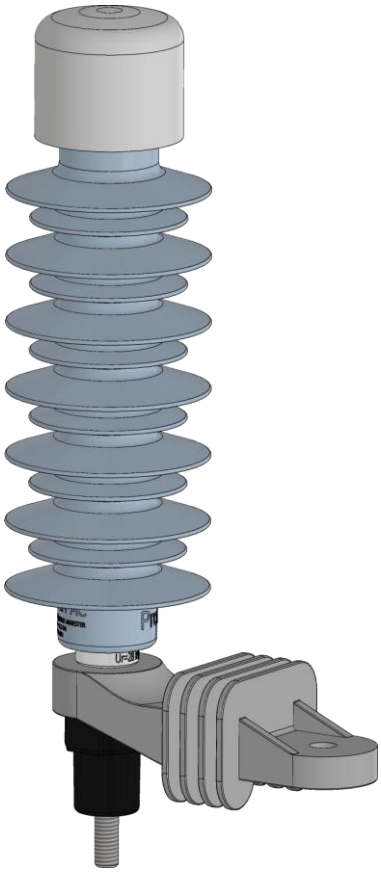
INSTALLATION AND OPERATING MANUAL FOR PROXAR-IN AC TYPE SURGE ARRESTERS



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1. GENERAL INFORMATION

Dear customer, thank you for choosing our product - the surge arrester type PROXAR-IN AC. Please read the operating manual before starting the installation. The manufacturer assumes no responsibility for incorrect installation of the product.

This manual does not cover all contingencies relating to the installation and operation manual for the arresters. If problems arise that are not covered in this manual, please contact the manufacturer. The described type of surge arresters are designed to be installed by qualified personnel with the required practice in the field of safety devices of high and medium voltage. These guidelines are drafted for such personnel and are not a substitute for proper training and experience in the safe operation of this type of devices.

WARNING

Any work on the surge arresters should be carried out on disconnected and grounded device. Follow all the rules and principles of international and national occupational health and safety.

2. DESCRIPTION OF THE PRODUCT

Surge arresters type PROXAR-IN AC are single-phase devices, designed to work both outdoors and indoors. The role of surge arresters is protection against over voltage by bringing it to the ground and reducing it. This allows other devices connected to the network are safely protected from the effects of each type of overvoltage.

Generally, arresters are constructed from a stack of variable resistance elements – i.e. zinc oxide (ZnO) resistors, placed in a durable mechanical structure made of an aramid composite terminated with electrodes and completely overmolded with an electrically insulating material, i.e. silicone. Surge arrester PROXAR-IIIN AC can be supplied with the following equipment:

Surge arrester PROXAR-IIIN AC can be supplied with the following equipment:

- Line terminal
- Ground terminal

3. ELECTRICAL DETAILS

Arrester classification according to IEC 60099-4: 2014	DH (Distribution High)
Line discharge class according to IEC 60099-4: 2009	1
System voltage (Us)	3.6 – 36 kV
Rated voltage (Ur)	1.2 – 48 kV
Nominal discharge current In 8/20 μs	10 kA
High current impulse Ihc 4/10 μs	100 kA
Rated repetitive charge transfer rating Q_{rs}	0.4 C
Rated thermal charge Q_{th}	1.1 C
Long duration current impulse resistance, 2000 μs	325 A
Short circuit rating	31.5 kA/0.2s
Maximal level of partial discharges	≤5 pC
Service conditions:	
- ambient temperature	-45 °C do +60 °C*
- altitude up to	1000 m*
- frequency	48 – 62 Hz
Mechanical strength:	
- SLL specified long-term load	210 Nm
- SSL specified short-term load	336 Nm
- torque	50 Nm

*) for higher parameters please contact with manufacturer

The nominal parameters are summarized in Table 1 below.

Table 1. **ELECTRICAL DATA**

Type PROXAR IN AC	Rated voltage Ur	Maximum operating voltage Uc	Residual voltage in [kV] pk at a specified impulse current							
			Wave 1/… µs	Wave 8/20 µs				Wave 30/60 µs		
			10kA	2.5kA	5kA	10kA	20kA	125A	250A	500A
	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV
1.2	1.2	1.0	3,55	2.8	2.9	3.2	3.5	2.3	2.3	2.4
2.2	2.2	1.8	6,49	5.0	5.4	5.9	6.5	4.2	4.3	4.5
2.5	2.5	2.0	7,38	5.7	6.1	6.8	7.4	4.7	4.9	5.1
3.0	3	2.4	8,85	6.9	7.4	8.1	8.8	5.7	5.9	6.1
4.0	4	3.2	11,68	9.2	9.8	10.8	11.8	7.6	7.8	8.2
5.0	5	4.0	14,60	11.5	12.3	13.5	14.7	9.5	9.8	10.2
6.0	6	4.8	17,52	13.8	14.7	16.2	17.7	11.4	11.7	12.2
7.0	7	5.6	20,44	16.1	17.2	18.9	20.6	13.3	13.7	14.3
8.0	8	6.4	23,29	18.4	19.7	21.6	23.5	15.2	15.7	16.3
9.0	9	7.2	26,20	20.7	22.1	24.3	26.5	17.1	17.6	18.3
10.0	10	8.0	29,11	23.0	24.6	27.0	29.4	19.0	19.6	20.4
11.0	11	8.8	32,02	25.2	27.0	29.7	32.4	20.8	21.5	22.4
12.0	12	9.6	34,93	27.5	29.5	32.4	35.3	22.7	23.5	24.5
13.0	13	10.4	37,84	29.8	31.9	35.1	38.3	24.6	25.4	26.5
14.0	14	11.2	40,75	32.1	34.4	37.8	41.2	26.5	27.4	28.5
15.0	15	12.0	43,67	34.4	36.9	40.5	44.1	28.4	29.4	30.6
16.0	16	12.8	46,58	36.7	39.3	43.2	47.1	30.3	31.3	32.6
17.0	17	13.6	49,49	39.0	41.8	45.9	50.0	32.2	33.3	34.7
18.0	18	14.4	52,40	41.3	44.2	48.6	53.0	34.1	35.2	36.7
19.0	19	15.2	55,31	43.6	46.7	51.3	55.9	36.0	37.2	38.7
20.0	20	16.0	58,22	45.9	49.1	54.0	58.9	37.9	39.2	40.8
21.0	21	16.8	61,13	48.2	51.6	56.7	61.8	39.8	41.1	42.8
22.0	22	17.6	64,04	50.5	54.1	59.4	64.7	41.7	43.1	44.8
23.0	23	18.4	66,95	52.8	56.5	62.1	67.7	43.6	45.0	46.9
24.0	24	19.2	69,86	55.1	59.0	64.8	70.6	45.5	47.0	48.9
25.0	25	20.0	72,78	57.4	61.4	67.5	73.6	47.4	48.9	51.0
26.0	26	20.8	75,69	59.7	63.9	70.2	76.5	49.3	50.9	53.0
27.0	27	21.6	78,60	62.0	66.3	72.9	79.5	51.2	52.9	55.0
28.0	28	22.4	81,51	64.3	68.8	75.6	82.4	53.1	54.8	57.1
29.0	29	23.2	84,42	66.6	71.3	78.3	85.3	55.0	56.8	59.1
30.0	30	24.0	87,33	68.9	73.7	81.0	88.3	56.9	58.7	61.2
33.0	33	26.4	96,06	75.7	81.1	89.1	97.1	62.5	64.6	67.3
36.0	36	28.8	104,80	82.6	88.5	97.2	105.9	68.2	70.5	73.4
39.0	39	31.2	113,53	89.5	95.8	105.3	114.8	73.9	76.3	79.5
42.0	42	33.6	122,26	96.4	103.2	113.4	123.6	79.6	82.2	85.6
44.0	44	35.2	128.10	101.0	108,1	118.8	129.4	83.4	86.1	89.7
45.0	45	36.0	131,00	103.3	110.6	121.5	132.4	85.3	88.1	91.7
48.0	48	38.4	139.73	110.2	117.9	129.6	141.2	91.0	94.0	97.8

There is a possibility of manufacturing surge arresters for different voltages that are not listed in the table.

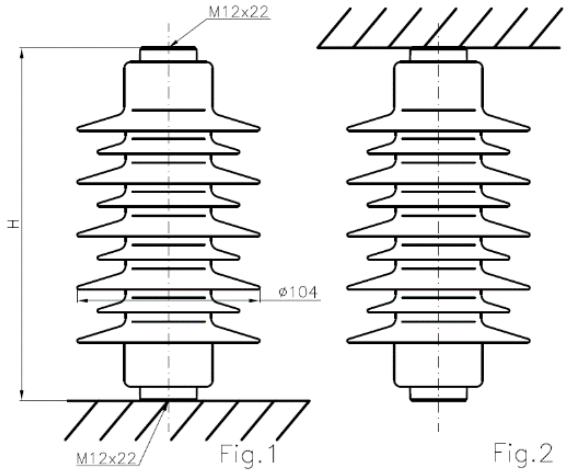

Fig.1

Fig.2

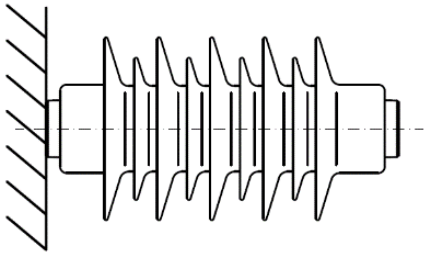
Fig.3

The figure shows the installation of surge arresters type PROXAR-IN AC The drawings No 1 – 3 presents different system of assembling surge arresters. Drawings No 1 presents vertical system of assembling. Drawings No 2 presents reverse system of assembling surge arrester. Drawings No 3 presents horizontal system of assembling. Below the

figures are presenting different options line and earth accessories available for use in surge arrester type PROXAR-IN AC. For horizontal working configuration of surge arresters is this same option like for vertical working.

Tabela 2 **TECHNICAL HOUSING DATA**

Us	Type PROXAR IN AC	External insulation		Minimal distances		H	Creepage distance	Flash-over distance	Housing number	Weight
		50 Hz wet (60s)	1.2/50 µs dry	Distance between arresters „b”	Distance between arrester and the nearest grounded structure „a”					
kV	kV	kV	kV	mm	mm	mm	mm	mm	Nr	kg
	1.2	10	21	105	58	80	127	100	01	0.27
	2.2			105	58					0.29
	2.5			105	58					0.30
	3.0			105	58					0.31
	4.0	17	35	105	58	96	143	113	02	0.47
3.6	5.0			105	59					0.48
	6.0			105	68					0.49
	7.0	26	54	105	77	118	242	137	03	0.62
	8.0			105	85					0.63
7.2	9.0			110	94					0.64
	10.0	34	70	119	103	137	338	157	04	0.72
	11.0			127	111					0.73
	12.0			136	120					0.74
	13.0	42	88	145	129	158	436	181	05	0.92
	14.0			153	137					0.93
12	15.0			162	146					0.94
	16.0	60	125	171	155	198	555	217	06	1.19
	17.0			179	163					1.20
	18.0			188	172					1.21
	19.0			197	181					1.22
	20.0			205	189					1.23
	21.0			214	198					1.24
17.5	22.0			223	207					1.25
	23.0	84	174	231	215	257	767	277	07	1.61
	24.0			240	224					1.62
	25.0			249	233					1.63
	26.0			257	241					1.64
	27.0			266	250					1.65
	28.0			275	259					1.66
	29.0			283	267					1.67
24	30.0			292	276					1.68
	33.0	105	218	318	302	308	972	331	08	2.00
	36.0			344	328					2.04
	39.0	130	270	370	354	368	1187	391	09	2.47
	42.0			396	380					2.50
	44.0			413	397					2.52
36	45.0			422	406					2.53
	48.0			448	432					2.56

Note: It is possible to make a surge arrester in a different housing than the catalog version. Us – maximum system voltage

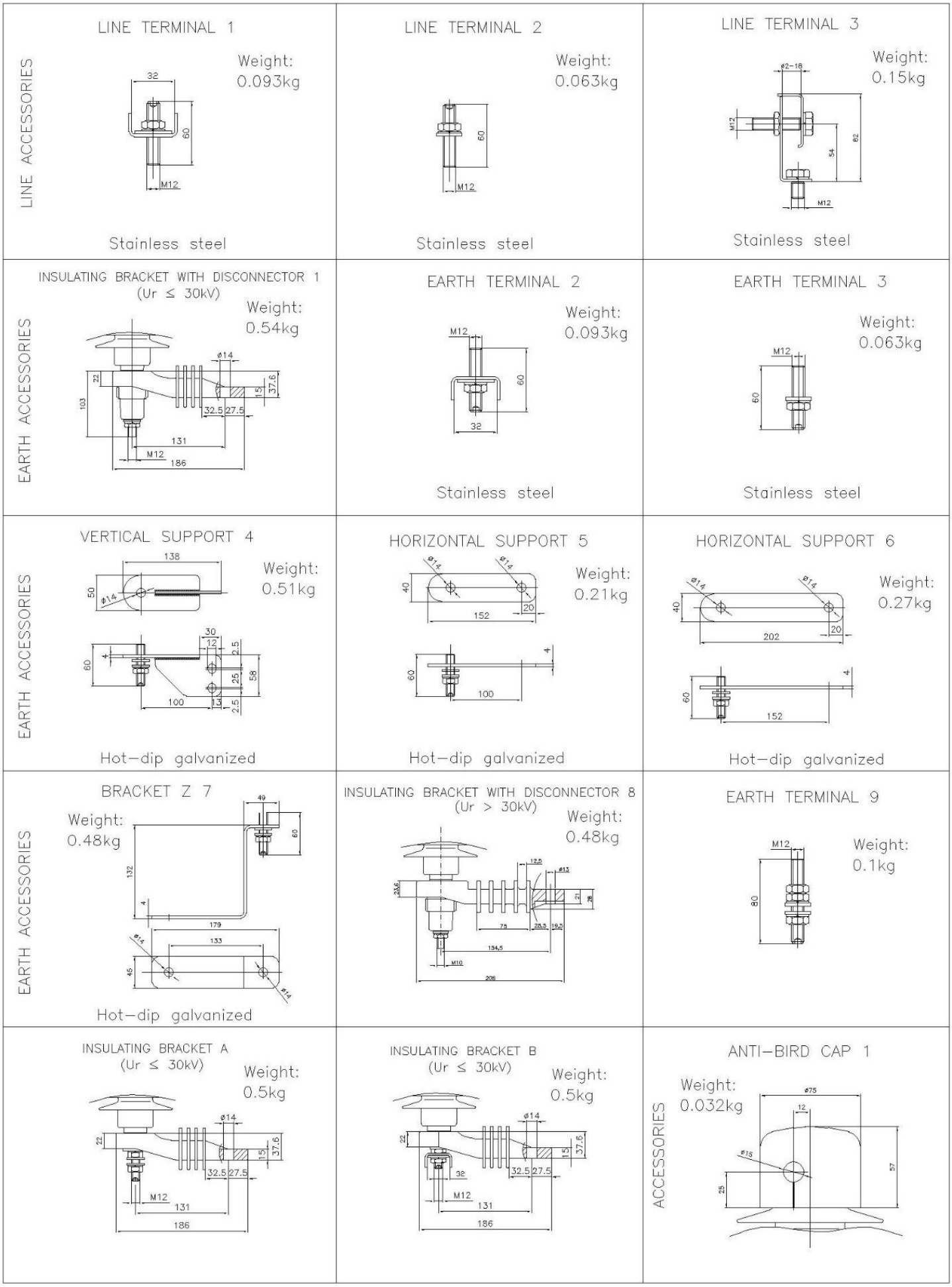

Fig.4. Equipment for surge arrester type PROXAR-IN AC

4. TRANSPORTATION, COLLECTION AND STORAGE

Surge arresters are supplied in cardboard packaging, on a pallet or in wooden boxes. Terminals or other accessories are packed separately. Equipment is shown in Figure "line and earth accessories", which is always attached to each batch of surge arresters.

Upon receipt, check number and completeness arresters. Must be stored in a dry and ventilated place, free from corrosive agents. Please observe the instructions on the cartons. Cartons can be bunk on top of another to a maximum of 3 layers. Surge arresters delivered on pallets should not be stacked.

5. INSTALATION

If damage was found during unloading or unpacking please do not hesitate to contact with the manufacturer.

Before final installation, check that the product is correct (type designation, Ur - rated voltage, Uc - continuous operating voltage, type of voltage system AC – alternate current, In – nominal discharge current, etc.). If in doubt about the appropriate model, please consult with the manufacturer's technical department (**+48 29 752 57 84**).

The method of assembling and tightening torques of screw connections are shown in Figure "Figure mounting surge arresters type PROXAR-IN AC", which is always attached to each batch of surge arresters. For screw connections used to be typical assembly tools in the form of keys and sockets using the torque wrench.

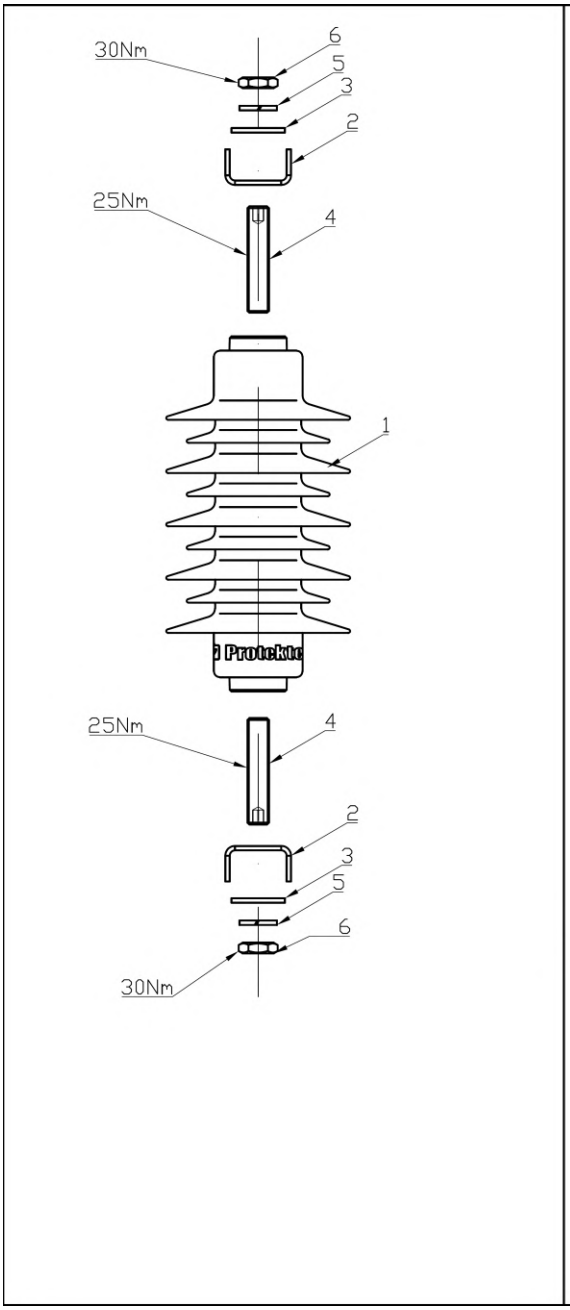

Fig. 5. Surge arrester with line terminal and earth terminal

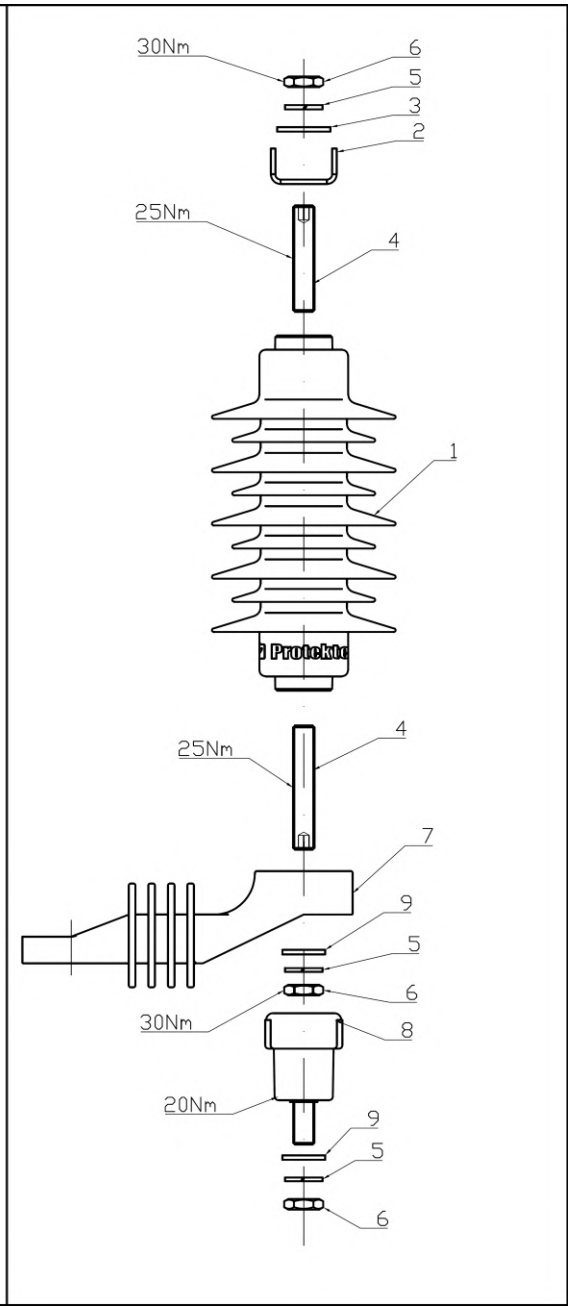

Fig. 6. Surge arrester with insulating bracket with disconnector

Installation of the earth terminal (Fig.5): Insert the pos. 4 screw into the bottom electrode of the surge arrester, apply pos.2, before applying the terminal washer pos. 3 insert the wire or lug of the cable connecting the surge arrester with the earthed structure, apply the spring washer pos. 5 and tighten with the nut pos. 6 with the given moment. All other versions of earthing terminals, vertical support, horizontal support, Z-bracket, should be assembled in the same way as

described above, taking into account minor differences resulting from the completion. The range of tightening moments of individual elements is the same as in the attached drawing No. 5.
Mounting method of the line terminal (fig.5): into the upper electrode of the surge arrester screw in the screw pos. 4 with the indicated moment, apply terminal pos. 2, before applying the terminal washer pos. 3 insert the wire or lug of the cable connecting the surge arrester with the protected object or line, apply the spring washer pos. 5 and tighten with the nut pos. 6 with the given moment. All other versions of line terminals should be made in the same way as described above, taking into account minor differences resulting from completion. The range of tightening moments of individual elements is identical to that of the attached figure 5.
The method of mounting the insulating bracket with the disconnector (fig.6): insert the screw, item 4, into the bottom electrode, slide the bracket pos. 7 and washer pos. 9 and 5 then tighten the pos. 6 with the given moment. On the protruding screw pos. 4 screw the disconnector pos. 8 with the given moment. Place the washer on the disconnector terminal pos. 9 and mount the elastic wire with the ring lug (it is recommended to use flexible copper wires), put on the spring washer pos. 5 and tighten the pos. 6 with the given moment, second the other end of the flexible wire connect to the grounded structure. Mounting method of the line terminal (Fig. 6): installation is the same as for drawing No. 5 with the difference that before connecting the cable connecting the surge arrester with the protected object / line on the cable, thread the insulation anti-bird cap through one of the holes to mount the line terminal put a cover on the protruding screw item 4.

Note: A flexible connection should always be used to connect the lower terminal of the disconnector to the grounded structure, as the terminal may fall off when the disconnector is tripped, causing a permanent break in the connection between the disconnector and the grounded structure, which will also be an indication of a fault in the surge arrester.

Lifting of surge arresters with, for example, shackles or eyelets screwed into the line terminals of surge arresters. Dimensions and weights (weight of the surge arrester without accessories) of individual surge arrester are given in table 2.
Table 2 and Figure No 7 show the recommended minimum distances that should be maintained during installation of arresters. These are the minimum distance between the axles of surge arrester and between the nearest grounded structure.
Figures 1-3 show different mounting systems for the surge arrester. Figure 1 shows vertical mounting. Figure 2 shows reverse mounting. Figure 3 shows horizontal mounting.
The assembly of surge arresters for horizontal operation is the same as for vertical installation.

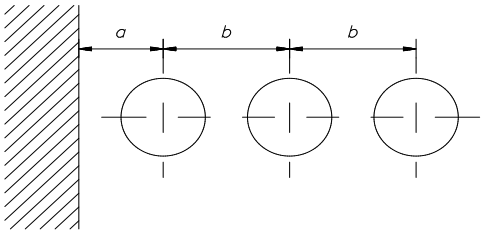

Fig. 7 Minimum mounting distances of surge arresters.

6. ELECTRICAL CONNECTIONS
It is recommended to install arresters as close as possible in relation to the protected equipment, moreover, observe the rules for the shortest possible cable connections and ground connectors for better protection of surge arresters. Connections not need be insulated unless the infrastructure requires the use of insulation. See Table 2, where they are given the minimum distance surge arrester from the grounded structure and distance between surge arresters.
First of all, make sure to perform a reliable grounding connection and then connect the surge arrester to the line. It is required that all installation works were carried out in a non-voltage protected system. The minimum section of the line conductor should be: Cu – 16 mm^2; Al – 25 mm^2. All line terminals and earth terminals are adapted to work with aluminum as well as copper elements – terminals are made of stainless steel.

In the case when the arrester is installed under tension, must be strictly followed safety guidelines for this type of work.

NOTE: Improper installation will void the warranty on the product.

7. DISASSEMBLY
When dismantling the arrester, make sure that the voltage supplied to the arrester terminal has been effectively disconnected. The line terminal must be disconnected from the line cable first. It is required that all dismantling work is performed in a voltage-free state of the protected system. During dismantling, the same safety rules as when installing the arrester must be observed.

8. OPERATION
Surge arresters type PROXAR-IN AC does not require any particular maintenance. Sufficient periodic inspection, under the inspection of other devices operating in the installation of arresters.

PROXAR surge arresters do not require cleaning of the external surface of the insulating housing during the entire period of operation. The insulating surface may appear dirty, but this does not affect the operation of the surge arrester. However, if the surge arrester were to be washed, then in addition to the usual precautions, the following should be taken into account:
- due to the soft structure of silicone insulation, do not use high-pressure water, which may damage the surface of the insulator
- use "soft" clean water without added detergents

9. IDENTIFICATION OF THE RATING PLATE
The nameplate is shown below in Figure 8 Description of the symbols (The nominal data of the surge arrester are marked by microprinting on the lower electrode):

1. Year of production
2. Serial number
3. The manufacturer's name
4. Product name
5. Basic rated parameters
6. Rated voltage Ur and the continuous operating voltage Uc in [kV]

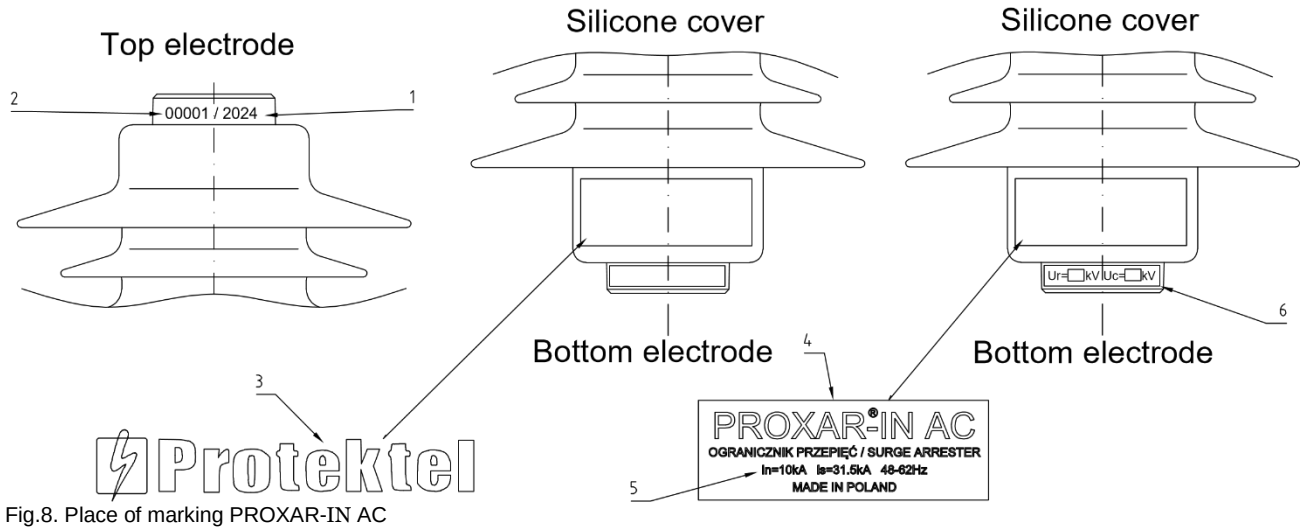

Fig.8. Place of marking PROXAR-IN AC

10. DISPOSAL OF WASTE PRODUCT - SCRAPPING
Surge arrester type PROXAR-IN AC are environmentally friendly but must be disposed of in accordance with local requirements in an environmentally friendly manner. Materials as far as possible should be recycled.
List of materials included in the arrester:

1. Silicone rubber
2. Aluminum
3. Ceramics - varistors based on zinc oxide
4. Aramide composite
5. Steel

The materials used for the production of the surge arresters does not pose a threat to human life and health.

11. AFTER-SALES SERVICE
In case the product is not delivered in good condition or would cause problems with the installation or during operation, please contact:

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