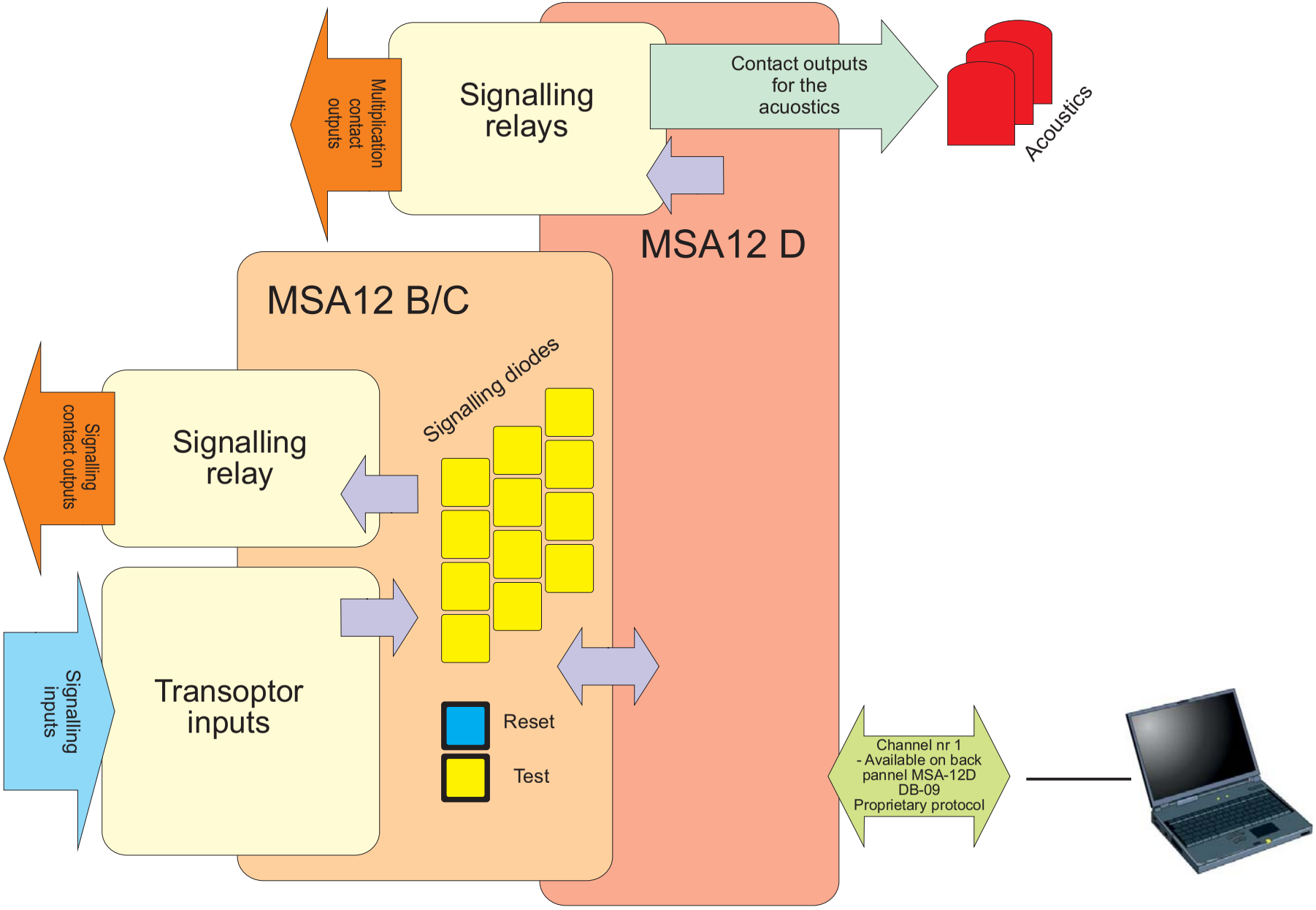
ZPrAE
Sp.z o.o.

MSA-12

SIGNALLING UNIT



Structural diagram of signalling unit MSA-12.

For many years ZPrAE Sp. z o.o. has been manufacturing and supplying power industry with central emergency signalling devices. MSA-51 and MSA-6 devices work in many power engineering facilities, where they provide visual and acoustic signalling functionality for the facilities in a reliable and transparent way. In the recent years new products have been introduced, like MSA-8 and now MSA-9, which is a state of the art design among signalling systems. However, the MSA-51 model manufactured as a 5 signal set (or MSA-51A – 10 signal set), and the simple MSA-12A signalling block are still in demand. To meet that expectation the latest member of the MSA family was developed. It combines the characteristics and advantages of the MSA-12, yet features select functions of more complex signalling systems. The new MSA-12 device is available in three versions: B, C or D.

1. APPLICATION.

The MSA-12 B/C/D signalling blocks are used for visual and acoustic signalling of activation of protections as well as for signalling malfunctions and disturbances in operation of power engineering and industrial facilities. They can be used to create combined group signals as required by staff, as well as to multiply incoming signals for remote signalling. They are used in power switching substations and power plants as primary signalling systems providing the operating personnel with accurate and fast information on appearing threats, activation of protections or malfunctions.

The MSA-12 B/C/D signalling block is an independent, fully autonomous device, equipped with a flashing light generator, test and reset buttons, as well as a small built-in sounder. It was designed to be used in mimic tables, for instance to replace obsolete electromechanical signalling blocks usually used in remote protections.

The B version of the MSA-12 features one connector addressed identically as in case of the previous MSA-12A version of the block, which is why it can replace it easily although has increased number of functions. The C version is equipped with a larger 18-pin connectors enabling separation of the power circuit, and splitting input circuit into four isolated groups. This way the block can be supplied independently of input activating voltage. The D version was additionally equipped with an internal relay card, as is the case with more complex signalling systems. This enables combining and creating group signals Aw(Aw1) / Al(Aw2) Up; the D version is also equipped with a communication port for configuration and monitoring of the block.

MSA devices are used both in permanently manned substations, as well as to provide necessary auxiliary equipment in high and highest voltage substations without permanent staff. In case of substations controlled remotely from a supervisory dispatcher's station, they enable performing start-up and inspection works; they also provide a backup solution enabling manual operation of a substation in case of malfunction of the remote control and monitoring system. Malfunctions of substation computer systems are not entirely impossible, requiring operation to be maintained "conventionally" by temporary staff with the right conditions to make correct decisions. Such cases require an independent local warning and disturbance signalling system working in parallel with a computer substation control system. Digital central emergency and warning signalling systems can provide a backup to substation computer control, data recording and processing systems.

2. CONSTRUCTION

The MSA-12 B/C/D signalling blocks are provided as 12-signal sets with LED TEST and RESET buttons, an additional OPERATION indicating LED and a small internal

sounder. Visual signalling uses LED backlights with 14×14 mm highlighted fields. Signals can be described on a foil slid in a socket in the front panel. Graphic layout of the front panel was designed to enable horizontal or vertical installation of the block. External contact of the group signal, which closes in case of appearance (loss) of any signal at block input, can be used to activate the primary central signalling system; moreover, the D version provides the ability to use 5 configurable relays to control any activated devices via selected input signals.

The **MSA-12B/C** signalling block features:

- 12 signalling channels,
- button for resetting signals,
- button for testing LED backlights,
- contact for group activation signalling,
- internal power supply unit,
- internal sounder,
- configuration switches

The **MSA-12D** signalling block additionally features:

- five configurable contacts for signalling activation,
- RS232 communication port for previewing current status of the module and configuring:
    - type of activating voltage AC / DC,
    - delay time of operation for each input,
    - duration of an operation pulse of relays on the additional card,
    - PD5 relay as an element indicating device malfunction (for units with updated software).

Input and power circuits are adapted to operation at supply voltages typical for power switching substations. Standard voltages include 220 V DC / 230 V AC, while 110 V DC, 48 V DC or other voltages are optionally available.

2.1 External dimensions.

MSA-12 B/C/D signalling blocks are made in a housing enabling simple installation in mimic tables. The complete set includes connectors and latches. The mounting hole in the table should be 68 × 138 mm.

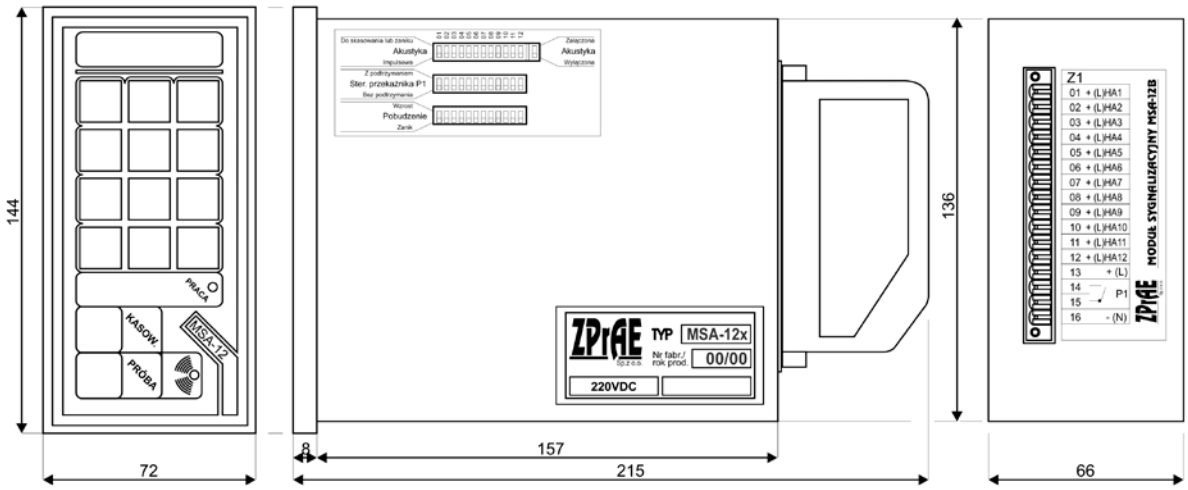


Fig. 1. External dimensions of an MSA-12 B/C/D.

2.2 Front panel of an MSA-12 B/C/D.

The front panel of the block has all the signalling elements including description fields and auxiliary test and reset buttons.

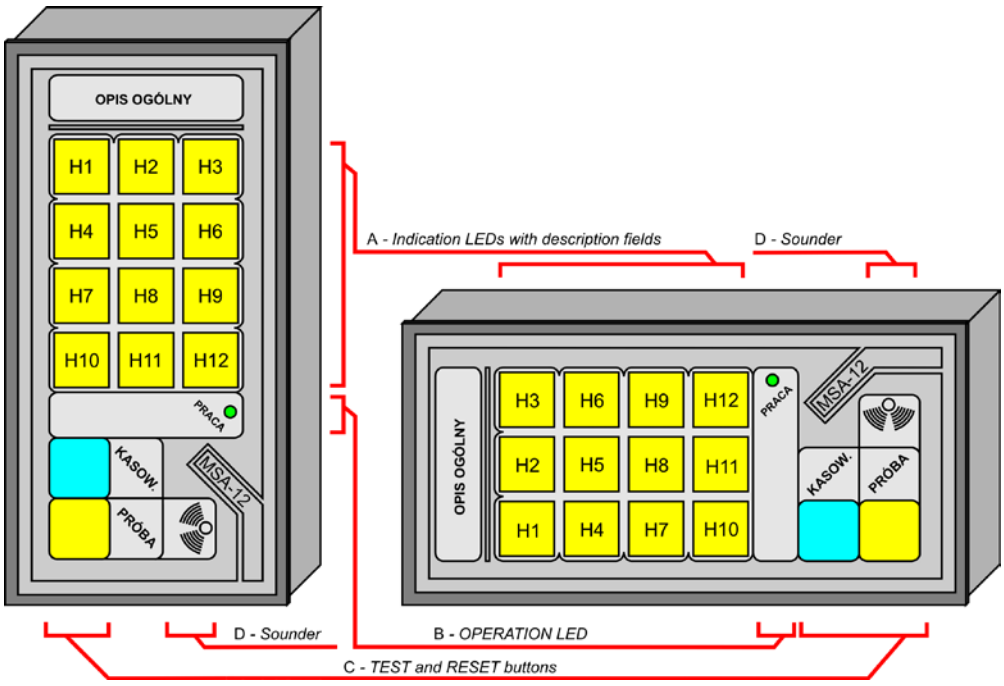


Fig. 2. Front panel of an MSA-12 B/C/D.

A – Indication LEDs with description fields.

Visual signalling system includes LED backlights with 14 × 14 mm highlighted fields. A slit in a front foil creates a gap where a transparent foil with the description of individual signals can be inserted. Additional field (fig. 2 “General Description”) can be used for general description of signalling block.

B – OPERATION LED.

- Green OPERATION LED informs about proper power supply and operation of the block.

C – TEST and RESET buttons.

- Yellow „TEST” button: pressing this button turns on all the indication backlight to check their functioning and to generate the acoustic signal.
- Blue „RESET” button: shortly pressing the button (< 2 s) resets the internal acoustic signal; pressing and holding the button (> 2 s) resets the flashing lights of all backlights and resets the operation of multiplying contacts.

D – Sounder.

Small internal sounder informs about a new incoming signal.

2.3 Rear panels of MSA-12 B/C/D.

On the rear panel of the device there are multipin connectors that can be used to connect external circuits. Number and size of the connectors depends on the block’s version (B, C or D).

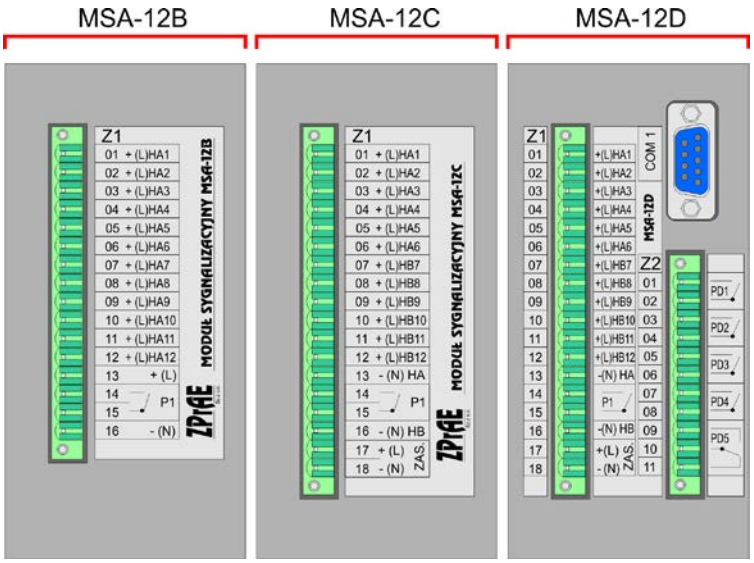


Fig. 3. Rear panels of MSA-24 B/C/D.

2.4 MSA-12 B/C/D versions.

MSA-12B is the simplest version that enables clear representation of 12 signals. It is fully interchangeable with the older version MSA-12A. It is equipped with flashing light function and internal sounder that can be set in pulse or continuous mode until resetting. It is also possible to configure the inputs to be triggered by disappearance or activation of a signal, as well as configure the sustained operation of a relay after disappearance of activation at a given input.

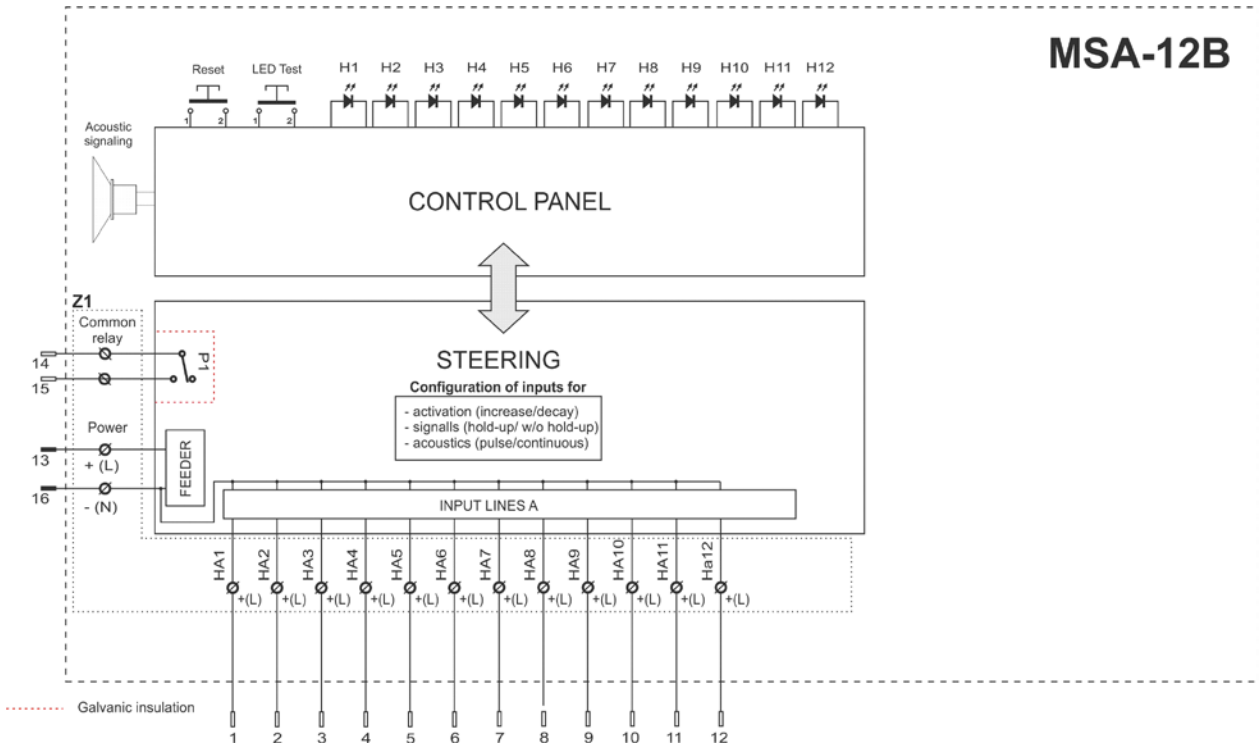


Fig. 4. Functional and logic diagram of an MSA-12B.

The C version has the same functions as the B version. The only difference is the use of two 18-pin connector which enabled galvanic separation of isolated supply circuit. Furthermore, the input channels are divided into four isolated groups. It makes it possible to connect four independent signalling circuits.

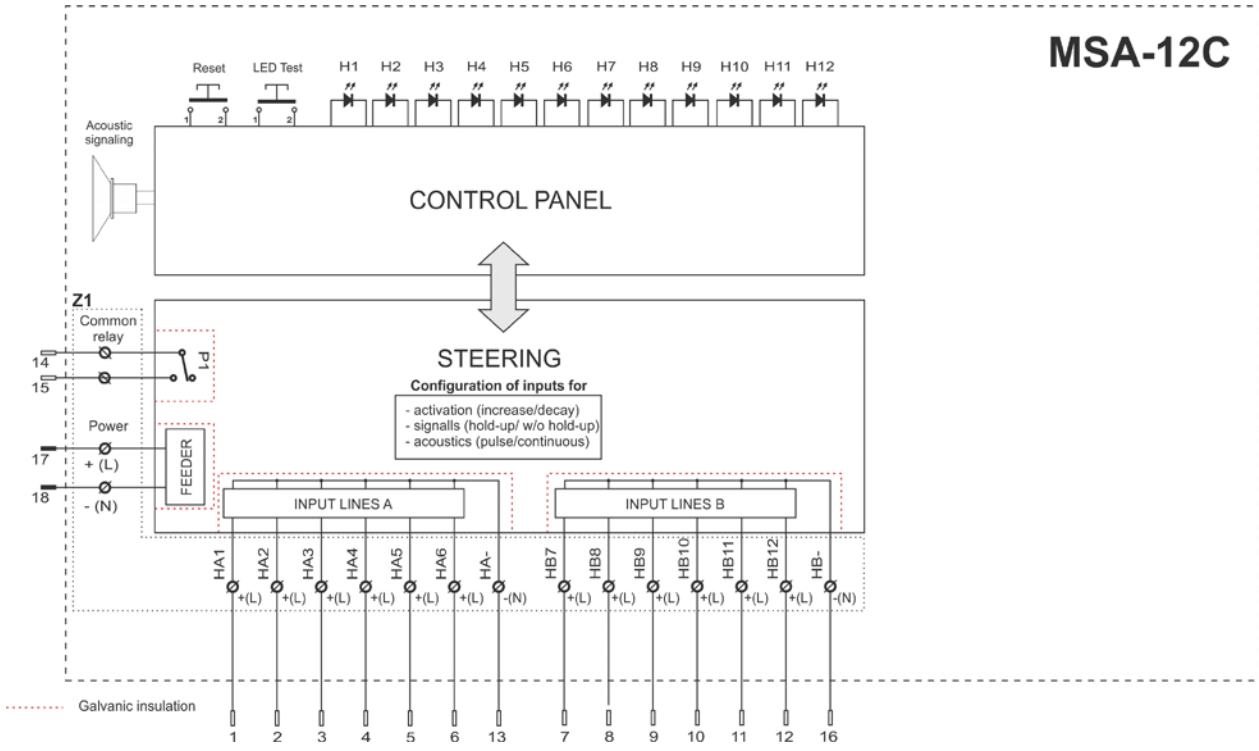


Fig. 5. Functional and logic diagram of an MSA-12C.

The D version is equipped with additional card of configurable relays, which enables multiplying the given signals or creating group signals, e.g. acoustic channels.

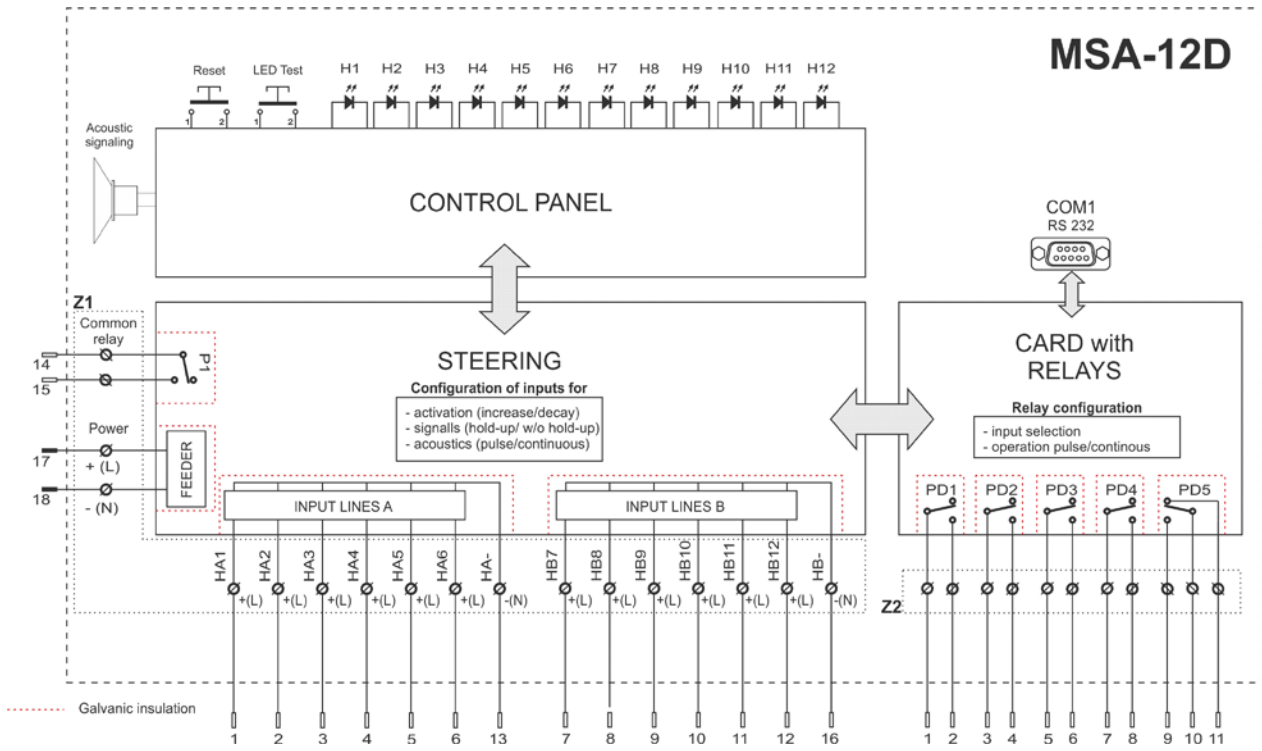


Fig. 6. Functional and logic diagram of an MSA-12D.

3. OPERATING PRINCIPLE.

The basic function of signalling system is to receive a signal, visualise it and give acoustic notification, as well as combine and assign input signals to the appropriate priorities. Those objectives of an MSA-12 signalling block are executed in the following way:

Activation of one of the signalling block input channels starts a flashing backlight of a given information field at 2 Hz frequency. The decay of activation changes the flashing frequency to a slower one i.e. 0.5 Hz. This state persists until the operator acknowledges the appearance of disturbance (by pressing and holding a “Reset” button). In addition, each activation triggers a group signal multiplying relay P1 and short or continuous (until resetting) acoustic signal. Group contact of the multiplying signal P1 can be configured. It can operate with hold up and remain closed until signal resetting, or operate without hold up and remain closed only for as long as the activation signal at the input lasts. Resetting of the internal acoustic alarm without resetting other elements can be done by a short-term pressing the “Reset” button.

Five additional multiplying relays PD1 – PD5 are available in an extended version of the MSA-12D. They can be triggered by activation at a given input (configured with ZPrAE-EDIT software). Multiplying signal can be a pulse signal (default 5 s) or it can last until the disappearance of activation at a given channel or until signal resetting.

Moreover, this version is also equipped with an RS232 connector that enables communication between the signalling block and a computer. ZPrAE-EDIT software can be used to read the present setups of a signalling block, modify them and enter new ones. The following setup parameters are available:

- minimum duration of a control impulse
- type of activating voltage AC/DC
- PD1-PD5 relays operation type (pulse, until decay of impulse or until resetting),
- duration of PD1-PD5 relay multiplying impulse,
- selection of inputs activating the additional PD1 – PD5 relays,
- PD-5 relay as an element indicating device malfunction.

ZPrAE-EDIT software can be used to view the present status of inputs, display fields and relay status.

MSA-12 signalling blocks are equipped with a ”Test” button to check the functioning of particular display information fields and internal acoustic signalling, as well as a “Reset” button to confirm the activation and resetting of visual, and acoustic systems, and contact signals.

4. CONFIGURATION OF AN MSA-12 B/C/D.

Functions of an MSA-12 B/C/D blocks are configured by switches located in a recess on the side of the signalling block. Extended functions of the D version can be configured using proprietary software supplied with MSA-12 D. If it is possible to specify the configuration, as well as the names of individual signals during the ordering process, the MSA-12 B/C/D will be configured according to the requirements. Moreover, it will be equipped with front foil with printed signal descriptions.

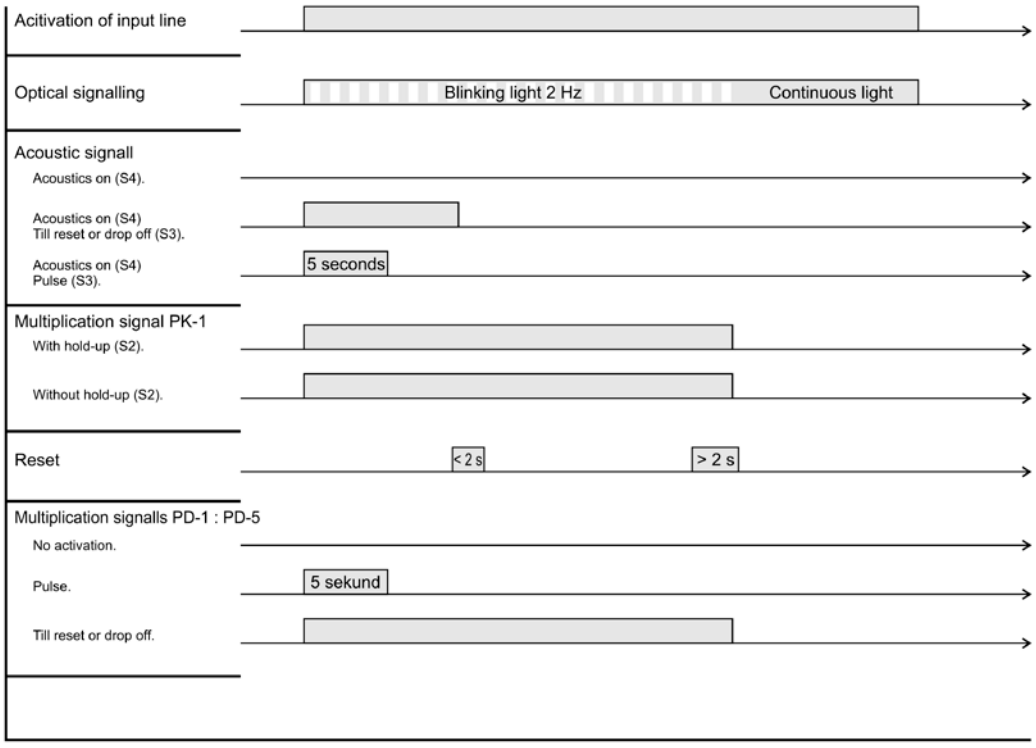


Fig. 7a. Operating diagram of an MSA-24 B/C/D block.
A case when the channel is active during resetting.

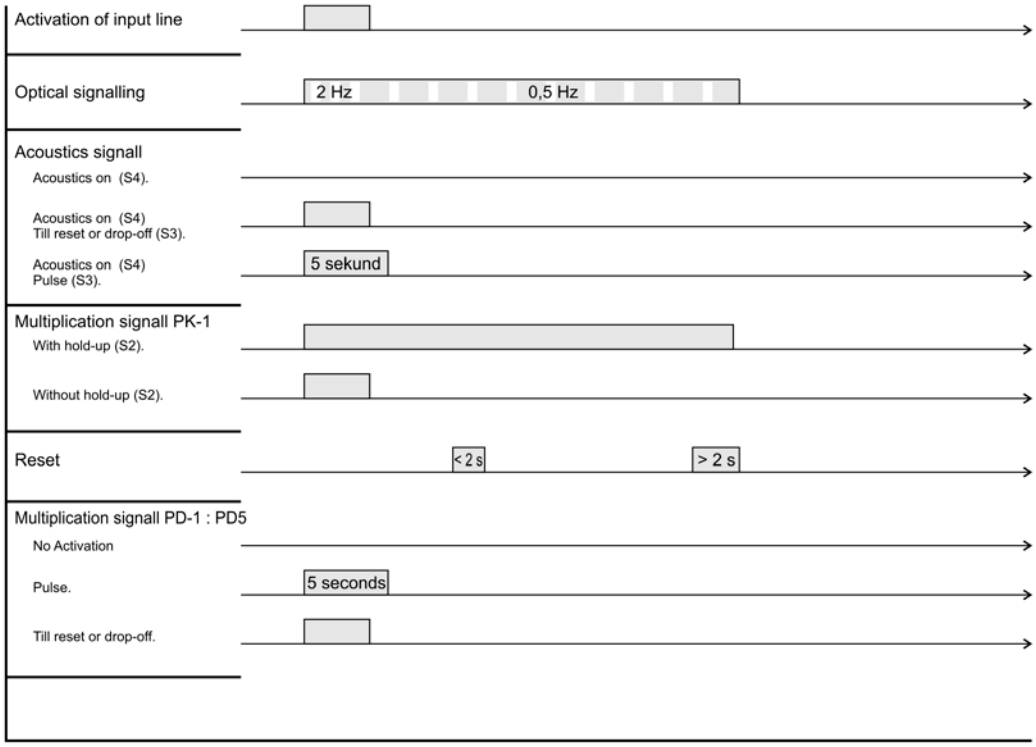


Fig. 7b. Operating diagram of an MSA-12 B/C/D block.
A case when activation disappears before resetting.

Main board of an MSA12 B/C/D contains three groups of switches: “Acoustics”, “Multiplying signal” and “Activation”. The switches are located in the recesses on the side of the signalling block.

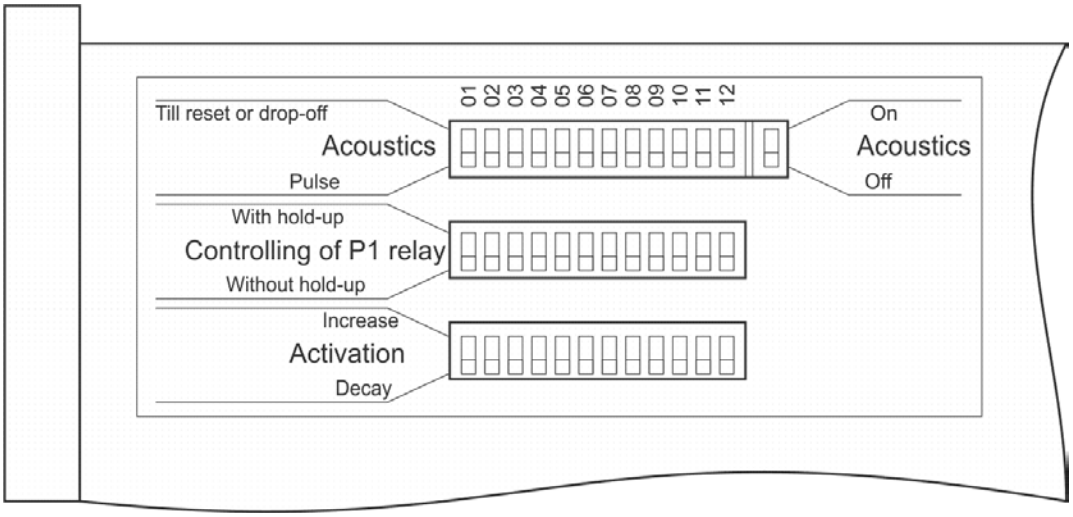


Fig. 8. Arrangement and functions of configuration switches of an MSA-12 B/C/D.

The internal sounder is activated by setting the single switch (located on the right side of the “Acoustics” group) to “ON” position.

Setting each of the twelve switches from the “Acoustics” group in “Until resetting or disappearance” position triggers the acoustic alarm after a new activation in a given

channel is detected. Acoustic signal lasts until the disappearance of activation or resetting acoustics by pressing the “Reset” button on the front panel.

Setting the “Pulse” position triggers short, two and a half second, acoustic signal after new activation in a given channel is detected.

Setting each of the twelve switches from the “P1 relay control” group to “With hold-up” position causes the sustained operation of P1 group relay after the disappearance of activation. Setting the relay to “Without hold-up” position disengages the P1 group relay when the activation of a given channel disappears. Setting each of the twelve switches from the “Activation” group to “Rise” position triggers a given channel when the voltage is detected at the input. Setting them to the “Loss” position, however, triggers the channel in case of voltage loss.

5. UTILITY SOFTWARE.

Together with an MSA-12D block the user receives **ZPrAE-EDIT** software enabling the configuration of additional functions and facilitating its operation. Installation software is provided on CDs. Front panel preview and configuration window can be displayed in the software.

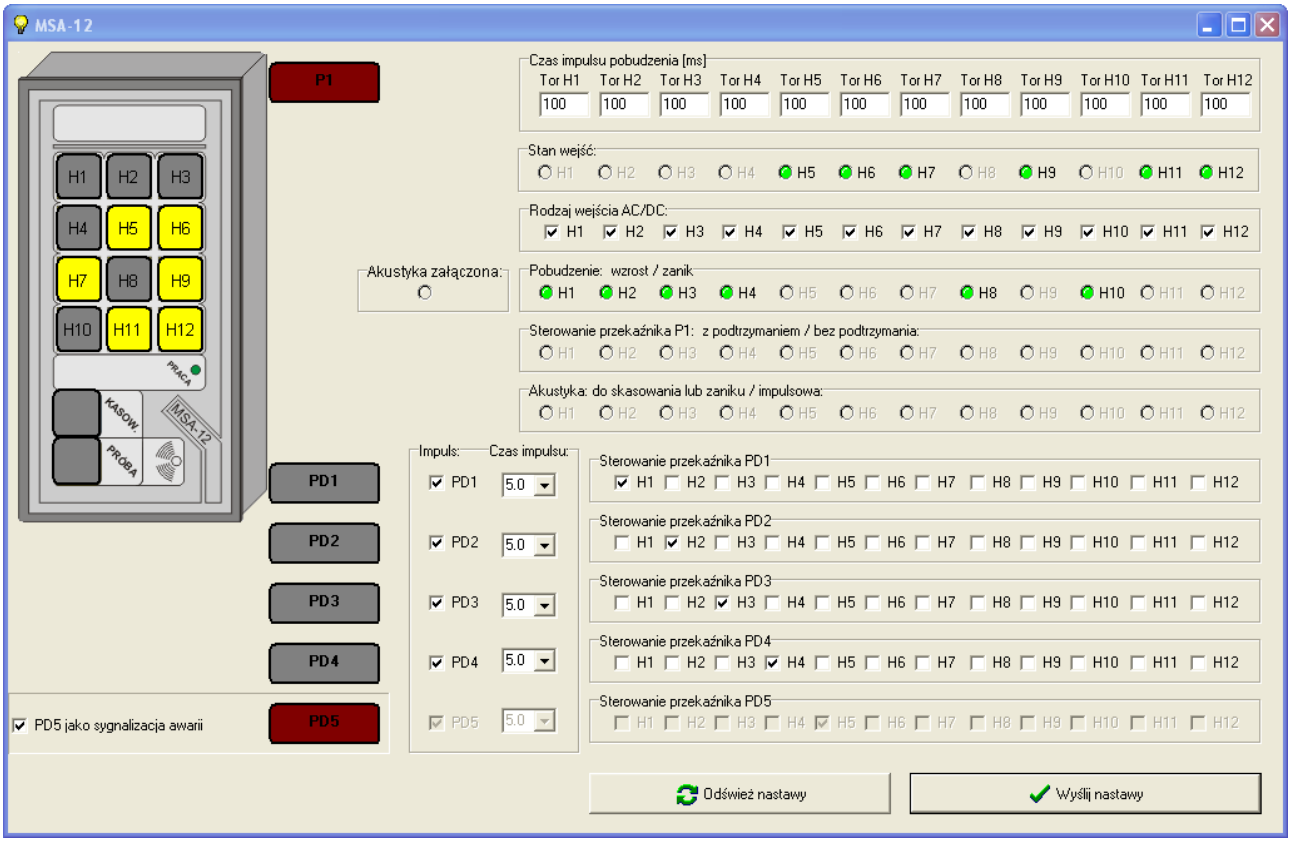


Fig. 9. Preview and configuration window of an MSA-24 B/C/D block.

Additional functions of an MSA-12D block make it possible to select a specific channel, which will be multiplied by relays from PD1 to PD5. This will trigger a given relay when the activation at the corresponding channel appears. Each of the additional relays has pulse or continuous operation mode. In pulse operation mode, the operation of a selected relay following the activation is short and is stopped after a period of time selected in range from 0.1 s to 25.5 s. In continuous operation mode, the relay operation is continued until the disappearance of activation or resetting of the signalling block.

The software is also used to select the activation of inputs either by AC or DC voltage. Depending on the selection it is possible to set an appropriate delay time for each of the channels from 30 ms to 65000 ms range with accuracy of 20 ms in case of AC voltages and more accurate selection from 2 ms to 65000 ms range with accuracy of 2 ms in case of DC voltages.

The units with updated software version enable configuration of PD5 relay to monitor proper operation of the device. If the operation of the device is correct the PD5 relay is permanently activated. When a malfunction or loss of auxiliary power is detected the activation disappears and the relay is disengaged thus signalling the disturbance. This option is a default setting.

6. SCOPE OF SERVICES PROVIDED BY THE MANUFACTURER.

The manufacturer provides support in designing of signalling systems using MSA-12 B/C/D blocks, as well as complex standby emergency signalling systems using an MSA-6 or an MSA-9 module system (we can provide ready-to-use **project outlines)**. The manufacturer supplies system devices configured as agreed, takes care of the equipment during the warranty period and ensures full service after its expiry.

The manufacturer also provides services in scope of designing new and revamping existing signalling systems – including inventory taking of the circuits and on-site installation of the supplied equipment.

Should you have any questions or doubts, please call us.

7. TECHNICAL PARAMETERS OF AN MSA-12 B/C/D SIGNALLING BLOCK.

Auxiliary power supply		
Rated auxiliary voltage:		220 V DC / 230 V AC or other as agreed
Permissible range of auxiliary voltage change:		85 – 265 V DC / AC
Power consumption		P ≤ 6 W
Signalling elements		
Count of inputs (ver. B)		12 inputs with a common pole
Count of inputs (ver. C/D)		2 galvanic isolated groups, each with 6 inputs with a common pole - separate for each group.
Activation of a block		Configurable – from rise or loss of voltage.
Operating threshold for rise of voltage		160 V DC / 165 AC
Operating threshold for loss of voltage		140 V DC / 135 AC
Power consumption of an input		≤ 0,3 W
Accuracy of setup of the activation impulse time		±1%
Version B/C	Type of input	Universal AC / DC
	Activation impulse time	100 ms or other as agreed
	Reaction time for activating pulse	20 ms
Version D	Type of input	Programmable AC or DC
	Activation impulse time for AC	Programmable in range 30 ms – 65000 ms
	Reaction time for activating pulse for AC	20 ms
	Activation impulse time for DC	Programmable in range 2 ms – 65000 ms
	Reaction time for activating pulse for DC	2 ms
Visualisation		
12 LED backlights		Yellow 14 mm × 14 mm
State of the LED	Activation	Fast blinking light (2 Hz)
	Signalling block reset during activation	Continuous light
	Short time activation	Slow blinking light (0,5 Hz)
	Signalling block reset after decay of activation	No light
Output relays		
Count of relays in versions B/C		1 group signal multiplying
Count of relays in version D		1 group signal multiplying + 5 configurable
Steering of the group signal multiplying relay configurable for each of the inputs		With or without hold-up
Steering of additional relays configurable in the D version		Until reset or loss of activation Pulse, programmable from 0,1 s to 25,5 s with resolution 0,1 s (default setting 5 s)
Internal time of the relay		≤ 10ms
Contacts of relays		
Breaking capacity of the contacts DC		I = 0,2 A for U = 220 V; L/R = 40 ms
Maximal continuous current		I = 5 A
Internal Acoustics		
Sounder		Activated with a switch
Acoustic steering configurable for each of the inputs		Without hold-up Pulse, with time duration of 2,5 s,

Insulation	
Rated voltage of insulation:	250 V
Overvoltage category:	III
Insulation electrical strength:	2 kV; 50 Hz; 1 min
Proof voltage of the contact gap	1 kV; 50 Hz; 1 min
Communication (only ver. D)	
Type of connection / Protocol / Speed	RS 232 / ZP6 / 9600 bps
Proprietary software	ZPrAE-EDIT
General Data	
Enclosure protection degree	IP30
Ambient temperature range	od -5 °C do +40 °C
Ambient protection	RT II
Signalling of operation	Green diode „OPERATION”
Terminals (socket/plug) Z1 and Z3	16 pin – ver. B / 18 pin – ver. C/D
Terminals (socket/plug) Z2	11 pin – ver. D
Terminals (socket/plug) COM1	DB9 – FEMALE RS 232
External dimensions (without socket)	144 × 144 × 165 mm (H×W×D)
Mounting	Plate mounting
Operating position	Vertical / horizontal

8. MSA-12 B/C/D BLOCK CONFIGURATION TABLE.

Input number	Input description	Input activation **W** – rise **Z**- loss	Group relay control **P** – sustained **B** – unsustained	Additional relays controlled by selected inputs **X** – channel control					Acoustics control **K** – until resetting or disappearance **I** – pulse	Duration of control impulse selected from 30 ms – 65000 ms range (factory setting 100 ms)
				PD1	PD2	PD3	PD4	PD5		
H1										
H2										
H3										
H4										
H5										
H6										
H7										
H8										
H9										
H10										
H11										
H12										

Additional relays control	Symbol of an additional relay				
	PD1	PD2	PD3	PD4	PD5
I – pulse control, **K** – until resetting or disappearance					
Pulse duration selected from 0.1 s to 25.5 s range (default setting - 5 s)					

MSA-12

OFFER

RE line® ENERGETIC STANDARDS

- RSH-3, RSH-3S - tripping
- RS-6, RPD-2, RPP-4, RPP-6 - interposing
- RMS-2 - signalling
- RCW-3, RCDW-1 - circuit continuity monitoring
- RKO-3 - power supply circuit continuity monitoring
- RB-1, RBS-1, RBS-2 - bistable
- RT-22 - time
- RUT-2, RUT-3 - time-voltage
- RJT-1, RJT-3 - time-current
- RKU-1, RKS-1 - final controlling
- LZ-1, LZ-2 - operation counters
- RPZ-1 - supply source switching
- GPS-1 - time synchronisation
- MDD-6, MDS-12 - Diode modules
- PH-XX, PS-XX - Modules of switches, pushbuttons and control lamps
- Relay racks

- Busbar protections and breaker failure protections type TSL-9r, TSL-11
- Auxiliary and signalization relays
- Reserve Central Signalling System type MSA-9, MSA-12, MSA-24
- Protection relays type AZT-9, APP-9
- Disturbance recorder RZS-9
- Energy measurement system and event recorder ZRZ-28
- Load Resistors for measuring transformers
- DC and AC auxiliary power supply switchgears
- Cubicle-contained sets of control and supervision protections
- Modular power supplies, measuring suitcases, measuring and registering system RFQ-8
- PROFIL-L cubicles
- Periodical and post-failure tests, as well as repairs and overhauls of busbar protections TSL
- Servicing, strting-up and post assembly tests

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