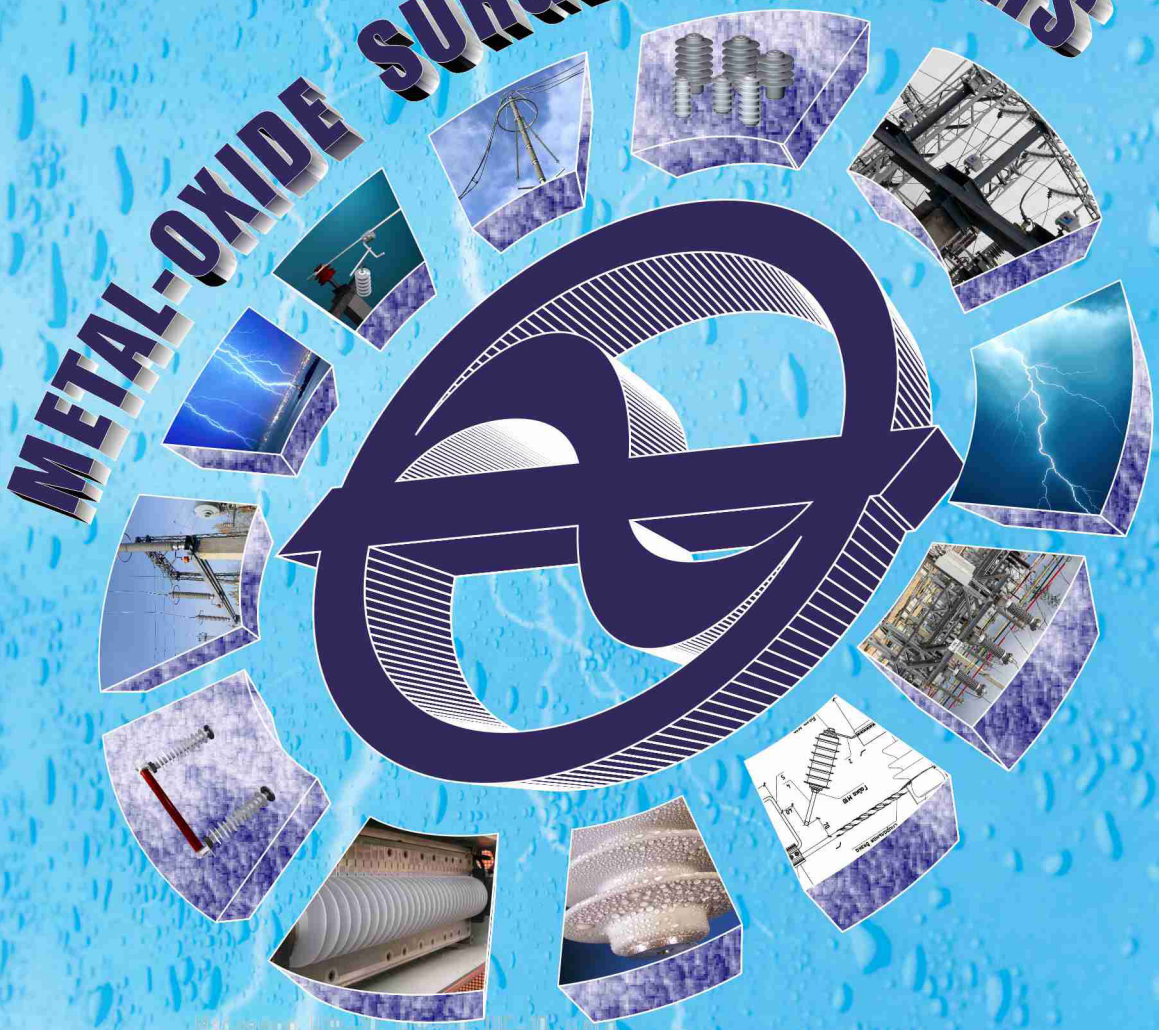
METAL-OXIDE SURGE ARRESTERS



CATALOGUE

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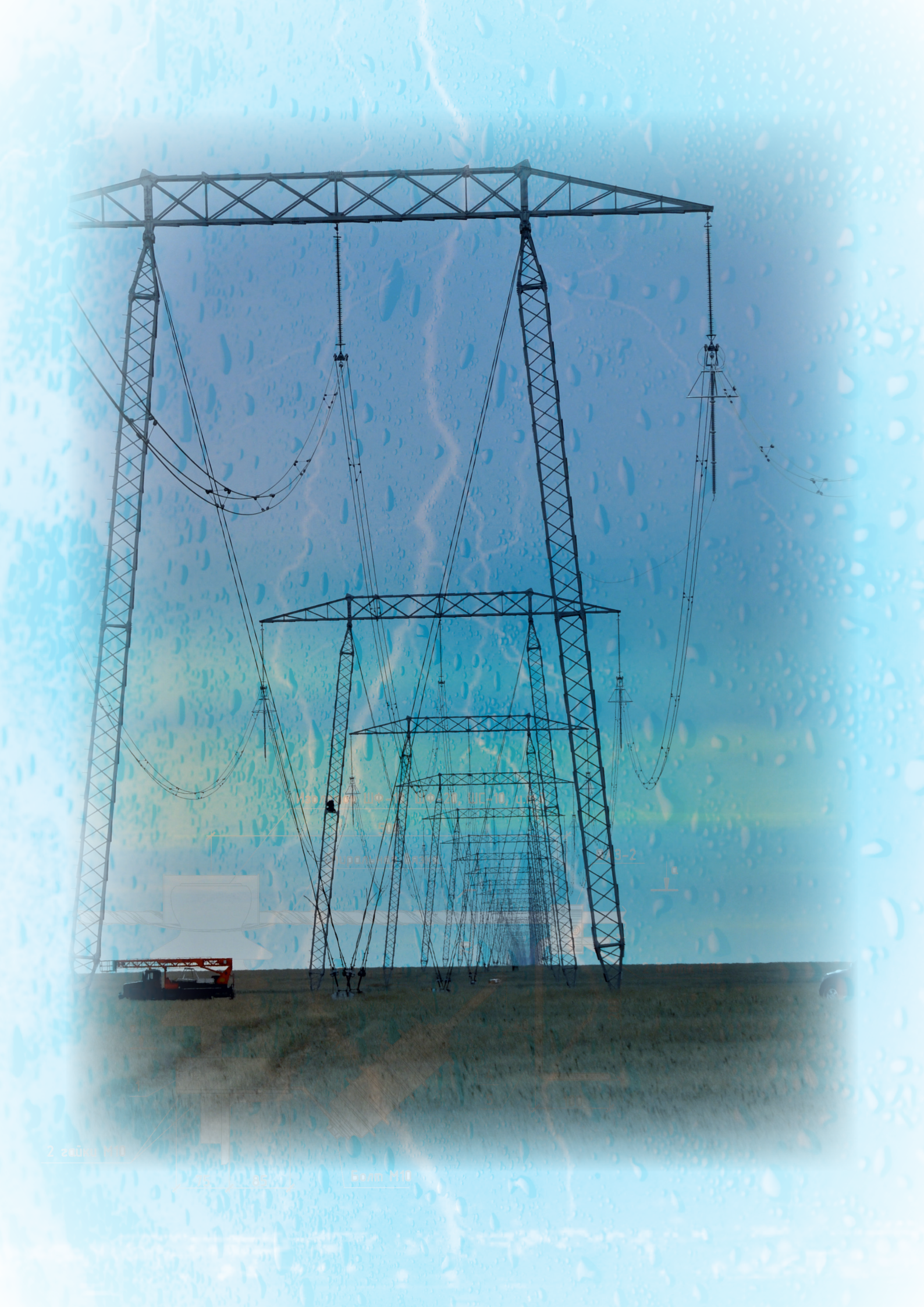


CONTENTS

ABOUT THE COMPANY

During operational process, not only the operating voltage of industrial frequency, but also all kinds of overvoltage affect the isolation of all electrical appliances. Overvoltage can be caused by switching of power grids or under the influence of lightning currents. Repeated exposure to surge can lead to rupture or closure of isolation, as well as gradual aging of isolation and premature failure of equipment. Lightning surges repeatedly exceed permissible voltage and may damage the isolation of new equipment, even with a single exposure. Limiting surge reduces the costs of transmission and distribution of electric energy. In order to limit surge level protective devices like metal-oxide surge arresters without gaps (MOSA) are used.

Modern surge arresters are the most effective means of protection against overvoltage. Surge arrester is a column highly non-linear resistors (varistors), enclosed in a sealed housing.

Surge arresters should be installed in all distribution facilities for the protection of expensive equipment - the power and measuring transformers, electric machines, etc. Sometimes nonlinear surge arresters are installed on towers or wires of overhead power lines to protect the isolation from lightning surges. The need for their use is dictated by the increasing demands on the quality of transmitted energy, reduction in number of disconnections of overhead lines and interruption in electricity supply.

Depending on the number and position of devices application of surge arresters on overhead lines allows you to:

- ensure uninterrupted power supply to consumer under any lightning effect on overhead lines;
- significantly reduce the number of trips throughout the overhead lines during protection of areas prone to lightning strikes (areas of overhead lines in the rocky soil, high intermediate flies over water reservoir, sections of overhead lines with weak isolation);
- abandon lightning protector line, where its use is not practical (glaze-ice and coastal marine areas).

The main products of scientific- production association «Polymer-Apparat» are metal-oxide surge arresters without gaps in polymeric isolation. Majority of engineering personnel of SPA «Polymer-Instrument» were involved in research and production of MOSA at the high-voltage engineering department of Saint-Petersburg State Polytechnical University in early 80-ies of past century.

Company «Polymer-Apparat» is constantly developing using the most modern technology in the production of MOSA. Currently, «Polymer-Apparat» produces surge arresters of any voltage class from 220 V to 750 kV. The scientific-production association «Polymer-Apparat» can offer protective devices of different designs: traditional tower structures, suspended design, for outdoor and indoor applications, for operation in conditions of polluted atmosphere, as well as in coastal marine regions. Surge arresters can be equipped with a diagnosis system that could allow monitoring the device state without disconnecting it from the network. Company «Polymer-Apparat» can also offer solutions for installation of surge arresters on any overhead lines of any voltage class taking features of protected objects and their operational conditions into consideration while manufacturing arresters. Our arresters are installed in all regions of Russia, Baltic countries, Ukraine, Kazakhstan, Belarus. Our surge arresters have been used to ensure uninterrupted power supply to Olympic facilities in Sochi. Also we have experience in supplying our products to Europe, South America, Asia and Africa.

1. LOW VOLTAGE ARRESTERS

- •Specification IEC 61643-1:2005
- •Low-voltage surge protective devices - class II tests.
- •Nominal discharge current - 10 кА.
- •Nominal discharge current - 10 кА.
- •Maximal discharge current - 40 кА.
- •Long Duration Current Impulse, 300 А

Characteristics are presented in the Tables 1.
Options are presented in the Tables 2.

Product Marking System

Example of arresters title: PA - LVA - 280 - ...

- Manufacturer's trademark – "Polymer-Apparat";
- Low-voltage arrester;
- Continuous voltage of arrester (MCOV), V.
- Options

Table 1

Product number	MCOV, V	Specific energy, kJ	Residual voltage 8/20 μs, kV, no more than		
			5 kA	10 kA	20 kA
PA-LVA-280	280	0.75	0.8	0.95	1.2
PA-LVA-440	440	1.10	1.2	1.45	1.75
PA-LVA-500	500	1.25	1.35	1.65	2.00
PA-LVA-660	660	1.65	1.75	2.10	2.55

Table 2

Options:	Integrated disconnector	Insulation piercing connector	Adapter	Bracket for transformer	Figure number
PA-LVA-(MCOV)	-	-		-	1
PA-LVA-(MCOV)-O	+	-		-	1
PA-LVA-(MCOV)-C1	+	+		-	2
PA-LVA-(MCOV)-C2	+	+/-	+	-	3
PA-LVA-(MCOV)-T	+	-	-	+	4

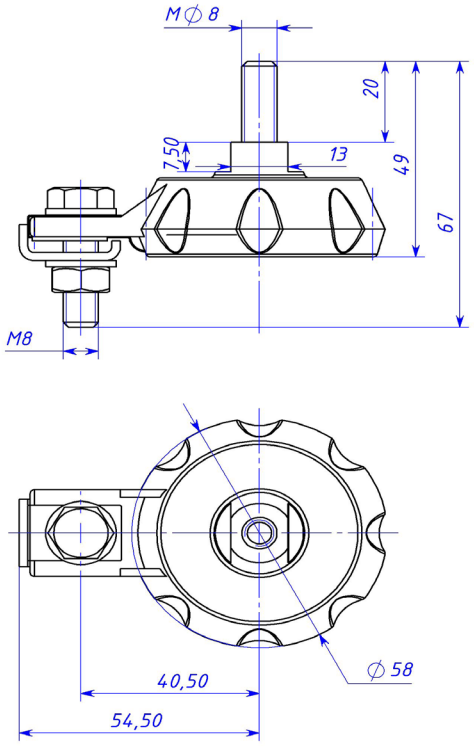
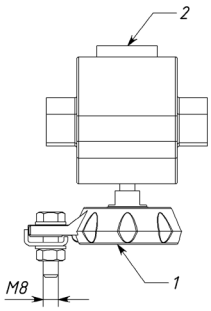


Fig.1 PA-LVA-(MCOV)



(1) - LVA;
(2) - Insulation piercing terminal;
(3) - Adapter.

Fig. 2 PA-LVA-(MCOV)-C1

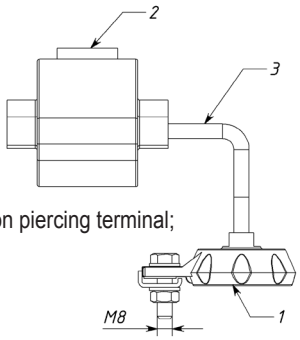


Fig. 3 PA-LVA-(MCOV)-C2

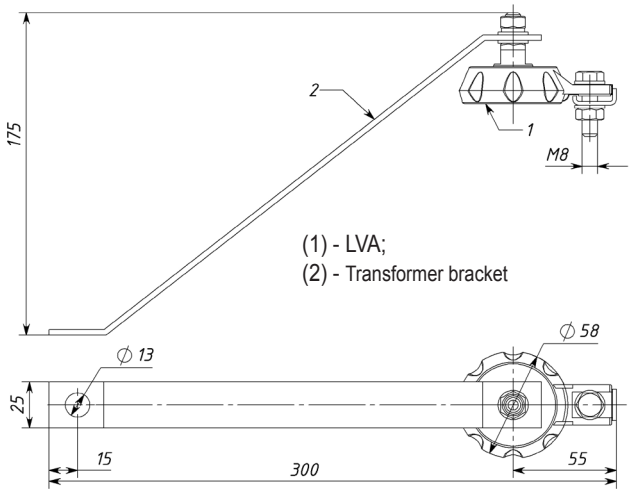


Fig. 4 PA-LVA-(MCOV)-T

2. METAL-OXIDE SURGE ARRESTERS FOR DISTRIBUTION SYSTEMS

2.1 Distribution Medium

Specification IEC 60099-4:2014 Metal-oxide surge arresters without gaps for a.c. systems.

Arrester classification – Distribution Medium.
The main parameters and characteristics:

- Rated voltage – from 3 to 54 kV;
- Continuous voltage of arrester (MCOV) – from 2.4 to 43.2 kV (rms);
- Nominal discharge current – 10000 A;
- High current impulse 4/10μs - 100 kA;
- Long Duration Current Impulse – 300 A;
- Repetitive Charge Transfer Rating Qrs – 0.4 C
- Specific energy (two impulse 2000 μs) – 2.3 kJ/kV (Ur);
- Thermal Charge Transfer Rating Qth – 1.1 C.

Operability of arresters is ensured under the following servicing conditions:

- Outdoor and indoor;
- Lower operating value of ambient temperature is -60° C;
- Upper operating value of ambient temperature is +50° C;
- Altitude above sea level is up to 1000 m.

Table 3

Rated voltage, kV	Product number*	MCOV, kV	Residual voltage, kV, no more than			
			8/20 μs 5 kA	8/20 μs 10 kA	8/20 μs 20 kA	30/60 μs 125 A
3	PA-DM-061-03	2.4	7.2	7.7	8.6	5.6
4	PA-DM-061-04	3.2	9.6	10.2	11.5	7.5
5	PA-DM-061-05	4	12	12.8	14.3	9.4
6	PA-DM-061-06	4.8	14.4	15.4	17.2	11.2
7	PA-DM-061-07	5.6	16.8	17.9	20.1	13.1
8	PA-DM-061-08	6.4	19.3	20.5	22.9	15
9	PA-DM-061-09	7.2	21.7	23	25.8	16.8
10	PA-DM-090-10	8	24.1	25.6	28.7	18.7
11	PA-DM-090-11	8.8	26.5	28.2	31.5	20.6
12	PA-DM-090-12	9.6	28.9	30.7	34.4	22.5
13	PA-DM-090-13	10.4	31.3	33.3	37.3	24.3
14	PA-DM-090-14	11.2	33.7	35.8	40.1	26.2
15	PA-DM-091-15	12	36.1	38.4	43	28.1
15	PA-DM-101-15	12	36.1	38.4	43	28.1
16	PA-DM-091-16	12.8	38.5	41	45.9	29.9
17	PA-DM-091-17	13.6	40.9	43.5	48.7	31.8
18	PA-DM-091-18	14.4	43.3	46.1	51.6	33.7
19	PA-DM-091-19	15.2	45.7	48.6	54.5	35.6
20	PA-DM-091-20	16	48.1	51.2	57.3	37.4
21	PA-DM-092-21	16.8	50.5	53.8	60.2	39.3
22	PA-DM-092-22	17.6	52.9	56.3	63.1	41.2
23	PA-DM-092-23	18.4	55.3	58.9	65.9	43
24	PA-DM-092-24	19.2	57.8	61.4	68.8	44.9
25	PA-DM-092-25	20	60.2	64	71.7	46.8
26	PA-DM-093-26	20.8	62.6	66.6	74.5	48.7
27	PA-DM-093-27	21.6	65	69.1	77.4	50.5
28	PA-DM-093-28	22.4	67.4	71.7	80.3	52.4
29	PA-DM-093-29	23.2	69.8	74.2	83.1	54.3
30	PA-DM-093-30	24	72.2	76.8	86	56.1
33	PA-DM-094-33	26.4	79.4	84.5	94.6	61.8
36	PA-DM-095-36	28.8	86.6	92.2	103	67.4
39	PA-DM-095-39	31.2	93.8	99.8	112	73
42	PA-DM-096-42	33.6	101	108	120	78.6
45	PA-DM-096-45	36	108	115	129	84.2
48	PA-DM-097-48	38.4	116	123	138	89.8
51	PA-DM-098-51	40.8	123	131	146	95.4
54	PA-DM-098-54	43.2	130	138	155	101

* housing type can be changed on request

METAL-OXIDE SURGE ARRESTERS WITHOUT GAPS FOR A.C. SYSTEMS
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•*TOV characteristics (relative to the Rated voltage) are presented in the Fig 5. below.*

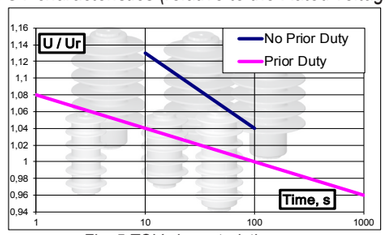

Fig. 5 TOV characteristics

Arresters are explosion-proof and withstand the following short-circuit currents without exploding:

– 20 kA (rms) during 0,2 s (no less than);
– 600 A (rms) during 2 s (no less than).

The arresters insulation is tracking-erosion stable and resistant to moisture penetration.

Permissible horizontal stress – 300 H.

Characteristics are presented in the Table 3. below.

Residual voltage, kV, no more than		Figure	H, mm	Weight, kg	Leakage distance, mm	Housing insulation	
30/60 μs 500 A	1/10 μs 10 kA					1.2/50 μs, kV	1 min 50 Hz, kV
5.9	8.4	6	109	0.8	190	60	21
7.8	11.2	6	109	0.8	190	60	21
9.8	14	6	109	0.8	190	60	21
11.7	16.7	6	109	0.8	190	60	21
13.7	19.5	6	109	0.8	190	60	21
15.6	22.3	6	109	0.8	190	60	21
17.6	25.1	6	109	0.8	190	60	21
19.5	27.9	8	163	0.8	530	85	53.6
21.5	30.7	8	163	1.3	530	85	53.6
23.4	33.5	8	163	1.3	530	85	53.6
25.4	36.3	8	163	1.3	530	85	53.6
27.3	39.1	8	163	1.3	530	85	53.6
29.3	41.9	8	200	1.5	649	105	66
29.3	41.9	7	153	1.2	265	75	27
31.2	44.6	8	163	1.3	530	85	53.6
33.2	47.4	8	200	1.5	649	105	66
35.1	50.2	8	200	1.5	649	105	66
37.1	53	8	200	1.5	649	105	66
39	55.8	8	200	1.5	649	105	66
41	58.6	8	238	1.8	785	125	78.4
42.9	61.4	8	238	1.8	785	125	78.4
44.9	64.2	8	238	1.8	785	125	78.4
46.8	67	8	238	1.8	785	125	78.4
48.8	69.8	8	238	1.8	785	125	78.4
50.7	72.6	8	275	2.2	920	144	90.7
52.7	75.3	8	275	2.2	920	144	90.7
54.6	78.1	8	275	2.2	920	144	90.7
56.6	80.9	8	275	2.2	920	144	90.7
58.5	83.7	8	275	2.2	920	144	90.7
64.4	92.1	8	313	2.5	1056	164	103
70.2	101	8	350	2.8	1192	184	116
76.1	109	8	350	2.8	1192	184	116
81.9	117	8	388	3.2	1328	204	128
87.8	126	8	388	3.2	1328	204	128
93.6	134	8	425	3.5	1463	223	140
99.5	142	8	463	3.8	1599	243	153
105	151	8	463	3.8	1599	243	153

PA-DM arresters dimensions

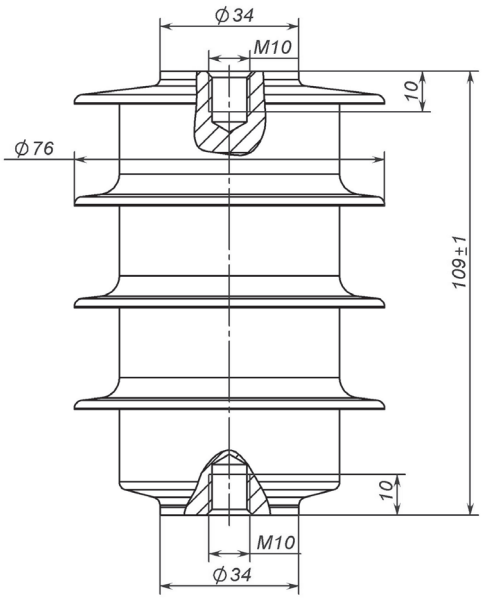

Fig. 6 PA-DM-061

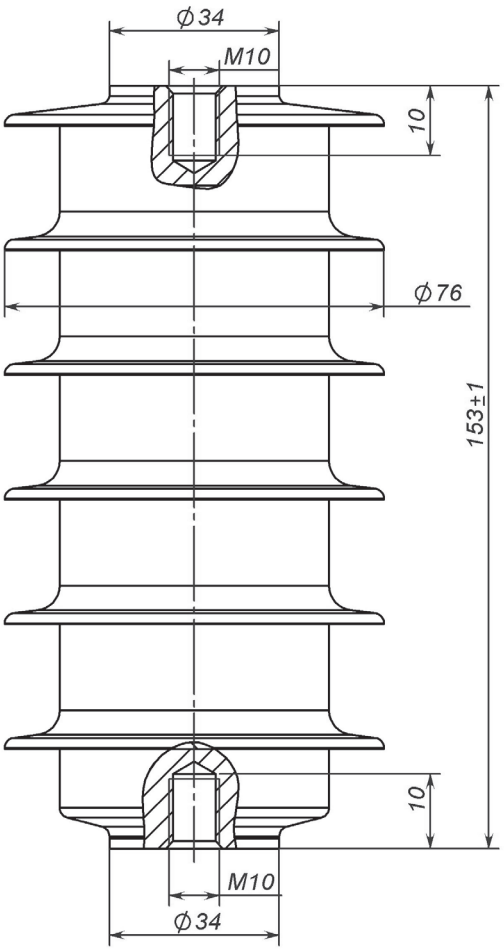

Fig. 7 PA-DM-101

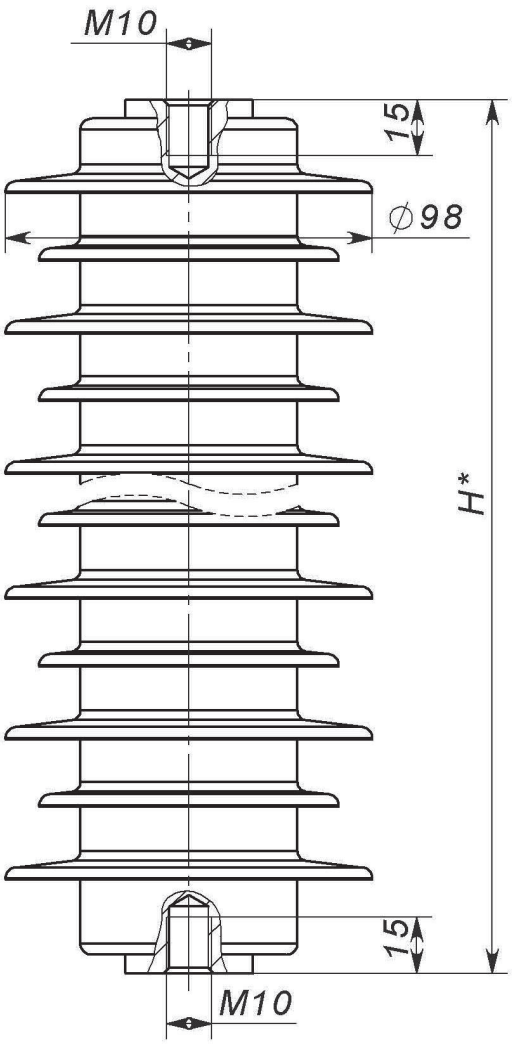

Fig. 8 PA-DM-090 ... PA-DM-098

2.2 Distribution High

Arrester classification – Distribution High.
The main parameters and characteristics:

- Rated voltage – from 3 to 54 kV;
- Continuous voltage of arrester (MCOV) – from 2.4 to 43.2 kV (rms);
- Nominal discharge current – 10000 A;
- High current impulse 4/10μs - 100 kA;
- Long Duration Current Impulse – 450 A;
- Repetitive Charge Transfer Rating Qrs – 0.5 C
- Specific energy IEC 60099-4 (two impulse 2000 μs) –3.54 kJ/kV (Ur);
- Thermal Charge Transfer Rating Qth – 1.1 C.

Operability of arresters is ensured under the following servicing conditions:

- Outdoor and indoor;
- Lower operating value of ambient temperature is -60° C;
- Upper operating value of ambient temperature is +50° C;
- Altitude above sea level is up to 1000 m.

Table 4

Rated voltage, kV	Product number*	MCOV, kV	Residual voltage, kV, no more than			
			8/20 μs 5 kA	8/20 μs 10 kA	8/20 μs 20 kA	30/60 μs 125 A
3	PA-DH-062-03	2.4	7.1	7.44	8	5.4
4	PA-DH-062-04	3.2	9.4	9.92	10.7	7.2
5	PA-DH-062-05	4	11.8	12.4	13.4	9.1
6	PA-DH-062-06	4.8	14.1	14.9	16.1	10.9
7	PA-DH-062-07	5.6	16.5	17.4	18.7	12.7
8	PA-DH-062-08	6.4	18.8	19.8	21.4	14.5
9	PA-DH-062-09	7.2	21.2	22.3	24.1	16.3
9	PA-DH-063-09	7.2	21.2	22.3	24.1	16.3
10	PA-DH-062-10	8	23.6	24.8	26.8	18.1
11	PA-DH-102-11	8.8	25.9	27.3	29.5	19.9
12	PA-DH-102-12	9.6	28.3	29.8	32.1	21.7
13	PA-DH-102-13	10.4	30.6	32.2	34.8	23.5
14	PA-DH-102-14	11.2	33	34.7	37.5	25.3
14	PA-DH-103-14	11.2	33	34.7	37.5	25.3
15	PA-DH-102-15	12	35.3	37.2	40.2	27.2
16	PA-DH-102-16	12.8	37.7	39.7	42.9	29
17	PA-DH-151-17	13.6	40.1	42.2	45.5	30.8
18	PA-DH-151-18	14.4	42.4	44.6	48.2	32.6
19	PA-DH-151-19	15.2	44.8	47.1	50.9	34.4
20	PA-DH-151-20	16	47.1	49.6	53.6	36.2
21	PA-DH-152-21	16.8	49.5	52.1	56.2	38
22	PA-DH-152-22	17.6	51.8	54.6	58.9	39.8
23	PA-DH-152-23	18.4	54.2	57	61.6	41.6
24	PA-DH-203-24	19.2	56.5	59.5	64.3	43.4
25	PA-DH-203-25	20	58.9	62	67	45.3
26	PA-DH-203-26	20.8	61.3	64.5	69.6	47.1
27	PA-DH-204-27	21.6	63.6	67	72.3	48.9
28	PA-DH-204-28	22.4	66	69.4	75	50.7
29	PA-DH-204-29	23.2	68.3	71.9	77.7	52.5
30	PA-DH-204-30	24	70.7	74.4	80.4	54.3
33	PA-DH-204-33	26.4	77.7	81.8	88.4	59.7
36	PA-DH-351-36	28.8	84.8	89.3	96.4	65.2
39	PA-DH-351-39	31.2	91.9	96.7	105	70.6
42	PA-DH-351-42	33.6	99	104	113	76
45	PA-DH-351-45	36	106	112	121	81.5
48	PA-DH-351-48	38.4	113	119	129	86.9
51	PA-DH-351-51	40.8	120	127	137	92.3
54	PA-DH-351-54	43.2	127	134	145	97.8

* housing type can be changed on request

METAL-OXIDE SURGE ARRESTERS WITHOUT GAPS FOR A.C. SYSTEMS
JSC «POLYMER-APPARAT»

•*TOV characteristics (relative to the Rated voltage) are presented in the Fig 5. below.*

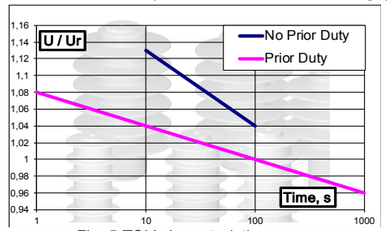

Fig. 5 TOV characteristics

Arresters are explosion-proof and withstand the following short-circuit currents without exploding:

– 20 kA (rms) during 0,2 s (no less than);
– 600 A (rms) during 2 s (no less than).

The arresters insulation is tracking-erosion stable and resistant to moisture penetration.

Permissible horizontal stress – 300 H.

Characteristics are presented in the Tables 4. below.

Residual voltage, kV, no more than		Figure	H, mm	Weight, kg	Leakage distance, mm	Housing insulation	
30/60 μs 500 A	1/10 μs 10 kA					1.2/50 μs, kV	1 min 50 Hz, kV
5.65	8.1	9	141	1.4	230	74.2	32.9
7.5	10.8	9	141	1.4	230	74.2	32.9
9.4	13.5	9	141	1.4	230	74.2	32.9
11.3	16.2	9	141	1.4	230	74.2	32.9
13.2	18.9	9	141	1.4	230	74.2	32.9
15.1	21.6	9	141	1.4	230	74.2	32.9
17	24.3	9	141	1.4	230	74.2	32.9
17	24.3	12	120	1.5	320	60	27
18.8	27	9	141	1.4	230	74.2	32.9
20.7	29.7	10	191	1.9	310	101	44.6
22.6	32.4	10	191	1.9	310	101	44.6
24.5	35.1	10	191	1.9	310	101	44.6
26.4	37.8	10	191	1.9	310	101	44.6
26.4	37.8	12	180	2.2	443	90	40
28.3	40.5	10	191	1.9	310	101	44.6
30.2	43.3	10	191	1.9	310	101	44.6
32	46	11	205	2.7	595	108	47.8
33.9	48.7	11	205	2.7	595	108	47.8
35.8	51.4	11	205	2.7	595	108	47.8
37.7	54.1	11	205	2.7	595	108	47.8
39.6	56.8	11	225	2.9	615	118	52.5
41.5	59.5	11	225	2.9	615	118	52.5
43.4	62.2	11	225	2.9	615	118	52.5
45.2	64.9	11	261	3.3	778	137	60.9
47.1	67.6	11	261	3.3	778	137	60.9
49	70.3	11	261	3.3	778	137	60.9
50.9	73	11	290	3.5	807	153	67.7
52.8	75.7	11	290	3.5	807	153	67.7
54.7	78.4	11	290	3.5	807	153	67.7
56.5	81.1	11	290	3.5	807	153	67.7
62.2	89.2	11	390	3.5	807	205	91.0
67.9	97.3	11	456	6.0	1060	240	106
73.5	105	11	456	6.0	1060	240	106
79.2	114	11	456	6.0	1060	240	106
84.8	122	11	456	6.0	1060	240	106
90.5	130	11	456	6.0	1060	240	106
96.1	138	11	456	6.0	1060	240	106
102	146	11	456	6.0	1060	240	106

PA-DH arrestes dimensions

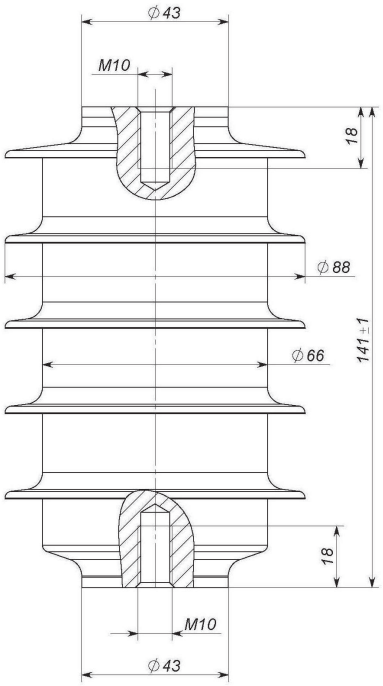

Fig. 9 PA-DH-062

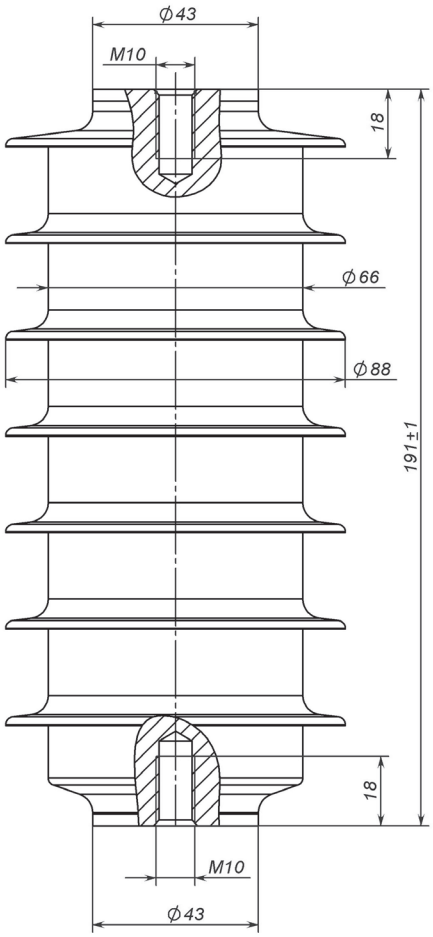

Fig. 10 PA-DH-102

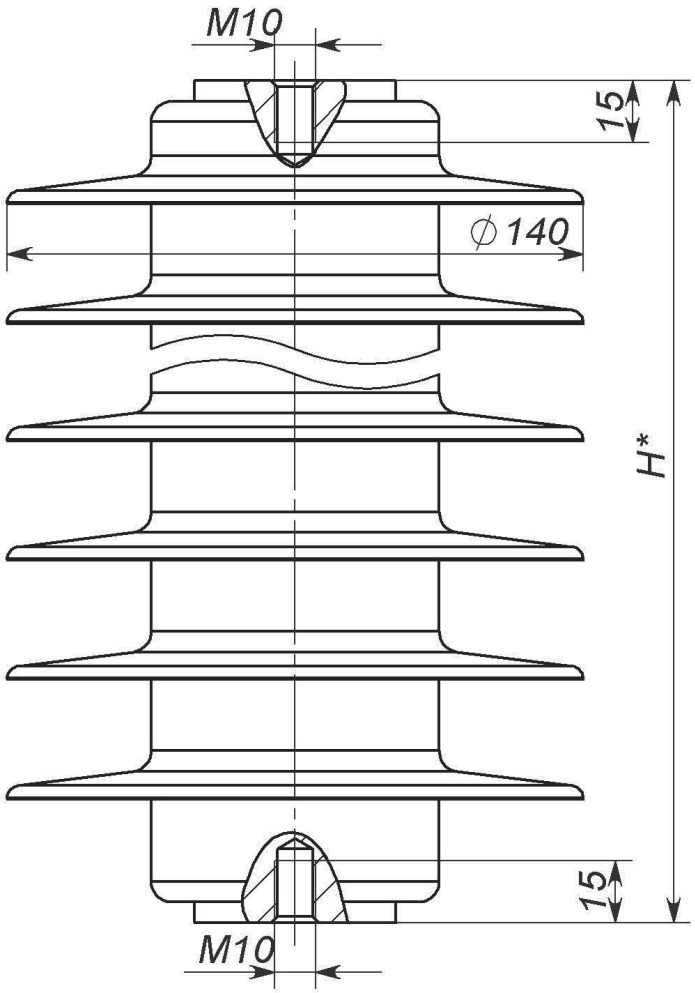

Fig. 11 PA-DH-151, 152, 203, 204, 351

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2.3 Options for PA-DM & PA-DH types

Product Marking System

Example of a product number: PA - DH - 062 - 03 - 02 / I1D2C3

- Manufacturer's trademark
- Arrester classification
  DM - Distribution Medium
  DH - Distribution High
- Type of housing
- Rated voltage, kV
- High-voltage input: type
- Ground terminal: options

High-voltage input: types & options

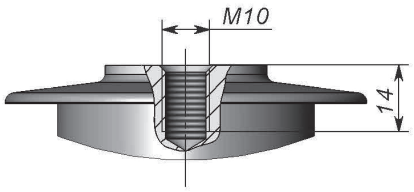


Fig. 11 High-voltage input «00» type

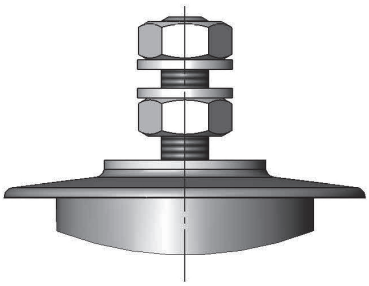


Fig. 12 High-voltage input «02» type (M10)

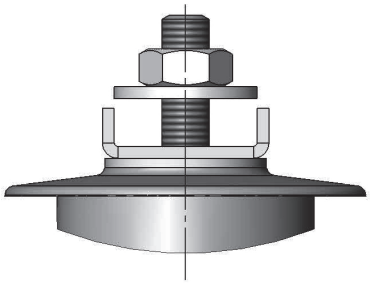


Fig. 13 High-voltage input «03» type (6 to 50 mm2)

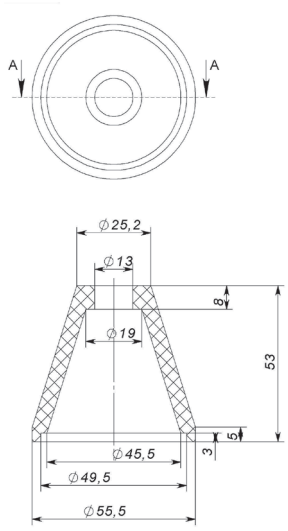


Fig. 14 Protective Caps «B1» type

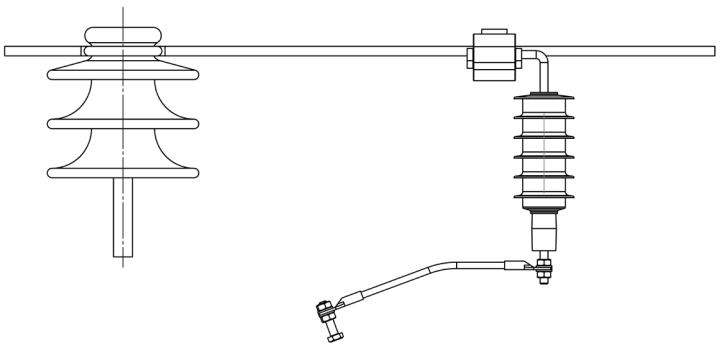


Fig. 15 Set of fittings for installation on insulated conductor «F1» type (Conductors size of 35 to 150 mm2).

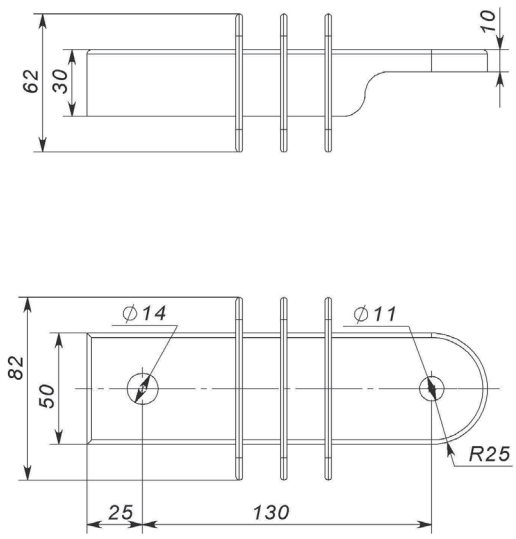


Fig. 16 Insulation bracket «I1» type.
MCOV 2.55 to 15.3 kV

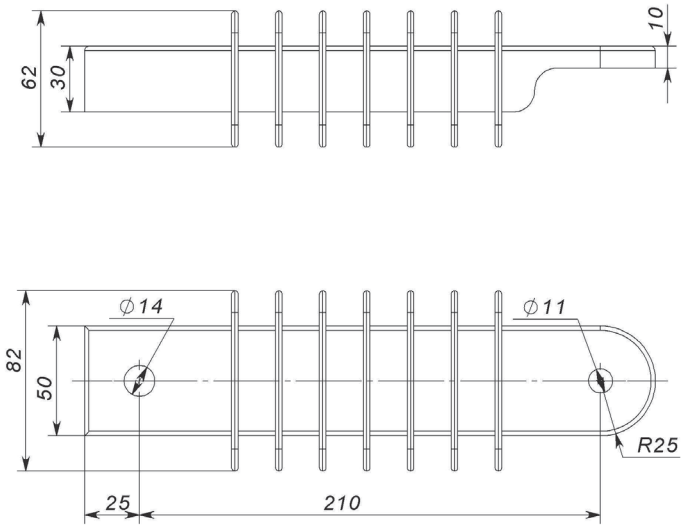


Fig. 17 Insulation bracket «I2» type.
MCOV 2.55 to 29 kV

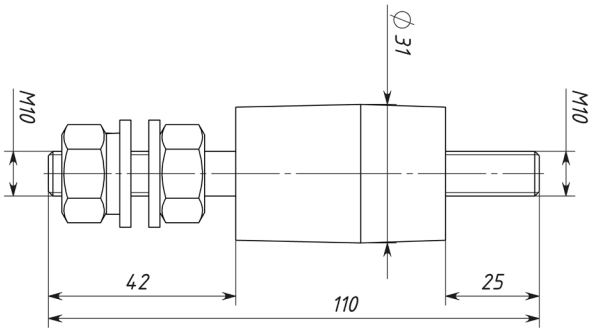


Fig. 19 D4 disconnector

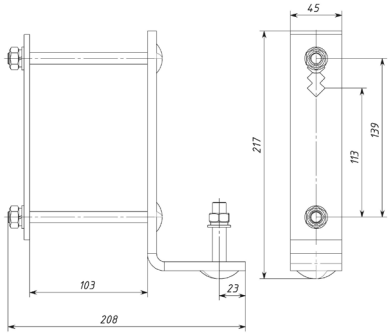


Fig. 18 Metal bracket «M1» type

Type	Sectional area of the wire, mm2	Diametr hole , mm	Long, mm
C1	6	11 or more on request	500 or more on request
C2	16		
C3	25		
C4	35		
C5	50		

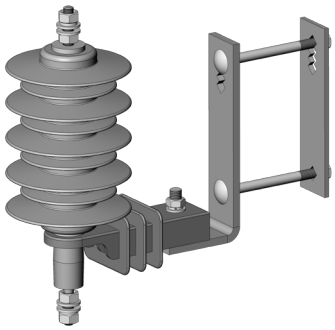


Fig. 20 Product example: PA-DM-090-09-02/I1D4M1

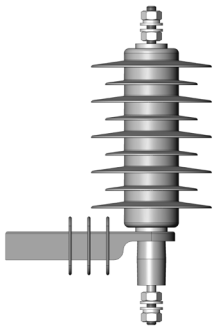


Fig. 21 Product example: PA-DM-092-18-02/I1D4

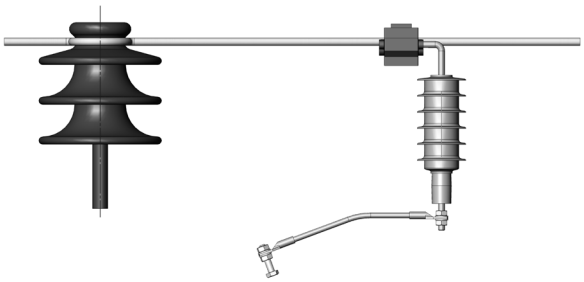


Fig. 22 Product example: PA-HD-102-09-00B1/D4C2(1000)

3. METAL-OXIDE SURGE ARRESTERS FOR SUBSTATIONS

3.1 Station Low.

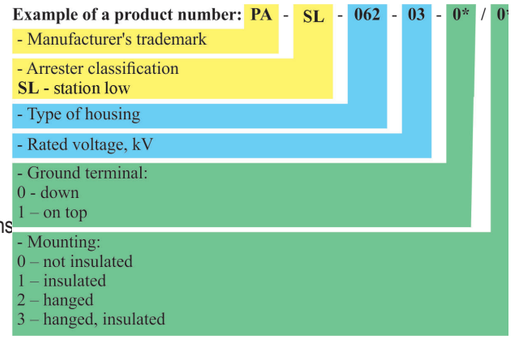
The main parameters and characteristics:

- Rated voltage – from 9 to 250 kV;
- Continuous voltage of arrester (MCOV) – from 7.2 to 200 kV (rms);
- Nominal discharge current – 10000 A;
- High current impulse 4/10μs - 100 kA;
- Long Duration Current Impulse – 680 A;
- Repetitive Charge Transfer Rating Qrs – 1.2 C;
- Thermal energy rating, Wth - 6.0 kJ/kV;

Operability of arresters is ensured under the following servicing conditions

- Outdoor and indoor;
- Lower operating value of ambient temperature is -60° C;
- Upper operating value of ambient temperature is +50° C;
- Altitude above sea level is up to 1000 m.

Product Marking System



* - marked only on the rated voltage of more than 36

Table 6

Rated voltage, kV	Product number*	MCOV, kV	Residual voltage, kV, no more than			
			8/20 μs 5 kA	8/20 μs 10 kA	8/20 μs 20 kA	30/60 μs 250 A
9	PA-SL-062-09	7.2	20.5	21.6	23.3	16.4
10	PA-SL-063-10	8	22.8	24.0	25.9	18.2
12	PA-SL-102-12	9.6	27.4	28.8	31.1	21.9
15	PA-SL-102-15	12	34.2	36.0	38.9	27.4
18	PA-SL-151-18	14.4	41.0	43.2	46.7	32.8
19	PA-SL-151-19	15.2	43.3	45.6	49.2	34.7
27	PA-SL-204-27	21.6	61.6	64.8	70.0	49.2
30	PA-SL-204-30	24	68.4	72.0	77.8	54.7
36	PA-SL-352-36	28.8	82.1	86.4	93.3	65.7
42	PA-SL-352-42	33.6	95.8	101	109	76.6
45	PA-SL-353-45	36	103	108	117	82.1
51	PA-SL-352-51	40.8	116	122	132	93.0
51	PA-SL-353-51	40.8	116	122	132	93.0
51	PA-SL-354-51**	40.8	116	122	132	93.0
54	PA-SL-352-54	43.2	123	130	140	98.5
60	PA-SL-562-60	48	137	144	156	109
66	PA-SL-562-66	52.8	150	158	171	120
72	PA-SL-562-72	57.6	164	173	187	131
78	PA-SL-562-78	62.4	178	187	202	142
84	PA-SL-111-84	67.2	192	202	218	153
90	PA-SL-111-90	72	205	216	233	164
96	PA-SL-111-96	76.8	219	230	249	175
108	PA-SL-111-108	86.4	246	259	280	197
120	PA-SL-112-120	96	274	288	311	219
132	PA-SL-112-132	106	301	317	342	241
144	PA-SL-256-144	115	328	346	373	263
156	PA-SL-256-156	125	356	374	404	285
168	PA-SL-256-168	134	383	403	435	306
180	PA-SL-222-180	144	410	432	467	328
192	PA-SL-222-192	154	438	461	498	350
204	PA-SL-222-204	163	465	490	529	372
204	PA-SL-223-204	163	465	490	529	372
216	PA-SL-222-216	173	492	518	560	394
238	PA-SL-222-238	190	543	571	617	434
250	PA-SL-222-250	200	570	600	648	456

* housing type can be changed on request
**indoor use only

METAL-OXIDE SURGE ARRESTERS WITHOUT GAPS FOR A.C. SYSTEMS
JSC «POLYMER-APPARAT»

•*TOV characteristics (relative to the Rated voltage) are presented in the Fig 5. below.*

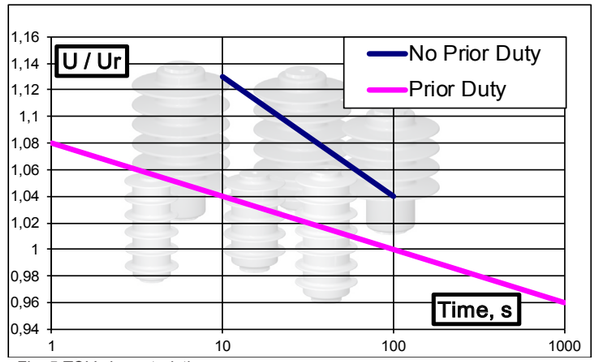


Fig. 5 TOV characteristics

Arresters are explosion-proof and withstand the following short-circuit currents without exploding:

– 40 kA (rms) during 0,2 s (no less than);
– 800 A (rms) during 2 s (no less than).

The arresters insulation is tracking-erosion stable and resistant to moisture penetration.

Permissible horizontal stress – 500 H.

Characteristics are presented in the Tables 6. below.

Residual voltage, kV, no more than			Figure	H, mm	Weight, kg	Leakage distance, mm	Housing insulation	
30/60 μs 500 A	30/60 μs 1000 A	1/10 μs 10 kA					1.2/50 μs, kV	1 min 50 Hz, kV
16.8	17.7	23.5	9	141	1.4	230	74.2	32.9
18.7	19.7	26.2	12	120	1.5	320	60	27
22.5	23.6	31.4	10	191	1.9	310	101	44.6
28.1	29.5	39.2	10	191	1.9	310	101	44.6
33.7	35.4	47.1	11	205	2.7	595	108	47.8
35.6	37.4	49.7	12	205	2,7	595	108	47.8
50.5	53.1	70.6	12	290	3.5	807	150	50
56.2	59.0	78.5	12	290	3.5	807	150	50
67.4	70.8	94	13	474	6.4	1060	190	70
78.6	82.7	110	13	474	6.4	1060	190	70
84.2	88.6	118	14	456	6.0	1060	190	70
95.5	100	133	13	474	6.4	1060	190	70
95.5	100	133	14	456	6.0	1060	190	70
95.5	100	133	15	507	6.5	530	190	70
101	106	141	13	474	6.4	1060	190	70
112	118	157	16. 21	870	10	2600	450	210
124	130	173	16. 21	870	10	2600	450	210
135	142	188	16. 21	870	10	2600	450	210
146	154	204	16. 21	870	10	2600	450	210
157	165	220	17.22.23	1040	15	3150	450	210
168	177	235	17.22.23	1040	15	3150	450	210
180	189	251	17.22.23	1040	15	3150	450	210
202	213	283	17.22.23	1040	15	3150	450	210
225	236	314	18. 24	1150	17	3900	650	300
247	260	345	18. 24	1150	17	3900	650	300
270	283	377	19	1550	19	5200	750	350
292	307	408	19	1550	19	5200	750	350
314	331	439	19	1550	19	5200	750	350
337	354	471	20	2130	56	6300	1000	420
359	378	502	20	2130	56	6300	1000	420
382	401	534	20	2130	56	6300	1000	420
382	401	534	25	2160	36	6300	1000	420
404	425	565	20	2130	56	6300	1000	420
446	468	623	20	2130	56	6300	1000	420
468	492	654	20	2130	56	6300	1000	420

Arresters without insulating base - Terminal/mounting type - 0/0

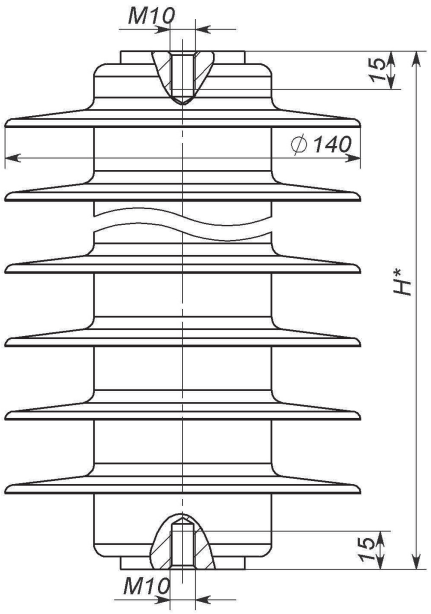
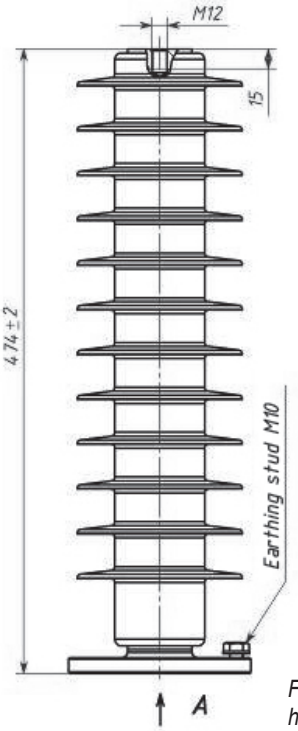


Fig. 12 Type of housing 063, 103, 203, 204, 151, 152



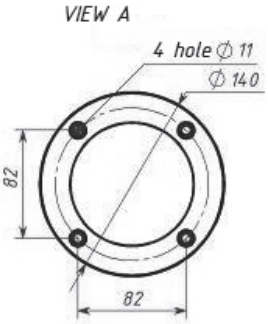


Fig. 13 Type of housing 352

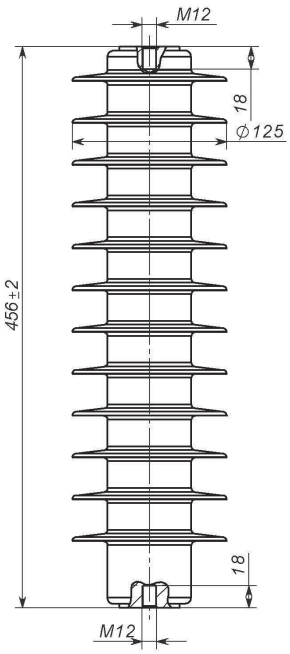


Fig. 14 Type of housing 353

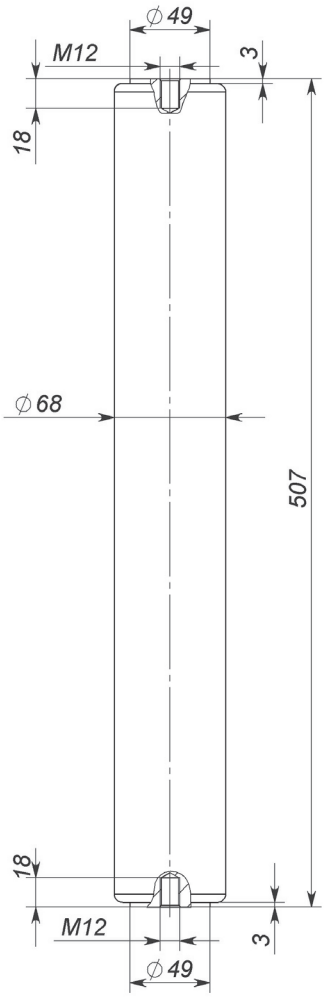
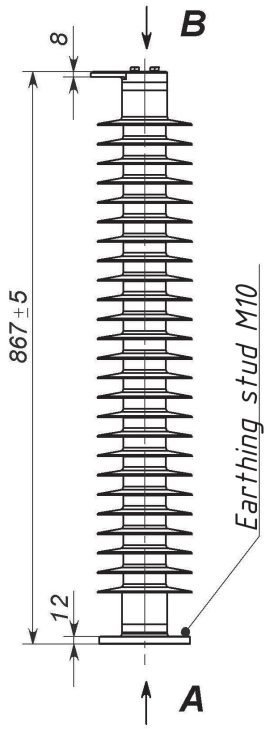


Fig. 15 Type of housing 354



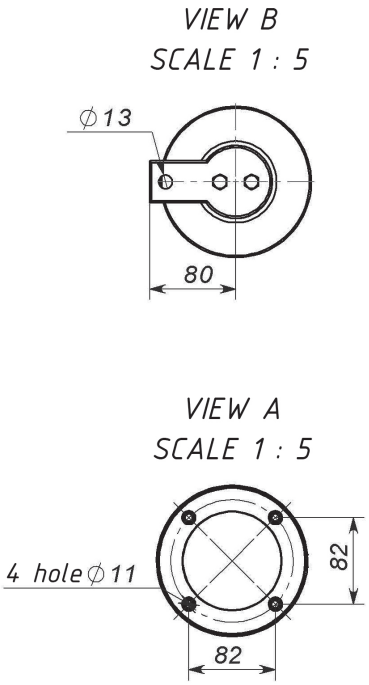


Fig. 16 Type of housing 562

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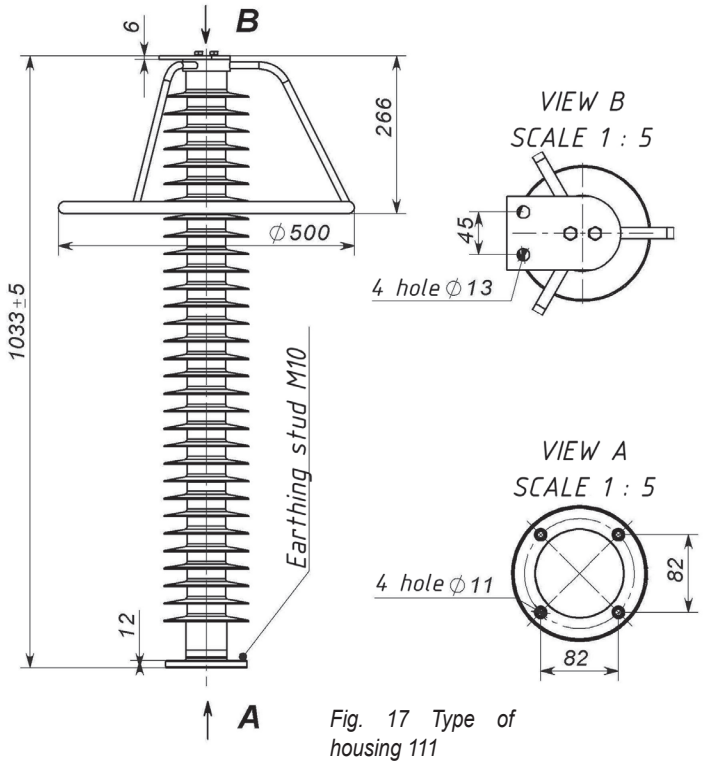


Fig. 17 Type of housing 111

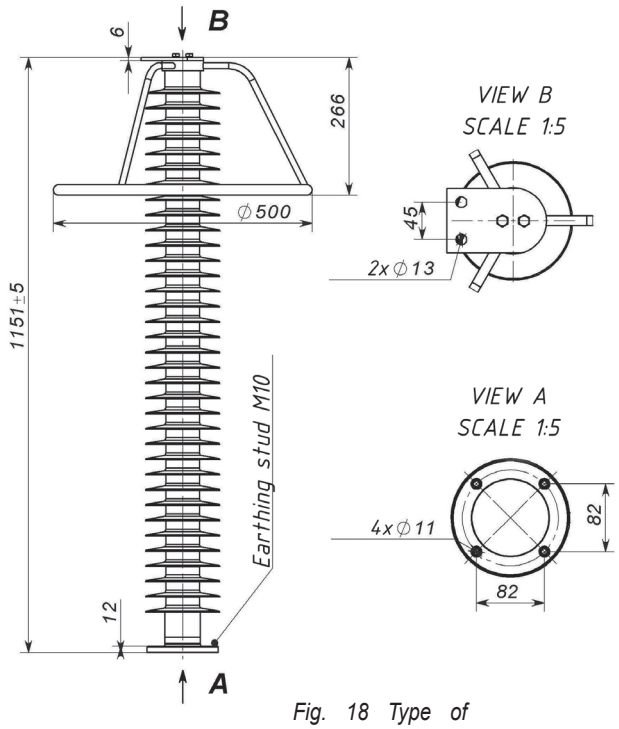


Fig. 18 Type of housing 112

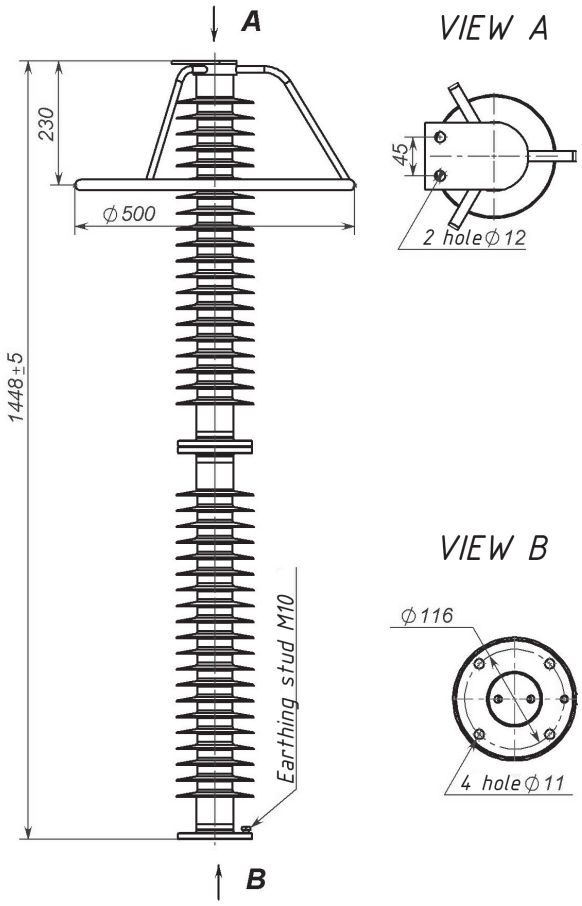


Fig. 19 Type of housing 256

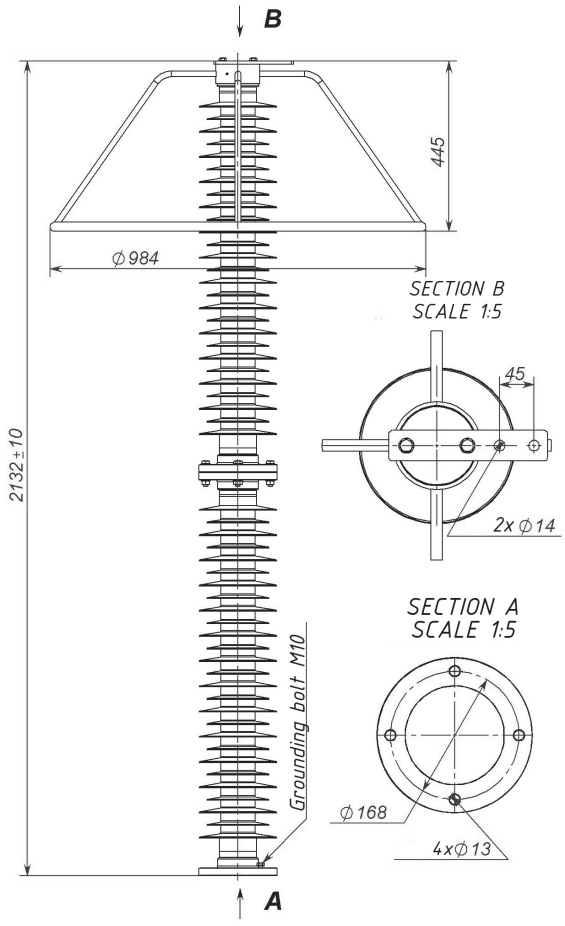


Fig. 20 Type of housing 222

Arresters with insulating base Terminal/mounting type - 0/1

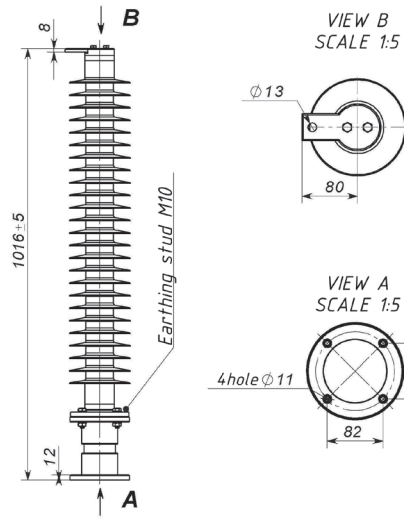


Fig. 21 Type of housing 562- -0/1

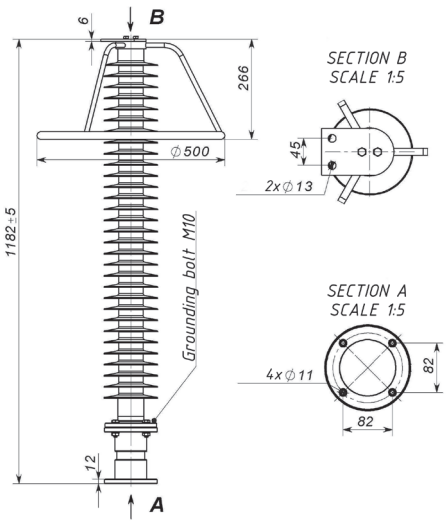


Fig. 22 Type of housing 111- -0/1

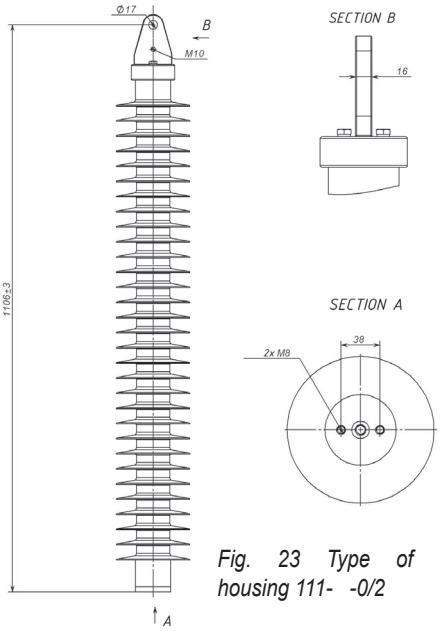


Fig. 23 Type of housing 111- -0/2

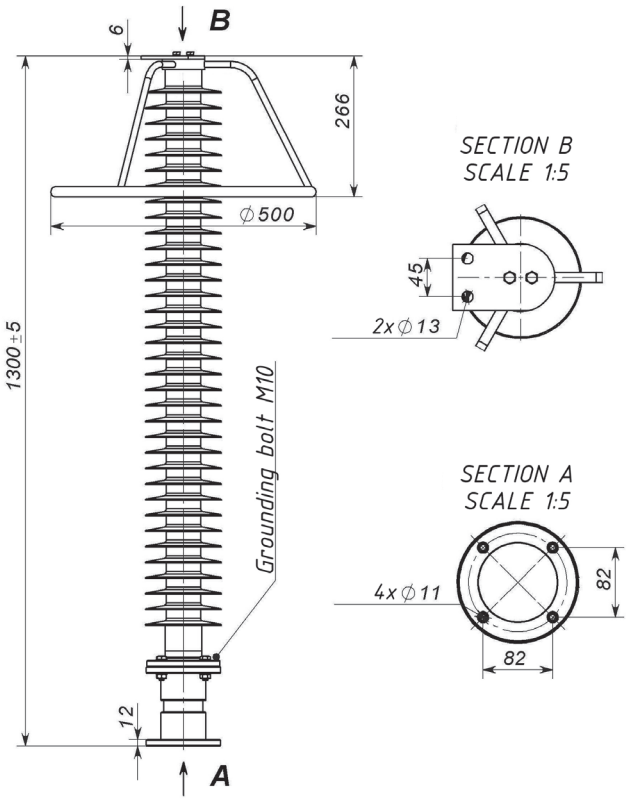


Fig. 24 Type of housing 112- -0/1

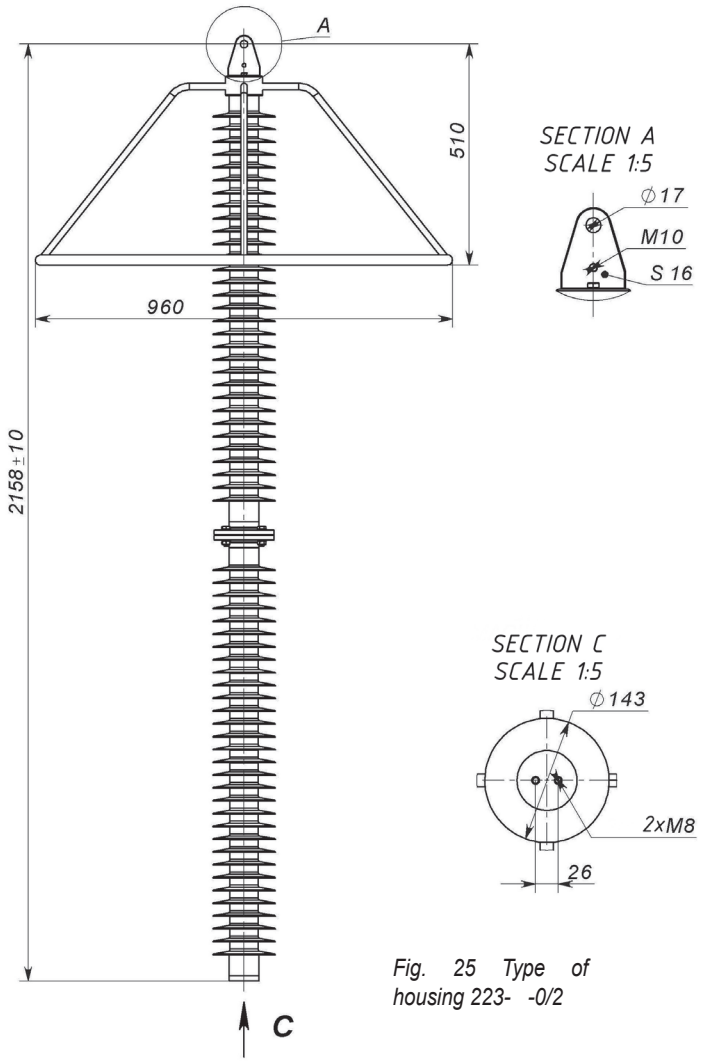


Fig. 25 Type of housing 223- -0/2

3.2 Station Medium

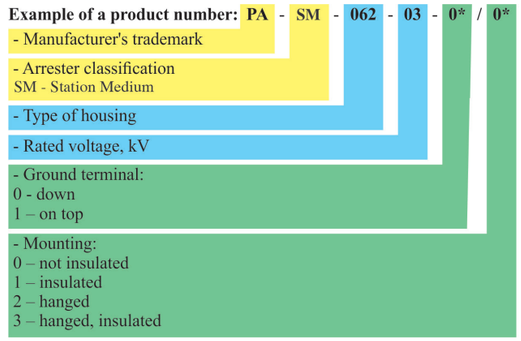
Arrester classification – Station Medium.
The main parameters and characteristics:

- Rated voltage – from 9 to 324 kV;
- Continuous voltage of arrester (MCOV) – from 7.2 to 259 kV (rms);
- Nominal discharge current – 10000 A;
- High current impulse 4/10μs - 100 kA;
- Long Duration Current Impulse – 1000 A;
- Repetitive Charge Transfer Rating Qrs – 2.0 C;
- Specific energy (two impulse 2000 μs, rated voltage) – 9.2 kJ/kV;

Operability of arresters is ensured under the following servicing conditions:

- Outdoor and indoor;
- Lower operating value of ambient temperature is -60° C;
- Upper operating value of ambient temperature is +50° C;
- Altitude above sea level is up to 1000 m.

Product Marking System



* - marked only on the rated voltage more than 36 kV

Table 7

Rated voltage, kV	Product number*	MCOV, kV	Residual voltage, kV, no more than			
			8/20 μs 5 kA	8/20 μs 10 kA	8/20 μs 20 kA	30/60 μs 500 A
10	PA-SM-355-10	8	22,1	23,2	25,8	18,1
15	PA-SM-355-15	12	33,1	34,8	38,7	27,1
30	PA-SM-355-30	24	66,3	69,6	77,3	54,2
36	PA-SM-355-36	28,8	79,5	83,5	92,8	65,1
45	PA-SM-356-45	36	99,4	104	116	81,3
54	PA-SM-356-54	43,2	119	125	139	97,6
66	PA-SM-563-66	52,8	146	153	170	119
72	PA-SM-563-72	57,6	159	167	186	130
78	PA-SM-563-78	62,4	172	181	201	141
84	PA-SM-116-84	67,2	186	195	217	152
90	PA-SM-116-90	72	199	209	232	163
96	PA-SM-116-96	76,8	212	223	247	173
98	PA-SM-116-98	78,4	216	227	253	177
102	PA-SM-116-102	81,6	225	237	263	184
108	PA-SM-116-108	86,4	239	251	278	195
144	PA-SM-257-144	115	318	334	371	260
156	PA-SM-257-156	125	345	362	402	282
168	PA-SM-257-168	134	371	390	433	304
180	PA-SM-222-180	144	398	418	464	325
192	PA-SM-222-192	154	424	445	495	347
204	PA-SM-222-204	163	451	473	526	369
216	PA-SM-222-216	173	477	501	557	390
228	PA-SM-222-228	182	504	529	588	412
240	PA-SM-222-240	192	530	557	619	434
252	PA-SM-301-252	202	557	585	650	455
264	PA-SM-301-264	211	583	612	680	477
276	PA-SM-301-276	221	610	640	711	499
288	PA-SM-301-288	230	636	668	742	520
306	PA-SM-301-306	245	676	710	789	553
306	PA-SM-302-306	245	676	710	789	553
324	PA-SM-301-324	259	716	752	835	586
324	PA-SM-302-306	259	716	752	835	586

* according to the customer type of housing can be changed
** the height & weight of the insulating base

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•*TOV characteristics (relative to the Rated voltage) are presented in the Fig 5. below.*

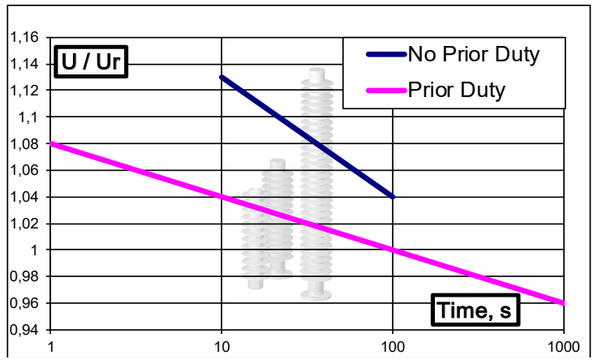

Fig. 5 TOV characteristics

Arresters are explosion-proof and withstand the following short-circuit currents without exploding:

– 65 kA (rms) during 0,2 s (no less than);
– 800 A (rms) during 2 s (no less than).

The arresters insulation is tracking-erosion stable and resistant to moisture penetration.

Permissible horizontal stress – 500 H.

Characteristics are presented in the Table 7. below.

Residual voltage. kV. no more than			Figure	H. m	Weight. kg	Leakage distance. mm	Housing insulation		
30/60 μs 1000 A	30/60 μs 2000 A	1/10 μs 10 kA					1.2/50 μs. kV	250/2500 μs. kV	1 min 50 Hz. kV
18,4	19,4	26,1	26	0.48	12	1370	239	-	100
27,6	29,1	39,2	26	0.48	12	1370	239	-	100
55,3	58,3	78,3	26	0.48	12	1370	239	-	100
66,3	69,9	94,0	26	0.48	12	1370	239	-	100
82,9	87,4	117	27	0.55	15	1700	274	-	115
99,5	105	141	27	0.55	15	1700	274	-	115
122	128	172	28	0.88	24	2600	438	-	185
133	140	188	28	0.88	24	2600	438	-	185
144	151	204	28	0.88	24	2600	438	-	185
155	163	219	29,31, 35, 38	1.01	28	3150	503	-	212
166	175	235	29,31, 35,38	1.01	28	3150	503	-	212
177	186	251	29,31, 35, 38	1.01	28	3150	503	-	212
181	190	256	29,31, 35, 38	1.01	28	3150	503	-	212
188	198	266	29,31, 35, 38	1.01	28	3150	503	-	212
199	210	282	29,31, 35,38	1.01	28	3150	503	-	212
265	280	376	30, 34	1.61	52	5200	797	-	336
287	303	407	30, 34	1.61	52	5200	797	-	336
309	326	438	30, 34	1.61	52	5200	797	-	336
332	350	470	32, 36, 39	2.32**	61	6300	1050	-	440
354	373	501	32, 36, 39	2.32**	61	6300	1050	-	440
376	396	532	32, 36, 39	2.32**	61	6300	1050	-	440
398	419	564	32, 36, 39	2.32**	61	6300	1050	-	440
420	443	595	32, 36, 39	2.32**	61	6300	1050	-	440
442	466	626	32, 36,39	2.32**	61	6300	1050	-	440
464	489	658	33	3.7**	150	9450	1740	1050	-
486	513	689	33	3.7**	150	9450	1740	1050	-
508	536	720	33	3.7**	150	9450	1740	1050	-
531	559	752	33	3.7**	150	9450	1740	1050	-
564	594	799	33	3.7**	150	9450	1740	1050	-
564	594	799	37	3.58	90	9450	1740	1050	-
597	629	846	33	3.7**	150	9450	1740	1050	-
597	629	846	37	3.58	90	9450	1740	1050	-

Arresters without insulating base. Terminal/mounting type - 0/0

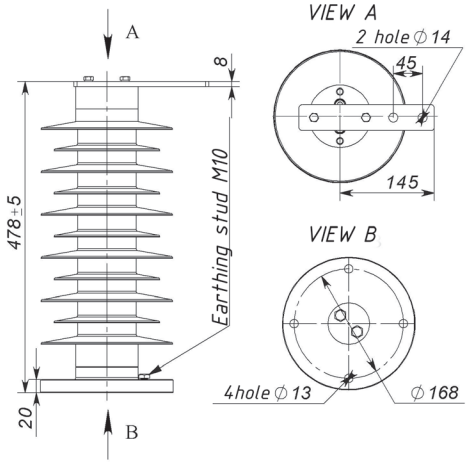

Fig. 26 Type of housing 355

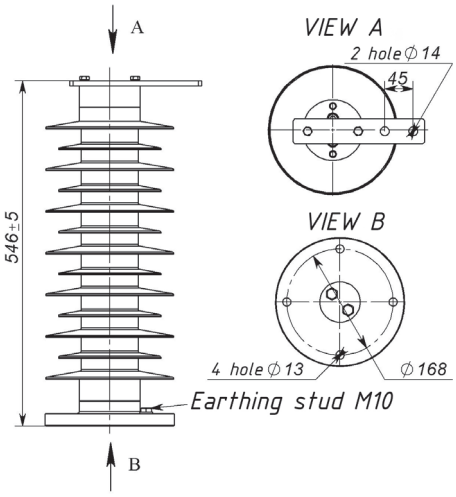

Fig. 27 Type of housing 356

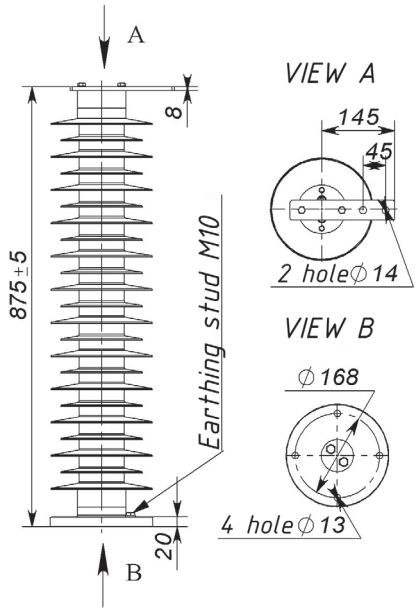

Fig. 28 Type of housing 563

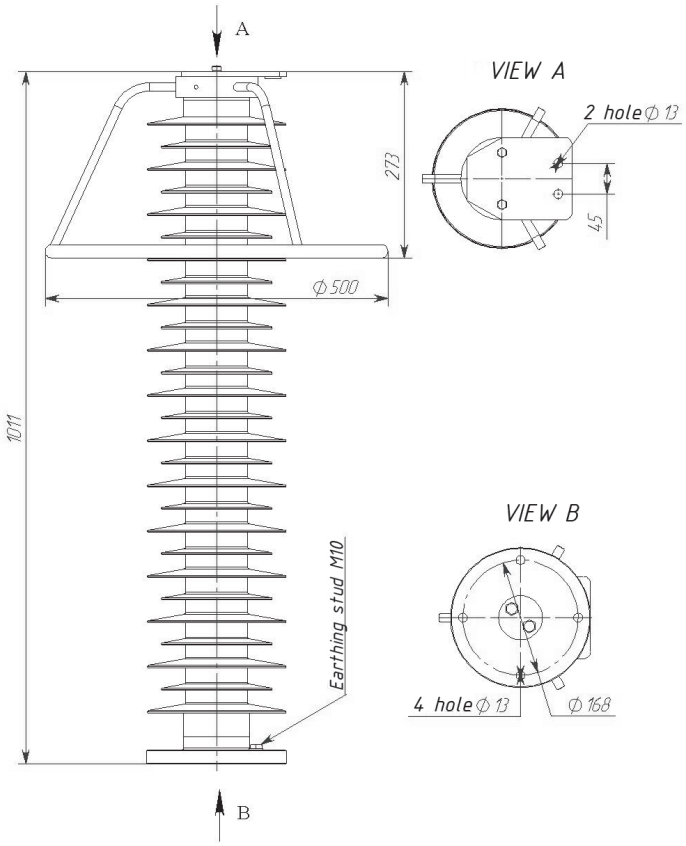

Fig. 29 Type of housing 116

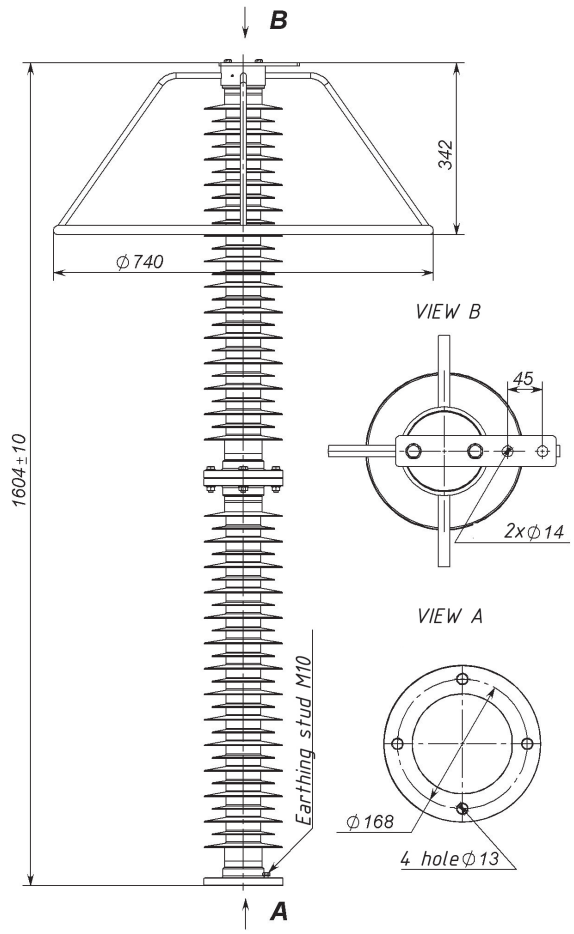

Fig. 30 Type of housing 222

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Surge arresters with insulating base. Terminal/mounting type - 0/1

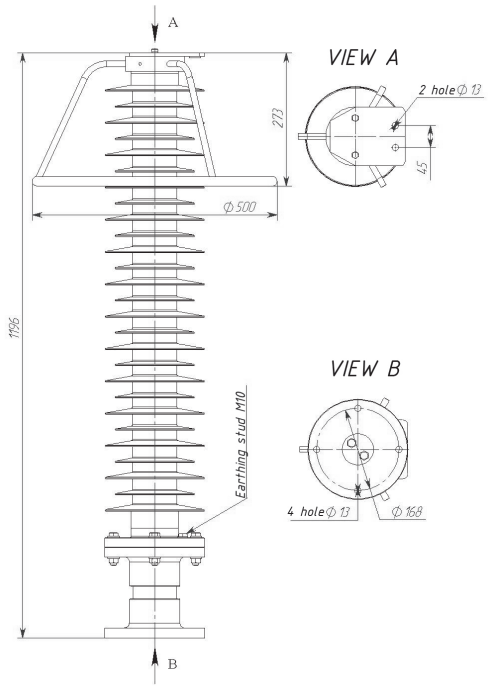

Fig. 31 Type of housing 116- -0/1

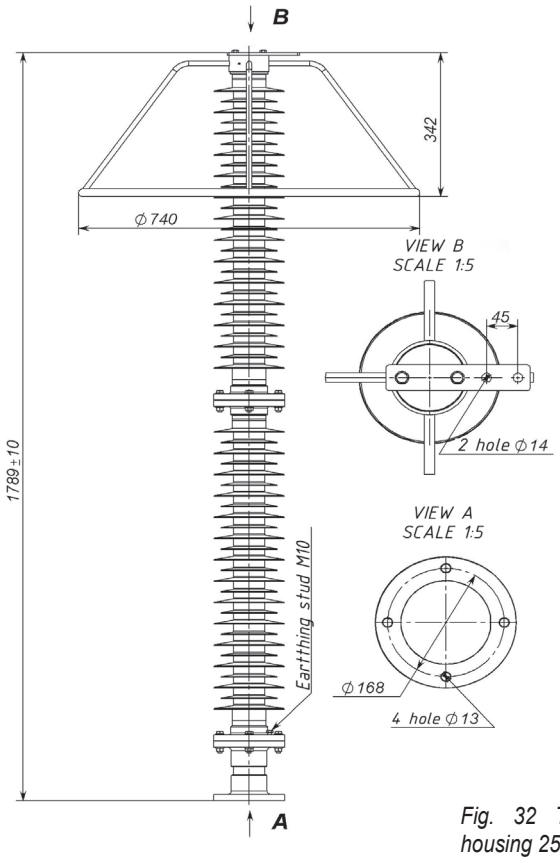

Fig. 32 Type of housing 257- -0/1

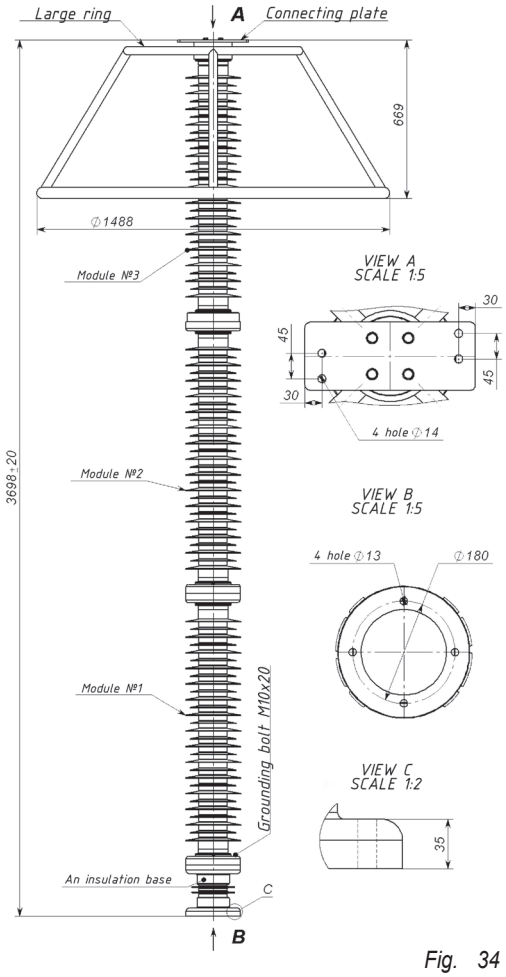

Fig. 34 Type of housing 301- -0/1

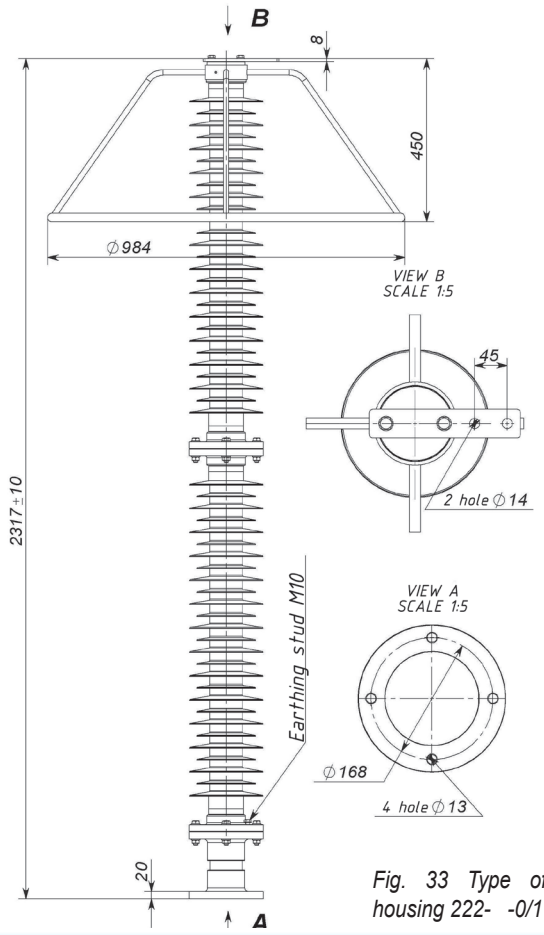

Fig. 33 Type of housing 222- -0/1

Hanging arresters without insulating base. Terminal/mounting type - 0/2

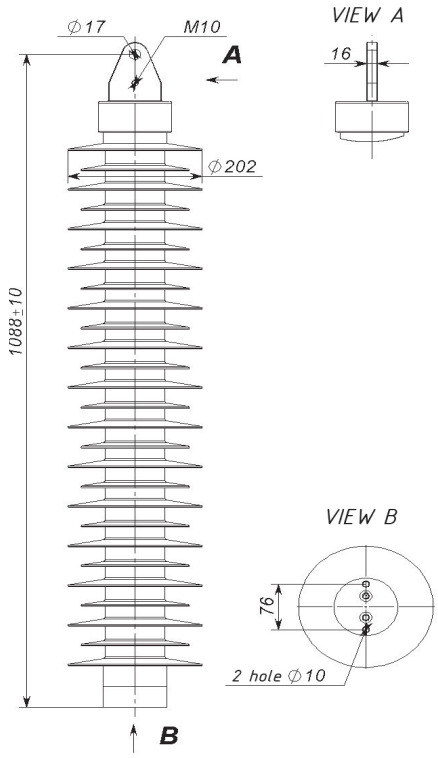

Fig. 35 Type of housing 116- -0/2

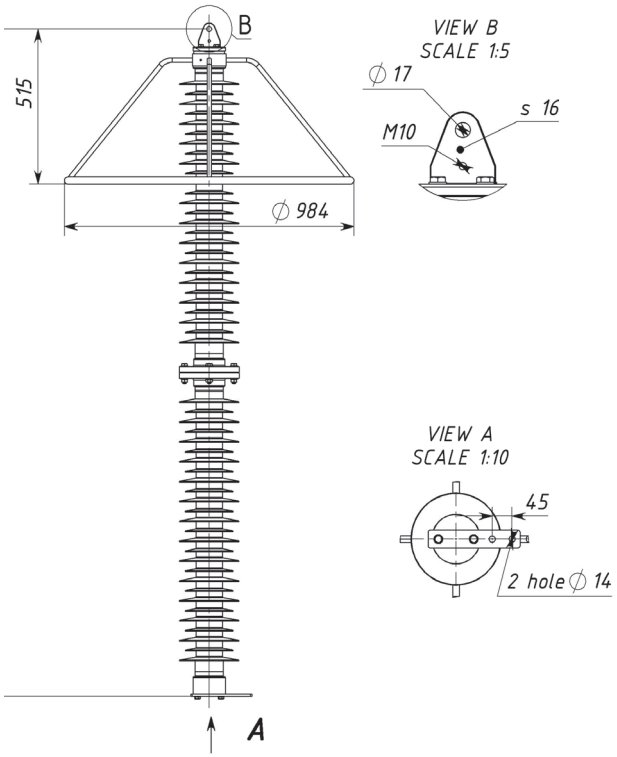

Fig. 36 Type of housing 222- -0/2

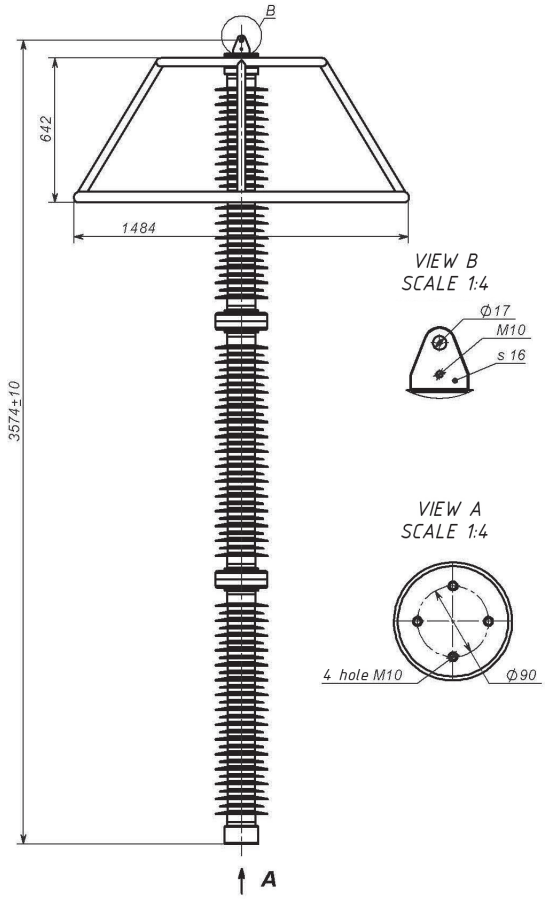

Fig. 37 Type of housing 302- -0/2

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Hanging arresters with insulating base. Terminal/mounting type-1/3

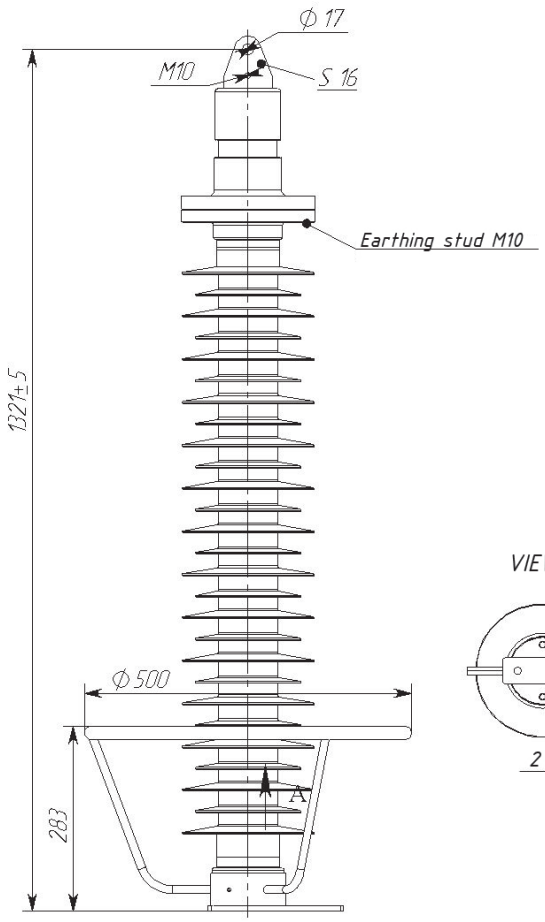

Fig. 38 Type of housing 116- -1/3

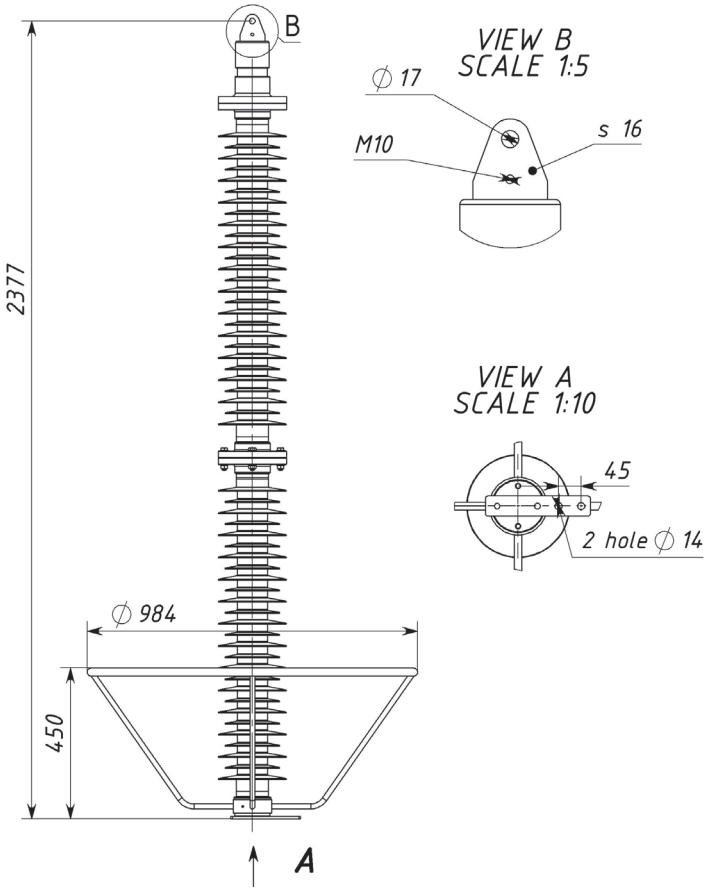

Fig. 39 Type of housing 301- -1/3

3.3 Station High

Arrester classification – Station High.
The main parameters and characteristics:

- Rated voltage – from 96 to 612 kV;
- Continuous voltage of arrester (MCOV) – from 76,8 to 490 kV (rms);
- Nominal discharge current – 20000 A;
- High current impulse 4/10μs - 100 kA;

Operability of arresters is ensured under the following servicing conditions:

- Outdoor and indoor;
- Lower operating value of ambient temperature is -60° C;
- Upper operating value of ambient temperature is +50° C;
- Altitude above sea level is up to 1000 m.

Product Marking System

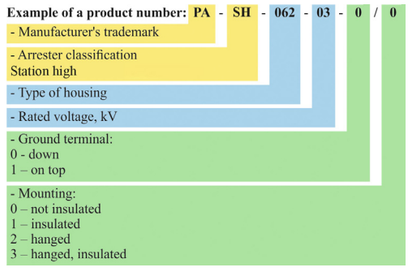

Table 8

Rated voltage. kV	Product number*	MCOV. kV	Long Duration Current Impulse. A	Repetitive Charge Transfer Rating. C	Specific energy (two impulse 2000 ms. rated voltage). kJ/kV	Residual voltage. kV. no more than			
						8/20 μs 10 kA	8/20 μs 20 kA	8/20 μs 40 kA	30/60 μs 500 A
96	PA-SH-117-96	76.8	1450	2.8	12.4	223	246	270	175
96	PA-SH-118-96	76.8	1800	3.6	15.2	223	245	274	186
108	PA-SH-117-108	86.4	1450	2.8	12.4	251	276	304	197
108	PA-SH-118-96	86.4	1800	3.6	15.2	251	275	308	209
120	PA-SH-117-120	96	1450	2.8	12.4	278	307	338	219
120	PA-SH-118-120	96	1800	3.6	15.2	278	306	342	232
132	PA-SH-117-132	106	1450	2.8	12.4	306	338	371	241
132	PA-SH-118-132	106	1800	3.6	15.2	306	337	376	255
144	PA-SH-227-144	115	1450	2.8	12.4	334	368	405	263
144	PA-SH-228-144	115	1800	3.6	15.2	334	367	410	279
168	PA-SH-227-168	134	1450	2.8	12.4	390	430	473	307
168	PA-SH-228-168	134	1800	3.6	15.2	390	428	479	325
192	PA-SH-227-192	154	1450	2.8	12.4	445	491	540	351
192	PA-SH-228-192	154	1800	3.6	15.2	445	489	547	372
204	PA-SH-227-204	163	1450	2.8	12.4	473	522	574	373
204	PA-SH-228-204	163	1800	3.6	15.2	473	520	481	395
228	PA-SH-227-228	182	1450	2.8	12.4	529	583	642	416
228	PA-SH-228-228	182	1800	3.6	15.2	529	581	650	441
264	PA-SH-307-264	211	1450	2.8	12.4	612	675	743	482
264	PA-SH-308-264	211	1800	3.6	15.2	612	673	752	511
276	PA-SH-307-276	221	1450	2.8	12.4	640	706	777	504
276	PA-SH-308-276	221	1800	3.6	15.2	640	704	787	534
288	PA-SH-307-288	230	1450	2.8	12.4	668	737	810	526
288	PA-SH-308-288	230	1800	3.6	15.2	668	734	821	557
306	PA-SH-307-306	245	1450	2.8	12.4	710	783	861	559
306	PA-SH-308-306	245	1800	3.6	15.2	710	780	872	592
396	PA-SH-507-396	317	1450	2.8	12.4	919	1010	1110	723
396	PA-SH-508-396	317	1800	3.6	15.2	919	1010	1130	766
396	PA-SH-509-396	317	2100	4.2	19.0	919	999	1100	766
420	PA-SH-507-420	336	1450	2.8	12.4	974	1070	1180	767
420	PA-SH-508-420	336	1800	3.6	15.2	974	1070	1200	813
420	PA-SH-509-420	336	2100	4.2	19.0	974	1060	1160	812
444	PA-SH-507-444	355	1450	2.8	12.4	1030	1140	1250	811
444	PA-SH-508-444	355	1800	3.6	15.2	1030	1130	1270	859
444	PA-SH-509-444	355	2100	4.2	19.0	1030	1120	1230	859
564	PA-SH-751-564	451	2100	4.2	19.0	1310	1420	1560	1090
564	PA-SH-752-564	451	3200	6.4	25.6	1310	1420	1560	1090
588	PA-SH-751-588	470	2100	4.2	19.0	1360	1480	1630	1140
588	PA-SH-752-588	470	3200	6.4	25.6	1360	1480	1630	1140
612	PA-SH-751-612	490	2100	4.2	19.0	1420	1540	1690	1180
612	PA-SH-752-612	490	3200	6.4	25.6	1420	1540	1690	1180

* housing type can be changed on request
** the height **&** weight of the insulating base

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•TOV characteristics (relative to the Rated voltage) are presented in the Fig 5. below.

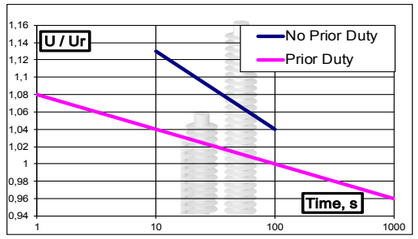

Fig. 5 TOV characteristics

TOV characteristics (relative to the r5ated voltage) are presented in the Fig 5.
Arresters are explosion-proof and withstand the following short-circuit currents without exploding:

– 65 kA (rms) during 0,2 s (no less than);
– 800 A (rms) during 2 s (no less than).

The arresters insulation is tracking-erosion stable and resistant to moisture penetration.
Characteristics are presented in the Table 8 below.

Residual voltage, kV, no more than			Figure	H, m	Weight, kg	Leakage distance, mm	SLL, H	Housing insulation		
30/60 μs 500 A	30/60 μs 1000 A	1/10 μs 10 kA						1.2/50 μs, kV	250/2500 μs, kV	1 min 50 Hz, kV
182	192	275	40	1.4	44	3150	500	450	-	210
191	200	272	40	1.4	44	3150	500	450	-	210
205	216	309	40	1.4	44	3150	500	450	-	210
214	225	306	40	1.4	44	3150	500	450	-	210
228	240	343	40	1.4	44	3150	500	450	-	210
238	250	340	40	1.4	44	3150	500	450	-	210
251	264	378	40	1.4	44	3150	500	450	-	210
262	275	374	40	1.4	44	3150	500	450	-	210
274	288	412	41	2.55	100	6300	1000	1000	-	420
286	300	408	41	2.55	100	6300	1000	1000	-	420
319	336	481	41	2.55	100	6300	1000	1000	-	420
334	350	476	41	2.55	100	6300	1000	1000	-	420
365	384	550	41	2.55	100	6300	1000	1000	-	420
381	400	544	41	2.55	100	6300	1000	1000	-	420
388	408	584	41	2.55	100	6300	1000	1000	-	420
405	425	578	41	2.55	100	6300	1000	1000	-	420
433	456	653	41	2.55	100	6300	1000	1000	-	420
453	475	646	41	2.55	100	6300	1000	1000	-	420
502	528	756	42	3.7	150	9450	1000	1500	1050	-
524	550	748	42	3.7	150	9450	1000	1500	1050	-
525	552	790	42	3.7	150	9450	1000	1500	1050	-
548	575	782	42	3.7	150	9450	1000	1500	1050	-
547	576	824	42	3.7	150	9450	1000	1500	1050	-
572	600	816	42	3.7	150	9450	1000	1500	1050	-
582	612	876	42	3.7	150	9450	1000	1500	1050	-
608	637	867	42	3.7	150	9450	1000	1500	1050	-
753	792	1130	43	4.95	350	12600	1000	2100	1300	-
786	825	1120	43	4.95	350	12600	1000	2100	1300	-
793	823	1080	44	4.8	400	12600	1000	2100	1300	-
798	840	1200	43	4.95	350	12600	1000	2100	1300	-
834	875	1190	43	4.95	350	12600	1000	2100	1300	-
841	873	1150	44	4.8	400	12600	1000	2100	1300	-
844	888	1270	43	4.95	350	12600	1000	2100	1300	-
882	925	1260	43	4.95	350	12600	1000	2100	1300	-
889	923	1220	44	4.8	400	12600	1000	2100	1300	-
1130	1170	1540	45	7.1	600	18900	1500	2700	1800	-
1130	1170	1540	45	7.1	600	18900	1500	2700	1800	-
1180	1220	1610	45	7.1	600	18900	1500	2700	1800	-
1180	1220	1610	45	7.1	600	18900	1500	2700	1800	-
1230	1270	1670	45	7.1	600	18900	1500	2700	1800	-
1230	1270	1670	45	7.1	600	18900	1500	2700	1800	-

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Arresters with insulating base. Terminal/mounting type - 0/1

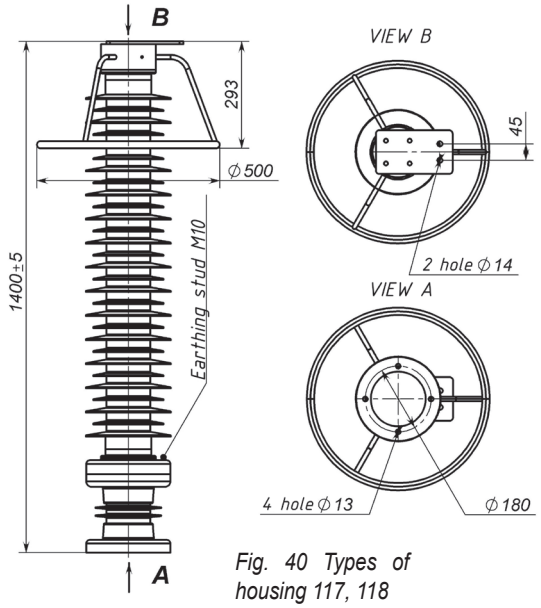

Fig. 40 Types of housing 117, 118

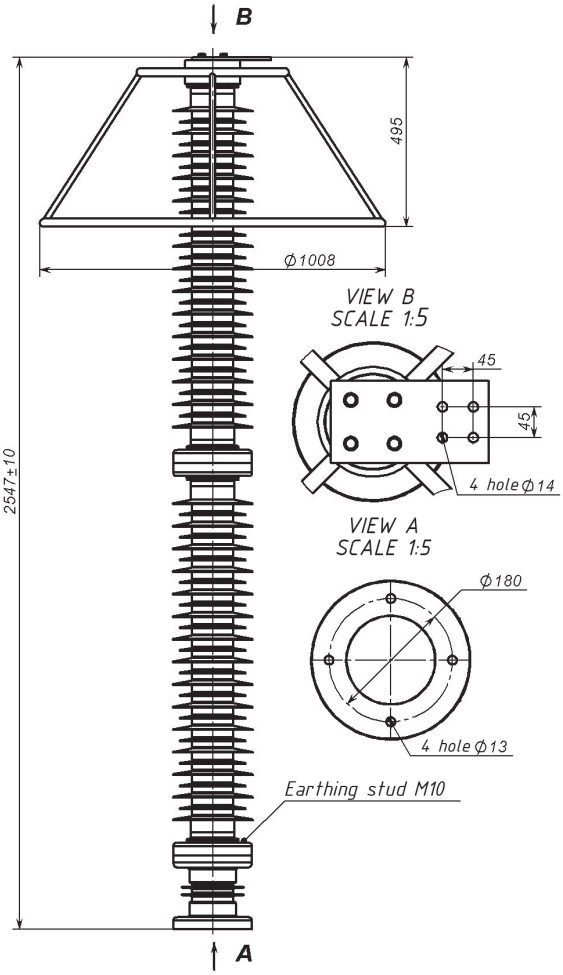

Fig. 41 Types of housing 227, 228

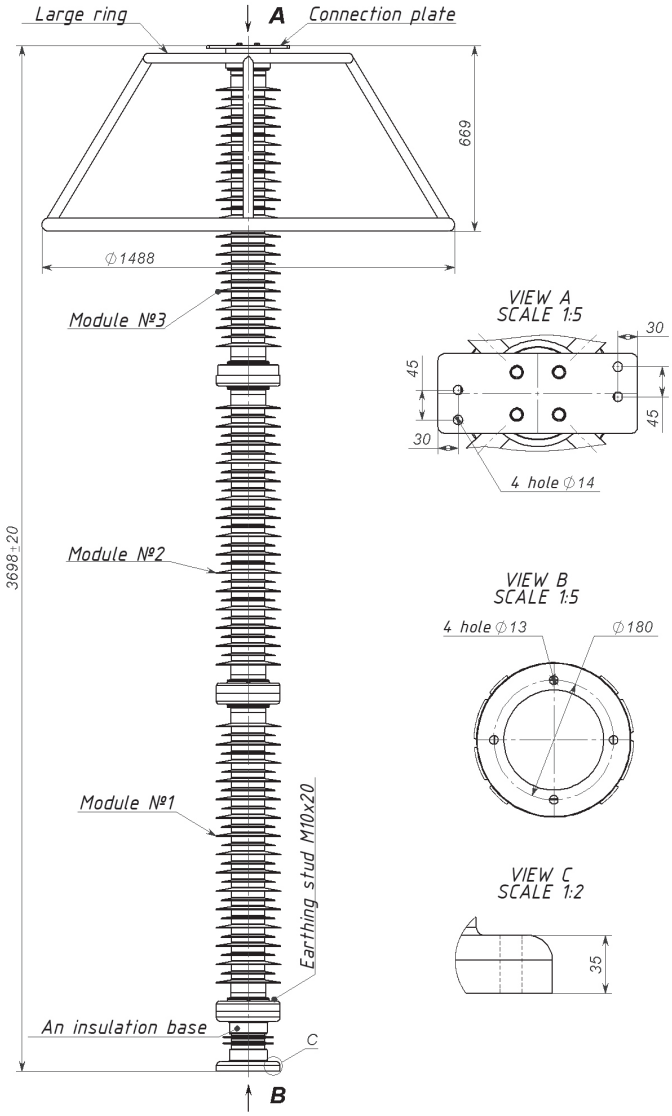

Fig. 42 Types of housing 307, 308

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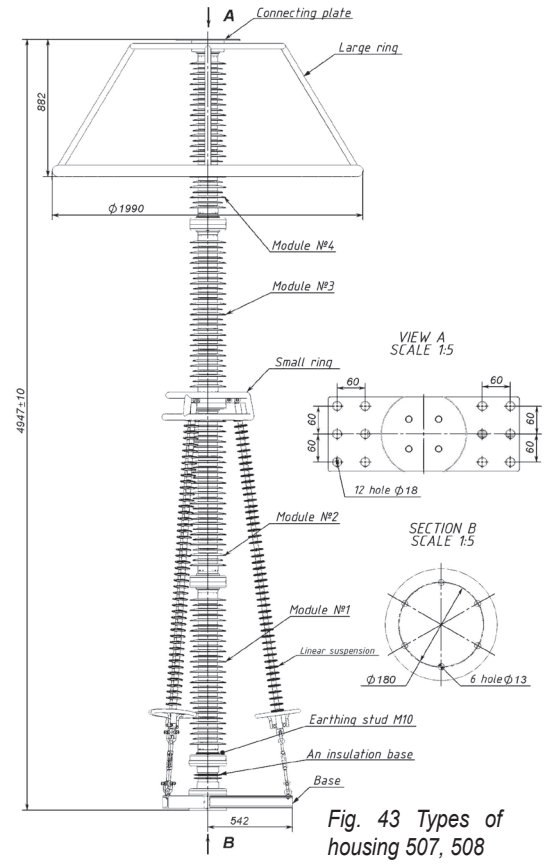


Fig. 43 Types of housing 507, 508

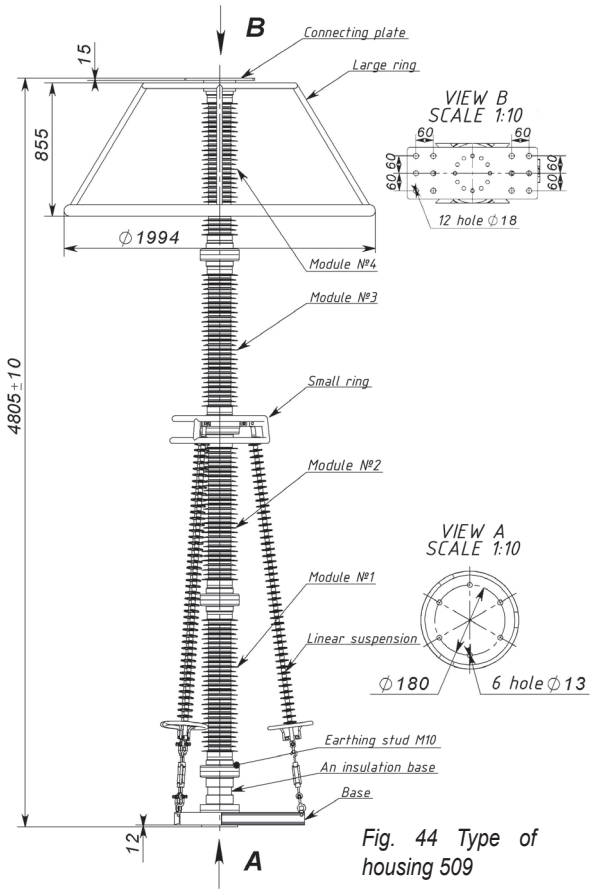


Fig. 44 Type of housing 509

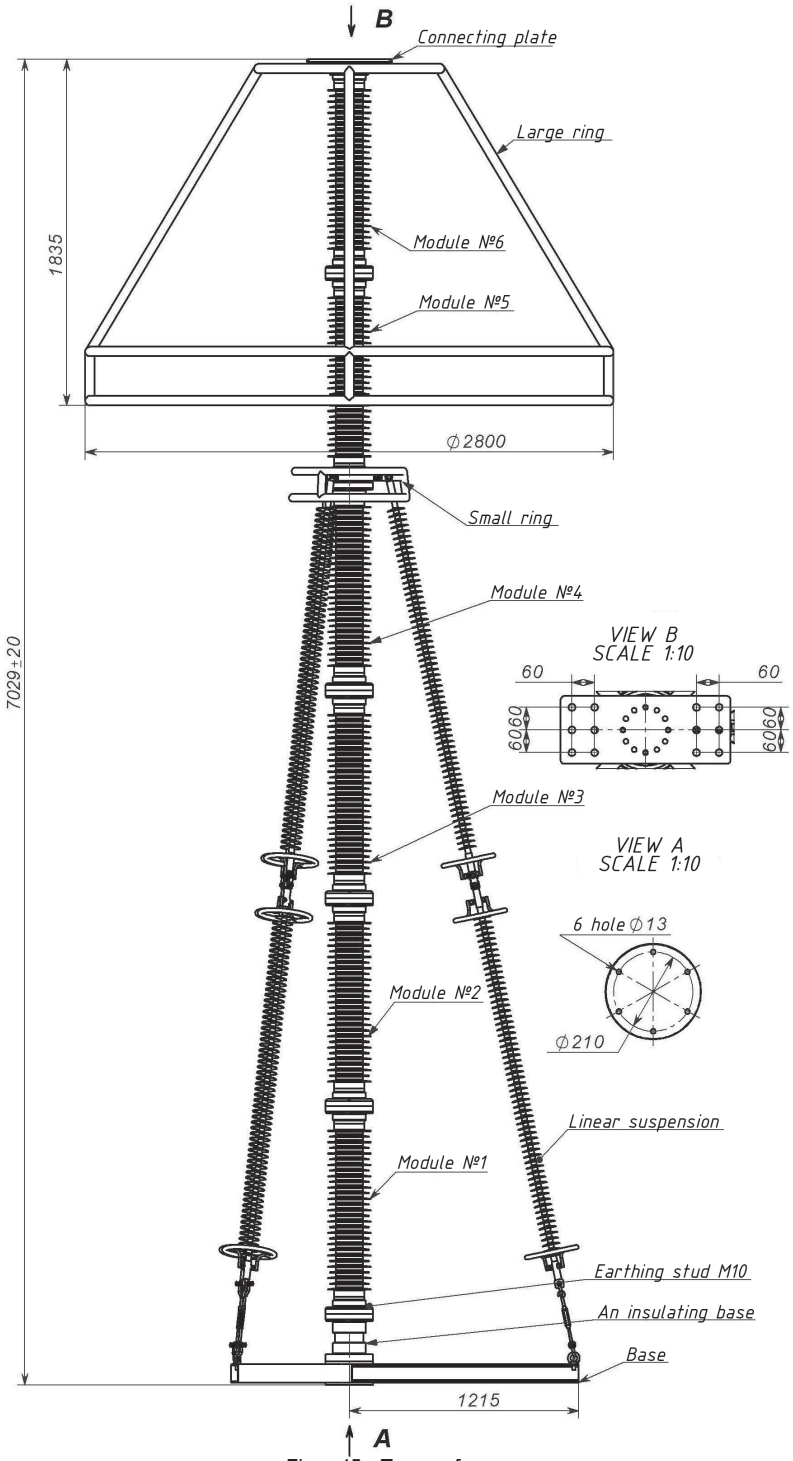
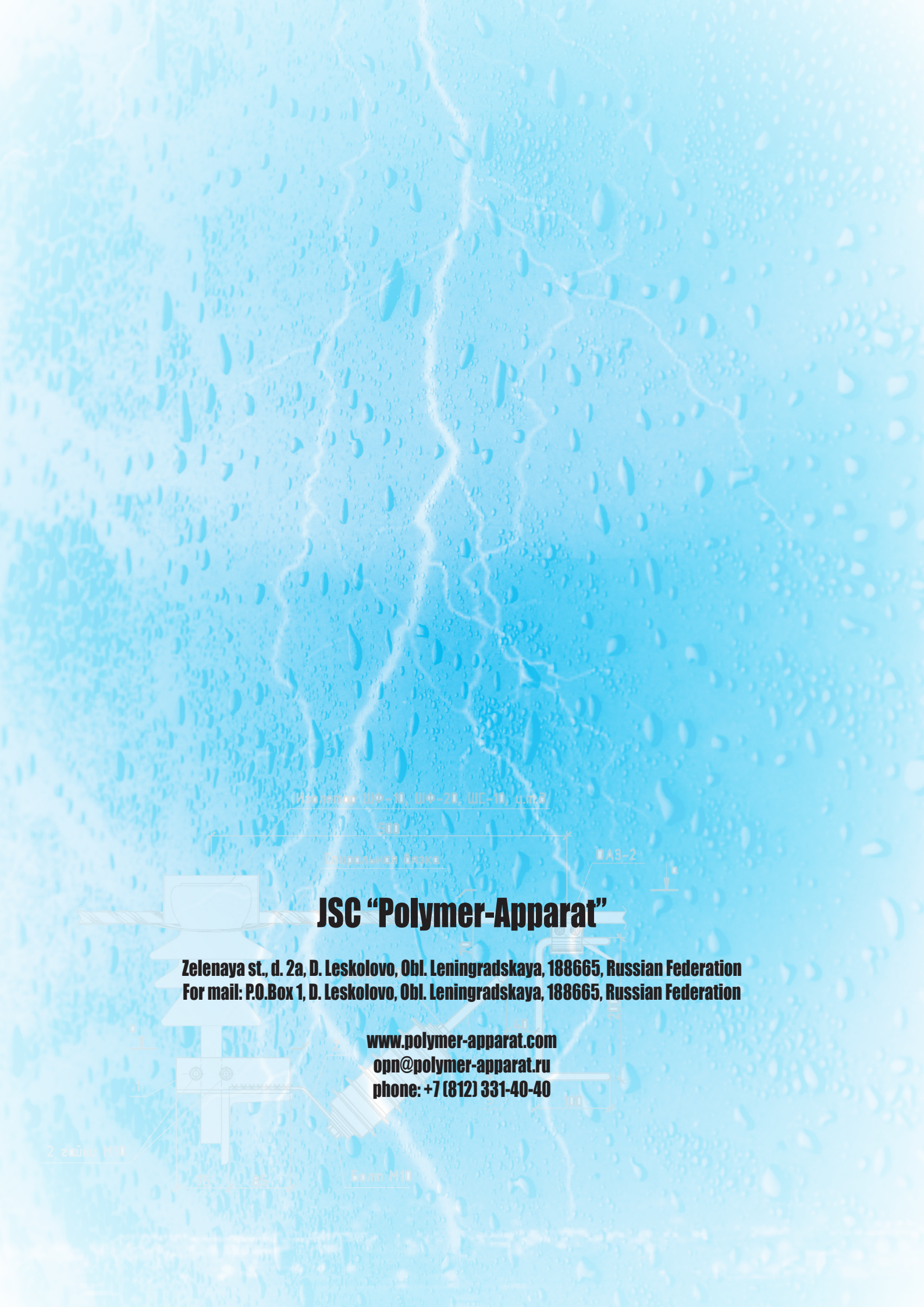


Fig. 45 Type of housing 751



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