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POLON 4000
INTERACTIVE FIRE DETECTION AND ALARM SYSTEM

POLON 4100

FIRE DETECTION AND ALARM ADDRESSABLE CONTROL PANEL

Operation and Maintenance Documentation

ID-E342-001GB

IB Edition

CE

CNBOP

Polon-Alfa Spółka z ograniczoną odpowiedzialnością Sp. k.
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The POLON 4100 fire detection and alarm control panel covered by the present manual, complies with the requirements of the following European Union Directives:

CPD 89/106/EWG on construction materials;
EMC 2004/108/WE on electromagnetic compatibility
LVD 2006/95/WE on low-voltage electric equipment.

The POLON 4100 addressable control panel has been attested with the EC-Certificate of Conformity No. 1438/CPD/0179 issued by the Scientific and Research Centre for Fire Protection (CNBOP) Józefów, Poland, a EU notified authority No. 1438, confirming its compliance with the requirements of 54-2:2002+A1:2007 standard.
The device has been also approved with the Allowance Certificate No. 0715/2010 issued by CNBOP.

The certificates may be downloaded from www.polon-alfa.pl web site.

CE **1438**
Polon-Alfa Spółka z ograniczoną odpowiedzialnością Sp. k. 155, Glinki Street, PL 85-861 Bydgoszcz, POLAND 10 1438/CPD/0179
EN 54-2:1997+A1:2006 **POLON 4100 Fire Detection and Alarm Control Panel** Addressable, for indoor use Provided options: - fire alarming devices output - output signal delays - interdependent alarming - testing mode - alarm counter and additional functions, inputs and outputs: see technical data contained in ID-E342-001GB manual

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.

A waste product, unsuitable for further use, shall be passed to a waste electric and electronic equipment collection point.	

NOTE: The manufacturer reserves the right to change specifications of products at any time without prior notice.

CONTENTS

1 INTRODUCTION

1.1 Documentation contents

The purpose of this Operation and Maintenance Documentation (OMD) is to present the application, design and operation of the POLON 4100 fire detection and alarm control panel which constitute a part of the POLON 4000 system. The OMD contains information necessary for the panel proper installation, servicing and operation as well as may be helpful in fire detection and alarm system designing.

The Programming Manual (PM) constitutes a supplement to the OMD and it describes the control panel programming process.

Line elements that interoperate with the panel and can be installed in the POLON 4100 control panel detection lines, are listed in Appendix A. Detailed information about the elements interoperation with the POLON 4100 control panel are contained in a particular device installation and maintenance manual.

The OMD is supplied to the panel user together with the device; the PM programming manual is delivered only to trained and authorized designing and installing companies.

1.2 Control panel application

The POLON 4100 fire detection and alarm control panel is designed to:

1. signal a fire occurrence detected by an interoperating fire warning devices (automatic and manual),
2. indicate a fire endangered place,
3. actuate fire protection equipment,
4. transmit a fire signal to proper services, e.g. Fire Brigades.

The control panel is intended for continuous operation in premises of low dust level at ambient temperature from - 5 °C to + 40 °C and air relative humidity up to 80 % at +40 °C.

1.3 Safety conditions

1.3.1 Electric shock protection

The POLON 4000 system fire control panels are ranked as the 1st protection class devices and can be used only in the case of application of additional protection against electric shocks, such as zeroing or protective grounding.

230 V/50 Hz mains supply circuits insulation is reinforced and resists 2800 V voltage test; low-voltage circuits (below 42 V) insulation is able to resist test voltage of 700 V DC. After mains circuits, the mains connectors should be protected with a factory shield.

1.3.2 Installation and equipment safety

Wire installation should be made using cables of the required fire resistance and should be properly protected in passages through fire zone boundaries. In order to avoid undesirable interaction, a

required distance between the low-voltage installation and a power installation and a lightning protection system should be maintained. From the system electromagnetic interference immunity, it is recommended to utilise protective grounding. Reserve power supply batteries should be connected to the panel at the final stage of the installation.

The panel components are heat sensitive. The maximum ambient temperature should not exceed + 40 °C. It is forbidden to block ventilation openings placed on the panel side. The space left around the device should be big enough to secure free air flow. Air humidity in the premises where the panel operates should not exceed 95 %.

1.3.3 Repairs and maintenance

Maintenance works and periodic inspections should be executed by skilled personnel employed by companies authorised or 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 serviced or repaired by unauthorised personnel.

1.3.4 Fuse replacement

In the event of fuse replacement, an equivalent fuse should be used: of the appropriate type and nominal value. The appropriate types and nominal values are contained in table 2.3.

1.4 Definitions

Addressable detection line
A detection line that enables an addressable element connection.
Side detection line
A detection line for two-state non-addressable fire warning devices, created using the ADC-4001 adapter.
Addressable element
A device operating in a detection line which possesses a unique and unchangeable identity feature in the form of serial number and an element number which is assigned during system configuration. An addressable element enables two-direction digital data exchange with the control panel (transmission and receiving).
Line element
An element installed in addressable detection lines (addressable element) and side lines (non-addressable element).
Factory (serial) number (factory address)
A unique 12-digit number which is assigned to every addressable element during manufacturing process. The factory number contains the addressable element type being identified by the control panel.
Line number
A consecutive number from 1 ÷ 2 range, which is assigned to an open or loop-shaped detection line.
Element number
A consecutive number from 1 ÷ 64 range, which is assigned to an addressable element during the detection line configuration. During normal operation, control panel intercommunicates using the element number (short number).
Address space
A set of digit pairs composed of a line number and element number that determines all possible program element arrangements in a circuit.
Zone
A separated part of a supervised facility that specific line elements are assigned to.

Non-maskable fault
A fault related to the EKS-4001 element or the LK monitoring lines.
Standard configuration
A set of data that determines the control panel equipment furnishing and its operation arrangement (e.g. addressable element declaration, element assignment to particular zones, alarm variants), settled and loaded to the memory by the manufacturer.
User message (text)
A message on the text display (a wordy text nor longer than 64 characters each), assigned to line elements or conventional lines during programming process, utilized by the user for their installation location identification.
Quiescent (supervision) mode
An operation mode, in which the control panel is power supplied from an electric energy source that meets the settled requirements, during which no other operation mode is indicated.
Alarm (fire) mode
An operation mode the control panel triggers after receipt and verification of a fire occurrence signal from fire warning devices.
Preliminary alarm mode (first alarm mode)
An operation mode the control panel triggers after receipt of the first alarm signal from fire warning devices.
Disablement mode
An operation mode, in which it is deliberately blocked the control panel ability to receive signals from any fire warning devices and to evoke alarms, or the control panel output and/or transmission path to any fire detection and alarm system component that is a part of alarm circuit.
Test mode
An operation mode in which the control panel indicates functioning checking.
Fault mode
An operation mode in which the control panel indicates a fault of anything in alarm installation or its own circuits.
Technical alarm mode
An operation mode in which the control panel indicates actuation of any supervised external devices or a service mode of fire detectors.
POLON 4000 system digital monitoring (PMC-4000)
A digital monitoring protocol applicable in POLON 4000 control panels.

2 DEVICE COMPLETENESS

Table 2.1 lists the set of items which compose the POLON 4100 control panel furnishings.
Table 2.2 specifies auxiliary equipment that can be installed in the POLON 4100 control panels. This equipment should be ordered separately.
Table 2.3 contains a list of the fuses used in the control panel.

Table 2.1

Item	Description	Drawing (catalogue) No.	Quantity
1	Complete casing	A/E342-50.00.00-1	1
2	PSC-41 central controller module	B/E300-80.00.00-1	1
3	PS-49 signalling devices board	C/E270-80.00.00-1	1
4	MLS-41 line-controlling module board	B/E342-03.00.00-1	1
5	Operation and Maintenance Documentation (OMD)	ID-E342-001	1

6	Servicing manual	IO-E342-001	1
7	Warranty certificate		1
8	Control panel package		1

Table 2.2

Item	Description	Drawing (catalogue) No.
1	Computer keyboard	

Table 2.3

Item	Part description	Quantity
1	NANO 3.15 A mini-fuse	1 pcs
2	NANO 630 mA mini-fuse	3 pcs.

3 TECHNICAL SPECIFICATIONS

INPUT PARAMETERS	
Control panel basic power supply voltage – 50 Hz mains	230 V AC + 10 % - 15 %
Maximum power draw from mains	< 250 VA
Control panel internal operation voltage – constant	24 V + 25 % - 15 %
Reserve power supply source (battery panel)	2 x 12 V / 22 Ah
Battery maximum internal resistance (with cables)	1 Ω
Reserve power supply switching	automatic
Battery panel charging/buffering switching	automatic
OUTPUT PARAMETERS	
Maximum current draw from batteries in quiescent mode	< 250 mA
Maximum current draw from batteries in alarm mode (without external devices)	< 400 mA
Maximum current draw disposable for external devices in alarm mode (including LS signal line)	1 A
DETECTION LINES	
Addressable detection lines number	2
Addressable detection line operation arrangements	loop-type (A type) radial (B type)
Maximum detection line voltage	23.4 V ÷ 24.6 V
Maximum detection line wires resistance	

• addressable depending on configuration • branch ADC-4001 • between two subsequent elements equipped with short circuit isolators	2 x 100 Ω, 2 x 75 Ω, 2 x 45 Ω 2 x 25 Ω 2 x 50 Ω
Maximum addressable detection line wires capacity	300 nF
Allowable detection line quiescent current (depending on configuration) • at maximum wires resistance 2 x 100 Ω • at maximum wires resistance 2 x 75 Ω • at maximum wires resistance 2 x 45 Ω	 20 mA 22 mA 50 mA
LINE ELEMENTS – NUMERIC PARAMETERS	
Number of addressable elements installed in one line, dependable on total quiescent mode, but not higher than • A type line (loop-shaped) • B type line (radial)	 64 32
Maximum number of EKS-4001 monitoring and controlling elements • in total, connected to control panel	 40
Maximum number of EWS-4001 multi-input controlling elements • in total, connected to control panel • connected to one detecting line	 40 20
Maximum number of EWK-4001 multi-output controlling elements • in total, connected to control panel • connected to one detecting line	 40 20
Maximum number of SAL-4001 acoustic signalling devices • in total, connected to control panel	 40
Maximum number of UCS 4000/UCS 6000 universal controlling panels • in total, connected to control panel • connected to one detecting line	 40 20
ALARMING	
Number of zones that line elements are program assigned to	128
Number of interdependent detector groups in a zone	2 (A and B)
Fire alarm types • 1st stage alarm • 2nd stage alarm	 1ST STAGE ALARM 2ND STAGE ALARM
Alarm variants number applicable in zones	17
Time programing ranges • T1 time –1ST STAGE ALARM confirmation awaiting • T2 time – recognition after 1ST STAGE ALARM confirmation • T3 time – alarm outputs activation delay	 0 ÷ 10 min 0 ÷ 10 min 0 ÷ 10 min
Maximum number of saved events – (EVENT MEMORY)	2,000

Maximum number of saved alarms – (ALARM MEMORY)	9,999
INPUTS / OUTPUTS	
Non-programmable output (fault relay) • non-potential switchable contacts 1 A / 30 V	1 (PK1 – PU)
Programmable outputs • non-potential switchable contacts 1 A / 30 V • signal line of 0,5 A/24 V load	2 (PK2, PK3) 1 (LS)
Programmable inputs – monitoring lines • number	2 (LK2, LK3)
Maximum number of zones assigned to outputs (total number of assigns to PK, LS type outputs and EKS-4001, EWS-4001, UCS 4000, UCS 6000 line elements)	64,000
ENVIRONMENTAL PARAMETERS	
Transportation temperature	- 25 °C ... + 55 °C
Operation temperature	- 5 °C ... + 40 °C
Allowable operation relative humidity	80 % at + 40 °C
DESIGN PARAMETERS	
Casing ingress protection	IP 30
Dimensions (without fixings)	420 x 384 x 115 mm
Mass (without batteries)	< 7 kg
Liquid crystal display (graphical) of resolution at	320 x 240 pixels
INTEROPERATION WITH DEVICES/SYSTEMS	
PS/2 standard computer keyboard	PS/2
PC computer	USB or RS-232
POLON 4000 system digital monitoring system (PMC 4000)	USB or RS-232
TSR-4000 terminal maximum number of terminals connected to control panel	16
CONTROL PANEL OPERATION	
Variable, program executed depending on premises fire scenario requirements	

4 DESIGN DESCRIPTIONS

4.1 Overall control panel description

The control panel is made in the form of a metal cabinet intended for wall mounting. The cabinet door, which is also the control panel front side, is equipped with a cylinder lock.

All signalling and handling elements are located on the control panel door. Electronic circuit modules and a mains power supply unit are placed inside the cabinet.

Round holes are provided (at the control panel back side top) for installation wires introduction. Below, there is a round rubber pass for introducing of mains power supply and grounding wires. It is possible to place two 12 V 17 – 22 Ah capacity batteries inside the cabinet on its floor.

4.2 Module arrangement

The POLON 4100 control panel module arrangement is shown on Fig. 4.1.

Note:
Any module installation or removal can be carried out only with disconnected power supply sources.

4.3 Handling and signalling elements

4.3.1 Optic LED indicators

The signalling and handling elements are placed on the control panel door, which is called the TSO-4100 signalling and controlling board or, in other words, the user's console. Fig. 2 presents the signalling and handling elements arrangement.

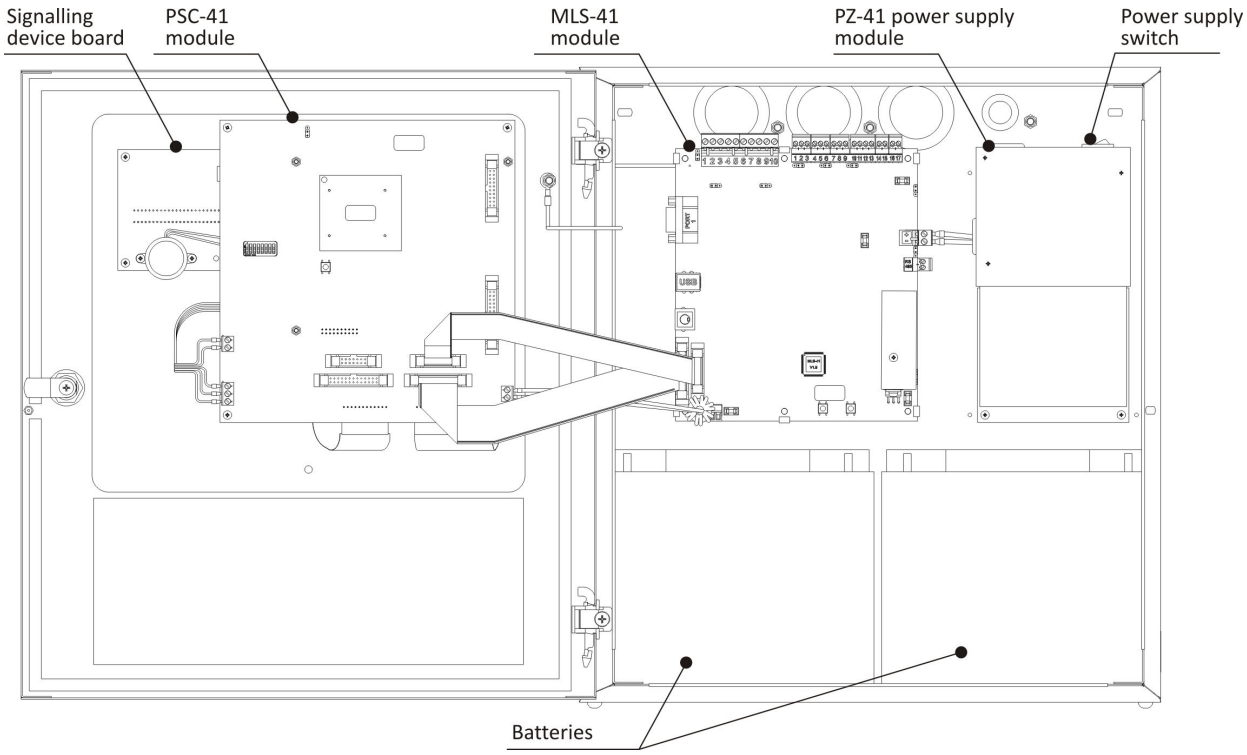


Fig. 4.1 POLON 4100 control panel main elements arrangement

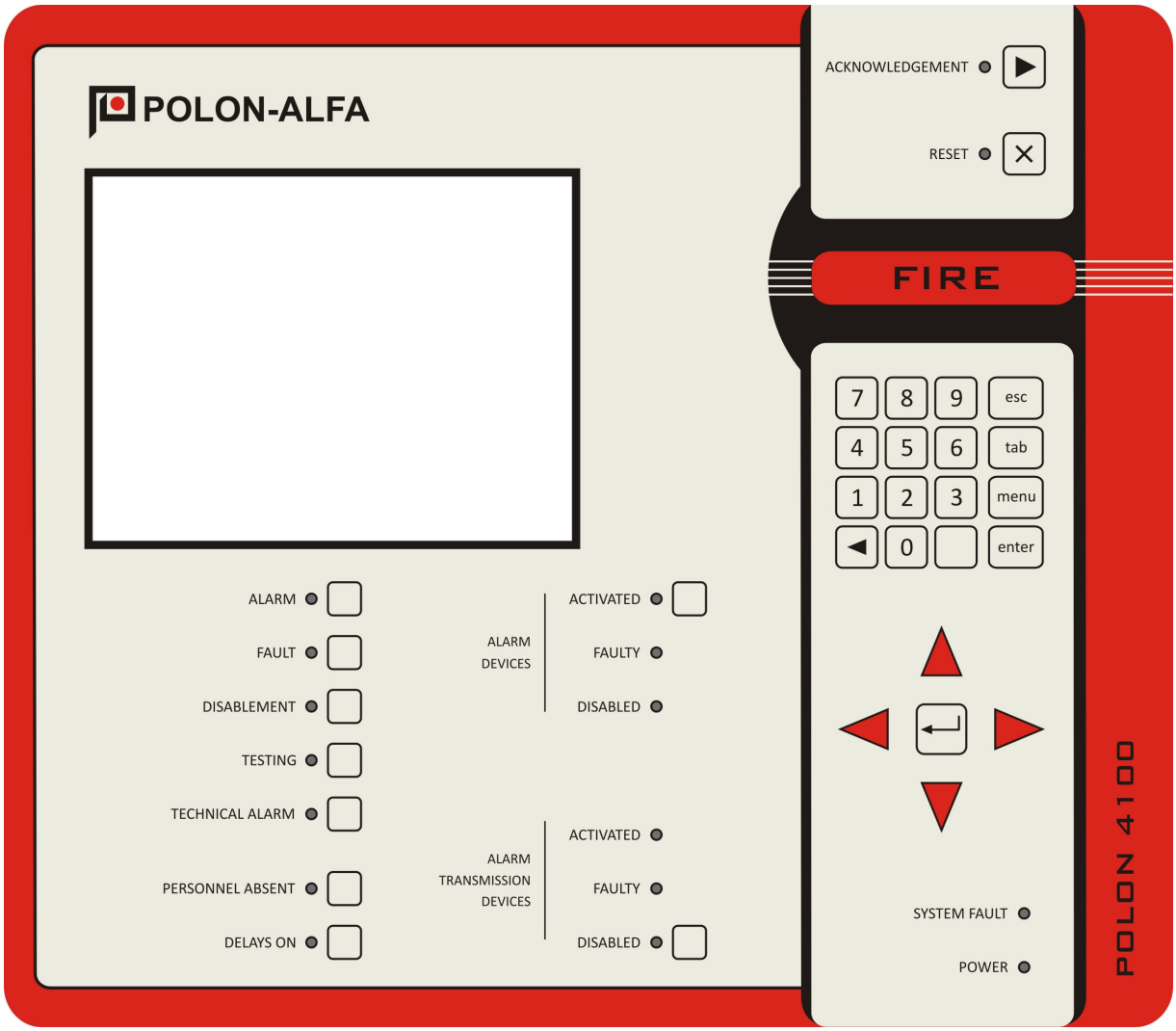


Fig. 4.2 Signalling and handling elements located on the control panel front panel

4.3.2 Control panel handling and signalling elements

Fig. 4.3 Control panel handling and signalling elements

NAME	INDICATOR – Description	PUSH BUTTON – Description
ACKNOWLEDGEMENT	An active confirmation function	Silencing of the buzzer located in the control panel in a fire alarm, technical alarm and fault mode; in the case of two-stage alarming it activates T2 time
RESET	An active reset (cancellation) function	Fire alarm reset (cancellation)
ACTIVATION OF ALARM TRANSMISSION DEVICES	Activation of at least one alarm transmission output	
FAULT OF ALARM TRANSMISSION DEVICES	Fault of alarm transmission outputs	
DISABLEMENT OF ALARM TRANSMISSION DEVICES	Disablement (blockade) of alarm device outputs ***continuous signalling*** – all outputs are disabled, ***flashing signalling*** – some outputs are disabled	Switching on/off all alarm transmission device outputs (except permanently disabled outputs)
ACTIVATED ALARM DEVICES	Activation of at least one alarm output	Switching on/off all alarm device outputs that meet actuation criterion (except permanently disabled outputs)
FAULTY ALARM DEVICES	A fault of some or all alarm device outputs	
DISABLED ALARM DEVICES	Disablement (blockade) of alarm device outputs ***continuous signalling*** – all outputs are disabled, ***flashing signalling*** – some outputs are disabled	
ALARM	Collective – of preliminary alarm or fire alarm ***continuous signalling*** – preliminary alarm or fire alarm is confirmed, ***flashing signalling*** – preliminary alarm or fire alarm is not confirmed	Fast access to technical alarm messages
FAULT	Collective – of faults ***continuous signalling*** – a fault is confirmed, ***flashing signalling*** – a fault is not confirmed	Fast access to fault messages
DISABLEMENT	Collective of disablement (blockade) ***continuous signalling*** – disablement switched on	Fast access to disablement messages

NAME	INDICATOR – Description	PUSH BUTTON – Description
TEST	Collective of tests being carried out ***continuous signalling*** – testing switched on	Fast access to test messages
TECHNICAL ALARM	Collective of technical alarm ***continuous signalling*** – a technical alarm is confirmed, ***flashing signalling*** – a technical alarm is not confirmed	Fast access to technical alarm messages
PERSONNEL ABSENT	***Personnel absent*** mode	***Personnel absent*** mode switching on/off
DELAYS ON	Delays switching on	Switching on/off all delay times (T1, T2, T3, Top)
SYSTEM FAULT	A system (microprocessor circuits) fault	
POWER	Control panel power supply ***continuous signalling*** – control panel supplied from mains, no faults, ***flashing signalling*** – any power supply fault	

4.3.3 Numeric keypad and edition push buttons

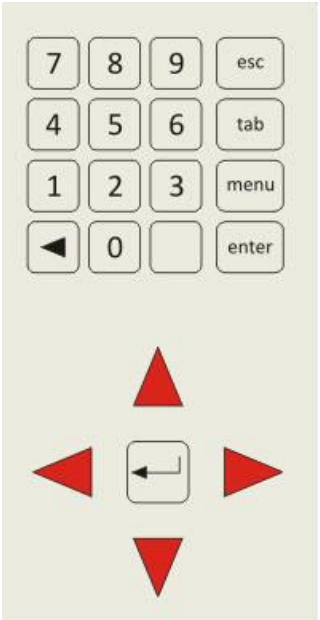
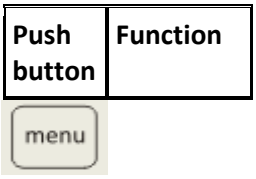
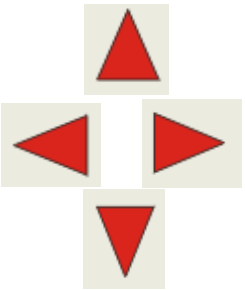


Fig. 4.4 Numeric keypad and edition push buttons

	0...9 numeric keypad
	menu control panel main menu display
	esc current operation aborting
	enter activation of a currently selected menu option and moving the cursor to the beginning of the next line (during communique/message edition)
	tab movement from one menu window to another
	backspace deleting the character to the left of the cursor and moving the text backwards one character space
	space unmarked key – inserting one character space in the cursor location
	cursors

Note:
Alternatively to the keypad located on the control panel door, a PS/2 computer keyboard can be used if it is connected through a socket placed on the MLS-41 module.

5 OPERATION DESCRIPTIONS

5.1 General description

The POLON 4100 control panel is a microprocessor based module-construction device. The control panel block diagram is presented in Fig. 5.1.
Line elements installed in an addressable detection line, after receiving an appropriate signal from the control panel (element's address), send relevant signals back with information about their type and status. Information exchange between the line elements and the control panel is executed

through the MLS-41 module. After an analysis of the received signals, the module passes proper information through the control panel to the PSC-41 central controller. Then the information is processed and adequate signals for remaining circuits are produced.
The PSC-41 module, fulfilling the programmed operation procedures, controls – through a bus – the relays or signalling lines located on the MLS-41module.
The liquid crystal display, the PS-48 main fire indicator and acoustic signalling device module, signalling and servicing elements of the TSO-4100 panel, are controlled with the use of the µPC microprocessor. The TSO-4100 panel main purpose is to provide communication between the attending personnel and the control panel.
The MLS-41 module enables external devices control using 3 relay outputs (PK1-PK3), 1 controlling line (LS1) and 2 monitoring lines (LK1, LK2). Auxiliary connections are provided in the module: a socket to connect a computer keyboard, 1 RS-232 serial connector, and 1 USB port to connect a computer or digital monitoring, as well as the RS-485 output to connect the TSR-4000 parallel indication terminals. Additionally, the module produces the following power supply voltage:

1. operating voltage: + 24 V for the control panel and + 24 V voltage for the user,
2. insulated voltage power supply: + 27 V for detection lines
3. insulated power supply voltage: + 5 V for serial outputs,
4. power supply voltage: + 5 V for the LCD display.

The PZ-41 mains supply device is designed to provide the control panel operating voltage supply, in the case of the mains power supply outage – this function is fulfilled by a reserve battery panel.

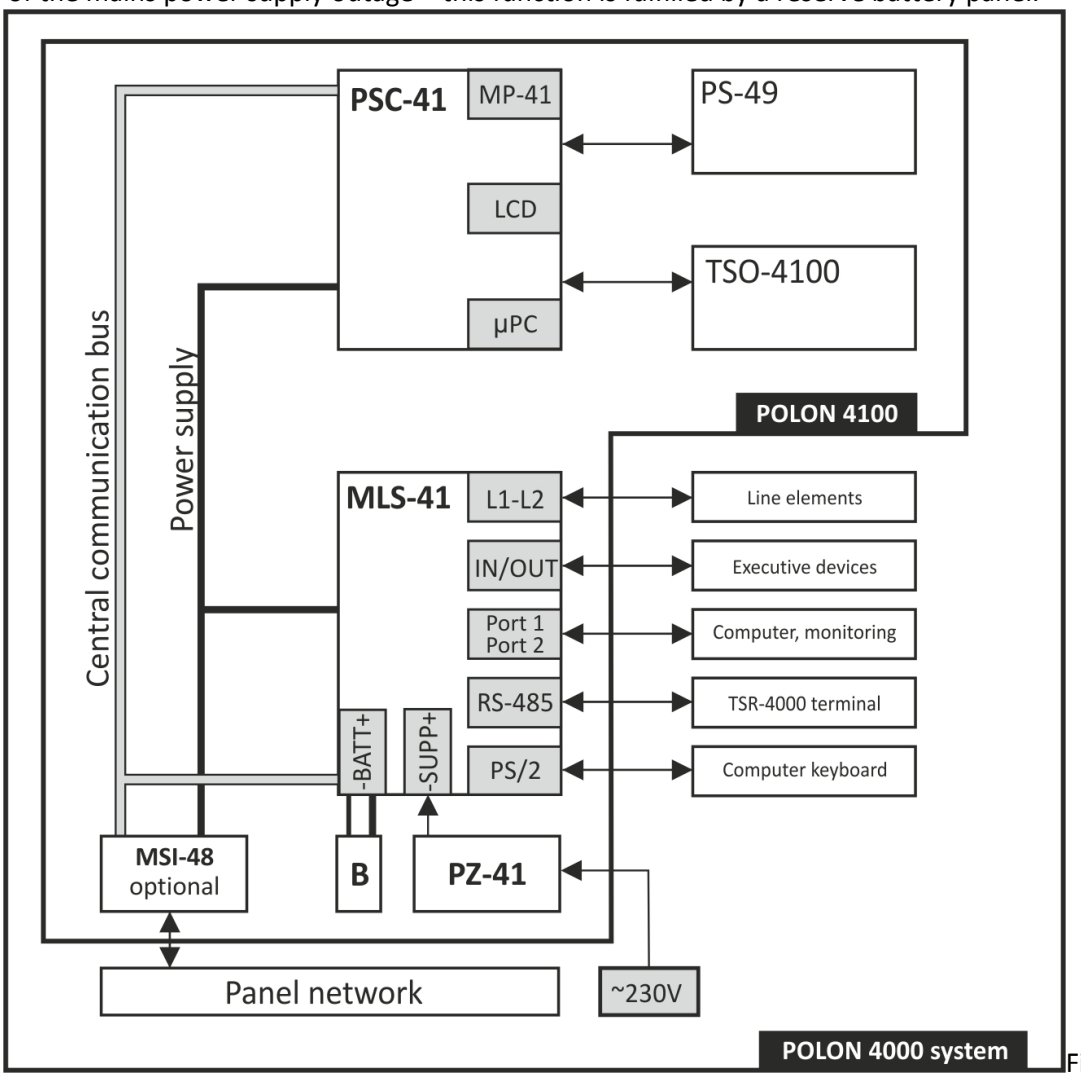


Fig. 5.1 POLON 4100 block diagram

5.2 PSC-41 central controller module

The PSC-41 central controller module is equipped with the µPC (logically identified as µP1) microprocessor circuit that ensures the control panel unfailing operation. The module is furnished with ROM program memory (located in a separated MP-41 module), RAM operational memory, and SETUP configuration memory (a database that determines the equipment environment and system operation arrangement).
The circuits that are provided for creation of the central panel communication bus for information exchange and other MLS-41 modules control are also located there.
The PSC-41 module is equipped with its own 5 V DC and 3 V DC converters to supply own and external electronic circuits.

5.2.1 Module signalling and handling elements

On the PSC-41 module left inner edge there are two illuminating diodes that indicate the module operation service status. A mini-switch, marked as Reset µPC, is located in the board back, which is used to perform the µPC microprocessor's restart (by a short button pressing). From the module left side, the SW1 switch is placed; the SW1 switch keys functions are described in Table 5.1.
In order to perform the K1 or K3 key operations described in Table 5.1, it is necessary to settle the appropriate SW1 switch key in ON position, push the Reset µPC unstable switch and, after ca. 30 s, to settle the SW1 switch key again in OFF position.

Table 5.1.

SW1 Key	Position	Function
K1	**ON**	After microprocessor µPC restart, standard system configuration loading
K2	**-**	Unused
K3	**ON**	After µPC microprocessor restart, loading standard access codes of 1st, 2nd and 3rd level
K4	**ON**	PSC-41 module servicing diodes switching on
K5	**-**	Unused
K6	**ON**	Authorisation for SYSTEM FAULT reset – the reset is executed after µPC microprocessor reset
K7	**-**	Unused
K8	**-**	Unused

Notes:
In case the SW1 switch key 1 is settled in ON position and the PSC-41 module is restarted, the previous system configuration is deleted and the standard one in loaded in its place.
Leaving the keys 1 and 3 in ON position can result in a loss of the entered data and is indicated as a fault.

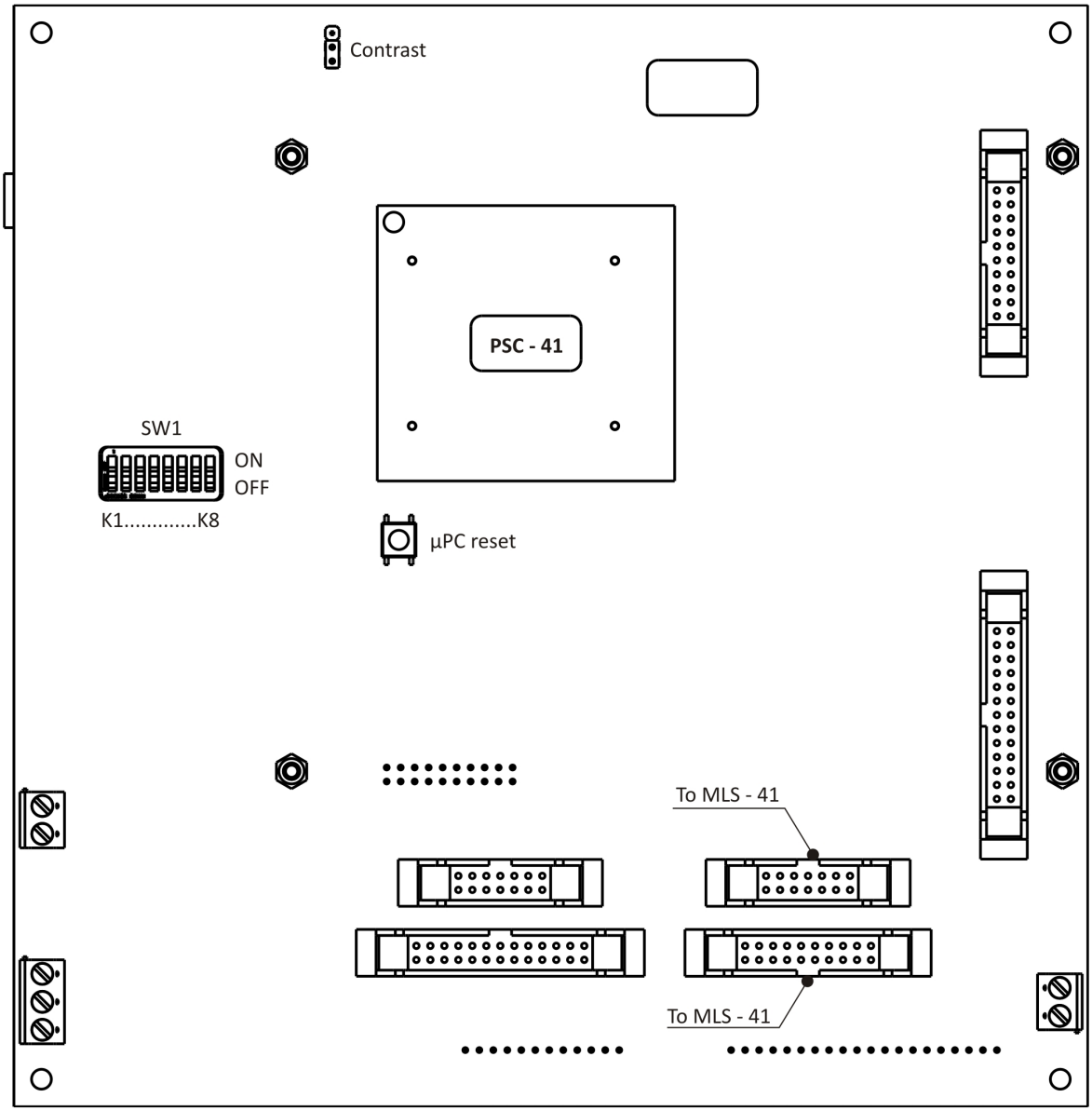


Fig. 5.2 PSC-41 central controller module

5.3 MLS – 41 line-controlling module

The POLON 4100 control panel is permanently equipped with the MLS – 41 line-controlling module that enables external fire detection and alarm system circuits connection. This module is furnished with:

- 2 L1 ÷ L2 addressable detection lines,
- 3 PK1 ÷ PK3 non-potential relays:
  - 1 PK1 (PU) non-programmable fault relay,
  - 2 PK2 ÷ PK3 programmable relays,
- 1 LS1 programmable signalling line of 0.5 A current efficiency,
- 2 LK1 ÷ LK2 programmable monitoring lines,
- 1 RS-232 serial port (PORT1) to connect a computer or monitoring station,
- 1 USB port (PORT2) to connect a computer or monitoring station,
- 1 port to connect a PS2 computer keyboard,
- 1 RS-485 serial port to connect the TSR-4000 parallel indication terminals,

- 1 power supply output for external devices supply – of 0.5 A load and 24 V voltage,
- controlling and power supply monitoring circuits (together with reserve power supply batteries).

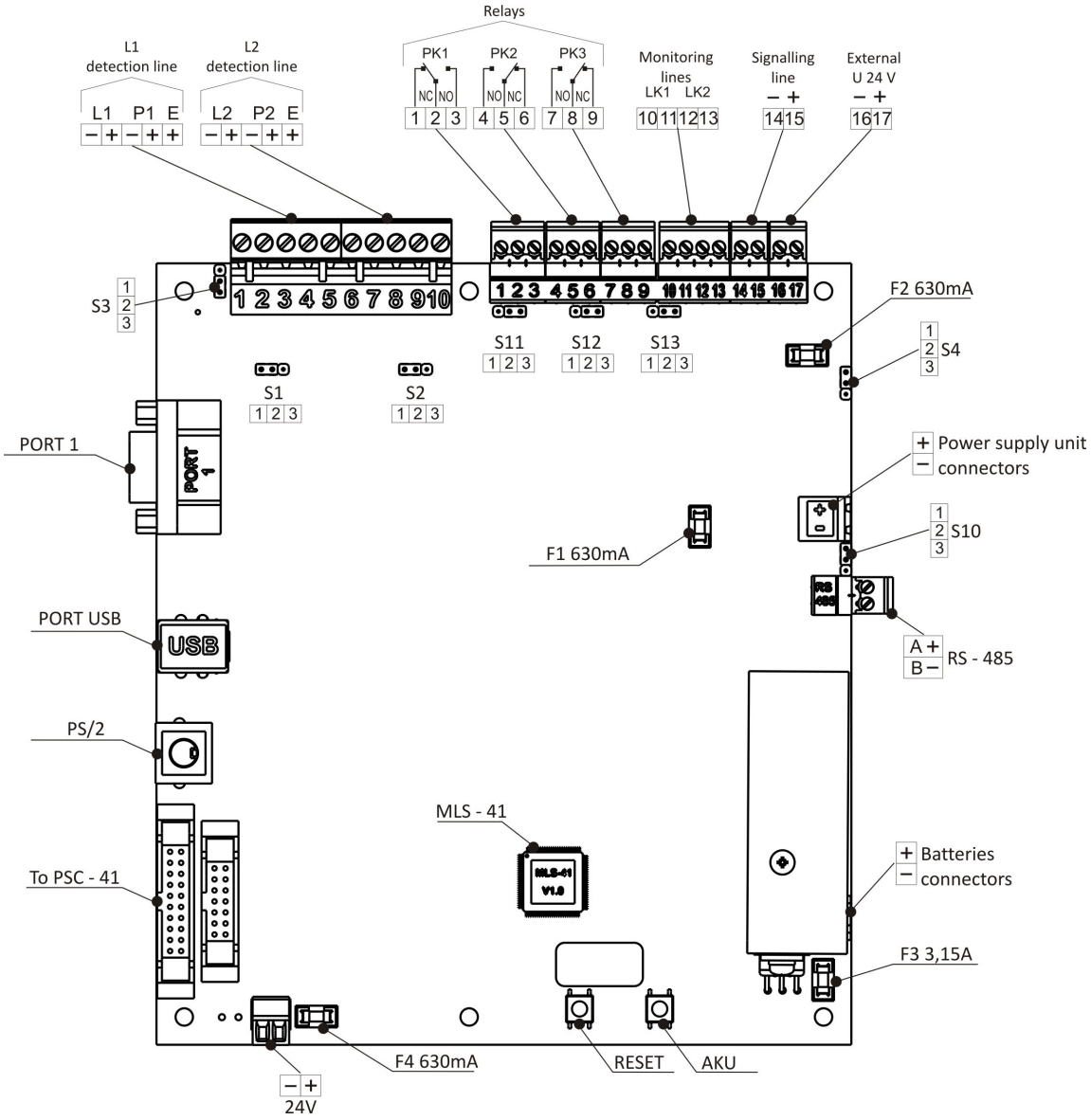


Fig. 5.3 MLS – 41 line-controlling module

5.4 Addressable detection lines

5.4.1 Detection lines types

Type A addressable detection lines – the POLON 4100 control panel loop-shaped lines are wire damage (short-circuit or break) resistant. This resistance is provided by the line loop shape and short circuit isolators built-in system addressable elements. Apart from this, it is possible to connect a B type open line – radial one, but in such configuration – according to the regulation in force – it cannot contain more than 32 fire warning devices. In loop-shaped lines, one line break does not eliminate any line element. The control panel, after a damage disclosure, signals it and activates the detection line monitoring from both ends. After the break repair, the damage fault signalling is automatically removed.

A detection line which operates without a loop forming, is not break-in-line resistant. A break results in switching off the line elements located between the break and the line end.
In radial detecting lines, after a short circuit disclosure, the closest before the short circuit isolator is automatically activated and the section located behind the isolator is cut off.
In the loop-shape layout, in case of the detecting line wires short circuit, two isolators located in the line elements closest to the short circuit occurrence are activated and – as a result of this – only the section placed between those two elements is cut off. It is not recommended to design detection lines with branches since a break or short circuit in a branch makes the elements located between the damage place and the side line end disconnected, regardless the detection line operates in loop-shaped layout or not. If the side line appears indispensable, it is advised to decrease as much as possible (less than a dozen) the number of the line elements installed in this line.
The POLON 4000 system detection lines should be routed as follows:

1. radial lines without branches,
2. loop-shaped lines with few branches are acceptable, but at least one addressable element should be installed between two neighbouring branches.

Such the lines routing way enables addressable elements automatic configuration.
When designing addressable detection lines, the program and electric requirements stated in Table 5.2 should be observed. Table 5.3 contains current-and-resistance parameters and the MLS-41 module configuration jumpers positions.

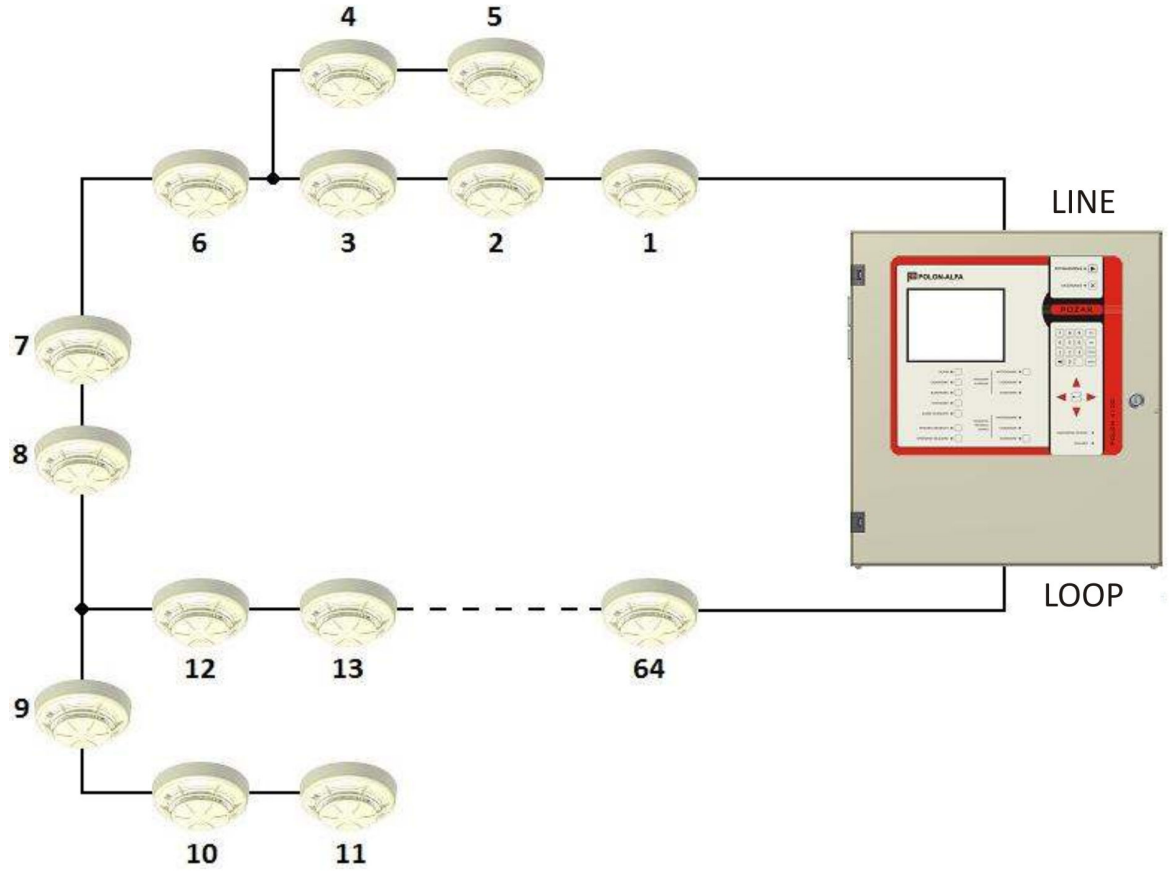
Table 5.2

Parameter	Value	Remarks
Number of elements max	64	32 for radial line
Current max	Pursuant to Table 5.3	
Line resistance max	2 x 100 Ω	
Line capacity max	300 nF	

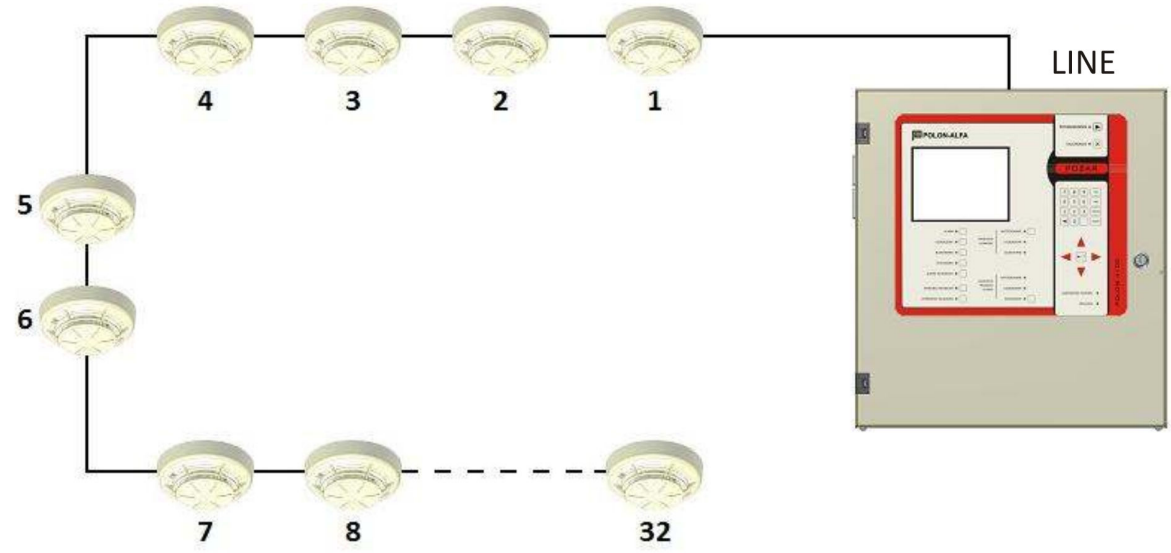
Table 5.3

Line No	Jumper	Jumper position	Max. current [mA]	Max. resistance [Ω]
L1	S1	1 - 2 1 - 2 2 - 3	20 22 50	2 x 100 2 x 75 2 x 45
L2	S2	1 - 2 1 - 2 2 - 3	20 22 50	2 x 100 2 x 75 2 x 45

Note:
In the case application of the ADC-4001M adapter with a grounded intrinsically safe barrier in a side line, it is necessary to switch the earth fault signal off, removing the S3 jumper in the MLS-41 module.



Loop-shaped line



Radial line

Fig. 5.4 POLON 4100 control panel exemplary detection lines

5.4.2 Addressable elements numbering

In POLON 4000 system each addressable element possesses a unique 12-digit number, which is also called the factory number, whereas the control panel in its normal operation refers to the addressable elements using a short number (the short number – a figure from 1 ÷ 64 range). During detecting lines configuration, every addressable element factory number is assigned to a consecutive element number.
In the POLON 4000 system addressable elements can be configured in three ways:

Automatic configuration
Elements installed in the main loop are numbered in ascending order from number 1 starting from the clamps marked as 'Lx' until the closest branch. Then the control panel allots consecutive numbers to the elements installed in the side line, until reaches its end. After completing allocation in the side line, it returns to the main line and continue numbering up to the next branch; afterwards the numbering process is performed in the same way as in the previous side line. The procedure is continued until all addressable elements set is used up. In this numbering method, the elements are always numbered from 1 up to n.

Configuration with verification
In this option it is necessary, on the basis of the circuit design and the control panel number allocation algorithm, to carry out a pre-declaration, i.e. to assign (from a keyboard or computer file) an element type to each number. Then a verification option should be run at the control panel. In case the element types declared for given numbers are consistent with the element types allocated in accordance with the required algorithm, the control panel automatically gives numbers to the addressable elements.

Manual number allocation
This method allows to assign numbers to addressable elements arbitrarily. Matching factory numbers with element numbers is carried out by typing the element number in the factory number box manually.
Manual number declaration in the whole detection line enables arbitrary elements configuration in this line (numbers allocation can be performed in any order, not necessarily abiding the numeration order.

Notes:
The ADC-4001M adapter with incorrectly assigned number can produce a detecting line overload. It is necessary to take the adapter out from its base and wait for at least 5 minutes. Reinstalled adapter shall draw only 150 μA from the line (the side line is automatically blocked). Before the adapter side line re-enablement, it should be assigned a proper operation mode in accordance with the programming manual. Since wireless radio detectors create a line branch, automatic configuration and configuration with verification is possible only in the case of the adapter installation in the detection line. If the adapter is installed in a radial line, its configuration should be carried our manually.

5.5 Design guidelines

Due to installation operation reliability, a loop-shaped detection line routing system should be applied. Radial lines should be used only exceptionally (e.g. in case a small number of detectors must be installed in a long distance).
When designing a detection line, each addressable element must be ascribed with its own address (element number), under which it shall be identified by the control panel. In order to assure the installation project clarity and service facilitation, it is recommended that the consecutively installed

elements possess consecutively increasing addresses – best if assigned in accordance with the control panel number allocation algorithm, which is utilized during automatic configuration.
The ADC-4001M adapters are fitted with an illuminating diode that signals a side line detector triggering. Therefore, such adapter can be installed in front of premises, instead of an actuation indicator. Regardless of this, it is possible to attach the WZ-31 actuation indicators to the ADC-4001M side line detectors as well as to 4043 and 4046 model range detectors.
It is recommended to use screened wires in the POLON 4000 system.
In the installation design process it is important to meet all requirements contained in technical specifications, it is necessary to pay special attention to the detection line capacity. The detection line appropriate resistance should be provided as well as resistance between neighbouring short circuit isolators.

5.6 Inputs-outputs

5.6.1 General description

Inputs and outputs enable external devices connection to the control panel, alarm and fault signal transmission, other units operation monitoring, etc. Inputs and outputs advanced software makes the panel flexible, allowing optional installation configuration.
The relay outputs marked PK2...PK3 can be supervised (in non-actuation state) regarding a short circuit or break in the relay output line.
The relay output line is supervised if the line continuity monitoring is declared during the relay programming.
The output line is properly supervised if in a quiescent more the controlled device is power supplied by voltage of **6...30 V** range and an appropriate jumper/bridge is set in the **1 - 2** position (Fig. 5.3).

Note:
The line continuity monitoring circuit draws less than 1 mA current from an external device and it can result in the device slight understeering. In case the device cannot be understeered, the line continuity monitoring circuit should be program blocked, declaring the lack of output monitoring and setting the output monitoring jumper in the **2 - 3** position.

5.6.2 PK relay and LS signal outputs

The PK1 relay output (PU – fault relay) is programmed permanently and operates as follows: The output is activated, if the control panel is in a fault mode (also in the case of complete power supply outage).
Other POLON 4100 control panel outputs: of relay type (PK2 ÷ PK3) as well as of potential type supervised (LS1) can be defined as:

TYP 0 - inactive output,
TYP 1 – fire alarm device output,
TYP 2 – fire alarm transmission device (monitoring) output,
TYP 3 – output protective devices,
TYP 4 – fault signalling output (to the fault signal transmission device),
TYP 5 – information output,
TYP 6 – deleting output (concerns only relays).

Depending on a given output defined type, it is possible to assign it a particular variant and specified actuation time parameters.

Table 5.4

Relay	State	Relay contacts state
PK1 (PU)	No faults, quiescent mode	Closed C-NC
	General fault	Closed C-NO
PK2 ÷ PK3	No actuation criterion	Closed C-NC
	Actuation criterion	Closed C-NO

Output actuation time parameters

Each output: PK relay type (except PU) as well as LS potential one can operate with a given switch-on time program (depending also on the output defined type).
Time dependence can be based on global parameters: **T1**, **T2**, **T3** and individual **Top**, or on a combination of those types and programming variants.

Table 5.5

Parameter	Range	Description
T1 time	00'00'' - 10'00''	Time to confirm a 1st stage alarm
T2 time	00'00'' - 10'00''	The control panel 2nd stage alarm triggering time without a reset after the 1st stage alarm confirmation
T3 time	00'00'' - 10'00''	Activation alarm outputs (TYPE 1) delay time counted from the moment of the 1st stage alarm triggering
Top time	00'00'' - 10'00''	Delay time individually programmed for each output

The LS supervised output potential line specifications
The potential output is a supervised output, i.e. it is tested by measurement of the potential line specific resistance in quiescent mode, in order to reveal a line damage, at reversed polarization way (negative) of the output voltage. The potential line resistance (together with connecting wires resistance) ranges between 2.7 kΩ and 16 kΩ. In case the line resistance is beyond the range mentioned, such a condition is treated as a fault and appropriately signalled at the control panel. After the output actuation – according to a proper actuation variant – the output voltage polarization is positive.

5.6.3 Fire alarm transmission device output (TYPE 1)

Table 5.6

Variant	Zone numbers	Time parameters	Actuation criterion
1	—	T3	The 1st stage alarm at the control panel or activation with the 'ACTIVATION' push button in the 'ALARMING DEVICES' field
2	0 ÷ 128	T3	The 1st stage alarm in assigned zones

Note:
Time elapsing is interrupted (the T3 time is set at 0 in the countdown time) and the alarm device outputs are immediately activated in case the control panels enters the 2nd stage alarm mode. If the T3 parameter is settled at the maximum level (10 min.), it is possible to obtain 'only from the 2nd stage alarm' actuation criterion.

In any time (quiescent mode) the fire alarm device outputs at an appropriate access level can be connected (provided it has not been permanently program disabled earlier) or disconnected with a push button located on the control panel front side:
ALARM DEVICES – ACTIVATED.

During a fire alarm the above mentioned button is used to switch the alarm devices off as well as to switch them on again (with an exception of the devices permanently program disabled). The output connection is indicated by a red diode in the box:

ALARM DEVICES – ACTIVATED.

The outputs disablement is indicated by a yellow diode in the box:

ALARM DEVICES – DISABLED - flashing – some outputs are disabled, steady – all outputs are disabled.

The outputs fault is indicated by a yellow diode in the box:

ALARM DEVICES – FAULTY.

5.6.4 Fire alarm transmission device output (TYPE 2)

Table 5.7

Variant	Zone numbers	Time parameters	Actuation criterion
1	—	T1, T2	The 2nd stage alarm at the control panel
2	0 ÷ 128	T1, T2	The 2nd stage alarm in assigned zones

In any time the fire alarm device outputs at an appropriate access level can be disabled and re-enabled (with an exception of the outputs permanently disabled) by pressing a push button located on the control panel front side:

ALARM TRANSMISSION DEVICES – DISABLED.

The outputs connection is indicated by a red diode in the box:

ALARM TRANSMISSION DEVICES – ACTIVATED.

The outputs disablement is indicated by a yellow diode in the box:

ALARM TRANSMISSION DEVICES – DISABLED - flashing – some outputs are disabled, steady – all outputs are disabled.

The outputs fault is indicated by a yellow diode in the box:

ALARM TRANSMISSION DEVICES – FAULTY.

5.6.5 Protective device output (TYPE 3)

Table 5.8

Variant	Zone numbers	Time parameters	Actuation criterion
1	—	T_{op}	The 1st stage alarm at the control panel
2	—	T_{op}	The 1st stage alarm at the control panel until acknowledgement
3	—	T_{op}	The 2nd stage alarm at the control panel
4	—	T_{op}	The 2nd stage alarm at the control panel until acknowledgement
5	0 ÷ 128	T_{op}	The 1st stage alarm in assigned zones
6	0 ÷ 128	T_{op}	The 1st stage alarm in assigned zones until acknowledgement
7	0 ÷ 128	T_{op}	The 2nd stage alarm in assigned zones
8	0 ÷ 128	T_{op}	The 2nd stage alarm in assigned zones until acknowledgement

5.6.6 Fault/technical alarm signalling output (TYPE 4)

Table 5.9

Variant	Zone/EKS/EWK numbers	Time parameters	Actuation criterion
1	—	T_{op}	General fault at the control panel
2	—	T_{op}	General non-maskable fault at the control panel
3	—	T_{op}	Technical general alarm at the control panel
4	—	T_{op}	General fault at the control panel until acknowledgement
5	—	T_{op}	General non-maskable fault at the control panel until acknowledgement
6	—	T_{op}	Technical general alarm at the control panel until acknowledgement
7	0 ÷ 128	T_{op}	Fault in a zone
8	1 ÷ 40	T_{op}	EKS fault inputs 1 ÷ 2
9	1 ÷ 40	T_{op}	EKS non-maskable fault inputs 1 ÷ 2
10	1 ÷ 40	T_{op}	EKS technical alarm inputs 1 ÷ 2
11	0 ÷ 128	T_{op}	Fault in a zone until acknowledgement
12	1 ÷ 40	T_{op}	EKS fault inputs 1 ÷ 2 until acknowledgement

13	1 ÷ 40	T_{op}	EKS non-maskable fault inputs 1 ÷ 2 until acknowledgement
14	1 ÷ 40	T_{op}	EKS technical alarm inputs 1 ÷ 2 until acknowledgement
15	—	T_{op}	Potential outputs fault
16	—	T_{op}	System fault
17	—	T_{op}	Power supply fault
18	—	T_{op}	Potential outputs fault until acknowledgement
19	—	T_{op}	System fault until acknowledgement
20	—	T_{op}	Power supply fault until acknowledgement
21	1 ÷ 40	T_{op}	EWK fault inputs 1 ÷ 8
22	1 ÷ 40	T_{op}	EWK technical alarm inputs 1 ÷ 8

Note:
Variants 1, 2, 4, 5, 15 and 16 should not be assigned to the LS potential line as it can cause (in the case of a break or short circuit in this line) those outputs improper operation.

5.6.7 Information output (TYPE 5)

The information output can be programmed to pass information about the system (control panel and line elements) status, which does not constitute a fire alarm mode or a fault mode.

Table 5.10

Variant	Time parameters	Actution criterion
1	—	Disablement mode
2	—	1 ÷ 128 zones disablement mode
3	—	Test mode
4	—	1 ÷ 128 zones test mode
5	—	Personnel absent

5.6.8 Reset output (TYPE 6)

The reset output concerns only relays and is designed for generating a reset impulse, which lasts ca. 4 seconds after a fire alarm reset. This type can be used for example to supply and reset the detectors that require separate power supply, e.g. flame detectors manufactured by DetTronics.

5.6.9 LK monitoring output

Each of two POLON 4100 control panel monitoring outputs can be programmed in the following variants:

1. to monitor external device actuation after an actuation criterion receipt from the declared relay output or potential output (for outputs of TYPE-1, TYPE-2, TYPE-3),

2. to monitor the external devices functioning,
3. as a technical alarm output.

The input status is analysed on the basis of measurement of the detection line specific resistance (Table 5.11). The specific resistance (together with connecting wires resistance) ranges between 2.7 kΩ and 16 kΩ. In case the detection line resistance is beyond the range mentioned, such a condition is treated as a confirmation of external device actuation (variant 1) or an external devices fault (variant 2).

At the control panel any improper status is respectively signalled as a fault in the case of:
1. lack of external device actuation confirmation at an alive actuation signal of the declared relay output or potential output,
2. external device fault disclosure.

Table 5.11

Variant	Function	PK or LS assigned output	Mode dependable on the detection line specific resistance	
1	Actuation monitoring	Not activated	Quiescent mode 2 k7< R < 16 k	Technical alarm R <0,9 k R > 30 k
		Activated	Non-maskable fault 2 k7< R < 16 k	Technical alarm R <0,9 k R > 30 k
2	Functioning monitoring	–	Quiescent mode 2 k7< R < 16 k	Non-maskable fault R <0,9 k R > 30 k
3	Technical alarm	–	Quiescent mode 2 k7< R < 16 k	Technical alarm R <0,9 k R > 30 k
R – line specific resistance, together with connecting wires resistance				

Monitoring inputs programming variants
Variant 1
A detection line input can be assigned to one of earlier declared outputs, relay type or potential one, defined as **TYP-1, 2, 3**. In this case this input can be used to monitor external device actuation after an actuation criterion receipt from the declared output. Such monitoring is performed after ca. 60 s from the moment of the declared output actuation (allowable activation delay time of the controlled device).
Exemplary use of a monitoring input assigned to a relay output or potential output are illustrated in Fig. 5.6 and Fig. 5.7.

Variant 2
A detection line input can be programmed to monitor functioning of for instance external devices. External device functioning monitoring consists in connecting the external device joint (which is usually opened) in parallel with an end-of-line resistor into the detection line circuit. A proper status is observed when the monitoring line specific resistance ranges between 2.7 kΩ and 16 kΩ. An exemplary joint connection into a monitoring line is shown in Fig. 5.8.

Variant 3
A detection line input can be can be programmed as a technical alarm input of a general purpose consisting in facilitating the installer specific needs. It operates as the external device function

monitoring input. In case resistance falling into the line technical alarm range is revealed, a technical alarm is evoked. An exemplary application is presented in Fig. 5.7 and Fig. 5.8.

Monitoring line outputs programming

Table 5.12

Variant	Monitored output type	Monitored output number	Monitoring type
0			Inactive input
1	1 – PK	2 ÷ 3	KZ actuation monitoring
	2 – LS	1	
2	–	–	KS functioning monitoring
3	–	–	AT technical alarm

Note:
The outputs defined as TYPE 4 should not be assigned to monitoring lines. It can result is mistaken status interpretation in the case of actuation variant assigning to a fault of detecting or potential lines circuits.

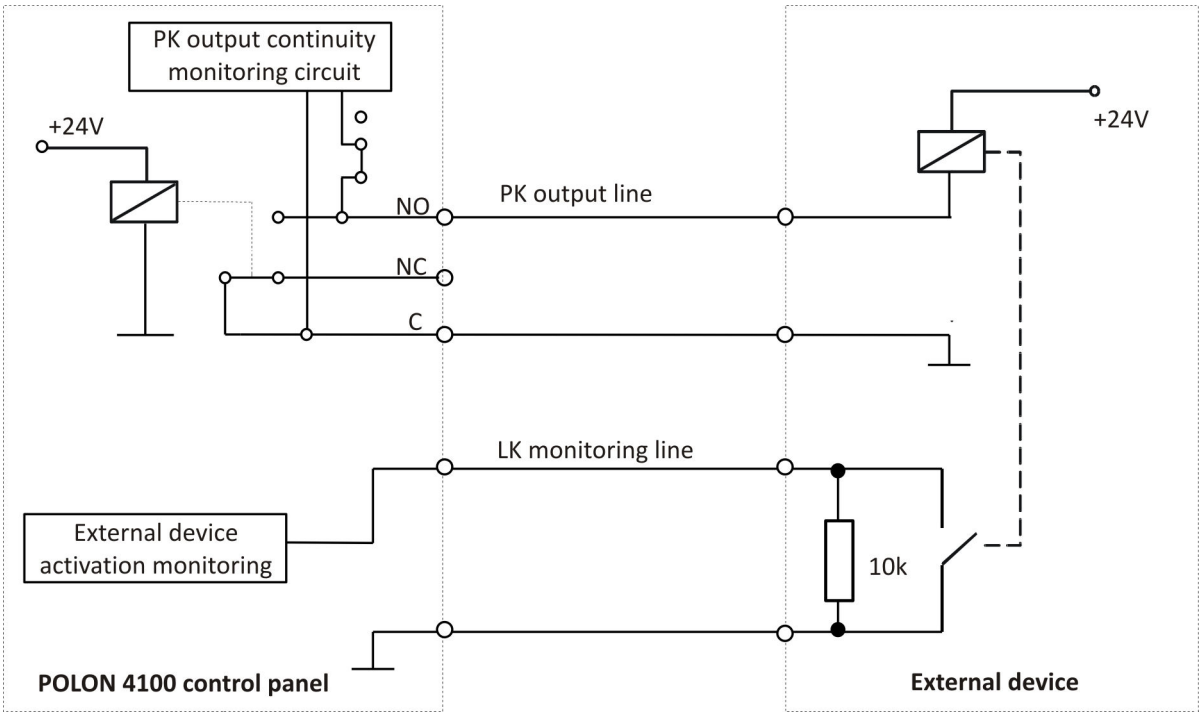


Fig. 5.6 Exemplary use of a monitoring line assigned to a relay output

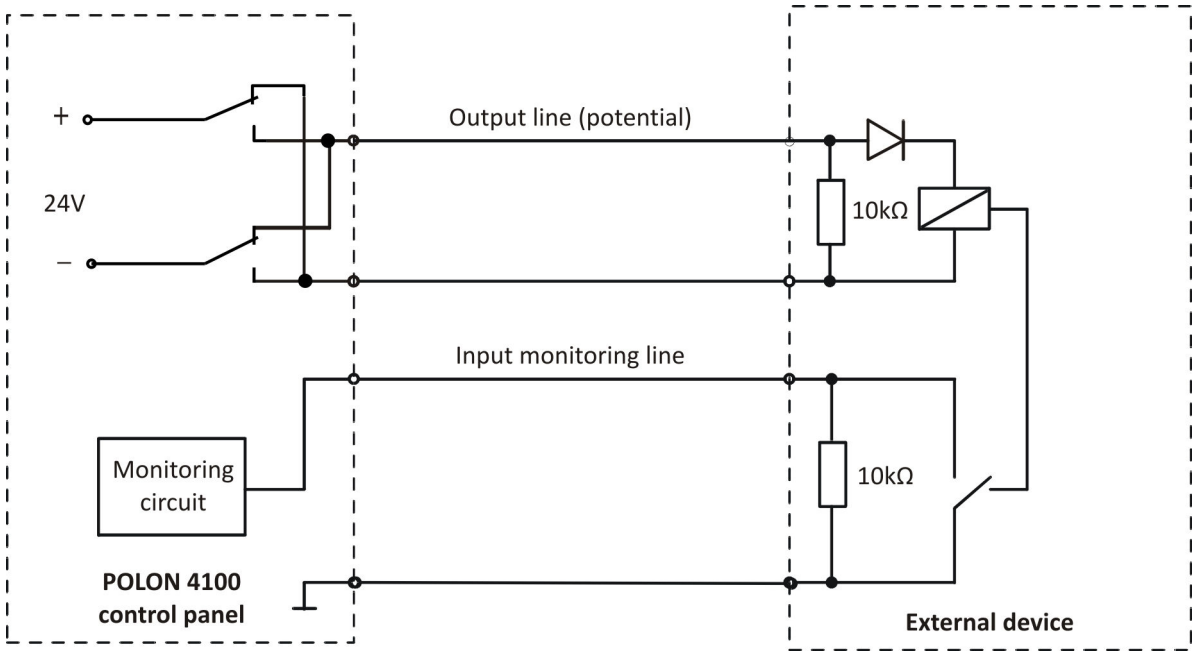


Fig. 5.7 Exemplary use of a monitoring line assigned to a potential output

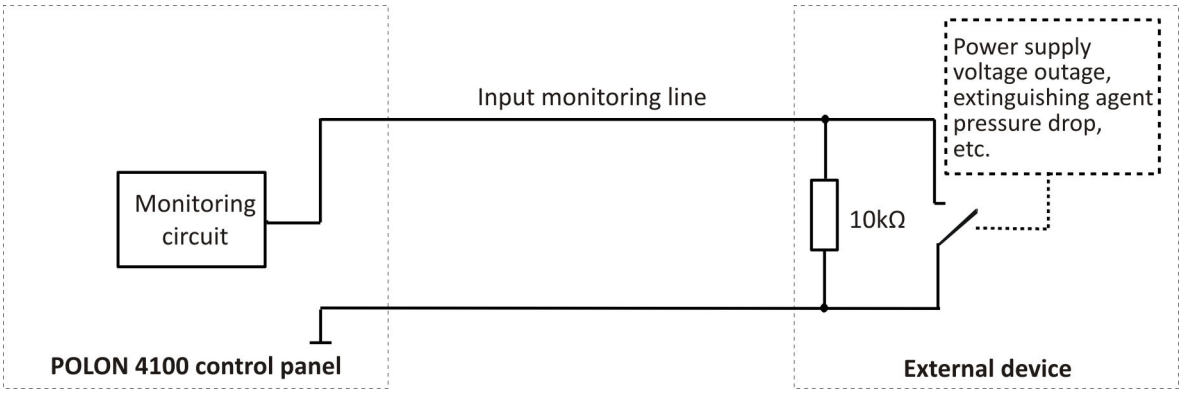


Fig. 5.8 Exemplary external device joint connection into a monitoring line

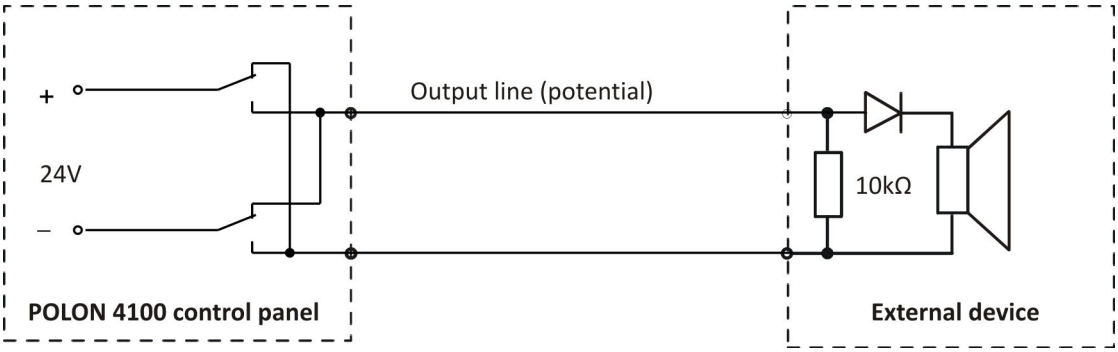


Fig. 5.9 Exemplary use of a potential line to switch an acoustic signalling device on

5.6.10 Serial ports

The following connectors are located on the MLS-41 module board: a RS-232 type serial port 9-pin joint and a RS-485 type 2-pin joint:

PORT 1 – to connect a computer, PMC-4000 monitoring or a serial printer,
USB – to connect a computer or PMC-4000 monitoring,
RS-485 – to connect the TSR-4000 parallel signalling terminal.

The serial ports (RS-232 and RS-485) and USB port are isolated from the control panel in a galvanic way.

Note:
A computer which is connected to the control panel, should be necessarily power supplied from the same source that the control panel; otherwise the difference between 'masses' of the computer and the control panel can cause the MLS-41 outputs fault.
Similarly, monitoring connection can bring the same result; therefore, the monitoring should be equipped with an output isolated in a galvanic way.

The serial port and the USB port are declarable (in accordance with the Programming Manual) and can be used for various purposes pursuantly to the declaration. The RS-232 port connection with external devices should be made with a standard computer cable applicable in connections with COM type serial outputs.

Table 5.13

PORT NO.	PORT TYPE	DESCRIPTION			
1 (RS)	0	Not declared			
2 (USB)		Speed [bps]	–	–	–
1 (RS)	1	Configuration from the computer			
2 (USB)		Speed [bps]	–	9600	19200
1 (RS)	2	PMC-4000 monitoring			
2 (USB)		Speed [bps]	2400	4800	9600
1 (RS)	6	Serial printer (normal print)			
		Speed [bps]	2400	4800	9600
1 (RS)	7	Serial printer (reverse print)			
		Speed [bps]	2400	4800	9600

The PMC-4000 protocol enables transmitting information of the following events to the control panel:

- fire alarms,
- technical alarms and their reset,
- 2nd stage alarm,
- deleting,
- confirmation,

- faults and their reset,
- non-maskable and their reset,
- tests and their reset,
- disablements and their reset,
- output actuations and their reset.

Moreover, the control panel remote handling option (SYSTEM CONFIGURATION -> REMOTE HANDLING -> HANDLING FROM MONITORING STATION: ENABLED) enables a remote alarm or fault confirmation, or remote alarm reset at the monitoring station.
The entire PCM-4000 protocol description is contained in a separate document.

Note to the PMC-4000 digital monitoring:
In order to activate the monitoring, the option PMC-4000 MONITORING in 'through RS-232 (PORT1)' should be settled in accordance with the Programming Manual.

5.6.10.1 Serial printer

The POLON 4100 control panel enable interoperation with a serial printer. The printer should be declared in accordance with the Programming Manual. Additionally, the printer should be configured as to its interoperation with the control panel (pursuantly to the printer operation manual), i.e. set the transmission parameters as per the control panel serial port settings:
- transmission speed at 2400 bps, 4800 bps or 9600 bps,
- 8 bits data (without parity);
Serial printer should support the Latin II coding standard. More detailed information – Marketing Department.

5.6.11 TSR-4000 terminal output

The MLS-41 module is equipped with one RS-485 type output to connect the TSR-4000 parallel signaling terminals (max 16).
Maximum length of the cable laid between the control panel and the last terminal should not exceed 1,200 m. It is recommended to use the YnTKSYekw. 1 x 2 x 0.8 mm installation cable. Detailed description of the terminals connection is contained in the ID-E305-001E Installation and Maintenance Manual of the TSR-4000 parallel signaling terminal.

5.6.12 Computer keyboard output

The MLS-41 module contains a socket to connect a PS/2 standard computer keyboard that can be used instead of the keypad in the handling area, and is necessary to enter the user messages. The keyboard declaration is needless.

5.7 Power supply

The POLON 4100 control panel can be power supplied from two sources:

1. 230 V/50 Hz alternating current mains as the basic power supply source,
2. 24 V direct current as the reserve power supply source in the form of battery panel.

The PZ-41 power supply module of 29 V rated voltage is equipped with a mains switch. It is a cuboid-shaped block, placed in the control panel upper-right corner, supplying all control panel modules and enabling interoperation with the battery panel through the MLS-41 module.

In the case of a 230 V/50 Hz mains voltage outage, the control panel switches over to the reserve power supply from the battery panel automatically, without any disruption in its operation. When mains voltage reappears, the power supply unit charges the batteries until reaching the terminal charge voltage; afterwards it switches to buffering mode.

The MLS-41 module contains:

1. input clamps to connect:
   - battery panel (AKU), secured with an F3 / 3.15 A fuse.
2. output clamps of the following voltages:
   - 24 V the control panel operating voltage, secured with an F4 / 630 mA fuse,
   - 24 V external device supply voltage, secured with an F2 / 630 mA fuse.

In the case of mains voltage outage, no voltage of the battery panel or external device supply fusing a collective FAULT indicator is lit and the POWER indicator is flashing at the TSO-4100 panel; additionally, an appropriate acoustic signal is evoked. The fault readout can be accomplished using the FAULT push button as described in the Programming Manual.

5.8 Control panel interoperation with battery panel

The POLON 4100 control panel interoperates with a battery panel composed of two 12 V air-tight batteries of 17 – 22 Ah capacity. The battery panel should be connected to the clamps marked with – AKU+ on the MLS-41 module board.

Batteries assembling, operation and utilisation should be carried out according to the batteries manufacturer's manual. Waste batteries should be obligatory recycled pursuant to the regulation in force.

6 ALARMING SYSTEM/STRUCTURE

The POLON 4100 control panel alarming system and other programmable parameters should be determined at the circuit design stage. For this purpose, taking into consideration the protected premises conditions, it is necessary to fill in the designer's tables, which constitute an inseparable part of the design and should be available to the circuit commissioning and servicing teams.

The alarming system programming is performer as follows:

1. declaration of addressable elements, zone assignment, operation modes, and groups,
2. declaration of alarm variants, user messages,
3. programming alarm general parameters (T1, T2, T3 times),
4. programming actuation variants and monitoring of all inputs and outputs of monitoring and controlling elements.

6.1 Detection zone

Addressable elements must be program divided into detection zones. It is possible to create up to 128 zones in the control panel. According to the standard, up to 32 line elements can be assigned to one zone. Zones, which are assigned with no element, are called empty or inactive. Zones are created in order to describe any supervised area with a defined set of line elements, in the way that enables their installation place. Moreover, a zone enables programming a proper alarm variant that eliminates false alarms in case of premises of high level of alarm warning devices accidental actuation probability.

The area of one zone can be divided into two alarm warning device group, marked as A and B. Every fire warning device must be assigned to one of those groups at the programming stage. Groups of fire elements (A/B) are created in order to program a group coincidental alarm variants, at the most eliminating false alarms.
Every zone can be personalized with a text message (the user message) of up to two text lines of 32 characters each. In case an alarm is received from a particular zone, the text is displayed on the LCD, indicating exact fire location.

6.2 Addressable elements declaration

The control panel receives information and control operation of addressable elements, which are declared (operationally assigned) by the user. In the standard configuration (that the user receives) no addressable element is declared. Until declaration, no signal concerning type and status of line elements is being received but every 2 minutes the control panel checks coherence of the elements installed in the addressable detection line with the declared ones and – in case an inconsistency is revealed – it signals a fault, which type me be red out.

An element declaration consists in defining its address of:

1. line number,
2. element number,
   and stipulating the following data concerning this address:
3. factory number (entering the number either manually or using a car code reader),
4. zone number or logical number:
   - zone number from 1 ÷ 128 range in the case of a fire warning device,
   - logical number from 1 ÷ 40 range for EKS-4001, SAL-4001, EWS-4001, EWK-4001, UCS 4000, UCS 6000 element number,
5. group (within the stated zone) A or B in the case of a fire warning device,
6. operation mode (depending on particular possibilities and needs, for each type of elements).

Addressable element declaration can be preceded by automatic configuration or configuration with verification; those operations enable assignment of consecutive elements numbers to their factory numbers.
An improper type assignment to an addressable element is revealed and indicated by the control panel as a fault.

Note:

1. Any quantity of fire warning devices can be installed in one detecting zone but it is recommended to install not more than 32 fire warning devices.
2. Logical numbers for any line element can be repeated only in the case of different element types, e.g. 35 logical number can be possessed at the same time by one element of the device group: EKS, EWK, EWS, SAL and UCS.

6.3 Assigning alarming parameters to zones

In order to group addressable elements, installed in the supervised premises, the territory is divided into zones (separated parts of the premises, rooms, etc.) in the POLON 4100 control panel it is possible to create up to 128 detection zones. Every zone can be described with the user message composed of two text lines up to 32 characters each.
Zone creation means to assign an addressable element with a short number to the zone number, according to the PM.

The POLON 4100 control panel ensures a possibility to choose an alarm method for a particular zone, one of 17 available ones.
Alarm variants should be matched so that they guarantee early and at the same time dependable fire danger detection. Alarm variants descriptions are contained in p. 8.1 of this Manual. As default, the control panel is programmed with the variant 2 in all zones. The alarm variants can be divided into two groups considering an alarm triggering way:

1. one-stage alarming (variants 1, 3, 4, 7, 9, 11, 17),
2. two-stage alarming (variants 2, 5, 6, 8, 10, 12, 13, 14, 15, 16).

Alarming is performer according to the programmed variants only in the case of PERSONNEL PRESENT operation mode. If the PERSONNEL ABSENT mode in set, alarming shall be performed in all zones, regardless of the programmed variants, pursuantly to one-stage variant (variant 1) that immediately generates the 2nd fire alarm at the control panel. Alarming as per the variants is not executed also in the case of a manual call point (ROP) triggering since such a situation is treated in different way than signals by other addressable element – the control panel evokes the 2nd fire alarm without any delay. The program alarm variants assignment to zones should be carried out together with the user message declaration according to the PM.

6.4 EKS-4001 monitoring and controlling elements declaration

EKS-4001 monitoring and controlling element (hereinafter called ‘EKS’) is a line element that enables activation and supervising of fire protection devices, e.g. smoke exhaust dampers, doors, sounders, optic signalling devices, etc. A single EKS (assembled in cases consisting 1, 2 or 3 devices) is equipped with one controlling relay output and two monitoring inputs. Each of two monitoring inputs can indicate – depending on the programmed operation mode and specific resistance – one of the following modes:

1. supervision,
2. fault,
3. non-maskable fault,
4. technical alarm.

The EKS proper programming consists of a line element declaration (similarly to fire warning devices) and its assignment to a logical number.
The EKS logical number is a figure from the 1 ÷ 40 range, which is assigned to the element in order to enable the EKS variant declaration depending on various events in the control panel, and to assign appropriate user messages. Each EKS type element can be assigned only to one logical number and reversely. In programming meaning – with some simplification – it can be stated that for the EKS element a logical number is an equivalent of a zone for fire elements. The EKS element is linked with actuation variants and the user messages for monitoring inputs just through the logical number.
The EKS-4001 operation way is a resultant of the element programmed operation mode and the output relay activation variant.
The entire EKS-4001 programming process is completed in two stages.

Table 6.1

1st stage – EKS-4001 declaration						
Parameter		**Value/Figure**				
Element number		1 ÷ 64				
Logical number		1 ÷ 40				
Operation mode:	Parameter	—				
	OUT continuity control	YES		NO		
	IN 1 actuation control	YES (40 s)	YES (70 s)	YES (130 s)	NO	
	IN 2 actuation control	YES (40 s)	YES (70 s)	YES (130 s)	NO	
	IN 1 operation way	NC		NO		
	IN 2 operation way	NC		NO		
	OUT actuation delay	0	30 s	60 s	90 s	
2nd stage – EKS-4001 logical configuration						
Parameter		**Value/Figure**				
Variant		15 (Table 6.2)				
Set of assigned zones		1 ÷ 128				
Set of assigned own inputs and other EKS's		EKS	1 ÷ 40	inputs	1 ÷ 2	
Set of assigned inputs of other EWK's		EWK	1 ÷ 40	inputs	1 ÷ 8	
Technical alarm message		2 x 32 characters				
Non-maskable fault message		2 x 32 characters				

EKS-4001 output relay activation variants
For variants with additional zone dependence: zone number = 0 means dependence on a 'union' or 'conjunction' (depending on a variant) of the events from any control panel zones that belong to the common supervision area.

Table 6.2

Variant	**Zone/EKS/EWK numbers**	**Actuation criterion**
0	—	Inactive output
1	—	General 1st stage alarm
2	0 ÷ 128	'union' of 1st stage alarms in assigned zones
3	0 ÷ 128	'conjunction' of 1st stage alarms in assigned zones
4	—	General 2nd stage alarm
5	0 ÷ 128	'union' of 2nd stage alarms in assigned zones
6	0 ÷ 128	'conjunction' of 2nd stage alarms in assigned zones
7	—	General fault in the control panel

8	—	General non-maskable fault in the control panel
9	—	General technical alarm in the control panel
10	0 ÷ 40	'union' of faults of assigned EKS inputs
11	0 ÷ 40	'union' of non-maskable faults of assigned EKS inputs
12	0 ÷ 40	'union' of technical alarms of assigned EKS inputs
13	0 ÷ 40	'union' of faults of assigned EWK inputs
14	0 ÷ 40	'union' of technical alarms of assigned EWK inputs
15	—	Reset output
16	—	Alarming device – general 1st stage alarm
17	0 ÷ 128	Alarming device – 'union' of 1st stage alarms in assigned zones

Variant 0
Means lack of the EKS actuation criterion (permanently non-activated output).

Variant 1 – general 1st stage alarm
The output activation is performed in the case of a 1st stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 2 – 'union' of 1st stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 3 – 'conjunction' of 1st stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least two zones that are assigned to this relay.

Variant 4 – general 2nd stage alarm
The output activation is performed in the case of a 2nd stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 5 – 'union' of 2nd stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 6 – 'conjunction' of 2nd stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least two zones that are assigned to this relay.

Variant 7 – general fault in the control panel
The output activation is performed in the case of a general fault occurrence in the control panel or any control panels of the common supervision area.

Variant 8 – general non-maskable fault in the control panel

The output activation is performed in the case of a general non-maskable fault occurrence in the control panel or any control panels of the common supervision area.

Variant 9 – general technical alarm in the control panel
The output activation is performed in the case of a general technical alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 10 – 'union' of faults of assigned EKS inputs
The output activation is performed in the case of a fault occurrence in at least one assigned input of the assigned EKS's. The assigned inputs can be own inputs of the controlled EKS.

Variant 11 – 'union' of non-maskable faults of assigned EKS inputs
The output activation is performed in the case of a non-maskable fault occurrence in at least one assigned input of the assigned EKS's. The assigned inputs cannot be own inputs of the controlled EKS.

Variant 12 – 'union' of technical alarms of assigned EKS inputs
The output activation is performed in the case of a technical alarm in at least one assigned input of the assigned EKS's. The assigned inputs can be own inputs of the controlled EKS.

Variant 13 – 'union' of faults of assigned EWK inputs
The output activation is performed in the case of a fault occurrence in at least one assigned input of the assigned EWK's.

Variant 14 – 'union' of technical alarms of assigned EWK inputs
The output activation is performed in the case of a technical alarm in at least one assigned input of the assigned EWK's.

Variant 15 – reset output
The reset output is provided in order to generate a resetting impulse, lasting for ca. 1.5 s, after fire alarm reset. This type can be utilized for instance for power supply and reset of detectors that require a separate power supply, e.g. flame detectors manufactured by Det -Tronics.

Variant 16 –alarming device – general 1st stage alarm
This variant output is treated in the system as an alarming device.
The output activation is performed in the case of a 1st stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 17 –alarming device – 'union' of 1st stage alarms in assigned zones
This variant output is treated in the system as an alarming device.
The output activation is performed in the case of a 1st stage alarm occurrence in at least zone assigned to this relay.

Output relay actuation variants are programmed only for an EKS that possesses a logical number.
In the case of variant 2 and variant 5 application, at least one zone should be assigned to an EKS, whereas in the case of variant 3 and variant 6 application, at least two zones should be assigned. Variants 1 and 4 do not require any zone assignation.
The total assignments number of zones, EKS's and EWK's to all executive outputs and SAL type elements in the control panel should not exceed 64,000.

Note:
Output non-maskable fault can occur only during the output actuation check. For example, for the 'Yes' mode (40 s), if during 40 s after actuation, a technical alarm mode has occurred and afterwards

the line resistance has changed for the one that corresponds to a non-maskable fault, such a non-maskable fault is not signalled yet.
A non-maskable fault is also not signalled if the output is settled at variant 0.
After the standard configuration loading and automatic configuration performance, EKS elements are assigned to a special logical number 0, which causes that such an element is inactive.

An exemplary drawing showing the EKS-4001 element use of is included in the shown in the EKS-4001 'Installation and Maintenance Manual".

6.5 EWS-4001 multi-output controlling elements declaration

The EWS-4001 multi-output controlling element (hereinafter called 'EWS') is a line element designed to control various fire protection equipment, e.g. smoke exhaust dampers, doors, sounders, optic signalling devices, etc. The EWS is furnished with 8 controlling relay outputs. It is possible to install up to 20 EWS elements in one detection line.
The EWS proper programming consists of a line element declaration (similarly to fire warning devices) and its assignment to a logical number.
The logical number is a figure from the 1 ÷ 40 range, which is assigned to the element in order to enable the EWS variant declaration depending on various events in the control panel.
Each EWS type element can be assigned only to one logical number and reversely. In programming meaning – with some simplification – it can be stated that for the EWS element a logical number is an equivalent of a zone for fire elements. The EWS element is linked with actuation variants just through the logical number. It is necessary to assign a logical number and actuation variant.
The EWS-4001 operation way depends on output relay activation variants assignment to particular outputs.

The entire EWS-4001 programming process is completed in two stages.

Table 6.3

1st stage – EWS-4001 declaration	
Parameter	**Value/Figure**
Element number	1 ÷ 64
Logical number	1 ÷ 40
2nd stage – EWS-4001 logical configuration	
Parameter	**Value/Figure**
Variant	7 (Table 6.4)
Set of assigned zones	1 ÷ 128

The EWS-4001 relay outputs activation variants

Table 6.4

Variant	Zone/EKS/EWK numbers	Actuation criterion
0	—	Inactive output
1	—	General 1st stage alarm

2	0 ÷ 128	'Union' of 1st stage alarms in assigned zones
3	0 ÷ 128	'Conjunction' of 1st stage alarms in assigned zones
4	—	General 2nd stage alarm
5	0 ÷ 128	'Union' of 2nd stage alarms in assigned zones
6	0 ÷ 128	'Conjunction' of 2nd stage alarms in assigned zones
7	—	Reset output

Variant 0

Means lack of the EWS actuation criterion (permanently non-activated output).

Variant 1 – general 1st stage alarm
The output activation is performed in the case of a 1st stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 2 – 'union' of 1st stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 3 – 'conjunction' of 1st stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least two zones that are assigned to this relay.

Variant 4 – general 2nd stage alarm
The output activation is performed in the case of a 2nd stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 5 – 'union' of 2nd stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 6 – 'conjunction' of 2nd stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least two zones that are assigned to this relay.

Variant 7 – reset output
The reset output is provided in order to generate a resetting impulse, lasting for ca. 1.5 s, after fire alarm reset. This type can be utilized for instance for power supply and reset of detectors that require a separate power supply, e.g. flame detectors manufactured by Det -Tronics.

Note:
Variant 7 is active only for the EWS element outputs 1 and 2.
Output relay actuation variants are programmed only for a EWS that possesses a logical number.
In the case of variant 2 and variant 5 application, at least one zone should be assigned to the EWS, whereas in the case of variant 3 and variant 6 application, at least two zones should be assigned. Variants 1 and 4 do not require any zone assignation.

The total assignments of zones to all executive outputs and SAL type elements in the control panel should not exceed 64,000.

Note:

Output non-maskable fault can occur only during the output activation check. For example, for the 'Yes' mode (40 s), if during 40 s after activation, a technical alarm mode has occurred and afterwards the line resistance has changed for the one that corresponds to a non-maskable fault, such a non-maskable fault is not signalled yet.

A non-maskable fault is also not signalled if the output is settled at variant 0.

After the standard configuration loading and automatic configuration performance, EWS elements are assigned to a special logical number 0, and after the number attribution, variant 0 is assigned, which causes that such an element is inactive.

An exemplary drawing showing the EWS-4001 element use of is included in the shown in the document called 'Fire alarm installation design using the POLON 4000 interactive fire signalling system', which is available at POLON-ALFA web site, and in the EWS-4001 'Installation and Maintenance Manual".

6.6 Multi-output controlling elements declaration

The EWK-4001 multi-output controlling element (hereinafter called 'EKS') is a line element equipped with 8 inputs that enables supervision of fire protection devices, e.g. smoke exhaust dampers, doors, sounders, other mechanic devices, etc. Additionally the EWK element is able – depending on its configuration –to receive alarm signals. Up to 20 EWK devices can be installed in one detection line. Each inputs can indicate – depending on the specific resistance – one of the following modes:

1. supervision,
2. fault,
3. alarm (technical alarm or fire alarm).

The EWK proper programming consists of a line element declaration (similarly to fire warning devices) and its assignment to a logical number.

The EWK logical number is a figure from the 1 ÷ 40 range, which is assigned to the element in order to enable the EWK input monitoring variant declaration depending on various events in the control panel, and to assign appropriate user messages. Each EWK type element can be assigned only to one logical number and reversely. In programming meaning – with some simplification – it can be stated that for the EWK element a logical number is an equivalent of a zone for fire elements. The EWK element is linked with monitoring variants and the user messages for monitoring inputs just through the logical number.

The EWK-4001 operation way is a resultant of the element programmed operation mode and the input monitoring variant.

The entire EWK-4001 programming process is completed in two stages.

Table 6.5

1st stage – EWK-4001 declaration			
Parameter		**Value/Figure**	
Element number		1 ÷ 64	
Logical number		1 ÷ 40	
Operation mode:	Parameter	—	
	INPUT operation way 1 ÷ 8	NC	NO

2nd stage – EWK-4001 logical configuration				
Parameter	**Value/Figure**			
Variant	3			
Set of assigned zones	1 ÷ 128			
Set of assigned own inputs of other EKS	EKS	1 ÷ 40	Inputs	1 ÷ 2
Set of assigned inputs of other EWK	EWK	1 ÷ 40	inputs	1 ÷ 8
Technical alarm/non-maskable fault message	2 x 32 characters			

The EWK-4001 input monitoring variants

Variant 0

Means inactive input (no signals from the input are received).

Variant 1 –technical alarm input
The input activation by specific resistance clench or opening (depending on the input settled operation mode) causes technical alarm evoking in the control panel.

Variant 2 – file alarm input
The input activation by specific resistance clench or opening (depending on the input settled operation mode) causes a fire alarm triggering in the control panel assigned zone (if the zone alarming variant criteria requirements are met).

Variant 3 – functioning monitoring
The input activation by specific resistance clench or opening (depending on the input settled operation mode) causes a non-maskable fault occurrence in the control panel.

Input monitoring variants are programmed only for an EWK that possesses a logical number.

Note:
After the standard configuration loading and automatic configuration performance, the EWK elements are assigned to a special logical number 0, and after the number attribution, variant 0 is assigned, which causes that such an element is inactive.

An exemplary drawing showing the EWK-4001 element use of is shown in the document called ‘Fire alarm installation design using the POLON 4000 interactive fire signalling system’, which is available at POLON-ALFA web site, and in the EWK-4001 ‘Installation and Maintenance Manual”.

6.7 SAL-4001 acoustic signalling devices declaration

The SAL-4001 acoustic signalling device is a line element equipped with a piezoelectric transducer which facilitates acoustic signal emission.
The SAL-4001 proper programming consists of a line element declaration (similarly to fire warning devices) and its assignment to a logical number. Afterwards, actuation type and variant should be allotted to this logical number.
The logical number is a figure from the 1 ÷ 40 range, which is assigned to the element in order to enable the SAL actuation variant declaration depending on various events in the control panel.
Each SAL type element can be assigned only to one logical number and reversely. In programming meaning – with some simplification – it can be stated that for the SAL element a logical number is an equivalent of a zone for fire elements. The SAL element is linked with actuation variants just through the logical number.

The SAL-4001 operation way is a resultant of the element programmed operation mode and the piezoelectric transducer activation variant.
The entire EWS-4001 programming process is completed in two stages.

Table 6.6

1st stage – SAL-4001 declaration				
Parameter		**Value/Figure**		
Element number		1 ÷ 64		
Logical number		1 ÷ 40		
Operation mode:	Parameter	—		
	Sound pattern	Type 1	Type 2	Type 3
	Battery supply monitoring	YES		NO
	External supply monitoring	YES		NO

2nd stage – SAL -4001 logical configuration		
Parameter	**Value/Figure**	
Output type	TYPE 1	TYPE 3
Variant	2 (table 6.7)	8 (table 6.8)
Set of assigned own inputs of other EKSs	1 ÷ 128	1 ÷ 128

Output types and variants

Type 1
Table 6.7

Variant	**Zone numbers**	**Time parameters**	**Actuation criterion**
1	—	T3	1st stage alarm in the control panel (or group of control panels in case of networking) or activation with 'ACTIVATION' push button in 'ALARM DEVICES' box
2	0 ÷ 128	T3	1st stage alarm in assigned zones

Note:
Time elapsing is interrupted (the T3 time is set at 0 in the countdown time) and the alarm device outputs are immediately activated in case the control panels enters the 2nd stage alarm mode. If the T3 parameter is settled at the maximum level (10 min.), it is possible to obtain 'only from the 2nd stage alarm' actuation criterion.

Type 3
Table 6.8

Variant	**Zone numbers**	**Time parameters**	**Actuation criterion**
1	—	T_{op}	1st stage alarm in the control panel
2	—	T_{op}	1st stage alarm in the control panel until acknowledgement
3	—	T_{op}	2nd stage alarm in the control panel

4	—	T_{op}	2nd stage alarm in the control panel until acknowledgement
5	0 ÷ 128	T_{op}	1st stage alarm in assigned zones
6	0 ÷ 128	T_{op}	1st stage alarm in assigned zones until acknowledgement
7	0 ÷ 128	T_{op}	2nd stage alarm in assigned zones
8	0 ÷ 128	T_{op}	2nd stage alarm in assigned zones until acknowledgement

The types and actuation variants are programmed only for a SAL that possesses a logical number.
The total assignments of zones to all executive outputs and SAL type elements in the control panel should not exceed 64,000.

Note:
The Top delay time is not applicable (equal to 0).
After the standard configuration loading and self-declaration performance, the SAL elements are assigned to a special logical number 0, and TYPE 0 is settled, what causes that such an element is inactive.

Detailed information concerning the device is contained in the SAL-4001 element 'Installation and Maintenance Manual'.

6.8 UCS 4000 universal controlling panel declaration

The UCS 4000 universal controlling panel (hereinafter called 'UCS) is a self-dependent apparatus that enables controlling and supervising fire protection devices, e.g. smoke exhaust dampers, doors, , etc. (detailed information is contained in the device I&MM). The UCS 4000 controller is able to interoperate with the POLON 4100 control panel using a detection line (connected to the circuit as any other line element).
The POLON 4100 control panel receives from the UCS 4000 controller the following modes:

1. quiescent mode (also during the UCS active airing function),
2. fire alarm (active RPO – manual smoke exhaust button connected to the UCS dedicated input or an alarm from a conventional detection line connected to the UCS controller),
3. technical alarm (of the P1 main relay or the P2, P3 additional ones) – output actuation confirmation in the UCS as a result of an fire alarm from the control panel,
4. non-maskable fault (from the P1 main relay or the P2, P3 additional ones) – lack of output actuation in the UCS as a result of an fire alarm from the control panel during certain period of time,
5. test mode – the UCS controller during testing of the elements and circuits connected with smoke exhaust process,
6. the UCS fault:
   - the UCS power supply fault,
   - the UCS controller fault,
   - the UCS P1 main relay fault,
   - the UCS special dedicated inputs and outputs fault.
7. modes of the addressable module provided for communication with the POLON 4000 system.

The POLON 4100 control panel – depending on a programmed variant accomplishment – sends to the UCS controlling unit a signal that activates the P1 main relay (and other inputs individually dependent on this signal). The UCS controlling unit can be programmed using the keys that are located in it, whereas in the POLON 4100 it is necessary to declare the data concerning the UCS controlling unit interoperation with a fire signalling control panel.
The UCS proper programming consists of a line element declaration (similarly to fire warning devices) and its assignment to a logical number.
The UCS logical number is a figure from the 1 ÷ 40 range, which is assigned to the element in order to enable the UCS main relay activation variant declaration depending on various events in the panel, and to assign appropriate user messages. Each UCS type element can be assigned only to one logical number and reversely.
The UCS 4000 operation way is a resultant of the P1 main relay actuation variant and individual settings of the keys in the UCS controlling unit.
The entire UCS 4000 programming process is completed in two stages.

Table 6.9

1st stage – UCS 4000 declaration		
Parameter	**Value/Figure**	
Element number	1 ÷ 64	
Logical number	1 ÷ 40	
2nd stage – UCS 4000 logical configuration		
Parameter	**Value/Figure**	
Variant	6 (Table 6.10)	
Set of assigned zones	1 ÷ 128	
Technical alarm message	P1, P2, P3 independently	2 x 32 characters
Non-maskable fault message	P1, P2, P3 independently	2 x 32 characters

The UCS 4000 panel P1 main relay activation variants.

Table 6.10

Variant	**Zone/EKS/EWK numbers**	**Actuation criterion**
0	—	Inactive output
1	—	General 1st stage alarm
2	0 ÷ 128	‘Union’ of 1st stage alarms in assigned zones
3	0 ÷ 128	‘Conjunction’ of 1st stage alarms in assigned zones
4	—	General 2nd stage alarm
5	0 ÷ 128	‘Union’ of 2nd stage alarms in assigned zones
6	0 ÷ 128	‘Conjunction’ of 2nd stage alarms in assigned zones

Variant 0
Means lack of the P1 main relay actuation criterion (permanently non-activated output).

Variant 1 – general 1st stage alarm
The output activation is performed in the case of a 1st stage alarm occurrence in the control panel or any control panel of the common supervision area.

Variant 2 – 'union' of 1st stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 3 – 'conjunction' of 1st stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least two zones that are assigned to this relay.

Variant 4 – general 2nd stage alarm
The output activation is performed in the case of a 2nd stage alarm occurrence in the control panel or any control panel of the common supervision area.

Variant 5 – 'union' of 2nd stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 6 – 'conjunction' of 2nd stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least two zones that are assigned to this relay.

The P1 main relay actuation variants are programmed only for a UCS 4000 that possesses a logical number.

In the case of variant 2 and variant 5 application, at least one zone should be assigned to the UCS device, whereas in the case of variant 3 and variant 6 application, at least two zones should be assigned. Variants 1 and 4 do not require any zone assignation.
The total number of zone assignments to all executive outputs and SAL type elements in the control panel should not exceed 64,000.

Note:
A non-maskable fault is also not signalled if the output is settled at variant 0.
After the standard configuration loading and automatic configuration performance, the UCS elements are assigned to a special logical number 0, which causes that such an element is inactive.

An exemplary drawing showing the UCS 4000 panel use is included in the UCS 4000 I&MM.

6.9 UCS 6000 universal controlling panel declaration

The UCS 6000 universal controlling panel is a self-dependent apparatus that enables controlling and supervising fire protection devices, e.g. smoke exhaust dampers, doors, , etc. (detailed information is contained in the device I&MM). The UCS 6000 controller is able to interoperate with the POLON 4100 control panel through a detection line (connected to the circuit as any other line element).

The POLON 4100 control panel receives from the UCS 6000 controller the following modes:

1. quiescent mode (also during the UCS active airing function),
2. fire alarm (active RPO – manual smoke exhaust button connected to the UCS dedicated input, an alarm from a conventional detection line connected to the UCS controller, or an alarm from an external inputs),
3. technical alarm – output actuation confirmation in the UCS as a result of an fire alarm from the control panel,
4. non-maskable fault – lack of output actuation in the UCS as a result of an fire alarm from the control panel,
5. the UCS fault.

The UCS 6000 entire configuration is performer using the dedicated software. The configuration procedure is described in the device I&M Manual.
The UCS proper programming consists of a line element declaration (similarly to fire warning devices) and its assignment to a logical number.
The UCS logical number is a figure from the 1 ÷ 40 range, which is assigned to the element in order to enable the UCS individual modules declaration and configuration.

The entire UCS 6000 programming process is completed in two stages:

1st stage:
The UCS 6000 declaration that consists in assignment of:
- element number (1 ÷ 64) using automatic configuration or configuration with verification, or manual configuration,
- logical number (1 ÷ 40).

2nd stage:
The UCS 6000 logical configuration consisting of:
- MGL modules declaration;
- MPD module declaration;
- MPW modules declaration;
- zone determination of a fire alarm signalled by an MGS module;
- MGL modules configuration:
  - zone ascertain of fire alarm signalled by the MGS module;
  - determination of the MGL module output activation variant;
  - user messages ascertain for a technical alarm and non-maskable fault of the MGL module output;
- MPD module configuration:
  - MPD module PK1 and PK2 outputs activation variants determination;
  - MPD module PK1 and PK2 user messages defining for a technical alarm and non-maskable fault;
- MPW modules configuration:
  - MPW module PK1 and PK2 outputs activation variants determination;
  - MPW module PK1 and PK2 user messages defining for a technical alarm and non-maskable fault;

UCS 6000 panel module outputs activation variants
The UCS 6000 panel module outputs activation variants programming possibilities are presented in Table 6.11.
The ‘panel number’ parameter (only for control panels operation in a network) possesses the following meaning:

panel number = 0 means dependence on an event in any control panel belonging to a common supervision area.
panel number > 0 means dependence on an event in a given control panel (provided it belongs to a common supervision area),
panel number"—" enables actuation dependence on evens in a local control panel only.
In case of variants with additional zone dependence, zone number = 0 means dependence on a 'union' of all events from all zones in a given control panel belonging to a common supervision area.

Table 6.11

Variant	Zones numbers	Actuation criterion
0	—	Inactive output
1	—	General 1st stage alarm
2	0 ÷ 128	'Union' of 1st stage alarms in assigned zones
3	0 ÷ 128	'Conjunction' of 1st stage alarms in assigned zones
4	—	General 2nd stage alarm
5	0 ÷ 128	'Union' of 2nd stage alarms in assigned zones
6	0 ÷ 128	'Conjunction' of 2nd stage alarms in assigned zones

Variant 0
Means lack of an actuation criterion (permanently non-activated output).

Variant 1 – general 1st stage alarm
The output activation is performed in the case of a 1st stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 2 – 'union' of 1st stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 3 – 'conjunction' of 1st stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 1st stage alarm occurrence in at least two zones that are assigned to this relay.

Variant 4 – general 2nd stage alarm
The output activation is performed in the case of a 2nd stage alarm occurrence in the control panel or any control panels of the common supervision area.

Variant 5 – 'union' of 2nd stage alarms in assigned zones of the common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least one zone that is assigned to this relay.

Variant 6 – 'conjunction' of 2nd stage alarms in assigned zones of common supervision area control panels
The output activation is performed in the case of a 2nd stage alarm occurrence in at least two zones that are assigned to this relay.

In the case of variant 2 and variant 5 application, at least one zone should be assigned to an UCS, whereas in the case of variant 3 and variant 6 application, at least two zones should be assigned. Variants 1 and 4 do not require any zone assignation.
In the case of variants with zone dependence, the assigned zones are allocated to own control panel (an alone panel) or to control panels of the common supervision area (panels operating in a network).
The total number of zones assignments to all executive outputs and SAL type elements in the control panel should not exceed 64,000.

Note:
A non-maskable fault is also not signalled if the output is settled at variant 0.
After the standard configuration loading and automatic configuration performance, UCS elements are assigned to a special logical number 0, which causes that such an element is inactive.

6.10 TSR-4000 terminals declaration

The TSR-4000 terminal is a remote device for the POLON 4000 system control panels state indication. Up to 16 terminals can be connected to one control panel; transmission is provided utilizing an RS-485 serial interface.
Terminals declaration consists in choosing one of two options: WITH ACCESS or WITHOUT ACCESS in SYSTEM CONFIGURATION -> HARDWARE DECLARATION -> TERMINALS DECLARATION option. WITH ACCESS means the control panel remote handling permission: an alarm remote acknowledgement or the control panel alarm remote reset are possible.

7 FUNCTIONALITY DESCRIPTIONS

7.1 Alarming

7.1.1 Alarm types

After triggering a line element installed in an addressable detection line, the POLON 4100 control panel – on a basis of decision algorithms – signals:

1. PRELIMINARY ALARM,
2. 1ST STAGE ALARM,
3. or 2ND STAGE STOPNIA,

depending on the alarming variants programmed for particular zones (premises).

PRELIMINARY ALARM is indicated by internal acoustic signalling and a red diode in the box marked ALARM. On the LCD a message!!! **PRELIMINARY ALARM !!!** appears as well as information about the alarming zones number and quantity of zones not mentioned on the display, in a separate box located below (due to limited space). The messages assigned to the alarming zones appear in the main alarm box. If the alarming zones number exceeds simultaneous display ability (i.e. 8 zones), unrevealed alarms can be read out using the ALARM push button.
The preliminary alarm is indicated internally and it can be acknowledged with the ACKNOWLEDGEMENT push button and afterwards cancelled with the RESET push button.

Note:
The preliminary alarm can be developed into a fire alarm or automatically reset by the control panel in accordance with appropriate algorithms arising from zone alarming variants.

1st STAGE ALARM (fire alarm) is indicated by internal acoustic signalling, a big red FIRE indicator fast flashing and additional red diode in the box marked ALARM.
On the LCD a message **!!! FIRE ALARMS !!!** appears as well as information about the alarming zones number and quantity of zones not mentioned on the display, in a separate box located below (due to limited space). On the right, information about elapsing time is displayed, after which the alarm transmission devices (monitoring) outputs shall be activated. Unit this moment the control panel signals 1st STAGE ALARM.
The 1st stage alarm is indicated internally and it always requires the attending personnel appearance and the alarm confirmation by pressing the CONFIRMATION push button during T1 period) and recognition of a danger in the premises (during T2 period). In the case of lack of appropriate reaction by the personnel on duty to the 1st alarm, the 2nd stage alarm is evoked.
The messages assigned to the alarming zones appear in the main fire alarm box. In case the number of the alarming zones exceeds simultaneous display ability (i.e. 8 zones); unrevealed alarms can be read out using the ALARM push button. All alarming zones can be reviewed except the first one (which is steadily displayed in the first two lines of the alarm box) and the last one (which is displayed in the last two lines.

2nd STAGE ALARM is the control panel internal state (indicated by internal acoustic signalling and the '2nd STAGE ALARM' message in the place of previously displayed monitoring clock), which cases – apart from the control panel signalling – outside transmission of a signal about a fire (actuation of the outputs declared as alarm transmission device outputs – monitoring) and activation of additional outputs, whose activation depends on a 2nd stage alarm occurrence (e.g. external signalling devices or fire protection apparatuses, controlled with the use of relay contacts or potential outputs).

A 2nd stage alarm can be preceded by a 1st stage alarm or is generated immediately depending on an alarm variant programmed for a particular zone in an object or the control panel operation mode. The 2nd stage alarm calls for immediate fire-fighting action. Simultaneously with the optical signalisation during a fire alarm, the control panel evokes a steady acoustic sound, which can be silenced using a backlit 'ACKNOWLEDGEMENT' press button.
Pressing the backlit 'ACKNOWLEDGEMENT' press button results in the fire alarm cancellation at the control panel. The fire alarm signalling cancellation is available after obtaining at least the 2nd level access authorisation.
In the POLON 4100 control panel it is possible to choose (to program) one of 17 alarm variants (conventionally marked with 1 ÷ 17 figures) for a particular zone. Triggering an alarm mode by any line element installed in an addressable detection line is verified by the control panel and is called a line element actuation in the further part of this I&MM.
All control panel zones can be subjected to alarming as per 1 ÷ 17 variants as a result of programming according to the PM. Within one zone it is possible to define two detector groups, conventionally named as A and B group. The detector groups enable creating of coincidence within one zone.

7.1.2 One-stage alarm (variant 1)

A fire warning device actuation immediately evokes the 2nd stage alarm. This variant is in particular suitable in the case of zones especially endangered by fire.

7.1.3 Two-stage alarm (variant 2)

A fire warning device actuation evokes a 1st stage alarm signalled acoustically and optically during the T1 period, which is provided for the attending personnel appearance and alarm confirmation (with ACKNOWLEDGEMENT push button). In the case of lack of appropriate reaction by the personnel on duty, the 2nd stage alarm is evoked. The personnel appearance extends the 1st stage alarm duration time with the T2 time, being measured from the 1st stage alarm acknowledgement, which is provided for the fire danger recognition.
After the T2 period, the 2nd stage alarm is triggered if the personnel does not cancel a fire alarm by obtaining the 2nd access level and pressing the RESET push button. The T1 and T2 times can be programmed in accordance with the PM, taking into consideration the supervised premises individual features.
Two-stage alarming switches to one-stage alarming (immediate 2nd stage alarm) in the case of the control panel 'PERSONNEL ABSENT' or 'DELAYS OFF' operation modes.

7.1.4 One-stage alarm with warning device single reset 40/60 s (variant 3)

After a warning device actuation, the control panel waits within 40 s for actuation of another warning device in the same zone. If it happens, the control panel evokes the 2nd stage alarm. Otherwise, the control panel resets the warning device, treating its actuation as false and awaits further signals from the premises. In case the same warning device is re-activated or another one is actuated in the same zone within the following 60 s, the control panel evokes the 2nd stage alarm.
Lack of the same or another warning device actuation in the same zone within 60-s period, causes that the control panel recognizes the previous actuation as false.
The variant described above should be applicable in the cases of momentary occurrence of a fire factor not related to a fire.

7.1.5 One-stage alarm with warning device single reset 60 s/8 min (variant 4)

After a warning device actuation, the control panel waits within 60 s actuation of another warning device in the same zone. If it happens, the control panel evokes the 2nd stage alarm. Otherwise, the control panel resets the warning device, treating its actuation as false and awaits further signals from the premises. In case the same warning device is re-activated or another one is actuated in the same zone within the following 8 minutes, the control panel evokes the 2nd stage alarm.

Lack of the same or another warning device actuation in the same zone within 8-min. period, causes that the control panel recognizes the previous actuation as false.
The variant described above should be applicable in the cases of momentary occurrence of a fire factor not related to a fire.

7.1.6 Two-stage alarm with warning device single reset 40/60 s (variant 5)

After a warning device actuation, the control panel waits within 40 s for actuation of another warning device in the same zone. If it happens, the control panel evokes the 1st stage alarm. Otherwise, the control panel resets the warning device, treating its actuation as false and awaits further signals from the premises. In case the same warning device is re-activated or another one is actuated in the same zone within the following 60 s, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2. Lack of the same or another warning device actuation in the same zone within 60-s period, causes that the control panel recognizes the previous actuation as false.
The variant described above should be applicable in the cases of momentary occurrence of a fire factor not related to a fire.

7.1.7 Two-stage alarm with warning device single reset 60 s/8 min (variant 6)

After a warning device actuation, the control panel waits within 60 s for actuation of another warning device in the same zone. If it happens, the control panel evokes the 1st stage alarm. Otherwise, the control panel resets the warning device, treating its actuation as false and awaits further signals from the premises. In case the same warning device is re-activated or another one is actuated in the same zone within the following 8 minutes, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2. Lack of the same or another warning device actuation in the same zone within 8-min period, causes that the control panel recognizes the previous actuation as false.
The variant described above should be applicable in the cases of momentary occurrence of a fire factor not related to a fire.

7.1.8 One-stage alarm with coincidence of two warning devices (variant 7)

After a warning device actuation, the control panel resets the warning device and indicates a preliminary alarm mode. In case the same (reset) warning device is re-activated and at least one more warning device is actuated in the same zone within the following 8 minutes, the control panel evokes the 2nd stage alarm. Otherwise, after 8 minutes the control panel resets the preliminary alarm mode treating the previous warning device actuation as false, and returns to the quiescent mode.

7.1.9 Two-stage alarm with coincidence of two warning devices (variant 8)

After a warning device actuation, the control panel resets the warning device and indicates a preliminary alarm mode. In case the same (reset) warning device is re-activated and at least one more warning device is actuated in the same zone within the following 8 minutes, the control panel evokes the 2nd stage alarm and the alarming process is continued as in the variant 2. Otherwise, after 8 minutes the control panel resets the preliminary alarm mode treating the previous warning device actuation as false, and returns to the quiescent mode.

7.1.10 One-stage interactive alarm (variant 9)

In case a detector reveals a fire factor change, it advises other detectors installed in the same zone about this. The change confirmation by other detectors installed in the zone, evokes this zone 2nd stage fire alarm at this control panel.
In many cases a fire can be detected significantly faster in this variant than in the case of waiting for a fire criterion accomplishment by a single detector. Simultaneously, due to proper detectors arrangement and their appropriate type choice for a given zone, the system sensitivity to interference factors is not increased.

Depending on the expected fire types, it is possible to use various combinations of smoke (ionization, optical) and heat detectors. An individual fixed temperature detector actuation in a zone evokes also an alarm in this zone and the 2nd stage fire alarm at this control panel.

Note:
The 4043 model range detectors (DIO-4043, DOR-4043, DUR-4043, and TUN-4043) are unable to operate in a zone programmed in an interactive alarm variant.

7.1.11 Two-stage interactive alarm (variant 10)

In case a detector reveals a fire factor change, it advises other detectors installed in the same zone about this. The change confirmation by other detectors installed in the zone, evokes this zone alarm and the 1st stage fire alarm at this control panel; afterwards, the alarming process is continued as in the variant 2.
In many cases a fire can be detected significantly faster in this variant than in the case of waiting for a fire criterion accomplishment by a single detector. Simultaneously, due to proper detectors arrangement and their appropriate type choice for a given zone, the system sensitivity to interference factors is not increased.
Depending on the expected fire types, it is possible to use various combinations of smoke (ionization, optical) and heat detectors. An individual fixed temperature detector actuation in a zone evokes also an alarm in this zone and the 1st stage fire alarm at this control panel; afterwards, the alarming process is continued as in the variant 2.

Note:
The 4043 model range detectors (DIO-4043, DOR-4043, DUR-4043, and TUN-4043) are unable to operate in a zone programmed in an interactive alarm variant.

7.1.12 One-stage alarm with group-time coincidence (variant 11)

After an actuation of warning devices belonging to one of the A or B group, the warning devices from one group are initially reset the control panel indicates a preliminary alarm mode. After the preliminary reset, if the warning devices belonging to A and B group (at least one device of each group) are actuated within the following 8 minutes, the control panel evokes the 2nd stage alarm. Otherwise, after 8 minutes the control panel resets the preliminary alarm mode treating the previous warning device actuation as false, and returns to the quiescent mode.

Note:
The variant proper performance requires declaring at least one warning device to A and B group (2 warning devices for each group are recommended). The groups created in this way should not be separated with any physical obstacle. Any failure to meet those conditions can result in the alarming warning device continual reset.

7.1.13 Two-stage alarm with group-time coincidence (variant 12)

After an actuation of warning devices belonging to one of the A or B group, the warning devices from one group are initially reset the control panel indicates a preliminary alarm mode. After the preliminary reset, if the warning devices belonging to A and B group (at least one device of each group) are actuated within the following 8 minutes, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2. Otherwise, after 8 minutes the control panel resets the preliminary alarm mode treating the previous warning device actuation as false, and returns to the quiescent mode.

Note:

The variant proper performance requires declaring at least one warning device to A and B group (2 warning devices for each group are recommended). The groups created in this way should not be separated with any physical obstacle. Any failure to meet those conditions can result in the alarming warning device continual reset.

7.1.14 Two-stage alarm with group coincidence in order to speed up 2nd stage alarm (variant 13)

After an actuation of warning devices belonging to one of the A or B group, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2.
Actuations of warning devices of both (A and B) groups simultaneously (coincidence) results in an immediate 2nd stage alarm triggering.

Note:
The variant proper performance requires declaring at least one warning device to A and B group (2 warning devices for each group are recommended). The groups created in this way should not be separated with any physical obstacle.

7.1.15 Two-stage alarm with preliminary zone reset and group coincidence in order to speed up 2nd stage alarm (variant 14)

After an actuation of a warning device belonging to the zone, the control panel measures out a 40-s period and automatically resets the zone then.
If any warning device is actuated again within 8 minutes from the zone reset, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2. Otherwise, in the case of a renewed fire warning device actuation outage in the zone within 8 minutes, the control panel treats the previous warning device activation as false, and returns to the quiescent mode.
Actuations of warning devices of both (A and B) groups simultaneously (coincidence) results in an immediate 2nd stage alarm triggering.

Note:
The variant proper performance requires declaring at least one warning device to A and B group (2 warning devices for each group are recommended). The groups created in this way should not be separated with any physical obstacle.

7.1.16 Two-stage alarm with two-detector coincidence in order to speed up 2nd stage alarm (variant 15)

After an actuation of a warning device belonging to the zone, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2.
Actuation of two or more warning devices in the zone results in the 2nd stage alarm triggering acceleration.

Note:
The variant proper performance requires declaring at least two warning devices (more is recommended) in the zone.

7.1.17 Two-stage alarm with preliminary zone reset and two warning devices coincidence in order to speed up 2nd stage alarm (variant 16)

After an actuation of a warning device belonging to the zone, the control panel measures out a 40-s period and automatically resets the zone then.

If any warning device is actuated again within 8 minutes from the zone reset, the control panel evokes the 1st stage alarm and the alarming process is continued as in the variant 2. Otherwise, in the

case of a renewed fire warning device actuation outage in the zone within 8 minutes, the control panel treats the previous warning device actuation as false, and returns to the quiescent mode.
Actuation of two or more warning devices in the zone results in an accelerated 2nd stage alarm triggering.

Note:
The variant proper performance requires declaring at least two warning devices (more is recommended) in the zone.

7.1.18 One-stage alarm with temporal zone disconnection (variant 17)

A fire warning device actuation during the control panel operation in the PERSONNEL ABSENT mode (the PERSONNEL ABSENT indicator is lit) evokes the 2nd stage alarm. During the control panel operation in the PERSONNEL ABSENT mode (the PERSONNEL ABSENT indicator is lit), the zone is automatically switched off (the control panel cannot 'see' warning devices).

7.1.19 ROP manual call point alarming

After the ROP-4001, ROP-4001H manual call points actuation, the control panel evokes the 2nd stage alarm immediately regardless of the alarm variant being programmed for the zone, which the call points are assigned to.

7.1.20 Alarm in 'DELAYS OFF' mode

In the 'DELAYS OFF' mode, the control panel enters no output activation delays. The T1, T2 and T3 times are set at 0, what results in two-stage alarms replacement with appropriate one-stage alarms. However, the delays outage does not mean cancellation of coincidental alarm variants and those with preliminary reset (in those variants two-stage alarms are replaced by one-stage alarms).

The 'DELAYS OFF' mode means that the delays of outputs for PK relays and LS potential output are set at 0.

Note:
The 'DELAYS OFF' mode does not cancels the delays being programmed directly in the EKS-4001 element with the use of 'OPERATION MODE' option.

7.1.21 Alarm in 'PERSONNEL ABSENT' mode

The alarm variants that are intended for false alarm elimination, require the attending personnel co-operation. Those variants are useless in the case of the personnel absence at the control panel. Then any delay in a fire reporting to the appropriate service is inadvisable. To achieve this, it is possible to switch the control panel to the PERSONNEL ABSENT operation mode what causes that the alarm variants of all zone are automatically changed for one-stage alarms (variant 1) or – in the case of interactive variants – for one-stage interactive alarms (variant 9.)

The operation mode switchover is performed after the PERSONNEL ABSENT push button pressing and is indicated by illumination of the diode located in the button. The control panel operation mode change is available from at least the 2nd access level.
The PERSONNEL ABSENT operation mode switchover is executed automatically if one of four times that automatically change the operation mode for the PERSONNEL ABSENT, is programmed. The operation mode change for the PERSONNEL ABSENT is carried out by pressing the PERSONNEL ABSENT push button again and is indicated by switching off the diode located in the button. Then, all zones are recovered with the alarm variants being programmed earlier.

7.2 Fault

The POLON 4100 control panel – due to internal self-monitoring circuits – reveals and indicates faults that occur in the detection lines and inside the panel, too. The revealed faults are indicated optically and acoustically. Faults are indicated optically by a steady yellow light of the FAULT collective diode and additionally they are indicated acoustically with a slow interrupted sound of a steady frequency.

The FAULT optical and acoustic indication is cancelled automatically after the fault removal. The FAULT acoustic indication is switched off after pressing the CONFIRMATION backlit push button.
Information about the revealed faults is automatically displayed on the LCD. In case any new fault does not occur within 10 minutes from the latest fault registered, the LCD is switch off. Then, it is possible to review the faults revealed recently, using the FAULT push button. Messages about recently revealed faults appear on the LCD after the FAULT push button repeated pressing. If the messages number exceeds the display capacity, the can be 'scrolled' with the help of the same push button or ↑↓ buttons.
An exception of the above rule is a non-maskable fault occurring in the monitoring circuits (properly programmed) of the LK monitoring lines or EKS-4001 monitoring and controlling elements, whose messages appear automatically on the display and are shown until their removal.

7.2.1 Faults type

a) System faults:
- faults of the program memory, RAM operation memory or SETUP configuration,
- the micro-processor operation interference.

b) Micro-processor based modules faults:
- the LCD display and operator console micro-processor controller fault,
- the MLS-41 module micro-processor controller fault,
- communication loss with the LCD controller and operator console,
- communication loss with the MLS-41 module controller,
- lack of declaration of the MLS-41 module.

c) Detection lines faults:
- line processor fault,
- line output short circuit,
- loop output short circuit,
- break in a detection line,
- detection line earth fault,
- number of line elements in a detection loop-shaped line higher than 64,
- non-declared elements in a detection line,
- improper detection line parameters (resistance, capacity),
- lack of line element response to a control panel enquiry,
- multiple declaration of the same line element.

d) line elements faults:
- measuring element fault,
- switched on short circuit isolator,
- EEPROM memory fault,
- EKS input line fault,
- EKS WE1 input line fault,
- EKS WE2 input line fault,
- EKS WE1 non-maskable fault WE1 EKS,
- EKS WE2 non-maskable fault WE2 EKS
- EWS relay fault
- SAL battery or external power supply unit fault.

e) control panel inputs and outputs fault:
- LS potential monitored outputs fault,
- LK monitoring line inputs non-maskable fault.

f) power supply faults:
- basic power supply source voltage outage,
- reserve power supply source fault (battery lack, short circuit of battery connection contacts),
- battery voltage drop below 22 V ± 1 V,
- battery panel charging device fault,
- + 5 V converter fault (also short circuit),
- temperature probe fault (short circuit, lack),
- earth fault, i.e. power supply module output circuit connection with the control panel case or grounding.

h) TSR 4000 terminal fault
- configuration memory fault,
- EPROM memory fault,
- LCD display fault,
- relay output fault,
- signal line fault,
- improper terminal number,
- 230 V power supply fault,
- battery fault,
- battery charging circuit fault,
- voltage drop below 22 V,
- terminal earth fault.

i) other faults:
- faults in UCS 4000 panels,
- faults in UCS 6000 panels.

Note:
In order to cancel a system fault it is necessary to switch the K6 key of SW1 switch located on PSC board and then perform the active processor reset. After the system fault cancellation, it is required to load the standard configuration and to configure the control panel again.

7.3 Testing

The POLON 4100 control panel enables execution of three types of tests to recognise efficiency of:

1. TSO-4100 table signalling elements,
2. line elements installed in the premises,
3. executive devices being controlled by the EKS-4001, EWS-4001, SAL-4001 controlling elements.

Test execution is allowable after obtaining a permission from the operator from at least the 2nd access level. The tests should be carried out in accordance with PM.

7.3.1 TSO-4100 table signalling elements testing

During signalling elements test execution, consecutive optical diodes are lit and acoustic signals are switched on. After the test, the control panel automatically returns to normal operation.
A testing process is automatically interrupted in the case of a fire alarm signal receipt by the control panel, it is impossible to switch to the test mode during a fire alarm signalling. Any elements testing process can be interrupted with ESC key.

7.3.2 Line fire elements in a zone testing

The POLON 4100 control panel enables performing tests of addressable line elements belonging to any zone.

The elements switch over for testing in the zone is carried out in accordance with the PM. The zone switch over for testing is signalled by a steady light of the yellow collective TEST diode.

After a test alarm signal receipt from a line element, information about the test alarm is displayed on the LCD. The alarming element reset takes place after ca. 60 s.
The elements (detectors) testing in a zone is switched off according to the PM. Then the yellow collective TEST diode is turned off (if no other elements are tested).
A fire alarm from a zone which is not switched over for testing, it causes that the testing process is automatically terminated and the control panel starts fire alarm signalling pursuantly to the variant programmed.
Within the tested zone any quantity of line elements can be simultaneously in an alarm mode, it is recommended, however, to activate the line elements consecutively in order to inspect them properly.
Switching for TEST is impossible during a fire alarm signalling and in the case of damaged or switched off zones.

7.3.3 EKS-4001 monitoring and controlling elements testing

The EKS-4001 element testing means that the device is switched over to a testing mode, what should result in the output relay activation. In response to that, the element should indicate an appropriate relay output state.

7.3.4 EWS-4001 controlling elements testing

The EWS-4001 element testing means that the element respective relay outputs are switched over to a testing mode, what should activate the relay being tested. In response to that, the element should indicate an appropriate state of the relay output being tested.

7.3.5 EWK-4001 monitoring elements testing

The EWK-4001 element testing consists in imposing the specific technical alarm state in respective inputs using a resistor. The control panel should indicate a technical alarm state of those inputs.

7.3.6 SAL-4001 acoustic signalling devices testing

The SAL-4001 device testing consists in switching the element over to a testing mode, what should activate acoustic signalling.

7.3.7 Line elements location monitoring

The POLON 4100 control panel enables checking a line element location through evoking alternate illumination of yellow and red diode of the element. The testing procedure is described in the PM.

7.4 System elements disablement/re-enablement

The control panel software enables disablement of line elements, zones, outputs controlled by the MLS-41 module or EKS-4001 monitoring and controlling elements.
Any disablement is indicated by the control panel with a steady light of the DISABLEMENT collective yellow diode. Disablement and re-enablement is executed from at least 2nd access level.

7.4.1 Fire warning devices and zones disablement/re-enablement

In the case of fire warning devices fault or performing repair works in the supervised premises that can produce false alarm triggering, the control panel provides possibility to switch off monitoring of the premises section through the entire zone (or its appropriate part) disablement.

Fire warning devices disablement/re-enablement is carried out in the FIRE WARNING DEVICES DISABLEMENT option.

A section of a zone disablement/re-enablement is performed disabling individual addressable in the zone, whereas the whole zone disablement/re-enablement can be performed in much simpler way, carrying out the operation for the whole zone in the ZONES DISABLEMENT option.

Disablement of fire warning device or entire zone entails that the control panel does not receive alarm and fault signals from the disabled line elements, therefore automatically switches off fault signalling within this zone, if such signal is sent. After the zone re-enablement, if the fault is not removed, the fault signalling occurs again.

Note:
Partial zone disablement, with programmed alarm variant larger than the second one, causes that this zone variant is automatically replaced with the immediate one (variant 1). After the zone complete re-enablement, the initially programmed variant recurs.

7.4.2 PK relays disablement/re-enablement

The PK relays disablement/re-enablement is accomplished in the RELAYS DISABLEMENT option. The PK relay disablement brings switching an appropriate relay off regardless of the control panel state.

7.4.3 LS signalling line disablement/re-enablement

The LS signalling line disablement/re-enablement is achieved in the SIGNALLING LINE DISABLEMENT option as a logical device. The LS line disablement results in a fault signalling interruption. After a re-enablement, unless the fault is removed, signalling is restored.

7.4.4 LK monitoring lines disablement/re-enablement

The LK monitoring lines disablement/re-enablement is executed in the MONITORING LINES DISABLEMENT option as a logical device. The LK line disablement results in an interruption of fault signalling or technical alarm signalling. After a re-enablement, unless the fault or technical alarm is removed, signalling appears again.

7.4.5 EKS-4001 monitoring and controlling elements disablement/re-enablement

The EKS-4001 monitoring and controlling elements disablement/re-enablement is accomplished in the EKS ELEMENTS DISABLEMENT option as logical devices. The EKS disablement produces switching the output relay off and an interruption of the element fault signalling or technical alarm signalling. After a re-enablement, unless the fault or technical alarm is removed, signalling is restored.

7.4.6 EWS-4001 controlling elements disablement/re-enablement

The EWS-4001 controlling elements disablement/re-enablement is achieved in the EWS ELEMENTS DISABLEMENT option as logical devices. The EWS disablement results in switching the output relay off and an interruption of the output fault signalling. After a re-enablement, unless the fault is removed, signalling is restored. After a re-enablement, unless the fault is removed, signalling is restored.

7.4.7 EWK-4001 monitoring elements disablement/re-enablement

The EWK-4001 monitoring elements disablement/re-enablement is executed in the EWK ELEMENT DISABLEMENT option as a logical device. The EWK disablement results in switching the output off, what induces that no signal from this output are received, and the fault or technical alarm signalling is interrupted. After a re-enablement, the control panel indicates the current state of this output.

7.4.8 SAL-4001 acoustic signalling devices disablement/re-enablement

The SAL-4001 acoustic signalling disablement/re-enablement is executed in the SAL ELEMENT DISABLEMENT option as a logical device. The SAL disablement results in switching the SAL signalling

and an interruption of the fault alarm signalling. After a re-enablement, unless the fault is removed, the fault signalling is restored.

7.5 Event memory and alarm memory

7.5.1 Event memory

The POLON 4100 control panel is able to store up to 2,000 latest events in its non-volatile memory. Every event is characterized with a detailed text description and date and time of event (with 1-s accuracy). In the event memory, among others, the following events are saved in chronological order:

1. alarm events,
2. technical alarms,
3. faults,
4. testing,
5. disablements,
6. executive devices activations,
7. attending personnel reaction of the following nature; confirmations, resets, delays switching on, etc.

The event memory contents can be reviewed on the display, printed out – with the control panel configuration software or a serial printer (the event memory operation description is included in the PM).

Note:
The standard configuration loading erases the event memory.

7.5.2 Alarm memory

The control panel is able to store up to 9,999 latest alarms in its non-volatile memory with information about the date and time (with 1-s accuracy) of an alarm occurrence as well as its location (zone).

The alarm memory contents can be reviewed on the display, printed out – with the control panel configuration software or a serial printer (the event memory operation description is included in the PM).

Note:
The alarm memory can be erased from the control panel after obtaining the 4^{th} access level. The standard configuration loading does not erase the alarm memory.

8 STANDARD CONFIGURATION

The POLON 4100 control panel is delivered to the user with initial operation conditions programmed by the manufacturer, what is called the standard (default) configuration.
Pursuantly to the standard configuration, the control panel is programmed as follows:

1. every addressable element (in the addressable area) is declared as type 0 (those elements are not reviewed by the control panel),
2. addressable elements are possibly assigned to the zones of the numbers that are consistent with the numbers of lines where they are installed; with A group being programmed,

3. lack of configuration of controlling, monitoring and signalling elements (EKS-4001, EWS-4001, SAL-4001, UCS 4000, UCS 6000); line elements not assigned, zones are not allotted (empty zone matrix), no variants are set,
4. all user messages are assigned to the logical numbers of EKS-4001, EWK-4001 – of standard type,
5. variant 2 (two-stage alarming) is assigned to all zones,
6. all user messages assigned to zones – of standard type,
7. the PK1 relay (marked as PU) steadily programmed as a general fault signalling output,
8. the PK2 output relay programmed as TYPE3 variant 1, with no delays (actuation in the case of the 1st stage alarm at the control panel),
9. the PK3 output relay programmed as TYPE2 (monitoring output),
10. the PK relay and LS signalling lines possibly without zone interdependence (empty zone matrices),
11. all LK monitoring lines programmed in variant 0 (inactive),
12. all user messages assigned to monitoring lines – of standard type,
13. T1 time (for acknowledgement) – settled at 30 s,
14. T2 time (for danger recognition) – settled at 1 min,
15. T3 time (acoustic signalling delay) – settled at 0,
16. time of automatic operation mode switching over PERSONNEL PRESENT/PERSONNEL ABSENT – not being programmed,
17. factory access level at the 2nd level - 2222,
18. factory access level at the 3rd level - 3333,
19. factory access level at the 4th level - 3112,
20. event memory – erased,
21. review register – erased, review monitoring function – inactive.

8.1 User configuration programming

In order to adjust the control panel to its operation conditions predicted in the circuit design, it is necessary to program the panel individually. The programming process should be carried out in accordance with the PM from the 3rd or 4th access level. The entered configuration data shall be saved also in the case of the control panel complete power supply outage.

Note:
After the control panel programming, it is recommended to send the configuration to a computer (utilising the configuration software) and prepare the data backup.

8.2 Standard configuration/access codes loading

It is possible that the user loads the control panel standard settings. The standard configuration loading operation should be performed exclusively in case an old configuration must be deleted (memory erasing) and a new one must be created from the beginning.

The standard configuration loading can be completed by restarting the µPC micro-processor in the PSC-41 module, if the K1 key of the SW1 switch is turned on.
The factory access codes loading can be completed by restarting the µPC micro-processor in the PSC-41 module, if the K1 key of the SW1 switch is turned on.

Note:
The standard configuration loading can last ca. 2 minutes.

9 ACCESS CODES

The POLON 4100 control panel is intended to be handled by 4 groups of people of various qualifications. The range of possible operations is divided into 4 levels as per Table 9.1.
Access to particular levels (with an exception of the 1st level) can be obtained by entering an access code. The access code is represented by a figure consisted of 4 to 8 digits.
The 2nd and 3rd level access codes can be program changed by the servicing personnel after obtaining the 3rd level access.

Table 9.1

Access level	Operator access	Allowable operations
1st (1	no code necessary	alarm or fault ACKNOWLEDGEMENT, turning acoustic signalling off, fire alarm readout, technical alarm readout, fault readout, disablement readout and zone testing readout
2nd (2	2nd level access code	As per 1st level plus alarm RESET, PERSONNEL PRESENT/PERSONNEL ABSENT switching over, disablement, switching over to testing
3rd (3	3rd level access code	As per 2nd level plus control panel configuration except modules and interface output declaration
4th (4	4th level access code	As per 3rd level plus hardware configuration change
(1 – for the control panel direct servicing personnel (2 – for the direct servicing personnel or the maintenance technician (3 – for a person being authorised for program configuration change (4 – for the manufacturer and authorised servicing company for hardware configuration change		

10 INSTALLATION

The POLON 4100 control panel should be installed in the premises where 24-hour duty is provided. In the case of lack of such 24-hour attendance, it is obligatory to ensure that the control panel signals are passed to a place where 24-hour personnel on duty is present, using the monitoring system or additional signalling relay contacts.
The control panel should be placed in a visible accessible place, which is not exposed to direct sunlight, far from heat sources.
Ambient temperature should not be lower than 0 °C and higher than + 40 °C. In the case of high noise level, outdoor acoustic signalling devices should be applicable, controlled by signalling line or the MLS-41 module relay contacts.
The control panel should be fixed to a wall (Fig. 10.1).
In the control panel vicinity (within sight) a manual fire call point should be installed.

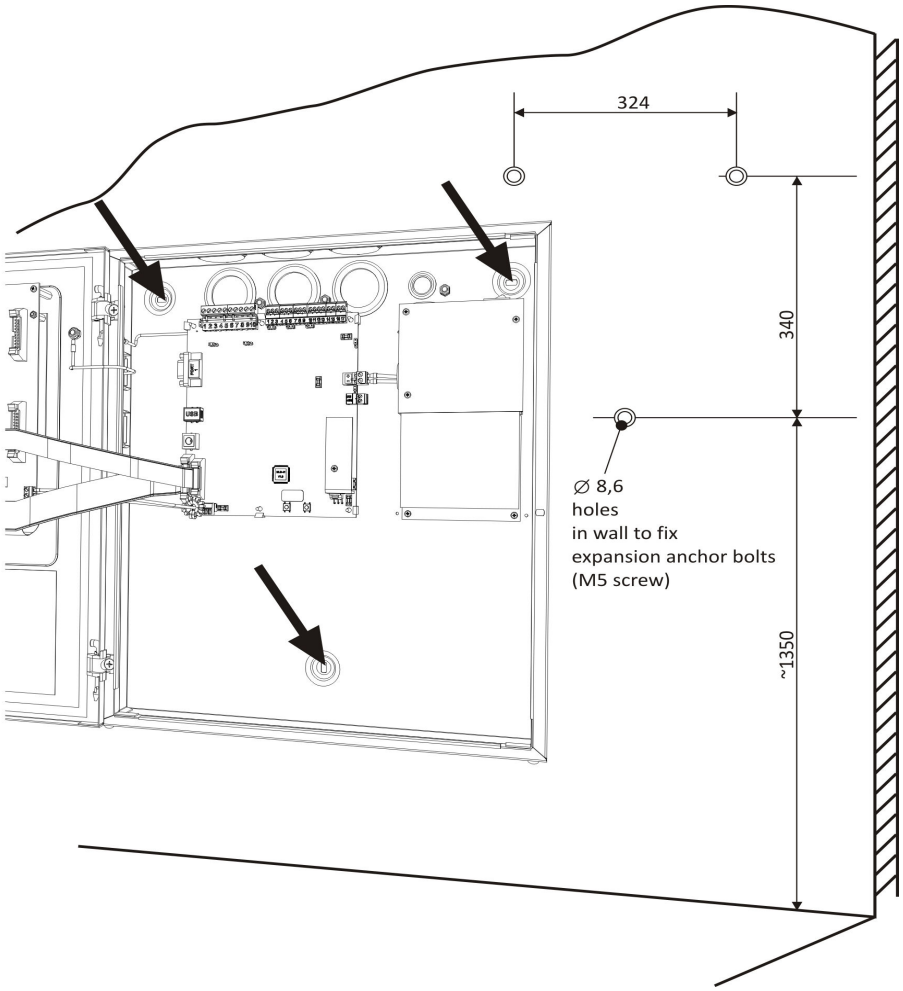


Fig. 10.1 Control panel wall mounting

10.1 Power supply connection

Three clamps (located in the PZ-41 power supply module) are provided to connect mains cables that supply the control panel. The mains clamps are covered with a special isolation shield with ~230 V/50 Hz description. The supplying cables marking is provided on appropriate clamps. The cables should be connected to the proper clamps in accordance with their dedication. The reserve power supply (batteries) should be connected after the mains power supply connection.

10.2 Line elements installation

Detection line wires and external signalling circuits wires are introduced to the control panel through a round opening placed in the top or back side of the panel.
Before wire connection, it is necessary to examine thoroughly particular circuits routing to the control panel output switch clamps. Special attention should be given to detection lines and loops wires polarization.
Before detection lines wires connection it is necessary to ensure whether the wires resistance and capacity, and insulation resistance do not exceed allowable values.
Addressable detection lines elements connection way is illustrated in Fig. 10.2 and 10.3.

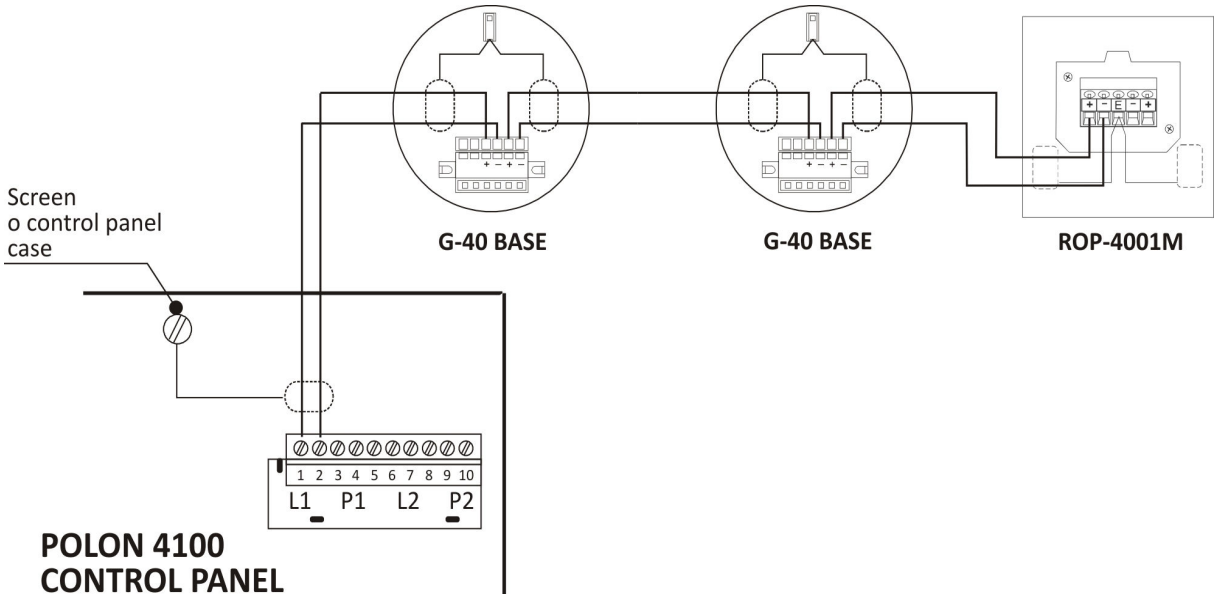


Fig. 10.2 Type B radial line elements connection way

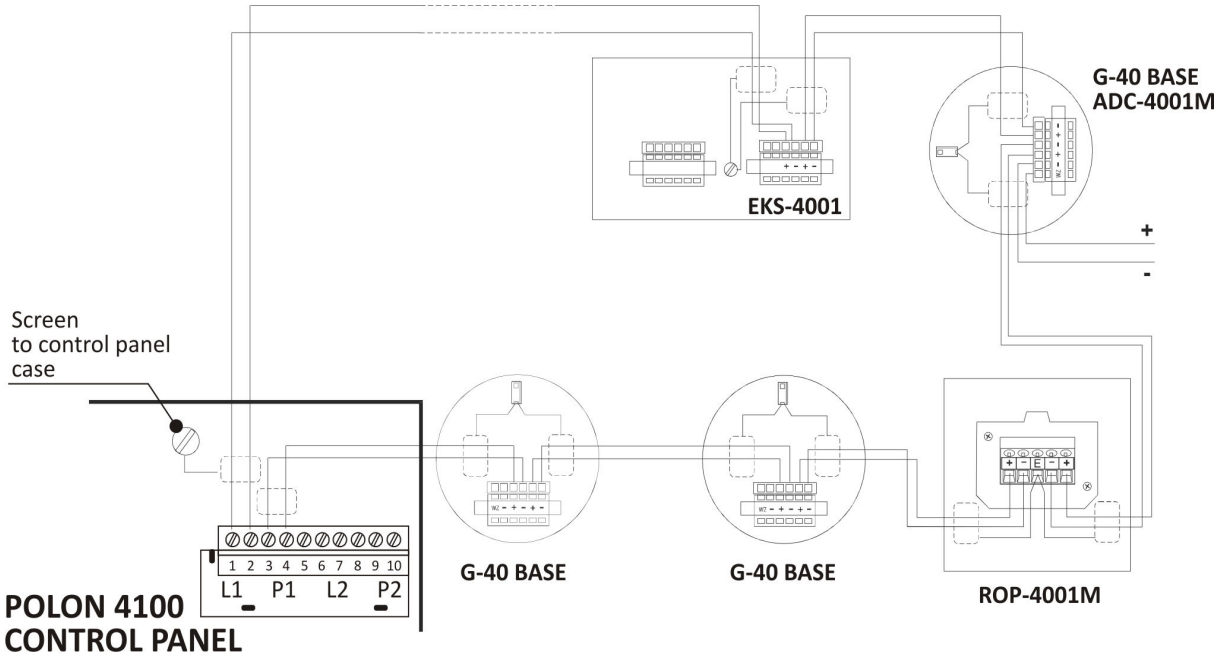


Fig. 10.3 Type A loop-shaped line elements connection way

11 OPERATION AND MAINTENANCE

11.1 Proper operation rules

The control panel unfailing operation depends on maintaining appropriate operating conditions, power supply voltage, battery condition and periodic inspections performance.
The periodical inspections should be carried out by an Authorised Service Station that was appointed by the user to perform maintenance works. Any damage should be immediately reported to the service station. In the case of fuse replacement, attention should be paid to their nominal values. It is not allowed to replace a burnt fuse with a spare fuse with a greater nominal value, since it can result in the unit damage.

The following fuses are used in the POLON 4100 control panels (MLS-41 module):

F1 / 630 mA	NANO type	LS signalling line protection,
F2 / 630 mA	NANO type	external devices power supply output protection,
F3 / 3.15 A	NANO type	battery panel circuit protection,
F4 / 630 mA	NANO type	control panel internal power supply protection.

11.2 Periodic inspections and maintenance rules

The POLON 4100 control panel periodical inspections, according to the point 11.2 of the PKN-CEN/TS 54-14:2006 standard, should be carried out at least once per year.
Every 6 months it recommended to check connections between the control panel case and the shielding, grounding and zeroing cable and to clean battery clamps.
The battery charging level should be checked at least once a year. For this purpose, it is necessary to disconnect the mains power supply with the AC power supply switch for approx. 2 hours and, after the system renewed activation, to check if, within a period not longer than 5 hours, the mains power supply device recharges the battery panel and automatically switches to the buffering mode.
A properly operating and regularly inspected control panel does not require any special maintenance works. It is recommended to regularly remove dust from the control panel outer surfaces.
The POLON 4100 control panel enables writing into its configuration a time parameter (expressed in months), stipulating required frequency of the system inspections and maintenance works. If the function is activated and, in case a new inspection is not confirmed (by entering into reviews register) despite the allowable time from the latest inspection has elapsed, the control panel signals on the liquid crystal display the necessity to perform new review (with 30-second interval).
The review register enables saving of up to 255 entries (without possibility of the previous entries modification). The register deleting is possible only through the standard configuration loading.

12 PACKING, TRANSPORTATION, STORAGE

12.1 Packing

The control panel, wrapped with a foil bag, is packed in a transport box made of five-layer cardboard. Apart from it, the following items are packed into the transport box:

1. spare parts,
2. technical documentation
3. warranty card.

12.2 Transport rules

The control panel in the factory packing should be carried in closed spaces of standard means of land transport taking into account the transport guidelines stated on the package and protecting it against sudden vibrations and ambient temperatures lower than - 25^{o}C and higher than + 55^{o}C.

12.3 Storage rules

The control panel should be stored in closed spaces of ambient temperature from + 5 ^{o}C to + 40 ^{o}C and relative humidity between 40% and 70%, free of caustic vapours and gases. During storage, the device should not be exposed to direct sunlight or heating elements influence.

13 DESIGNER'S TABLELS

Table 13.1 DETECTION LINES DECLARATION

Line No. 1	
Line No. 2	

Table 13.2 SERIAL PORTS DECLARATION

	PORT TYPE	*TRANSMISSION SPEED*
PORT No. 1		
PORT No. 2		

Table 13.3 ALARMING DELAY TIMES

T1 time	
T2 time	
T3 time	

Table 13.4 PERSONNEL ABSENT MODE CHANGE TIMES

PERSONNEL ABSENT mode change time	
PN1 time	
PN2 time	
PN3 time	
PN4 time	

Table 13.5 PARAMETERS OF LINE ELEMENTS – FIRE WARNING DEVICES

Line No.	*Element No.*	*Factory No.*	*Type*	*Operation Mode*	*Zone*	*Group*

Table 13.6 ZONES CONFIGURATION

Zone No.	*Alarming variant*	*Message max 32 characters (text line 1)*
		Message max 32 characters (text line 2)

Table 13.7 EKS – 4001 MONITORING AND CONTROLLING ELEMENTS PARAMETERS

Line No.	***Element No.***	***Factory No.***	***Operation mode***						***EKS logical No.***
			Continuity monitoring	***Actuation monitoring***		***monitoring way***		***Out relay actuation delay***	
			YES/NO	***Input 1***	***Input 2***	***Input 1***	***Input 2***		

Table 13.8 EKS – 4001 MONITORING AND CONTROLLING ELEMENTS LOGICAL CONFIGURATION

EKS logical No.	***Actuation Variant***	***Assigned zones***	***Input No.***	***User message***	
				Non-maskable fault	***Technical alarm***
			1	max 32 characters	max 32 characters
			2	max 32 characters	max 32 characters
			1		
			2		
			1		
			2		
			1		
			2		
			2		

Table 13.9 RELAYS CONFIGURATION

PK Number	*Zones/EKS*	*Type*	*Variant*	*Delay*

Table 13.10 SIGNALLING LINES CONFIGURATION

LS Number	*Zones/EKS*	*Type*	*Variant*	*Delay*

Table 13.11 MONITORING LINES CONFIGURATION

LK No.	*Variant*	*Monitored output type PK/LS (only in var.1)*	*Monitored output No.*	*User message*	
				Non-maskable fault	*Technical alarm*
				max 2 x 32 characters	max 2 x 32 characters
				.....	.....

Table 13.12 EWS-4001 MULTI-OUPUT CONTROLLING ELEMENTS PARAMETERS AND CONFIGURATION

Line No.	*Elem. No.*	*Factory No.*	*EWS log. No.*	*Output No.*	*Output actuation variant*	*Zone assignment*

Table 13.13 EWK-4001 MULTI-INPUT MONITORING ELEMENTS PARAMETERS AND CONFIGURATION

Line No.	*Elem. No.*	*Factory No.*	*EWK log. No.*	*Input No.*	*Input monitoring variant*	*Technical alarm message*

Table 13.14 SAL – 4001 ACOUSTIC SIGNALLING DEVICES PARAMETERS AND CONFIGURATION

Line No.	*Elem. No.*	*Factory No.*	*Oper. mode*	*SAL log. No.*	*Output type*	*Actuation variant.*	*Assigned zones*

APPENDIX A – POLON 4000 SYSTEM LINE ELEMENTS

Table A.1

	Element description	Quiescent current [1)]
DIO-4043	addressable ionisation smoke detector	150 µA
DIO-4046	,,	
DOR-4043	addressable optical smoke detector	150 µA
DOR-4046	,,	
DUR-4043	addressable universal optical smoke detector	150 µA
DUR-4046	,,	
TUN-4043	addressable universal heat detector	120 µA
TUN-4046	,,	
DOT-4046	addressable multi-sensor smoke and heat detector	150 µA
DPR-4046	addressable multi-sensor smoke detector	170 µA
DUT-6046	addressable multi-sensor smoke and heat detector	150 µA
DOP-6001	optical line smoke detector	300 µA
DUR-4047	optical smoke radio detector	-
ROP-4001M, ROP-4001MH	manual fire call points	135 µA
ADC-4001M	adapter (burdened with a side line):	
	- programmed in operation mode 1	6.8 mA
	- programmed in operation mode 2	16.0 mA
	- programmed in operation mode 3	2.5 mA
	- programmed in operation mode 4	0.5 mA
	- programmed in operation mode 5	2.2 mA
	- programmed in operation mode 6	1.33 mA
ACR-4001	radio detectors adapter	6.0 mA
EKS-4001	monitoring and controlling element	145 µA
EWS-4001	multi-output controlling element	400 µA
EWK-4001	multi-input monitoring element	150 µA
SAL-4001	addressable acoustic signalling device:	
	- power supplied from battery or ext. source	150 µA
	- power supplied only from line [2)]	600 µA
UCS 4000	universal fire controlling unit	600 µA
UCS 6000	universal fire controlling unit	600 µA

[1)] maximum current drawn by element from detection line/loop of POLON 4000 system control panel.
[2)] signalling device without additional power supply must be provided with line/loop current for alarming.

END