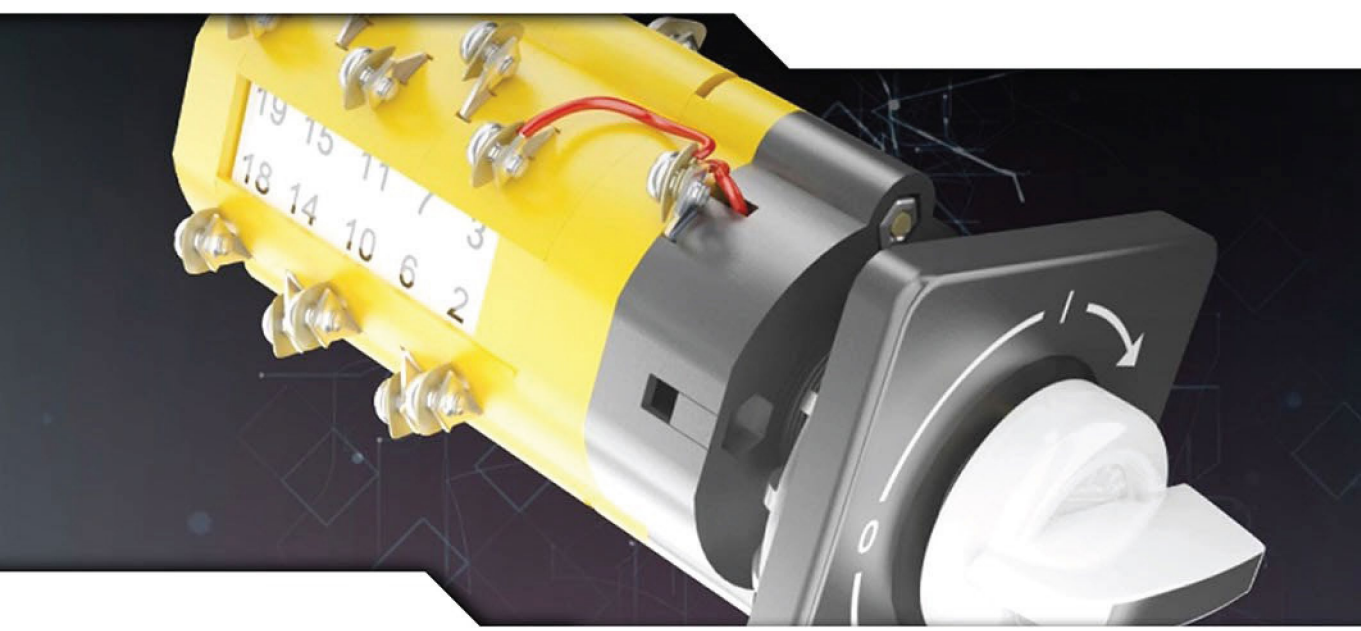


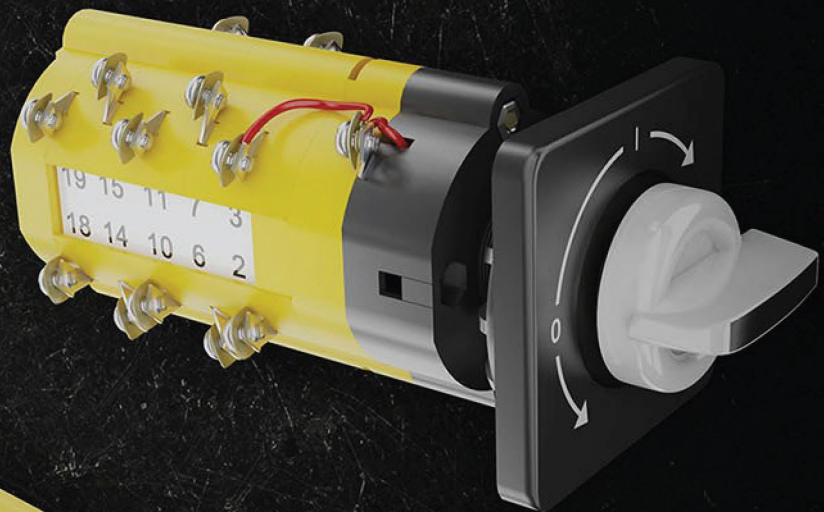


ELBAR INVESTMENT

SECURE ENERGY NETWORKS



PRODUCT CATALOGUE



Presentation of the company

TRADITION

ELBAR INVESTMENT goes back to 1960. It specializes in the manufacturer of electric multi-layered switches.

It is a modern company that cultivates the traditional values originated by company founder, Franciszek Bartczak. It was his vision and perfectionism that made it possible for such a well-organised company to continue and thrive today.

Strong family ties, which the company is based on, responsibility and consistent modernization have all been conducive to the maintenance of quality standards at the highest level since its founding so as to meet the expectations of our customers, proving that ELBAR Investment is a reliable partner.

This is confirmed by the positive tests periodically carried out on our products and the up-to-date "CE" and "B" safety mark certificates issued by Association of Polish Electrical Engineers (SEP) in Warsaw.

WE CARE ABOUT OUR CUSTOMERS

As a manufacturer the highest quality devices for both small and large companies, our company approaches each and every customer individually, offering professional advice and satisfaction from the high-durability products we produce.

ELBAR Investment focuses on safety and quality, two factors which have been critical for the success of the company and the satisfaction of our customers for many years.

On the website, you can find documented references directly from our customers on the basis of many years of collaboration.

www.elbar.com.pl

Strengths of Elbar Investment

It is worth noting the strengths of the company, such as:

- experienced technical staff
- technical counselling
- individual approach to the customer
- fast delivery time
- high quality and precision of all components in the manufacturing process
- competitive prices
- on-the-spot service
- 2-year warranty on all products (optionally up to 5 years)

Environmental protection

Conservation of the natural environment is a fundamental matter in our company. For its high quality products, Elbar Investment uses the best raw materials available in the market. At the same time, through modernisation and introduction of new technologies, it protects the natural environment.

Introduction

This catalogue includes standard designs of switches, control switches and discrepancy switches manufactured by our company, which are widely used in many operational and currently constructed facilities in power and other industries.

Our connectors are used mainly in electrical switching stations, and also by installers and manufacturers of various electrical devices (e.g. welding machines and rectifiers).

The purpose of the catalogue is to provide distribution, automation and control equipment designers and builders and supply department employees with practical basic information about the application, design and technical characteristics of the connectors manufactured by us.

Orders for switches, control switches and discrepancy switches included in this catalogue should be submitted to the manufacturer:

ELBAR INVESTMENT
05-420 Józefów k. Otwocka
ul. Piłsudskiego 100

Phone +48 22 789 22 36
Fax +48 22 789 52 15
internet: <http://www.elbar.com.pl/>
e-mail: elbar@elbar.com.pl

ATTENTION!

The order should include:

- the connector type
- the drawing number according to the catalogue (or your own switching programme)
- the marking plate no. according to the catalogue (or your own plate drawing)
- the colour of the marking plate (applies to RS-PMt type connectors): black with white markings or yellow with black markings
- the knob colour (applies to RS-PMt type connectors): red or black



The image features several yellow mechanical components, likely parts of a connector, arranged in a circular pattern around the central text. These include a large flange-like part on the left, a smaller ring-like part at the top, and another ring-like part on the right. At the bottom, there are two small, dark-colored fasteners, possibly bolts or screws, positioned vertically.

SECTION I

CONNECTOR DESIGN

The design of RS-PMt switches, Sod-SMt control switches and Sod-KMt discrepancy switches

The core of the above-mentioned connectors is a set of properly shaped insulating layers (side-plates, packets). These layers are stacked one on the other (up to 10 layers in the most common designs, and more in custom designs) to form chambers. In the appropriate slots on the perimeter of the insulating discs, there are fixed contacts with terminals for connecting wires. The contacts are located inside the chambers and the terminals are labelled with numbers on the outside. The contacts and terminals are made from copper and form one unit.



Fig. 1. Type of fixed contact systems

Inside the chambers, in the fixed contacts plane, there are moving spring contacts made of phosphor bronze. The moving contacts are placed on a common axis that passes through all the layers of the connector. Upon connection, the fixed contacts get between the jaws of the moving spring contacts.

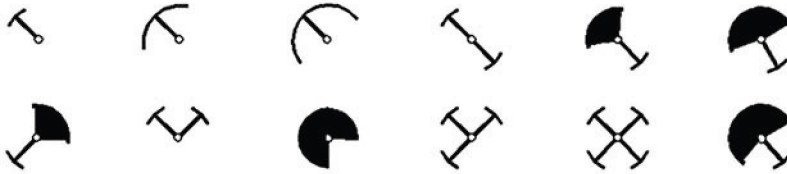


Fig. 2. Type of moving contact systems

The design of the fixed and moving contacts and materials appropriately selected for the design ensure the appropriate pressure between the contacts as well as automatic cleaning of the contact surfaces.

Connecting and disconnecting fixed and moving contacts occurs at high speeds as a result of the break-over mechanism on the connector axis, when adequate spring tension of this mechanism is achieved by means of an insulation knob placed on the axis.

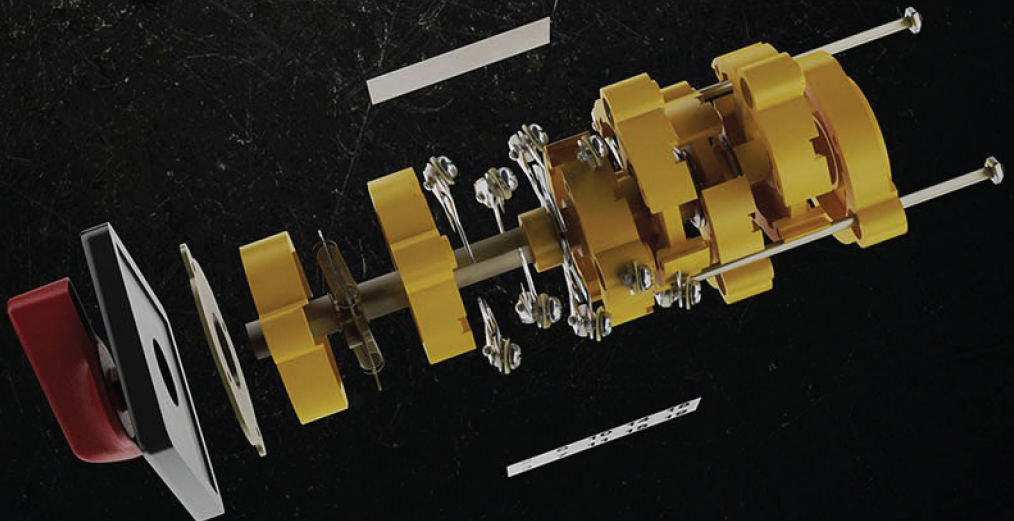
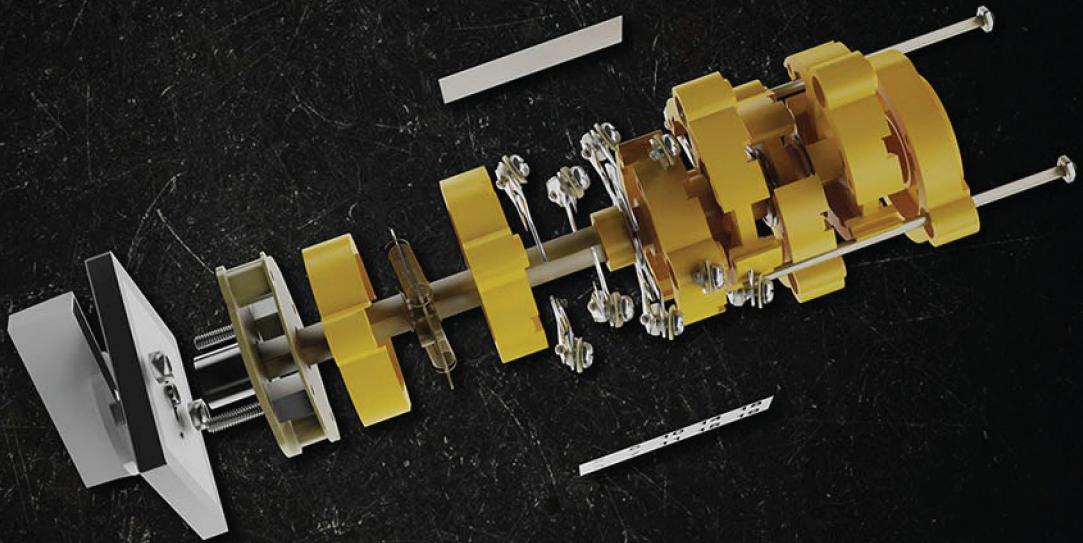
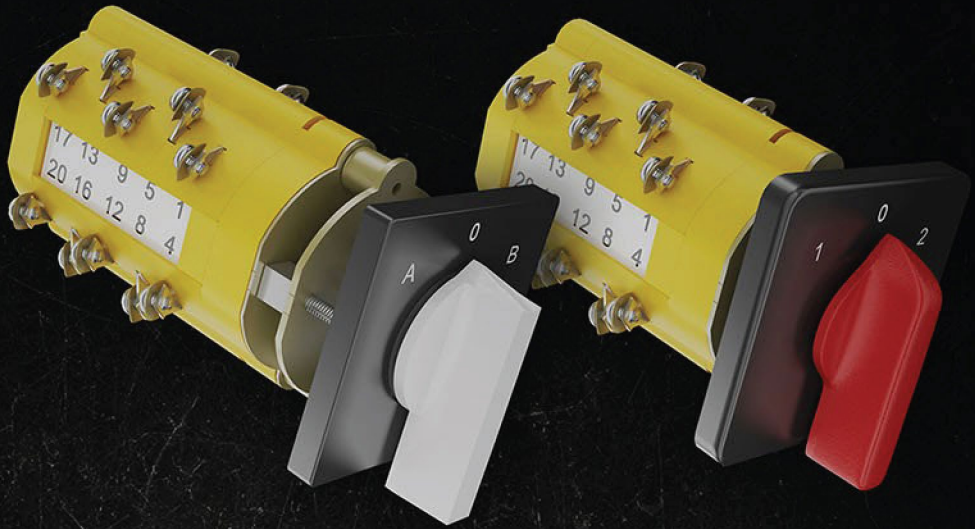
A variety of connection options for connectors can be obtained by:

- selection of the appropriate number of insulation layers,
- selection of the number and layout of fixed contacts and of the layout of moving contacts in different layers,
- choice of the angle of rotation and the number of positions of the moving brushes.

The background of the page is white and features several yellow gears and screws scattered around. A large gear is in the top right corner, and another is in the bottom center. There are also several screws of different sizes and orientations scattered across the page.

SECTION II

SWITCHES WITH FIXED KNOB: RS-PMt
SWITCHES WITH REMOVABLE KNOB: RS-PMt/p.o.



RS-PMt and RS-PMt/p.o. multi-layered panel switches

APPLICATION

Multi-layered panel switches are used in electrical equipment where there is a need to perform complex circuit switching.

In particular, they are used to switch measuring circuits, perform synchronization operations and control electrical equipment. The trigger mechanisms used in switches makes it possible to achieve the following table angles of rotation of the moving contacts.

Rotation angle of the moving contacts	Knob rotation angle	Possible number of knob positions:	
		the smallest	the greatest
45°	45°	2	8
90°	90°	2	4

The switches are designed with a knob fixed on the axis or a universal removable knob, which enables the moving contacts to rotate by 45° or 90° angles in relation to the zero position.

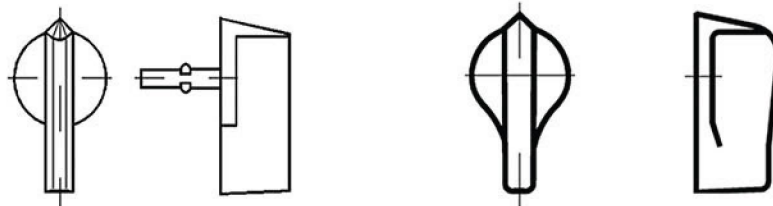


Fig. 3. Removable universal knob for RS-PMt/p.o. switches

Knob fixed on the axis for RS-PMt switches

Knobs can be inserted and removed in the zero position. Switches are adjusted to panels made of 1-6 mm thick metal sheets. Switches are equipped with a square marking plate placed after assembly on the panel. The plate indicates the number of knob positions (and axis, respectively) and indications about the type of connections.

TECHNICAL SPECIFICATIONS

Rated insulation voltage $U_i = 440$ V
 Impulse surge voltage $U_{imp} = 4$ kV
 Rated thermal current $I_{th} = 16$ A
 Making/breaking current $I_{mk} = I_{br} = 48$ A
 Rated Duty continually
 Nominal short-lived withstand current $I_{ov} = 200$ A
 Time of occurrence $T_r = 1$ sec
 Connector short-circuit making capacity $I_{sc} = 700$ A

Rated switching current (AC-3)
 Rated switching voltage
 Frequency
 Rated switching current (DC-13)
 Rated switching voltage
 Degree of contamination
 Terminals for wires with the diameter
 Compliance with standards

$I_n = 6$ A
 $U_n = 400$ V
 $f = 50-60$ Hz
 $I_d = 0.5$ A
 $U_n = 220$ V
 $\alpha = 3$
 $1 - 2.5$ mm²
 IEC/EN 60947-3

Design designation	No. of layers	Dimension L		Mass kg/pc for switches with a fixed key	Mass kg/pc for switches with a removable key
		switches with a fixed key	switches with a removable key		
		mm			
RS-1-PMt	1	43	67	0,19	0,29
RS-2-PMt	2	54	78	0,22	0,32
RS-3-PMt	3	65	89	0,25	0,35
RS-4-PMt	4	76	100	0,28	0,38
RS-5-PMt	5	87	111	0,31	0,41
RS-6-PMt	6	98	122	0,34	0,44
RS-7-PMt	7	109	133	0,37	0,47
RS-8-PMt	8	120	144	0,40	0,50
RS-9-PMt	9	131	155	0,43	0,53
RS-10-PMt	10	142	166	0,46	0,56
RS-11-PMt	11	153	177	0,49	0,59
RS-12-PMt	12	164	188	0,52	0,62
RS-13-PMt	13	175	199	0,55	0,65
RS-14-PMt	14	186	210	0,58	0,68
RS-15-PMt	15	197	221	0,61	0,71
RS-16-PMt	16	208	232	0,64	0,74

Fig. 4. Table of design types

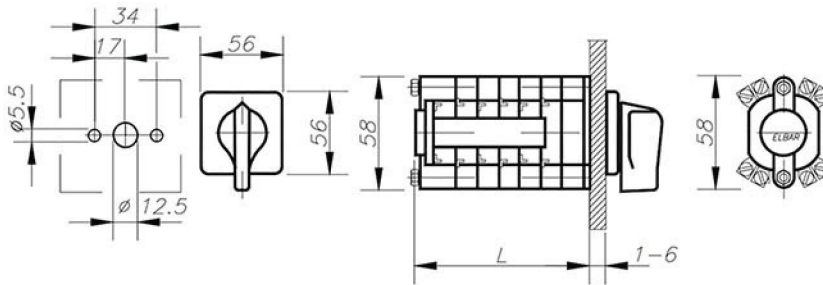


Fig. 5. External dimensions of switches with a fixed key and mounting holes.

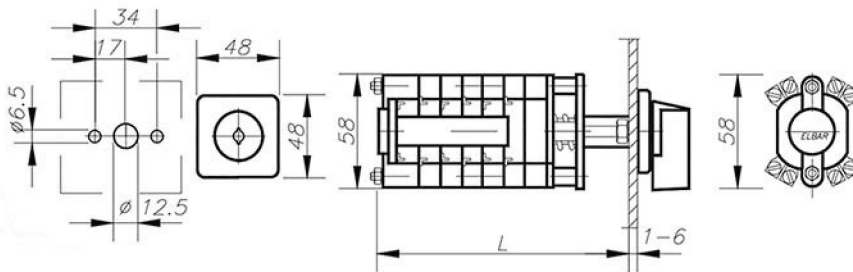
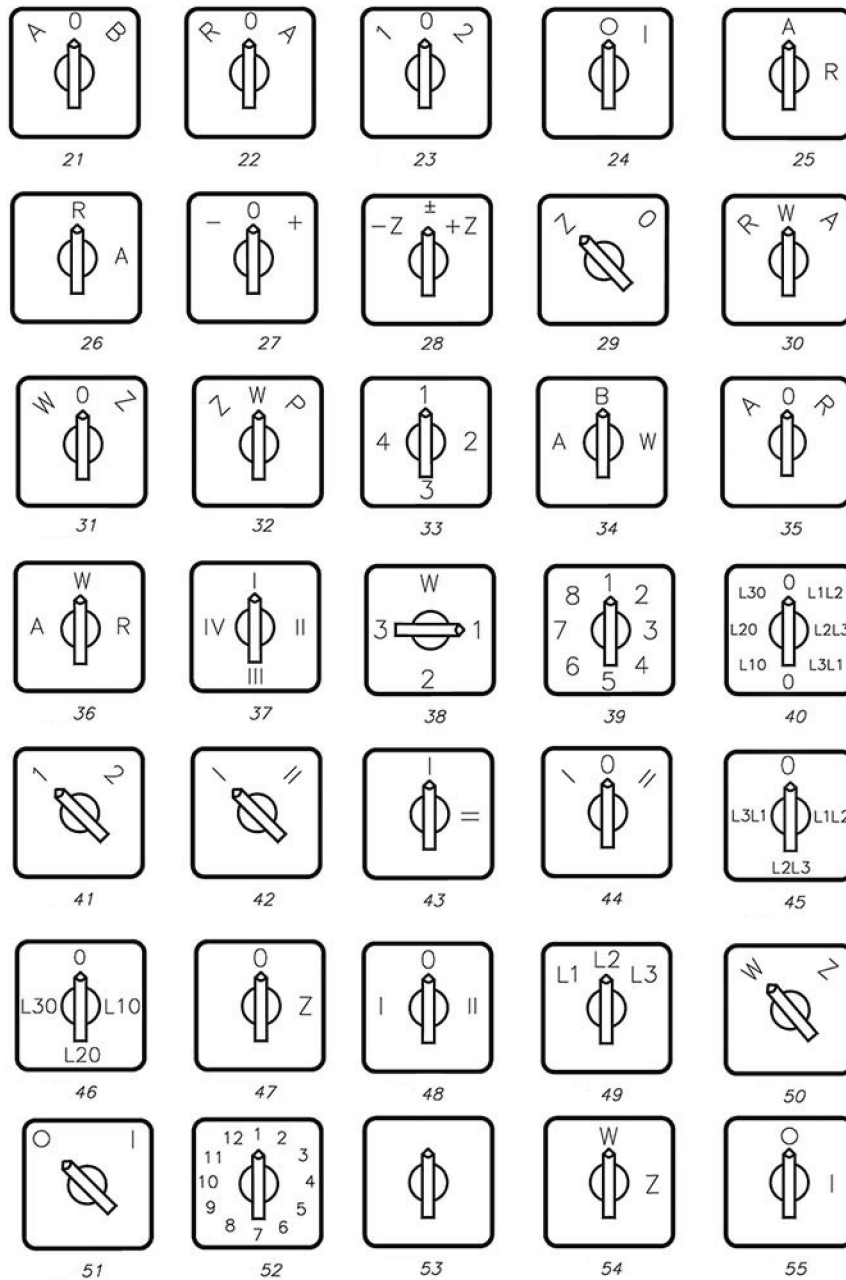


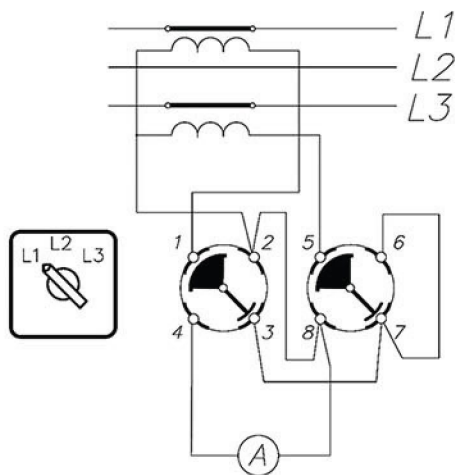
Fig. 6. External dimensions of switches with a removable key



* and others depending on the customer's needs

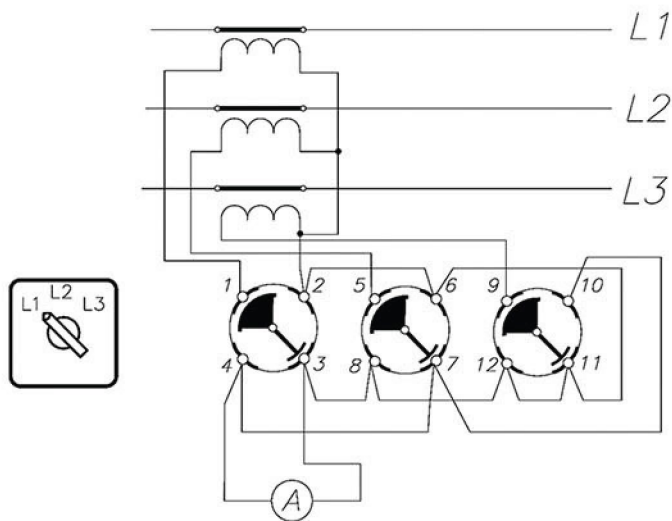
Fig. 7. Types of marking plates.

EXAMPLES OF APPLICATION SCHEMES AND SWITCH DIAGRAMS



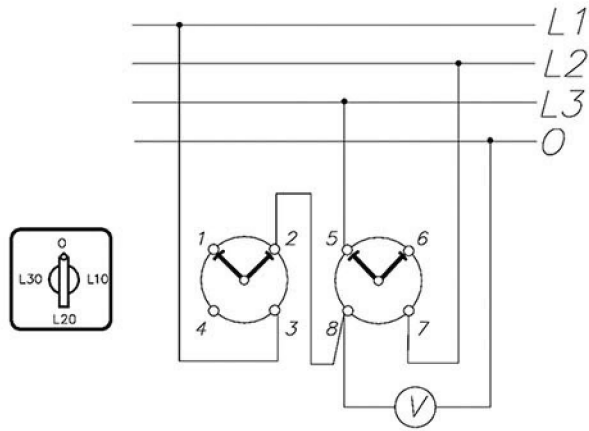
Layer designation (packages)	I	II
Dial position / Contact system		
L1		1-4
L2		1-3
L3		1-2
		5-8
		5-7
		5-6

Fig. P-I. Scheme of measurement of currents in phase wires using 2 instrument transformers, with application of RS-2-PMt switches and diagram corresponding to these switches.



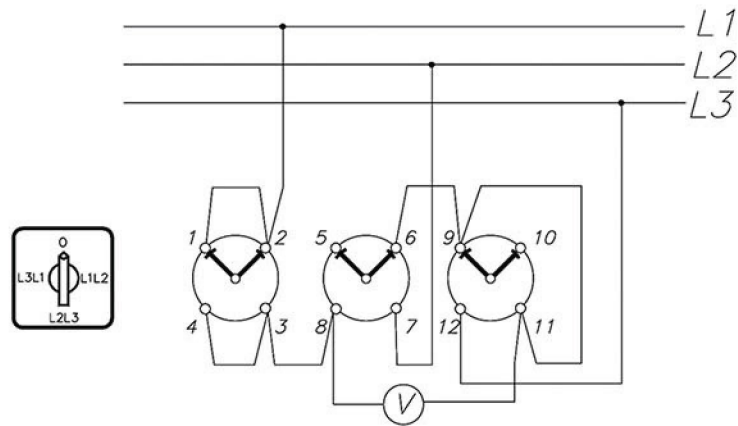
Layer designation (packages)		I	II	III
Dial position	Contact system			
L1		1-4	5-8	9-12
L2		1-3	5-7	9-11
L3		1-2	5-6	9-10

Fig. P-2. Scheme of measurement of currents in phase wires using 3 instrument transformers, with application of RS-3-PMt switches and diagram corresponding to these switches.



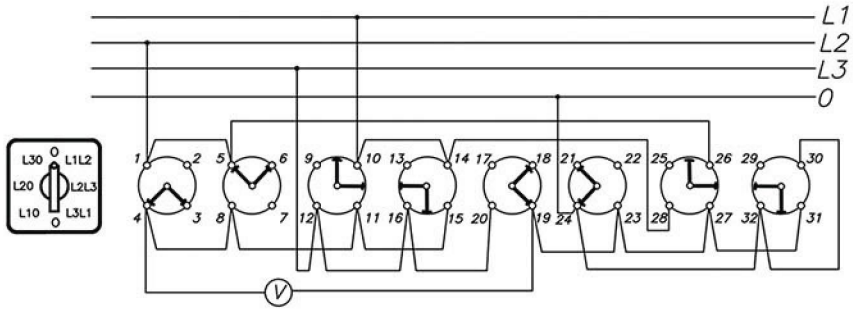
Layer designation (packages)		I	II
Dial position	Contact system		
	0		1-2 5-6
L1-0		2-3 6-7	
L2-0		3-4 7-8	
L3-0		1-4 5-7	

Fig. P-3. Scheme of measurement of phase voltages, with application of RS-2-PMt switches and diagram corresponding to these switches.



Layer designation (packages)		I	II	III	
Dial position	Contact system				
	0		1-2	5-6	9-10
	L1-L2		2-3	6-7	10-11
	L2-L3		4-3	8-7	11-12
	L3-L1		1-4	5-8	9-12

Fig. P-4. Scheme of measurement of wire voltages in a 3-phase system, with application of RS-3-PMt switches and diagram corresponding to these switches.



Layer designation (packages)	I	II	III	IV	V	VI	VII	VIII
Dial position								
0	 3-4	 5-6	—	—	 18-19	 21-24	—	—
L1-L2	—	—	 10-11	 13-16	—	—	 26-27	 29-32
L2-L3	 4-1	 6-7	—	—	 19-20	 21-22	—	—
L3-L1	—	—	 11-12	 13-14	—	—	 27-28	 29-30
0	 1-2	 7-8	—	—	 20-17	 22-23	—	—
L1-0	—	—	 9-12	 14-15	—	—	 25-26	 31-30
L2-0	 2-3	 8-5	—	—	 17-18	 23-24	—	—
L3-0	—	—	 9-10	 15-16	—	—	 25-26	 31-32

Fig. P-5. Scheme of measurement of phase and wire voltages, with application of RS-8-PMt switches and diagram corresponding to these switches.

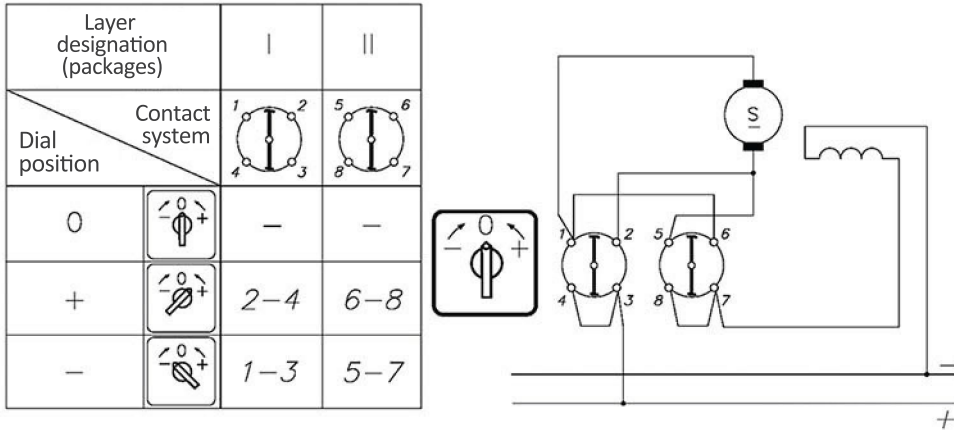


Fig. P-6 (right) and Fig. P-29a (left). Scheme of the control of engine to the valve drive, with application of RS-2-PMt switches and diagram corresponding to these switches.

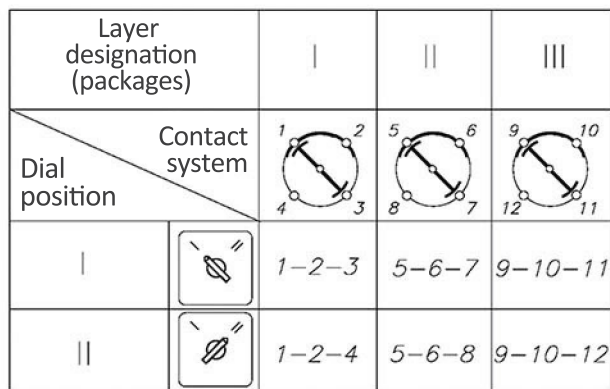


Fig. P-I / 62. Diagram of RS-3-PMt 2-position switch.

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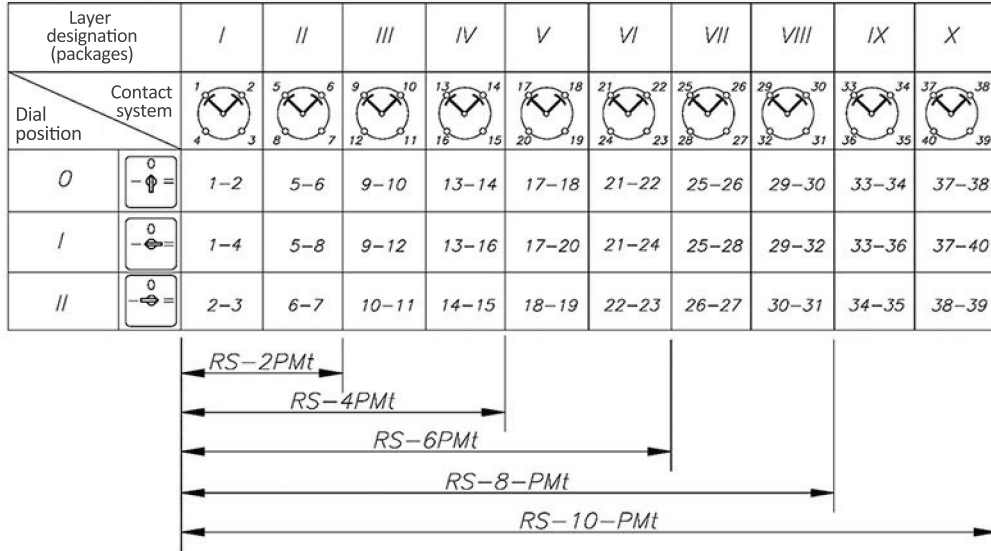


Fig. P-17. Diagram of 3-position switch RS-10-PMt.

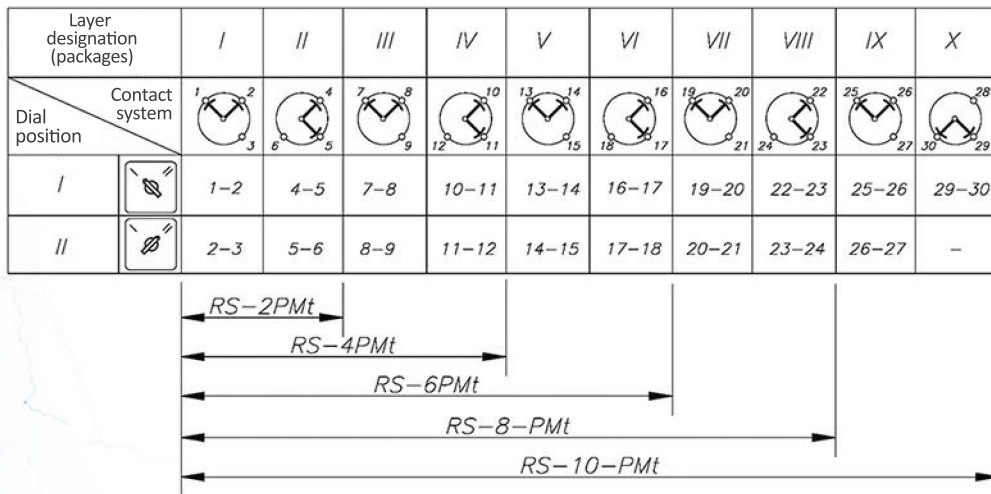


Fig. P-19. Diagram of 2-position switch RS-10-PMt.

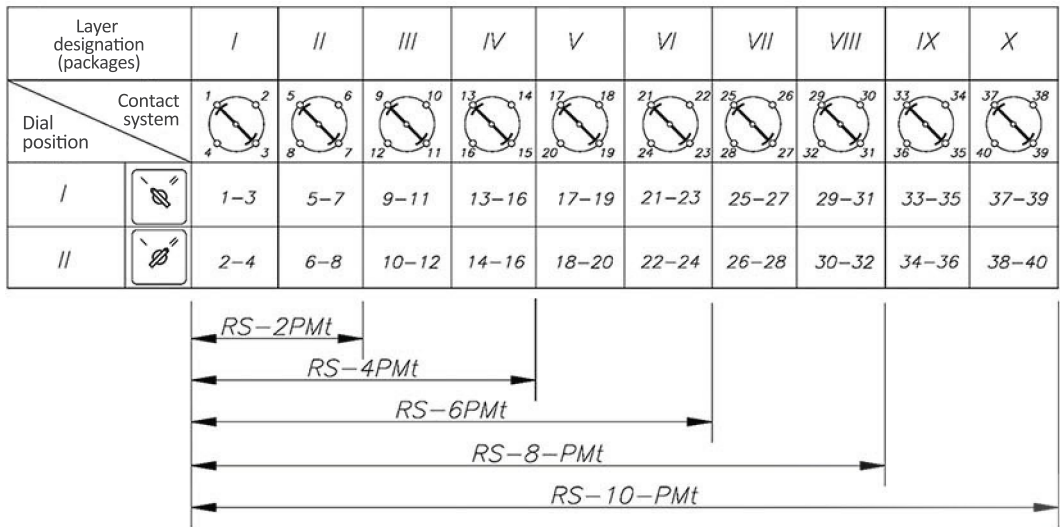


Fig. P-20. Diagram of 2-position switch RS-10-PMt.

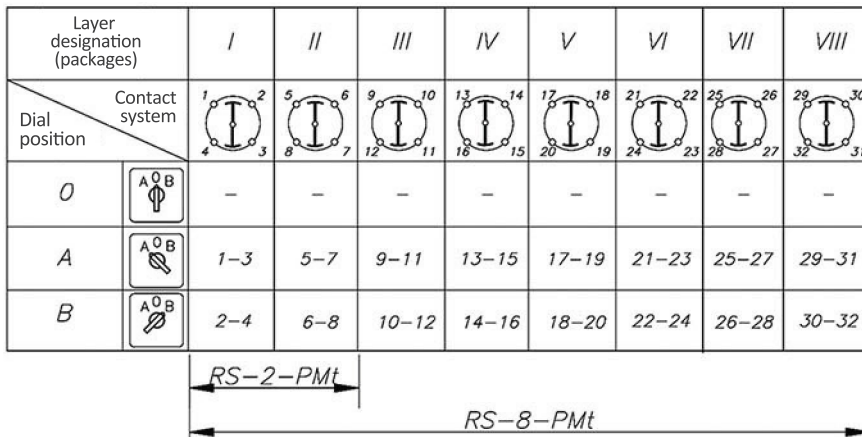


Fig. P-22. Diagram of 3-position switch RS-8-PMt.

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Layer designation (packages)		I	II	III	IV	V	VI	VII	VIII
Dial position	Contact system								
	0		-	-	-	-	-	-	-
I		1-3	4-5	7-9	10-11	13-15	16-17	19-21	22-23
II		1-2	5-6	7-8	11-12	13-14	17-18	19-20	23-24

Fig. P-23. Diagram of 3-position switch RS-8-PMt.

Layer designation (packages)		I	II	III	IV	V	VI
Dial position	Contact system						
	0 stable		-	-	-	-	-
- returned		2-4	6-8	10-12	14-16	18-20	22-24
+ returned		1-3	5-7	9-11	13-15	17-19	21-23

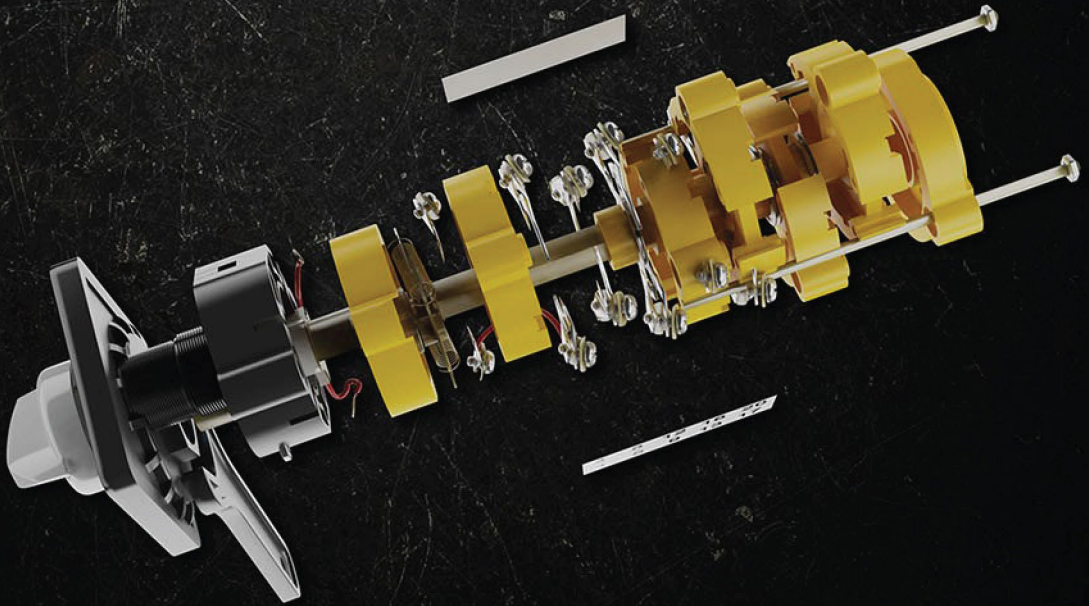
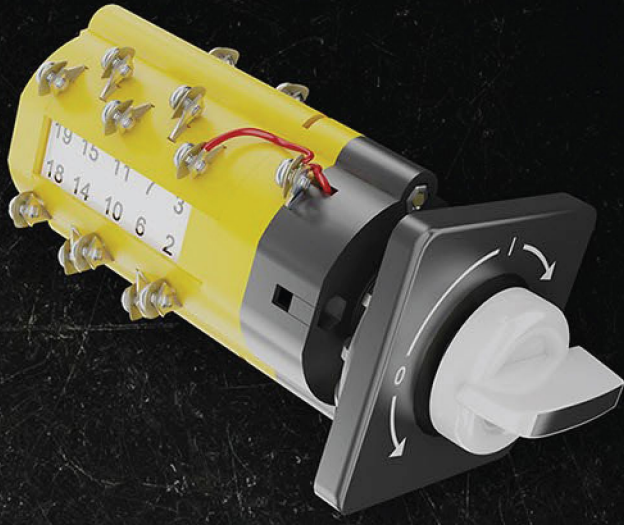
Fig. P-29. Diagram of 3-position switch RS-6-PMt.



SECTION III

Sod-SMt CONTROL SWITCHES and
Sod-KMt DISCREPANCY SWITCHES





Sod-SMt / Sod-KMt multi-layered control and discrepancy switches with optical signalling for panel holes with a diameter of 22.5 mm.

APPLICATION

Control and discrepancy panel switches are used to remotely control low and high voltage connectors while optically signalling the state of the contact position (on or off). The control switches are additionally used in control systems in various industrial equipment. Discrepancy switches are used to indicate the position of the high-voltage connectors and signal activities of any kind of technological equipment.

TECHNICAL SPECIFICATIONS

Rated insulation voltage	$U_i = 440 \text{ V}$	Rated switching voltage	$U_s = 400 \text{ V}$
Impulse surge voltage	$U_{imp} = 4 \text{ kV}$	Frequency	$f = 50-60 \text{ Hz}$
Rated thermal current	$I_{th} = 16 \text{ A}$	Rated switching current (DC-13)	$I_{sc} = 0.5 \text{ A}$
Making/breaking current	$I_{mk} = I_{br} = 48 \text{ A}$	Rated switching voltage	$U_s = 220 \text{ V}$
Rated short-time withstand current	$I_{st} = 200 \text{ A}$	Continuous rated duty	continually
Time of occurrence	$T_s = 1 \text{ sec}$	Degree of contamination	= 3
Connector short-circuit making capacity	$I_{sc} = 700 \text{ A}$	Terminals for wires with the diameter	1 - 2.5 mm ²
Rated switching current (AC-3)	$I = 6 \text{ A}$	Compliance with standards	IEC/EN 60947-3

NOTE:

Orders should specify the optical signalling supply voltage.
LED Lighting 24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC, 230 VAC

Design designation	No. of layers	L dimension mm	Weight kg/pc.
Sod-1-SMt (KMI)	1	78	0.32
Sod-2-SMt (KMI)	2	89	0.35
Sod-3-SMt (KMI)	3	100	0.38
Sod-4-SMt	4	111	0.42
Sod-5-SMt	5	122	0.45
Sod-6-SMt	6	133	0.49
Sod-7-SMt	7	144	0.52
Sod-8-SMt	8	155	0.56
Sod-9-SMt	9	166	0.59
Sod-10-SMt	10	177	0.63

Fig. 1. Table of design types of Sod-SMt controller switches and Sod-KMt discrepancy switches for a panel hole with a diameter of 22.5 mm.

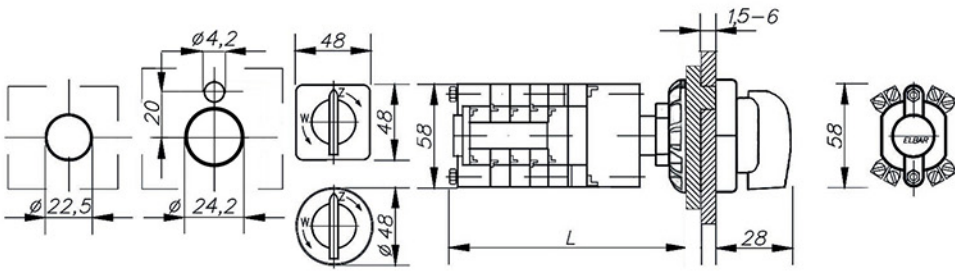


Fig. 2. Panel hole

Fig. 3. External dimensions of Sod-SMt control switches and Sod-KMt discrepancy switches.

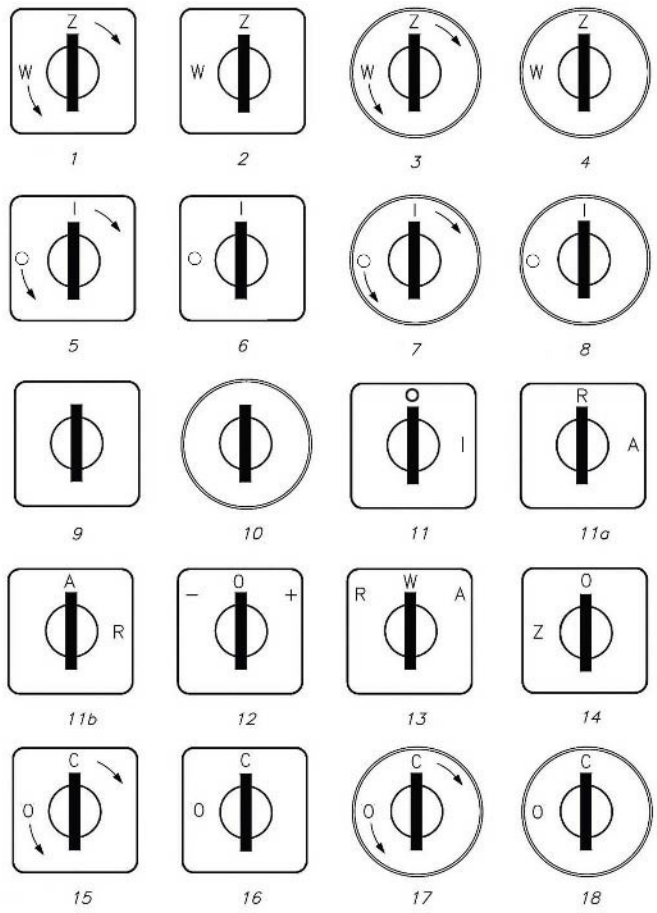
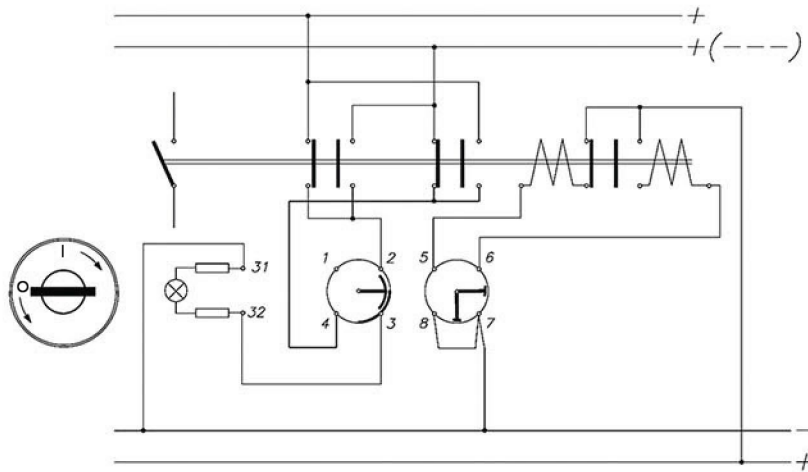
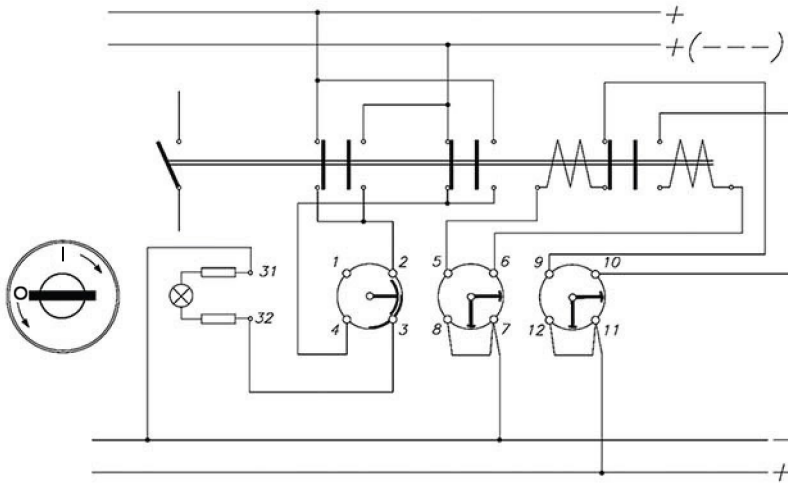


Fig. 4. Types of marking plates of Sod-SMt control switches and Sod-KMt discrepancy switches.



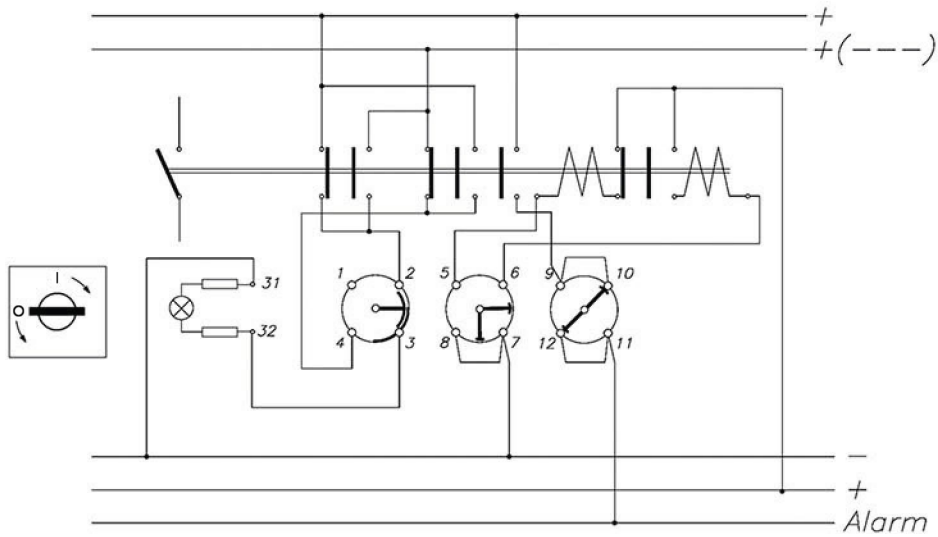
Layer designation (packages)			I	II
Dial position	Contact system			
	OFF		—	2-3
To turn OFF		—	2-3	6-7
ON		—	3-4	—
To turn ON		—	3-4	5-8

Fig. 5. Scheme of unipolar control and signalling of the disconnector or on-off switch contact position, without automatic tripping, with application of Sod-2-SMt control switches and diagram corresponding to these control switches.



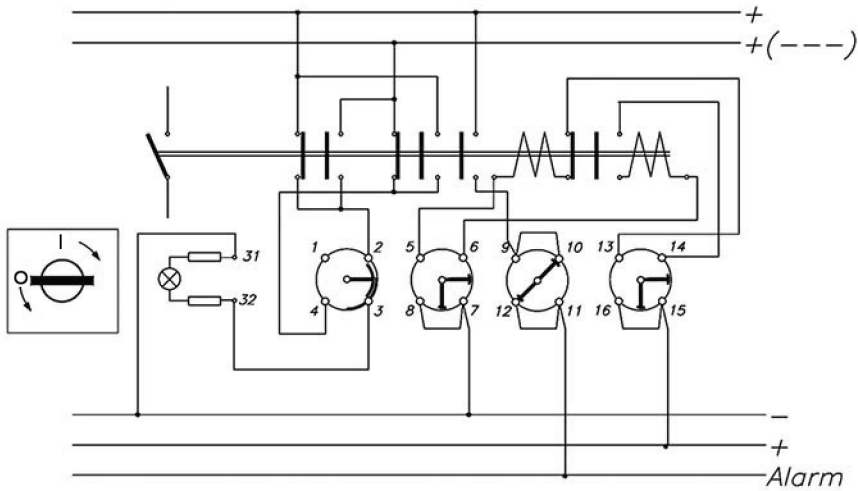
Layer designation (packages)			I	II	III
Dial position	Contact system				
	OFF		—	2-3	—
To turn OFF		—	2-3	6-7	10-11
ON		—	3-4	—	—
To turn ON		—	3-4	5-8	9-12

Fig. 6. Scheme of bipolar control and signalling of the disconnector or on-off switch contact position, without automatic tripping, with application of Sod-3-SMt control switches and diagram corresponding to these control switches.



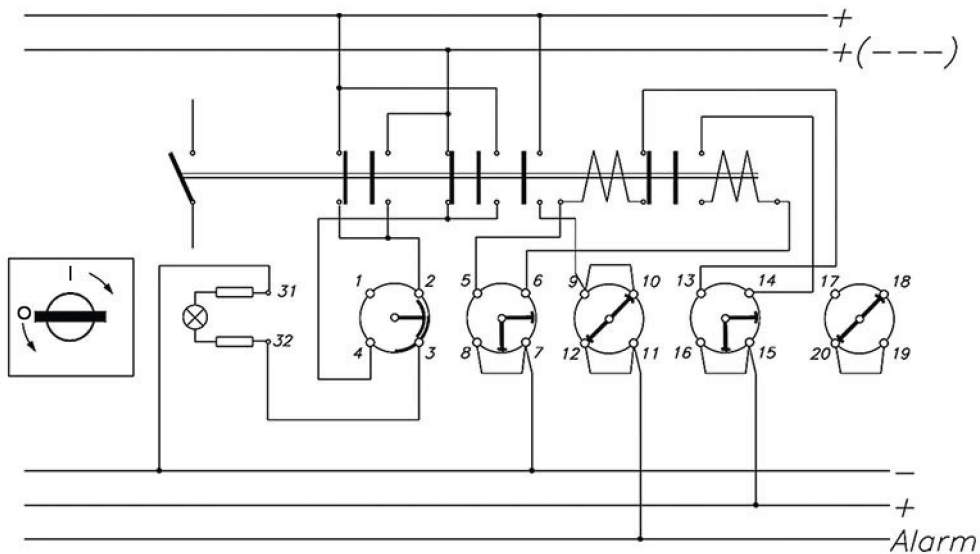
Layer designation (packages)		I	II	III	
Dial position	Contact system				
	OFF		—	2-3	—
To turn OFF		—	2-3	6-7	—
ON		—	3-4	—	9-11
To turn ON		—	3-4	5-8	—

Fig. 7. Scheme of unipolar control and signalling of the on-off switch contact position, with automatic tripping, with application of Sod-3-SMt control switches and diagram corresponding to these control switches.



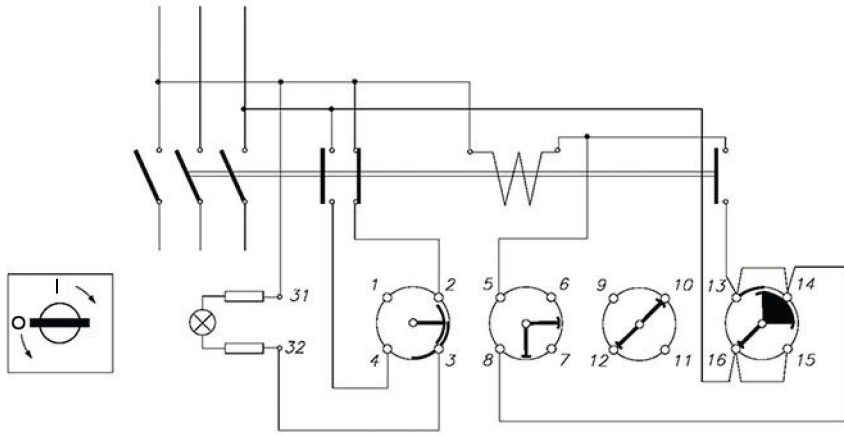
Layer designation (packages)			I	II	III	IV
Dial position	Contact system					
	OFF		-	2-3	-	10-12
To turn OFF		-	2-3	6-7	-	14-15
ON		-	3-4	-	9-11	-
To turn ON		-	3-4	5-8	-	13-16

Fig. 8. Scheme of bipolar control and signalling of the on-off switch contact position, with automatic tripping, with application of Sod-4-SMt control switches and diagram corresponding to these control switches.



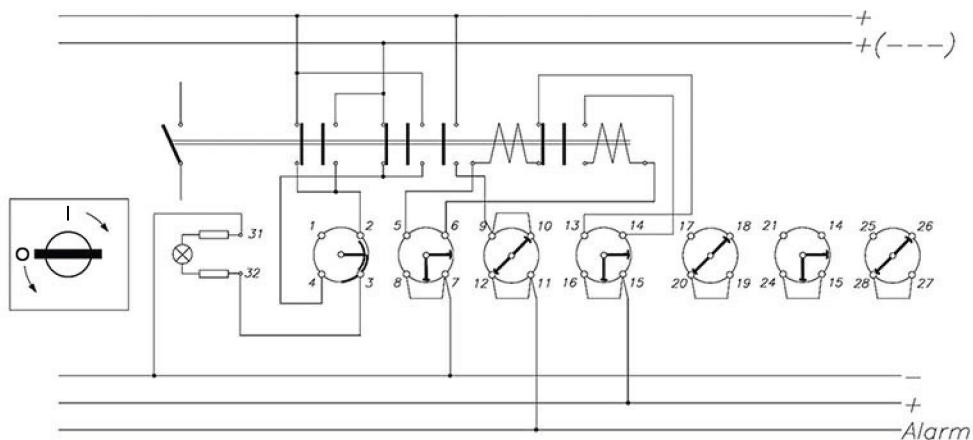
Layer designation (packages)			I	II	III	IV	V
Dial position	Contact system						
	OFF		2-3	-	10-12	-	18-20
To turn OFF		-	2-3	6-7	-	14-15	-
ON		-	3-4	-	9-11	-	17-19
To turn ON		-	3-4	5-8	-	13-16	-

Fig. 9. Scheme of bipolar control and signalling of the on-off switch contact position, with automatic tripping, with application of Sod-5-SMt control switches and diagram corresponding to these control switches.



Layer designation (packages)			I	II	III	IV
Dial position	Contact system					
	OFF		—	2-3	—	10-12 14-16
To turn OFF		—	2-3	6-7	—	—
ON		—	3-4	—	9-11	13-15
To turn ON		—	3-4	5-8	—	14-16 13-15

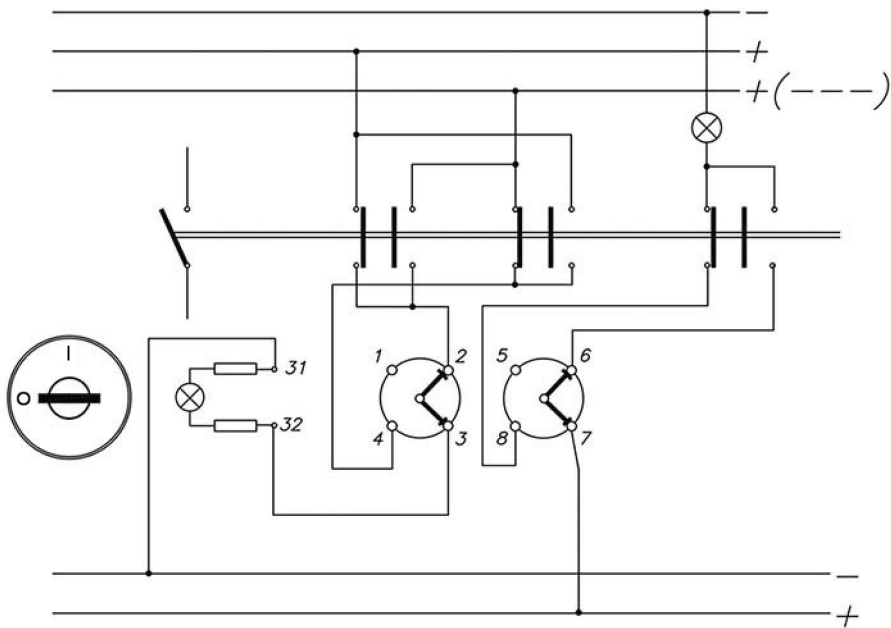
Fig. 10. Scheme of control and signalling of the contactor contact position, with application of Sod-4-SMt control switches and diagram corresponding to these control switches.



Layer designation (packages)			I	II	III	IV	V	VI	VII
Dial position	Contact system								
	OFF		-	2-3	-	10-12	-	18-20	-
To turn OFF		-	2-3	6-7	-	14-15	-	22-23	-
ON		-	3-4	-	9-11	-	17-19	-	25-27
To turn ON		-	3-4	5-8	-	13-16	-	21-24	-

Fig. 11. Scheme of bipolar control and signalling of the on-off switch contact position, with automatic tripping, with application of Sod-7-SMt control switches and diagram corresponding to these control switches.

EXAMPLES OF APPLICATION SCHEMES AND DISCREPANCY



Layer designation (packages)		I	II
Contact system			
Dial position			
OFF		—	2-3
ON		—	7-8

Fig. 12. Connection scheme of signalling of the connector contact position, with service command communication capability, with application of Sod-2-SMt control switches and diagram corresponding to these control switches.





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