CARBON MONOXIDE DETECTOR DOES NOT RESPOND TO HAZARDOUS CONCENTRATIONS OF COMBUSTIBLE GASES (E.G. NATURAL GAS, PROPANE-BUTANE), WHICH MEANS THAT IT CANNOT BE USED AS AN EXPLOSIVE GAS DETECTOR.
- THE RISK OF A GAS EXPLOSION MOST OFTEN ARISES AS A RESULT OF LEAKS IN THE GAS INSTALLATION OR IMPROPER USE OF GAS APPLIANCES. THE USE OF A COMBUSTIBLE GAS DETECTOR DOES NOT EXEMPT THE USER FROM CARRYING OUT REGULAR INSPECTIONS OF THE GAS INSTALLATION AND COMPLYING WITH THE OPERATING REQUIREMENTS OF GAS APPLIANCES AND APPLICABLE NATIONAL REGULATIONS !
- A COMBUSTIBLE GAS DETECTOR CALIBRATED FOR NATURAL GAS SHOULD NOT BE USED TO DETECT PROPANE-BUTANE,
AND VICE VERSA.

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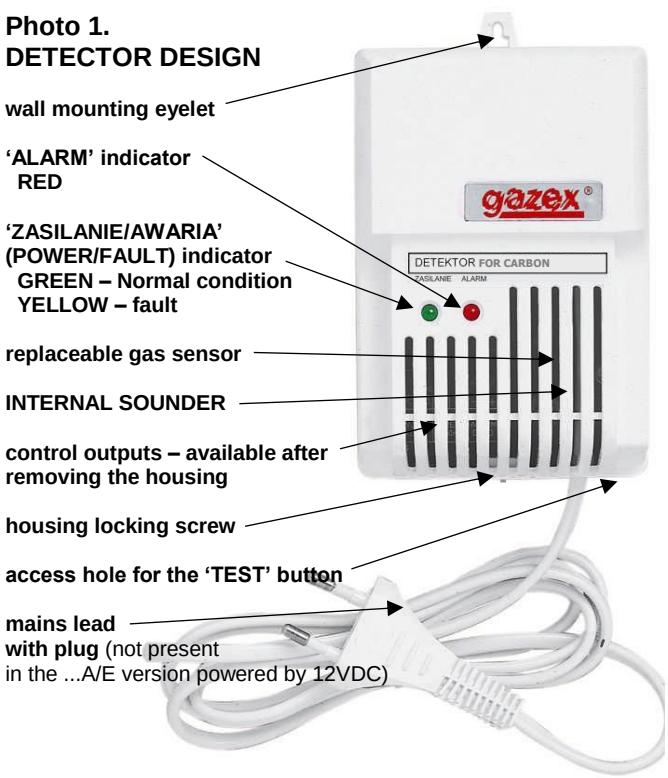
*The DK-nn/E detector complies with the requirements of Directive **2014/30/EU** of 26.02.2014 (EMC), Directive **2014/35/EU** of 26.02.2014 (LVD) and Directive **2011/65/EU** of 8.06.2011. (RoHS) in accordance with the relevant Declaration of Conformity available at www.gazex.pl*

Photo 1.
DETECTOR DESIGN



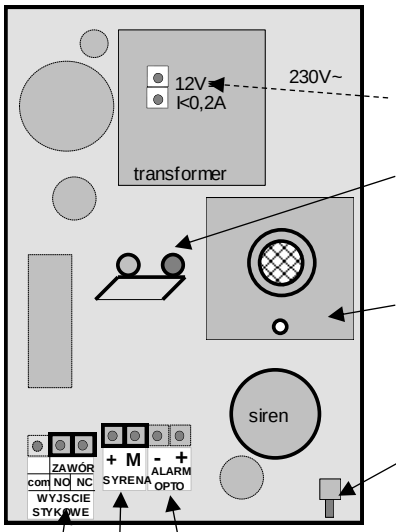


Fig. 1. DK – view without housing

12V DC power supply terminals (DK...A/E only)

LED indicators (on the mounting plate)

Replaceable gas sensor module

"TEST" button

OPTO input for connection to other detectors (DK...Z/E version only)

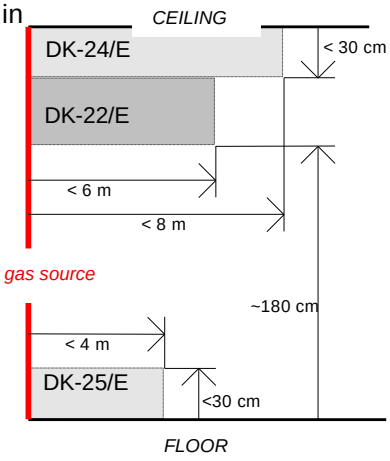
SIREN output for an external alarm sounder (all versions)

VALVE control output (2 terminals, DK...Z/E version only) or RELAY CONTACT output (3 terminals, DK...A/E and DK...P/E versions)

2. INSTALLATION OF THE DETECTOR AND EXTERNAL DEVICES

2.1 Detector location.

DK installation zone



The installation location of the ***DK*** has a **FUNDAMENTAL** influence on correct gas detection in a room exposed to its presence. The installation criteria are strictly dependent on the type of gas being detected and **differ significantly** for natural gas and propane-butane mixtures. In most cases, the optimum installation location is shown below.

The ***DK-22/E*** model for detecting ***CARBON MONOXIDE*** (CO, commonly referred to as carbon monoxide poisoning gas, slightly lighter than air and readily mixing with air) should be installed:

- on a wall, at the height of an adult's head (approx. 180 cm) or higher (but > 30 cm from the ceiling);
- as close as possible to the potential source of CO emissions, no more than approx. 6 m away !;
- in a location that is NOT obstructed by furniture or curtains (or other objects restricting airflow to the detector);
- in a location where the alarm siren will be clearly audible to most household members – it is recommended to connect an additional DK-S3 type siren;
- away from ventilation air inlets and windows;
- not closer than 1 m to gas cookers, microwave ovens and ovens;
- away from places where lead-acid batteries are charged (hydrogen = possibility of false alarms);
- in a location not exposed to direct sunlight, not exposed to the direct effects of water vapour, water from showers, flue gases from furnaces or combustion engines, dust and ash, and not exposed to mechanical shock or vibration
- away from sources of strong electromagnetic fields or heat sources (not above radiators).

The ***DK-24/E*** model for detecting ***CARBON MONOXIDE*** and ***NATURAL GAS*** should be installed:

- on a wall, at a height: **not lower than 30 cm** from the ceiling (because methane - the main component of natural gas - is much lighter than air and accumulates near the ceiling, while carbon monoxide mixes very easily with air and may occur throughout the room volume);
- ALWAYS above the upper edge of doors or windows,
- away from ventilation openings, windows and doors (increased airflow in these locations may locally reduce gas concentration),
- as close as possible to the potential source of gas emissions (no more than **8 m** away, measured along the ceiling),
- in a location that is NOT separated from the gas emission source by ceiling partitions higher than 30 cm, i.e. beams, coffers (gas may accumulate near the ceiling on one side of the partition)
- not directly above a gas cooker, but at a distance of **>1 m** from it or from an oven or microwave oven (small gas releases during cooker ignition, cooking vapours and grease contamination may cause false alarms and interfere with correct operation of the device),
- in a location that is NOT obstructed by furniture, curtains or other objects restricting airflow to the detector,
- in a location not exposed to direct sunlight and not exposed to the direct effects of water vapour (not above a sink), water from showers, flue gases from furnaces, dust and ash,
- away from sources of strong electromagnetic fields or heat sources (not above radiators).
- other installation requirements as for ***DK-22/E*** models.

The ***DK-25/E*** model for detecting ***CARBON MONOXIDE*** and ***PROPANE-BUTANE*** should be installed:

- on a wall, at a height: **NO HIGHER than 30÷50 cm** above floor level (because propane-butane is much heavier than air, while CO mixes very easily with air throughout the room volume);
- as CLOSE as possible to the potential source of gas emissions, no more than **4 m** away (measured along the floor),
- away from doors,
- NOT above floor recesses,
- in a location that is NOT separated from the potential gas emission source by steps, thresholds or floor channels,
- in a location not exposed to direct sunlight, not exposed to the direct effects of outside air, not exposed to direct splashing with water (>0.5 m from a sink), and not exposed to mechanical shock or vibration,
- away from sources of strong electromagnetic fields or heat sources (not above radiators),
- away from spoiled (or fermenting) organic waste,
- away from containers of paint, alcohol and aerosols.
- other installation requirements as for ***DK-22/E*** models.

2.2 Detector installation.

THE DETECTOR SHOULD BE INSTALLED BY A COMPETENT PERSON !
BEFORE CONNECTING THE POWER SUPPLY, CHECK THE TYPE OF POWER SUPPLY SPECIFIED ON THE DETECTOR'S RATING PLATE !
DUE TO THE RISK OF ELECTRIC SHOCK, ALL INSTALLATION WORK MUST BE CARRIED OUT WITH THE POWER SUPPLY DISCONNECTED !

- Remove the detector from the cardboard packaging. Wait approx. 15 minutes for the device temperature to equalise with the ambient temperature, and only then remove it from the plastic bag.
- The detector housing should show no signs of mechanical damage, and its opening should be secured by a locking screw in the lower part of the housing. ONLY a complete and undamaged detector is suitable for installation.
- Hang the detector on the wall in the designated location using a secure hook/screw.

2.2.1 Connecting the detector to the power supply.

Check the detector power supply type specified on its rating plate on the side of the housing.

The detector in the ***230V AC*** power supply version is equipped with a mains lead (non-detachable) with a plug without a protective earth contact. Connection by inserting the detector plug into a mains socket is only permitted if the socket is not used to connect (even temporarily) other appliances and there is no risk that children or unauthorised persons may disconnect the detector! It is recommended to cut off the plug and permanently connect the power lead to the electrical installation in a wall-mounted junction box.

WARNING - IMPORTANT: The electrical circuit to which the detector is connected must be equipped with a disconnecting device for both poles of the grid power supply! A permanent power connection ensures that the detector will always operate under all circumstances, regardless of the current 'demand' for electrical sockets. The above connection may only be carried out by a person with the appropriate qualifications. The original power lead must not be replaced or its fixing altered, and if it becomes damaged, its replacement must be arranged through the Manufacturer or an Authorised Service Centre.

- The detector in the ***12V DC*** power supply version (*DK-nn.A/E*) is not equipped with a factory-fitted power lead. The detector housing must be removed (see section 2.3.1). Connect the 12V DC power supply to the 'POWER SUPPLY 12V=' terminal (polarity not important) using a 2-core cable (recommended type 2 x 0.5). The cable must be secured to the printed circuit board using cable ties, such as the factory-supplied tie (width 2.5 mm).

2.3 Connection of external devices.

Devices can be connected to the detector terminals after removing the housing. Depending on the version, the detector has the following additional terminals:

- 'SYRENA' (SIREN) – output for controlling an additional external signalling device - it is recommended to connect an additional DK-S3 type siren; alternatively, it is possible to connect a DK-L2 type warning light;
- 'ZAWOR' (VALVE) – pulse output for controlling a gas shut-off valve (with a 12V release coil);
- 'WYJ.STYKOWE' (RELAY OUTPUT) – relay output for controlling solenoid valves or fans;
- 'OPTO ALARM' – input enabling expansion of the gas shut-off system by connecting additional DK detectors, applying remote valve closing, or connecting the output of a fire alarm system.

Table 2.3.A. Additional inputs/outputs of the DK detector depending on the version:

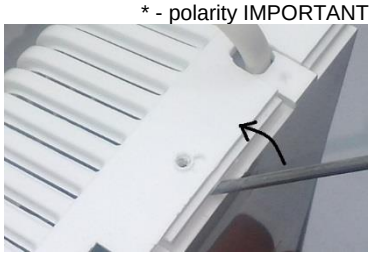
VERSION	SIREN	RELAY OUTPUT	VALVE OUTPUT	OPTO ALARM
DK-nn/E	**+**			
DK-nn.A/E	**+**	**+**		
DK-nn.P/E	**+**	**+**		
DK-nn.Z/E	**+**		**+**	**+**

Table 2.3.B. Functions implemented on DK inputs/outputs:

DETECTOR Status	SIREN max. 50 mA	RELAY OUTPUT	VALVE OUTPUT NO - NC pair	OPTO ALARM input *
WARM-UP	no voltage	com NC NO	no voltage	voltage present 5÷15 V⎓ causes an ALARM condition at the outputs, regardless of the current detector status !
NORMAL	no voltage	com NC NO	no voltage	
ALARM	U_N = 9 V	com NC NO	PULSE U_{max}= 22 V, t_{max}= 2 sec.	
FAULT	no voltage	com NC NO	no voltage	

* - polarity IMPORTANT

2.3.1 Removal of the housing.
Make sure that the power supply is disconnected. Unscrew the locking screw in the lower part of the housing. Holding the detector in your hand, gently pry the lower edge of the cover with a flat, thin screwdriver or knife (photo opposite). Then release it from the catch and remove the housing cover.



2.3.2 'SYRENA' (SIREN) output (applies to all versions).
Connect an additional DK-S3 siren or DK-L2 warning lamp to the 'SIREN' terminals. The cable selection depends on the type of rooms through which it is to be routed - recommended type 2 x 0.5 mm².

2.3.3 'WYJ.STYKOWE' (RELAY OUTPUT) (applies to DK-*nn*.A/E and DK-*nn*.P/E versions).
Connect the control cable for external devices to the 'RELAY OUTPUT' terminals. The cable selection depends on the value of the connected control voltage and load current.
WARNING: The maximum voltage and current values specified in section 6 in the technical parameters table MUST NOT be exceeded.

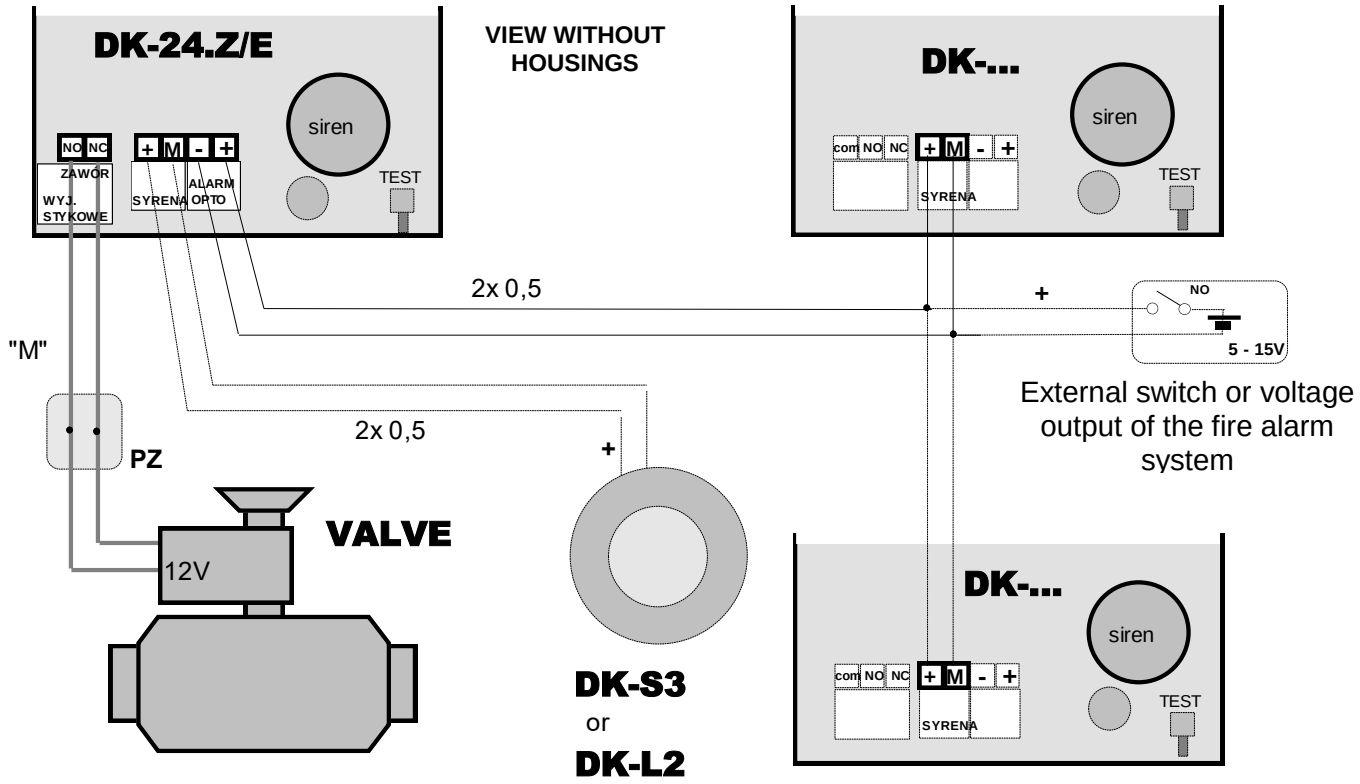
2.3.4 'ZAWOR' (VALVE) output (applies to DK-nn.Z/E versions).
Before connecting the valve, remove the characteristic resistor R=1kΩ from the connector, which simulates the presence of the valve (and enables detector operation without connecting a valve). Connect the valve to the 'NO-NC' terminals of the 'VALVE' output (any polarity). If it is necessary to extend the connecting cable, an additional sealed (IP54) terminal box - PZ must be used (Fig. 2.3.5). If the detector is to operate (even periodically) without a valve, the characteristic resistor (delivered with a new detector) must be reconnected to the NO-NC terminals.
The ***DK*** detector can control ONLY one valve of the type: ZB or MAG-3 (manufactured by FLAMA-GAZ) or another normally open poppet valve equipped with a release coil of similar parameters, i.e. nominal voltage 12V, coil power <26W. No devices other than a shut-off valve may be connected to the VALVE terminals!
WARNING - IMPORTANT: for correct system operation, the ***DK*** detector should be connected to the valve with a two-core 'M' cable (Fig. 2.3.5), with the appropriate core cross-section. Selection according to the table below:

Table 2.3.4 Selection of valve connection cable

LENGTH of 'M' cable connecting *DK-nn.Z/E* to the valve	**Minimum** permissible core **cross-section** (depending on valve type) **[mm²]**	
[m]	**ZB valves or similar**	**MAG-3** (located outside the Ex zone)
< 10	**1.0**	**1.5**
< 20	**1.5**	**2.5**
< 50	**2.5**	do not use

2.3.5 ALARM OPTO input - system expansion (applies to DK-*nn*.Z/E versions).
Connect the cable linking additional detectors to the ALARM OPTO input according to the diagram below.
WARNING: The terminals are isolated from the detector's internal circuits. Correct cable polarity must be maintained.
Alarm conditions of additional DK detectors will put the **DK-*nn*.Z/E** detector into ALARM condition and activate the outputs, resulting in closure of the valve and/or activation of the external signalling device. In this case, the detector's optical and acoustic indication will be different (see Table 3) from that in an alarm condition generated by the ***DK-nn.Z/E*** detector itself.
The selection of the connection cable to other detectors is not critical. It is recommended to use a two-core cable with a core cross-section of 0.5 mm2.

Fig. 2.3.5 WIRING DIAGRAM FOR DK-nn.Z/E (does not include power supply):

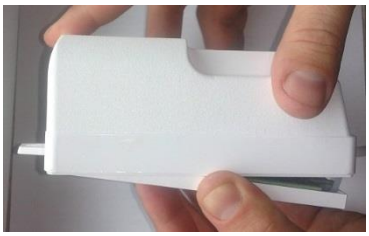


2.3.6 Housing installation.

Before closing the housing, all cables connected to the output terminals must be secured to the printed circuit board using cable ties no thinner than the factory-supplied tie. In addition, holes matching the diameters of the inserted cables must be carefully cut in the lower wall of the cover. The size of the cut-outs should be selected so that, after the housing is assembled, the resulting gaps around the cables are no larger than 1 mm.

To assemble the housing:

- place the cover on the base with the electronics, starting from the mounting eyelet side;
- check that the detector indicator lights have entered the holes in the front wall of the cover (photo opposite);
- snap the housing shut;
- screw in the housing locking screw.



After hanging it on the prepared, secure hook, the detector is ready for operation. Turn on the power.

3. DESCRIPTION OF DETECTOR OPERATION

After switching the power on, the DK detector starts the signalling elements test sequence – single flashes of the yellow and green 'POWER/FAULT' indicator, followed by the red 'ALARM' indicator together with a single acoustic signal (Note: ALL signals MUST be present!). The detector then automatically enters the sensor testing and warm-up condition - a slowly pulsing green indicator indicates correct power supply to the *DK* measuring circuits. After approximately 1 minute, the green indicator should switch to continuous illumination. The ALARM indicator should be off. If the indication is different, check the fault or alarm code in Table 3.

When starting the detector for the first time, carry out the checking operations described in section 3.3. Before carrying out gas tests according to section 3.3.1 or 3.3.2, switch the detector power supply on for at least 15 minutes.

Only the green indicator being lit (after warm-up is complete) means the Normal condition - the detector is operational and there is no hazardous concentration of the detected gases in the room. Nevertheless, the user should be aware that the *DK* detector is designed for continuous operation. It achieves full measuring performance **after 4 days** of continuous power supply. Power interruptions longer than 1 hour may reduce the sensitivity of the sensor in the detector during the first 15 minutes after power is restored. Occasional, short power interruptions of a few minutes have practically no effect on the detector's metrological properties.

Short, cyclical extinguishing of the green 'POWER' indicator (see Table 3) indicates the presence of a specific *gas*: *methane or propane-butane* at a concentration of: >10% of the Lower Explosive Limit or *carbon monoxide* at a concentration of >50 ppm (even before any ALARM condition is activated). This provides the User with information about the presence of gas around the detector, the concentration of which does not yet pose a hazard to persons near the detector.

A lit or pulsing yellow indicator along with a pulsating sound signal means a device fault. In this case, check the fault condition code in Table 3. If possible, remove the fault (in accordance with the recommendations in Table 3) or contact the Distributor or Manufacturer.

Table 3. – Indication of *DK* detector conditions *(with sensor module in version [W2])*

STATUS	INDICATORS POWER / FAULT	INDICATORS ALARM	SIREN	CAUSE	WHAT TO DO ?
NORMAL	green, flashes slowly once per sec.	none	none	sensor **warm-up** for 1 min. after switching the power on or after a momentary power failure	wait until it switches to the NORMAL condition
	green, constantly on	none	none	**NORMAL** operating condition	sleep peacefully, DK is watching over you !
	green, pulses quickly 5 times per sec.	none	none	**NORMAL** operating condition, the period of 3 years of operation since the last calibration has elapsed	recalibration of the gas sensor recommended
NORMAL before ALARM	green, extinguished **once** every 2 sec.	none	none	**CO detected**, alarm concentration exceeded; if it persists, it automatically switches to ALARM condition	not yet hazardous concentration of carbon monoxide or interfering factors
	green, extinguished **twice** every 2 sec.	none	none	**Combustible gas detected,** alarm concentration exceeded; if it persists, it automatically switches to ALARM condition	not yet hazardous concentration of combustible gas or interfering factors
	green, extinguished **3 times** every 2 sec.	none	none	**CO and combustible gas detected**, alarm concentration exceeded; if it persists, it automatically switches to ALARM condition	not yet hazardous concentration of carbon monoxide and combustible gas or interfering factors
ALARM	green, extinguished **once** every 2 sec.	red, pulses slowly (f=1 Hz)	intermittent tone in time with the ALARM indicator pulsing	**ALARM carbon monoxide**, alarm concentration exceeded	**RISK OF CARBON MONOXIDE POISONING** Follow the relevant alarm procedure according to section 3.1
	green, extinguished **twice** every 2 sec.	red, pulses quickly (f= 5 Hz)		**ALARM combustible gas**, alarm concentration exceeded	**RISK OF GAS EXPLOSION** Follow the relevant alarm procedure according to section 3.2
	green, extinguished **3 times** every 2 sec.	red, pulses alternately slowly (f= 1Hz) and quickly (f= 5Hz)		**ALARM carbon monoxide and combustible gas,** alarm concentrations exceeded	**RISK: CARBON MONOXIDE POISONING and GAS EXPLOSION** Follow the relevant alarm procedures according to section 3.1 and section 3.2.
	green, constantly on	flashes 3 times every 2 sec.		*Applies to DK-nn.Z/E:* External **ALARM** from another detector	**RISK: CO POISONING or GAS EXPLOSION at the installation location of the additional detector !!!** Check that the valve is closed. Follow the Alarm procedure at the installation location of the additional detector(s)
FAULT	none	none	none	no grid power	switch the power on;
	Yellow constantly on	none	none	**FAULT**, no sensor module or sensor module fault	detector faulty, contact the Distributor or Manufacturer
	Yellow, 1 blink every 7 sec.	none	1 beep every 7 seconds	**FAULT**, power supply parameters outside the permissible range	fault of internal power supply circuits, contact the Distributor or Manufacturer
	Yellow, 2 blinks every 7 sec.	none	2 beeps every 7 seconds	FAULT, damaged gas sensor or electronic circuits of the sensor module	detector is faulty, please contact the Distributor or Manufacturer
	Yellow 3 extinguishings every 7 sec.	none	3 beeps every 7 seconds	**FAULT**, end of CO sensor life	the detector is faulty, the sensor module must be replaced
	Yellow 4 extinguishings every 7 sec.	none	4 beeps every 7 seconds	**FAULT**, mismatch between detector type and sensor module type [W2]	the detector is faulty, insert the correct type of sensor module
	Yellow 5 extinguishings every 7 sec.	none	5 beeps every 7 seconds	**FAULT**, valve not connected to the WYJ.STYK. terminals.	connect the valve; when operating without a valve – connect a resistor of approx. 1kΩ to the control terminals
	Yellow, 6 extinguishings every 7 sec.	none	6 beeps every 7 seconds	**FAULT**, short circuit or overload at the SYRENA output, output control circuit damage	disconnect the signalling device from the SYRENA output; generate an ALARM; if the fault does not clear contact the Manufacturer
	Yellow, 7 extinguishings every 7 sec.	none	7 beeps every 7 seconds	**FAULT**, damaged valve closing circuit or contact output relay, damaged SYRENA output control circuit	detector faulty, contact the Distributor or Manufacturer

In other cases not described above, contact an Authorised Service Centre or the Manufacturer.

3.1 <u>ALARM – RISK OF CARBON MONOXIDE POISONING</u> (applies to DK-22/E, DK-24/E, DK-25/E).

A slowly pulsing (f=1Hz) red ALARM indicator and an intermittent acoustic signal in time with the indicator (see Table 3) **mean that the detector is in ALARM condition**, i.e. it has detected a hazardous concentration of carbon monoxide in the air and activated the alarm outputs.

The detector measures the carbon monoxide concentration and the duration of the hazard, and activates the alarm indication faster the higher the CO concentration is. These relationships correspond to the guidelines of the PN-EN 50291-1 standard and are as follows:

- 30 ppm – no ALARM before 120 minutes have elapsed;
- 50 ppm – ALARM within 60-90 minutes;
- 100 ppm – ALARM within 10-40 minutes;
- 300 ppm – ALARM before 3 minutes have elapsed. *(100 ppm = 0.01% by volume)*

HAZARDS to humans resulting from the presence of carbon monoxide

CARBON MONOXIDE – most often forms as a result of incomplete combustion of various fuels (with limited air supply). It is a colourless and odourless gas (therefore undetectable by human senses), only slightly lighter than air (it follows convection currents and mixes readily with air). It is therefore a **VERY DANGEROUS** factor threatening human **HEALTH and LIFE**.

CO is a gas that is readily and rapidly absorbed by the human body. It enters the bloodstream through the lungs, where it binds permanently with haemoglobin (which causes the absorbed dose to accumulate). This causes hypoxia of the brain (irreversible damage) and hypoxia of the entire body and, consequently (at high CO concentration in inhaled air or with prolonged inhalation), leads to loss of consciousness and ***rapid death*** !!!

To illustrate the hazard caused by the presence of CARBON MONOXIDE in air inhaled by humans, Table 3.1 below is provided, prepared on the basis of the Safety Data Sheet for a Hazardous Substance issued by the Central Institute for Labour Protection – National Research Institute.

Table 3.1. Effect of carbon monoxide on humans, according to Warsaw CIOP-PIB
(Note: for CO 1% vol. = 10000 ppm = ~8600 mg/m³)

CO concentration *in the air*	***INHALATION TIME*** *and observed* ***POISONING SYMPTOMS***
~ **50 ÷ 200** ppm (*60 ÷ 240 mg/m³*)	slight headache after a few hours
~ **400** ppm (*450 mg/m³*)	headache, nausea, vomiting, muscle weakness, apathy after a period of 1 to 2 hours
~ **800 ÷ 900** ppm (*900 ÷ 1000 mg/m³*)	collapse, loss of consciousness after 2 hours
~ **1500 ÷ 1700** ppm (*1800 ÷ 2000 mg/m³*)	collapse within 20 minutes, risk of **DEATH** after 2 hours
~ **3400** ppm (*4000 mg/m³*)	collapse after 5–10 minutes, risk of **DEATH** after 30 minutes
~ **7000** ppm (*8000 mg/m³*)	collapse after 1–2 minutes, risk of **DEATH** after 10–15 minutes
~ **13000** ppm (*15000 mg/m³*)	**DEATH after 1 to 3 minutes !**

WARNING - IMPORTANT: The user should be aware that the toxic effect of CARBON MONOXIDE on the human body is proportional to the CO concentration in the air and to the time and intensity of absorption. This means that:

the **DANGER** of poisoning **INCREASES** as the **CO CONCENTRATION INCREASES** for a given absorption TIME
or as the ABSORPTION **TIME INCREASES**
or as the **INTENSITY** of breathing **increases** at a constant CO concentration.

Therefore, if an ALARM occurs, intervention must be taken immediately:

- take actions to remove CO, i.e. natural ventilation (opening windows and doors) and forced ventilation (switching on fans or kitchen extractors);
- stop or reduce CO emission (extinguishing the gas water heater, switching off the gas cooker or making appropriate adjustments to the central heating furnace, increasing the fireplace draught or extinguishing it, extinguishing the charcoal grill or switching off the vehicle engine);
- persons who have been staying in the monitored room should be taken into fresh air for at least 15 minutes or until any symptoms of poisoning subside (according to Table 3.1);
- do not switch off the detector;
- have gas appliances or the furnace repaired or adjusted by an authorised specialist.

The fact that CO concentration distribution in a room is never uniform and that there may be locations with higher CO concentration than at the ***DK*** installation location should also be taken into account. Therefore, staying in the monitored room during an ALARM should be limited to the necessary minimum.

It should be understood that the detector sensitivity has been selected in accordance with the requirements of European Standards. The absence of a detector ALARM must not be equated with complete safety of all persons in the monitored room – this may depend on the individual sensitivity and health condition of each person. Examples include children and pets, which show significantly greater sensitivity to carbon monoxide than adults.

It should be remembered that the detector is intended to protect persons against the effects of acute carbon monoxide poisoning. It may not fully prevent the effects of chronic exposure to relatively low concentrations of carbon monoxide. It may not fully protect persons with specific medical conditions.

Normal use of the room may only be resumed after the sources of carbon monoxide have been located and removed and the alarm signals have switched off and *DK* has returned to the NORMAL condition !!!

3.2 <u>ALARM – RISK OF GAS EXPLOSION</u> (applies to DK-24/E, DK-25/E).

A rapidly pulsing (f=2.5Hz) red ALARM indicator and an intermittent acoustic signal in time with the indicator (see Table 3) mean that the detector is in ALARM condition, i.e. it has detected a hazardous concentration of combustible gas in the air and activated the alarm outputs.

The detector responds several seconds after the instantaneous gas concentration exceeds the alarm threshold. The threshold value is defined in relation to the Lower Explosive Limit of the explosive gas and, in accordance with the PN-EN 194-1 standard, is:

- for DK-24/E – 10% LEL of methane - ALARM before 1 minute has elapsed;
- for DK-25/E – 10% LEL of propane-butane - ALARM before 1 minute has elapsed;

Activation of the alarm when 10% LEL is exceeded (i.e. a concentration approximately 10 times lower than that at which the gas may explode) does not mean that a higher concentration is not present in the monitored room. Depending on the size of the gas emission, the explosion hazard level may be reached quickly.

It should be remembered that gas concentration distribution in a room is never uniform. Local accumulations of gas posing an explosion hazard may form (therefore optimum selection of the installation location is so important).

Therefore, if an ALARM occurs, intervention must be taken immediately:

- extinguish all sources of fire, cigarettes, pipes, candles, etc.,
- **DO NOT** switch any electrical appliances or lights on or off during this time.
- DO NOT switch off the **detector** !!!
- close all taps of the gas cooker and water heater; close the valve of the cylinder, tank or installation,
- ventilate the room by opening windows and doors wide (not only in the monitored room, but also in adjacent rooms),
- make sure that the shut-off valve has been closed (DK-*nn*.Z/E version only),
- if identifying the source of gas emission is not possible and/or the cause of the leak is not obvious, the gas emergency service or the competent gas installation supervisory authorities must be notified immediately, and their instructions must be strictly followed.

At the same time, it should be noted that natural gas (mains gas) supplied to domestic installations as well as liquefied gas (bottled gas, LPG) is specially odorised. The intensity of the smell of escaping gas (which depends on individual characteristics and environmental conditions) is not a reliable factor for determining the level of hazard! The concentration of odorising agents in the gas is selected so that it can be detected at the lowest possible concentrations and reveals even the smallest leaks in the installation. The detector responds to gas concentrations many times higher, and the presence of a 'smell' in the absence of a detector ALARM is not a sign of its improper operation!

Normal use of the room may only be resumed after the sources of carbon monoxide have been located and removed and the alarm signals have switched off and *DK* has returned to the NORMAL condition !!!

3.3 DETECTOR TEST – output and optical-acoustic signalling test *(all models)*

The test procedure is intended for checking the operation of external devices connected to the detector. It bypasses the gas sensor operation and allows the user, at any time and regardless of the gas concentration in the air, to generate alarm conditions on all detector outputs and verify the correct operation of peripheral devices.

WARNING: The User must be aware that triggering a test in a ***DK*** detector activates the connected external devices; among other things, for the DK-*nn*.Z/E version it will generate a pulse closing the gas valve and consequently cut off the gas supply to the flat/building.

There is an opening in the lower part of the housing marked 'TEST' on the rating plate - into which the tip of a ballpoint pen refill, a toothpick or a thin screwdriver should be inserted - and the internal button lightly pressed for a specified period of time to trigger a specific procedure. Table 3.3 describes the required timing relationships.

Table 3.3. Output TEST

		Time [sec.]	Light POWER SUPPLY	Light ALARM	Internal siren	Output condition
triggering the test	press and hold the TEST button	0 – 5	flashes every 1 second	unlit	muted	NORMAL (on all outputs)
	release the button between 5 and 10 seconds after pressing	5 – 10	pulses rapidly (f = 5 Hz)			
upon release of the button, testing of successive outputs begins						
subsequent test stages	siren test	0 – 10	flash every 1 sec.		signal/ pulse every 1 sec.	'SYRENA' – active, other outputs - normal
	valve test (DK-*nn*.Z/E version)	10 – 12 *OR* 10 – 20	flash every 1 sec.		signal/ pulse every 1 sec.	'ZAWOR' – active (*), other outputs - normal
	relay output test (DK-*nn.A/E*, DK-*nn.P/E* versions)		flash every 1 sec.		signal/ pulse every 1 sec.	'WYJ.STYKOWE' – active other outputs - normal
	end of test	12+ or 20+	return to normal operation – current detector condition			normal (on all outputs)
	(*) After closing, the gas valve must be reopened manually! The test procedure may be triggered at intervals of no less than 1 minute. This is the minimum time required to accumulate energy for another valve closure.					

3.3.1 Gas sensor TEST - carbon monoxide (applies to DK-22…/E, DK-24…/E, DK-25…/E).

The test consists in putting the detector into an alarm condition by applying test gas in the vicinity of the sensor at a concentration of >300 ppm carbon monoxide in synthetic air. If the appropriate test gas is unavailable, gas from the smoke of

a smouldering piece of corrugated cardboard or a cigarette may be used (the most readily available natural sources of CO). Place the lit, smouldering cigarette/cardboard in an ashtray or a small non-flammable container. Place the ashtray under the detector (near the sensor) and cover the detector from above with a small box or plastic bag. Hold it in place for approximately 1 minute, until an ALARM is generated, i.e. **slow pulsing of the red 'ALARM'** indicator and an intermittent tone from the internal siren in time with the indicator.
Remove the CO source. Within less than 6 minutes, the ***DK*** should return to the normal condition (only the green POWER indicator lit).
If a low carbon monoxide concentration higher than 50 ppm is generated, the detector indicates gas detection by the sensor **only through cyclic, brief extinguishing of the green 'POWER/FAULT' indicator**. Combined with the test sequence performed when the power supply is switched on, this is a sufficient operational test of the detector. A similar effect can be achieved by blowing a large amount of cigarette smoke into the detector previously placed inside a small plastic bag.

3.3.2 Gas sensor TEST - combustible gas (applies to DK-24…/E, DK-25…/E)
The test consists in putting the detector into an alarm condition by applying test gas in the vicinity of the sensor at a concentration of >20% LEL of the calibration gas in synthetic air.
Generating an ALARM may be easier if the detector is placed in a sealed plastic bag and gas is introduced into it. A generated ALARM will always persist for at least 10 sec. after the gas source is removed. After several minutes, the detector returns to the NORMAL condition.
For DK-25.../E: if the appropriate test gas is unavailable, gas from an unlit gas lighter may be used (the DK-24…/E model does not respond to this). Apply the gas near the sensor for approximately 1 second. Short, cyclic extinguishing of the green 'POWER' indicator for the duration of the gas presence confirms **CORRECT detector operation** !! To generate an ALARM condition, gas from the lighter must be introduced CYCLICALLY so as to maintain a continuous gas presence for at least 30 seconds: **GAS = 0.5 sec., PAUSE = 2 sec.** - until the **red 'ALARM' indicator pulses rapidly** and the internal siren emits an intermittent tone in time with the indicator.

3.3.3 ALARM-OPTO input test. (applies to DK-*nn*.Z/E)
The test enables verification of the correct connection of external detectors to the detector's ALARM-OPTO input. The check consists in generating alarm conditions on individual external detectors one after another. In each test, the *DK* should enter an alarm condition (signalling described in Table 3) and activate the alarm outputs. Simultaneous generation of multiple alarms in external devices is visible as a single alarm in the *DK* (the voltage signal is continuously applied to the ALARM-OPTO input). Always maintain an interval of approximately **1 minute between successive** valve closure tests.

If correct operation of the detector and additional devices is confirmed, it may be concluded that:
***The gas detection system with DK* is operational and functioning CORRECTLY.**

4. MAINTENANCE / OPERATION

***DK* is a fully AUTOMATIC device !**
It DOES NOT HAVE any adjustment elements requiring user operation !
Therefore, ***any attempt to interfere*** with the internal circuits of the *DK* or tamper with seals/barcode labels results in:
1. Loss of all warranty rights;
2. May create a risk of electric shock;
3. May cause permanent, irreparable damage to the detector;
4. May cause changes to the device's electrical and measuring parameters, and thereby result in loss of functionality as a warning device.

DK is a highly precise device intended to protect HEALTH and even LIFE, designed for use in residential premises, therefore it should be protected against:
- strong shocks, impacts, strong electromagnetic fields (e.g. mobile phones used close to the detector),
- flooding or splashing with water, paints or any other liquids (this may result in electric shock and irreparable damage to the sensor, i.e. the gas-sensitive element),
- direct exposure to streams of aerosol substances (varnishes, deodorants, air fresheners, etc.),
- prolonged operation in an atmosphere containing high levels of strongly reducing gases, exhaust fumes, vapours of chemically aggressive liquids, thinners, etc. = this significantly shortens the sensor life or may lead to sensor damage or changes in alarm threshold settings.
If renovation work is being carried out, the detector should be switched off and enclosed in a gas-tight plastic bag for the duration of the work and for the time necessary for paints to dry and the rooms to be ventilated. Protect the detector against dust and paint splashes.

Calibration of the detector is recommended at least every 3 years (paid service performed by the Manufacturer or an Authorised Service Centre after delivery of the sensor module only to the above-mentioned entity (see procedure 4.1 for removal/installation of the sensor module below). Calibration may also be necessary after **any** exposure to extremely high concentrations of combustible or toxic gases or their prolonged presence. In such cases, sensor replacement may be required – a paid service provided by the Manufacturer!
A correctly located, installed and powered ***DK*** detector requires no additional user operation. It is only RECOMMENDED to carry out periodic checks of ***DK*** operation according to section 3.3.

***Recommended inspection frequency:* <u>every 3 months !!!</u>**

WARNING: Prolonged detector operation under gas concentrations above the alarm threshold or in the continuous presence of other explosive or toxic gases may lead to permanent changes in the gas sensor parameters or irreparable damage to the sensor! Recalibration or replacement of the gas sensor is not covered by the warranty – a paid service provided by the Manufacturer.

4.1. Sensor module replacement

REMOVAL OF THE SENSOR MODULE:

- switch off the DK power supply, remove the housing (procedure 2.3.1);
- remove the sensor module from its socket by gripping its edges (photo =>);
- install the housing (procedure 2.3.6);
- the DK power supply may be connected (only the yellow FAULT indicator should be lit) = but in this condition the detector DOES NOT FUNCTION as a gas detector!

INSTALLATION OF THE SENSOR MODULE (*only original modules supplied by the Manufacturer may be installed!*):

- switch off the DK power supply, remove the housing (procedure 2.3.1);
- ensure that the two-digit detector type designation (indicated by circling the appropriate field on the detector main board between the sensor module sockets) matches the two-digit sensor module type (circled field on the edge of the sensor module) – IMPORTANT = mismatch of these numbers causes a detector fault condition;
- holding the sensor module by its edges (photo opposite), carefully slide the module into the socket, ensuring that the positioning pin on the detector board enters the hole in the sensor board;
- install the housing (procedure 2.3.6);
- connect the power supply and wait until the DK enters the NORMAL condition with the green indicator continuously lit – any other indication means incorrect positioning of the sensor module in the socket or damage to the sensor module (description of fault conditions in Table 3);
- perform the test according to procedure 3.3.

5. MAINTENANCE

Detector maintenance consists of periodic inspection of the ventilation openings in the housing and, if necessary, cleaning them of excess dust using a dry brush, dry cloth or vacuum cleaner (with the detector power supply switched off). This is particularly important in the case of significant dust contamination in the monitored room.

Under NO circumstances may sharp, thin objects such as nails, screwdrivers, sheet metal, etc. be used for this purpose. Clean the outer housing of the detector (with the power supply switched off!) using a soft cloth <u>lightly</u> moistened with clean water (under no circumstances use solvents, alcohol or detergents). The frequency of this cleaning should be adjusted to the dust conditions in the monitored room but: **not less than once a year !!!**

The expected service life of the CO sensor in the ***DK*** is estimated at approximately 10 years of operation in clean air. The detector signals the end of sensor life with a FAULT signal according to Table 3.The expected durability of the explosive gas sensor in DK-24(25)…/E is estimated at approximately 15 years of operation in clean air.

It is recommended to calibrate the detector at least <u>every three years</u>. This is a paid service provided by the Manufacturer.

In accordance with the Act of 11 September 2015 on waste electrical and electronic equipment, a used detector must not be disposed of together with other household waste. It must be taken to a designated waste collection point. Therefore, it is marked with a special symbol:

Proper waste disposal protects against the adverse effects on human health and the environment.

6. TECHNICAL PARAMETERS

Models:	**DK-22/E, DK-24/E, DK-25/E, DK-22.P/E, DK-24.P/E, DK-25.P/E, DK-22.Z/E, DK-24.Z/E, DK-25.Z/E**
Power supply parameters	U_N= 230 V AC (±10%), f= 50 Hz, P_{MAX}= 3 W (continuous operation)
Models:	**DK-22.A/E, DK-24.A/E, DK-25.A/E**
Power supply parameters	U_N= 12 V DC (10.5 ÷ 15.0 V), P_{MAX}= 1.6 W (continuous operation)
Type of gas sensor	electrochemical – for carbon monoxide detection; semiconductor (SnO_2-based) – for for detecting flammable gases; replaceable with the sensor module
Detected gases	**DK-22…/E** – carbon monoxide (CO) **DK-24…/E** – carbon monoxide (CO) and methane (natural gas) **DK-25…/E** – carbon monoxide (CO) and propane-butane (LPG)
Interfering factors	hydrogen, alcohol (high concentrations), other hydrocarbons, chlorine; significant oxygen deficiency (<19% vol.); large, rapid increase in humidity
Operating temperature	recommended: 0°C to +40°C; *permissible periodically (<1h/24h): -15℃ to +50℃*
Relative air humidity	recommended: from 30% to 90%
Storage and transport conditions *(in factory packaging)*	no vibration or strong shocks; no corrosive atmosphere; ambient temperature: *-10℃ to +50℃* at relative air humidity <90% (non-condensing)

Alarm thresholds for carbon monoxide *according to the PN-EN 50291-1 standard guidelines*	■ 30 ppm CO - no ALARM before 120 minutes have elapsed; ■ 50 ppm CO - ALARM within 60-90 minutes; ■ 100 ppm CO - ALARM within 10-40 minutes; ■ 300 ppm CO - ALARM before 3 minutes have elapsed.
Alarm threshold (applies to **DK-24…/E**)	10% LEL methane (±5% LEL) - ALARM before 1 min. has elapsed, *according to PN-EN 50194-1*
Alarm threshold (applies to **DK-25…/E**)	10% LEL propane-butane (±5% LEL) - ALARM before 1 min. has elapsed, *according to PN-EN 50194-1*
Expected service life	10 years from the year of manufacture *(specified on the rating plate)*
Optical indication	'ZASILANIE/AWARIA' (POWER/FAULT) indicator – green (normal condition) or yellow (fault condition), ALARM indicator – red (alarm condition); detailed description of indications Table 3
Audible signalling	internal siren, sound level 85 dB /1m, pulsed tone f=4kHz; DK-S3 outdoor siren, intensity 85 dB/3 m, pulsating tone f= 2.5 kHz
Outputs *	'SYRENA' (SIREN) - voltage output U_N= 9 V, I_{max}= 50 mA, for connection of a DK-S3 siren or DK-L2 lamp; 'WYJ.STYKOWE' (RELAY OUTPUT) - relay contact output, U_{MAX}=250 V AC or U_{MAX}= 24 V DC; I_{MAX} = 4 A (resistive load) or I_{MAX} = 2 A (inductive load – motors) or I_{MAX} = 0.6 A (purely inductive load – fluorescent lamps); 'ZAWOR' (VALVE) - voltage output U_{max}=22 V (pulse, t_{max}= 2 sec.), for connection of a ZB or MAG-3 shut-off valve;
Inputs (DK-*nn*.Z/E version only) *	'ALARM OPTO' - 1 kV isolated, control voltage U_{in} = 5 ÷ 15 VDC, R_{in} = 3 kΩ
Dimensions, housing, weight	140 x 85 x 55 mm; ABS housing; protection rating IPX1D; approx. 0.4 kg

(*) – assignment of inputs and outputs to specific versions – see Table 2.3.A

7. WARRANTY CONDITIONS within the territory of Poland

WARNING: For DK manufactured after 1.07.2021, the manufacturer <u>neither issues nor requires</u> warranty cards!!!

Extract from the conditions of the new Gazex Standard 3-year plus Warranty (SGG3Y+) – full terms available at www.gazex.pl:

…valve

1. GAZEX guarantees proper operation of its products until the end of the year in which the device was manufactured and for **the following 3 years**.

1.1 The year of manufacture is taken from the device's rating plate.

1.2 If the rating plate is illegible – the year of manufacture is determined based on the serial number or barcode labels on the subassemblies (*if such labels are present*) together with records in the GAZEX electronic production supervision system. Such verification is subject to a charge. The fee is PLN 50.00 net for each started verification of a batch of up to 10 devices.

1.3. Unidentifiable devices, i.e. with a damaged/illegible rating plate or lack thereof, and with the GAZEX logotype permanently removed/covered, will not be covered by warranty service.

1.4 The SGG3Y+ warranty covers all devices manufactured by GAZEX after **1st January 2021**, which feature the production year '2021' or later on their rating plate.

…

2. Defects revealed during the period referred to in section 1 shall be remedied free of charge within 14 days from the date the registered device is delivered by the Purchaser to the GAZEX headquarters (at the manufacturer's expense, using a transport method agreed with it, properly packaged). Special conditions:
   a) before shipment, a warranty repair request must be registered on the portal: <u>https://www.gazex.com/pl/serwis</u>;
   b) the defect description must be included in the above warranty repair request;
   c) lack of complete information about the Purchaser or the device defect may extend the repair period.
3. The concept of a warranty repair does not include activities related to:
   a) calibration/verification of detectors/sensors;
   b) adjustment and programming of non-standard versions of devices;
   c) cleaning or other maintenance activities recommended in the device User Manual;
   d) replacement of fuses, batteries, accumulators and other components whose replacement is provided for in the User Manual.
4. The warranty does not cover damage caused by:
   a) shocks, vibrations and mechanical impacts, thermal impacts, and the effects of chemical substances;
   b) damage resulting from improper storage, faulty installation, or incorrect operating conditions contrary to the device's User Manual;
   c) failure to perform periodic maintenance activities or other forms of negligence;
   d) deliberate actions by the user, third parties, or persons unauthorised to carry out repairs;
   e) lightning strikes, power grid overvoltages, or electrostatic discharges;
   f) force majeure or other events beyond the Manufacturer's control.

   …
5. Warranty rights expire in the following cases:
   a) damage to factory seals, service seals, or marks identifying the device/components;
   b) interference with the internal circuits of the device or the introduction of any other changes to the device or control program, or when the device operates with non-original components not originating from GAZEX;

   …