POLON-ALFA LATEST TECHNOLOGY. HIGHEST QUALITY

POLON 4000

INTERACTIVE FIRE DETECTION AND ALARM SYSTEM

POLON 4500

AUTOMATIC FIRE EXTINGUISHING ADDRESSABLE CONTROL PANEL

Operation and Maintenance Documentation

ID-E316-001GB

IIIC Edition

CE

CNBOP

Polon-Alfa Spółka z ograniczoną odpowiedzialnością Sp. k.

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The POLON 4500 automatic fire extinguishing 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 4500 addressable control panel has been attested with the EC-Certificate of Conformity No. 1438/CPD/0188 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 EN 54-2:1997+A1:2006, EN 12094-1:2003 standards.
The device has been also approved with the Allowance Certificate No. 0791/2010 issued by CNBOP.

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

CE

1438

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155, Glinki Street, PL 85-861 Bydgoszcz, POLAND
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1438/CPD/0188

EN 12094-1:2003

POLON 4500 Fire Extinguishing Control Panel

Extinguishing installation types:

- high-pressure,
- low- pressure,
- neutral gases and extinguishing gases mixtures.

Provided options:

- extinguishing signal delay,
- sub-assemblies status supervision,
- discharge time control,
- initiation signal transmission to extinguishing installation devices,
- additional release actuation,
- signal transmission to devices outside extinguishing installation,
- extended release time control.

and other additional functions: see technical specification included in the ID-E316-001GB manual.

EN 54-2:1997+A1:2006

POLON 4500 Fire Extinguishing Control Panel (fire detection and alarming)
Addressable, for indoor use
Provided options:

- fire alarm devices output,
- output signal delays,
- interdependent alarming,
- test mode,
- test mode

and additional functions, inputs and outputs: see technical data contained in ID-E316-001GB 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

This Operation and Maintenance Documentation (OMD) presents the purpose, construction and operation of the POLON 4500 automatic fire extinguishing control panel constituting a part of the POLON 4000 system. The Documentation contains information necessary in order to properly install, operate and utilise the control panels. It may also facilitate the process of designing fire alarm and extinguishing installations.

The Documentation does not include other POLON 4000 system elements which are described in separate technical documents. The Manual is complemented with the Programming Manual (PM) describing the control panel programming process. The line elements which interoperate with and may be installed in the POLON 4500 control panel detection lines are listed in Appendix A.

The Operation and Maintenance Documentation is delivered to a user together with the control panel; however, the Programming Manual is provided only for properly trained and authorised designing and installation companies.

1.2 CONTROL PANEL APPLICATION

The POLON 4500 fire alarm is designed for:

- signalling sources of fire detected by interoperating (automatic and manual) fire warning devices;
- defining locations endangered with fire;
- activation of fire protection devices;
- informing appropriate services, e.g. National Fire Service units about a fire;
- automatic fire extinguishing in zones 1 ÷ 4 provided the control panel is properly configured.

The POLON 4500 control panels are intended to operate continuously in premises of low dust content, within the -5 ^{o}C – +40 ^{o}C temperature range and air relative humidity up to 80 % at +40 ^{o}C.

1.3 SAFETY CONDITIONS

1.3.1 Electric shock protection

The POLON 4000 system fire control panels are ranked as 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.
Insulation of the 230 V/50 Hz power circuits is reinforced and resists the test voltage of 2800 V. Insulation of low-voltage circuits (below 42 V) resists the test voltage of 700 V DC. After connecting the power network cabling, the network connection must be protected with a manufacturer's housing.

1.3.2 Installation and equipment safety

The wiring installation should be made of wires with the required fire resistance and it should be properly protected when crossing the fire zone borders. In order to prevent unwelcome effects, the distance between the low-voltage installation and the power and lightning protection systems should be kept as required. Taking into account system resistance to electromagnetic interference, it is recommended to use protective grounding. A reserve batteries cluster must be connected to the unit during the final installation process stages.
The components of this unit are high-temperature sensitive. The maximum ambient temperature must not exceed 40 °C. It is forbidden to block the ventilation openings on the side of the unit. The space around the unit must facilitate free flow of air. The air humidity in the rooms where the unit operates must not exceed 95 %.

1.3.3 Repairs and maintenance

The maintenance works and periodical inspections should be conducted by the authorised employees of companies which have been authorised or trained by Polon-Alfa personnel. All repair works must be done exclusively by the manufacturer. Polon-Alfa does not bear any responsibility for the operation of devices maintained and repaired by unauthorised personnel.

1.3.4 Fuse replacement

When replacing fuses, use only spare parts of the appropriate type and nominal value. See table 2.2 and chapter 14 of this Manual for the appropriate types and nominal values.

1.4 DEFINITIONS

Addressable detection line
A detection line that enables connection of addressable elements.
Side detection line
A detection line for two-state non-addressable fire warning devices, created using the ADC-4001 adapter.
Addressable element
An element operating in a detection addressable line with a unique and unchangeable identifier, i.e. serial number, and the element number defined during its configuration. An addressable element enables two-way exchange of digital data with the control panel (transmission and reception).
Line element
An element installed in detection addressable lines (addressable element) and side lines (non-addressable element).
Serial number
A unique 12-digit number assigned to each addressable element during the production process. The serial number contains the addressable element type identified by the control panel.
Line number
An ordinal number (range 1 ÷ 4) assigned to open or loop detection lines.
Element number
An ordinal number (range 1 ÷ 127) assigned to an addressable element when a detection line is configured. During normal operation, the control panel communicates using the element number (so-called "short number").
Address space
A set of number pairs containing line and element numbers that define all possible program locations of the elements within an installation.
Zone
A separated section of the protected premises to which defined line elements are assigned.
Extinguishing zone - a zone (described with a number from the 1 ÷ 4 range) equipped with permanent fire extinguishing devices.
E.A. – extinguishing agent.
Non-maskable fault
A fault connected with the EKS-4001 elements or LK monitoring lines
Standard configuration
A set of data defining the control panel equipment furnishing and its operation organisation (e.g. addressable elements declaration, assignment of elements to zones, alarming variants) which has been defined and stored in the memory by the manufacturer.
User message (text)
Information on the text display (text - max. length 64 characters each) assigned, during the programming process, to zones or input/output elements and used by users to identify an occurrence location.

Quiescent (detecting) mode
An operating condition in which the control panel is supplied from an electric energy source meeting defined requirements and in which no other operation mode is signalled.
Alarm (fire) mode
An operating condition the control panel enters after receipt from warning devices information regarding fire detection.
Preliminary alarm mode (first alarm mode)
An operating condition the control panel enters after warning devices transmits the first fire alarm signal.
Disablement mode
An operating condition in which the control panel's reception of signals and generation of alarms from any call points are intentionally disabled or the output from the control panel and/or the transmission track to any fire alarm system elements which create the alarm installation are disabled.
Test mode
An operating condition in which the control panel signals that applicable functions are being checked.
Fault mode
A condition in which the control panel signals a fault in any element of the alarm installation or own circuits.
Technical alarm mode
An operating condition in which the control panel signals actuation of any supervised external devices or provides information regarding the service status of fire detectors.
POLON 4000 system digital monitoring (PMC-4000)
A digital monitoring protocol defined in the POLON 4000 control panels.

2 DEVICE COMPLETENESS

Table 2.1 lists the set of items which compose the POLON 4500 control panel furnishings.
See Table 2.2 for a list of fuses installed in the control panel.
Table 2.3 contains a list of additional equipment which may be installed in the POLON 4500 control panels (ordered separately).

Table 2.1

Item	Description	Drawing (catalogue) No.	Quantity
1	Complete casing	A/E300-50.00.00-1	1
2	M1C-FES, 30V/10A mains power supply unit		1
3	MZ-48 power supply unit	B/E270-50.00.00	1
4	PSC-46 central controller module	B/E270-180.00.00-1	1
5	DR-48 printer	C/E270-40.00.00	1
6	MSL-1M line module	B/E270-20.00.00	1
7	PPW-45 programmable outputs module	B/E316-20.10.00	1
8	MIK-48 interface module	B/E270-60.00.00	1
9	PS-48 signalling devices board	C/E270-80.00.00	1
10	PP-45 intermediate board	C/E316-30.00.00	1
11	MSG-45 extinguishing control module	B/E316-10.00.00	1
12	Frame - complete	D/E240-120.00.00.00-5	1
13	Operation and Maintenance Documentation (OMD)	ID-E300-001	1
14	Servicing manual	IO-E300-001	1
15	Warranty certificate		1
16	Control panel package		1

Table 2.2

Item	Module name	Description	Quantity
1	MZ-48	Melt fuse T 10L125 V	1
2	MZ-48	Melt fuse T3,15L250 V	1
3	MSL-1M	Melt fuse F500L250 V	1
4	PPW-45	Melt fuse F1AL250 V	1
5	MSG-45	Melt fuse F1AL250 V	1
6	MIK-48	Melt fuse F500L250 V	1

Table 2.3

Item	Description	Drawing (catalogue) No.
1	MSG-45 extinguishing control module	B/E316-20.10.00
2	MSI-48 mains module	B/E270-70.00.00-1
3	PAR-4800 battery casing	A/E270-140.00.00-1
4	Hanger	B/E297-04.00
5	PAR-2000 battery casing	
6	Bar code reader	
7	Computer keyboard	

3 TECHNICAL SPECIFICATIONS

Control panel supply voltage - mains 50 Hz	230 V +10 %-15 %
Maximum mains current consumption	2.8 A
Control panel internal operating voltage (DC)	24 V + 25 %-15 %
Basic supply source:	
– AC power adaptor	30 V/10 A
Reserve supply source:	
– Pb ”24V” battery (airtight) cluster – capacity	38 ÷ 180 Ah
Maximum internal resistance of the battery cluster plus supply cables resistance	1 Ω
Switching to reserve supply	automatic
Switching to battery charging	automatic
Maximum battery current consumption in the quiescent mode:	
– with 2 MSG-45 modules (without external devices current)	0.55 A
– with 4 MSG-45 modules (without external devices current)	0.65 A
Maximum consumption of current supplied to external devices from the power supply module terminals	3 A
Maximum total consumption of current supplied to external devices in an alarm mode (including potential outputs)	8 A
Number of addressable detection lines	4
Maximum voltage in a detection line	23.4 V ÷ 24.6 V
Permissible quiescent current in a detection line (depending on configuration):	
– at maximum cabling resistance equal to 2 x 100 Ω	20 mA
– at maximum cabling resistance equal to 2 x 75 Ω	22 mA
– at maximum cabling resistance equal to 2 x 45 Ω	50 mA
Maximum permissible resistance of detection line cabling	
– addressable line, depending on configuration	2 x 100 Ω, 2 x 75 Ω
– ADC-4001 side line	or 2 x 45 Ω
– between two consecutive elements containing short circuit isolators	2 x 25 Ω

Maximum permissible capacity of detection addressable line cabling	2 x 50 Ω
Minimum insulation resistance between cables in the installation	300 nF
Addressable detection line operation layout:	100 kΩ
– loop-shaped – with a possibility to eliminate one break or short circuit in the detection line cabling (A type detection line)	
– radial without a loop (B type detection line)	
Number of addressable elements in one line, depending on the total quiescent current but not higher than:	
– for A type lines	
– for B type lines	127
Maximum number of EKS-4001 monitoring and controlling elements connected to a control panel	32
Maximum number of EWS-4001 multi-output control elements connected to a control panel	250
	80
Maximum number of EWS-4001 multi-output control elements connected to one detection line	20
	80
Maximum number of EWK-4001 multi-input monitoring elements connected to a control panel	20
Maximum number of EWK-4001 multi-input monitoring elements connected to one detection line	250
	1024
Maximum number of SAL-4001 acoustic signalling devices connected to a control panel	1 (A and B)
Number of zones to which line elements are program assigned	
Number of inter-dependent detector groups in a zone	
Fire alarm types:	
– preliminary alarm	1ST STAGE ALARM
– main alarm	2ND STAGE ALARM
Liquid Cristal Display (graphical) - resolution:	
Number of alarming variants to be used in 1 ÷ 4 fire extinguishing zones	320 x 240 pixels
Number of alarming variants to be used in other zones	4
Time programming ranges:	17
– T1 time - waiting for confirmation of a 1st STAGE ALARM	
– T2 time - situation recognition after the 1st STAGE ALARM confirmation	0 ÷ 10 min
– T3 time - alarm outputs activation delay	0 ÷ 10 min
Programmable outputs:	0 ÷ 10 min
– 1 A/30 V relay non-potential switchable contacts	
– signalling lines of 1 A/24 V capacity	8 (PK1 ÷ PK8)
– signalling lines of 0.5 A / 24 V capacity	1 (LS1)
Programmable inputs – monitoring lines:	3 (LS2÷LS4)
Number of monitoring lines	
Monitoring line resistance	4 (LK1÷LK4)
Maximum number of zones assigned to outputs (total number of assignments to PK and LS type outputs and EKS-4001, EWS-4001, UCS 4000 and UCS 6000 type line elements)	see Table 5.9
Maximum number of stored events (EVENT MEMORY)	64,000
Maximum number of stored alarms (ALARM MEMORY)	2,000
	9,999

Fire extinguishing zones::

Number of fire extinguishing zones (MSG-45 fire extinguishing control modules)	
One MSG-45 fire extinguishing module contains:	1, 2, 3 or 4
– 2 A/24 V relay potential outputs (PK1 ÷ PK3)	
– 0.6 A/24 V relay potential outputs (PK4 ÷ PK7)	3
– 3 A / 30 V relay non-potential outputs (PK8 ÷ PK16)	4
– monitoring inputs (LK1 ÷ LK11)	9
	11

Activation mode time delay, max.
Output activation time delay, max. 3 s
Time programming ranges: 1 s
- fire extinguishing signal delay
- duration of impulses controlling electro valves (t1, t2, t3) 0 ÷ 60 s
- "sealing" delay 0 ÷ 30 min.

Types of push buttons installed in monitoring lines: 0 ÷ 120 s
- PU-61 - START EXTINGUISHING,
- PW-61 - STOP EXTINGUISHING,
- PB-61 - EXTINGUISHING BLOCKADE,
- PD-61 - START RESERVE.

Fire extinguishing installation types:
- high-pressure,
- low-pressure,
- neutral gases and extinguishing gas mixtures.

The MSG-45 modules additional functions (except for the functions required by the EN-12094-1 standard):
- fire extinguishing signal delay,
- receipt of the extinguishing agent flow signal,
- subassembly status supervision,
- receipt of signals emitted by emergency suspension devices,
- separate supervision over the blocking device non-electric status,
- discharge time control,
- receipt of signals informing about operation modes changes - switching from the manual to automatic/manual mode and vice versa,
- transmission of actuating signals to the fire extinguishing installation devices,
- actuation of an additional discharge,
- signal transmission to devices outside the fire extinguishing installation,
- receipt of signals emitted by emergency disconnecting devices,
- extended outflow control,
- actuation of alarm devices of different signals,

Control panel case ingress protection degree according to PN-EN 60259:2003 IP30
Operating temperature range - 5 ºC ÷ + 40 ºC
Control panel mass ca. 18 kg
Control panel dimensions
536x492x218 mm
PAR-4800 battery container dimensions
212x492x195 mm
Interoperation with devices:
- computer keyboard,
- computer,
- the TELSAP 2100 digital monitoring system for,
- the POLON 4000 (PMC-4000) digital monitoring system,
- control panel co-operation with the TSR-4000 terminals – maximum number of terminals connected to one control panel 16.

4 DESIGN DESCRIPTIONS

4.1 CONTROL PANEL OVERALL DESCRIPTION

The control panel is designed in the form of a metal cuboid cabinet to be installed on walls using a special frame. The cabinet door (front panel of the unit) is secured with a cylinder lock.
The POLON 4500 control panel is functionally divided into two independent, but closely co-operating units:

- detection unit, which fulfils the same role as in the POLON 4900 fire alarm control panel;
- fire extinguishing unit, which can support from 1 to 4 fire extinguishing zones (depending on its configuration).

All signalling and handling elements for both units (some elements are shared by both, e.g. the display) are placed within two separate areas located on the control panel door. Additionally, the fire extinguishing zones boxes on the door contain descriptive areas where zone descriptions can be written in (see Fig. 4.2). The control panel is delivered with 2 sheets of paper (basis weight 200 g/m) to create labels with the zone descriptions. When the required text is written and labels are cut our properly (pursuantly to the outline), they are placed in the slots from the inside of the control panel door. Visit www.polon-alfa.pl to use a template for labels creation with zone descriptions as computer printouts.
Electronic circuit modules and an AC power adaptor are located inside the cabinet.
Round openings in the upper and middle section of the control panel back wall are used to route the installation cables inside the cabinet. Below a round rubber seal opening is provided for routing mains power supply and grounding wires.
The control panel may be optionally equipped with the PAR-4800 container for two 12 V 44 Ah capacity batteries. In case higher capacity batteries are necessary (over 44 Ah), the PAR-2000 battery box may be used. A computer keyboard (PS/2) can be connected to the control panel.

4.2 MODULES ARRANGEMENT

The POLON 4500 control panel module layout is illustrated in Fig. 4.1.
The POLON 4500 control panel modules are mounted on the door and walls by means of screws.
The PSC-46 central controller module with an LCD display is attached to the control panel door. The PP-45 intermediate module is located beneath the PSC-46 module. It controls the handling and signalling elements of the fire extinguishing zones 1 ÷ 4. The DR-48 thermal printer is placed in the left lower corner of the cabinet. The acoustic signalling device and main fire indicator board are located above.
The following elements are installed on the back wall:

- on the left – the MSL-1M detection line module that supports lines numbered 1 ÷ 4;
- the PPW-45 programmable outputs module laid on the MSL-1M module;
- in the right upper corner – the MSG-1 – the 1st zone fire extinguishing control module;
- on the right below the first module – the MSG-2 – the 2nd zone fire extinguishing control module;
- over the MSG-1 module (option) – the MSG-3 – the 3rd zone 3 fire extinguishing control module;
- over the MSG-2 module (option) – the MSG-4 – the 4th zone fire extinguishing control module;
- in the left lower corner – the PZ-48 power supply module;
- in the right lower corner – the M1CFES AC power adaptor.

The following elements are installed on the left side wall:

- at the top – the MIK-48 interfaces module;
- at the bottom (option) – the MSI-48 network module.

Note:
It is allowed to install or remove the modules only when the power supply sources are disconnected.

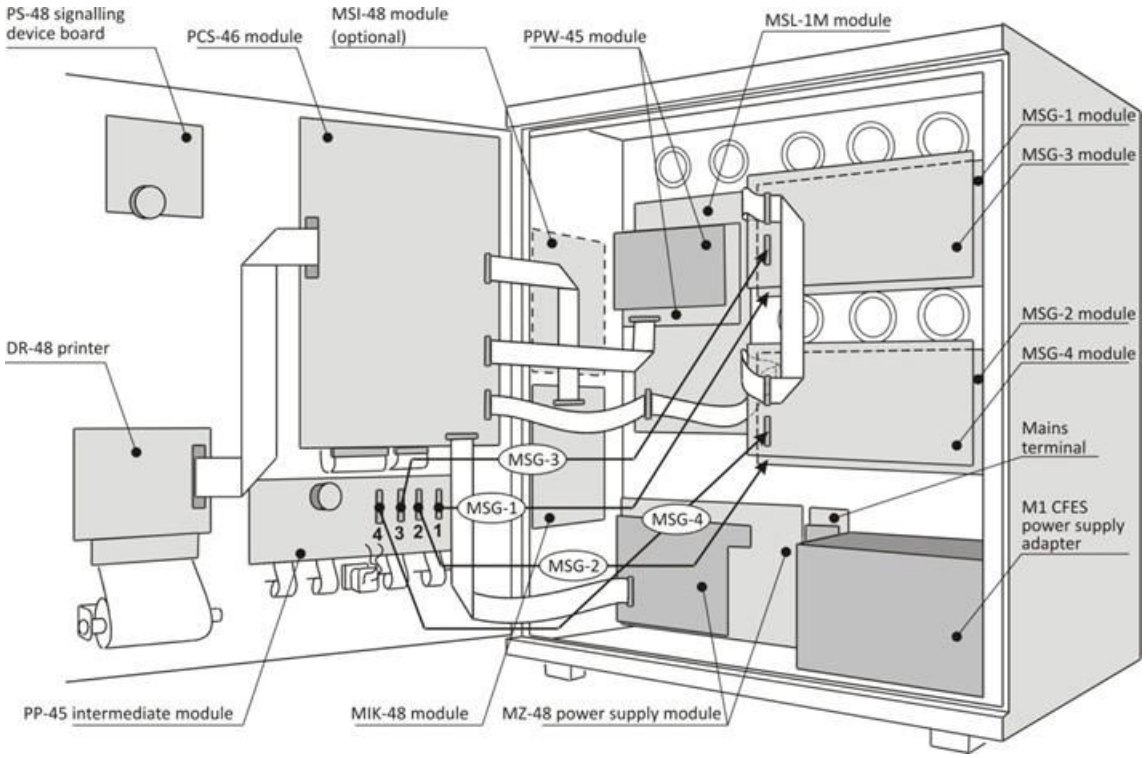

Fig. 4.1 POLON 4500 control panel modules arrangement

4.3 HANDLING AND SIGNALLING ELEMENTS

4.3.1 Introduction

Handling and signalling elements are located in the TSO-4500 panel placed on the control panel door, which is called a signalling and operation board or an operator's console.

The operator's console area is divided into two sections:

- a section containing handling and signalling elements of the control panel detection unit;
- a section containing handling and signalling elements of the fire extinguishing zones (1÷4) unit.

The location of handling and signalling elements is presented in Fig. 4.2.

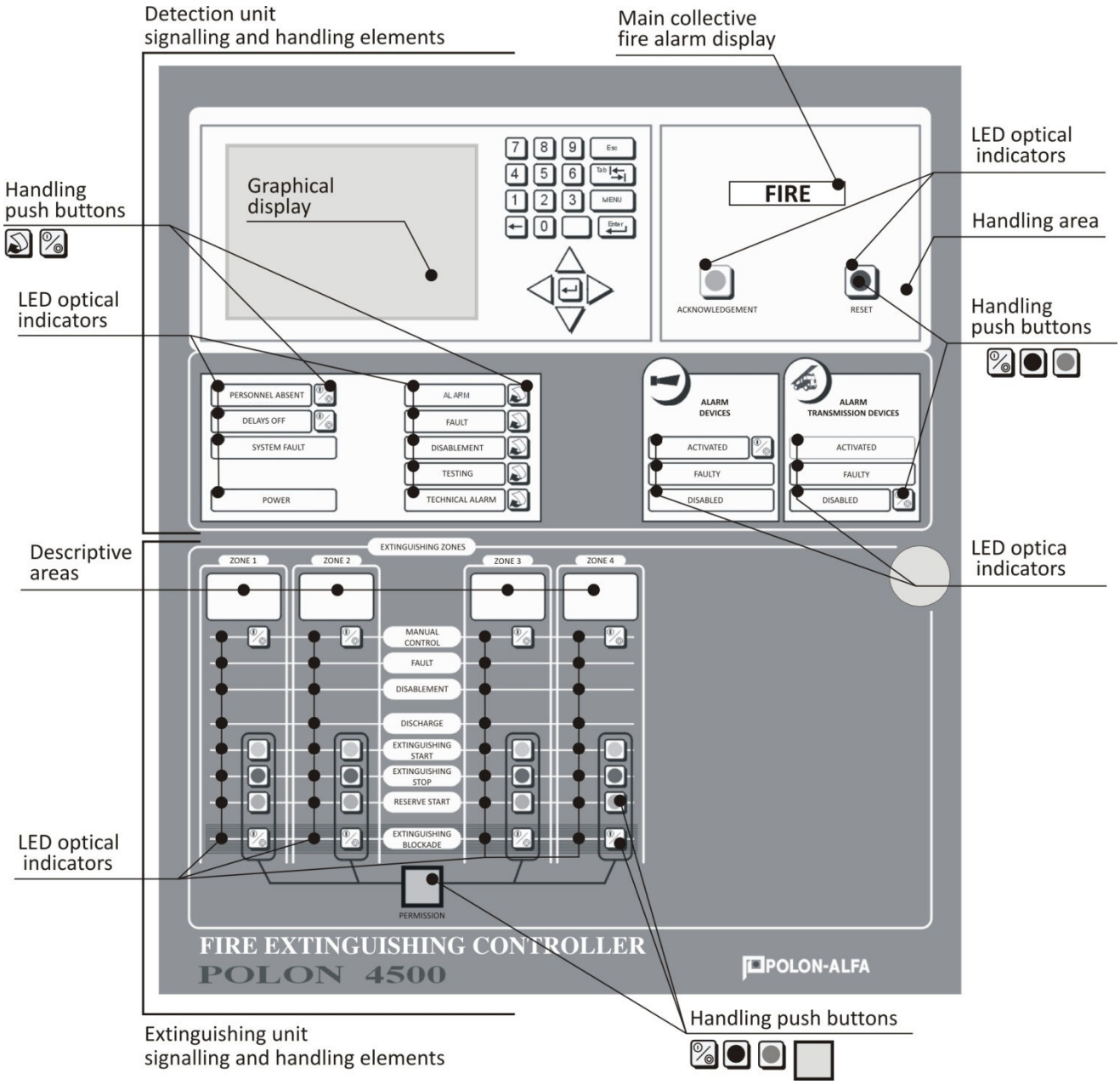

Fig. 4.2 Handling and signalling elements located on the front panel

4.3.2 Detection unit handling and signalling elements

1 – ACKNOWLEDGEMENT

a) indicator - acknowledgement function active;

b) push button – used for silencing the buzzer in the control panel at a fire alarm, technical alarm or fault mode; activates T2 time with two-stage alarming.

2 – RESET

a) indicator - reset function active;

b) push button - fire alarm reset.

3 – ACTIVATED (ALARM TRANSMISSION DEVICES)

a) indicator - activation of at least one alarm transmission output.

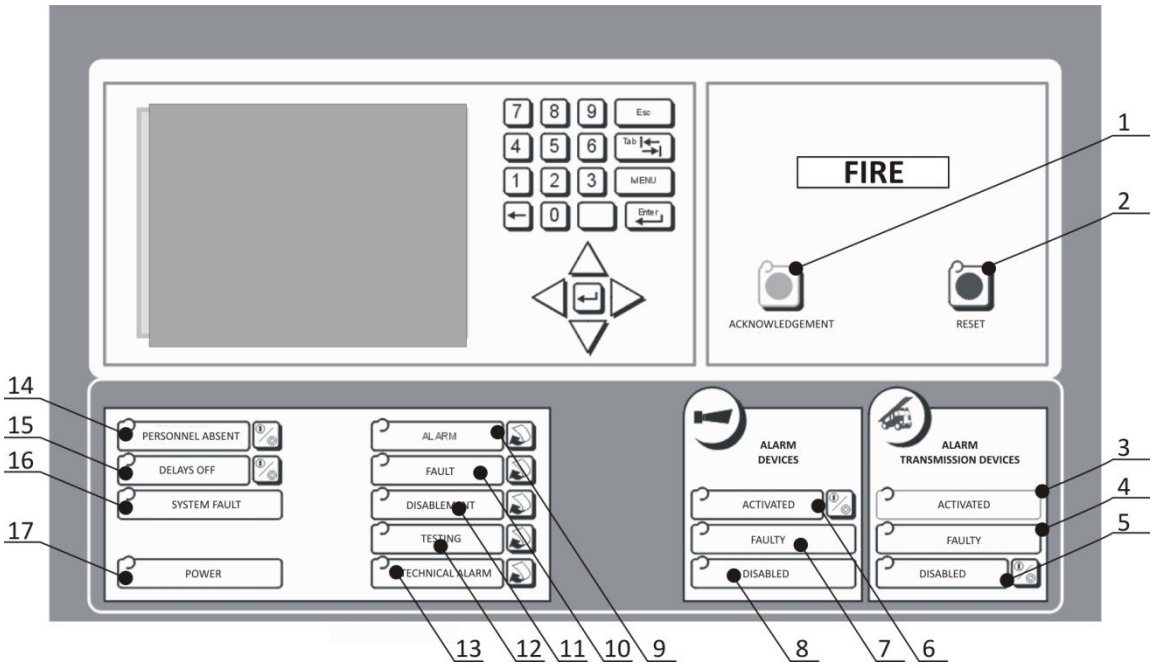

Fig. 4.3 Detection unit LED optical signalling devices

4 – FAULTY (ALARM TRANSMISSION DEVICES)

a) indicator - faults of outputs to alarm transmission devices:
- steady light - some or all outputs to alarm transmission devices are faulty.

5 – DISABLED (ALARM TRANSMISSION DEVICES)

a) indicator – disablements of outputs to alarm transmission devices:
- steady light - all outputs to alarm transmission devices are disabled;
- blinking light - some outputs to alarm transmission devices are disabled.

b) push button - turning on/off all outputs to alarm transmission devices (except for permanently disabled outputs).

6 – ACTIVATED (ALARM DEVICES)

a) indicator - activation of at least one alarm output.

b) push button - turning on/off all outputs to alarm devices and the ones meeting the activation criterion (except for permanently disabled outputs).

7 – FAULTY (ALARM DEVICES)

a) indicator - faults of some or all outputs to alarm devices.

8 – DISABLED (ALARM DEVICES)

a) indicator – disablements of outputs to alarm transmission devices:
- steady light - all outputs to alarm devices are disabled;
- blinking light - some outputs to alarm devices are disabled.

9 – ALARM

a) indicator - collective fire alarm indicator:
- steady light - fire alarm confirmed;
- blinking light - fire alarm unconfirmed.

b) push button - fast access to fire alarm messages.

10 – FAULT

a) indicator - collective fault indicator:
- steady light - fault confirmed;

- blinking light - fault unconfirmed.
b) push button - fast access to fault messages.

11 – DISABLEMENT

a) indicator - collective disablement indicator:
- steady light - disablement turned on.
b) push button - fast access to disablement messages.

12 – TESTING

a) indicator - collective testing indicator:
- steady light - testing activated.
b) push button - fast access to testing messages.

13 – TECHNICAL ALARM

a) indicator - collective technical alarm indicator:
- steady light - technical alarm confirmed;
- blinking light - technical alarm unconfirmed.
b) push button - fast access to technical alarm messages.

14 – PERSONNEL ABSENT

a) indicator - Personnel Absent mode.
b) push button - turning on/off the Personnel Absent mode.

15 – DELAYS OFF

a) indicator - delays turned off.
b) push button - turning on/off all delay times (T1, T2, T3, Top).

16 – SYSTEM FAULT

a) indicator - system (processor circuits) fault.

17 – POWER

a) indicator - control panel power supply:
- steady light - control panel supplied from the mains; no faults;
- blinking light - any power supply fault.

4.3.3 Extinguishing unit LED optical signalling devices

1 - MANUAL CONTROL

a) indicator:
- ON - only manual control;
- OFF - automatic and manual control.
b) push button - turning on/off manual control.

2 - FAULT

a) indicator - collective fault indicator:
- steady light - fault in a fire extinguishing zone.

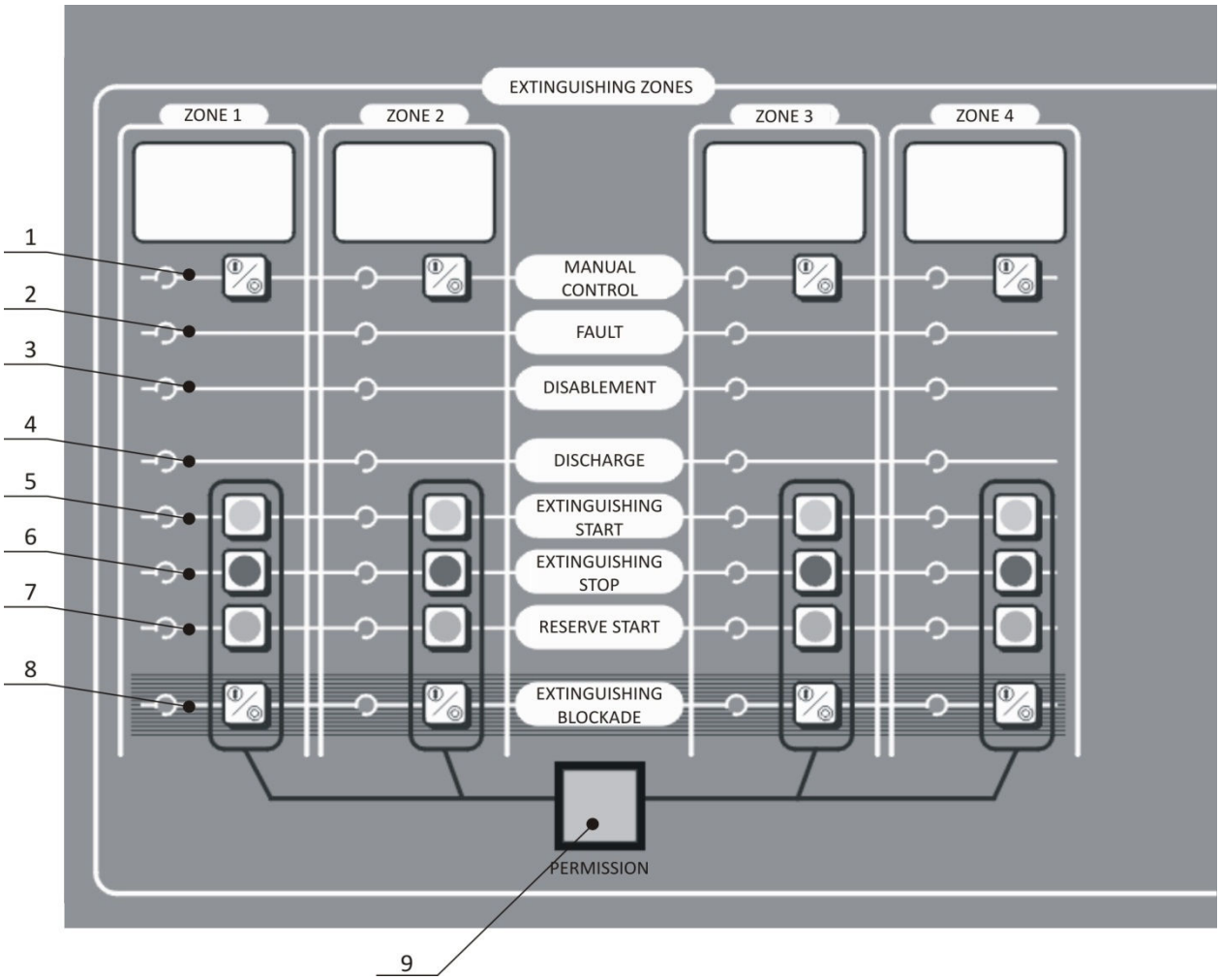

Fig. 4.4 Extinguishing unit LED optical signalling devices

3 - DISABLEMENT

a) indicator - collective disablement indicator:
- steady light - disablement of a fire extinguishing zone.

4 - DISCHARGE - extinguishing agent discharge indicator.

a) indicator:
- steady light - extinguishing agent discharge.

5 - FIRE EXTINGUISHING START

a) indicator:
- steady light - fire extinguishing procedure started.

b) push button - fire extinguishing procedure start.

6 - FIRE EXTINGUISHING STOP

a) indicator:
- steady light - fire extinguishing procedure stopped.

b) push button - fire extinguishing procedure stop.

7 – RESERVE START

a) indicator:
- steady light - extinguishing agent reserve discharge.

b) push button - extinguishing agent reserve discharge activation.

8 – FIRE EXTINGUISHING BLOCKADE

a) indicator:
- steady light - fire extinguishing procedure blocked.
b) push button – blockade of a fire extinguishing procedure.

9 - PERMISSION – common push button that enables to push buttons in fire extinguishing zones 1 ÷ 4.

4.3.4 Numerical keypad and edition push buttons

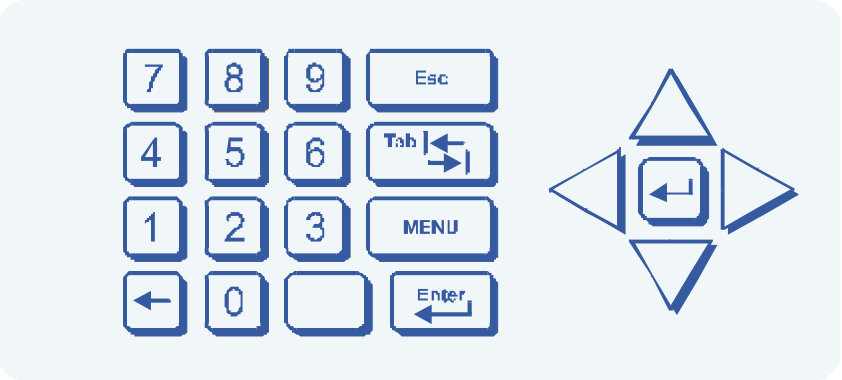

Fig. 4.5 Numerical keypad and edition push buttons

MENU – opens the control panel main menu.
Esc – cancels a current operation.
↵ **Enter** – confirms selected menu options and moves the cursor to the beginning of the next line (when messages are edited).
↔ **Tab** – navigates among menu windows.
← **Back Space** – deletes a character before the cursor and moves the text one character to the left.
Space, unmarked key – enters a space in the cursor location.
←↑↓→ cursors.
Note:
Instead of using the keypad located on the control panel door, a computer keyboard may be connected to the port on the MIK-48 module.

5 OPERATION DESCRIPTION

5.1 GENERAL DESCRIPTION

The POLON 4500 automatic fire extinguishing control panel (of the POLON 4000 system) is a multi-processor device of a modular design. The control panel block diagram is presented in Fig. 5.1.
The POLON 4500 control panel is divided into two independent, but closely co-operating units:

- fire detection unit fulfilling the same role as in the POLON 4900 fire alarm system;
- fire extinguishing unit which may operate from 1 to 4 fire extinguishing zones (depending on its configuration).

Within the detection unit, after receiving a proper signal from the control panel (element address), line elements installed in the addressable detection line transmit return signals with information regarding their type and status. The exchange of information between line elements and the control panel is possible through the four-loop MSL-1M module. Having analysed the received signals, the MSL-1M module transmits required information (through the control panel bus) to the PSC-46 central controller being the main module of the control panel. PSC-46 processes the information and provides correct signals for other systems.

While implementing the programmed operation procedures, the PSC-46 controls (through the bus) the relays or signalling lines in the PPW-45 module, LCD display and signalling/handling elements (only in the detection unit) of the TSO-4500 board. The board is responsible for communication between the operating personnel and the control panel.

The PPW-45 programmable outputs module makes it possible to control external devices by means of 8 relay outputs, 4 control lines and 4 monitoring lines.

The MSG-45 modules (one per each fire extinguishing zone) are responsible for controlling extinguishing and signalling devices in the fire extinguishing zones. Each module is connected to own signalling and handling elements on the TSO-4500 board and the main PSC-46 module which emits alarm signals necessary to activate the fire extinguishing procedure. During the hardware/software setup, the modules obtain logical names (from MSG-1 to MSG-4 as required) in order to identify them with the fire extinguishing zones from 1 to 4.

The MZ-48 power supply module generates the following voltages:

- + 24 V operating voltage of the control panel and voltage for users;
- insulated + 27 V voltage to supply detection lines;
- insulated + 5 V supply voltage for serial outputs;
- + 5 V supply voltage for the LCD display and DR-48 printer.

The AC power adaptor (capacity 30 V/10 A) supplies the operating voltage to the control panel and, in the event of mains power failure, the voltage is supplied from the reserve battery cluster.

5.2 TSO-4500 OPERATOR PANEL

The TSO-4500 operator's panel contains:
- liquid crystal display
- PS-48 signalling devices board
- PP-45 intermediate board
- PO-45 service panel (keypad + signalling diodes)
- DR-48 printer.

The LCD display in mechanically and electrically connected with the PCS-46 main controller located on the control panel door.

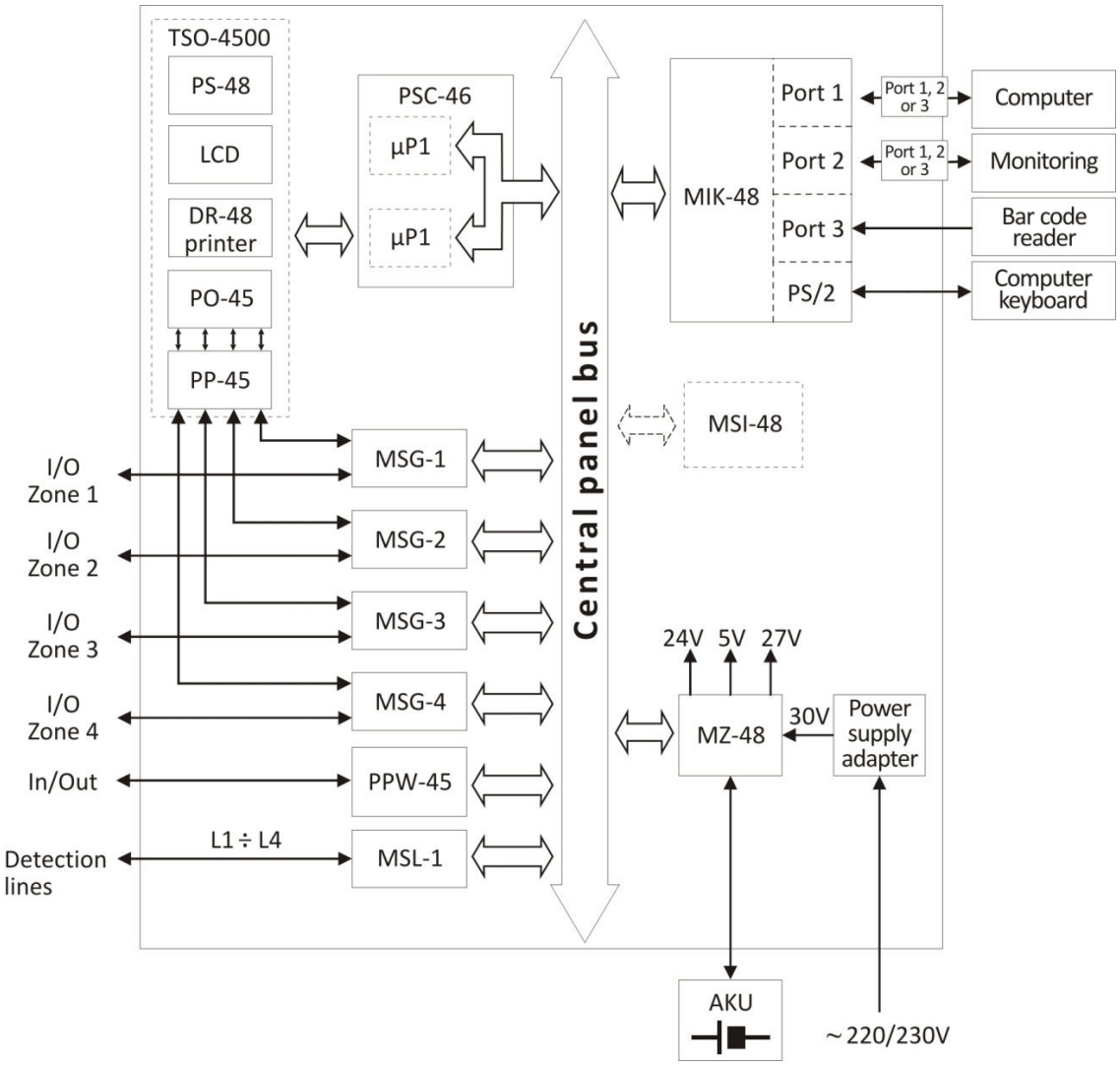

Fig. 5.1 POLON 4500 control panel block diagram

5.3 PSC-46 CENTRAL CONTROLLER MODULE

The central controller module is equipped with two independent microprocessor circuits (µP1 and µP2) which ensure mutual supervision and unfailing control panel operation. Each circuit has an independent set of ROM memory (in a separate MP-49 memory module), RAM operating memory and SETUP configuration memory (set of data defining the hardware environment and system operation organisation). In normal operating conditions, the whole control panel operation is managed by the first microprocessor circuit (µP1), i.e. the active microprocessor. In case this circuit fails, the entire control panel operation is monitored by the other (redundant) microprocessor circuit (µP2).
In this condition, µP2 is the active circuit.
The module also includes circuits creating the control panel bus for information exchange and controlling other modules (MSL-1M, PPW-45, MSG-45, MIK-48 and MZ-48).
The PSC-46 has two transducers generating constant voltage of 3 V and 5 V to supply own and external electronic systems.

5.3.1 Module signalling and handling elements

LEDs indicating the service conditions of the module operation are provided on the left internal edge of the PSC-49 module.
At the back, two miniature push buttons marked as Reset µP1 and Reset µP2 are located below the MP-49 module. They are used to restart a relevant µP1 or µP2 microprocessor (with short push button pressing).

The SW1 switch is located in the centre of the module. It is a set of 8 keys (K1 ÷ K8) to change the hardware and software setup of the control panel. The SW1 switch keys functions are described in table 5.1.
In order to carry out the operations described for the K1 or K2 key in the Table 5, it is necessary to turn the proper SW1 switch key ON, press a proper momentary switch (Reset µP1 or Reset µP2) and after about 30 seconds, turn the SW1 switch key back OFF.

Table 5.1

SW1 Key	Position	Function
K1	ON	After an active microprocessor restart, the control panel standard configuration loading
K2	ON	After an active microprocessor restart, the control panel operation data actuation
K3	ON	After an active microprocessor restart, loading standard access codes at the 2nd, 3rd and 4th levels
K4	ON	Switching on service diodes located on PSC-49 module
K5		Unused
K6	ON	Permission to reset SYSTEM FAULT – the reset is performer after an active µP1 or µP2 microprocessor reset
K7	ON OFF	If the K8 key in in the ON position: - extortion of µP2 operation as the active microprocessor - extortion of µP1 operation as the active microprocessor (e.g. in the system fault condition)
K8	ON	Permission for 'manual' extortion of active microprocessor operation (using the K7 key)

Note:
Turning the key 1 switch ON and restarting the PSC-46 module results in deleting the previous system configuration and loading the standard one.
Leaving the keys 1, 2 and 3 in the ON position may result in losing the entered data (signalled as a system fault).

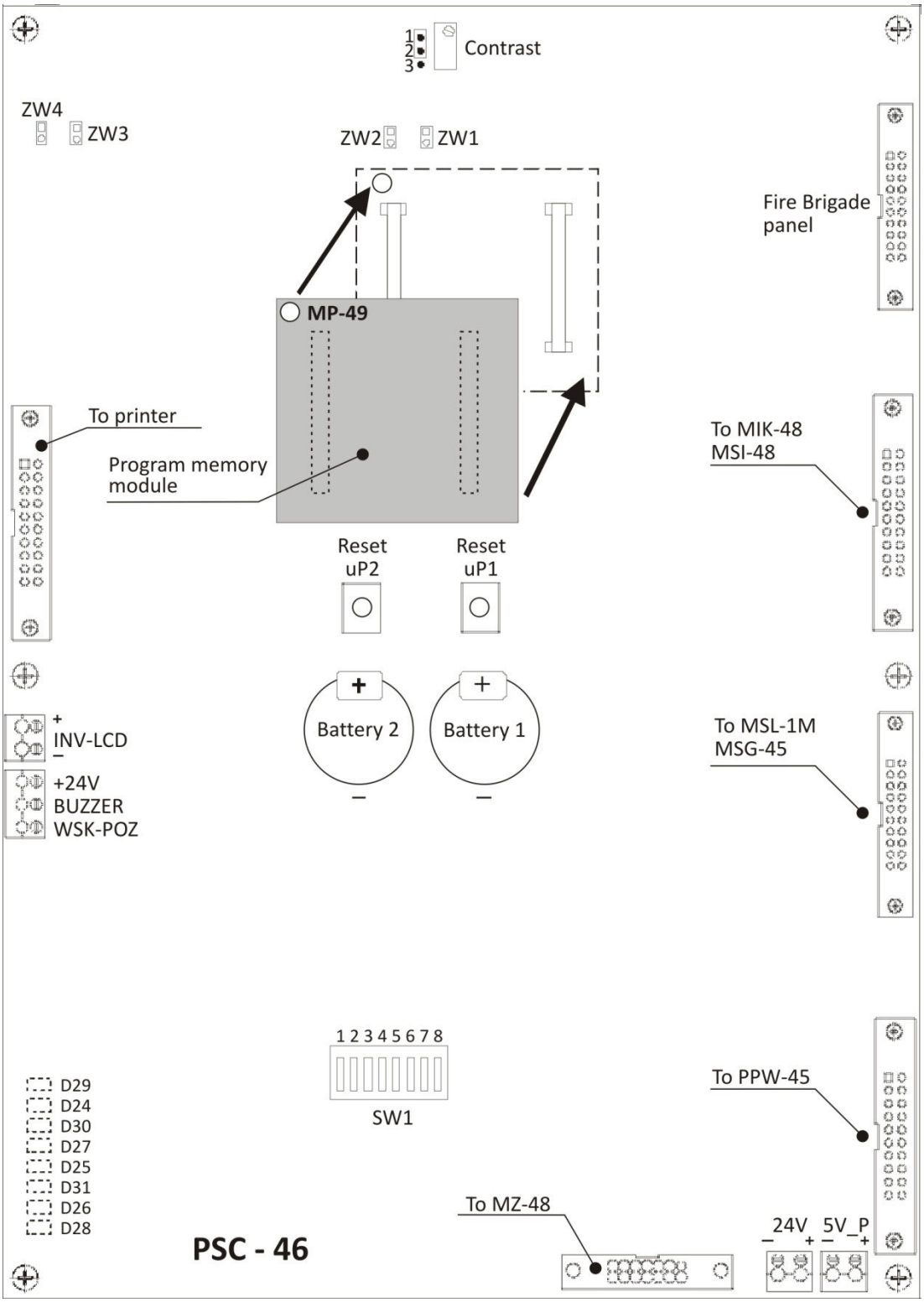

Fig. 5.2 PSC-46 central controller module

5.4 MSL-1M LINE MODULE

POLON 4500 control panels are permanently equipped with one MSL-1M line module (logical name - MSL-1) supporting 4 loop-shaped or radial detection lines marked as L1 ÷ L4.
In the control panel, the MSL-1M module is located under the PPW-45 programmable O/I module (the connected modules are presented in Fig. 5.4). The view of the uncovered MSL-1M module (after removing the PPW-45 module) is presented in Fig. 5.3.
The MSL-1M module controls and operates the detection lines to which the addressable elements of the POLON 4000 system are connected.

An addressable detection line may operate in a loop circuit as A type or radial circuit as B type (open line).
The following elements may be connected to one detection line:

- max. 127 addressable elements in the loop circuit;
- max. 32 addressable elements in the radial circuit.

Operation in the loop circuit enables to eliminate one "line break" type fault and isolate the line short circuits between neighbouring addressable elements (all addressable elements are equipped with short circuit isolators).

The MSL-1M line module supports loop lines by default. The detection line type (loop, radial) may be changed in the setup MENU of the MSL-1M module.
The maximum detection current of each detection line is linked with the total resistance of the detection line cabling and location of the programming line jumpers (see Table 5.2).

The S1 jumper and S9, S10, S11, S12 jumpers programming the MSL-1M module must always be in the position presented in Fig. 5.3.
The service diodes located on the left module edge display general service conditions of the main processor and line processors. The line service diodes (located inside the module) ensure service display of the detection line conditions.
The MSL-1M line module contains a microprocessor controller system with EPROM and RAM memory, 5 V power adaptor and circuits co-operating with the PSC-46 central module via the control panel bus. The detection lines are supplied from an insulated + 27 V power supply source, which makes it highly resistant to interferences and surges.
The module also contains the 27 V voltage monitoring system and earth fault circuit, restart circuit with a switch and the addressable detection lines condition signalling system based on LEDs.

Table 5.2

Line No.	Jumper	Jumper position	Max. current [mA]	Max. resistance [Ω]
L1	S21	1-2 1-2 2-3	20 22 50	2 x 100 2 x 75 2 x 45
L2	S22	1-2 1-2 2-3	20 22 50	2 x 100 2 x 75 2 x 45
L3	S23	1-2 1-2 2-3	20 22 50	2 x 100 2 x 75 2 x 45
L4	S24	1-2 1-2 2-3	20 22 50	2 x 100 2 x 75 2 x 45

Note:
In case the ADC-4001 adapter with a grounded intrinsically safe barrier on a side line is used, the earth fault signalling system must be disconnected by the S4 jumper removal from the MSL-1M module.
The MSL-1M module communicates with the PSC-46 module receiving information regarding the current configuration of addressable elements in lines and commands to be executed (actuate/dis-actuate an element, lines, reset an element, etc.) and returns processed data regarding the addressable elements status and the detection line.

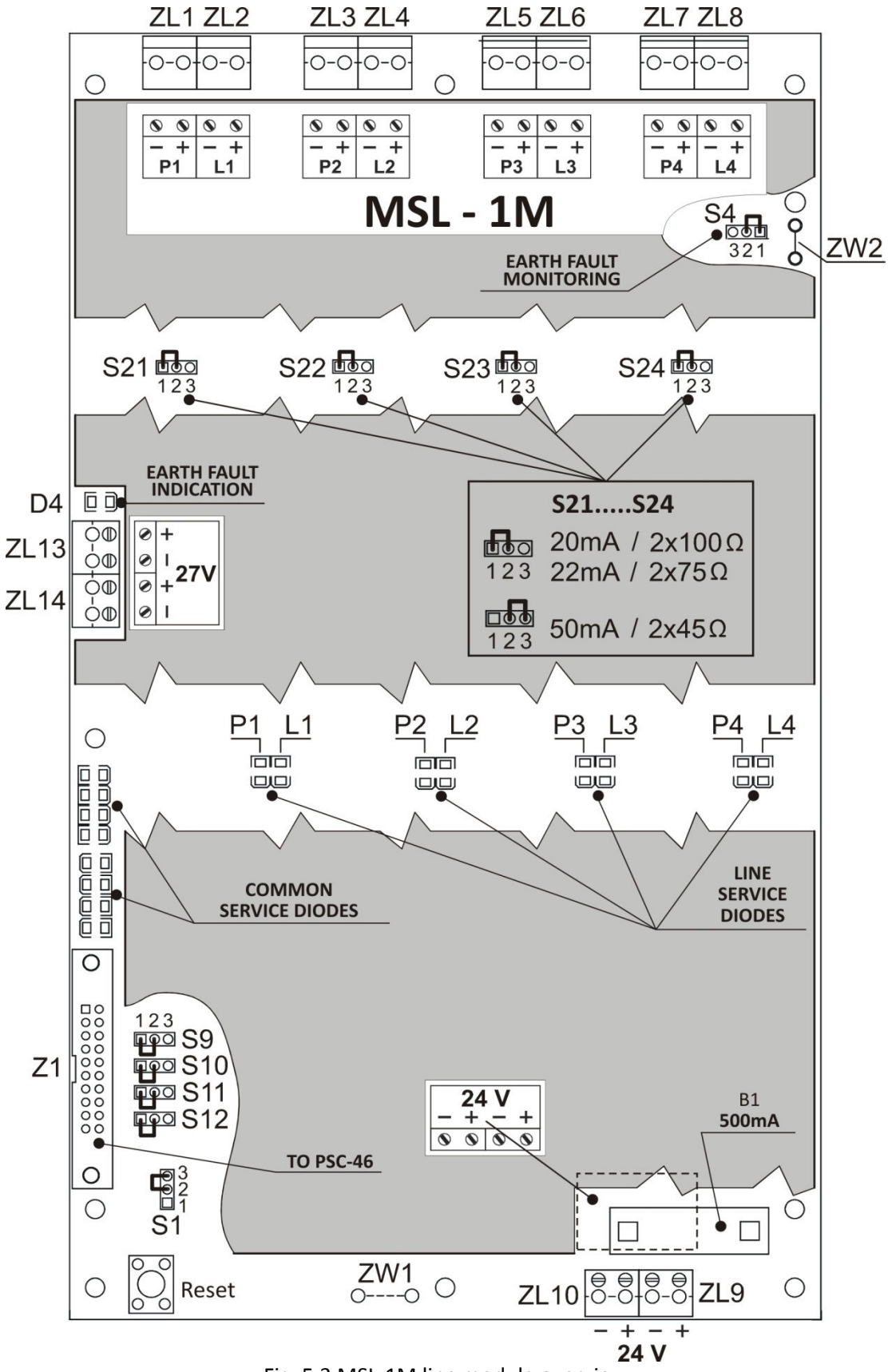

Fig. 5.3 MSL-1M line module overview

5.5 PPW-45 PROGRAMMABLE OUTPUTS/INPUTS MODULE

5.5.1 General description

Within the control panel, the PPW-45 module is located above the MSL-1M line module (connected modules are presented in Fig. 5.4).
The programmable outputs/inputs module facilitates external devices connection to the control panel, transmission of alarm and fault signals, supervision over other equipment operation, etc.
The comprehensive outputs software makes the device extremely flexible allowing for any required installation setup.
The PPW-45 module provides the following outputs:

- **8** relay outputs (**PK1 ÷ PK8)** with switchable contacts;
- **1** supervised signal (potential) output (**LS1**) of 1 A capacity;
- **3** supervised signal (potential) outputs (**LS2 - LS4**) of 0.5 A capacity.

The PPW-45 module has 4 monitoring inputs (**LK1 ÷ LK4**).
The **PK2 ÷ PK8** relay outputs may be supervised (in the dis-actuation condition) in relation to short circuits or breaks in the relay output line.
The relay output line is supervised if, during the relay programming process, the line continuity monitoring is declared.
The output line will be properly supervised if, in the quiescent mode, the monitored device is supplied with 6...30 V voltage range and a relevant output monitoring bridge is settled in position 2-3 = “YES” (see Fig. 5.4).

Note 1:
Each signal output (LS1 ÷ LS4) is protected with a multi-actuation polymer fuse. In the event of a short circuit, the fuse may isolate the output even after the short circuit is removed (with operating load). In order to return the fuse to its normal condition, the output load must be momentarily removed.

Note 2:
The line continuity monitoring system for relay outputs consumes less than 1 mA of current from an external device, which may cause its slight actuation (unwanted and unfavourable). To avoid such the situation, the line continuity monitoring circuit should be disabled within the software (no output monitoring declared) and hardware (output monitoring jumper in 1-2 = ”NO” position).

5.5.2 PK relay outputs and LS signal outputs

The PK1 relay output (PU - fault relay) is permanently programmed and operates in the following manner: the output is activated if the control panel is in a fault mode (also during a complete power outage).
Other POLON 4500 control panel outputs, both relay outputs (PK2 ÷ PK8) and supervised potential outputs (LS1 ÷ LS4) may be defined as:

- TYPE 0 - inactive output;
- TYPE 1 - output to external fire alarm devices;
- TYPE 2 - output to fire alarm transmission devices (monitoring);
- TYPE 3 - output to protection devices;
- TYPE 4 - fault signalling output (to fault signal transmission devices);
- TYPE 5 - information output;
- TYPE 6 - reset output (only for relays).

In order to program individual physical potential or relay outputs, such parameters as: output type, actuation variant, proper setup options selection (zone numbers, occurrence selection, output actuation time program setting, etc.) must be defined in applicable output setup menu windows.
Depending on how a given output type is defined, it is possible to assign a given variant and defined actuation time parameters to this output.

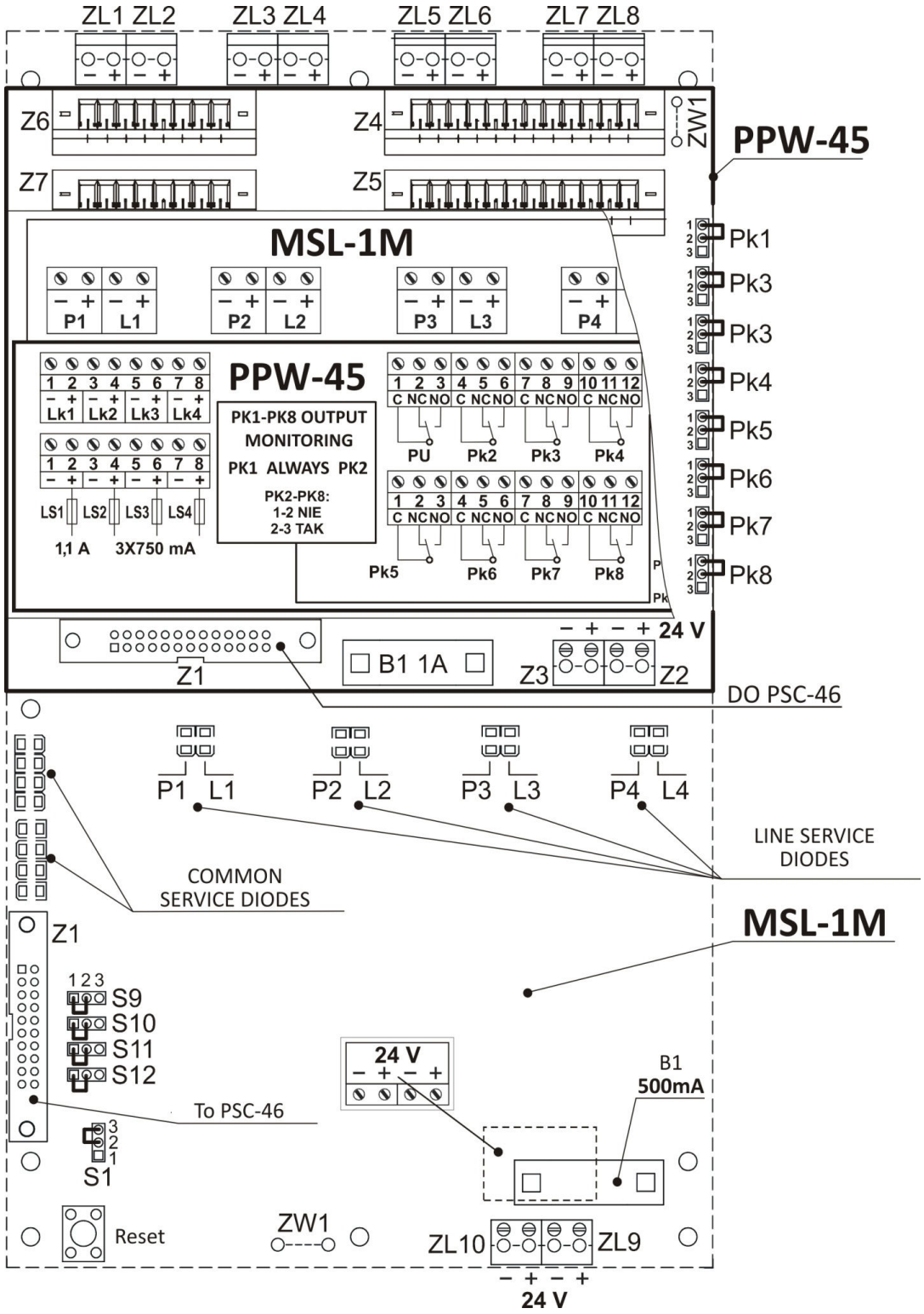

Fig. 5.4 PPW-45 programmable input/output module (view together with MSL-1M module)

Table 5.3

Relay	Event	Relay contacts
PU (PK1)	No fault, monitoring	Closed C-NO
	General fault	Closed C-NC
PK2÷PK8	No actuation criterion	Closed C-NC
	Actuation criterion	Closed C-NO

Output actuation time parameters

Both PK relay outputs (except for PU) and LS potential outputs may operate with a defined actuation time program (also depending on the defined output time).

It may depend on the global parameters (T1, T2 and T3), individual parameters (Top) or a combination of these parameters, depending on the programming types and variants.

Meaning of time parameters:

- T1 - time necessary to confirm 1st degree alarms;
- T2 – time necessary to investigate the situation after an alarm is confirmed or reset (after this time, the control panel switches to the 2nd degree alarm mode);
- T3 – alarm output (TYPE 1) actuation delay time from the moment the 1st degree alarm is evoked. The T3 is reset (alarm outputs are immediately activated) after the control panel enters the 2nd stage alarm mode;
- Top - individually programmable output actuation delay time.

Parameter range: T1, T2, T3, Top – from 00:00 to 10:00.

Specification of the LS supervised potential output lines

The potential outputs are defined as supervised outputs, i.e. they are tested by measuring the characteristic resistance of a potential line during quiescent mode in order to detect line faults with the reversed polarisation (negative) of the output voltage. The range of potential lines resistance (including the connecting cables resistance) is 2.7 kΩ - 16 kΩ. If the line resistance is outside the defined range, this situation is interpreted as a fault mode and is appropriately signalled in the control panel. After the output is actuated (according to a proper actuation variant), the output voltage polarisation is positive.

Output actuation criteria for control panel network version

In tables 5.4 ÷ 5.8 presenting the programming possibilities of the PK and LS outputs, the "control panels' numbers" parameter (for control panels operating within a network) has the following meaning:

I. For variants without additional zone dependencies:

- control panel number = 0 means the dependence on an occurrence in any control panel included in the common detection area;
- control panel number > 0 means the dependence on an occurrence in a given control panel (provided it is included in the common detection area);
- control panel number ”—” allows for making actuation dependent only on local control panel occurrences.

II. For variants with additional zone dependencies:

- control panel number = 0 means the dependence on a 'union' of occurrences in selected zones in any control panel included in the common detection area;
- control panel number > 0 means the dependence on a 'union' of occurrences in selected zones from given control panels (provided they are included in the common detection area);
- control panel number ”—” allows for making actuation dependent only on local control panel occurrences.

Notes:

1. "Zone 0" means the dependence on the 'union' of occurrences from all zones operated by a given control panel.
2. "The union of occurrences" means that an actuation criterion is fulfilled if at least one occurrence happens.
3. The total number of zones, EKS and EWK elements assigned to all executive outputs and SAL type elements in the control panel must not exceed 64,000.

5.5.3 Fire alarm devices output (TYPE 1)

Outputs to fire alarm devices (e.g. acoustic signalling devices) may be programmed in the following variants:
Table 5.4

Variant	Control Panel Nos	Zone Nos	Time Parameters	Activation Criterion
1	0	—	T3	1st stage alarm in control panel (or central panels group in case of network operation) or activation with ACTIVATED push button in ALARM DEVICES box
2	0 ÷ 31	0 ÷1024	T3	1st stage alarm in assigned zones

Note:
The countdown of the delay time will be discontinued (T3 time will be reset during the countdown) and the outputs to alarm devices will be activated immediately after the control panel enters the 2nd stage alarm mode. After setting the T3 parameter to maximum time (10 minutes), the actuation criterion may be dependent on "the 2nd stage alarm only".

At any given time (quiescent mode), the outputs to fire alarm devices may be activated (if this setting has not been permanently disabled within the program) or deactivated at a given access level by using the push button on the control panel front panel: ALARM DEVICES – ACTIVATED.
During a fire alarm, the above mentioned push button is used to deactivate and reactivate alarm devices (excluding the devices permanently disabled within the program).
The output activation is signalled by the red LED in the following field:
ALARM DEVICES – ACTIVATED.
The output disablement is signalled by the yellow LED in the following field:
ALARM DEVICES – DISABLED - flashing - some outputs disabled; steady - all outputs disabled.
The output fault is signalled by the yellow LED in the following field:
ALARM DEVICES – FAULTY.

5.5.4 Fire alarm transmission devices output (TYPE 2)

The outputs to fire alarm transmission devices may be programmed as follows:
Table 5.5

Variant	Control Panel Nos	Zone Nos	Time Parameters	Activation Criterion
1	0	—	T1, T2	2nd stage fire alarm in control panel
2	0 ÷ 31	0 ÷1024	T1, T2	2nd stage fire alarm in assigned zones

At any given time, the outputs to fire alarm transmission devices may be disabled and re-enabled (excluding outputs permanently disabled within the program) at a given access level by using the push button on the control panel front panel marked: ALARM TRANSMISSION DEVICES – DISABLED.
The output actuation is signalled by the red LED in the following field:
ALARM TRANSMISSION DEVICES – ACTIVATED.
The output disablement is signalled by the yellow LED in the following field:
ALARM TRANSMISSION DEVICES – DISABLED - flashing - some outputs disabled; steady - all outputs disabled.
The output fault is signalled by the yellow LED in the following field:
ALARM TRANSMISSION DEVICES – FAULTY.

5.5.5 Protecting devices output (TYPE 3)

Outputs to protecting devices may be programmed in the following variants:

Table 5.6

Variant	Control Panel Nos	Zone Nos	Time Parameters	Activation Criterion
1	0	—	T_{op}	1st stage alarm in control panel
2	0	—	T_{op}	1st stage alarm in control panel until acknowledgement
3	0	—	T_{op}	2nd stage fire alarm in control panel
4	0	—	T_{op}	2nd stage alarm in control panel until acknowledgement
5	0 ÷ 31	0 ÷ 1024	T_{op}	1st stage alarm in assigned zones
6	0 ÷ 31	0 ÷ 1024	T_{op}	1st stage alarm in assigned zones until acknowledgement
7	0 ÷ 31	0 ÷ 1024	T_{op}	2nd stage alarm in in assigned zones
8	0 ÷ 31	0 ÷ 1024	T_{op}	2nd stage alarm in assigned zones until acknowledgement

5.5.6 Fault/technical alarm signalling output (TYPE 4)

The output of the fault signalling system may be programmed in the following variants:

Table 5.7

Variant	Control Panel No.	Zones/EKS/EWK Numbers	Time Parameters	Activation Criterion
1	0 ÷ 31	—	T_{op}	General fault in control panel
2	0 ÷ 31	—	T_{op}	General non-maskable fault in control panel
3	0 ÷ 31	—	T_{op}	General technical alarm in control panel
4	0 ÷ 31	—	T_{op}	General fault in control panel until acknowledgement
5	0 ÷ 31	—	T_{op}	General non-maskable fault in control panel until

				acknowledgement
6	0 ÷ 31	—	T_{op}	General technical alarm in control panel until acknowledgement
7	—	0 ÷ 1024	T_{op}	Fault in zone
8	—	1 ÷ 250	T_{op}	EKS 1 ÷ 2 inputs fault
9	—	1 ÷ 250	T_{op}	EKS 1 ÷ 2 inputs non-maskable fault
10	—	1 ÷ 250	T_{op}	EKS 1 ÷ 2 inputs technical alarm
11	—	0 ÷ 1024	T_{op}	Fault in zone until acknowledgement
12	—	1 ÷ 250	T_{op}	EKS 1 ÷ 2 inputs fault until acknowledgement
13	—	1 ÷ 250	T_{op}	EKS 1 ÷ 2 inputs non-maskable fault until acknowledgement
14	—	1 ÷ 250	T_{op}	EKS 1 ÷ 2 inputs technical alarm 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 ÷ 100	T_{op}	EWK inputs 1 ÷ 8 fault
22	—	1 ÷ 100	T_{op}	EWK inputs 1 ÷ 8 technical alarm

Note:
Variants 1, 2, 4, 5 and 15, 16 must not be assigned to LS potential lines as it may result (if this line is broken or shorted) in improper operation of these outputs.

5.5.7 Information output (TYPE 5)

The information output may be programmed to transmit information about the mode of the system (control panel and line elements) not being the fire alarm or fault mode.

Table 5.8

Variant	Control Panel No.	Time Parameters	Activation Criterion
1	—	—	Disablement mode
2	—	—	1 ÷ 1024 zones disablement mode
3	—	—	Test mode
4	—	—	1 ÷ 1024 zones test mode
5	—	—	Personnel absent

5.5.8 Reset output (TYPE 6)

The reset output supports only relays and its objective is to generate a reset impulse (duration approx. 4 seconds), after a fire alarm reset. This type may be used, e.g. to power supply or reset of detectors requiring a separate power supply source, e.g. flame detectors manufactured by Det-Tronics.

5.5.9 LK monitoring input

Each of the POLON 4500 control panel four monitoring inputs for may be programmed in the following variants:

- to monitor the actuation of external devices after receiving an actuation criterion from a declared relay output or potential output (for TYPE-1, TYPE-2, TYPE-3 outputs);
- to monitor the proper operation of external devices;
- as a technical alarm input.

The input condition is analysed on the basis of the monitoring line characteristic resistance measurement (Table 5.9). The range of the characteristic resistance (including the connecting cables resistance) is 2.7 kΩ - 16 kΩ. If the monitoring line resistance is outside the defined range, this condition is interpreted as an acknowledgement of external devices actuation (variant 1) or external devices fault (variant 2).

In the control panel, improper conditions are signalled as faults in the following cases:

- no acknowledgement of external device actuation with an active actuation signal of a declared relay or potential output;
- detection of an external device fault.

Table 5.9

Variant	**Function**	**PK or LS assigned output**	**Mode dependent on detection line characteristic resistance**	
1	Actuation monitoring	Activated	Non-maskable fault 2k7< R < 16 k	Technical alarm R <0,9 k R > 30 k
		Non-activated	Quiescent mode 2k7< R < 16 k	Technical alarm R <0,9 k R > 30 k
2	Functioning inspection	-	Quiescent mode 2k7< R < 16 k	Non-maskable fault R <0,9 k R > 30 k
3	Technical alarm	-	Quiescent mode 2k7< R < 16 k	Technical alarm R <0,9 k R > 30 k
R – characteristic resistance of detection lines together with connecting cables				

Monitoring inputs programming variants

Variant 1:

A monitoring line input may be assigned to one of the previously declared outputs (relay or potential) defined as TYPE-1, TYPE-2, TYPE-3. Then, this input may be used to monitor external devices actuation after receiving an actuation criterion from the declared output. Monitoring is enabled approx. 60 seconds after the monitored output is actuated (permissible time of the controlled device actuation delay). Examples of using a monitoring input assigned to a relay or potential output are shown in Fig. 5.6 and 5.7.

Variant 2:

A monitoring line input may be programmed to monitor efficiency of, e.g. external devices. It consists in connecting an NO contact of this device in parallel with the end-of-line resistor in the monitoring line circuit. The correct condition is observed when the monitoring line characteristic resistance is within the 2.7 kΩ - 16 kΩ range. An example of connecting the contact in the monitoring line is presented in Fig. 5.8.

Variant 3:
A monitoring line input may be programmed as a general purpose technical alarm input to be used by the installer for individual needs.
It operates as an input for monitoring external devices efficiency. In case any resistance within the line technical alarm range is detected, the technical alarm is evoked. Applicable examples are presented in Fig. 5.6 and 5.7.

Monitoring line inputs programming

Table 5.10

Variant	Monitored output type	Monitored output number	Monitoring type
0			Output inactive
1	1-PK, 2-LS	2 ÷ 8 or 1 ÷ 2	KZ actuation monitoring
2	-	-	KS functioning inspection
3	-	-	AT technical alarm

Note:
Outputs defined as TYPE 4 must not be assigned to monitoring lines as it may result in incorrect interpretation of the current condition if an actuation variant is assigned to a fault of monitoring or potential lines circuits.

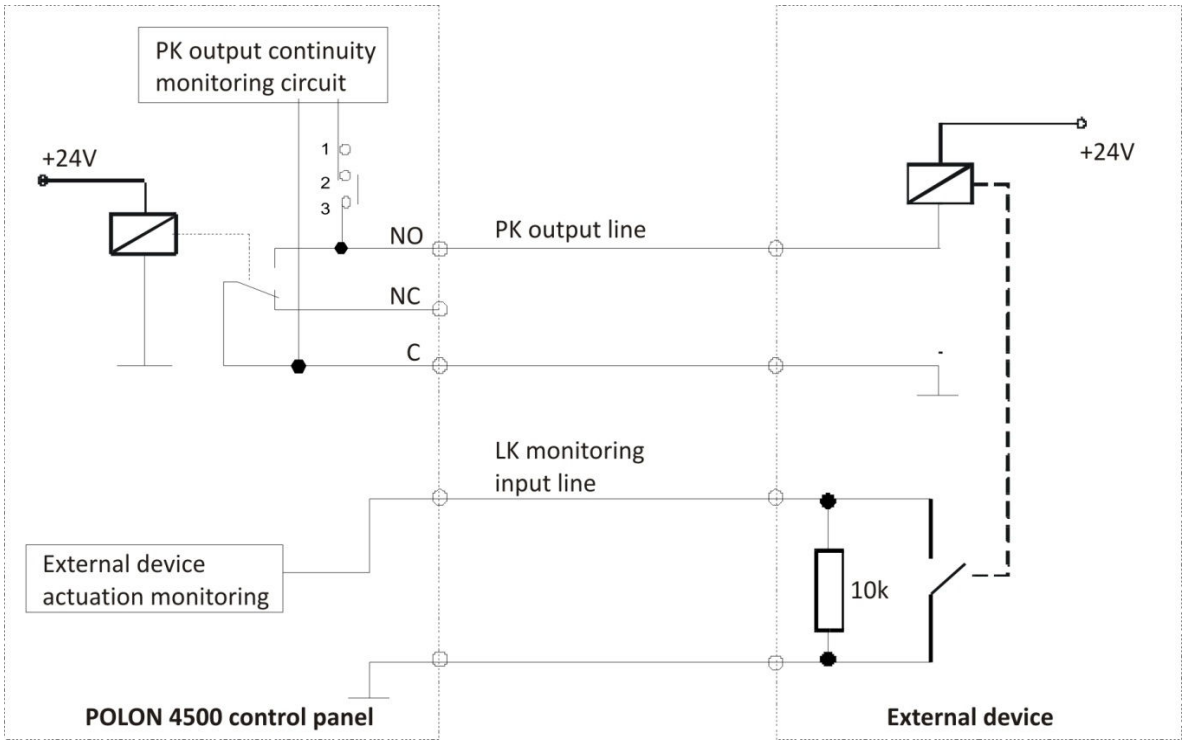

Fig. 5.5 Exemplary use of monitoring line assigned to relay output

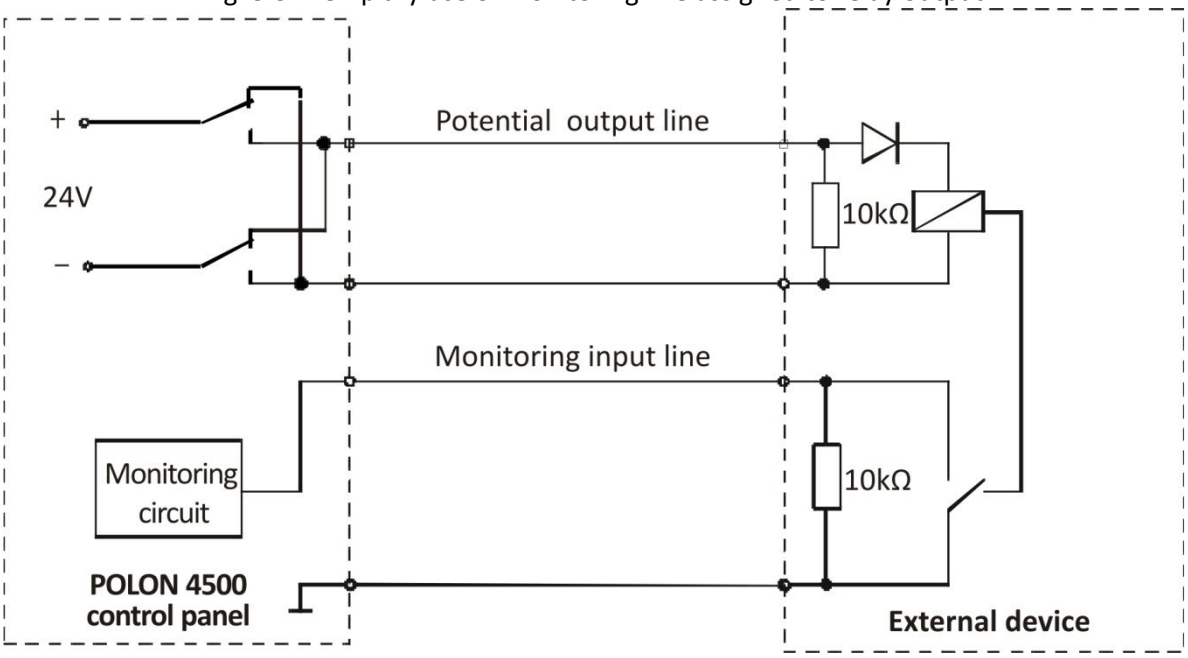

Fig. 5.6 Exemplary use of LK monitoring line assigned to LS potential output

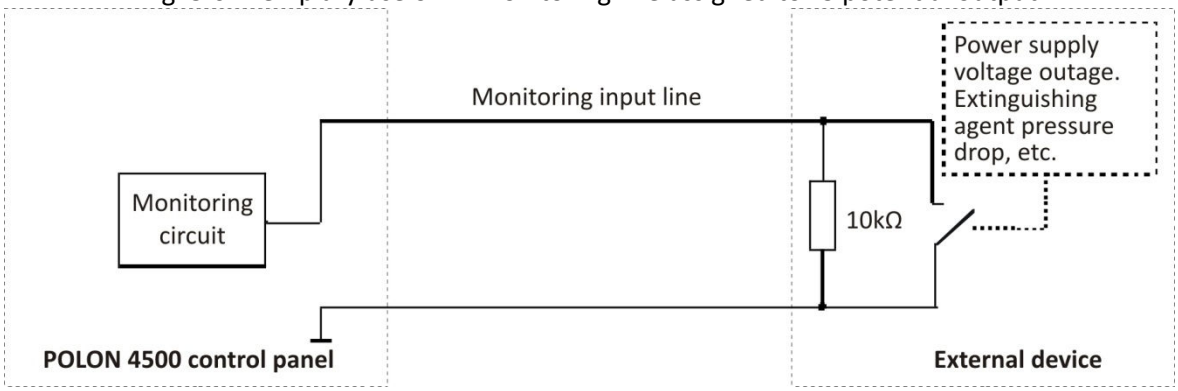

Fig. 5.7 Exemplary connection of external device contact into LK monitoring line

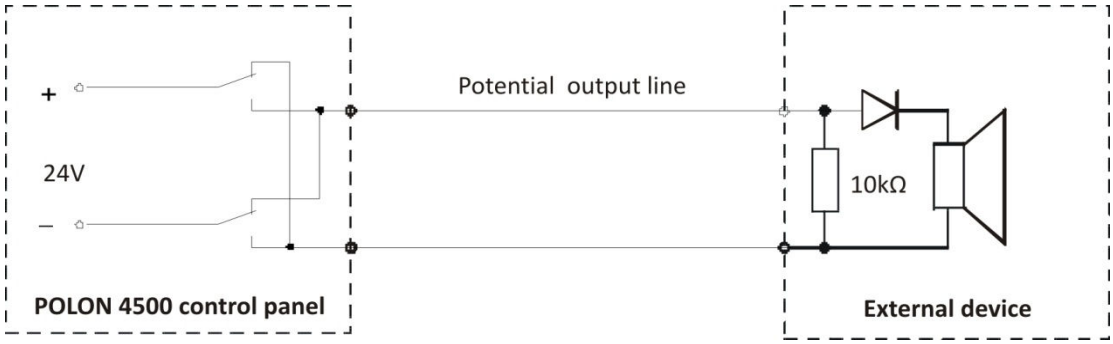

Fig. 5.8 Exemplary use of LS potential line for acoustic signalling device actuation

5.6 MIK-48 INTERFACE MODULE

The interface module is used to connect external devices to the control panel.
The following elements are located on the interface panel:

- one universal USB serial port connector:
- ZP1 - PORT 1 - computer, PMC-4000 monitoring, TELSAP 2100 monitoring
- two 9-pin EIA RS-232 standard serial port connectors:
  - ZP2 - PORT 2 - computer, PMC-4000 monitoring, TELSAP 2100 monitoring;
  - ZP3 - PORT 3 – computer, PMC-4000 monitoring, TELSAP 2100 monitoring, bar code reader.

Moreover, the panel is equipped with RS-485 standard serial connector terminals:

- ”A”, ”B”, ”CHGND” - output to the TSR-4000 terminal.
-

All module outputs are galvanically isolated from the control panel.

Note:
When control panels operate in an optical fibre version of the network, an optical fibre converter supplied with the control panel power removes the galvanic isolation. In this case, connecting a PC supplied from mains results in the earth fault signal emission. Thus a PC connected to the control panel must always be supplied from the same point of mains as the panel. Otherwise, the difference between the PC and control panel "mass" may result in the MIK-48 module outputs fault.
The above may also be caused by connecting a monitoring system. That is why the monitoring system must be equipped with a galvanically isolated input.
However, the best solution is to use an external power supply adapter to support the optical fibre converter – see 10.1. Note.

Each serial port is declared (see the programming manual [PM]) and may be used for different purposes according with the declaration. An RS232 port should be connected with an external device by means of a standard PC cable connecting devices with COM type serial outputs. See section 5.6.2 for instructions regarding an RS485 port connection.
MIK-48 is equipped with a ZK1 connector to install a PS/2 keyboard which may replace the keypad provided in the handling area. Moreover, the keyboard is necessary to enter user's messages. The connected keyboard may not be declared.

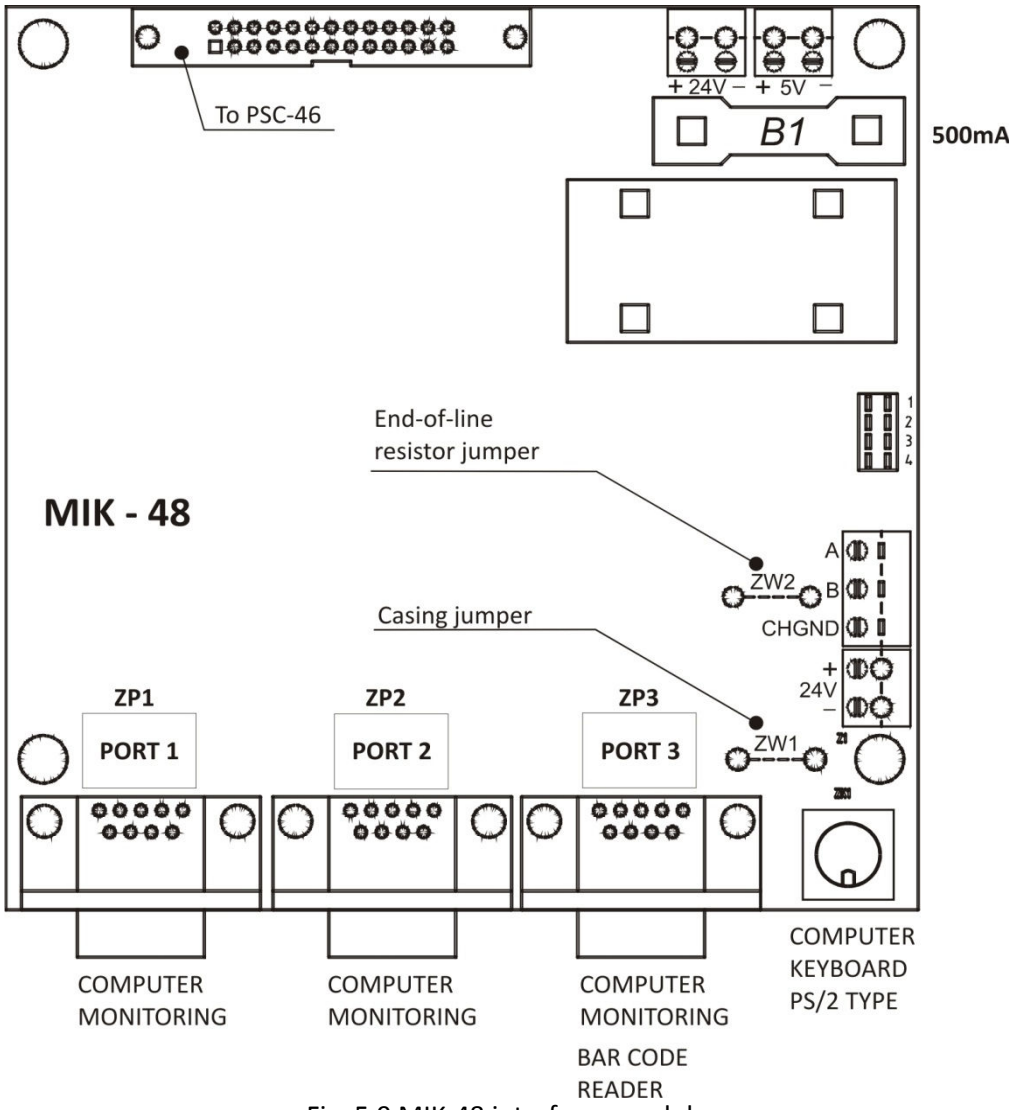

Fig. 5.9 MIK-48 interfaces module

5.6.1 PORT 1, PORT 2, PORT 3 communication ports

Each of the serial ports may be used to operate with an external device, after a port type is declared. A given port type may be declared only for one port. Type 5 (barcode reader) may only be declared for PORT no. 3.

PORT TYPE: 0 - not declared port - inactive.

PORT TYPE: 1 - interoperation with a PC

Used to transmit or read the configuration by means of a PC - special software for the POLON 4000 control panels configuration must be used.

The transmission bitrate is 9600 bps.

PORT TYPE: 2 - interoperation with the PMC-4000 monitoring system

Used to operate with the monitoring station utilising the PMC-4000 digital monitoring protocol of the POLON 4000 system.

Declared transmission bitrate: 2400 bps, 4800 bps, 9600 bps.

The PMC-4000 protocol makes it possible to supply a monitoring station with information regarding the following events/occurrences:

- fire alarms;
- technical alarms and their resets;
- 2nd stage alarms;
- reset;
- acknowledgement;

- faults and their resets;
- non-maskable faults and their resets;
- tests and their resets;
- disablements and its resets;
- output actuation and its resets.

Moreover, the permission for remote operation in the control panel (SYSTEM SETUP -> REMOTE OPERATION -> OPERATION FROM MONITORING STATION: RE-ENABLED) enables the monitoring station to remotely acknowledge an alarm or fault and remotely reset an alarm.
A full description of the PMC-4000 protocol is provided in a separate document.

Notes regarding the PMC-4000 monitoring in the network system:

Information from a given control panel may be transmitted to a monitoring station through one of the serial ports or, in the network system, through the network and, next, through the remote control panel serial port. Both these methods may also be applied simultaneously, i.e. supervision transmission through own port and simultaneous transmission through the network and, then, through the remote control panel port. Thus each control panel may be supervised in two points at the same time.
In order to ensure correct monitoring transmission over the network, the following data must be declared in the NETWORK MONITORING option (see the programming manual [PM]):

- in the control panel to be supervised, it is necessary to define the transmission control panel number in the TRANSMISSION CONTROL PANEL option (i.e. remote control panel directly connected with the monitoring station through a serial port);
- in the remote control panel (option: CENTRAL MONITORING), declare from which control panels in the network the monitoring is to be received in order to transmit it through a serial port directly to the monitoring station.

Recommendations regarding control panel operation in the network mode

- network groups of control panels should coincide with the monitored groups of control panels;
- taking into account the system reaction time, each control station should be directly connected with a monitoring station (only options - through a serial port).

PORT TYPE: 3 - TELSAP 2100 monitoring
Facilitates operation of the monitoring station in a format identical to the basic digital monitoring protocol of a TELSAP 2100 control panel.
Declared transmission bitrate: 2400 bps, 4800 bps.
PORT TYPE: 4 - TELSAP 2100 extended monitoring
Facilitates operation of the monitoring station in a format identical to the extended digital monitoring protocol of a TELSAP 2100 control panel.
Declared transmission bitrate: 2400 bps, 4800 bps.
Note:
The TELSAP 2100 system digital monitoring may be implemented only from a local control panel. This means that each control panel operating in the network may provide monitoring stations only with information regarding events within the local detection area.
PORT TYPE: 5 - barcode reader
Facilitates operation with a barcode reader to enter line elements serial numbers.

5.6.2 Output to TSR-4000 terminal

The output marked as ”A”, ”B” and ”CHGND” is used only to connect the TSR-4000 terminal. It is an output of the RS485 standard serial bus to which max. 16 TSR-4000 terminals may be connected.
The A and B output terminals of the control panel must be correctly connected with A and B input terminals (A with A and B with B). The correct A and B terminal clamps should be connected in the same manner with A and B clamps of the next terminal, etc.
The maximum length of the cable connecting the control panel with the last terminal must not exceed **1200 m**. It is recommended to use a YnTKSYekw installation cable (1 x 2 x 0.8 mm). A detailed description of the method of connecting terminals is provided in the Operation and Maintenance Manual (ID-E305-001E) of the TSR-4000 Parallel Signalling Terminals.

5.7 DR-48 PRINTER

The DR-48 printer is used to register (in a printout form, on a paper band) the events which take place when a facility is monitored by the POLON 4500 control panel.
The events include:

- alarms;
- faults and their removals;
- fault or alarm acknowledgements;
- switching the control panel operating mode from PERSONNEL PRESENT to PERSONNEL ABSENT and vice versa;
- delays switching on and off;
- alarm resets;
- testing;
- disablements;
- access to the configuration.

Each event message contains its date and time and a short description. Additionally, if a text message is assigned to a zone (user's text), during an alarm of this fire protection element, apart from the line number, element number and zone number, the assigned message is also printed out.
The POLON 4800 control panel stores 1,000 latest events that have been signalled. The stored events, sorted by their date and time of occurrence may be printed after choosing a proper function on the keypad according to the programming manual (PM).

On-going events recording on the paper tape and printing out the contents of the event memory is possible only when the printer is assigned for operation in accordance with the programming manual (PM). Regardless of assigning the printer to operation, the event memory is constantly updated.
See below for examples of incident printouts:

FAULT !
TERMISTOR IN TUN-4046 !
L-1 E-8 ZONE-31
2007-01-30 / 14:53:18

ACKNOWLEDGEMENT !
2007-01-30 14:54:00

FIRE ALARM WITH TUN-4046 !
L-1 E-98 ZONE-25
CONFERENCE HALL
2ND FLOOR
2007-01-30 17:20:00

** 1ST STAGE FIRE ALARM! **
2007-01-30 17:20:00

ACKNOWLEDGEMENT !
2007-01-30 17:22:30

----- ALARMU RESET -----
2007-01-30 17:25:17

The printer is equipped with a thermal paper roll (width 80 mm and max. diameter Ø 50 mm).
At the back of the printer on a panel, there are two monostable push buttons located (PAPER and RESET) used for the following operations:

- printer paper out feed using the PAPER push button;
- printer test: press PAPER and RESET buttons simultaneously; next, release the RESET button; next, after 1 second, release the PAPER button;
- printer controller restart after pressing the RESET push button.

In order to replace a paper roll:

- use lever 1 to open the printer mechanism;
- replace the used roll with a new one on the holder;
- insert the paper into the printer mechanism guide slit so that the thermo-sensitive surface is visible while inserting it into the printing mechanism guide slit;
- use lever 1 to close the printer mechanism;
- press PAPER to pull the paper into the mechanism.

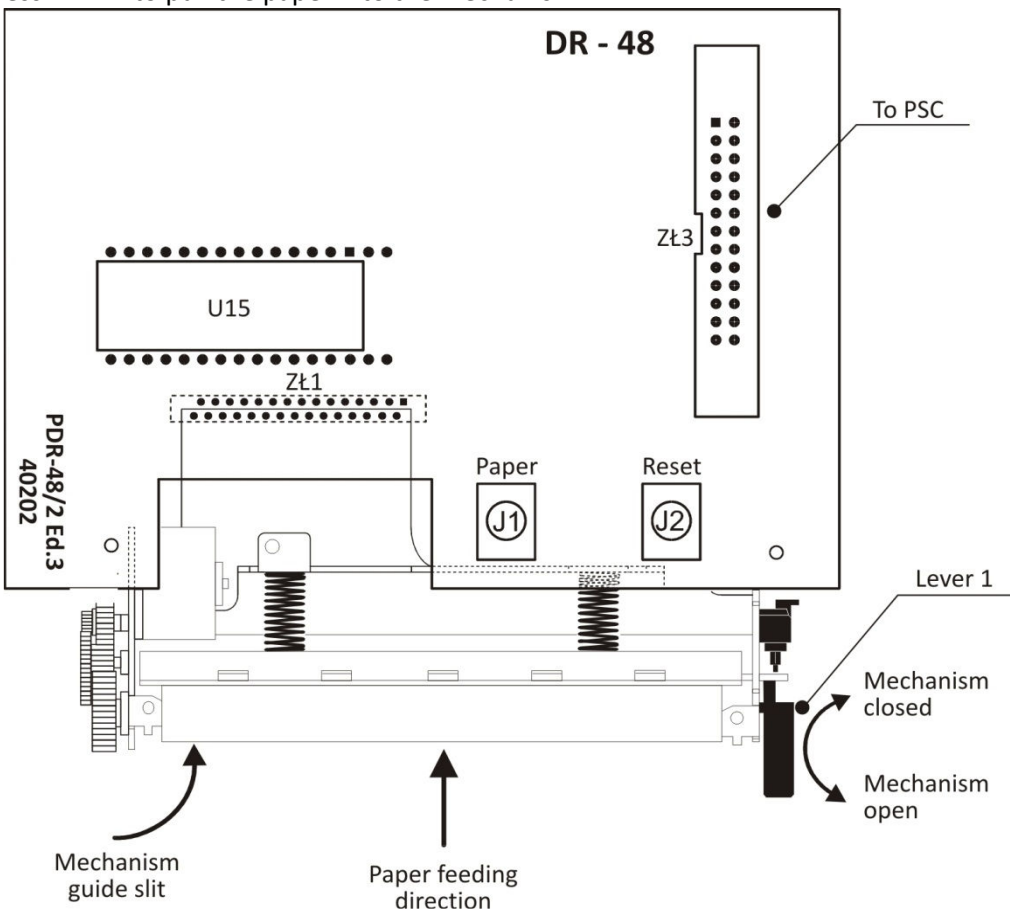

Fig. 5.10 DR-48 printer view from control panel inside

5.8 POWER SUPPLY MODULE

The POLON 4500 control panel's design makes it possible to supply it from two power sources:

- AC 230 V/50 Hz - basic power source;
- DC 24 V – reserve power source (battery cluster).

The AC power adaptor (nominal voltage 30 V/10 A) is equipped with a circuit breaker and fuse. It is designed as a separate module located in the right lower corner of the control panel. The adaptor supplies all control panel modules and facilitates operation with the battery cluster by means of the MZ-48 power supply module.

In the case of 230 V/50 Hz mains power failure, the control panel is automatically switched to power supply provided by the battery cluster and the device operation remains uninterrupted. When the mains

power supply is restored, the power adaptor recharges batteries until the "recharging complete" voltage is obtained and switches to the buffering mode.
Apart from the basic functions including supplying power to the control panel, recharging or buffering the battery cluster, the power supply module protects the energised control panel circuits.
The power adaptor is equipped with the following protection, monitoring and signalling circuits:

- overvoltage circuit - actuated when the output voltage increases over 33 V - 35 V, which results in permanent power adaptor disconnection. In order to remove the results of the protection element actuation and return to the normal operation condition, the power adaptor must be disconnected from mains for approx. 5 seconds;
- current limiting circuit - actuated when the power adaptor is overloaded - signalled with the LIMIT lamp;
- correct operation indication - green OK diode is lit.

The MZ-48 power supply module has output terminal blocks for the following voltages:

- 24 V - control panel operating voltage;
- 27 V - insulated voltage to supply detection lines;
- 5 V - electronic circuits supply voltage;
- 24 V - internal equipment supply voltage protected with a B2 / 3.15 A fuse.

Moreover, the MZ-48 has input terminal blocks to connect the following elements:

- AC power adaptor (+ 30 V);
- battery cluster (AK) protected with a B1 / 10 A fuse;
- temperature probe (PROBE).

The MZ-48 power supply module is equipped with the following protection, monitoring and signalling circuits:

- 230 / 50 Hz voltage monitoring circuit – "mains OK" LED is lit;
- + 5 V power adaptor correct operation indication - green "5 V OK" LED is lit;
- battery recharging indication - green "CHARGING" LED is lit;
- battery efficiency control circuit - faults indicated by the yellow "BATTERY FAULT" LED;
- control panel ground fault indication - yellow "EARTH FAULT" LED is lit;
- voltage decrease detection circuit - when the battery voltage drops below 22V ± 1V.

Such conditions as loss of mains voltage, loss of battery cluster voltage or fuse failure are also indicated on the TSO-4500 board – the collective "FAULT" diode is lit, "POWER" diode blinks and an acoustic signal is emitted. The fault indication messages may be accessed by pressing the "FAULT" push button, in accordance with the programming manual (PM).

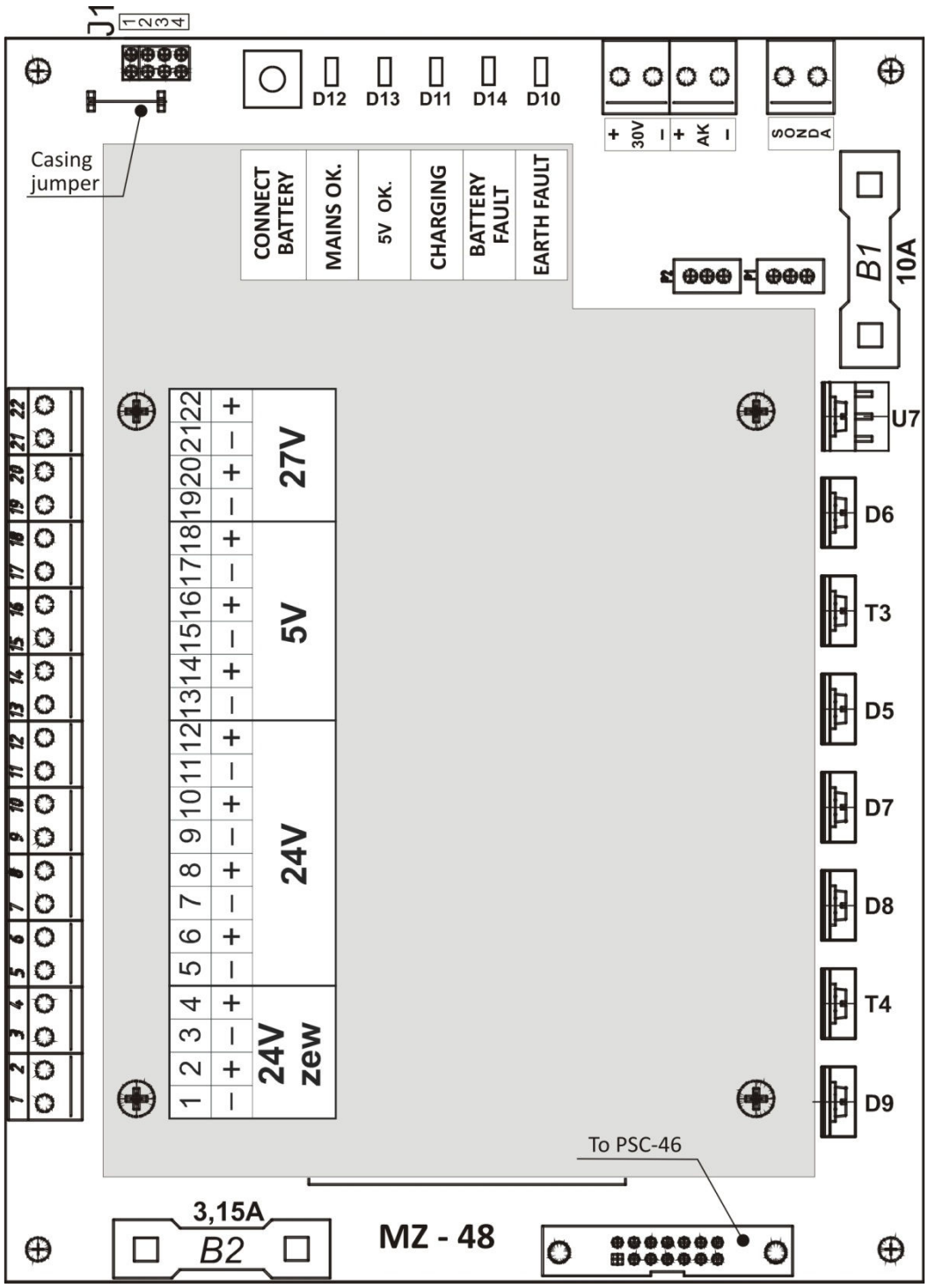

Fig. 5.11 MZ-48 control panel power supply module

5.9 CONTROL PANEL OPERATION WITH BATTERY CLUSTER

The POLON 4500 control panel may be supplied by the battery cluster comprising of two 12 V leak-proof lead-acid batteries of minimum capacity equal to 38 Ah (due to the 10 A power adaptor efficiency). The battery cluster must be connected to the terminals marked as AK on the MZ-48 module board. A terminal block marked as "PROBE" is also located on the same board and it is used to connect a temperature probe.

The advantage of using this probe in the vicinity of the batteries is a possibility of automatic adjustment of the buffering voltage depending on the temperature and according to the defined temperature factor. It extends the life of batteries operated in different ambient temperatures. While choosing a battery size, the rule resulting from section 6.8.3 of the PN-E-08350-14 standard must be applied, i.e.:

- with accessibility of a service within a period shorter than 24 h from a fault occurrence, in case the mains voltage is interrupted, battery capacity should ensure at least 30-hour operation of the control panel in the quiescent mode and, next, a 30-minute alarm;
- with accessibility of a service within a period exceeding 24 h from a fault occurrence, in case the mains voltage is interrupted, battery capacity should ensure at least 72-hour operation of the control panel in the quiescent mode and, next, a 30-minute alarm;

Formula defining the minimum battery capacity:
a) for 30-hour version

$$Q = 30h(I_{dc} + I_{du}) + 0.5\ h(I_{ac} + I_{au})$$

b) for 72-hour version

$$Q = 72h(I_{dc} + I_{du}) + 0.5\ h(I_{ac} + I_{au})$$

where:

I_{dc} - average current drawn by control panel in quiescent mode without external devices,
I_{ac} - average current drawn by control panel in alarm mode without external devices,
I_{du} - average current drawn by external devices in quiescent mode,
I_{au} - average current drawn by external devices in alarm mode.

See Table 5.11 for the average power consumption (without user's current, with full load on the MSL-1M line) depending on the hardware configuration.

Table 5.11

MSG-45 modules quantity	Average current drawn by control panel (without ext. devices)	
	Quiescent mode I_{dc}	Alarm mode I_{ac}
2	0,55 A	0,65 A
3	0,60 A	0,70 A
4	0,65 A	0,75 A

Table 5.12

MSG-45 modules quantity	**Reserve power supply operation time (+ 0,5h in alarm mode) [hours]**	**Average current drawn by control panel (without ext. devices)**		**Average current drawn by external devices**		**Minimum battery capacity [Ah]**
		Quiesc. I_{dc} [A]	**Alarm I_{ac} [A]**	**Quiesc. I_{du} [A]**	**Alarm I_{au} [A]**	
2	30	0,55	0,65	0,5	6	35
4	30	0,65	0,75	0,5	6	38
2	72	0,55	0,65	0	6	43
4	72	0,65	0,75	0	6	50
2	72	0,55	0,65	0,5	6	80
4	72	0,65	0,75	0,5	6	86

The battery cluster may be installed:

- in a PAR-4800 box suspended under the control panel in which 2 x 38 Ah or 2 x 44 Ah batteries may be located (30 hours of power supply for the control panel in the above-mentioned conditions);
- in an external box (e.g. PAR-2000) of capacity max. 180 Ah (maximum recharger capability).

Note:

1. As far as an optical fibre network is concerned, the current drawn by the optical fibre transducer must be taken into account – max. 150 mA.
2. The battery box must be located max. 1 m away from the control panel.
3. The cross section of the cabling used to connect the batteries should be at least 2.5 mm^2.
4. Installation, operation and disposal of waste batteries should be carried out in accordance with the battery manufacturer guidelines. Used batteries should be handed over for recycling in accordance with the regulations in force.

6 ADDRESSABLE DETECTION LINES

6.1 DETECTION LINE TYPES

The POLON 4500 control panel type A addressable detection lines of are resistant to line wires faults (short circuit or break). This resistance is ensured by: the loop-shaped line operation system and built-in short circuit isolators in the system addressable elements. Moreover, it is possible to connect a type B (radial) open line, however, according to the applicable standards, more than 32 warning devices must not be installed in this configuration.
In the loop-shaped system, one line break does not eliminate any line element from operation. Having detected a fault, the control panel informs about its occurrence and ensures the addressable detection line is reviewed from both sides. After the break is removed, the signal informing about this fault is automatically cleared.

A detection system operating without the loop is not resistant to line breaks. A break results in disconnecting line elements from the fault location to the last element in the line.
As far as radial detection lines are concerned, in case a short circuit is detected, the isolator closest to the short circuit is actuated and the line section behind this isolator is disconnected.
In the loop-shaped system, if a line cabling short circuit is detected, two isolators in line elements installed closest to the fault location are actuated, which triggers the disconnection only of the detection line section located between these elements. It is not recommended to design detection lines with branches as a break or short circuit in a side line results in disconnection of the elements from the fault location to the end of a given branch, regardless of whether or not the line operates in a loop system. If creating a branch is necessary, it is recommended that only a few line elements are installed in the branch (i.e. fewer than a dozen or so).

The detection lines in the POLON 4000 system should be routed in the following manner:

- radial lines without branches;
- loop-shaped lines may have single branches but two neighbouring branches should be separate with at least one addressable element.

This method of line routing makes enables to carry out automatically the addressable elements configuration.
While designing addressable detection lines, the following program and electric requirements must be taken into account:

- the number of addressable elements in a detection line must not exceed 127;
- the maximum current consumption of all elements in a quiescent mode:

for the detection line cabling resistance at 2 x 100 Ω: . . . . . 20 mA

for the detection line cabling resistance at 2 x 75 Ω: . . . . . 22 mA
for the detection line cabling resistance at 2 x 45 Ω: . . . . . 50 mA

- the detection line cabling capacity must not exceed 300 nF.

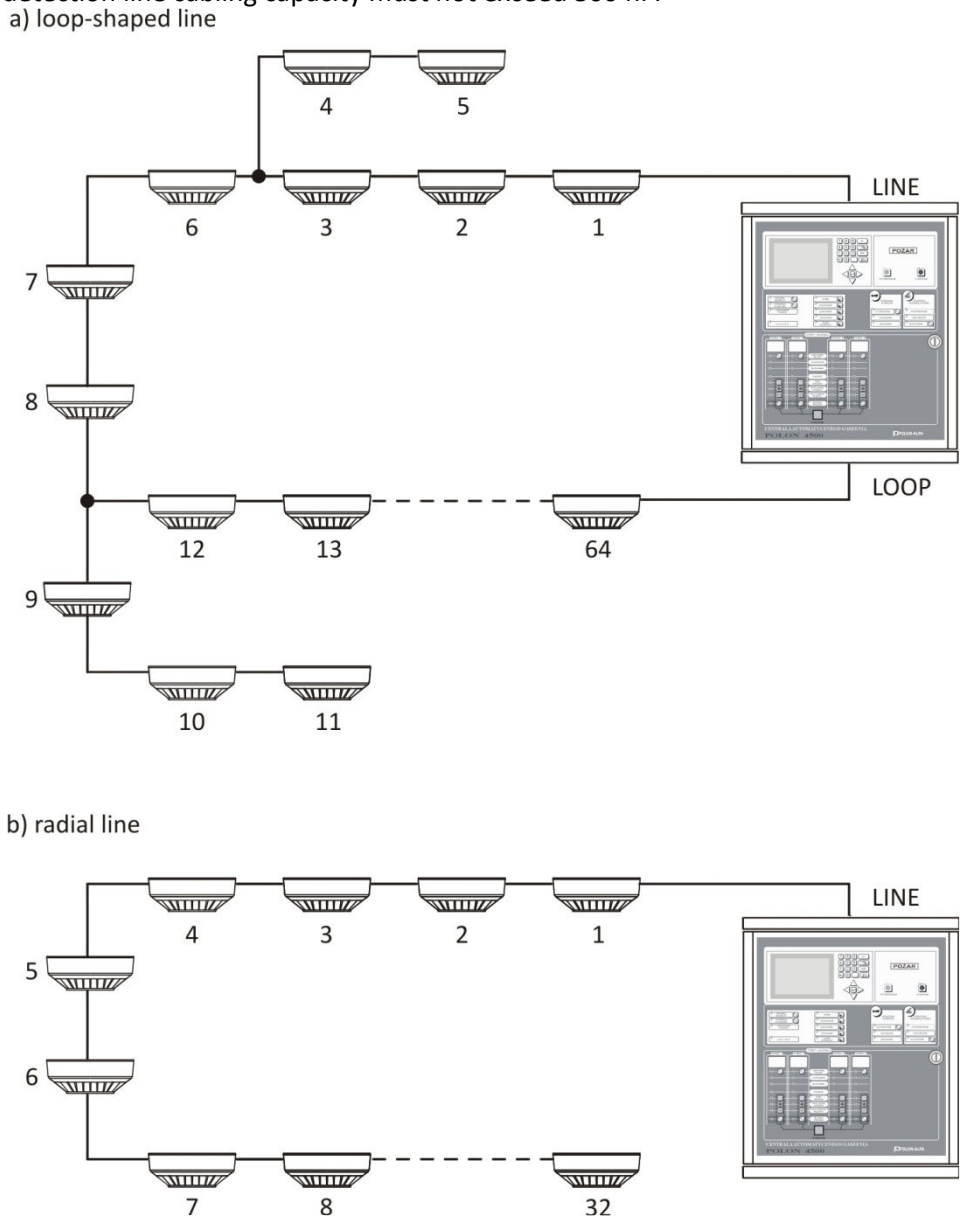

Fig. 6.1 POLON 4500 control panel addressable detection line examples

6.2 ADDRESSABLE ELEMENTS NUMBERING

In the POLON 4000 system, each addressable element has a unique 12-digit number (serial number) but the control panel, during normal operation, refers to addressable elements via their element numbers (short number - 1 ÷ 127 range). During the detection lines configuration, the serial numbers of addressable elements are assigned to the consecutive element numbers.
There are three methods of addressable elements configuration in the POLON 4000 system:

- automatic configuration
- configuration with verification
- manual numbering.

6.2.1 Automatic configuration

Elements located in the main loop are numbered consecutively starting from 1 from the side of the terminals marked as Lx up to the closest branch. Next, the control panel numbers the elements located in the branch to its end. After the numbering process is finished in the branch, the system returns to the main loop and numbers the elements to the next branch and then continues numbering the elements within the branch according to the above-mentioned procedure. This process includes all addressable elements.
This numbering method always designates elements with numbers from 1 to n.

6.2.2 Configuration with verification

In this option, it is necessary (on the basis of the installation design and control panel numbering algorithm) to pre-declare, i.e. define (by means of a keyboard or computer file) an element type for each number within a given loop. Next, the verification option must be actuated in the control panel. If the element types declared with given numbers are compliant with the element types numbered according to the required algorithm, the control panel automatically numbers the addressable elements.

6.2.3 Manual number assigning

This method makes it possible to number addressable elements in any given way. In order to assign the serial numbers to the element numbers, they may be entered in the serial numbers box manually or using a barcode reader.
Manual declaration of numbers for the whole detection line ensures free configuration of the elements located in this line (elements may be numbered in any order without maintaining continuity of the numbering).

Note:

- An ADC-4001 adapter with a wrongly defined operation mode may cause current overload of the detection line. Should it happen, it is necessary to unplug the adapter from the socket and wait at least 5 minutes. A re-installed adapter will only draw 150 µA from the line (the side line is automatically disabled). Before the adapter side line is re-enabled, it must be entered in a correct operation mode according to the programming manual (PM).
- As the radio detectors constitute a line branch, the automatic configuration and configuration with verification procedures are only possible if the adapter is located in the loop-shaped detection line. If the adapter is connected to a radial line, the line must be set up manually.

6.3 DESIGN GUIDELINES

In order to ensure reliability of installation operation, the loop system of routing detection lines should be employed. Radial lines should be used in special circumstances (e.g. when a few detectors must be installed at a considerable distance from the system).
While designing an addressable detection line, each addressable line element must be provided with its address (element number) to be identified by the control panel. In order to create a clear design and streamline the service process, it is recommended that the consecutively installed line elements have increasing address numbers. The best solution is to assign the numbers according to the algorithm used by the control panel to number elements during the automatic configuration process.
The ADC-4001 adapters have a built-in LED informing about actuation of a detector in a side line. Due to the above, an ADC-4001 adapter may be installed at an entrance to the room, instead of an actuation indicator. Regardless of the above, it is also possible to connect WZ-31 actuation indicators both to the detectors operating in the ADC-4001 adapter side line and 4046 series detectors.

In the POLON 4000 system, screened cabling should be used.
While designing the installation, all requirements defined in the technical data must be met. Special attention must be paid to the capacity of an addressable detection line. Moreover, proper resistance of the detection line and proper resistance of the line between the neighbouring short circuit isolators must be ensured.

7 ALARMING ARRANGEMENT

Organisation of the alarming procedure and other programmable parameters the POLON 4500 control panel must be defined during the installation designing stage. To this end, taking into account the conditions existing in the protected premises, the designer's tables must be correctly filled in. These tables are an integral part of a design and must be made available to the commissioning and service personnel.

The organisation of the alarming procedure is programmed as follows:
- declaring addressable elements, assignments to zones, operation modes and groups;
- declaring alarming variants and user's messages;
- programming general alarming parameters (T1, T2, T3 times).

7.1 DETECTION ZONE

Addressable elements must be program grouped in detection zones. It is possible to create max. 1024 zones in the control panel and the zones number 1, 2, 3 and 4 are permanently defined as fire extinguishing zones. According to the standard, max. 32 line elements may be assigned to one zone. Zones to which no element has been assigned are referred to as empty or inactive zones. The zones are created to describe a given detection area with a given set of line elements in a manner making it possible to identify the installation location. Moreover, a zone allows programming a given alarming variant in order to eliminate false alarms in facilities where the risk of accidental actuation of fire warning devices is high.
An area of one zone may be divided into two groups of fire warning devices, defined as A and B. Each fire warning device must be assigned to one of these groups during the programming process. The groups of fire protection elements (A/B) are created in order to program coincidental variants of zone alarming in order to eliminate false alarms as much as it is possible.

The program makes it possible to provide each zone with a text message (user message) containing two lines of text and max. 32 characters in each line.

In case an alarm is received from a zone, this text is displayed on the LCD screen showing the precise location of the fire.

7.2 ADDRESSABLE ELEMENTS DECLARATION

The control panel receives information and controls the operation of addressable elements which have been declared (assigned to operation) by the user. The control panel is delivered with the standard configuration loaded in which no addressable element is declared. Until the elements are declared, the control panel does not receive signals regarding line elements type and condition but, every 2 minutes, it checks the compliance of the elements installed in the addressable detection line with the declared ones and, in case an irregularity is detected, a fault whose type can be read is indicated.
An addressable element declaration consists in defining the following data for an address element:

- line number;
- element number;

and providing the following data for this address:

- serial number (entered manually or using a bar code reader);
- zone number (from range 1 ÷ 1024) for a warning device or a logical number (range 1 - 250) for the EKS-4001 monitoring and controlling element or a logical number (range 1 - 80) for the EWS-4001 multi-output controlling element or a logical number (range 1 - 80) for the EWK-4001 multi-input monitoring element or a logical number (range 1 - 250) for the SAL-4001 addressable signalling device;
- A or B group (within a given zone) for warning devices;
- operation mode (according to individual possibilities and needs of different element types).

7.3 ASSIGNING ALARMING PARAMETERS TO ZONES

In order to group addressable elements installed in a protected facility, zones are created (separated sections of the facility, room, etc.). The POLON 4500 control panel makes it possible to create 1024 detection zones.
Each zone may be assigned a user message consisting of two lines of text with max. 32 characters in each line.
Creating a zone consists in assigning an addressable element with a short number to a zone number, according to the programming manual (PM).
The POLON 4500 control panel allows selecting an alarming method for individual zones (one of 17 variants).
The alarming variants must be selected in such a manner that they ensure reliable and early detection of a fire danger. See section 8.1 of this Manual for the description of alarming variants. As a standard, the control panel is programmed according to variant 2 in all zones. Due to the method of an alarm evoking, these variants may be divided into two groups:
1-stage alarming (variants 1, 3, 4, 7, 9, 11, 17);
2-stage alarming (variants 2, 5, 6, 8, 10, 12, 13, 14, 15, 16).

The alarms are generated according to the programmed variants only during the system operation in the PERSONNEL PRESENT mode. After switching to the PERSONNEL ABSENT mode, in all zones, regardless of the programmed variants, alarms will be generated according to the 1-stage variant (variant 1) immediately generating a 2nd stage alarm in the control panel. Alarms are not generated according to variants after a manual call point (ROP) is activated as it is treated in a different manner than other addressable elements - the control panel immediately generates a 2nd stage alarm.

The fire extinguishing zones numbered from 1 to 4 may only be programmed with variants provided especially for them, i.e. 13, 14, 15 or 16 (which does not prevent from using these variants for other zones).
The alarming variants for zones must be programmed together with declaring a user message, according to the programming manual (PM).

7.4 EKS-4001 MONITORING AND CONTROLLING ELEMENTS DECLARATION

The EKS-4001 (EKS in short) monitoring and controlling element is a line element making it possible to control and supervise fire protection devices, e.g. smoke exhaust dampers, doors, sirens, light signalling devices, etc. A single EKS element (it is possible to install 1, 2 or 4 such elements in one housing) has one relay monitoring output and two monitoring inputs. Depending on the programmed operation modes and characteristic resistance, each of the two monitoring inputs may indicate one of the following modes:

- quiescent (monitoring);
- fault;
- non-maskable fault;
- technical alarm.

The EKS proper programming consists in declaring a line element (similarly to fire warning devices) and assigning it to a logical number.
A logical number for EKS is selected from the 1 ÷ 250 range and assigned to an element in order to make the EKS actuation variants dependent on different events in its own control panel or control panels in the common detection area, and provide it with the required user messages. Each EKS type element may be assigned only to one logical number and vice versa. As far as the program is concerned, a logical number for the EKS is an approximate equivalent to a zone for fire protection elements. The logical number links the EKS with actuation variants and user messages for monitoring inputs.
The EKS-4001 operation results from the operation mode programmed for an element and the output relay actuation variant.
The EKS-4001 entire programming procedure includes two stages:
Stage I:
EKS-4001 declaration consisting in assigning:

- an element number (1 ÷ 127) using the automatic configuration or the configuration with verification or the manual configuration procedures;
- a logical number (1 ÷ 250);
- an operation mode (it is factory set but may be changed - see below).

The EKS-4001 **operation mode** is defined by the following element parameters (standard mode in bold print):

- output line continuity monitoring (**YES** or NO);
- input 1 - actuation monitoring (YES (40 sec.) or YES (70 sec.) or YES (130 sec.) or **NO**);
- input 2 - actuation monitoring (YES (40 sec.) or YES (70 sec.) or YES (130 sec.) or **NO**);
- input 1 method of operation (NC or **NO**);
- input 2 method of operation (NC or **NO**);
- output relay actuation delay (0 sec. or 30 sec. or 60 sec. or 90 sec.).

The set of parameters defining an operation mode is directly connected with a line element and is programmed while declaring the EKS element as a line element. An operation mode may always be changed in the program.
Stage II:
EKS-4001 logical configuration consisting in assigning:

- a variant to a previously assigned logical number;
- a set of assigned zones if it is required by a given variant (from the 1 ÷ 1024 range; from own control panel or control panels of the common detection area);
- a set of assigned inputs of other EKS elements if it is required by a given variant (or own inputs if a given variant permits it) (range of assigned EKS elements: 1 ÷ 250, EKS inputs range: 1 ÷ 2 – only own control panel);

- a set of assigned EWK inputs if it is required by a given variant (range of assigned EWK elements: 1 ÷ 80, EWK inputs range: 1 ÷ 8 – only own control panel);
- user messages for a technical alarm and non-maskable fault of monitoring inputs.

The EKS-4001 output relay activation variants

See Table 7.1 for the possibilities of programming the EKS output. The "control panel number" parameter (only for control panels operating in a network) has the following meaning:

- control panel number = 0 shows the dependence on an event in any control panel included in the common detection area;
- control panel number > 0 shows the dependence on an event from a given control panel (provided it is included in the common detection area);
- control panel number "—" allows for making actuation dependent only on local control panel events.

For variants with additional zone dependencies: zone number = 0 shows the dependence on the total number of events within all zones in a selected control panel included in the common detection area.

Table 7.1

Variant	Control Panel No.	Zones/EKS/EWK Numbers	Actuation Criterion
0	—	—	Output inactive
1	0	—	1st stage general alarm
2	0 ÷ 31	0 ÷ 1024	'union' of 1st stage alarms in assigned zones
3	0 ÷ 31	0 ÷ 1024	'conjunction' of 1st stage alarms in assigned zones
4	0	—	2nd stage general alarm
5	0 ÷ 31	0 ÷ 1024	'union' of 2nd stage alarms in assigned zones
6	0 ÷ 31	0 ÷ 1024	'conjunction' of 2nd stage alarms in assigned zones
7	0	—	general fault in control panel
8	0	—	Non-maskable general fault in control panel
9	0	—	general technical alarm in control panel
10	—	1 ÷ 250	'union' of faults of assigned EKS inputs
11	—	1 ÷ 250	'union' of non-maskable faults of assigned EKS inputs
12	—	1 ÷ 250	'union' of technical alarms of assigned EKS inputs
13	—	1 ÷ 80	'union' of faults of assigned EWK inputs
14	—	1 ÷ 80	'union' of technical alarms of assigned EWK inputs
15	—	—	reset output
16	—	—	alarming device – 1st stage general alarm
17	—	0 ÷ 1024	alarming device – 'union' of 1st stage alarms in assigned zones

Variant 0

- No EKS actuation criterion (output permanently deactivated).

Variant 1 – general 1st stage alarm

- The output is activated in case a 1st stage alarm is generated in the control panel or in any control panel from the common detection area.

Variant 2 – 'union' of 1st stage alarms in the assigned zones of the control panels from the common detection area

- the output is activated when a 1st stage alarm is generated in at least one of the zones assigned to this relay.

Variant 3 – 'conjunction' of 1st stage alarms in the assigned zones of the control panels from the common detection area

- the output is activated when a 1st stage alarm is generated in at least two of the zones assigned to this relay.

Variant 4 – general 2nd stage alarm

- the output is activated in case a 2nd stage alarm is generated in the control panel or in any control panel from the common detection area.

Variant 5 – 'union' of 2nd stage alarms in the assigned zones of the control panels from the common detection area

- the output is activated when a 2nd stage alarm is generated in at least one of the zones assigned to this relay.

Variant 6 – 'conjunction' of 2nd stage alarms in the assigned zones of the control panels from the common detection area

- the output is activated when a 2nd stage alarm is generated in at least two of the zones assigned to this relay.

Variant 7 – general fault in the control panel

- the output is activated in case a general fault is detected in the control panel or in any control panel from the common detection area.

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

- the output is activated in case a general non-maskable fault is detected in the control panel or in any control panel from the common detection area.

Variant 9 – general technical alarm in the control panel

- the output is activated in case a general technical alarm is generated in the control panel or in any control panel from the common detection area.

Variant 10 – 'union' of faults in assigned EKS inputs

- the output is activated in case a fault has occurred in at least one assigned input from the list of assigned EKS elements. The assigned inputs may include own inputs of the controlled EKS element. The list of assigned EKS inputs may include only their own control panel (when the control panel operates in a network).

Variant 11 – 'union' of non-maskable faults in assigned EKS inputs

- the output is activated in case a non-maskable fault is revealed in at least one assigned input from the list of assigned EKS elements. The assigned inputs may not include own inputs of the controlled EKS element. The list of assigned EKS inputs may include only their own control panel (when the control panel operates in a network).

Variant 12 – 'union' of technical alarms in assigned EKS inputs

- the output is activated in case a technical alarm is generated in at least one assigned input from the list of assigned EKS elements. The assigned inputs may include own inputs of the controlled

EKS element. The list of assigned EKS inputs may include only their own control panel (when the control panel operates in a network).

Variant 13 – 'union' of faults in assigned EWK inputs

- the output is activated in case a fault is revealed in at least one assigned input from the list of assigned EWK elements. The list of assigned EWK inputs may include only their own control panel (when the control panel operates in a network).

Variant 14 – 'union' of technical alarms in assigned EWK inputs

- the output is activated in case a technical alarm is generated in at least one assigned input from the list of assigned EWK elements. The list of assigned EWK inputs may include only their own control panel (when the control panel operates in a network).

Variant 15 – reset output

- the reset output's objective is to generate a reset impulse (duration approx. 1.5 second), after a fire alarm is reset. This type may be used, e.g. to supply or reset detectors requiring a separate power supply, e.g. flame detectors manufactured by Det-Tronics.

Variant 16 – alarm device - general 1st stage alarm

- in this variant, an output is treated in the system as an alarm device.
  The output is activated in case a 1st stage alarm is generated in the control panel or in any control panel from the common detection area.

Variant 17 – alarm device – 'union' of 1st stage alarms in assigned zones

- in this variant, an output is treated in the system as an alarm device.
  The output is activated when a 1st stage alarm is generated in at least one of the zones assigned to this relay.

The output relay actuation variants are programmed only for an EKS element with a logical number defined.
In case variant 2 or 5 is used, at least one zone must be assigned to the EKS element, however, if variant 3 or 6 is used, at least two zones must be assigned. Variants 1 and 4 do not require assigning any zones.

As far as the variants with zone dependence are concerned, the assigned zones may originate in their own control panel (a standalone control panel) or in any control panels from the common detection area (a control panel operating in a network).

The total number of zones, EKS and EWK elements assigned to all executive outputs and SAL type elements in the control panel must not exceed 64,000.

Note:

- A non-maskable fault of an output may occur only during the output actuation monitoring time. For example, for the Yes (40 sec.) mode, if a technical alarm mode occurred during 40 seconds from output actuation and the line resistance changed into the resistance equivalent to a non-maskable fault, a non-maskable fault will not be signalled.
- A non-maskable fault will not be signalled if variant 0 is set for an output.
- After completing the standard and automatic configuration procedures, the EKS type elements are assigned to a special logical number 0 which makes them inactive.

An illustration of an exemplary implementation of an EKS-4001 element is provided in the manual called "Designing fire alarm installations using the POLON 4000 interactive fire signalling system" available at POLON-ALFA website and the EKS-4001 Installation and Maintenance Manual.

7.5 EWS-4001 MULTI-OUTPUT CONTROLLING ELEMENTS DECLARATION

The EWS-4001 (EWS in short) multi-output controlling element is a line element that enables to control fire protection devices, e.g. smoke exhaust dampers, doors, sirens, light signalling devices, etc. The EWS element has 8 relay control outputs. Up to 20 EWS elements may be connected to a single detection line.

The EWS proper programming consists in declaring a line element (similarly to fire warning devices) and assigning it to a logical number.

A logical number for EWS is selected from the 1 ÷ 80 range and assigned to an element in order to make the EWS actuation variants dependent on different events in the control panel. Each EWS type element may be assigned only to one logical number and vice versa. As far as the program is concerned, a logical number for the EWS is an approximate equivalent to a zone for fire protection elements. The logical number connects the EWS with actuation variants. A logical number or actuation variant must be assigned to an EWS element.
The EWS-4001 operation depends on assigning output relay actuation variants to different outputs.

The EWS-4001 entire programming procedure includes two stages:
Stage I:
The EWS-4001 declaration consisting in assigning:
- an element number (1 ÷ 127) using the automatic configuration or the configuration with verification or the manual configuration procedures;
- a logical number (1 ÷ 80).

Stage II:
The EWS-4001 logical configuration consisting in assigning:
- a variant for each output of the previously assigned logical number (see below);
- a set of assigned zones for each output if it is required by a given variant (from the 1 ÷ 1024 range; from own control panel or control panels of the common detection area).

Variants of activating individual EWS-4001 relay outputs
See Table 7.2 for the programming possibilities of each EWS output. The "control panel number" parameter (only for control panels operating in a network) has the following meaning:
- control panel number = 0 shows the dependence on an event in any control panel included in the common detection area;
- control panel number > 0 shows the dependence on an event from a given control panel (provided it is included in the common detection area);
- control panel number ”—” allows for making actuation dependent only on local control panel events.

For variants with additional zone dependencies: zone number = 0 shows the dependence on the total number of events within all zones in a selected control panel included in the common detection area.

Table 7.2

Variant	Control Panel No.	Zones Numbers	Actuation Criterion
0	—	—	inactive output
1	0	—	general 1st stage alarm
2	0 ÷ 31	0 ÷ 1024	‘conjunction’ of 1st stage alarms in assigned zones
3	0 ÷ 31	0 ÷ 1024	‘conjunction’ of 1st stage alarms in assigned zones
4	0	—	general 2nd stage alarm

5	0 ÷ 31	0 ÷ 1024	'conjunction' of 2nd stage alarms in assigned zones
6	0 ÷ 31	0 ÷ 1024	'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.
In variants with zone dependence, the assigned zones can be allocated from own control panel (in the case of independently operating control panel) or from any control panel of the common supervision area In the case of control panel network.
The total assignments of zones to all executive outputs and SAL type elements in the control panel should not exceed 64,000.

Note:

After the standard configuration loading and automatic configuration performance, EWS elements are assigned to a special logical number 0, and after a number attribution, variant 0 is assigned, which causes that such an element is inactive.
Detailed information concerning the EWS element is contained in the EWS-4001 'Installation and Maintenance Manual'.

7.6 EWK-4001 MULTI-INPUT MONITORING ELEMENTS DECLARATION

The EWK-4001 (EWK in short) multi-input monitoring element is a line element with 8 monitoring inputs. An EWK element makes it possible to monitor the condition of fire protection devices, .e.g. smoke exhaust dampers, doors, sirens or other technical devices and receive fire alarms depending on the configuration. Up to 20 EWK elements may be connected to a single detection line.

Depending on the characteristic resistance, each input may indicate one of the three following modes:

1. quiescent (operation);
2. fault;
3. (technical or fire) alarm.

The EWK proper programming consists in declaring a line element (similarly to fire warning devices) and assigning it to a logical number.
A logical number for EWK is selected from the 1 ÷ 80 range and assigned to an element in order to make the EWK actuation variants dependent on different events in the control panel and assign the required user messages to it. Each EWK type element may be assigned only to one logical number and vice versa. As far as the program is concerned, a logical number for the EWK is an approximate equivalent to a zone for fire protection elements. The logical number connects the EWK with monitoring variants and user messages for monitoring inputs.
The EWK-4001 operation results from the operation mode programmed for an element and the input monitoring variant.

The EWK-4001 entire programming procedure includes two stages:
Stage I:
EWK-4001 declaration consisting in assigning:

- an element number (1 ÷ 127) using the automatic configuration or the configuration with verification or the manual configuration procedures;
- a logical number (1 ÷ 80);
- an operation mode (it is factory set but may be changed - see below).

The EWK-4001 **operation mode** defines the operation method (standard mode in bold print) for individual 1 - 8 inputs:

- **NO –** shows characteristic resistance closing in order to generate an alarm;
- **NC –** shows a characteristic resistance opening in order to generate an alarm.

Stage II:
The EWK-4001 logical configuration consists in assigning (with a previously defined logical number) the following elements to each input:

- variant (see below);
- fire alarm zone (if required by the variant);
- technical alarm message (if required by the variant).

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 a number attribution, variant 0 is assigned, which causes that such an element is inactive.
Detailed information concerning the EWK element is contained in the EWS-4001 'Installation and Maintenance Manual'.

7.7 SAL-4001 ACOUSTIC SIGNALLING DEVICES DECLARATION

A SAL-4001 addressable acoustic signalling device is a line element equipped with a piezoelectric transducer used to generate an acoustic signal.
The SAL proper programming consists in declaring a line element (similarly to fire warning devices), assigning it to a logical number and assigning the type and actuation variant by means of this logical number.
A logical number for the SAL element is selected from the 1 ÷ 250 range and assigned to an element in order to make the SAL actuation variants dependent on different events in the control panel. Each SAL type element may be assigned only to one logical number and vice versa. As far as the program is concerned, a logical number for the SAL element is an approximate equivalent to a zone for fire protection elements. The logical number connects the SAL with actuation variants.

The SAL-4001 operation results from the operation mode programmed for an element and the piezoelectric transducer actuation variant.

The SAL-4001 entire programming procedure includes two stages:
Stage I:
SAL-4001 declaration consisting in assigning:
- an element number (1 ÷ 127) using the automatic configuration or the configuration with verification or the manual declaration procedures;
- a logical number (1 ÷ 250);
- an operation mode (it is factory set but may be changed - see below).

The operation mode is defined by the following element parameters (standard mode in bold print):
sound pattern – **type1** or type2 or type3;
battery power supply monitoring (YES or **NO**);
internal power supply monitoring (**YES** or NO).

The set of parameters defining an operation mode is directly connected with a line element and is programmed while declaring the SAL element as a line element. An operation mode may always be changed in the program.

Stage II:
The SAL-4001 logical configuration consisting in assigning:

- an output type (TYPE-1 or TYPE-3);
- variant (depending on the output type);
- a set of assigned zones if it is required by a given variant (from the 1 ÷ 1024 range; from own control panel or control panels of the common detection area).

Output types and variants

See Tables 7.3 and 7.4 for the programming possibilities of the SAL elements. The "control panel number" parameter (only for control panels operating in a network) has the following meaning:

- control panel number = 0 shows the dependence on an event in any control panel included in the common detection area;
- control panel number > 0 shows the dependence on an event from a given control panel (provided it is included in the common detection area);
- control panel number ”—” allows for making actuation dependent only on local control panel events.

For variants with additional zone dependencies: zone number = 0 shows the dependence on the total number of events within all zones in a selected control panel included in the common detection area.

Type1

Table 7.3

Variant	Control Panels No.	Zones Numbers	Time Parameters	Actuation Criterion
1	0	—	T3	1st stage alarm in control panel (or control panel group in case of network operation) or activation with ACTIVATION push button in ALARM DEVICES area
2	0 ÷ 31	0 ÷ 1024	T3	1st stage alarm in assigned zones

Note:

The countdown of the delay time will be discontinued (T3 time will be reset during the countdown time) and the outputs to alarm devices will be activated immediately after the control panel enters the 2nd stage alarm mode. After setting the T3 parameter to maximum time (10 minutes), the actuation criterion may be dependent on "the 2nd stage alarm only".

Type 3

Table 7.4

Variant	Control Panels No.	Zones Numbers	Time Parameters	Actuation Criterion
1	0	—	T_{op}	1st stage alarm in control panel
2	0	—	T_{op}	1st stage alarm in control panel until acknowledgement
3	0	—	T_{op}	2nd stage alarm in control panel
4	0	—	T_{op}	2nd stage alarm in control panel until acknowledgement
5	0 ÷ 31	0 ÷ 1024	T_{op}	1st stage alarm in assigned zones
6	0 ÷ 31	0 ÷ 1024	T_{op}	1st stage alarm in assigned zones until acknowledgement
7	0 ÷ 31	0 ÷ 1024	T_{op}	2nd stage alarm in assigned zones
8	0 ÷ 31	0 ÷ 1024	T_{op}	2nd stage alarm in assigned zones until acknowledgement

The type and actuation variants are programmed only for a SAL element with a logical number defined.
As far as the variants with zone dependence are concerned, the assigned zones may originate in their own control panel (a standalone control panel) or in any control panels from the common detection area (a control panel operating in a network).
The total number of zone assignments to all executive outputs and SAL type elements in the control panel must not exceed 64,000.

Note:
- The "Top" delay time is not applicable (equal to 0).
- After completing the standard configuration and automatic declaration procedures, the SAL type elements are assigned to a special logical number 0 and TYPE 0 is set, which makes them inactive.

Detailed information regarding a SAL element itself is provided in the SAL-4001 Installation and Maintenance Manual.

7.8 UCS 4000 UNIVERSAL CONTROLLING PANELS DECLARATION

The UCS 4000 (UCS in short) universal controlling panel is a standalone device enabling to control and supervise fire protection devices, e.g. smoke exhaust dampers, doors, etc. (see the detailed description provided in its Operation and Maintenance Manual). The UCS 4000 control panel may co-operate with the POLON 4500 control panel through a detection line (connected to the circuit similarly to any other line elements).
The POLON 4500 control panel may receive the following modes from the UCS 4000:
- quiescent (also during operation of the air venting function in the UCS);
- fire alarm (manual call point active - manual smoke extraction button connected to a dedicated UCS input or alarm from a conventional detection line connected to UCS);
- technical alarm (of the main relay [P1] and additional relays [P2, P3]) – acknowledgement of output actuation in the UCS transformed into a fire alarm from the control panel;
- non-maskable fault (from the monitored main relay [P1] and additional relays [P2, P3]) – lack of actuation of an output in the UCS transformed into a fire alarm in the control panel;
- testing – the UCS in a mode of testing elements and systems connected with a smoke exhaust system;
- UCS fault:
    - UCS power supply fault:
        - 230 V power supply fault;
        - battery fault;
        - battery charging circuit fault;
        - voltage drop below 22 V;
        - earth fault;
    - UCS controller fault:
        - microprocessor or program memory fault;
        - EEPROM memory fault;
    - UCS main (P1) relay fault;
    - faults of UCS special dedicated inputs and outputs:
        - PA alarm relay fault (PSU-4000 module);
        - P2 or P3 individually programmed relays fault (PSD-4000 module);
        - conventional detection line fault (PSU-4000 module);
        - RPO (manual smoke exhaust button) line fault (PSU-4000 module);
        - fault of an output to alarm devices (PSU-4000 module);
        - power supply (fuse) of a rain/wind sensor fault (PSU-4000 module);
        - declared PSD-4000 module faulty or lack;
- modes of an addressable module for communication with the POLON 4000 system:

- EEPROM memory fault;
- short circuit isolator actuation;
- shot circuit isolation;
- no connection between the line processor and main UCS element.

Depending on whether the programmed variant condition is met, the POLON 4500 control panel may send a signal actuating the P1 main relay to the UCS (and other outputs individually dependent on this signal).
The UCS controlling panel configuration may be programmed by means of keys located in this unit, however, the data regarding the co-operation of the UCS with a fire detecting control panel must be declared in the POLON 4500 control panel.
The UCS proper programming consists in declaring a line element (similarly to fire warning devices) and assigning it to a logical number.
A logical number for UCS is selected from the 1 ÷ 80 range and assigned to an element in order to make the UCS actuation variants dependent on different events in its own control panel or control panels in the common detection area and provide it with the required user messages. Each UCS type element may be assigned only to one logical number and vice versa.
The UCS 4000 operation results from the P1 main relay actuation variant and individual setting for keys in UCS 4000.
A full UCS 4000 programming procedure in the POLON 4500 includes two stages:
Stage I:
UCS 4000 declaration consisting in assigning:

- an element number (1 ÷ 127) using the automatic configuration or the configuration with verification or the manual configuration procedures;
- a logical number (1 ÷ 80).
-

Stage II:
UCS 4000 logical configuration consisting in assigning:

- a P1 main relay actuation variant to a previously assigned logical number;
- fire alarm zone (1 ÷ 1024) or zone 0 to block the reception of a fire alarm from the UCS unit;
- user messages for a technical alarm and non-maskable fault of outputs: P1 main relay and P2/P3 additional relays.

The P1 main relay actuation variants for the UCS 4000 control panel
See Table 7.5 for the possibilities of activating the P1 main relay for the UCS 4000 control panel. The "control panel number" parameter (only for control panels operating in a network) has the following meaning:

- control panel number = 0 shows the dependence on an event in any control panel included in the common detection area;
- control panel number > 0 shows the dependence on an event from a given control panel (provided it is included in the common detection area);
- control panel number ”—” allows for making actuation dependent only on local control panel events.

For variants with additional zone dependencies: zone number = 0 shows the dependence on the total number of events within all zones in a selected control panel included in the common detection area.

Table 7.5

Variant	Control Panel No.	Zone Number	Actuation criterion
0	—	—	Inactive output
1	0	—	1st stage general alarm
2	0 ÷ 31	0 ÷ 1024	‘union’ of 1st stage alarms in assigned zones

3	0 ÷ 31	0 ÷ 1024	'conjunction' of 1st stage alarms in assigned zones
4	0	—	2nd stage general alarm
5	0 ÷ 31	0 ÷ 1024	'union' of 2nd stage alarms in assigned zones
6	0 ÷ 31	0 ÷ 1024	'conjunction' of 2nd stage alarms in assigned zones

Variant 0
Means lack of the 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 unit with a logical number defined.
In case variant 2 or 5 is used, at least one zone must be assigned to the UCS, however, if variant 3 or 6 is used, at least two zones must be assigned. Variants 1 and 4 do not require assigning any zones.
As far as the variants with zone dependence are concerned, the assigned zones may originate in their own control panel (a standalone control panel) or in any control panels from the common detection area (a control panel operating in a network).
The total number of zone assignments to all executive outputs and SAL type elements in the control panel must not exceed 64,000.

Note:
- A non-maskable fault will not be signalled if variant 0 is set for an output.
- After completing the standard and automatic configuration procedures, the UCS type elements are assigned to a special logical number 0 which makes them inactive.

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

7.9 UCS 6000 UNIVERSAL CONTROL PANELS DECLARATION

The UCS 6000 (UCS in short) universal control panel is a standalone device making it possible to control and supervise fire protection devices, e.g. smoke exhaust dampers, doors, etc. (see the detailed description provided in its Operation and Maintenance Manual). The UCS controlling panel may co-operate with the POLON 4500 control panel through a detection line (connected to the circuit similarly to any other line elements).
The POLON 4500 control panel may receive the following modes from the UCS 6000:

1. quiescent (also during operation of the air venting function in the UCS);
2. fire alarm (manual call point active - manual smoke exhaust button connected to a dedicated UCS input, alarm from a conventional detection line connected to UCS or alarm from an external input);
3. technical alarm – acknowledgement of output actuation in the UCS transformed into a fire alarm from the control panel;
4. non-maskable fault – lack of actuation of an output in the UCS during a given period of time transformed into a fire alarm in the control panel;
5. UCS fault.

The UCS controlling panel full configuration is performed by means of dedicated software.
See the detailed description provided in the product Operation and Maintenance Manual.
The UCS proper programming in the POLON 4500 control panel consists in declaring a line element (similarly to fire warning devices) and assigning it to a logical number.
A logical number for UCS is selected from the 1 ÷ 80 range and assigned to an element in order to declare and configure individual modules of the UCS 6000 control panel.
The UCS 6000 entire programming procedure in the POLON 4500 panel includes two stages:
Stage I:
UCS 6000 declaration consisting in assigning:

- an element number (1 ÷ 127) using the automatic configuration or the configuration with verification or the manual configuration procedures;
- a logical number (1 ÷ 80);

Stage II:
UCS 6000 logical configuration consisting in:

- declaring MGL modules;
- declaring an MPD module;
- declaring MPW modules;
- defining the zone for the fire alarm generated by the MGS module;
- MGL modules configuration:
  - defining the zone for the fire alarm generated by the MGL module;
  - defining the activation variant of an MGL module;
  - defining user messages for a technical alarm and non-maskable fault of an MGL module output;
- MPD module configuration:
  - defining activation variants for PK1, PK2 and an MPD module;
  - defining user messages for a technical alarm and non-maskable fault of PK1 and PK2 outputs of an MPD module;
- MPW module configuration:
  - defining activation variants for PK1, PK2 and an MPW module;
  - defining user messages for a technical alarm and non-maskable fault of PK1 and PK2 outputs of an MPW module;

Variants of activating UCS 6000 control panel module outputs
See Table 7.6 for the possibilities of programming activation of UCS 6000 control panel module outputs.

The "control panel number" parameter (only for control panels operating in a network) has the following meaning:
control panel number = 0 shows the dependence on an event in any control panel included in the common detection area;
control panel number > 0 shows the dependence on an event from a given control panel (provided it is included in the common detection area);
control panel number "—" allows for making actuation dependent only on local control panel events.
For variants with additional zone dependencies: zone number = 0 shows the dependence on the total number of events within all zones in a selected control panel included in the common detection area.

Table 7.6

Variant	Control Panel No.	Zone number	Actuation Criterion
0	—	—	inactive output
1	0	—	general 1st stage alarm
2	0 ÷ 31	0 ÷ 1024	'union' of 1st stage alarms in assigned zones
3	0 ÷ 31	0 ÷ 1024	'conjunction' of 1st stage alarms in assigned zones
4	0	—	general 2nd stage alarm
5	0 ÷ 31	0 ÷ 1024	'union' of 2nd stage alarms in assigned zones
6	0 ÷ 31	0 ÷ 1024	'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.

7.10 TSR-4000 TERMINALS DECLARATION

A TSR-4000 terminal is a remote device to signal the POLON 4000 system control panel modes. Up to 16 terminals may be connected to one control panel and an RS-485 serial interface is responsible for transmission.
The declaration of terminals consists in selecting the SYSTEM CONFIGURATION -> HARDWARE DECLARATION -> TSR-4000 TERMINAL DECLARATION option for the declared terminal numbers of one of the two following options: WITH ACCESS and WITHOUT ACCESS. WITH ACCESS shows the permission for remote operation of the control panel and the fact that a terminal may remotely acknowledge an alarm or fault and remotely reset the control panel alarm.

8 FUNCTIONALITY DESCRIPTION

8.1 ALARMING

8.1.1 Alarm types

After a line element in an addressable detection line is actuated, the POLON 4500 control panel, on the basis of the decision algorithms, generates the PRELIMINARY ALARM, 1st stage alarm or 2nd stage alarm depending on the alarming variants programmed for given zones (rooms).
A preliminary alarm is signalled by means of the internal acoustic signalling system and a red diode in the ALARM field.
The LCD display shows a window marked as !!! PRELIMINARY ALARM !!! and the information regarding the number of alarming zones and the number of zones not shown on the display (due to limited space) is displayed in a separated field below. The main alarm window displays messages assigned to the alarming zones. If the number of alarming zones is too big to display them simultaneously, i.e. more than 8 zones, the alarms which are not displayed may be viewed by means of the ALARM push button.

A preliminary alarm is an internal alarm and may be acknowledged with the ACKNOWLEDGEMENT push button and reset with the RESET push button.

Note:
A preliminary alarm may be transformed into a fire alarm or automatically cleared by the control panel according to the applicable algorithms resulting from alarming variants for zones.

1st stage alarm is signalled by fast flashing of a big red FIRE indicator and an additional diode in the ALARM field.

The LCD display shows a window marked as !!! FIRE ALARMS !!! and information regarding the number of alarming zones and the number of zones not shown on the display (due to a limited space) is displayed in a separated field below. On the right hand side, the system displays information regarding the elapsing time after which outputs to alarm transmission (monitoring) devices will be activated. Until that time, the control panel signals the 1ST STAGE ALARM.
The 1st stage alarm is an internal alarm and it always requires that the personnel on duty reacts in an appropriate manner, the alarm is acknowledged with the ACKNOWLEDGEMENT push button (during the T1 time) and the hazards within the facility are recognised (during the T2 time). If the personnel does not react properly to a 1st stage alarm, a 2nd stage alarm is generated.
The main alarm window displays messages assigned to the alarming zones. If the number of alarming zones is too big to display them simultaneously, i.e. more than 8 zones, the alarms which are not displayed may be viewed by means of the ALARM push button. All alarming zones will be viewed apart from the first one which is permanently displayed in two alarm window lines and the last one displayed in the last two lines.

2nd stage alarm is an internal control panel mode (signalled with the 2ND STAGE ALARM message in the location of the previously displayed monitoring clock) which, apart from generating the signals in the control panel, causes the transmission of the fire signal outside (actuation of declared outputs as outputs to alarming-monitoring devices and actuation of additional outputs whose actuation depends on the 2nd stage alarm occurrence (e.g. external signalling devices or fire protection devices controlled with relay or potential outputs contacts).
A 2nd stage alarm may be preceded with a 1st stage alarm or it is generated immediately depending on the programmed alarming variant for a given zone in the premises or the operation mode set for the control panel. A 2nd stage alarm requires an immediate fire fighting action. During a fire alarm, a constant acoustic signal is evoked in the control panel (simultaneously with the optical signalling) which may be dis-actuated by pressing the backlit ACKNOWLEDGEMENT push button.
Pressing the backlit RESET push button results in clearing the fire alarm in the control panel. At least 2nd access level is required to reset the fire alarm signalling.

The POLON 4500 control panel enables users to choose (program) one of the 17 alarming variants for a given zone (marked as 1 ÷ 17). The process of switching a given line element in the addressable detection line into the alarm mode is verified by the control panel and, in the following sections of this Manual will be referred to as line element actuation.

The alarming process defined by means of variants 1 ÷ 17 may include all zones in the control panel programmed according to the programming manual PM. Within one zone, two groups of detectors marked as group A and group B may be defined. The groups allow creating coincidences within one zone.
When a fire alarm is generated, an applicable message is printed on the paper tape if the printer has been provided for operation.

Note:
The fire extinguishing zones numbered from 1 to 4 may only be programmed with variants provided especially for them, i.e. 13, 14, 15 or 16 (which does not prevent from using these variants for the other zones).

8.1.2 One-stage alarm (variant #1)

Actuation of a fire warning device results in immediate generation of a 2nd stage alarm.
This variant is applicable especially for zones of high fire danger.

8.1.3 Two-stage alarm (variant #2)

Actuation of a fire warning device generates a 1st stage alarm which is signalled acoustically and optically during the T1 time allocated for the personnel to react and acknowledge the alarm (ACKNOWLEDGEMENT push button). If the personnel does not react during the T1 time, a 2nd stage alarm is evoked. Personnel's reaction prolongs the duration of a 1st stage alarm with the T2 time measured from the moment the 1st stage alarm is acknowledged. This alarm objective is to investigate the current fire danger.

After the T2 time elapses, if the personnel has not reset the alarm by accessing the system at the 2nd level and pressing the backlit RESET push button, the 2nd stage alarm is generated. The T1 and T2 times may be programmed taking into account individual features of the protected facility, in accordance with the programming manual (PM).
Two-stage alarming switches into one-stage alarming (immediate 2nd stage alarm) when the control panel operates in "PERSONNEL ABSENT" and "DELAYS OFF" mode.

8.1.4 One-stage alarm with single reset (40/60 sec.) of a fire warning device (variant #3)

After a fire warning device is actuated, the control panel waits for 40 seconds for another fire warning device in the same zone to be actuated. Then the control panel generates a 2nd stage alarm. Otherwise, the control panel resets the device treating its actuation as false and waits for other signals from the facility. If, during 60 seconds, the same or different fire warning device is not actuated in the same zone again, the control panel generates a 2nd stage alarm.

If the same or different element in the same zone is not re-actuated during 60 seconds, the control panel will treat the previous actuation as a false alarm.
The above-mentioned variant must be implemented for momentary occurrences of fire factors not connected with the fire.

8.1.5 One-stage alarm with single reset (60 sec./8 min.) of a fire warning device (variant #4)

After a fire warning device is actuated, the control panel waits for 60 seconds for another fire warning device in the same zone to be actuated. Then the control panel generates a 2nd stage alarm. Otherwise, the control panel resets the device treating its actuation as false and waits for other signals from the facility. If, during 8 minutes, the same or different fire warning device is re-actuated in the same zone, the control panel generates a 2nd stage alarm.
If the same or different device in the same zone is not re-actuated during 8 minutes, the control panel will treat the previous actuation as a false alarm.
The above-mentioned variant must be implemented for momentary occurrences of fire factors not connected with the fire.

8.1.6 Two-stage alarming with single reset (40/60 sec.) of a fire warning device (variant #5)

After a fire warning device is actuated, the control panel waits for 40 seconds for another fire warning device in the same zone to be actuated. Then the control panel generates a 1st stage alarm. Otherwise, the control panel resets the device treating its actuation as false and waits for other signals from the facility. If, during 60 seconds, the same or different element is re-actuated in the same zone, the control panel generates a 1st stage alarm and the alarming procedure is the same as in variant 2.
If the same or different element in the same zone is not re-actuated during 60 seconds, the control panel will treat the previous actuation as a false alarm.
The above-mentioned variant must be implemented for momentary occurrences of fire factors not connected with the fire.

8.1.7 Two-stage alarm with single reset (60 sec./8 min.) (variant #6)

After a fire warning device is actuated, the control panel waits for 60 seconds for another fire warning device in the same zone to be actuated. Then the control panel generates a 1st stage alarm. Otherwise, the control panel resets the device treating its actuation as false and waits for other signals from the facility. If, during 8 minutes, the same or different element is re-actuated in the same zone, the control panel generates a 1st stage alarm and the alarming procedure is the same as in variant 2.
If the same or different device in the same zone is not re-actuated during 8 minutes, the control panel will treat the previous actuation as a false alarm.
The above-mentioned variant must be implemented for momentary occurrences of fire factors not connected with the fire.

8.1.8 One-stage alarm with a coincidence including two fire warning devices (variant #7)

After a fire warning device is actuated, it is initially reset and the control panel generates the initial alarm mode. If, during 8 minutes, the reset device and at least one more device in the same zone are actuated, the control panel generates a 2nd stage alarm. Otherwise, after 8 minutes, the control panel resets the preliminary alarm mode treating the device actuation as false and returns to the quiescent mode.

Note:
Correct operation of this variant requires that at least two (preferably three) fire warning devices are declared in the zone which are not separated with any physical obstacles. Failure to meet the above-mentioned requirements may result in constant reset of the alarming device.

8.1.9 Two-stage alarm with a coincidence including two fire warning devices (variant #8)

After a fire warning device is actuated, it is initially reset and the control panel generates the initial alarm mode. If, during 8 minutes, the reset device and at least one more device in the same zone are actuated, the control panel generates a 1st stage alarm and the alarming process is the same as in variant 2. Otherwise, after 8 minutes, the control panel cancels the preliminary alarm mode treating the device actuation as false and returns to the quiescent mode.

Note:
Correct operation of this variant requires that at least two (preferably three) fire warning devices are declared in the zone which are not separated with any physical obstacles. Failure to meet the above-mentioned requirements may result in constant reset of the alarming device.

8.1.10 Interactive one-stage alarm (variant #9)

After a detector detects fire factor changes, other detectors located in this zone are informed about this fact. Confirmation of the changes by other detectors in the zone results in an alarm for this zone and a 2nd stage alarm in the control panel.
In this variant, fire may often be detected much faster than in the cases when the system waits for a single detector to fulfil a given criterion. Simultaneously, correct location of detectors and selection of their types does not result in increasing the system vulnerability to interrupting factors.
Depending of the forecast fire types, different smoke (ionising, optical) and heat detectors combinations may be used. Redundant actuation of a single detector in a given zone also generates an alarm in this zone and a 2nd stage alarm in the control panel.

8.1.11 Interactive two-stage alarm (variant #10)

After a detector detects fire factor changes, other detectors located in this zone are informed about this fact. Confirmation of the changes by other detectors in the zone results in an alarm for this zone and a 1st stage alarm in the control and the alarming procedure is the same as in variant 2.

In this variant, fire may often be detected much faster than in the cases when the system waits for a single detector to fulfil a given criterion. Simultaneously, correct location of detectors and selection of their types does not result in increasing the system vulnerability to interrupting factors.
Depending of the forecast fire types, different smoke (ionising, optical) and heat detectors combinations may be used. Redundant actuation of a single detector in the zone results in an alarm for this zone and a 1st stage alarm in the control panel and the alarming procedure is the same as in variant 2.

8.1.12 One-stage alarm with a group-time coincidence (variant #11)

After fire warning devices belonging either to group A or group B are actuated, the devices in this group are initially reset and the control panel generates the preliminary alarm mode. After the initial reset, if, during 8 minutes, the devices belonging to group A and B (at least one device in each group) report actuation, the control panel generates a 2nd stage alarm.

Otherwise, after 8 minutes, the control panel resets the preliminary alarm mode treating the devices actuation as false and returns to the quiescent mode.
Note:
Correct operation of this variant requires that one (preferably two) fire warning device is declared both for group A and group B. Such created groups must not be separated with any physical obstacles. Failure to meet the above mentioned requirements may result in constant reset of the alarming device.

8.1.13 two-stage alarm with a group-time coincidence (variant #12)

After fire warning devices belonging either to group A or group B are actuated, the devices in this group are initially reset and the control panel generates the preliminary alarm mode. After the initial reset, if, during 8 minutes, the devices belonging to group A and B (at least one device in each group) report actuation, the control panel generates a 1st stage alarm and the alarming procedure is the same as in variant 2.

Otherwise, after 8 minutes, the control panel resets the preliminary alarm mode treating the devices actuation as false and returns to the quiescent mode.
Note:
Correct operation of this variant requires that one (preferably two) fire warning device is declared both for group A and group B. Such created groups must not be separated with any physical obstacles. Failure to meet the above-mentioned requirements may result in constant cancellation of the alarming device.

8.1.14 Two-stage alarm with a group-time coincidence to accelerate a 2nd stage alarm (variant #13)

After a fire warning device belonging either to group A or group B is actuated, the control panel generates a 1st stage alarm and the alarming procedure is the same as in variant 2.
Simultaneous actuation (coincidence) of fire warning devices from both groups results in immediate generation of a 2nd stage alarm.
Note:

1. Correct operation of this variant requires that one (preferably two) fire warning device is declared both for group A and group B. Such created groups must not be separated with any physical obstacles.
2. This variant may be implemented in fire extinguishing zones 1÷4. The fire extinguishing procedure in the zone is actuated in the automatic mode only after the coincidence requirement is met, regardless of the control panel operation mode (PERSONNEL PRESENT/PERSONNEL ABSENT).

8.1.15 Two-stage alarm with initial zone reset and a group coincidence to accelerate a 2nd stage alarm (variant #14)

After a fire warning device belonging to a zone is actuated, the control panel waits for 40 seconds and cancels the zone automatically.
If, during 8 minutes from the zone reset, any other device is re-actuated, the control panel generates a 1st stage alarm and the alarming procedure is the same as in variant 2.
Otherwise, if the devices in the zone are not re-actuated within 8 minutes, the control panel treats the previous actuation as false and returns to the quiescent mode.
Simultaneous actuation (coincidence) of fire warning devices from both groups results in immediate generation of a 2nd stage alarm.

Note:

1. Correct operation of this variant requires that one (preferably two) fire warning device is declared both for group A and group B. Such created groups must not be separated with any physical obstacles.
2. This variant may be implemented in fire extinguishing zones 1÷4. The fire extinguishing procedure in the zone is actuated in the automatic mode only when the coincidence requirement is met after initial reset, regardless of the control panel operation mode (PERSONNEL PRESENT/PERSONNEL ABSENT).

8.1.16 Two-stage alarm with a coincidence including two fire warning devices to accelerate a 2nd stage alarm (variant #15)

After a fire warning device belonging to a zone is actuated, the control panel generates the 1st stage alarm and the alarming procedure is the same as in variant 2.
Actuation of two or more fire warning devices in this zone results in accelerated generation of a 2nd stage alarm.

Note:

1. Correct operation of this variant requires that at least two (preferably three) fire warning devices are declared in the zone.
2. This variant may be implemented in fire extinguishing zones 1 ÷ 4. The fire extinguishing procedure in the zone is actuated in the automatic mode only after the coincidence requirement is met, regardless of the control panel operation mode (PERSONNEL PRESENT/PERSONNEL ABSENT).

8.1.17 Two-stage alarm with initial zone RESET and a coincidence including two fire warning devices to accelerate a 2nd stage alarm (variant #16)

After a fire warning device belonging to a zone is actuated, the control panel waits for 40 seconds and resets the zone automatically.
If, during 8 minutes from the zone reset, any other device is re-actuated, the control panel generates a 1st stage alarm and the alarming procedure is the same as in variant 2.
Otherwise, if the devices in the zone are not re-actuated within 8 minutes, the control panel treats the previous actuation as false and returns to the quiescent mode.
Actuation of two or more fire warning devices in this zone results in accelerated generation of a 2nd stage alarm.

Note:

1. Correct operation of this variant requires that at least two (preferably three) fire warning devices are declared in the zone.
2. This variant may be implemented in fire extinguishing zones 1 ÷ 4. The fire extinguishing procedure in the zone is actuated in the automatic mode only when the coincidence requirement is met after initial reset, regardless of the control panel operation mode (PERSONNEL PRESENT/PERSONNEL ABSENT).

8.1.18 One-stage alarm with temporary zone dis-actuation (variant #17)

Actuation of a fire warning device in a zone during control panel operation in the PERSONNEL ABSENT mode (the PERSONNEL ABSENT diode is lit) results in generating a 2nd stage alarm. When the control panel operates in the PERSONNEL PRESENT mode (the PERSONNEL ABSENT diode is off), the zone is automatically dis-actuated (fire warning devices are not visible to the control panel).

8.1.19 Alarm with a manual call point (ROP)

After the ROP-4001M or ROP-4001MH manual call points is actuated, the control panel immediately generates a 2nd stage alarm, regardless of the variant programmed in the zone to which the manual call point is assigned.

8.1.20 Alarming in the "DELAYS OFF" mode

In the "DELAYS OFF" mode, the control panel does not introduce any delays of given outputs actuation. The T1, T2 and T3 time is reset so two-stage alarm changes into appropriate one-stage alarm. However, the lack of delays does not result in removing any coincidental variants or variants with initial reset (in these variants two-stage alarm is replaced with one-stage alarm).
The "DELAYS OFF" mode also results in zeroing delays for PK relays and LS potential outputs.

Note:
The "DELAYS OFF" mode does not reset the delays programmed directly in the EKS-4001 element by means of the "OPERATION MODE" option.

8.1.21 Alarming in the "PERSONNEL ABSENT" mode

The alarming variants aimed at eliminating false alarms require the operating personnel's co-operation. These variants are useless if an operator is not present by the control panel. In such cases, programming any delays in informing the responsible service about a fire is not advisable. To this end, it is possible to switch the control panel operation mode into PERSONNEL ABSENT, which will result in the fact that the alarming variants for all zones (apart from the fire extinguishing zones 1 ÷ 4) are automatically changed into standard one-stage alarm (variant 1) or, in the case of interactive variants, they are changed into one-stage interactive alarm (variant 9).

This rule does not include 1 ÷ 4 fire extinguishing zones which retain the programmed alarming variant in each control panel operation mode.
The operation mode is switched after pressing the PERSONNEL ABSENT push button (the diode located in this push button is lit). Changing the control panel operation mode is possible with at least 2nd access level.

The operation mode is automatically switched to PERSONNEL ABSENT when one of the four times for automatic operation mode switching into the PERSONNEL ABSENT is programmed.
The operation mode is switched to PERSONNEL PRESENT after pressing the PERSONNEL ABSENT push button again (the diode located in this push button is off). The programmed alarming variants are restored to all zones.

8.2 FAULTS SIGNALLING

Thanks to its internal self-monitoring systems, the POLON 4500 control panel detects and signals faults in detection lines and in the control panel.
Any detected fault is signalled optically and acoustically. Faults are signalled optically by steady light of the yellow collective FAULT diode and acoustically by a slow intermittent signal of constant frequency.

Clearing the optical and acoustic signals (FAULT) takes place automatically after the fault is removed. The FAULT acoustic signalling is dis-actuated after pressing the backlit ACKNOWLEDGEMENT button.
Information regarding the detected faults is provided on the display. If, during 10 minutes from the latest registered fault occurrence, there is no new fault, the LCD display is dis-actuated. If the display is dis-actuated, the currently detected faults may be viewed after pressing the FAULT push button. Then the display will present fault messages. If the number of messages exceeds the display capability, they may be scrolled using the same push button or ↓↑ push buttons.

The exception from this rule are non-maskable faults in (properly programmed) monitoring circuits of LK monitoring lines or the EKS-4001 monitoring and controlling elements whose messages are automatically presented on the display until they are cleared.
If a printer is provided for operation, a message regarding a given fault will be printed on a paper tape after it is detected.

8.2.1 Fault types

1. System faults:
   - program memory, RAM memory or CONFIGURATION fault;
   - microprocessor operation interference.

2. Microprocessor module faults:
   - microprocessor controller for the LCD display and operator's console fault;
   - the MSL-1 module microprocessor controller fault;
   - loss of communication with the controller for the LCD display and operator's console;
   - loss of communication with the MSL-1 module controller;
   - loss of communication with the controller for the following modules: MSG-1, MSG-2, MSG-3 and MSG-4;
   - non-declared MSL-1 module if connected;
   - non-declared MSG-1, MSG-2, MSG-3 or MSG-4 module if connected.

3. Detection line 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 exceeding 127;
   - presence of not declared elements in a detection line;
   - incorrect parameters for the detection loop (resistance, capacity);
   - no response from a line element to a query from the control panel;
   - multiple declaration of the same line element.

4. Line element faults:
   - measuring element fault;
   - short circuit isolator actuated;
   - EEPROM memory fault;
   - EKS output line fault;
   - IN1 EKS input line fault;
   - IN2 EKS input line fault;
   - IN1 EKS non-maskable fault;
   - IN2 EKS non-maskable fault;
   - EWS relay fault;
   - battery of SAL external power adaptor fault.

5. Control panel input and output faults:
   - PK supervised relay outputs fault;
   - LS supervised potential outputs fault;
   - LK monitoring line outputs non-maskable fault.

6. Power supply fault:
   - voltage outage on the main power source;
   - reserve power supply fault (no battery, short circuit in terminals connecting the batteries or B1 fuse damage);
   - decrease in battery voltage below 22 V ± 1 V;
   - battery cluster charger fault;
   - + 5 V transducer fault (also a short circuit);
   - temperature probe fault (short circuit, no probe);
   - burnt or missing melt insert of the B2 fuse for the MZ-48 module;
   - earth fault, i.e. connection of the power supply output module with the control panel housing or grounding.

7. Network faults:
   - hardware number not compliant with the declaration;
   - no network control panel declaration;
   - repeated control panel numbers in the network;
   - no. 1 ring fault;
   - no. 2 ring fault;
   - incorrect connection of rings;
   - no communication with the network control panel.
   -

8. TSR-4000 terminal faults
   - configuration memory fault;
   - EPROM memory fault;
   - LCD display fault;
   - relay output fault;
   - signalling line fault;
   - incorrect terminal number;
   - 230 V power supply fault;
   - battery fault;
   - battery charging system fault;
   - voltage drop below 22 V;
   - terminal earth fault.

9. Other faults:
   - thermal printer fault;
   - no paper in the printer.

Note:
In order to clear a system fault, it is necessary to switch the K6 key of the SW1 switch on the PSC board and reset the active microprocessor. After clearing a system fault, the standard configuration must be loaded and the control panel must be set up again.

8.3 TESTING

The POLON 4500 control panel provides three types of operation tests:
   - tests of the TSO-4500 board signalling elements;
   - tests of line elements installed in the facility;
   - tests of executive devices controlled by the EKS-4001, EWS-4001 and SAL-4001 controlling elements.

Tests may be carried out by operators at the 2nd or higher access level authorisation. The testing procedures must be in accordance with the programming manual (PM).

8.3.1 TSO-4500 board signalling elements testing

During the test of signalling elements, all optical diodes and acoustic signals are actuated one after another. When the test is finished, the control panel automatically returns to the standard operation mode.
Testing is automatically stopped when the control panel receives a fire alarm signal. Moreover, switching to the testing mode during fire alarm signalling is not possible.

The signalling elements test may always be stopped after pressing the ESC key.

8.3.2 Testing fire line elements in zone

The POLON 4500 control panel makes it possible to test line elements in an addressable line which belong to any zone.
The procedure of switching into the testing mode of elements in a zone is carried out according to the programming manual (PM). Switching a given zone into the test mode is signalled by steady light of the yellow collective TESTING diode.
After an alarm signal is received from a line element, information regarding a test alarm is shown on the LCD display and printed out (if a printer is connected).
The alarming element is cancelled in approx. 60 seconds.
The procedure of dis-actuating of the mode for testing elements (detectors) in a zone is carried out according to the programming manual (PM). The collective TESTING diode is switched off (unless other elements are tested).
A fire alarm from the zone which has not been switched into the testing mode results in automatic dis-actuation of the testing mode and switching into fire alarm signalling in the control panel according to the programmed variant.
Any number of line elements within the tested zone may be in the alarm mode at the same time, however, for the inspection purposes, it is recommended to actuate line elements consecutively.
It is impossible to switch the system into the TEST mode within faulty or disabled zones or in case a fire alarm is signalled.
The EKS-4001 monitoring and controlling elements tests consist in switching an element into the testing mode, which should result in actuating an output relay. The element should indicate a correct relay output condition.

8.3.3 EWS-4001 controlling elements testing

The EWS-4001 testing consists in switching individual relay outputs of an element into the testing mode, which should result in activating the tested relay. The element should indicate a correct condition of the relay output tested.

8.3.4 EWK-4001 monitoring elements testing

The EWK-4001 testing consists in forcing (by means of a characteristic resistor) a technical alarm mode on individual inputs. The control panel should indicate a technical alarm mode for these inputs.

8.3.5 SAL-4001 acoustic signalling devices testing

The SAL-4001 testing consists in switching an element into a testing mode, which should result in actuation of the required sound signals.

8.3.6 Line elements location

The control panel enables its users to physically inspect the line element location through alternate actuation of the red and yellow LEDs of the element. This testing procedure is described in the programming manual (PM).

8.3.7 MSG-45 modules testing

See chapter 9 for MSG-45 module testing procedures.

8.4 SYSTEM ELEMENTS DISABLEMENT/RE-ENABLEMENT

The control panel program makes it possible to disable line elements, zones, control panel outputs/inputs or executive line elements.
The fact that an element is disabled is signalled by the control panel with the steady light of the yellow collective DISABLEMENT diode.
An element may be disabled/re-enabled by operators at the 2nd or higher access level authorisation.

8.4.1 Fire warning devices and zones disablement/re-enablement

In case fire warning devices are faulty or repair works are executed in the protected facility (which may result in generating false alarms), the control panel makes it possible to disconnect monitoring for a given section of the facility through disablement of the whole zone or its part as required.
The FIRE WARNING DEVICE DISABLEMENT option is used to disable/re-enable fire warning devices.
A part of a zone may be disabled/re-enabled by disablement of individual addressable elements in the zone. The whole zone may be disabled/re-enabled in a simpler way, i.e. by carrying out the above activity within the whole zone using the ZONE DISABLEMENT option.

Disablement of fire warning devices or the whole zone results in the fact that the control panel does not receive alarm and fault information from the disabled line elements and automatically restore the possible fault signalling within the zone. If the fault is not removed, the fault signalling is restored, after the zone is re-enabled.

Partial disablement of a zone with a programmed alarming variant higher than the other one, results in the fact that the variant for this zone is automatically changed into the immediate operation variant (variant 1). After the zone is fully re-enabled, the previously programmed variant is restored.

8.4.2 PK relays disablement/re-enablement

The PK relays may be disabled/re-enabled in the RELAY DISABLEMENT option. If a PK relay is disabled, a given relay is disabled, regardless of the control panel condition.

8.4.3 LS signalling lines disablement/re-enablement

The LS signalling lines may be disabled/re-enabled as logical devices in the SIGNALLING LINE DISABLEMENT option. After an LS line is disabled, a fault is no longer signalled. If the fault is not removed, the fault signalling is restored, after the line is re-enabled.

8.4.4 LK monitoring lines disablement/re-enablement

The LK monitoring lines may be disabled/re-enabled as logical devices in the MONITORING LINE DISABLEMENT option. If an LK line is disabled, faults and technical alarms for this line are no longer

signalled. If the fault or technical alarm is not removed, the fault/alarm signalling is restored, after the line is re-enabled.

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

The EKS-4001 may be disabled/re-enabled as a logical device in the EKS ELEMENTS DISABLEMENT option.
When an EKS element is disabled, the output relay is dis-actuated and the fault/technical alarm for this element is no longer signalled. If the fault is not removed, the fault signalling is restored, after the element is re-enabled.

8.4.6 EWS-4001 controlling elements disablement/re-enablement

The EWS-4001 may be disabled/re-enabled as a logical device in the EWS ELEMENTS DISABLEMENT option.
If a given EWS output is disabled, the disabled output relay is dis-actuated and the fault signalling for the disabled output is discontinued. If the fault is not removed, the fault signalling is restored, after the element is re-enabled.

8.4.7 EWK-4001 monitoring elements disablement/re-enablement

The EWK-4001 may be disabled/re-enabled as a logical device in the EWK ELEMENTS DISABLEMENT option.
If a given EWK input is disabled, the disabled input is excluded from monitoring, which results in the fact that no signals from this input are received and the fault/technical alarm signalling is discontinued. After re-enablement, the control panel will indicate the current condition of this input again.

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

The SAL-4001 may be disabled/re-enabled as a logical device in the SAL ELEMENTS DISABLEMENT option.
After a SAL device disablement, SAL signalling is dis-actuated and a fault is no longer signalled. If the fault is not removed, the fault signalling is restored, after the element is disabled.

8.4.9 MSG-45 modules disablement

See chapter 9 for MSG-45 module disablement procedures.

8.5 EVENT AND ALARM MEMORY

8.5.1 Event memory

The POLON 4500 control panel may store 2,000 last events in its non-volatile memory. Each event is accompanied by a description, date and time of occurrence (accuracy up to 1 second). The events stored in the memory in chronological order include:

- alarm occurrences;
- technical alarms;
- faults;
- tests;
- disabled elements;
- actuation of executive devices;
- personnel reactions: ACKNOWLEDGEMENT, RESET, delay actuation, etc.

The event memory contents may be viewed on the display or printed out (see the counter manual in the programming manual [PM]).

Note:
Loading the standard configuration results in clearing the event memory.

8.5.2 Alarm memory

The control panel may store up to 9,999 latest alarms in its non-volatile memory together with the date, time (accuracy up to 1 second) and zone of their occurrence. Moreover, if the control panel operates in a network, the unit number is also stored.
The alarm memory contents may be viewed on the display or printed out (see the counter manual in the programming manual [PM]).

Note:
The alarm memory may be cleared only from the control panel menu (4^{th} access level authorisation necessary). Loading the standard configuration does not result in clearing the alarm memory.

9 MSG-45 FIRE EXTINGUISHING CONTROL MODULE

9.1 GENERAL DESCRIPTION

The MSG-45 fire extinguishing control module equipped with an independent microprocessor controller is used to control stationary fire extinguishing devices in one fire extinguishing zone.
The control panel is prepared to operate up to four fire extinguishing zones (no. 1, 2, 3 and 4), which means that four MSG-45 modules may be installed in the maximum configuration.
The number of the zone with which a given MSG-45 module is connected to depends on the individual module number programming by means of the programming jumpers. The programming method is shown in Fig. 9.1.
The MSG-45 module with the programmed (zone) number has a logical name MSG-n where n means the fire extinguishing zone number 1 ÷ 4, e.g. MSG-2 is a module operating the fire extinguishing zone 2.
In the basic version, the control panel is equipped with one MSG-1 fire extinguishing control module.
Additionally, three other modules may be installed in layers. They should be located as follows:

- MSG-2 module below MSG-1 module;
- MSG-3 module over MSG-1 module;
- MSG-4 module below MSG-2 module.

The modules installed in layers have a common protection plate with names of inputs/outputs and programming jumpers.
A module with a programmed n number must be connected by means of 14-core strip cable with a proper zone connector Zn (n = 1, 2, 3 or 4) located on the PP-45 module (e.g. MSG-2 with the Z2 connector on PP-45). The Zn zone connector on the PP-45 module is connected to the group of signalling-handling elements of the fire extinguishing zone marked with the same number.
The programmed module number must be fully compliant with the zone connector number. Otherwise, the control panel will signal a fault.
The comprehensive software for inputs and outputs makes it possible to flexibly adapt device functionalities to the requirements of a given installation.

Each MSG-45 is equipped with:

- seven PK1 ÷ PK7 potential relay outputs (24 V) supervised for short circuits or breaks in the connected line;
- nine PK8 ÷ PK16 non-potential relay outputs making it possible to monitor the relay contacts and the continuity of the connected circuit;
- eleven LK1 ÷ LK11 monitoring inputs to connect external controlling and monitoring lines.

The control panel has an external interface necessary to communicate with modules responsible for fire detection and signalling.
The module power supply for its own circuits and controlled external devices is provided by the main control panel power adaptor.
See Fig. 9.1 for the module view.

Note 1:
Each potential relay output PK1 ÷ PK7 is protected by a multi-actuation polymer fuse. In the event of a short circuit, the fuse may isolate the output even after the short circuit is removed (with operating load).

In order to return the fuse to its normal condition, the output load must be momentarily removed.

Note 2:
The line continuity monitoring system for relay outputs consumes less than 1 mA of current from an external device, which may cause its slight actuation (unwanted and unfavourable). To avoid such the situation, the line continuity monitoring circuit should be disabled within the software (no output monitoring declared) and hardware (output monitoring jumper in 1-2 = ”NO” position).

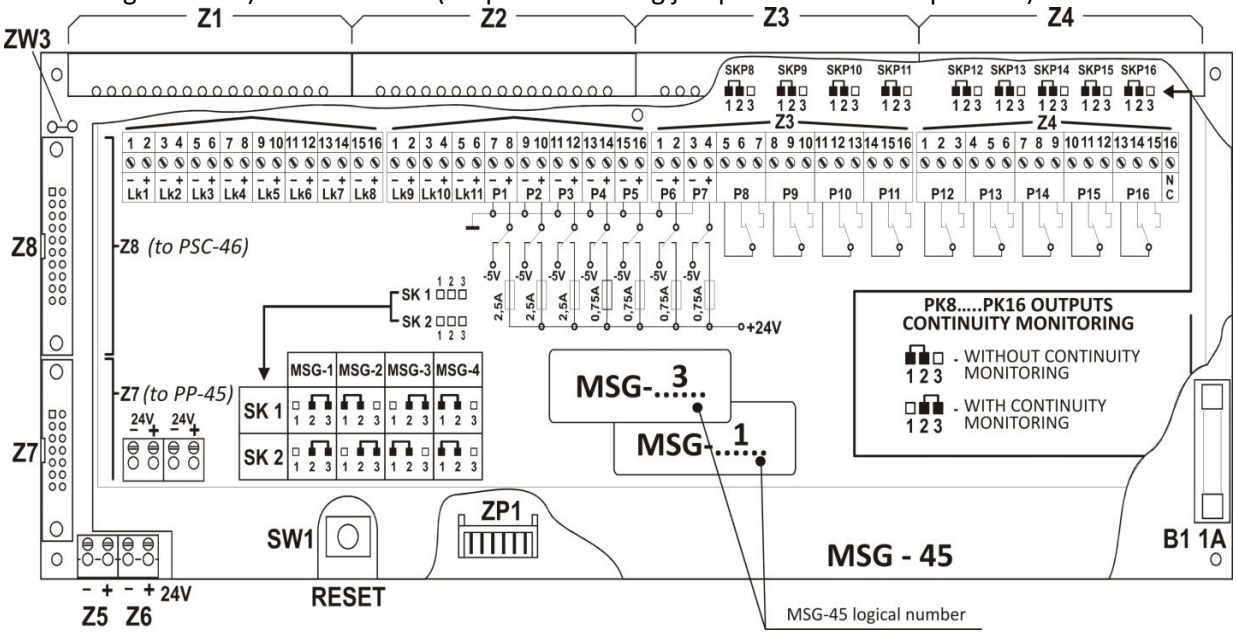

Fig. 9.1 MSG-45 extinguishing control module (single module view with described board)

9.2 OPERATION MODES

9.2.1 Fire extinguishing actuation mode (EXTINGUISHING START)

The actuation condition (EXTINGUISHING START) in the fire extinguishing zone may be established in the following manner:
1. For the operation in the automatic mode, in the following cases:
a) 2nd stage alarm in the fire extinguishing zone with the additional mode:
detection of a fire by at least two detectors operating in the group coincidence or the coincidence including two fire warning devices installed in a given fire extinguishing zone (variants 13, 14, 15, 16);
b) manual actuation of the proper fire extinguishing zone by pressing the EXTINGUISHING START push button (together with the PERMISSION push button) on the control panel door;
c) manual actuation (as a result of pressing the EXTINGUISHING START push button) with the external push button connected to the monitoring line fulfilling the EXTINGUISHING START function.
2. For the operation in the manual mode, in the following cases:

a) manual actuation of the proper fire extinguishing zone by pressing the EXTINGUISHING START push button (together with the PERMISSION push button) on the control panel door;

b) manual actuation (as a result of pressing the EXTINGUISHING START push button) with the external push button connected to the monitoring line fulfilling the EXTINGUISHING START function.

Note:
The above mentioned criteria may not be sufficient if blocks and damages are present.
The fire extinguishing actuation mode is signalled:
- optically – the red EXTINGUISHING START diode in the control panel zone field is lit;
- acoustically – the internal signalling of the control panel is turned on (if it has been silenced).

The control panel actuates outputs for which the following functions are programmed:
- ACTUATION SIGNALLING DEVICE;
- EVACUATION SIGNALLING DEVICE;
- 2^{ND} STAGE ALARM SIGNALLING;
- EXTINGUISHING MODE SIGNALLING.

The ACTUATION mode may be reset together with the ALARM mode by means of the RESET push button (on the control panel detection unit). The ACTUATION mode reset is disabled until at least one condition is fulfilled (depending on which condition is fulfilled earlier):

- confirmation of the extinguishing agent outflow received by the EXTINGUISHING AGENT RELEASE END MONITORING input;
- end of the time defined by the "ACTUATION RESET blocking time" parameter.

The ACTUATION mode may also be reset directly with the EXTINGUISHING DISABLEMENT push button.

Note:
The "ACTUATION RESET blocking time" is a parameter programmable within the 0 ÷ 30 minutes range (default value - 0).

9.2.2 Discharge mode (DISCHARGE)

The discharge mode is signalled:
- optically – the red DISCHARGE diode in the control panel zone field is lit;
- acoustically – the internal signalling of the control panel is turned on (if it has been silenced).

In this mode, the relay outputs for which the following functions have been programmed are activated:
- WARNING SIGNALLING DEVICE;
- DISCHARGE CONDITION SIGNALLING;
- SEALING SIGNAL.

The control panel may switch to the extinguishing agent discharge indication condition:
- after is passes through all conditions before the discharge during the automatic fire extinguishing procedure resulting from manual or automatic actuation;
- after omitting the conditions before the discharge as a result of receiving the signal informing about the extinguishing agent outflow from the monitoring line ("EXTINGUISHING AGENT RELEASE").

If the extinguishing agent outflow signal from the "EXTINGUISHING AGENT RELEASE" line is received when there have been no conditions preceding the discharge, the signalling is turned on and the outputs are activated as for the discharge condition.

9.2.3 Technical alarm mode

The fire extinguishing unit detects and evokes a technical alarm if the following modes of any monitoring line to which one of the following functions is assigned occur:
- fK=6 OUTFLOW MONITORING (indicates extinguishing agent outflow);
- fK=7 PRESSURE/MASS MONITORING (indicates shortage or lack of the extinguishing agent);
- fK=11 UNIVERSAL MONITORING INPUT (general purpose input) is in an active mode.

The technical alarm mode reported by the MSG-45 module is indicated by the collective TECHNICAL ALARM diode on the detection unit. It is also possible to read a technical alarm message (among other messages) on the display.
During the control panel programming process, it is possible to assign individual technical alarm messages to the universal monitoring lines (fK=11).

9.2.4 Fault mode (FAULT)

The MSG-45 fire extinguishing module detects and signals the following faults:
- break or short circuit in at least one monitoring line (LK1 ÷ LK11);
- break or short circuit in at least one output circuits of PK1 ÷ PK7 and PK8 ÷ PK16 relays (if the contact monitoring function is active);
The fault mode is signalled by the control panel separately for each fire extinguishing zone by means of the yellow collective FAULT diode.

9.2.5 Blockade mode (BLOCKADE)

The blockade mode signalled by means of the yellow collective BLOCKADE diode separately for each fire extinguishing zone is present in the following cases:
- at least one monitoring line (LK1 ÷ LK11) is blocked;
- at least one relay (PK1 ÷ PK16) is blocked;
- the EXTINGUISHING START procedure actuation is blocked (see 9.2.6);
- the extinguishing agent discharge (DISCHARGE) is blocked (see 9.2.7);
- non-electrical blockade supervised by the monitoring line fulfilling the "NON-ELECTRICAL BLOCKADE" function is detected.

9.2.6 EXTINGUISHING START blockade

The fire extinguishing procedure actuation is blocked when the "EXTINGUISHING BLOCKADE" function is active or there is a reason making its actuation impossible:
- the EXTINGUISHING BLOCKADE is actuated in the control panel or on the MSG module monitoring line to which the fK = 4 –EXTINGUISHING BLOCKADE function has been assigned;
- the MSG module monitoring line with assigned fK = 4 –EXTINGUISHING BLOCKADE function is faulty (short circuit, missing 10 kΩ end-of-line resistor);
- the MSG module monitoring line input is blocked in the menu of the control panel to fK = 4 – EXTINGUISHING BLOCKADE function has been assigned.

9.2.7 DISCHARGE blocking

1. After a fire extinguishing procedure is actuated, the discharge of the fire extinguishing agent (EXTINGUISHING) is blocked when:

- the “EXTINGUISHING STOP" function is active or there is a reason making its actuation impossible;
- during the countdown of the extinguishing agent release delay time, the EXTINGUISHING STOP push button is pressed (suspension) in the control panel or in the MSG module monitoring line to which the fK = 3 – EXTINGUISHING STOP function has been assigned;
- the MSG module monitoring line with assigned fK = 3 –EXTINGUISHING STOP function is faulty (short circuit, missing 10 kΩ end-of-line resistor);
- the MSG module monitoring line input is blocked in the menu of the control panel to fK = 3 – EXTINGUISHING STOP function has been assigned.

2. an alarm output is blocked;

- at least one PK relay output of the MSG module in the control panel menu is blocked to which alarm functions have been assigned:
- fK = 4 – ACTUATION SIGNALLING CONTROL;
- fK = 5 – EVACUATION SIGNALLING CONTROL;
- fK = 6 – WARNING SIGNALLING CONTROL.

9.2.8 Testing mode

After activating a proper testing function in the control panel menu, it is possible to check the following elements of their proper operation:

- optical signalling devices of the control panel;
- MSG-45 module monitoring lines.

A monitoring line testing consists in forcing the active mode in the line and observing the operation of a given diode (indirectly assigned to this line by the function number) in the EXTINGUISHING ZONES field, according to Table 9.1. If the diode is lit during the active mode, the monitoring line and the control panel input circuit are operational.

Table 9.1 Diodes used to indicate functions performance of tested detection lines

DETECTION LINE fK FUNCTION NUMBER	DETECTION LINE FUNCTION NAME	DIODE INDICATING DETECTION LINE FUNCTIONING	RESISTANCE OF DETECTION LINE EXTERNAL CIRCUIT IN ACTIVE MODE
0	INACTIVE LINE (SWITCHED OFF)	-	-
1	EXTINGUISHING START	EXTINGUISHING START	500 Ω ÷ 2 kΩ
2	RESERVE START	RESERVE START	500 Ω ÷ 2 kΩ
3	EXTINGUISHING STOP	EXTINGUISHING STOP	500 Ω ÷ 2 kΩ
4	EXTINGUISHING BLOCKADE	EXTINGUISHING BLOCKADE	500 Ω ÷ 2 kΩ
5	(ONLY) MANUAL CONTROL	MANUAL CONTROL	500 Ω ÷ 2 kΩ
6	E.A. RELEASE MONITORING	RELEASE	500 Ω ÷ 2 kΩ
7	PRESSURE/MASS MONITORING	RELEASE	500 Ω ÷ 2 kΩ
8	EXT. ALARMU INPUT	RELEASE	500 Ω ÷ 2 kΩ
9	NON-ELECTR. BLOCKADE POSITION	RELEASE	500 Ω ÷ 2 kΩ
10	E.A. DISCHARGE END MONITORING	RELEASE	500 Ω ÷ 2 kΩ
11	UNIVERSALNE MONITORING INPUT	RELEASE	500 Ω ÷ 2 kΩ

9.3 MONITORING LINES AND THEIR FUNCTIONS

The MSG-45 module is equipped with eleven LK1 ÷ LK11 inputs used to connect monitoring lines. Each input ensures constant monitoring of the connected line resistance. Four line resistance ranges defining the line mode are established:

- 0 ÷ 200 Ω – fault mode (line short circuit);
- 500 Ω ÷ 2 kΩ – active mode (alarm);

- 3.3 Ω ÷ 13 kΩ – quiescent mode (detection);
- over 30 kΩ – fault mode (line break).

Lines are supplied with 18 V measuring voltage. An active mode of a monitoring line is triggered by loading it with 1 kΩ characteristic resistance. In the quiescent mode, each monitoring line should be loaded with a 10 kΩ end-of-line resistor connected to the end of this line.
Each of the 11 inputs may be programmed to perform the fK functions defined in Table 9.2.

Table 9.2 MSG-45 module monitoring lines functions

DETECTION LINE fK FUNCTION NUMBER	**DETECTION LINE FUNCTION NAME**	**Indication by collective diodes in detecting unit**	
		Line active mode effect	**Line fault mode**
0	INACTIVE LINE (SWITCHED OFF)		
1	EXTINGUISHING START	2ND STAGE ALARM	FAULT
2	RELEASE START	2ND STAGE ALARM (continuation)	FAULT
3	EXTINGUISHING STOP	BLOCKADE	FAULT BLOCKADE
4	EXTINGUISHING BLOCKADE	BLOCKADE	FAULT BLOCKADE
5	(ONLY) MANUAL CONTROL	MANUAL CONTROL	FAULT
6	E.A. RELEASE MONITORING	TECHNICAL ALARM	FAULT
7	PRESSURE/MASS MONITORING	TECHNICAL ALARM	FAULT
8	EXT. ALARM INPUT.	2ND STAGE ALARM	FAULT
9	NON-ELECTR. BLOCKADE POSITION.		FAULT
10	E.A. DISCHARGE END MONITORING	Permission for ACTUATION MODE RESET	FAULT
11	UNIVERSAL MONITORING INPUT	TECHNICAL ALARM	FAULT

Other lines functionalities can be programmed in accordance with Table 9.3.

Table 9.3 MSG-45 module monitoring lines functions programming possibilities

Line No.	***Numbers and names of functions recommended for monitoring lines assignation***	***Function choice range in programming***	***Function Default No. ****
1	**1 - EXTINGUISHING START**	0, **1**, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**1**
2	2 – RESERVE START	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
3	**3 - EXTINGUISHING STOP**	0, 1, 2, **3**, 4, 5, 6 ÷ 11	**3**
4	4 - EXTINGUISHING BLOCKADE	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
5	**5 - (ONLY) MANUAL CONTROL**	0, 1, 2, 3, 4, **5**, 6 ÷ 11	**5**

Line No.	*Numbers and names of functions recommended for monitoring lines assignation*	*Function choice range in programming*	*Function Default No. **
6	6 – E.A. DISCHARGE MONITORING	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
7	7 – PRESSURE/MASS MONITORING	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
8	8 - EXTERNAL ALARM INPUT	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
9	9 – NON-ELECTRICAL BLOCKADE POSITION	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
10	10 – E.A. DISCHARGE END MONITORING	0, 1, 2, 3, 4, 5, 6 ÷ 11	0
11	11 - UNIVERSAL MONITORING INPUT	0, 1, 2, 3, 4, 5, 6 ÷ 11	0

* function default numbers are the functions numbers that have been assigned to monitoring lines after factory programming or standard configuration loading

9.3.1 fK1 EXTINGUISHING START function

The EXTINGUISHING START function is performed in connection with the monitoring line no. 1 used to supervise and transmit the signal for manual actuation of fire extinguishing from external EXTINGUISHING START push buttons. One push button (or more push buttons in parallel) may be connected to a monitoring line. See Fig. 9.2 for an example of a monitoring line circuit using a PU-61 push button. A LED indicates operation of the line and push button when it is pressed.
After the push button is pressed:

the automatic fire extinguishing procedure is initiated;
the actuation state is signalled by the EXTINGUISHING START diode switching on;
acoustic signalling of the control panel and proper relay outputs performing the fP4, fP5, fP7, fP13 functions is activated;
after the programmed delay time elapses, the fire extinguishing agent outflow signal (actuation of relays performing the fP1, fP2, fP6, fP14 functions) is emitted.

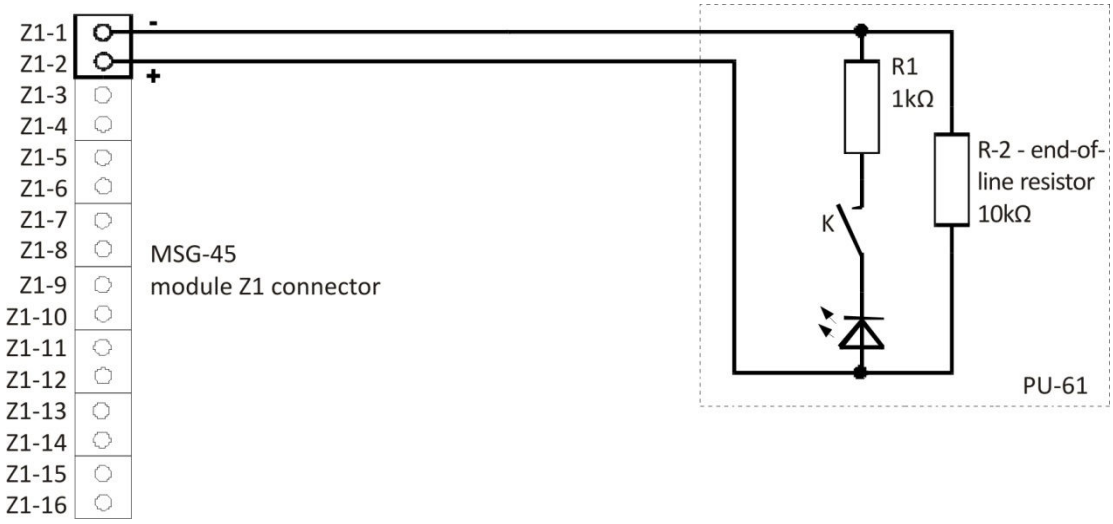

Fig. 9.2 Monitoring line circuit to perform EXTINGUISHING START function

9.3.2 fK2 RESERVE START function

The RESERVE START function is executed in connection with the monitoring line no. 2 used to supervise and transmit the signal for actuation of additional supply of the fire extinguishing agent from external PD-61 FIRE "RESERVE START" push buttons. One push button (or more push buttons in parallel) may be connected to a monitoring line. See Fig. 9.3 for a monitoring line circuit with one push button. A LED shows the operation of the line and push buttons while pressing them.

After the push button is pressed:

- additional supply of a fire extinguishing agent is actuated provided the control panel is in the discharge condition, i.e. the main supply of the fire extinguishing agent has been depleted and the alarm is not cancelled;
- the relay performing the fP3 functions is activated;
- the red RESERVE START diode is lit in the control panel area field.

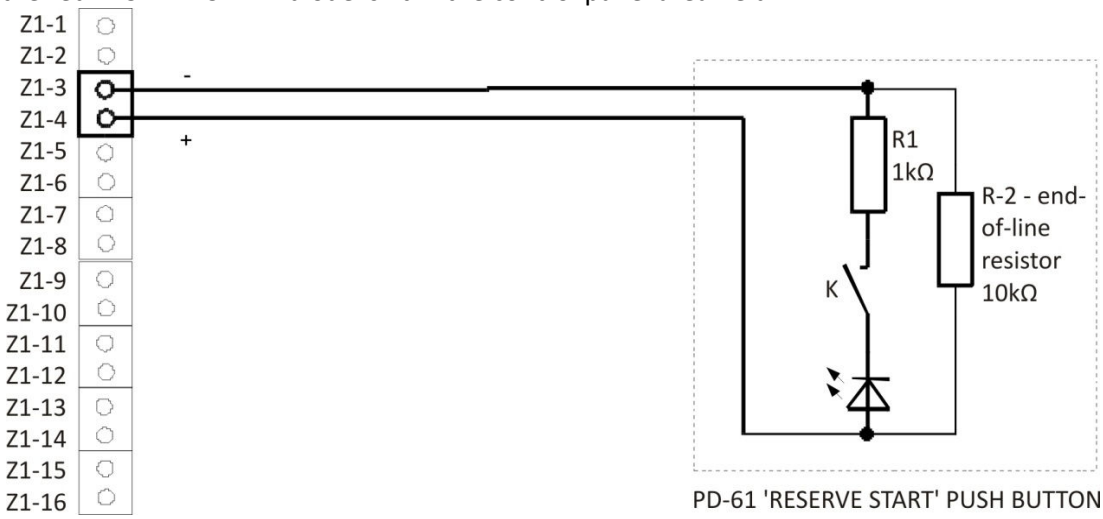

Fig. 9.3 Monitoring line circuit to perform RESERVE START function

9.3.3 fK3 EXTINGUISHING STOP function

The EXTINGUISHING STOP function is executed in connection with the monitoring line no. 3 used to supervise and transmit the signal for manual stopping the fire extinguishing process from external EXTINGUISHING STOP push buttons. One push button (or more push buttons in parallel) may be connected to a monitoring line. See fig 9.4 for the monitoring line circuit with one PW-61 "fire extinguishing stop" push button. A LED shows the operation of the line and push buttons while pressing them.

After the push button is pressed:

- the automatic fire extinguishing procedure is suspended;
- this condition is indicated by the EXTINGUISHING STOP diode on the control panel front panel, in the EXTINGUISHING ZONES field;
- the control panel acoustic signalling is switched on provided it has been silenced;
- the relay output performing the fP12 functions is activated if the relay is assigned to transfer information regarding the suspension devices actuation.

One of the two following suspension algorithms may be selected in the control panel menu:

Algorithm 1:

Pressing the EXTINGUISHING STOP push button results in disablement of the fire extinguishing signal and stopping the evacuation time countdown. Releasing the EXTINGUISHING STOP push button results in starting the programmed evacuation time countdown from the beginning.

Algorithm 2:

Pressing the EXTINGUISHING STOP push button results in disablement of the fire extinguishing signal but it does not stop the extinguishing agent discharge delay time countdown (evacuation time). Releasing the EXTINGUISHING STOP push button results in immediate sending a fire extinguishing signal to the fire extinguishing agent discharge devices (if the delay time elapsed when the push button was pressed). In case the push button is released before the set delay (evacuation) time elapses, the fire extinguishing signal is sent after the countdown is completed.

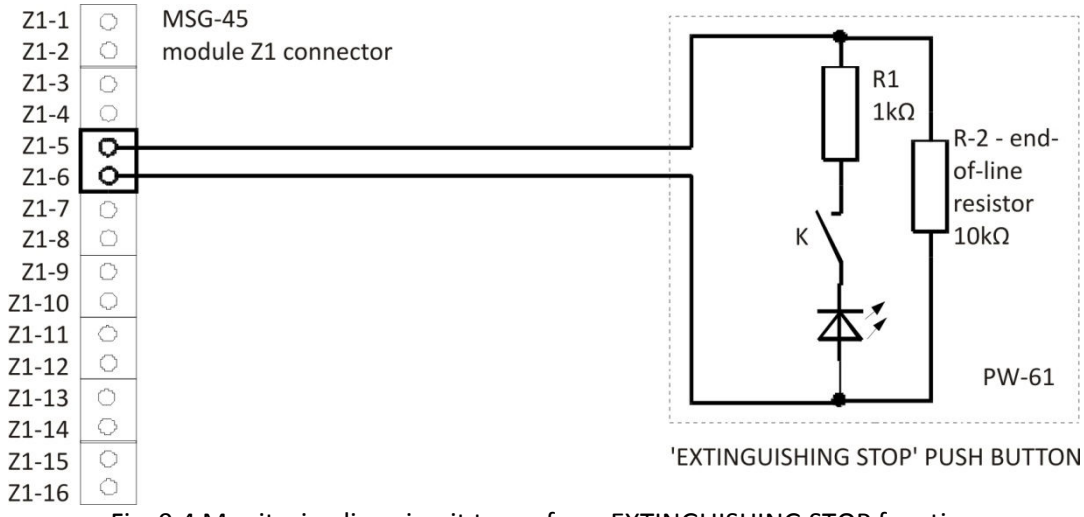

Fig. 9.4 Monitoring line circuit to perform EXTINGUISHING STOP function

9.3.4 fK4 EXTINGUISHING BLOCKADE function

The EXTINGUISHING BLOCKADE function is performed in connection with the monitoring line no. 4 used to supervise and transmit the signal for fire extinguishing blockade from an external push button. One push button (or more push buttons in parallel) may be connected to a monitoring line. See Fig 9.5 for the monitoring line circuit with one PB-61 push button. A LED in the monitoring line circuit indicates actuation of the fire extinguishing blocking function and circuit operation.

Switching the system into the blockade mode by means of the push button installed in the monitoring line or the push button in the control panel results in:

- blocking the actuation of the fire extinguishing procedure or cancelling the actuation mode and triggering the actuation blocking if the procedure was actuated earlier (if the blocking is triggered after the fire extinguishing procedure is started, the red EXTINGUISHING START diode starts blinking);
- activating the control panel acoustic signalling provided it has been silenced;
- activating the yellow EXTINGUISHING BLOCKADE diode in the control panel zone field.

When the blockade is released, the EXTINGUISHING BLOCKADE diode is switched off (it also applies to the blinking EXTINGUISHING START diode if the blockade was applied after the extinguishing agent was discharged) and the fire extinguishing module switches into the quiescent mode, provided the alarm which might re-actuate the fire extinguishing procedure has been disabled in the control panel detection area.

Note:
The blockade can be released if all EXTINGUISHING BLOCKADE push buttons in the monitoring line and the push button in the control panel are released. The fault mode in the "fire extinguishing blocking" monitoring line also results in the fire extinguishing blocking mode.

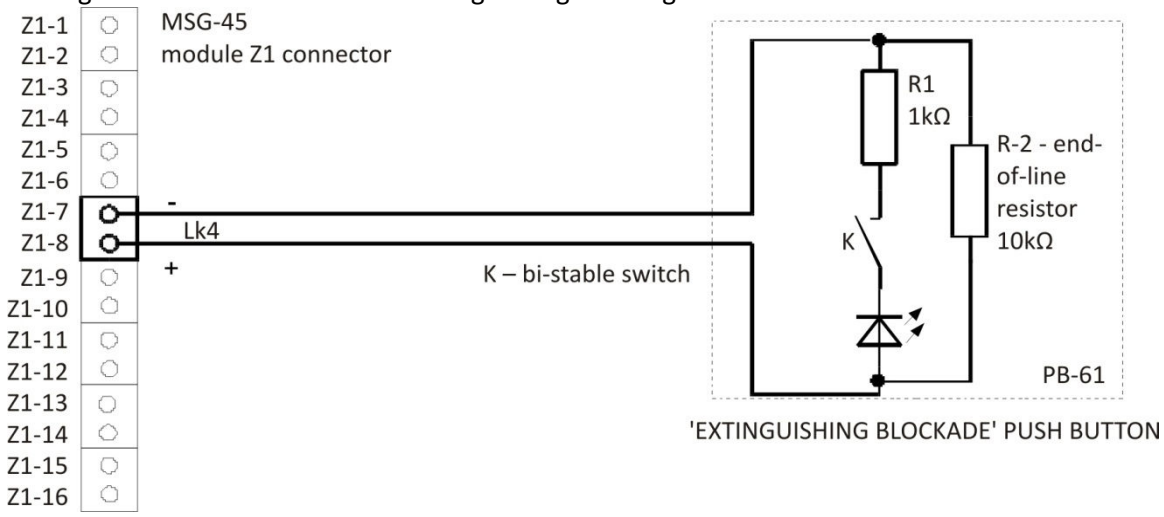

Fig. 9.5 Monitoring line circuit to perform EXTINGUISHING BLOCKADE function

9.3.5 fK5 MANUAL CONTROL function

This function is performed in connection with the monitoring line no. 5 used to supervise and transmit the MANUAL CONTROL signal from an external switch. One switch (or more switches in parallel) may be connected to a monitoring line. See Fig. 9.6 for a monitoring line circuit with one switch. A LED in the monitoring line circuit indicates actuation of the only manual operation mode and the proper operation of the circuit.
This function is also executed by the MANUAL CONTROL push button in the control panel zone field.
If the system is switched to the manual control mode by means of an external push button or a control panel push button, the alarm signal activating the fire extinguishing procedure coming from automatic fire warning devices (detectors) is disabled. The only manual control mode is indicated by the light of the yellow MANUAL CONTROL push button located in the control panel zone field. If the diode is switched off, the control panel operates in the automatic (and manual) control mode.
Note:
Exiting the MANUAL CONTROL mode is possible when all switches in the monitoring line and the push button in the control panel are released.

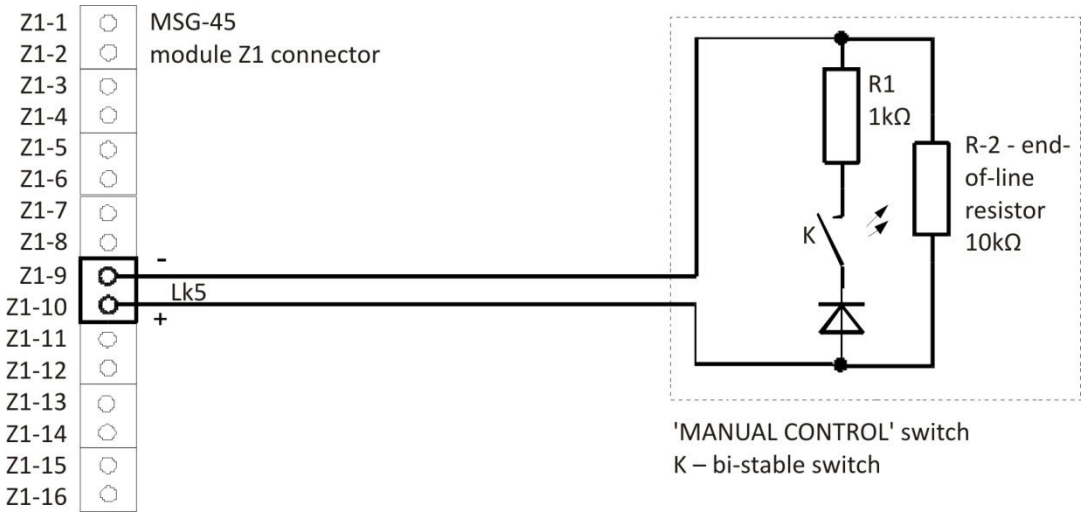

Fig. 9.6 Monitoring line circuit to perform MANUAL CONTROL function

9.3.6 fK6 FIRE EXTINGUISHING AGENT OUTFLOW MONITORING function

The function may be performed using monitoring lines (no. 1 ÷ 11). The monitoring line no. 6 is recommended for extinguishing agent outflow control. See Fig. 9.7 for the typical system of connections for the EXTINGUISHING AGENT DISCHARGE monitoring line. Closing the K contact results in providing the control panel with the real extinguishing agent outflow signal, which is indicated in the following manner:

- the red DISCHARGE diode is lit in the control panel area field (provided that the EXTINGUISHING AGENT DISCHARGE signalling mode is selected in the control panel menu on the basis of the return signal from the EXTINGUISHING AGENT DISCHARGE monitoring line and not on the basis of relay actuation);
- restoring the control panel acoustic signalling provided it has been silenced;
- actuation of the warning signalling relay (performing the fP6 functions).

A larger number of K monitoring contacts may be connected in parallel to the monitoring line.

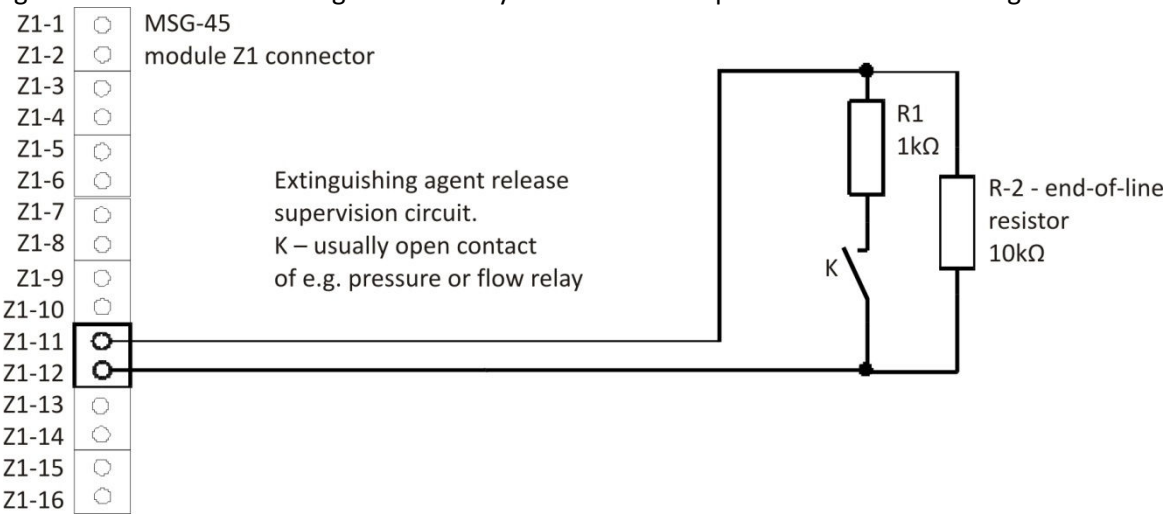

Fig. 9.7 Monitoring line circuit to perform EXTINGUISHING AGENT DISCHARGE MONITORING function

9.3.7 fK7 FIRE EXTINGUISHING AGENT PRESSURE/MASS MONITORING function

The function may be executed using monitoring lines no. 1 ÷ 11. Line no. 7 is recommended for monitoring the fire extinguishing agent reserves. Typical connections are shown in Fig. 9.8. In the first system, if the K contact is closed, the "no fire extinguishing agent" signal is transmitted to the control panel, which is indicated with a technical alarm. The second system makes it possible to use an NC

contact. In this system, both line faults and opening a contact is indicated with a common message as a pressure/mass monitoring line fault.
A larger number of normally-open and normally-closed (in series) K monitoring contacts may be connected to the monitoring line.

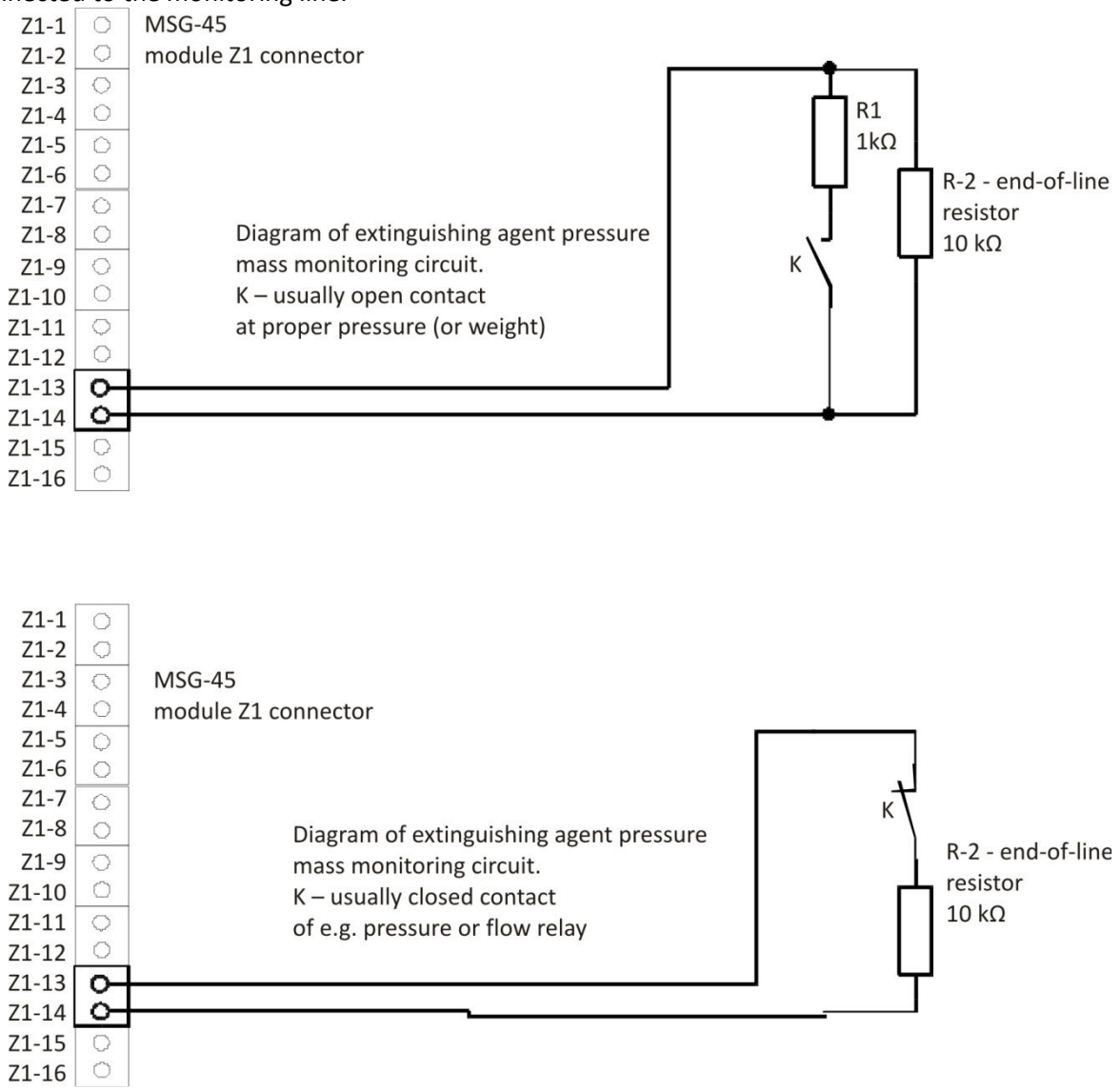

Fig. 9.8 Monitoring line circuits to perform PRESSURE/MASS MONITORING function

9.3.8 fK8 EXTERNAL ALARM INPUT function

The function may be executed using monitoring lines no. 1 ÷ 11. Line no. 8 is recommended for receiving the alarm signal. See Fig. 9.9 for a typical connection diagram. When the K contact is closed, a signal is transmitted to the control panel and a fire extinguishing procedure is actuated, provided the fire extinguishing zone has not been switched into the (only) manual control mode. The actuation signal is treated as a signal emitted from an automatic source. The K contact may be an alarm relay contact from a different fire signalling control panel.

A larger number of K contacts may be connected in parallel to one monitoring line.

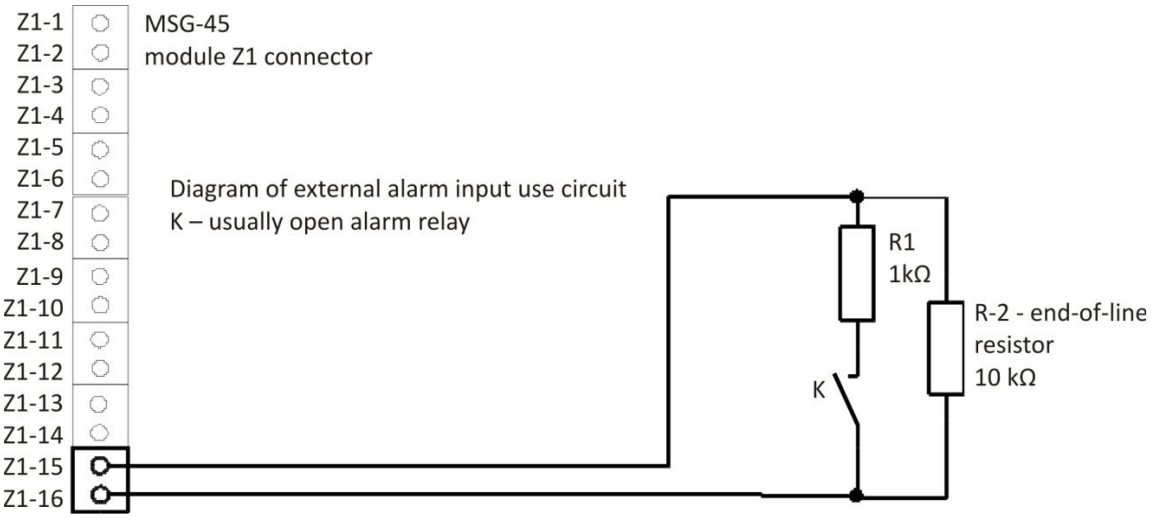

Fig. 9.9 Monitoring line circuit to perform EXTERNAL ALARM OUTPUT function

9.3.9 fK9 NON-ELECTRICAL BLOCKADE monitoring function

The function may be executed using monitoring lines no. 1 ÷ 11. Monitoring line no. 9 is recommended for monitoring the non-electrical blockade position. Typical connections are shown in Fig. 9.10. If a K contact is closed, the active blocking position is indicated. A LED in the monitoring line circuit indicates the blockade position and circuit operation.

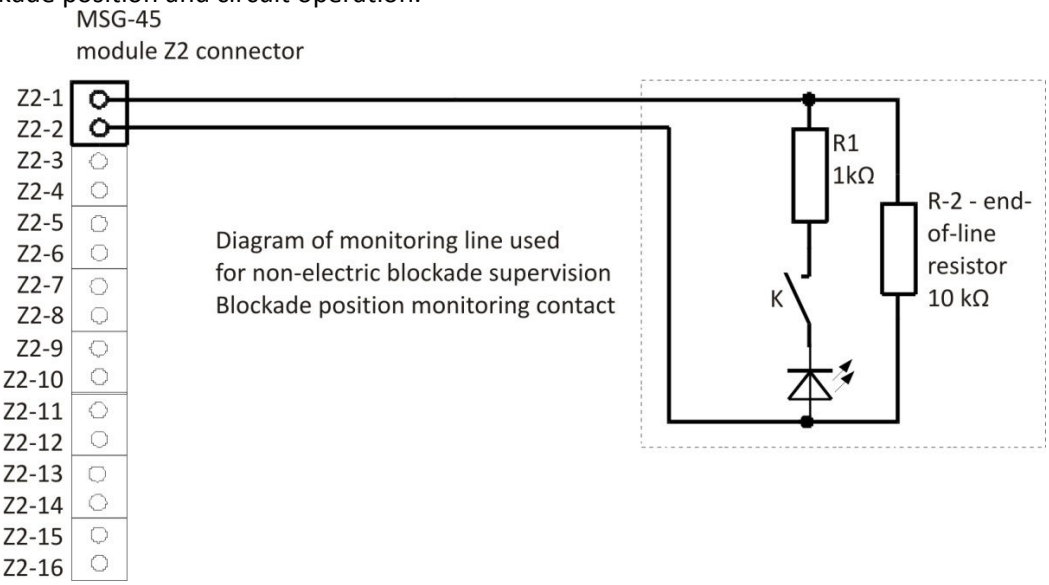

Fig. 9.10 Monitoring line circuit to perform NON-ELECTRICAL BLOCKADE function

9.3.10 fK10 FIRE EXTINGUISHING AGENT OUTFLOW END function

The control panel makes it possible to cancel the alarming mode and the initiated fire extinguishing procedure in any operation mode. However, in some cases, unintentional cancellation of an alarming mode may have detrimental impact on fire extinguishing procedure effectiveness. It may be prevented by programming the procedure of cancelling function disablement for a set time of 0.30 min. from the moment of initiating a fire extinguishing procedure. After the fire extinguishing agent outflow is finished, the cancelling function disablement is not advisable. Using the outflow end signal through a monitoring line makes it possible to optimally unblock the cancelling function.

The function may be fulfilled using monitoring lines no. 1 ÷ 11. Line no. 10 is recommended for monitoring the end of fire extinguishing agent outflow. When a K contact is closed, it is interpreted as the end of the fire extinguishing agent outflow. In case the cancelling function is disabled due to the set time, a signal from the line results in its resetting to zero and re-enablement of the alarming mode cancelling function. The fact that a K contact is in the detection position is of no significance here.

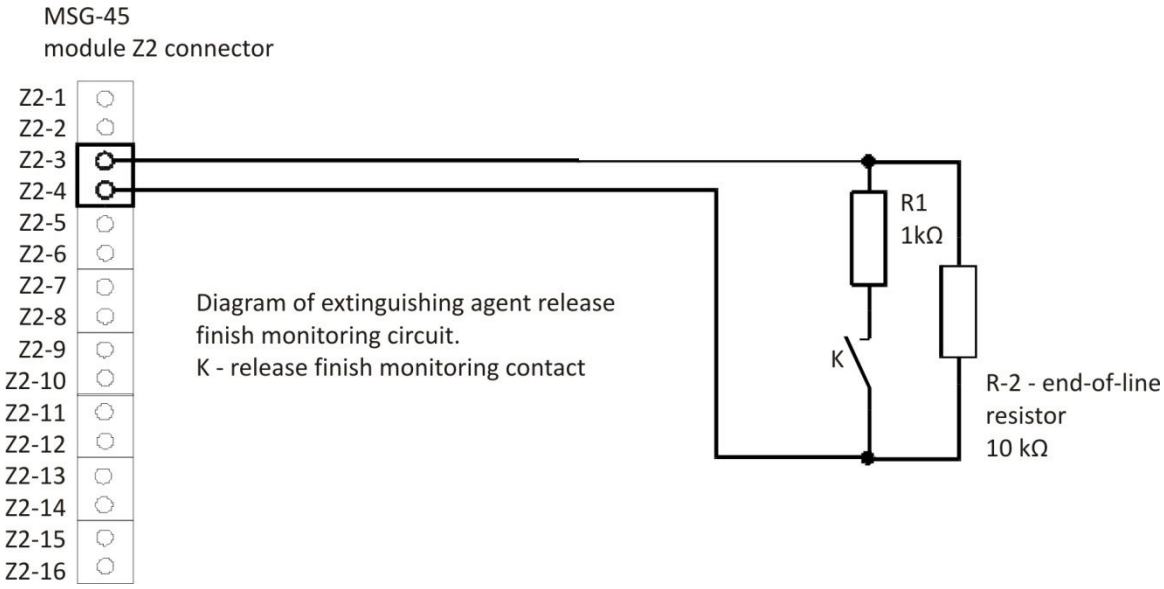

Fig. 9.11 Monitoring line circuit to perform E.A. DISCHARGE END function

9.3.11 fK11 UNIVERSAL MONITORING INPUT function

This function may be used to monitor the operation of any external device equipped with a monitoring contact. When the contact is closed, a fault signal of the supervised device is indicated. The connection diagram is presented in Fig. 9.12. The function may be executed using monitoring lines no. 1 ÷ 11. Line no. 11 is recommended for monitoring the operation.

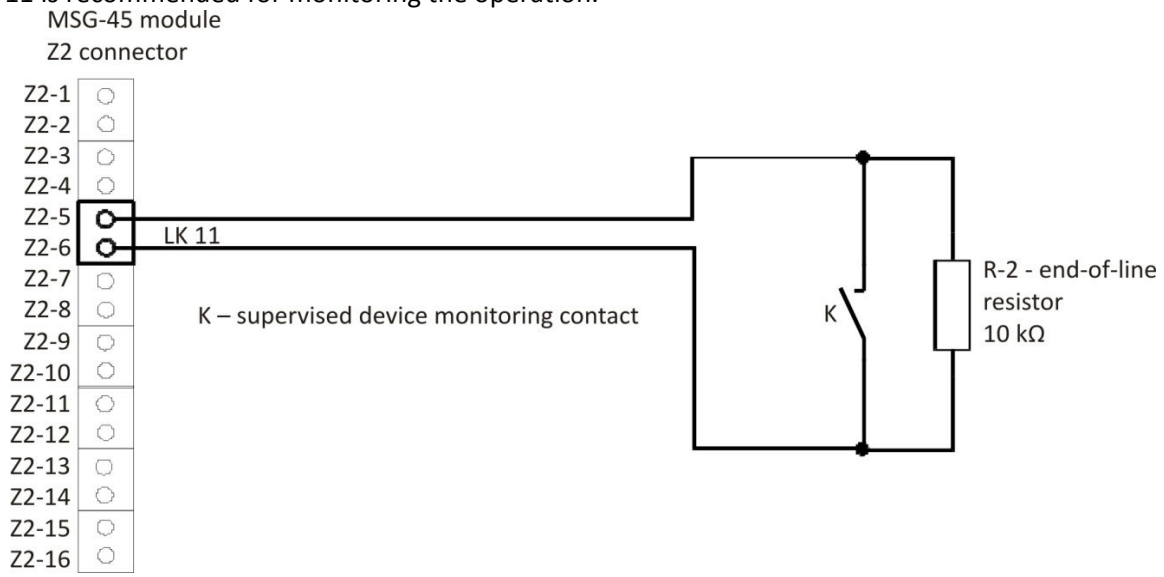

Fig. 9.12 Monitoring line circuit to perform UNIVERSAL MONITORING INPUT function

9.4 RELAY OUTPUTS

9.4.1 Relay outputs general description

The MSG-45 module is equipped with the following outputs:

- seven PK1 ÷ PK7 potential relay outputs (24 V) supervised for short circuits or breaks in the connected line;
- nine PK8 ÷ PK16 non-potential relay outputs with a possibility to monitor the relay contacts and the continuity of the connected circuit.

Potential outputs are used to control external devices. A relay actuation results in supplying the internal 24 V voltage from the control panel power adaptor to an output. When the contacts are in normal position (relay is switched off), the relay output mode is analysed on the basis of the resistance measurement for the connected circuit in order to detect a line fault. The circuit resistance is measured by means of the auxiliary 5 V voltage of reversed polarisation in relation to the + 24 V control voltage.

Three line resistance ranges defining the condition of the lines connected to the relay outputs are established:

- 0 ÷ 200 Ω – fault mode (line short circuit);
- 3.3 Ω ÷ 16 kΩ – normal mode (detection);
- over 30 kΩ – fault mode (line break).

In lines connected to PK1 ÷ PK7 outputs, the quiescent mode is ensured when the line is loaded with a 10 kΩ end-of-line resistor.
When a relay is ON and supplies 24 V voltage, the monitoring line is not supervised.
PK1 ÷ PK3 outputs may be loaded with current up to 2 A (the other outputs – up to 0.6 A).

The lines connected to these outputs should have resistance not exceeding 2 x 50 Ω and insulation resistance between conductors equal at least to 100 kΩ. While designing a line, voltage drops on cable resistance occurring at the maximum load must be taken into account.
Non-potential outputs provide switchable contacts for 3 A / 30 V relays which are galvanically isolated from other control panel circuits. They may be used to monitor the control panel or other equipment operation modes, or perform control functions.
The non-potential outputs are equipped with a galvanically isolated system monitoring the contacts and continuity of the connected circuit by means of the external device voltage. The output line will be correctly supervised if, in a quiescent mode, the controlled device is supplied with 6...30 V voltage and a proper output monitoring bridge will be installed in position 2-3 = “YES” (see Fig. 9.16).

The relay output line is supervised if, during the relay programming process, the line continuity monitoring is configured.

Note:

1. The line continuity monitoring system consumes less than 1 mA of current from an external device, which may cause its slight load. If no current may be drawn from the device, the line continuity monitoring system must be disabled within the software (no output monitoring) and hardware (output monitoring jumper in 1-2 = ”NO” position).

2. The potential and non-potential output continuity monitoring functions may be individually turned ON or OFF for each output by means of the programming functions available in the control panel menu.

9.4.2 Relay outputs functions general description

Most indicators may be programmed by assigning them different **fP** functions as necessary (see Table 9.4). The number of functions which may be assigned to some relays is limited (in order to eliminate possible mistakes). See Table 9.5 for relay programming options.
See Table 9.6 for the criterion of relays actuation depending on the programmed function and time parameters.
See Table 9.7 for the default settings for the MSG-45 module after the standard configuration procedure is completed.

Table 9.4 MSG-45 module relays functions

fP Function No.	Function Name
0	INACTIVE RELAY
1	ELECTROVALVE 1
2	ELECTROVALVE 2
3	ELECTROVALVE 3
4	ACTUATION SIGNALLING CONTROL
5	EVACUATION SIGNALLING CONTROL
6	WARNING SIGNALLING CONTROL
7	2ND STAGE ALARMU MODE SIGNALLING (EXTINGUISHING ZONE)
8	1ST STAGE ALARMU MODE SIGNALLING (EXTINGUISHING ZONE)
9	(ONLY) MANUAL CONTROL SIGNALLING
10	NON-ELECTRIC BLOCKADE SIGNALLING
11	EXTINGUISHING BLOCKADE SIGNALLING
12	EXTINGUISHING STOP MODE SIGNALLING
13	EXTINGUISHING START MODE SIGNALLING
14	DISCHARGE MODE SIGNALLING
15	SEALING
16	COMMON ELECTROVALVE

Explanation of the fP function operation
0 – assigning the "0" function results in excluding a relay from the configuration.

1, 2 – ELECTRO-VALVE 1, ELECTROVALVE 2 functions assigned to relays used to control the fire extinguishing agent discharge. The triggering impulse duration time for function 1 and 2 is set independently.

3 – ELECTRO-VALVE 3 function is reserved to control the electro-valve supporting a "reserve ". The relay to which this function is assigned will be actuated only when the "normal discharge" process is actuated and the "reserve start" push button is pressed to initiate additional discharge.

4 – the relay for which this function is programmed sends an intermittent signal from the moment in which the alarm that initiates the fire extinguishing procedure is generated to the moment in which the control panel alarming mode is reset.

5 – operation similar to function 4 but the intermittent signal switches into a constant signal after the fire extinguishing is discharged.

6 – the relay for which this function is programmed sends an intermittent signal from the moment at which the fire extinguishing agent is discharged to the moment at which the control panel alarming mode is reset.

7 – the relay, to which function 7 is assigned, is ON from the moment at which a 2^{nd} stage alarm in the fire extinguishing zone is generated (2^{nd} stage alarming mode in the manual control mode does not initiate the automatic fire extinguishing procedure when detectors or signals from the external alarm output are the sources of an alarm) to the moment at which the alarming mode is reset.
8 – the relay, to which function 8 is assigned, is ON from the moment at which a 1^{st} stage alarm in the fire extinguishing zone is generated (actuation of one detector or one group of detectors assigned to a given fire extinguishing zone) to the moment at which the alarming mode is reset.
9 – the relay, to which function 9 is assigned, is used to transmit information regarding actuation of the manual control mode (automatic mode blocking).
10 – the relay, to which function 10 is assigned, is used to transmit information regarding actuation of the non-electrical blockade (the source of information is a signal received by the input monitoring line to which the fK = 9 function is assigned).
11 – the relay, to which function 11 is assigned, is used to transmit information regarding actuation of the fire extinguishing blockade (pressing the EXTINGUISHING BLOCKADE push button).
12 – the relay, to which function 11 is assigned, is used to transmit information regarding stopping the fire extinguishing procedure (pressing the EXTINGUISHING STOP push button during the delay time countdown before the discharge).
13 – the relay, to which function 13 is assigned, is used to transmit information regarding actuation of the fire extinguishing procedure (ON from the moment at which the countdown delay before the discharge is initiated to the moment at which the alarming mode is reset).
14 – the relay, to which function 14 is assigned, at is used to transmit information regarding the occurrence of the fire extinguishing agent discharge conditions (turned ON at the moment in which the discharged is initiated and turned OFF at the moment in which he alarming mode is reset).
15 – the relay, to which function 15 is assigned, is used to transmit a signal activating the devices sealing a room in order to maintain the assumed fire extinguishing agent concentration (the relay switches the contacts after the counting down the programmed delay time initiated at the moment in which the discharge started).
16 – the function is used in the multi-zone configuration (with more than one MSG-45 configuration) and together with a common fire extinguishing agent tank. The COMMON ELECTRO-VALVE function is used to open the cylinder valve immediately after the signal for actuating a directional valve in a given fire extinguishing zone is emitted. Directional valves should be controlled by relays to which ELECTRO-VALVE 1 and ELECTRO-VALVE 2 functions are assigned. Their actuation is the condition for actuating the COMMON ELECTRO-VALVE function. The relay to which the COMMON ELECTRO-VALVE function is assigned may be located in any MSG-45 module.

Table 9.5 MSG-45 module relay –programming possibilities

PK No.	Functions numbers and names recommended for relay outputs assignments	Function number choice range in programming	fP function default number *	Remarks
PK1	**1 ELECTROVALVE 1**	**1**, 2	**1**	PK1 ÷ PK7 – potential relay outputs 24 V/ -5 V supervised quiescent mode - 3,3 kΩ ÷ 13 kΩ short circuit - < 200 Ω break - > 30 kΩ
PK2	2 ELECTROVALVE 2	0, 1, 2, 16	0	
PK3	3 ELECTROVALVE 3	0, 3, 16	0	
PK4	**4 ACTUATION SIGNALLING CONTROL**	0, 4 ÷ 15	**4**	
PK5	**5 EVACUATION SIGNALLING CONTROL**	0, 4 ÷ 15	**5**	
PK6	**6 WARNING SIGNALLING CONTROL**	0, 4 ÷ 15	**6**	
PK7	7 2ND STAGE ALARM STATE SIGNALLING (EXTINGUISHING ZONE)	0, 4 ÷ 15	0	
PK8	8 1ST STAGE ALARM STATE SIGNALLING (EXTINGUISHING ZONE)	0, 4 ÷ 15	0	PK8 ÷ PK16 – non-potential relay outputs galvanically isolated supervised: voltage range in quiescent mode to monitor circuit continuity 6 V ÷ 30 V
PK9	9 (ONLY) MANUAL CONTROL SIGNALLING	0, 4 ÷ 15	0	
PK10	10 NON-ELECTRIC BLOCKADE SIGNALLING	0, 4 ÷ 15	0	
PK11	11 EXTINGUISHING BLOCKADE SIGNALLING	0, 4 ÷ 15	0	
PK12	12 EXTINGUISHING STOP STATE SIGNALLING	0, 4 ÷ 15	0	
PK13	13 EXTINGUISHING START STATE SIGNALLING	0, 4 ÷ 15	0	
PK14	14 DISCHARGE STATE SIGNALLING	0, 4 ÷ 15	0	
PK15	15 SEALING	0, 4 ÷ 15	0	
PK16	1 ELECTROVALVE 1	0 ÷ 16	0	

*default function numbers are the numbers of functions assigned to monitoring lines after factory programming or standard configuration loading

Table 9.6 Relay functions actuation criterion and time parameters

fP Function	**Time parameters**	***Actuation criterion***
1 ELECTROVALVE 1	” **Pk ELECTROVALVE 1 Activ. Time”** Impulse t1 = 0...30 min.	EXTINGUISHING START function actuation and **EXTINGUISHING delay time (0..60 s)**elapse
2 ELECTROVALVE 2	” **Pk ELECTROVALVE 2 Activ. Time”** Impulse t2 = 0...30 min.	EXTINGUISHING START function actuation and **EXTINGUISHING delay time (0..60 s)**elapse
3 ELECTROVALVE 3	”**Pk ELECTROVALVE 3 Activ. Time”** Impulse t3 = 0...30 min.	RESERVE START function actuation under condition the control panel is in discharge mode
4 ACTUATION SIGNALLINIG CONTROL	Interrupted impulses, Impulse duration time/break time 1s/1s, until alarm reset	EXTINGUISHING START function actuation
5 EVACUATION SIGNALLINIG CONTROL	Interrupted impulses, Impulse duration time/break time 1 s/1 s, after E.A. release steady sound, until alarm reset	EXTINGUISHING START function actuation
6 WARNING SIGNALLINIG CONTROL	Interrupted impulses, Impulse duration time/break time 1 s/1 s, until alarm reset	E.A. release
7 2ND STAGE ALARM MODE SIGNALLINIG	Steady sound until alarm reset	2nd stage alarm in extinguishing zone
8 1ST STAGE ALARM MODE SIGNALLINIG (EXTINGUISHING ZONES)	PK actuation until alarm reset	1st stage alarm in extinguishing zone
9 (ONLY) MANUAL CONTROL SIGNALLINIG	PK actuation when function is active	Switching over into manual control
10 NON-ELECTRIC BLOCKADE SIGNALLINIG	PK actuation during when blockade is active	NON-ELECTRIC BLOCKADE function actuation
11 EXTINGUISHING BLOCKADE SIGNALLINIG	PK actuation during when blockade is active	EXTINGUISHING BLOCKADE function actuation
12 „EXTINGUISHING STOP” MODE SIGNALLINIG	PK actuation during when extinguishing is suspended (i.e. during EXTINGUISHING STOP push button pressing	Function actuation with EXTINGUISHING STOP push button
13 „EXTINGUISHING START” MODE SIGNALLINIG	PK actuation from function activation until alarm reset	EXTINGUISHING START function manual or automatic actuation
14 DISCHARGE MODE SIGNALLINIG	PK actuation from function activation until alarm reset	E.A. DISCHARGE signal occurrence

fP Function	Time parameters	*Actuation criterion*
15 SEALING	SEALING ”Delay time” Programmable time t4 = 0...120 s counted from E.A. discharge moment , PK actuation from t4 time countdown until alarm reset	t4 time countdown
16 COMMON ELECTROVALVE	”Pk COMMON ELECTROVALVE activation time” Programmable impulse t4 = 0...30 min.	EXTINGUISHING START function actuation and ELECTROVALVE1 or ELECTROVALVE2 relay switch on, in at least one (any) extinguishing zone

Table 9.7 Default settings of relays, monitoring lines and time parameters after standard configuration loading

Declared relays numbers	**Relays assigned functions – fP**
PK1	ELECTROVALVE 1
PK4	ACTUATION SIGNALLING CONTROL
PK5	EVACUATION SIGNALLING CONTROL
PK6	WARNING SIGNALLING CONTROL
Declared monitoring lines numbers	**Monitoring lines functions names – fK**
1	EXTINGUISHING START
3	EXTINGUISHING STOP
5	(ONLY) MANUAL CONTROL
Time parameters	
PK „ELECTROVALVE 1” activation time	5 s
PK „ELECTROVALVE 2” activation time	5 s
PK „ELECTROVALVE 3” activation time	5 s
SEALING delay time	10 s
RESET disablement time	0 s
EXTINGUISHING delay time	60 s
PK „COMMON ELECTROVALVE” activation time	5 s

See Fig. 9.13 for exemplary connection of the PK1 relay output (performing the fP1 function) used to control an electro-valve or other device triggering the fire extinguishing agent discharge during the automatic fire extinguishing procedure. The connection diagram for PK2 and PK3 outputs is analogous.

In order to separate the measurement voltage - 5 V from the supply voltage + 24 V, electro-valves should be installed in the line through a serially connected rectifying diode of applicable power in relation to the load.

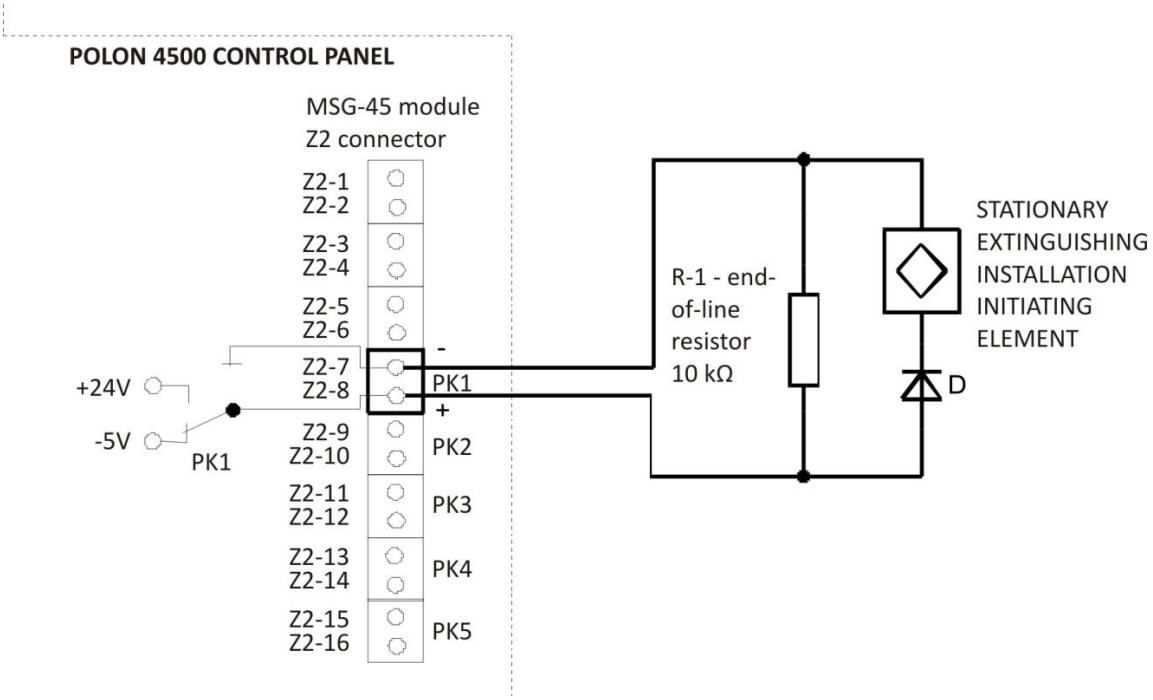

Fig. 9.13 PK1 relay output exemplary connection

See Fig. 9.14 and 9.15 for exemplary connections of the PK4 and PK5 relay outputs used to control fire alarming devices, e.g. acoustic signalling devices or warning diodes. The connection diagram for PK6 and PK7 outputs is analogous.

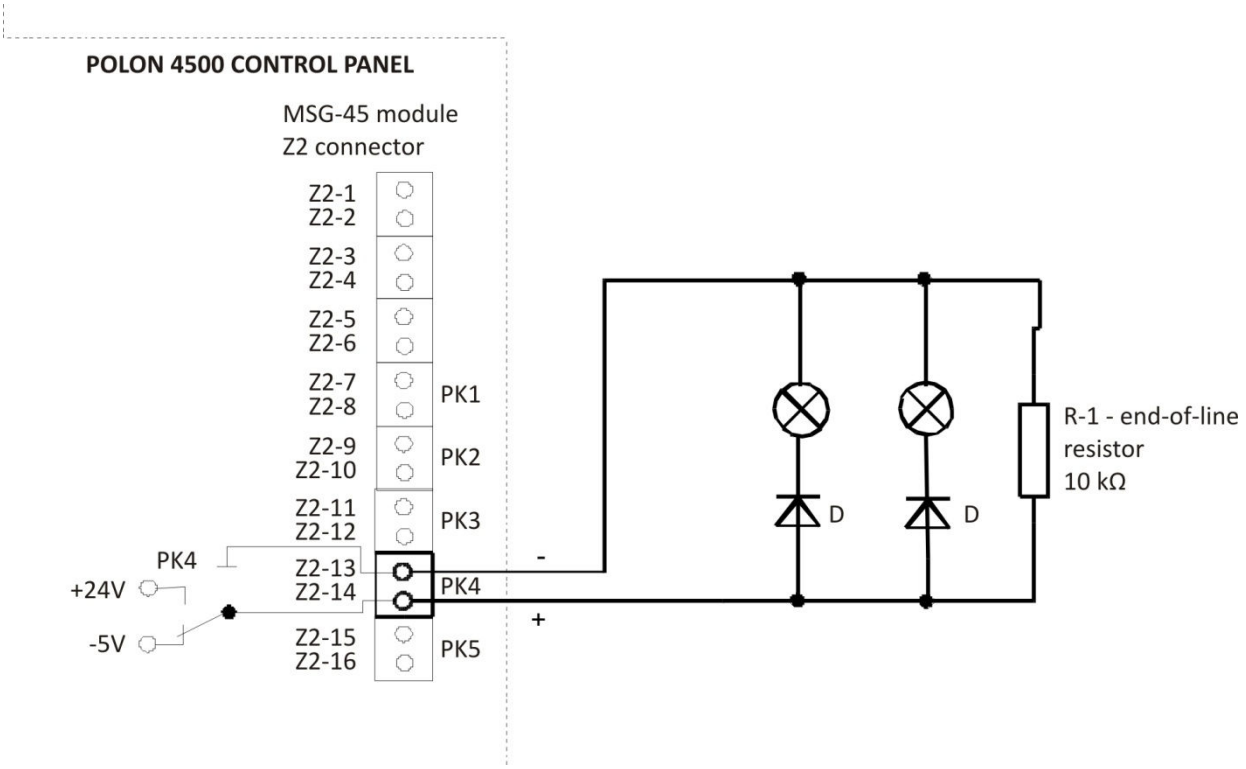

Fig. 9.14 Potential output exemplary connection

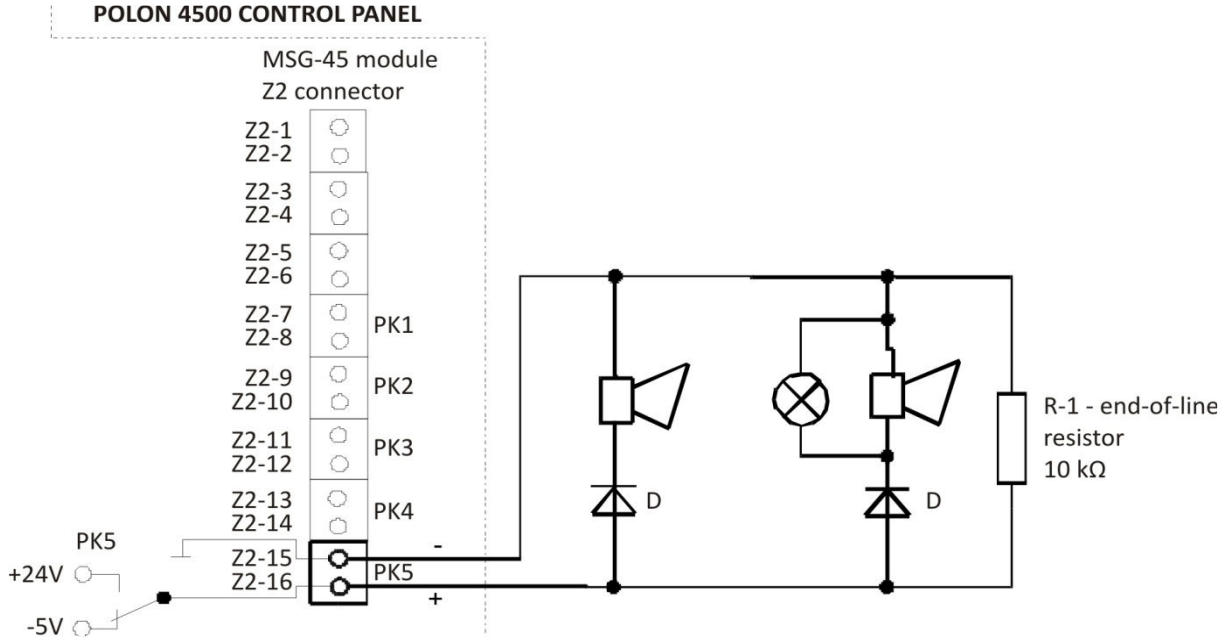

Fig. 9.15 Potential output exemplary connection

In order to separate the measurement voltage - 5 V from the supply voltage + 24 V, signalling devices should be installed in the line through a serially connected rectifying diode of applicable power in relation to the load.

See Fig. 9.16 for exemplary connections of the PK13 non-potential relay outputs used to control ventilation and process equipment.

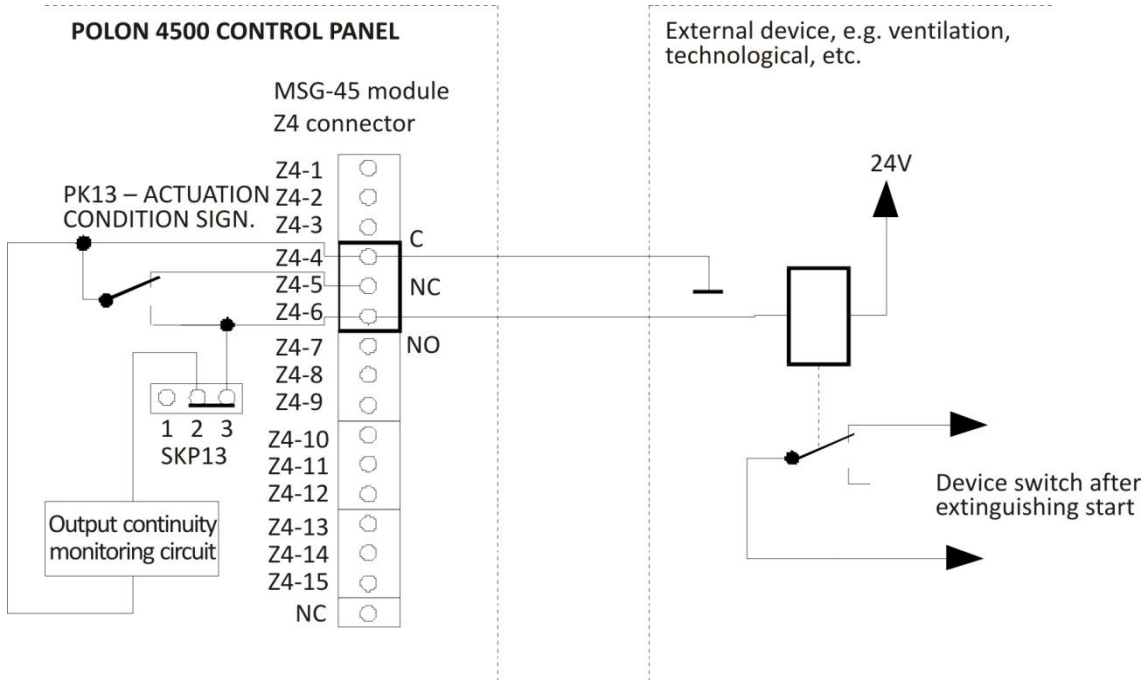

Fig. 9.16 Non-potential output exemplary connection

See below for exemplary time runs in the alarming mode with automatic fire extinguishing procedure implementation which present the occurrence of control panel output modes.

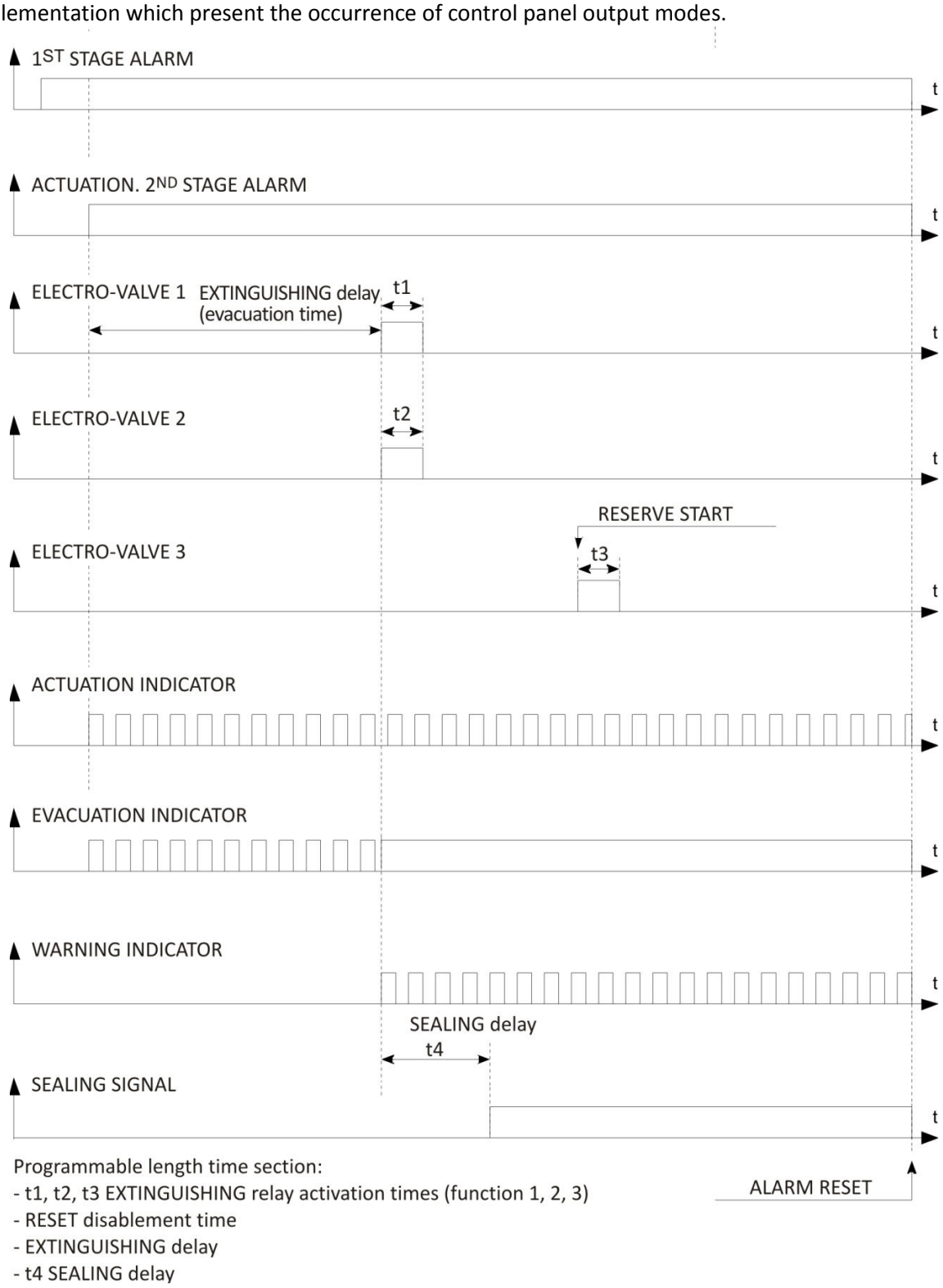

Fig. 9.17 Exemplary time runs in alarming mode with automatic fire extinguishing procedure implementation

10 CONTROL PANEL NETWORK OPERATION

The POLON 4000 system control panels may be connected with one another by means of a double pair of wires (or a pair of optical fibre cables) in a form of a ring in order to create a network of control panels. The double ring of connections among control panels prevents from the network system fault in case any transmission path is faulty (redundancy).
Up to 31 control panels equipped with the MSI-48 module may operate in a network. All units should be equipped with identical software versions. Each control panel should have an individually programmed number from the 1 ÷31 range (local control panel number) and the numbers must not repeat. A control panel number is declared within software and additionally set within hardware on the MSI-48 module keys. The compliance between the declaration and hardware setting is checked. The number set within hardware is used by the MSI-48 module in case the I2C connectivity with the PSC-46 module is interrupted. A standalone control panel (outside the network) must be programmed as No. 0 (the MSI-48 must be disconnected and not declared). The network should include a control panel programmed with no. 1 – MASTER. The MASTER control panel makes it possible to program the system configuration, i.e. the set of numbers of control panels belonging to the network elements, i.e. SLAVE control panels. The MASTER panel transmits the system configuration to the SLAVE panels and monitors the network. In the event of the MASTER control panel fault, the next control panel in the sequence takes its role over.

Every network control panel makes it possible to declare a group of control panels which co-operate with it in order to create this control panel common detection zone. The network control panel, in which other (remote) panels are declared for co-operation, works as a collective control panel.
This function is not symmetrical, i.e. if control panel B is within the common detection area of control panel A, control panel A is not required to be included in the common detection area of control panel B. In particular, this function allows creating zones in which the differentiated control panel enables to collect fire and fault signals from several control panels without reciprocity or with full reciprocity. The network logical configuration diagram is shown in Fig. 10.1.

In special cases, the collective control panel may serve as a local control panel if no remote panel has been declared to co-operate with it.

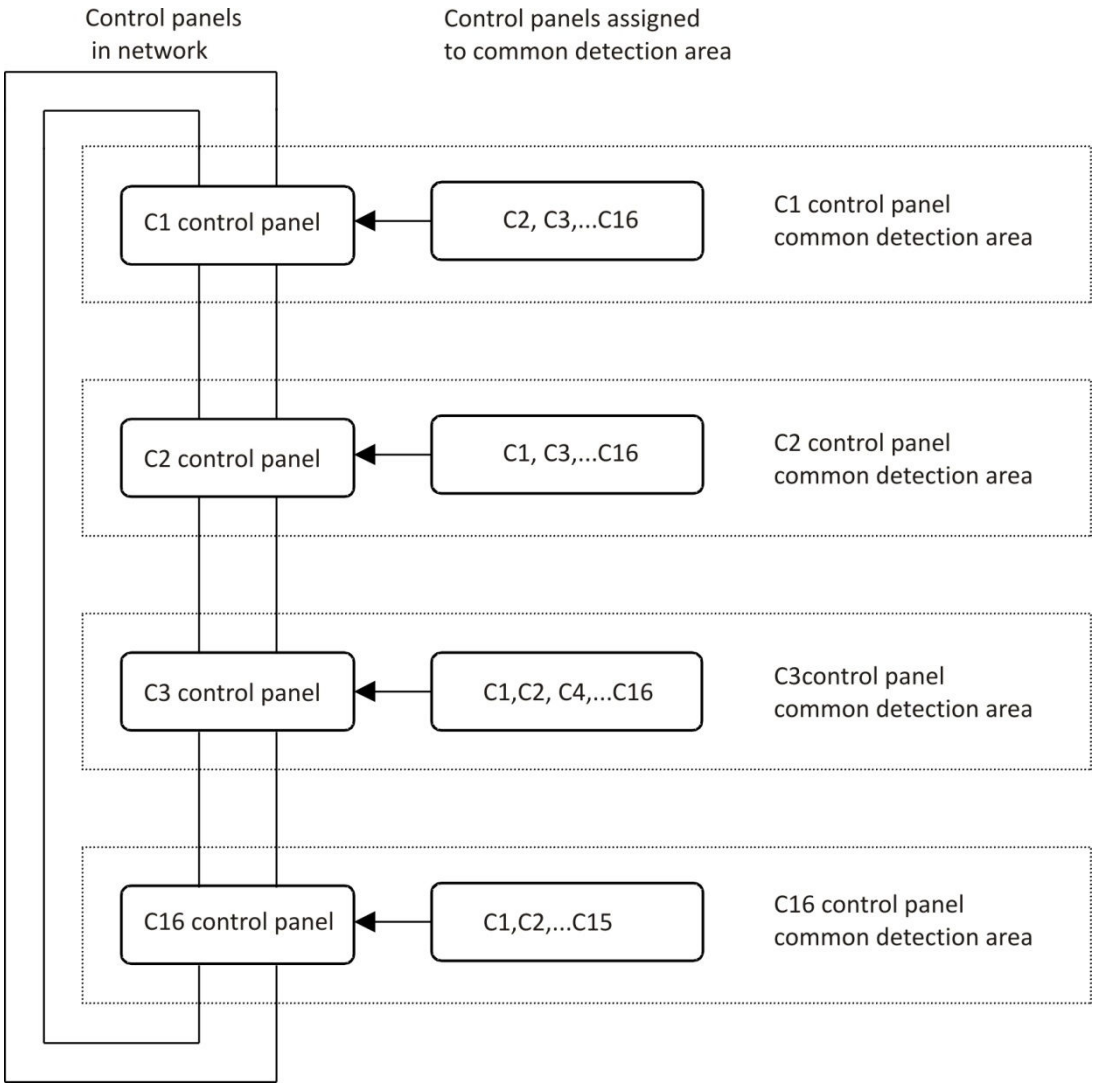

Fig. 10.1 General diagram of network control panels logical configuration

10.1 MSI-48 NETWORK MODULE

The optional MSI-48 and MSI-48 Ed.3 network module makes it possible to connect control panels within a network by means of RS-422 serial interfaces (bitrate 19,200 bps). Every module operates as an amplifier enabling the ring's total length to be extended. In case the module is faulty or cut off from power supply, it is disconnected from the ring (by means of hardware) and other control panels (participants to the network) may operate without interruptions.

The module is supplied with separated 5 V or 24 V (Ed.3) voltage generated on the MIK-48 interfaces module. If the module is purchased individually, it must be installed on the left side of the control panel, above the MIK-48 module. Next, the MIK-48 module output terminals marked as + 5 V – (Z2 connection) or + 24 V – (Ed.3) (Z3 connection) must be connected with + 5 V – or + 24 V – (Ed.3) (ZL5 connection) input terminals of the MSI-48 module. Then, the middle pin of the 26-core strip cable connecting the PSC-46 with the MIK-48 must be inserted in the ZL6 socket marked as "TO PSC-46”.

The MSI-48 module is equipped with an 8-position switch containing keys K1...K8.
Keys K1...K5 are used to assign (by means of hardware) a number to a control panel using the binary code. Each of these five keys has significance (Wn) defined by its number.

The control panel number may be expressed by means of the following formula:

CONTROL PANEL NO. = W1*1 + W2*2 + W3*4 + W4*8 + W5*16
where:
Wn=0, if Kn key is in OFF position
Wn=1, if Kn key is in ON position
E.g. control panel numbered as 9 has the following keys settings:
K1 - ON
K2 - OFF
K3 - OFF
K4 - ON
K5 – OFF
CONTROL PANEL NO. = 1*1 + 0*2 + 0*4 + 1*8 + 0*16 = 9
Keys K6, K7, K8 currently are not used.
The MSI-48 module is equipped with ZW1 ÷ ZW4 or ZW1 ÷ ZW6 (Ed.3) programming jumpers which should be set in the position shown in Fig. 10.2.
Additionally, the module is equipped with 8 service diodes (D1 ÷ D8) which may be tuned off by setting the ZW5 or ZW8 (Ed.3) in position 2-3, which results in decreasing the total current consumption of the module.

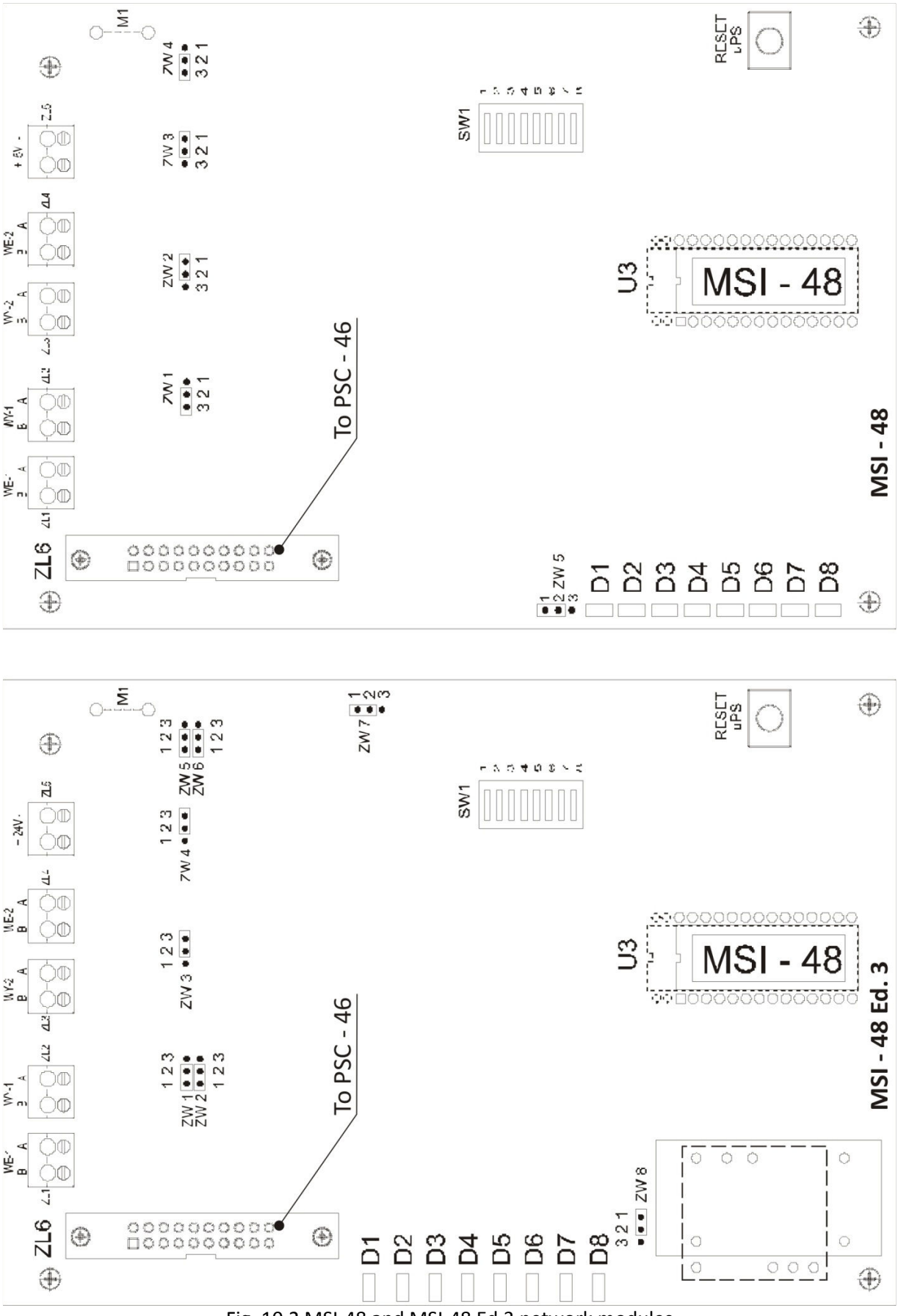

Fig. 10.2 MSI-48 and MSI-48 Ed.3 network modules

There are two methods of interconnecting the control panels:

- in a form of a double ring created by means of two independent pairs of wires in a screen;
- in a form of a double ring created by a pair of optical fibre cables.

In case the control panels are connected by means of wires, the first ring is created by connecting a pair of wires to applicable output terminals A and B (OUT-1) in one control panel with applicable input terminals A and B (IN-1) in the other control panel (terminal is connected with terminal A and terminal B is connected with terminal B). By analogy, applicable terminals A and B (OUT-2) of one control panel must be connected with terminals A and B (IN-2) of the other control panel in order to create the second ring. An example of connecting four control panels by means of a double ring of wires is shown in Fig. 10.3. In order to connect control panels, a copper twisted pair must be used (screening attenuation not exceeding 3 dB/km). The maximum cable length between two control panels must not exceed 1,200 m. It is recommended to use the YnTKSYekw. 1 x 2 x 0.8 mm installation cable.

The screen of each cable section should be grounded only from one side and the other end should be connected (via 10 nF/1500 V capacitor) to the grounding system of a remote control panel (in order to ensure better resistance to interference – see Fig. 10.3). Both rings should be created independently, i.e. wire pairs should not be routed in the same cable in order to provide their resistance to interference and possible cable damage.

In case control panels are connected by means of optical fibre cables, each unit should be equipped with two optical fibre converters of the following types:
- TR-43.7.1 for 62.5/125 µm or 50/125 µm multi-mode optical fibre cables (850 nm wave) terminated with ST® type contacts. This connection makes it possible to ensure (depending on the attenuation) the distance between two neighbouring control panels in the ring equal to approx. 3 km.
- TR-43.7.2 for 9/125 µm single-mode optical fibre cables (1,300 nm wave) terminated with FC type contacts. This connection makes it possible to ensure (depending on the attenuation) the distance between two neighbouring control panels in the ring equal to approx. 12 km.

Each converter has a special latch for fast installation on a typical supporting rail (DIN EN 50022) under the upper wall of the control panel. Converters should be supplied with + 24 V voltage which can be routed from the MZ-48 module or MIK-48 module output terminal blocks. If the converters are supplied from the control panel voltage and the MSI-48 Ed.3 module, the ZW7 jumper should be switched into position 2-3. The diagram showing connections between the converters and the MSI-48 module and further between control panels by means of optical fibre cables is presented in Fig. 10.4.

Note:
When control panels are connected by means of optical fibre cables, it is recommended to provide power supply for the optical fibre converters from an external power adaptor (independent from the control panel voltage) of the following parameters: output U 10 ÷ 40 V, output I min. 200 mA, insulation strength min. 1000 V DC. If, for maintenance purposes, the control panels in which optical fibre converters are supplied by external voltage are disconnected, the rings connecting the units are not discontinued (for power supply provided for converters supplied with the control panel voltage, dis-actuation of a control panel results in discontinuity of both rings connecting the control panels but one break in the rings does not influence the continuity of transmission between control panels). It is advisable that the power adaptor is fitted with a latch (similarly to the optical fibre converter) to install it on the rail shared with converters.

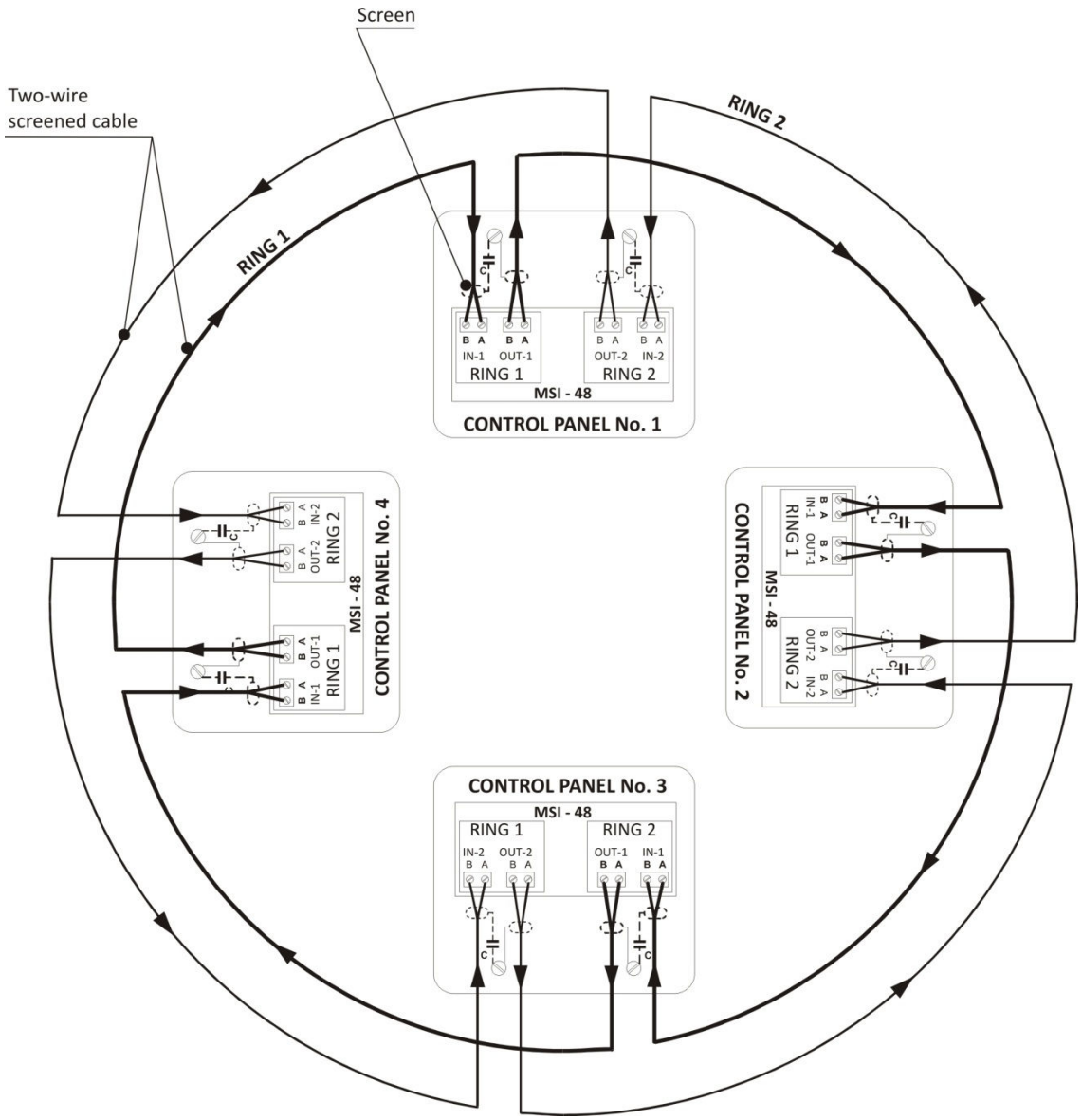

Fig. 10.3 Four control panels network connection with two pairs of cables

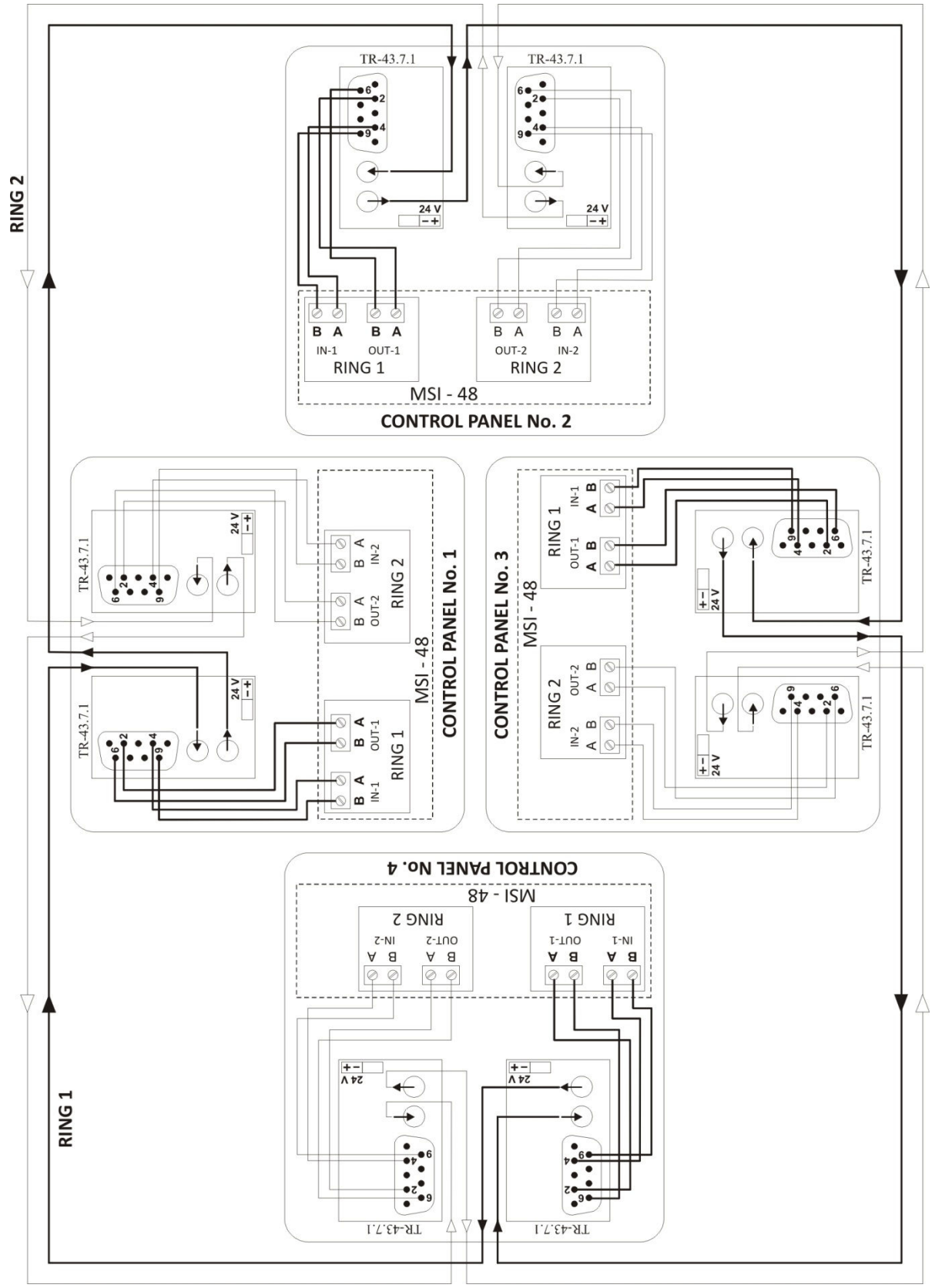

Fig. 10.4 Four control panels network connection with a pair of optical fibres (ST type contact)

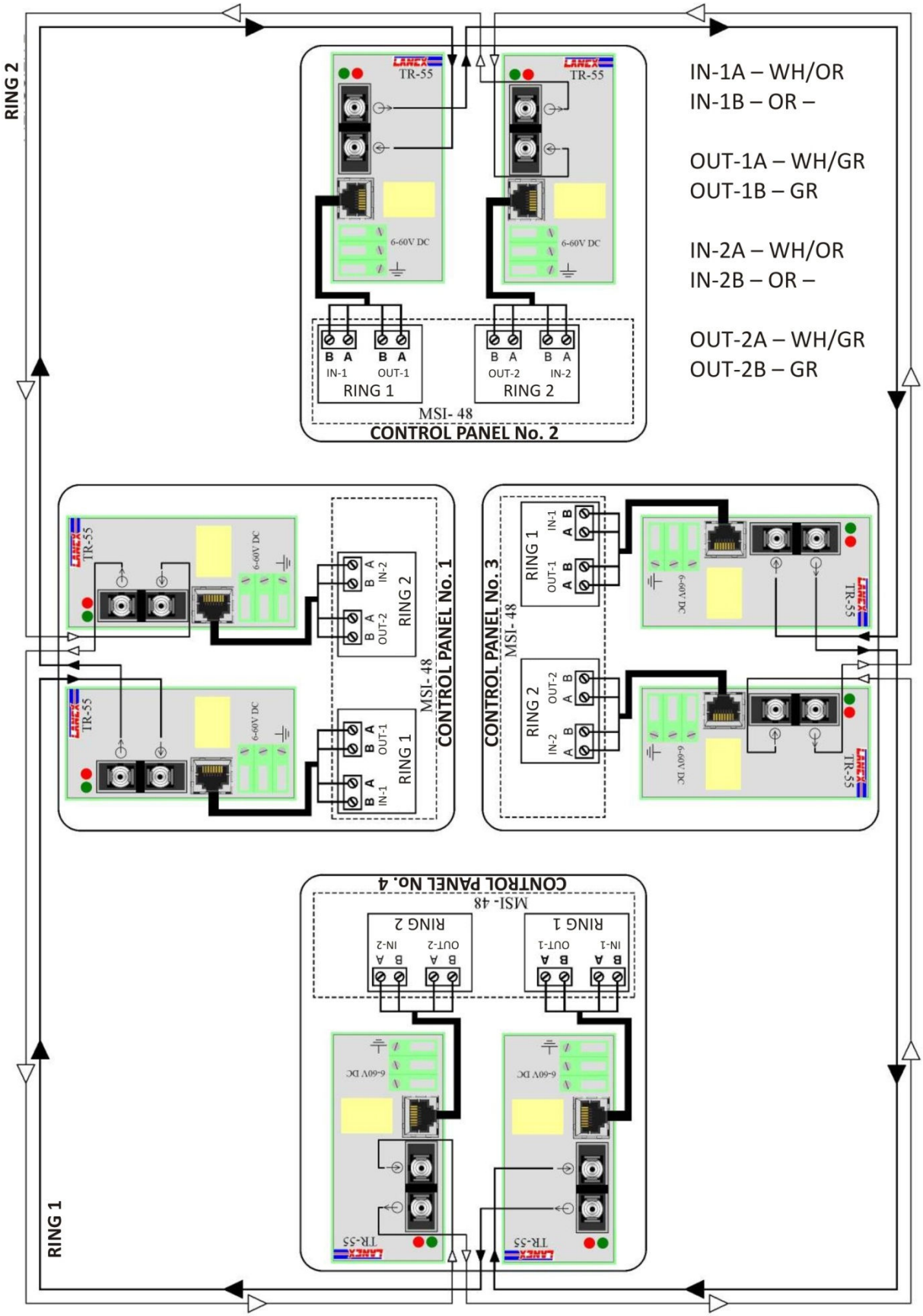

Fig. 10.5 Four control panels network connection with two pairs of optical fibres (SC/PC type contact)

10.2 NETWORK PANEL FUNCTIONALITY

The console of a control panel operating in the network may work in three display and access modes:

- **local mode** – when a control panel with a local number is selected;
- **collective (group) mode** – when a control panel with number 0 is selected;
- **remote mode** – when a control panel with a different number is selected (it should exist in the network).

Display and access modes may be changed at any moment by direct selection of a control panel number and its confirmation with the Enter key or in the configuration menu.
The basic display mode for a control panel operating in the network is the collective mode.

10.2.1 Local mode

In the local mode (when the local control panel number is selected) the local control panel mode is displayed. All readout and configuration functions relate to the control panel in which these actions are taken. Signalling diodes and the acoustic signalling device indicate the internal mode of a local control panel.
In order to select the local ("our") control panel, the access to its network number must be selected. Then, the control panel shows (by means of its indicators) only the condition of this local control panel (local detection area condition).

10.2.2 Collective mode

The collective mode is the basic mode for control panel operation in a network. In case the fire is detected in the common detection area, the control panel automatically switches into the collective operation mode.
In order to select the collective mode, the control panel No. 0 must be selected, which means that the control panel indicators will display the condition of the common detection area for the control panel.
If no other control panels are assigned to the control panel (single control panel local detection area), the indications for the local and common detection areas are identical.

Within the common detection area (when the control panel no. 0 [collective] is selected), the indicators operate as follows:

- FIRE indicator – global fire mode for the control panels of the common detection area;
- ALARM indicator – global fire mode for the control panels of the common detection area; the push button enables display of all alarming zones of the common detection area with control panels numbers given;
- FAULT indicator – global fault mode for the control panels of the common detection area; the push button enables display of all control panel faults and general information regarding the fault occurrence in co-operating control panels. Similarly to alarms, non-maskable faults can be viewed in detail within the entire common detection area. In order to view the faults within the remote control panel in detail, it is necessary to select the remote control panel and view its faults.
- DISABLEMENT indicator – global disablement mode for the control panels of the common detection area; the push button enables display of all control panel disablements and general information regarding the disablement occurrences in the control panels within the common detection area. In order to view the disablements within the remote control panel in detail, select the remote control panel and view its disablements.
- TEST indicator – global testing mode for the control panels of the common detection area; the push button enables display of all control panel tests and general information regarding the test occurrences in the control panels within the common detection area. In order to view the fault

tests within the remote control panel in detail, select the remote control panel and view its tests.
- TECHNICAL ALARM indicator – global technical alarm mode for the control panels of the common detection area; the push button enables display of all control panel technical alarms and general information regarding the technical alarm occurrences in the control panels within the common detection area. In order to view the technical alarms within the remote control panel in detail, select the remote control panel and view its technical alarms.
- ACKNOWLEDGEMENT indicator – global mode of the indicator for the control panels of the common detection area; the push button enables acknowledgement of all events in the control panels within the common detection area.
- RESET indicator – shows the possibility of cancelling a local control panel alarm or locally received alarm from the control panels of the detection area; the push button resets an alarm in the control panels within the common detection area.
- Other indicators, i.e. PERSONNEL ABSENT, DELAYS OFF, POWER SUPPLY, ALARM DEVICES and ALARM TRANSMISSION DEVICES, show the local control panel mode.

In order to view the events in a remote control panel, select this panel and proceed similarly to viewing the events in a local control panel.
In the collective mode, if a remote control panel is declared for co-operation as one of the control panels within the common detection area, even after disabling the remote operation in this control panel, it is still possible to remotely operate the ACKNOWLEDGEMENT and RESET push buttons.
In the collective mode, all programming, disablement, testing and programming review functions relate to the control panel with the local number.

10.2.3 Remote mode

In the remote mode, it is possible to select access to any "remote" control panel (also outside the common detection area) and view its software resources and condition (i.e. faults, disablements, event memory, etc.).
In the remote mode, when the number of a different control panel is selected, the remote control panel mode is displayed on the operator's panel. All readout and configuration functions relate to the remote control panel. In this mode, the real condition of the remote control panel is displayed without displaying the common (collective) condition of a distant control panel. For example, if an alarm from a different control panel within the common detection area is generated in the remote control panel, detection is remotely visible in this control panel since no zones belonging to this control panel is in the alarm mode.

The possibility of changing the condition and modifying the configuration resources in the remote control panel depends on the remote operation option programmed in this panel.
Three levels of remote access to a remote control panel may be programmed in this panel. They correspond to the access levels in a local control panel. The 4^{th} level is remotely forbidden (disabled). The remote access may be disabled (recommended) but it does not mean that the access is fully denied to this control panel as its condition and software resources may still be reviewed.

After selecting a "remote" control panel, the indicators of "our" local control panel show the mode of the indicators installed in the former. The possibility of using the operating push buttons (in order to change its mode) depends on the provided level of "remote operation" in the remote control panel.
Note:
Common detection areas should be created as follows:
- Hierarchical group: among n allocated control panels only one k control panel (collective control panel) has the remaining n-1 control panels declared to the common detection area.

The general diagram of a hierarchical group is as follows:

C1→Ck, C2→Ck, ... Cn→Ck,

where k is the defined number of the collective control panel.

- Group of equal control panels: among n allocated control panels each k control panel (k = 1, 2, ... n) is defined as a collective control panel for the remaining n-1 control panels to the common detection area.

The general diagram of a group of equal control panels is as follows:

C1→Ck , C2→Ck, ... Cn→Ck,

where k = 1, 2, …. n is a control panel of separated set of n panels.

It is not recommended to create cascade-type network configuration, e.g. for three control panels C1, C2, C3. C1→Ck and C2→Ck.

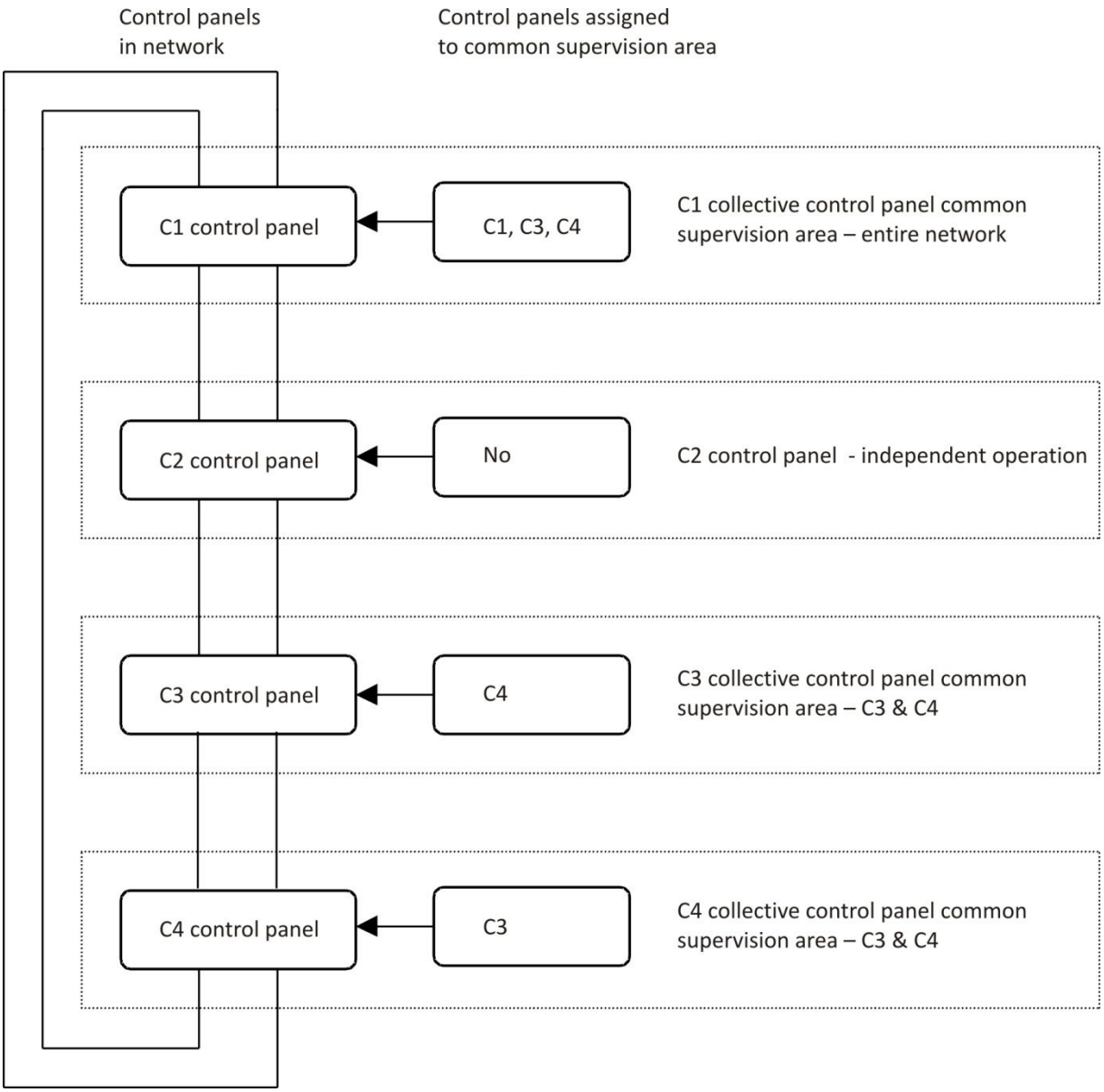

Fig. 10.6 Exemplary layout of four-control-panel network

11 STANDARD CONFIGURATION

The POLON 4500 control panel delivered to a customer has manufacturer's pre-programmed operation modes defined as the standard configuration.
According to the standard configuration, a control panel is programmed as follows:

- the MSL-1 module is declared;
- the MSG-1 module is declared;
- functions of the monitoring lines for the MSG-45 modules are programmed according to Table 9.3;
- functions of the relay outputs for the MSG-45 modules are programmed according to Table 9.5;
- all addressable elements (in the addressable space) have type 0 declared (are not reviewed by the control panel);
- addressable elements are potentially assigned to the zones with numbers compliant with numbers of lines in which they are installed, with the group A programmed;
- controlling, monitoring and signalling (EKS-4001, EWS-4001, SAL-4001) elements are not configured; zones are not assigned (zone matrix empty); no variants;
- all user messages assigned to the EKS-4001, EWK-4001 logical numbers – standard;
- fire extinguishing zones (1 ÷ 4) are assigned with variant 15 (two-stage alarm with coincidence including two fire warning devices), other zones are assigned with variant 2 (two-stage alarm);
- all user messages assigned to zones – standard;
- the PK1 relay (marked as PU) permanently programmed as an output signalling a general fault;
- the PK2 output relay programmed as TYPE 3, variant 1 without delays (actuation in the event of a 1st stage alarm occurrence in the control panel);
- the PK3 output relay programmed as TYPE 2 (monitoring output);
- other relays (PK4 ÷ PK8) and signal lines (LS1 ÷ LS4) programmed as TYPE 0 (inactive);
- the PK relays and LS signal lines potentially without zone interdependence (zone matrix empty);
- all LK monitoring lines programmed with variant 0 (inactive);
- all user messages assigned to monitoring lines - standard;
- the DR-48 printer not declared;
- the T1 time (for ACKNOWLEDGEMENT) set at 30 seconds;
- the T2 time (for hazard recognition) set at 1 minute;
- the T3 time (alarm output actuation delay) set at 0;
- the time of automatic switching between the PERSONNEL PRESENT/PERSONNEL ABSENT operation mode - not programmed;
- factory access code at the 2nd level – 2222;
- factory access code at the 3rd level – 3333;
- factory access code at the 4th level – 3112;
- event memory cleared.

11.1 USER CONFIGURATION PROGRAMMING

In order to adapt the control panel to operation compliant with the installation design, it is necessary to program it individually. The panel must be programmed according to the programming manual (PM) after obtaining the 3rd or 4th access level authorisation. The entered configuration data will also be stored when the total power failure occurs.

Note:
After the control panel is programmed, the configuration data should be immediately sent to a computer (using the configuration program) and saved.

11.2 STANDARD CONFIGURATION/ACCESS CODES LOADING

A user may load the standard control panel settings. The standard configuration may be loaded only if it is necessary to delete the previous configuration data (memory clearing) and create new configuration from the very beginning.

To load the standard configuration, restart the µPC microprocessor on the PSC-46 module with K1 key of the SW1 switch actuated.

To load the factory access codes, RESTART the µPC microprocessor with K3 key of the SW1 switch actuated on the PSC-46 module.

Note:
The standard configuration loading process may take approx. 2 minutes. During this time, "NO CONNECTION WITH µP1" message is displayed on the screen.

12 ACCESS CODES

The POLON 4500 control panel may be operated by four groups of people with different levels of qualifications. The range of possible operations is divided into four levels – see Table 12.1.
Access to individual levels (apart from the 1st level) is authorised after entering an applicable access code. An access code is a number containing from 4 to 8 digits.
The access codes at the 2nd and 3rd level may be changed (via software) after obtaining the 3rd level access.

Table 12.1

Access level	Operator access	Allowable operations
1st *	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 **	2nd level access code	As per 1st level plus alarm RESET, PERSONNEL PRESENT/PERSONNEL ABSENT switching over, disablement, switching over to testing
3rd ***	3rd level access code	As per 2nd level plus control panel configuration except modules and interface output declaration
4th ****	4th level access code	As per 3rd level plus hardware configuration change

* for the control panel direct servicing personnel
** for the direct servicing personnel or the maintenance technician
*** for a person being authorised for program configuration change
**** for the manufacturer and authorised servicing company for hardware configuration change.

Note:
Using the EXTINGUISHING START, EXTINGUISHING STOP, RESERVE START and EXTINGUISHING DISABLEMENT push buttons in the fire extinguishing zones is possible only in conjunction with the PERMISSION push button protected with a sealed casing against unauthorised use.
The above mentioned push buttons may be used without any access code. They execute functions (apart from the PERMISSION push button) identical to their corresponding external push buttons in the fire extinguishing zones.

13 INSTALLATION

13.1 CONTROL PANELS INSTALLATION LOCATION

The POLON 4500 control panels should usually be installed in rooms included in 24-h duty. In case the control panel installation location is not included in 24-h duty, signals from the unit must be transmitted to the locations where the personnel is on constant duty by means of the monitoring system or contacts of the relays for additional signalling.
A control panel must be installed in a visible, easily accessible location, protected against direct sunlight and heat sources.
The ambient temperature must not be lower than 0 ^{o}C and higher than +40 ^{o}C. In rooms with high noise emission, use external acoustic signalling devices controlled with signal lines of relay contacts located on the PPW-45 module.
Control panels are mounted on walls by means of the special supporting frame delivered with the device.
A manual call point should be installed in the vicinity of a control panel (in sight distance).

13.2 POWER SUPPLY CONNECTION

In order to connect the mains power supply cabling to the control panel, use the three terminals located on the mains connection board on the back wall between the AC power adaptor and the PZ-48 power supply module. The power supply cable may be routed to the control panel through a round seal located over the mains connection board. The method of connecting the mains power supply is presented in Fig.

The mains terminals are covered with the insulating cover marked as ~230 V/50 Hz. Wire indications are provided next to applicable terminals. Wires must be connected to proper terminals, according to their purpose. The PE protection wire must be connected directly to the collective grounding terminal above the PZ-48 module on the control panel housing and to the PE terminal of the mains connecting terminal line.
The emergency power supply (batteries) must be connected after the mains power supply is connected.

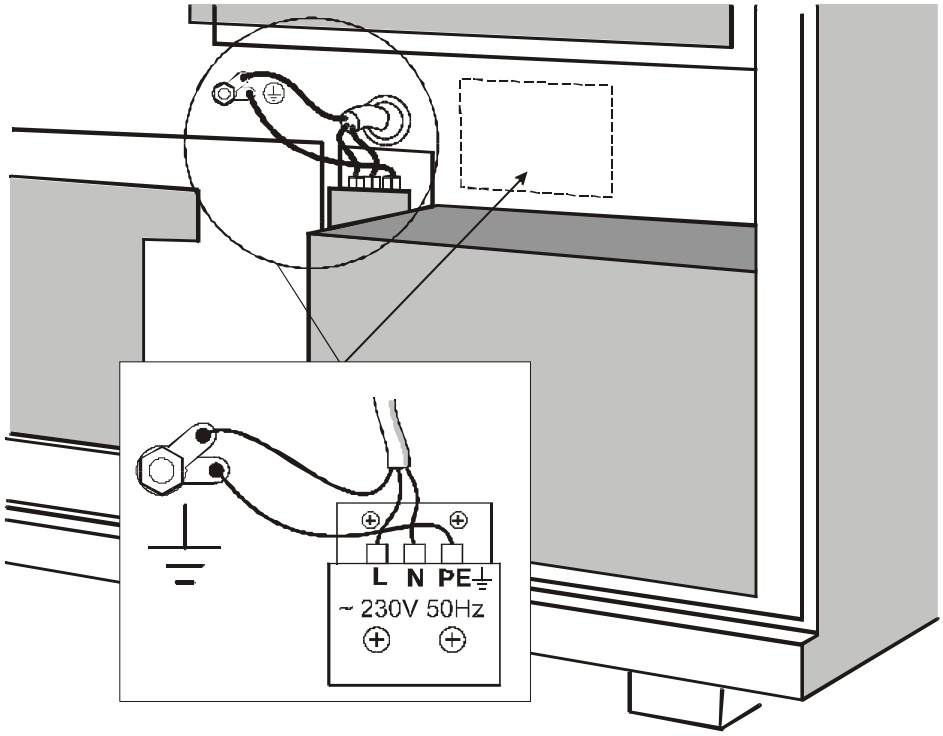

Fig. 13.1 Mains power supply connection method in POLON 4500 control panel

13.3 LINE ELEMENTS INSTALLATION

The detection lines and external signalling circuits cabling is routed to the control panel through the round opening on the control panel back wall.
Before connecting the cabling, analyse the routing method for individual circuits to the output terminal boards of the control panel. pay special attention to the polarisation of detection lines and loops cabling.
Before connecting the detection lines cabling, make sure that the cabling resistance, its capacity and insulation resistance are within permissible limits.
The method of connecting the addressable detection lines elements is shown in Fig. 13.2 and 13.3.

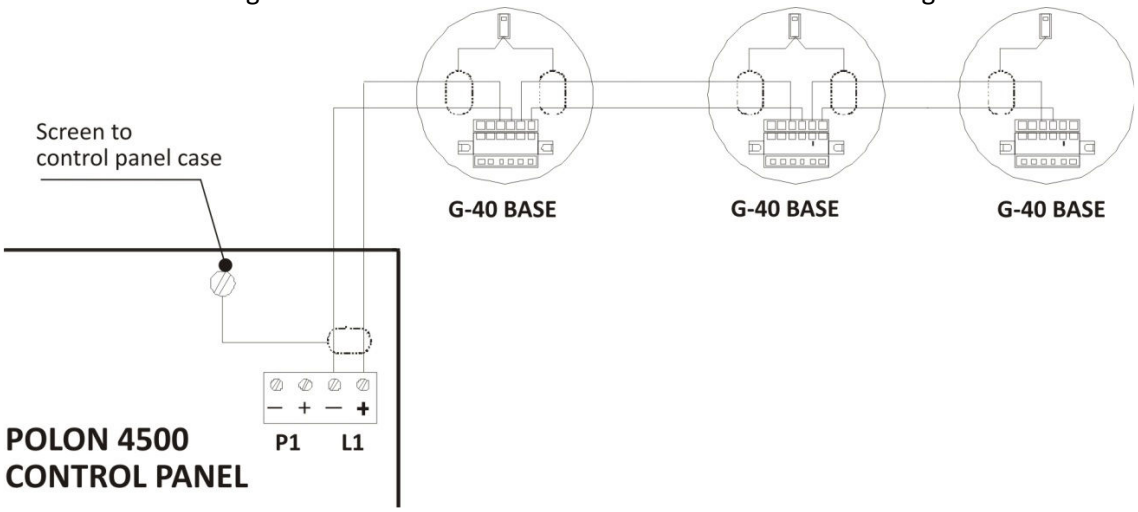

Fig. 13.2 Elements connection way in B type radial detection line

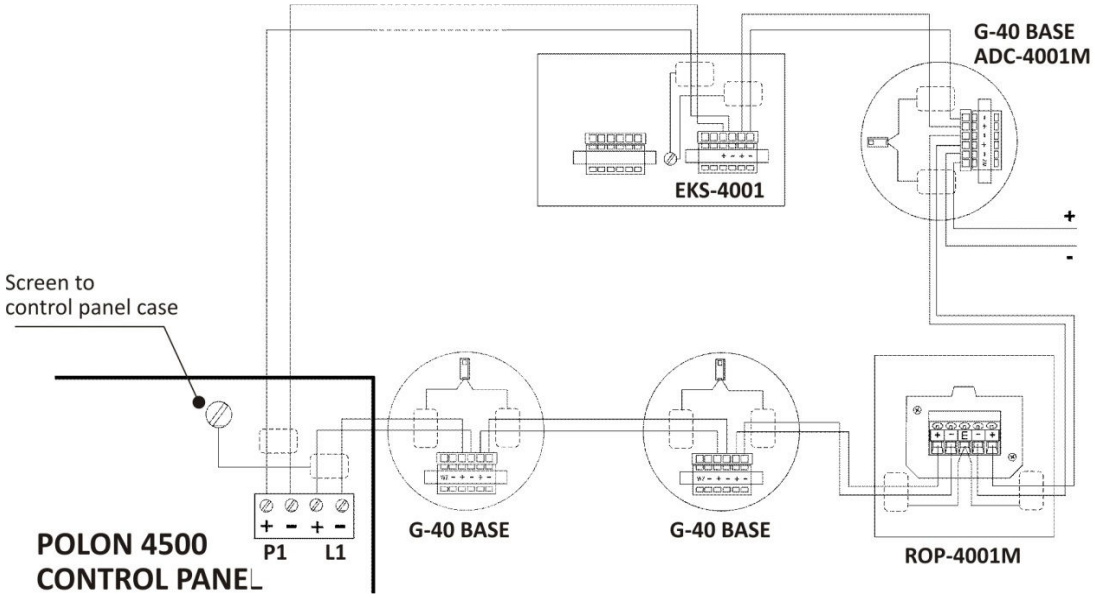

Fig. 13.3 Elements connection way in A type loop-shaped detection line

13.4 CONTROL PANEL INPUTS AND OUTPUTS

Terminal block	Contacts marking	Location	Description
ZL1	– + P1	MSL-1M	Detection line 1 return
ZL2	– + L1	„	Detection line/loop 1 output
ZL3	– + P2	„	Detection line 2 return
ZL4	– + L2	„	Detection line/loop 2 output
ZL5	– + P3	„	Detection line 3 return
ZL6	– + L3	„	Detection line/loop 3 output
ZL7	– + P4	„	Detection line 4 return
ZL8	– + L4	„	Detection line/loop 4 output
Z4	1 C 2 NC 3 NO	PPW-45	Fault signalling PU relay output, in quiescent mode closed C–NO
Z4	4 C 5 NC 6 NO	„	PK2 relay programmable outputs
Z4	7 C 8 NC 9 NO	„	PK3 relay programmable outputs

Terminal block	Contacts marking	Location	Description
Z4	10 C 11 NC 12 NO	„	PK4 relay programmable outputs
Z5	1 C 2 NC 3 NO	„	PK5 relay programmable outputs
Z5	4 C 5 NC 6 NO	„	PK6 relay programmable outputs
Z5	7 C 8 NC 9 NO	„	PK7 relay programmable outputs
Z5	10 C 11 NC 12 NO	„	PK8 relay programmable outputs
Z6	1 – 2 +	„	LK1 monitoring line input
Z6	3 – 4 +	„	LK2 monitoring line input
Z6	5 – 6 +	„	LK3 monitoring line input
Z6	7 – 8 +	„	LK4 monitoring line input
Z7	1 – 2 +	„	LS1 signalling line output (of 1 A load in alarm)
Z7	3 – 4 +	„	LS2 signalling line output (of 0.5 A load in alarm)
Z7	5 – 6 +	„	LS3 signalling line output (of 0.5 A load in alarm)
Z7	7 – 8 +	„	LS4 signalling line output (of 0.5 A load in alarm)
Z1	1 – 2 +	MSG-1, MSG-2, MSG-3, MSG-4	LK1 monitoring line input

Terminal block	Contacts marking	Location	Description
Z1	3 – 4 +	„	LK2 monitoring line input
Z1	5 – 6 +	„	LK3 monitoring line input
Z1	7 – 8 +	„	LK4 monitoring line input
Z1	9 – 10 +	„	LK5 monitoring line input
Z1	11 – 12 +	„	LK6 monitoring line input
Z1	13 – 14 +	„	LK7 monitoring line input
Z1	15 – 16 +	„	LK8 monitoring line input
Z2	1 – 2 +	„	LK9 monitoring line input
Z2	3 – 4 +	„	LK10 monitoring line input
Z2	5 – 6 +	„	LK11 monitoring line input
Z2	7 – 8 +	„	P1 potential output of 2 A allowable load
Z2	9 – 10 +	„	P2 potential output of 2 A allowable load
Z2	11 – 12 +	„	P3 potential output of 2 A allowable load
Z2	13 – 14 +	„	P4 potential output of 0.6 A allowable load
Z2	15 – 16 +	„	P5 potential output of 0.6 A allowable load
Z3	1 – 2 +	„	P6 potential output of 0.6 A allowable load

Terminal block	Contacts marking	Location	Description
Z3	3 – 4 +	„	P7 potential output of 0.6 A allowable load
Z3	5 C 6 NC 7 NO	„	P8 non-potential output of 3 A/30 V allowable load
Z3	8 C 9 NC 10 NO	„	P9 non-potential output of 3 A/30 V allowable load
Z3	11 C 12 NC 13 NO	„	P10 non-potential output of 3 A/30 V allowable load
Z3	14 C 15 NC 16 NO	„	P11 non-potential output of 3 A/30 V allowable load
Z4	1 C 2 NC 3 NO	„	P12 non-potential output of 3 A/30 V allowable load
Z4	4 C 5 NC 6 NO	„	P13 non-potential output of 3 A/30 V allowable load
Z4	7 C 8 NC 9 NO	„	P14 non-potential output of 3 A/30 V allowable load
Z4	10 C 11 NC 12 NO	„	P15 non-potential output of 3 A/30 V allowable load
Z4	13 C 14 NC 15 NO	„	P16 non-potential output of 3 A/30 V allowable load
ZP1	9-pin connector according to RS-232 standard	MIK-48	PORT 1 output, RS 232 to (acc. to declaration) PC computer or digital monitoring
ZP2	9-pin connector according to RS-232 standard	„	PORT 2 output, RS 232 to (acc. to declaration) PC computer or digital monitoring
ZP3	9-pin connector according to RS-	„	PORT31 output, RS 232 to (acc. to declaration) PC computer , digital monitoring or bar code

Terminal block	Contacts marking	Location	Description
	232 standard		reader
ZK1	Pursuant to PS/2 standard	„	External keyboard terminal
ZP4	A B, CHGND	„	Output to TSR 4000 terminal
WE-1	A , B	MSI-48	Control panel network ring 1 input
WY-1	A , B	„	Control panel network ring 1 output
WY-2	A , B	„	Control panel network ring 2 output
WE-2	A , B	„	Control panel network ring 2 input
24 V ext.	1 – 2 + 3 – 4 +	MZ-48	External devices power supply output of maximum total load at 3 A/24 V

14 OPERATION AND MAINTENANCE

14.1 PROPER USAGE REGULATIONS

The reliability of control panels depends on maintaining correct operating modes, supply voltage, battery condition and carrying out periodical inspections.
The periodical inspections should be executed by the Authorised Service Station that was appointed by the user to perform maintenance works. Any fault should be immediately reported to the Service Station. While replacing fuses, 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. This may damage the unit.

The following fuses are used in the POLON 4500 control panels:
a) in the power supply segment:
- B1/10 A type T10L125 V – protection of the battery cluster circuit;
- B2/3.15 A type T3, 15L250 V – protection of the + 24 V circuit supplying additional external devices;

b) in the MSL-1M module:
- B1/500 mA type F500L250 V – protection of MSL-1M;

c) in the PPW-45 module:
- B1/1 A type F1L250 V – protection of PPW-45;

d) in the MSG-45 module:
B1/1 A type F1L250 V – protection of MSG-45.

14.2 PERIODICAL INSPECTIONS AND MAINTENANCE GUIDELINES

The POLON 4500 control panels periodical inspections, including the checks described in section 8.3, must be carried out according to PN-E-08350-14:2002 standard at least once a year.
The condition of the screens, grounding or ground wiring (with the control panel housing) should be inspected and the battery clamps should be cleaned every six months.
The battery charging level should be checked at least once a year. To this end, use the mains switch in the AC power adaptor to disconnect the mains power supply for approx. 2 hours and, after the system is reactivated, check if, during a period not longer than 5 hours, the power adaptor charges the battery cluster and automatically switches to the buffering mode.
A correctly operating and regularly inspected control panel does not require any special maintenance works. It is recommended to regularly remove dust from the control panel surfaces.

15 PACKAGING, TRANSPORTATION AND STORAGE

15.1 PACKAGING

A control panel is wrapped in a plastic bag and packed to a transport box made of 5-ply cardboard. The following elements are also packed in the transport box:
- control panel installation frame with fixing elements;
- modules in individual packages;
- spare parts;
- descriptive documentation;
- warranty certificate.

15.2 TRANSPORT GUIDELINES

A factory packed control panel must be carried in a closed space of standard land transport means taking into account the transport guidelines provided on the packaging and protecting it against sudden vibrations and ambient temperatures lower than - 25 °C and higher than + 55 °C.

15.3 STORAGE GUIDELINES

The control panel must be stored in closed spaces with ambient temperature from + 5 °C to + 40 °C and relative humidity from 40 % to 70 %, free of caustic vapours and gases.
A stored device must be protected from direct sunlight or heating elements.

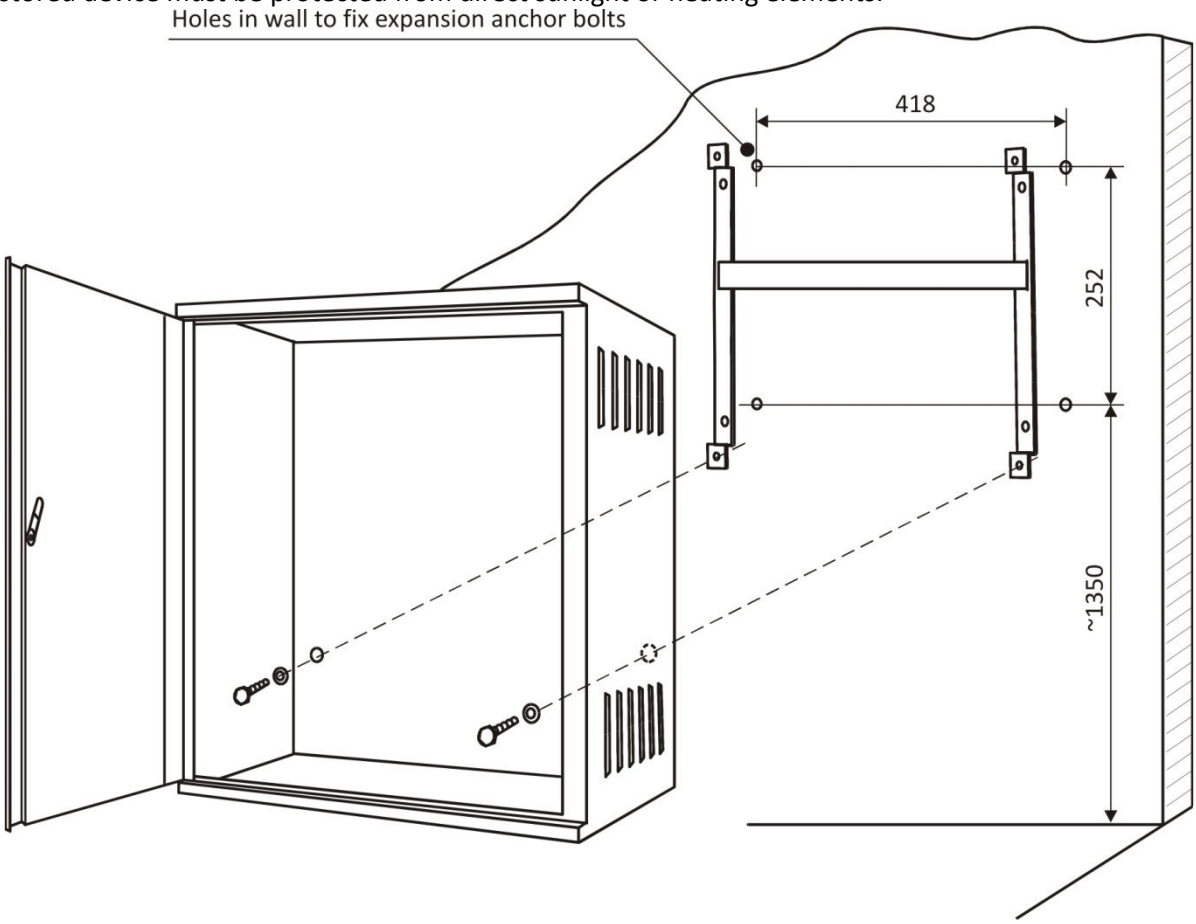

Fig. 15.1 Control panel wall mounting

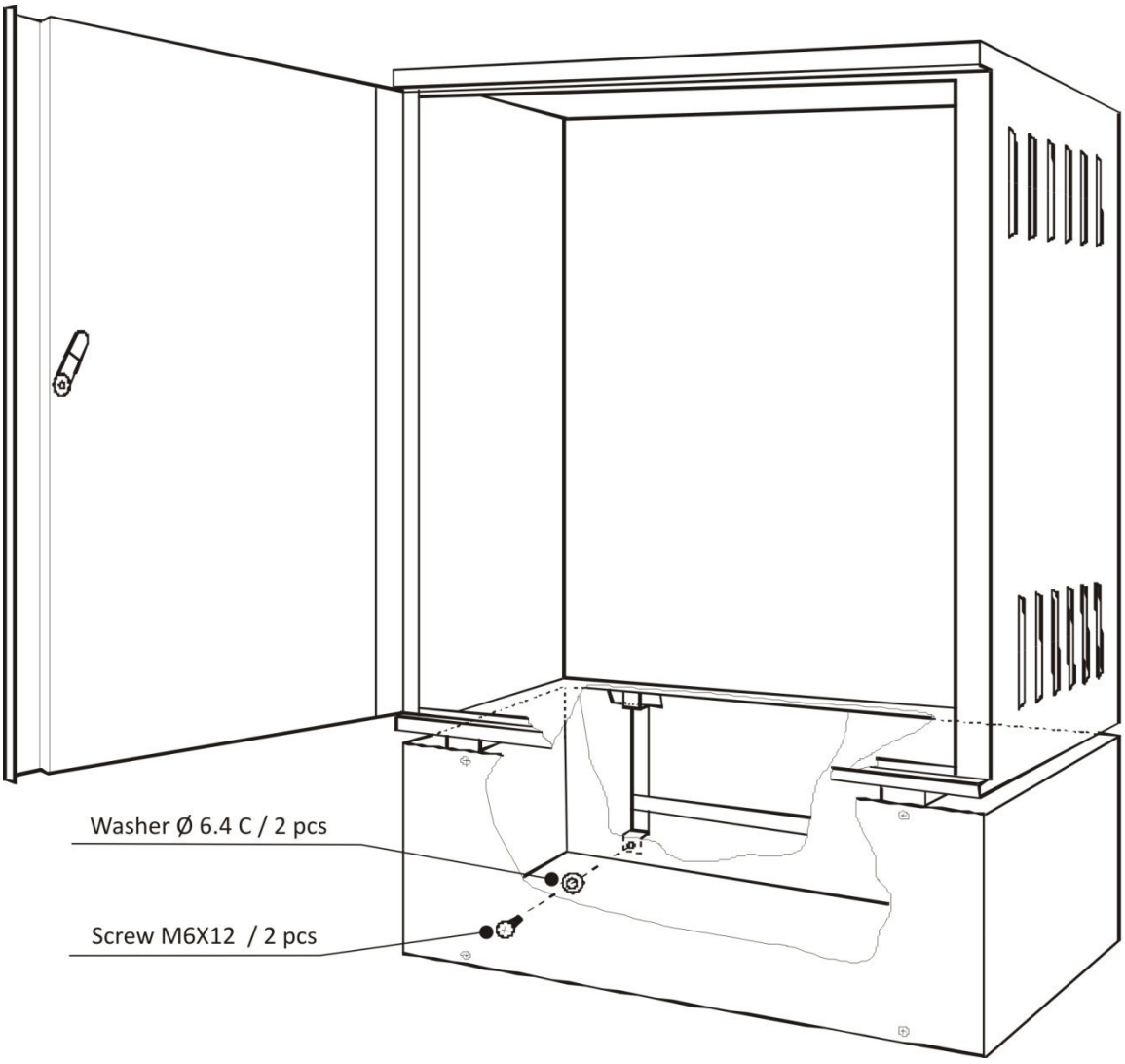

Fig. 15.2 PAR-4800 battery container mounting

Note:
In order to drill holes necessary to mount the control panel, use the template located in the packaging.

16 DESIGNER'S TABLES – DETECTION UNIT

Table 16.1 MSL-1 MODULE DECLARATION

MSL- 1 module.....	**LINE No. 1 : .....** **LINE No. 2 : .....** **LINE No. 3 : .....** **LINE No. 4 : .....**

Table 16.2 SERIAL PORTS DECLARATION

	PORT TYPE	***TRANSMISSION SPEED***
PORT No. 1		
PORT No. 2		
PORT No. 3		

Table 16.3 ALARM DELAY TIMES

T1 Time	
T2 Time	
T3 Time	

Table 16.4 PERSONNEL ABSENT MODE CHANGE TIMES

PERSONNEL ABSENT switch over times	
PN1 Time	
PN2 Time	
PN3 Time	
PN4 Time	

Table 16.5 LINE ELEMENTS PARAMETERS - FIRE WARNING DEVICES

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

Table 16.6 ZONES CONFIGURATION

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

Table 16.7 EKS – 4001 MONITORING AND CONTROLLING ELEMENTS PARAMETERS

Line No.	***Elem. No.***	***Factory No.***	***Operation mode***						***EKS logical No.***
			Continuity monitor.	*Actuation monitoring*		*Monitoring method*		*Output relay actuation delay*	
			YES/ NO	*IN1*	*IN2*	*IN1*	*IN2*		

Table 16.8 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		
			1		
			2		

Table 16.9 RELAYS CONFIGURATION

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

Table 16.10 SIGNALLING LINES CONFIGURATION

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

Table 16.11 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 2x32 characters	max 2x32 characters
				....	....
				....	....
				....	....
				....	....
				....	....
				....	....
				....	....

Table 16.12 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 16.13 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 16.14 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*

17 DESIGNER'S TABLES – EXTINGUISHING UNIT

Table 17.1 PK relay outputs configuration

RELAYS			
RELAY NO.	**TYPE**	**fP FUNCTION NO.**	**LINE CONTIN. MONITOR.**
1	POTENTIAL	1 – ELECTROVALVE 1	-
2	POTENTIAL	2 – ELECTROVALVE 2	-
3	POTENTIAL		-
4	POTENTIAL		-
5	POTENTIAL		-
6	POTENTIAL		-
7	POTENTIAL		-
8	NON-POTENTIAL	7 – 2^{ND} STAGE ALARM SIGNALLING DEVICE	YES
9	NON-POTENTIAL	14 – DISCHARGE STATE SIGNALLING DEVICE	NO
10	NON-POTENTIAL		
11	NON-POTENTIAL		
12	NON-POTENTIAL		
13	NON-POTENTIAL		
14	NON-POTENTIAL		
15	NON-POTENTIAL		
16	NON-POTENTIAL		

Table 17.2 LK monitoring lines configuration

MONITORING LINES manual or automat.		
LINE No.	**fK FUNCTION NO.**	**MESSAGE (only for FUNCTION No. 11)**
1	**1 – EXTINGUISHING START**	
2		
3	**3 – EXTINGUISHING STOP**	
4		
5		
6	**11**	LIFT SWITCHED OFF
7	**11**	VENTILATION SWITCHED OFF
8		
9		
10		
11		

Table 17.3 Time parameters declaration

TIME PARAMETERS	
PARAMETER	**TIME**
PK ” ELECTROVALVE 1” activation time	_ _:_ _
PK ” ELECTROVALVE 2” activation time	_ _:_ _
PK ” ELECTROVALVE 3 ” activation time	_ _:_ _
SEALING delay time	_ _:_ _
ATUATION RESET disablement time	_ _:_ _
EXTINGUISHING delay time	_ _:_ _

Table 17.4 Discharge state monitoring

DISCHARGE STATE SIGNALLING		
	Signal from LK	PK activation
Signalling on the basis of *	**X**	

Table 17.5 EXTINGUISHING STOP push button operation way

EXTINGUISHING STOP push button		
	way 1	way 2
Push button operation *	**X**	

APPENDIX A

POLON 4000 SYSTEM LINE ELEMENTY

Element description	**Quiescent current [1)]**
DIO-4046 addressable ionisation smoke detector	150 µA
DOR-4046 addressable optical smoke detector	150 µA
DUR-4046 universal addressable optical smoke detector	150 µA
TUN-4046 addressable universal heat detector	120 µA
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
DUR-4047 optical smoke radio detector	–
DOP-6001 optical line smoke detector	300 µA
ROP-4001, ROP-4001H manual fire call points	135 µA
ADC-4001 adapter (burdened with a side line): - programmed in operation mode 1 - programmed in operation mode 2 - programmed in operation mode 3 - programmed in operation mode 4 - programmed in operation mode 5 - programmed in operation mode 6	 6,8 mA 16,0 mA 2,5 mA 0,5 mA 2,2 mA 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 - power supplied only from line [2)]	 150 µA 600 µA
UCS 4000 universal fire control panel	600 µA
UCS 6000 universal fire control panel	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.