

POLON 4000 AND POLON 6000  
INTERACTIVE FIRE DETECTION AND ALARM SYSTEM

DUCT SMOKE DETECTOR  
DUO-6046K

Installation and Maintenance Manual

IK- E376-001

1 Edition



DUO-6046K duct smoke detector covered by the present manual complies with the requirements of the following European Union Directives:

**CPR** Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEG;

**EMC** The electromagnetic compatibility (EMC) Directive 2014/30/EU

The CNBOP-PIB, Notified Body No. 1438 has been issued for the product the national certificate of constancy of performance confirming the possession of technical features/parameters required by EN 54-27:2015

The CNBOP-PIB, Notified Body No. 1438 has been issued for the product the certificate of constancy of performance confirming the possession of technical features/parameters required by EN 54-17:2005 + AC:2007

The features/technical parameters above that exceeds the requirements of the aforementioned standards and other features/parameters specified in this manual that are not specified in the mentioned standards are confirmed by the Manufacturer.

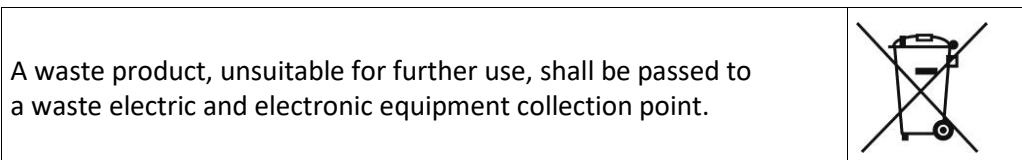
For the product the manufacturer has issued a declaration of performance.

The certificate and the declaration of performance may be downloaded from [www.polon-alfa.pl](http://www.polon-alfa.pl) web site.

Read the manual carefully before the detector assembling and commissioning.

Any nonconformity with the instructions contained in the manual may be harmful or may cause violation of the law in force.

POLON-ALFA bears no responsibility for any damage resulting from usage inconsistent with the manual.



NOTE: The manufacturer reserves the right to change specifications of products at any time.



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POLON-ALFA S.A.  
85-861 Bydgoszcz, ul. Glinki 155

Duct smoke detector  
**DUO-6046K**

Intended use:

Fire safety – duct smoke detector using stray light, with an integrated short-circuit isolator, designed for fire alarm systems used in buildings.

Notified Body No:

1438 -CNBOP-PIB

Declaration of Performance No.

1/E376/2019/PL

Standards:

EN 54-27

Essential Characteristics	Performance	Technical Specifications EN 54-27:2015
Nominal activation conditions/sensitivity		
Individual alarm indication	pass	4.2.1
Additional visual indication	pass	4.2.2
Alarm resetting for standard-alone systems	pass	4.2.3
Connection of ancillary devices (option with requirement)	pass	4.2.4
Response to slowly developing fires	pass	4.2.5
Dazzling	pass	4.2.6
Operational reliability		
Repetability	pass	4.3.1
Reproducibility	pass	4.3.2
On-site adjustment of response behaviour	pass	4.3.3

Essential Characteristics	Performance	Technical Specifications EN 54-27:2015
Operational reliability		
Manufacturer's adjustments	Nie dotyczy	4.3.4
Monitoring of detachable detectors	pass	4.3.5
Software controlled detectors	pass	4.3.6
Tolerance to supply voltage		
Variation in supply parameters	pass	4.4
Fire sensitivity	pass	4.5
Durability of nominal activation conditions, temperature resistance		
Dry heat (resistance)	pass	4.6.1.1
Durability of operational reliability, shock and vibration resistance		
Impacts (resistance)	pass	4.6.4.1
Shock (resistance)	pass	4.6.4.2
Vibration sinusoidal (operational)	pass	4.6.4.3
Vibration sinusoidal (endurance)	Pass	4.6.4.4
Durability of operational reliability, humidity resistance		
Damp heat, steady state (operational)	Pass	4.6.2.1
Damp heat, steady state (endurance)	Pass	4.6.2.2
Durability of operational reliability, corrosion resistance		
Sulphur dioxide (SO <sub>2</sub> ) corrosion endurance	Pass	4.6.2.3
Durability of operational reliability: electrical stability		
Electromagnetic compability (EMC)	Pass	4.6.5
Air leakage	Pass	4.6.6



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Notified Body No:

1438 -CNBOP-PIB

Declaration of Performance No.

1/E376/2018/PL

Harmonised standards:

EN 54-17

Essential characteristics	Performance	Harmonised technical specifications EN 54-17:2005 + AC:2007 Clause
Nominal activation conditions		
Reproducibility	pass	5.2
Operational reliability		
Requirements	pass	4
Durability of operational reliability: temperature resistance		
Dry heat (operational)	pass	5.4
Cold (operational)	pass	5.5
Durability of operational reliability: vibration resistance		
Shock (operational)	pass	5.9

Impact (operational)	pass	5.10
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Essential characteristics of the product	Performance	Harmonised technical specifications EN 54-17:2005 + AC:2007 Clause
Sinusoidal vibration (operational)	pass	5.11
Sinusoidal vibration (endurance)	pass	5.12
Durability of operational reliability: humidity resistance		
Damp heat cyclic (operational)	pass	5.6
Damp heat steady state (endurance)	pass	5.7
Durability of operational reliability: corrosion resistance		
Sulphur dioxide (SO <sub>2</sub> )corrosion (endurance)	pass	5.8
Durability of operational reliability: electrical stability		
Variation in supply voltage	pass	5.3
EMC immunity	pass	5.13
Technical data – see manual: IK-E376-001		

## 1 PURPOSE

DUO-6046K duct smoke detector is designed for detecting the presence of smoke in the airstream of ductwork sections of the HVAC air handling systems and similar, where, due to the cross-section of the duct, rapid air movements well as other factors, it is not possible to install the detector.

Duct smoke detector responds to fire tests specific to optical detectors. It has a high sensitivity to visible and invisible smoke.

DUO-6046K duct smoke detector is equipped with short circuit isolator. It is dedicated to work in addressable detection lines of POLON 4000 and POLON 6000 systems.

## 2 TECHNICAL SPECIFICATIONS

Operating voltage	(16.5÷24.6) V
Current consumption from the detection line	≤ 150 μA
Operating temperature range	od - 25 °C do + 55 °C
Relative humidity	do 95% przy 40 °C
Dimensions without tubes	175 mm x 196 mm x 100 mm
Weight (without socket)	< 0,95 kg
Air velocity in the duct	od 1 m/s do 20 m/s
International Protection Rating	IP 65
Cable ducts	2 pcs of PG7
Exhaust tube length	240 mm
Intake sampling tube length	240 mm basic tube included, optional 600 mm, 900 mm and 1200 mm.
Test fire detection capability	TF2D, TF4D, TF8D
Address coding	programmable from the control panel

## 3 SAFETY CONDITIONS

### Repairs and maintenance

Any maintenance works or periodic inspections shall be executed by skilled personnel employed by companies authorised and trained by POLON-ALFA.

Any repairs must be carried out by the manufacturer. POLON-ALFA bears no responsibility for the operation of any apparatus being repaired by unauthorised personnel.

### Works at height

Any detector installation works carried out at height must be executed with particular care utilising tools and machinery in good working condition.

Special attention shall be given to stability of ladders, elevators, lifts, etc.

Any electric tools shall be used strictly obeying the safety rules stated in instruction manuals by manufacturers.

### Anti-dusting eye protection

It is obligatory to use protective anti-dusting glasses and masks during detector installation works that produce high amount of dust, such as hole drilling in ceilings.



#### 4 CONSTRUCTION

DUO-6046K duct smoke detector (fig. no. 1) is made of a plastic housing. Two tubes are attached to the housing : intake sampling tube and exhaust tube. There are G-40 base and DUO-6046 smoke detector in the housing. The electrical wiring is fed through one or two sealed conduits (one of them is pre-sealed).

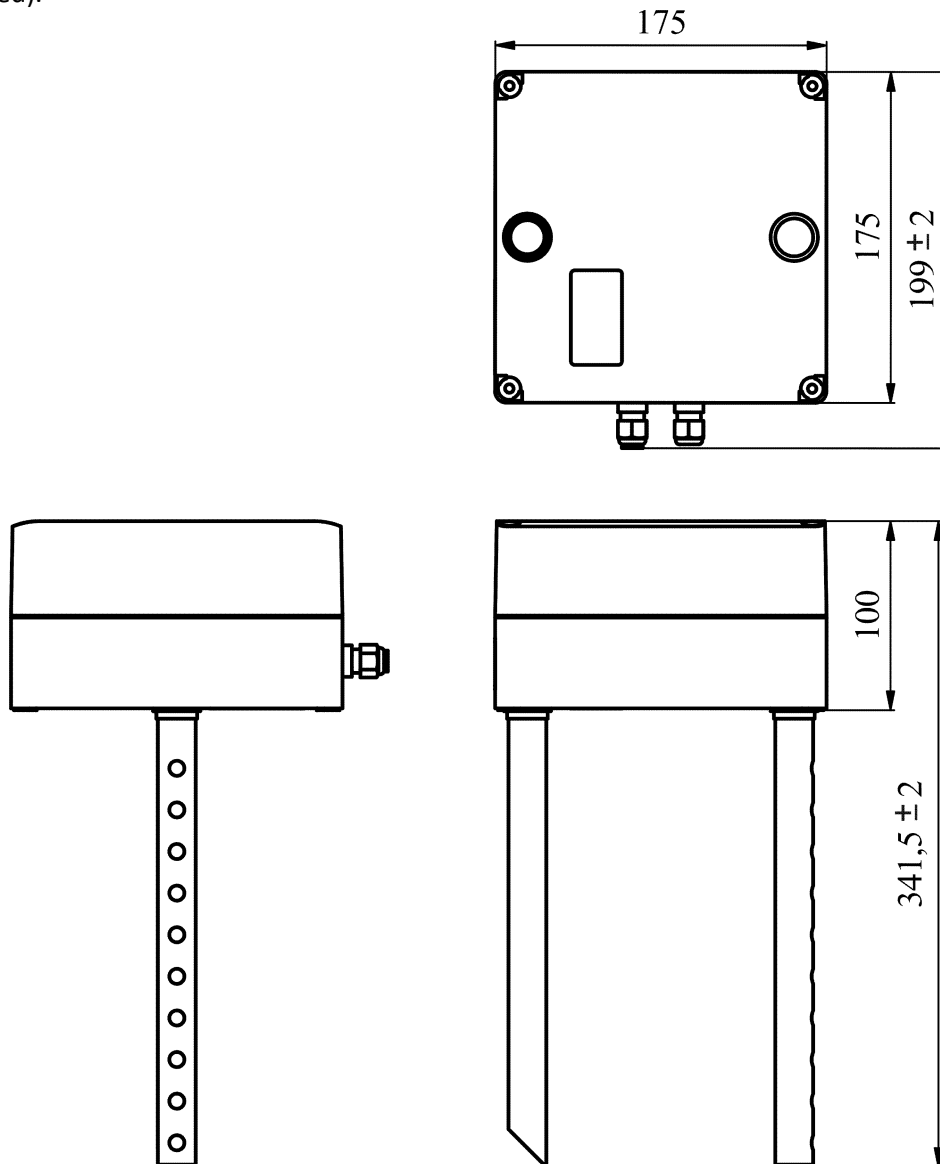


Fig. No. 1 DUO-6046K duct smoke detector construction .

The mechanical design of the DUO-6046 detector, which is the so-called detector head is shown on Fig. 2.

The main part of the detector is the optical system, consisting of two transmitting diodes, emitting light in the ultraviolet and infrared range, and a photodiode which is a radiation receiver. The diodes are mounted in the holder in such a way that the light emitted by the diodes does not reach the receiving diode directly.

The detection system (a handle with diodes) is mounted directly to the printed circuit board containing electronics parts with a processor supervising the detector operation. The labyrinth prevents the diodes from external light interference. A metal protective net prevents the chamber against small insects or pieces of dirt irruption. The whole is placed in a white plastic housing, which

consists of: a basket, a detector cover and a screen.

## 5. PRINCIPLE OF OPERATION

A duct smoke detector DUO-6046K consists of a chamber and a detector installed in it, into which a small portion of the air flowing through the duct is fed. A duct smoke detector consists of a chamber and a detector installed in it, into which a small portion of the air flowing through the duct is fed. Together with intake and outlet tubes it constitutes an air bypass system in such a way that the cross-section of the duct - due to the small diameter of the tubes introduced into the duct - is practically not reduced, and the air velocity in the chamber with the detector is lower than in the duct due to the large difference in the cross-section of the tubes and the chamber. In the event of a fire hazard, when there is smoke in the duct, some of the smoke from the duct will be routed to a detector that will trigger a fire alarm in the fire panel. The alarm status of the detector is indicated by the pulsed red light of two diodes located on opposite sides of the detector housing. The indicator allows you to quickly locate the alarming detector and helps you to periodically check the detector's operation. If the detector is not easily visible or is installed in a location that is difficult to access, an additional visual alarm indicator can be attached to the detector and installed in an accessible and visible location.

Communication between the POLON 4000 or POLON 6000 system fire alarm control panel and the DUO-6046K detectors is provided through a two-wire addressable detection line. A unique, fully digital communication protocol enables passing any information from the control panel to the detector and inversely.

In addition to transmitting to the panel the evaluation of the state of the fire factors and their trends in its surroundings, the detector can transmit, on request of the panel, the current analogue value. The detector operation controlling microprocessor monitors correctness of its basic circuits operation and, in case an irregularity is found, delivers relevant information to the control panel.

The DUO-6046K duct detector is an analogue detector with a digital self-regulation mechanism, i.e. it maintains constant sensitivity during the measurement chamber contamination progress. In case a settled technical alarm threshold is exceeded, the detector sends information to the 4000 series or 6000 series control panel of the measurement chamber partial contamination. This information is generated in order to inform the service personnel that in the future, if the contamination trend continues and appropriate actions are not taken, the detector may not keep all its parameters at the declared level. However, it should be noted that the detector will still be fully operational for about 1/3 of the time since the last maintenance. The detector is equipped with an internal short circuit isolator that cuts off an efficient detection line from the neighbouring shorted section what enables further undisturbed detector operation. The alarm mode is indicated with pulse red light emitted by an illuminating diode. A fault mode, technical alarm and actuation of a short circuit isolator are signalled with yellow flashes of the diode.

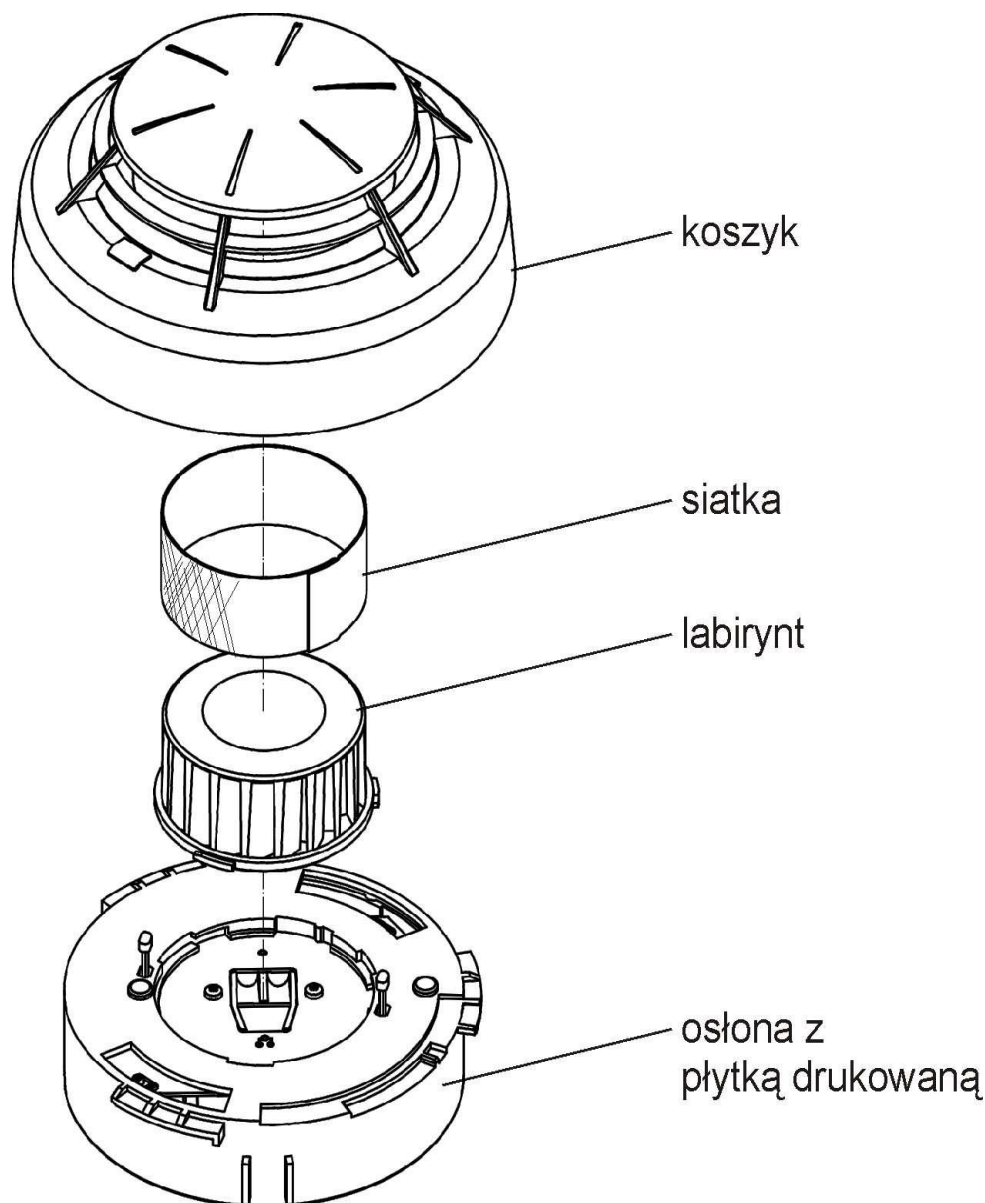
## 5 OPERATION DESCRIPTION

During the detectors operation it is obligatory to avoid creation of dew or rime on the detector surface as well as to protect against excessive contamination with dust.

**For the period of repair works, the detector should be taken out or protected with appropriate for this purpose cover. Such a cover can be obtained from an installer or purchased from the manufacturer. In case the detector is taken out, its base should be protected against being painted utilising a painting tape. Detectors which are damaged during painting and renovation works due to a fault of the persons executing such works (e.g. painted detector casing, stuck-with-paint net, etc.) are not subject to warranty**

**repairs.**

During the operation life, the DUO-6046K detector should be subjected to periodical inspection which is executed in order to confirm the detector proper operation and its appropriate interoperation with the control panel. The inspection should be carried out at least once in 6 months. The detector operation is checked with a smoke simulator or smoke generator.



The DUO-6046K duct smoke detector long-lasting operation may result in dust accumulation inside the internal optical chamber of DUO-6046 detector. After exceeding the self-regulation range due to the chamber contamination progress, the detector triggers a technical alarm mode. Therefore, it is necessary to clean the optical system of the detector: labyrinth and lenses of diodes - transmitting and photodiode.

Fig. 2 Detector elements after dismantling

The way of mounting and dismantling the detector is shown in Fig. 2.

In order to assemble the detector, it is necessary to:

- a) press the blockade (fig. 1) and turn the detector right, until it is removed
- b) remove the net from the labyrinth

- c) turn around and take out the labyrinth
- d) perform the necessary cleaning.

A delicate brush as well as vacuum cleaner are recommended for cleaning works. Compressed air can be possibly used. It is permitted to wash the labyrinth with warm water with addition of washing-up liquid. No damp patches should remain on the labyrinth internal surfaces after washing and drying.

After cleaning the detector should be assembled. In order to do it, it is necessary to:

- a) place the labyrinth in the leads and turn until you feel a click;
- b) put a net on the labyrinth; konfiguracja sensoróá.
- c) insert the cover into the basket so that the activation indicator diode is placed a little to the right in relation to the glass;
- d) turn the cover to the left.;

Note: In case the cleaning does not produce the required result, it is necessary to send the detector to the manufacturer for repair.

## 7 DETECTION OPERATION MODES

The detector operation mode configuration depends on the system (4000 or 6000) in which the detector is working. Configuration for the 4000 system includes only the smoke sensor setting, and for the 6000 system it additionally includes the WZ output setting.

### 7.1 OPERATION IN 4000 SYSTEM

Detector is provided with three operation modes (apart from alarm variants in the control panel) that enable the best adjustment of its characteristics to given operation environment:

**Smoke detector selection (at least 1 must be selected):**

- **Smoke sensor IR: YES/NO**
- **Smoke sensor UV: YES/NO**

**Interaction:**

- **Independent sensors (0)** - the sensors operates independently (OR function)
- **Interdependent sensors (1)** – increasing the fire factor on the one sensor make the other sensor more sensitive and accelerates fire detection,
- **Sensors in coincidence (2)** – sensors operate in coincidence (AND function), the alarm threshold for the two sensors must be exceeded for the detector to signal an alarm, which is used to increase false alarm immunity,

**Sensitivity:**

- **normal**
- **increased by 20%**
- **decreased by 20%**
- **decreased by 40%**

### 7.2 OPERATION IN POLON 6000 SYSTEM

In the POLON 6000 system, in addition to configuration of the sensors, the WZ output should also be configured.

WZ output operation mode:

- **As in POLON 4000 system** - WZ flashes as the diode in the detector which reports an alarm

- **duplication of the red diode flash** - WZ flashes the same way as the diode in the detector which reports an alarm, however the multiple alarm indicator is to be used, connected to the positive connector of the base (max 5 pcs)
- **flashing regardless of an alarm, the group of outputs must be declared**

## 8. DETECTOR INSTALLATION

DUO-6046K duct smoke detectors are installed in accordance with selected installation guidelines. The installation site should be chosen carefully. It must not be too close to the duct inlet, as only part of the duct may be filled with smoke with laminar air movement. The detector must also not be installed too far away from the inlet, as smoke may settle on the walls along the way. This should be noted, especially when installing housings in long ducts and tunnels. DUO-6046K duct smoke detector and inlet and exhaust tubes are purchased as a set. Bolt the tubes to the housing before installing the cover. Inlet and outlet openings must be in a position that allows air to flow (fig. 1).

Arrangement of the tubes and the casing in relation to the air movement is shown in figure 3. Pay special attention to the correct positioning of tubes in the duct and their sealing as shown in Fig. 3 (e.g. with silicone). The casing should be mounted on the duct using the holes in the casing or additional mounting brackets SFL-1 (fig. 4).

The wires connecting the detector in the housing with the loop and the cooperating devices should be carefully sealed by tightening the glands in the passages as much as possible.

The maximum number of detectors with or without housing per loop is specified in the technical and operating documentation of the fire panel.

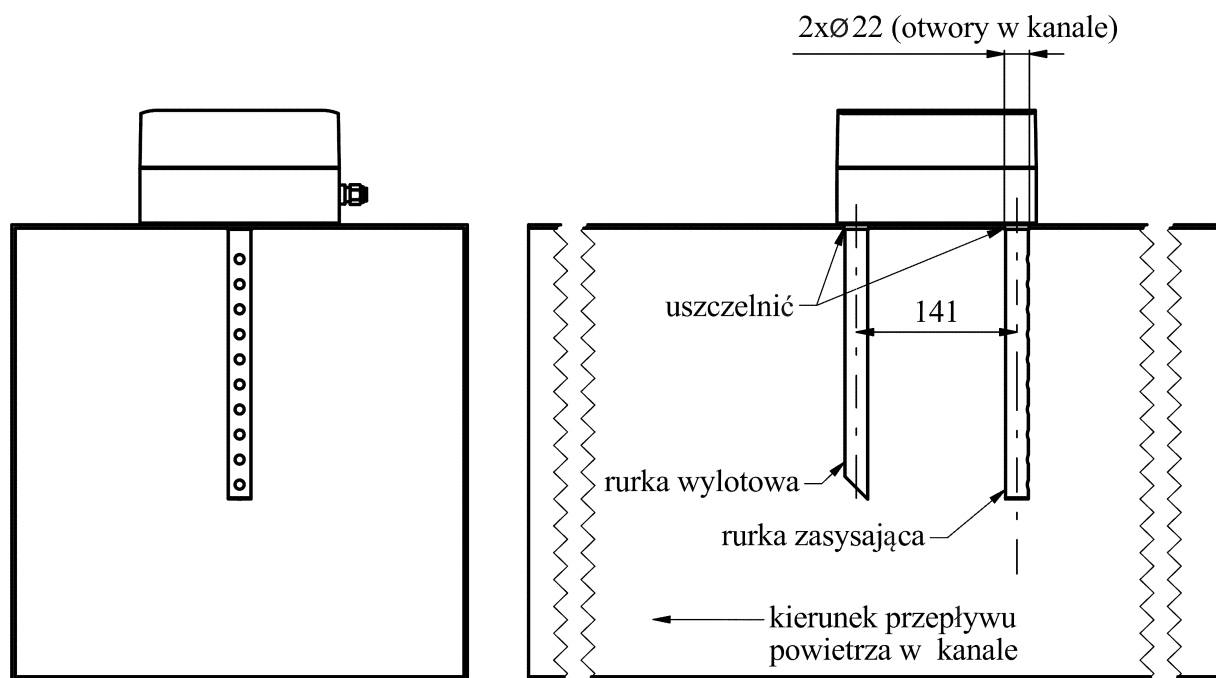


Fig. 3 Example of installing a detector in a duct

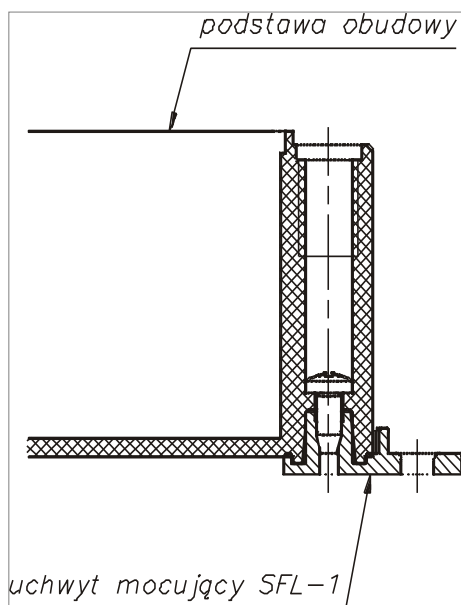
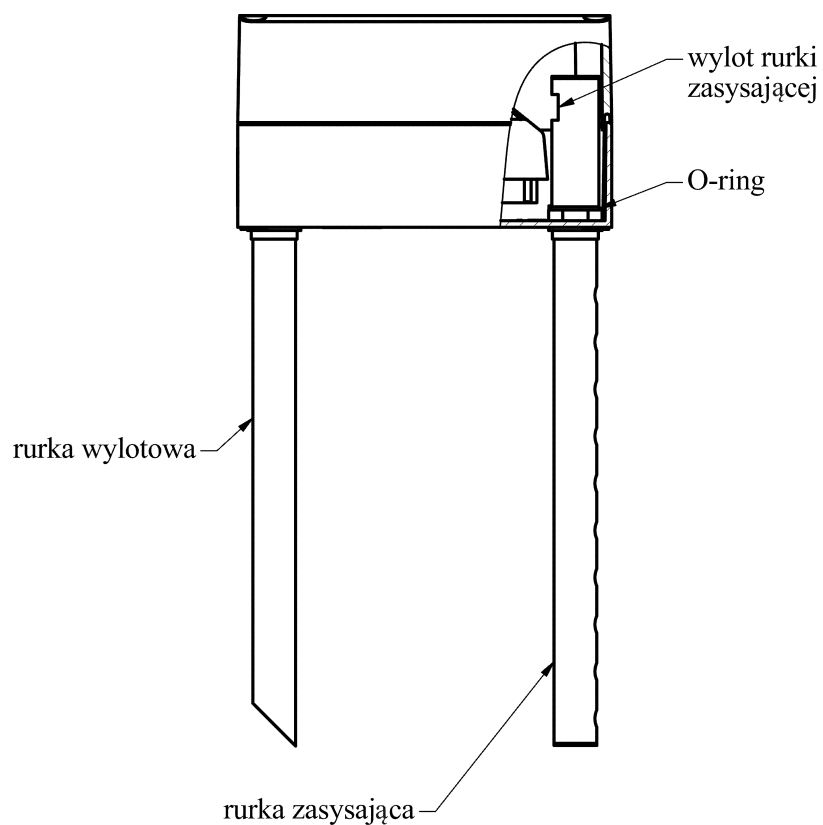


Fig. 4 Mounting with mounting brackets SFL-1 (supplied together with DUO-6046K)



Rys. 5 Installing the intake sampling tube outlet

After fixing the housing on the duct, gently screw the outlet of the intake sampling tube inside the cover so that its outlet faces the detector placed in the socket.

The DUO-6046 is then installed in the G-40 base. The method of connecting the loop is described in the Installation and Maintenance Manual for the G-40 base. Additional optical signalling of a single detector or a group of detectors can be obtained by connecting the WZ-31 remote alarm indicator:

- standard configuration of remote alarm indicator,

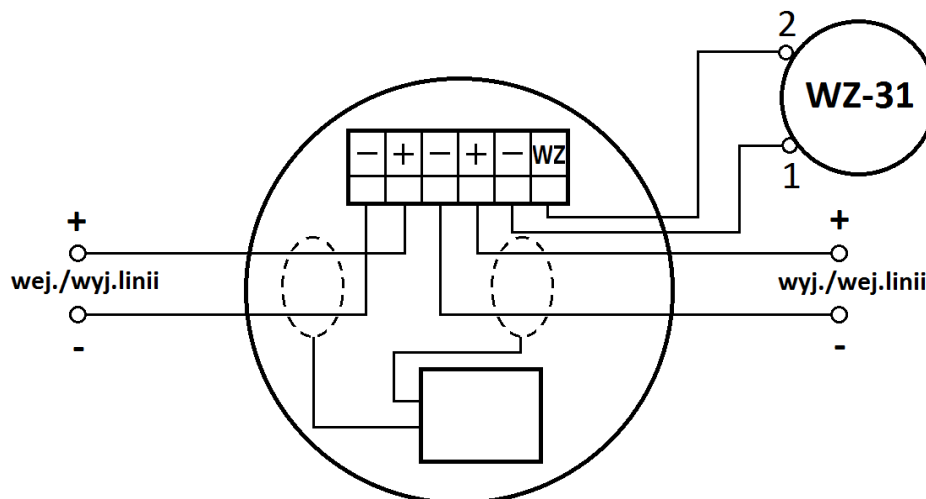
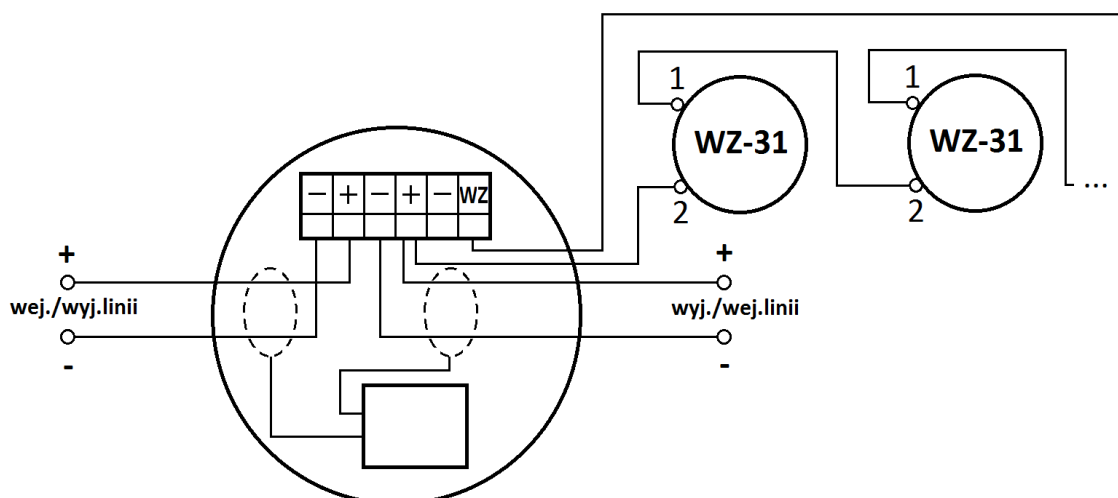


Fig.6 Wiring diagram for detector operating in supplementary mode zero.

- the multiple alarm indicator connected to the positive connector of the base:



Rys.7 The wiring diagram for a detector operating in the POLON 6000 system with additional WZ modes. It is possible to connect from 2 to 5 remote alarm indicators.

The alarm system cables must be laid in accordance with the regulations for low-voltage installations (below 42V).

**Note: The detectors should not be installed in corrosive atmosphere that contains caustic gases and vapours as well as dust. Steam condensation on detectors is impermissible.**

## 9 STORAGE AND TRANSPORTATION

### **Storage**

DUO-6046K duct smoke detectors should be kept in closed premises free of caustic gases and vapours at the temperature between +0 °C and +40 °C, and relative humidity not exceeding 80 % at +35 °C.

In the time of storing, the detectors should not be exposed to either direct sunlight or heat from heating equipment. The detectors storage period in transportation packing should not exceed 6 months.

### **Transport**

DUO-6046K detectors should be carried in closed transport means spaces, in packing that meets the requirements of transportation regulations in force. The temperature during transportation should not be lower than -40 °C and higher than +70 °C, and relative humidity should not be higher than 95% at + 45 °C or 80% at +70 °C.

IK-E376-001/06.2019