

## INSTALLATION AND OPERATING INSTRUCTION FOR SURGE ARRESTERS TYPE PROXAR-IVN DC



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## 1. GENERAL INFORMATION

Dear customer, thank you for choosing our product - the surge arrester type PROXAR-IVN DC. Please read the operating instructions 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 instruction of arresters. If problems arise that are not covered in this manual, please contact with 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.

## 2. DESCRIPTION OF THE PRODUCT

Surge arresters type PROXAR-IVN DC are single-phase devices, designed to work in the outdoor as well as indoor.

The role of surge arresters is overvoltage protection by bringing it to the ground and reduction it. This allows other devices connected to the network are safely protected from the effects of each type of overvoltage. The IV N DC surge arrester is symmetrical, so the assembly is the same regardless of the polarity.

The main part of a surge arrester is a stock of varistors made of zinc oxides with an additive of other metal oxides which are characterized by high nonlinearity of voltage-current characteristic and stability of electric parameters during long standing operation at operating voltage.

The stock of varistors is placed in composite supporting construction and closed in it from both sides with electrodes made of aluminium. Proper electric connection between varistors and electrodes is enabled by appropriate clamp. The housing is made of polymer silicone of very good electro-insulating properties (the housing is put on the inside of surge arrester during the process of direct vulcanisation of silicon).

Surge arrester PROXAR-IVN DC can be supplied with the following equipment:

- Line terminal
- Base
- Insulating base

Optional equipment:

- Insulating bracket
- Disconnecter

## 3. TECHNICAL DATA

System voltage ( $U_{NDC}$ )	0.6 - 3 kV
Continuous operating voltage ( $U_{CDC}$ )	1.0 – 4.7 kV
Nominal discharge current $I_n$ 8/20 $\mu$ s	20 kA
High current impulse $I_{hc}$ 4/10 $\mu$ s	200 kA
Long duration impulse current strength	1350 A      2000 $\mu$ s 1000 A      2800 $\mu$ s 1600 A      2800 $\mu$ s
Long duration impulse current at operating duty test	4
Line discharge class according to IEC 60099-4: 2009	DC-B
Line discharge class according to EN 50526-1: 2012	DC-B
Energy capability, 2 impulses	13.5 kJ/kV of $U_c$ dc
Energy capability in operating duty test	10,5 kJ/kV of $U_c$ dc
Energy input with $I_{hc}$	2.65 kJ/kV of $U_c$ dc
Short circuit rating	40 kA dc for 0.2s*

\* structure of surge arrester is resistant on 50 kA short circuit current according to Report no 8060/NBR/10 IEL

Service conditions:

- temperature -40 °C do +60 °C\*\*
- altitude up to 1000 m\*\*

Mechanical data:

- short-term bending moment 1800 Nm
- long-term bending moment 1200 Nm

- torque moment
- vertical load

650 Nm  
20 kN

Mechanical shock resistance and vibration:

- according to PN-EN 60068-2-6:2008
- according to PN-EN 60068-2-27:2009
- according to PN-EN 661373:2011

3 g 10 ÷ 500 Hz  
30 g  
category 1, class B

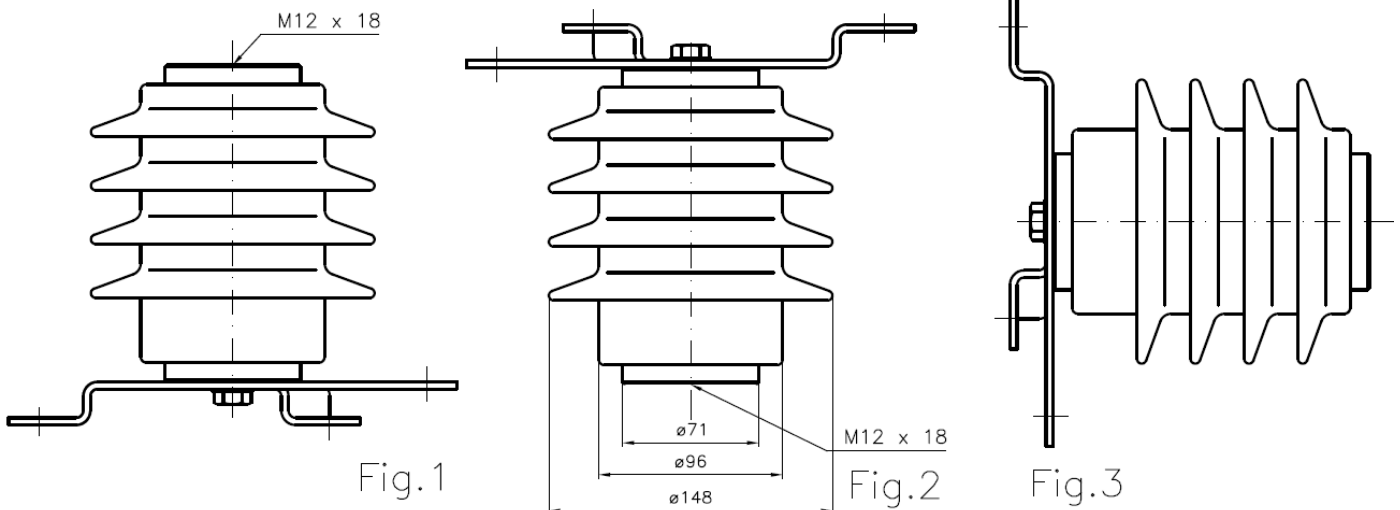
\*\*for higher parameters please contact with manufacturer

The nominal parameters are summarized in Table 1 below.

Table 1. **ELECTRICAL DATA**

TYPE PROXAR-IVN DC	Continuous operating voltage Uc(DC) kV	Residual voltage in kV pk at a specified impulse current								
		Wave 1/... μs (pk)		Wave 8/20 μs (pk)				Wave 30/60 μs (pk)		
		10kA	20kA	5kA	10kA	20kA	40kA	500A	1kA	2kA
1.0	1.0	2.65	2.97	2.30	2.42	2.60	2.87	1.99	2.03	2.10
1.5	1.5	4.12	4.57	3.53	3.74	4.01	4.39	3.06	3.15	3.24
2.0	2.0	5.37	5.95	4.63	4.90	5.28	5.80	3.98	4.06	4.23
2.5	2.5	6.77	7.51	5.81	6.14	6.59	7.22	5.03	5.18	5.33
3.0	3.0	8.06	8.92	6.95	7.38	7.91	8.65	5.99	6.12	6.37
4.2	4.2	11.10	12.10	9.40	10.00	10.90	12.00	8.10	8.40	8.70
4.5	4.5	12.01	13.09	10.17	10.82	11.80	12.98	8.76	9.08	9.41
4.7	4.7	12.52	13.64	10.60	11.28	12.30	13.53	9.13	9.47	9.81

Note: It is possible to make PROXAR-IVN DC surge arrester with a different range of continuous operating voltage.



The figure shows the installation of surge arresters type PROXAR-IVN DC. Figure 1 shows a vertical installation, Figure 2 shows a reversed installation. There is also a possibility to work / install surge arresters in a horizontal position – Fig.3. Completion of surge arresters to work in horizontal position is the same as for vertical installation.

In the upper part of the surge arrester – line accessories (please see fig. 5) can be located line terminal allows, to connect the linear conductor Cu or Al up to 80 mm<sup>2</sup>. If you would like extend cross section of conductor please use wire with the tip of the ring adequate for “connector M12. After that, you can apply metal banding tape. It is recommended to use the cables in isolation. Metal banding tape must be properly labeled according to the applicable regulations at the installation site.

According to earth accessories (please see fig. 5), do not connect the surge arrester disconnector by metal banding tape, this connection should be made by flexible connection such as copper cable, which allows you to reject the disconnector terminal during its trip.

Table 2 **TECHNICAL HOUSING DATA**

Type PROXAR-IVN DC	Insulation withstand voltage of empty housing		Minimal distances		Height H	Creepage distance L	Weight
	DC voltage wet (60s)	1.2/50 $\mu$ s dry	Distance between arresters „b”	Distance between arrester and the nearest grounded structure „a”			
kV	kV	kV	mm	mm	mm	mm	kg
1.0	17	75	180	100	165	318	2.3
1.5			180	100			2.5
2.0			180	100			2.7
2.5			180	100			3.0
3.0			180	100			3.2
4.2			180	100			3.5
4.5			180	100			3.6
4.7			180	100			3.6

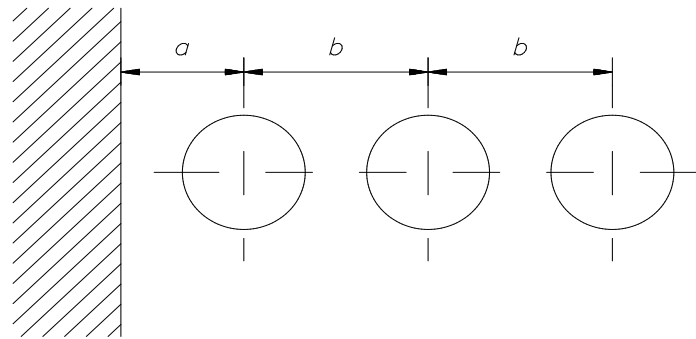


Fig.4. Minimal mounting distances of surge arresters.

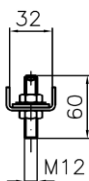
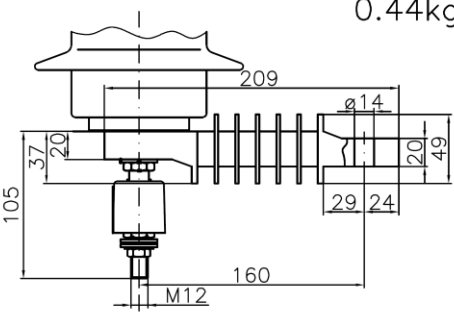
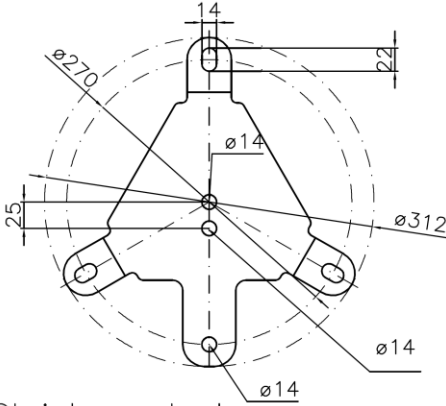
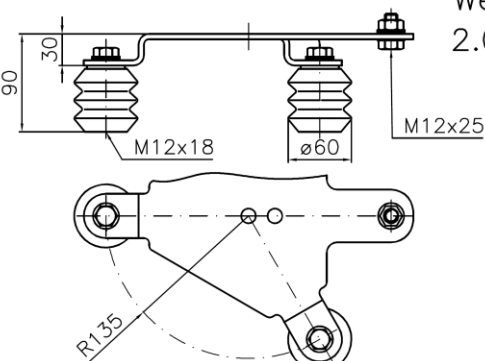
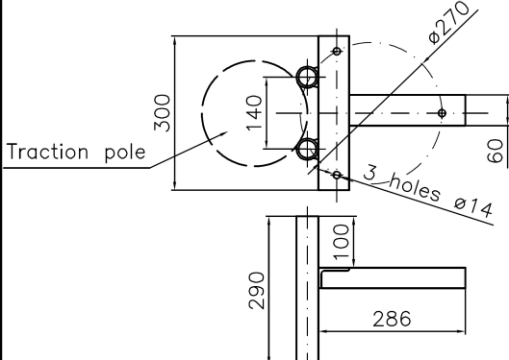
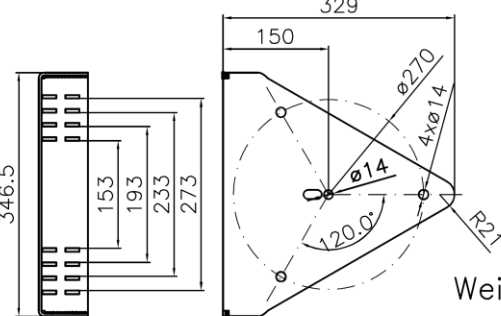
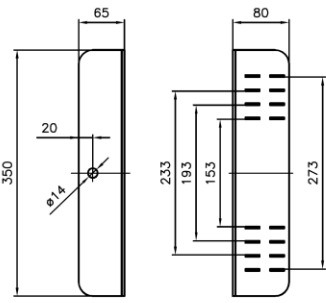
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">LINE ACCESSORIES</p> <p style="text-align: center;">LINE TERMINAL 1</p> <p style="text-align: right;">Weight: 0.23kg</p>  <p style="text-align: center;">Stainless steel</p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">EARTH ACCESSORIES</p> <p style="text-align: center;">INSULATING BRACKET WITH DISCONNECTOR 1</p> <p style="text-align: right;">Weight: 0.44kg</p> 
<p style="text-align: center;">MOUNTING BASE 1</p> <p style="text-align: right;">Weight: 1.18kg</p>  <p style="text-align: center;">Stainless steel</p>	<p style="text-align: center;">INSULATING BASE 2</p> <p style="text-align: right;">Weight: 2.06kg</p>  <p style="text-align: center;">Cycloaliphatic resin</p>
<p style="text-align: center;">MOUNTING BASE 3 (for traction pole)</p> <p style="text-align: right;">Weight: 4.54kg</p>  <p style="text-align: center;">Hot-dip galvanized</p>	<p style="text-align: center;">MOUNTING BASE 4 (for traction pole)</p> <p style="text-align: right;">Weight: 2.97kg</p>  <p style="text-align: center;">Stainless steel</p>
<p style="text-align: center;">MOUNTING BASE 5 (for traction pole)</p> <p style="text-align: right;">Weight: 1.47kg</p>  <p style="text-align: center;">Stainless steel</p>	

Fig.5. Equipment for surge arresters type PROXAR-IVN DC

#### 4. TRANSPORT, RECEIVING and STORAGE

Surge arresters are supplied in a strong, cardboard packs, which are packed in carton boxes. Terminals and base or other accessories are packed separately. Equipment is shown in Figure 5, "Figure mounting surge arresters type PROXAR-IVN DC", 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 6 layers.

#### 5. ASSEMBLY

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

Before final installation, check that the product is correct (type designation,  $U_r$  - rated voltage,  $U_c$  - continuous operating voltage, type of voltage system DC – direct current,  $I_n$  – nominal discharge current, etc.). If in doubt about the appropriate model, please consult with the manufacturer's technical department.

The method of assembling and tightening torques of screw connections are shown in Figure "Correctly mounting of surge arrester with line terminal" and "Correctly mounting of surge arrester with disconnecter", 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. Figure 6 shows a examples mounting of surge arrester equipped with mounting base and line terminal. When installing the terminal line first tighten the grub screw pos. 6 (using hex head cap 6 mm - for grub screw M12) with a torque of 50 Nm and then develop it in the nuts and washers pos. 2, 3, 5, 9. Tightening the individual nuts pos. 5 (use a cap, wrench size 19 mm) of terminal line is also 50 Nm. Installation of the mounting base

should start screwing in the bottom electrode arrester grub screw M12 pos. 7 (using hex head cap 6 mm) - tightening 30Nm then tighten mounting base using the screw M12x25 pos. 8 (use the cap wrench size 19 mm) - tightening torque 50Nm of prior use corrugated pads pos. 9. If the surge arrester is additionally equipped with an insulating base is pre-assembled to the mounting base must be assemble 3 insulators using 3 screws M12x20 and washers (use the cap wrench size 19 mm) - 50Nm torque.

Table 2 shows the recommended minimum distances that should be maintained during installation of arresters (please see fig.4). These are the minimum distance between the axles of surge arrester and between the nearest grounded structure.

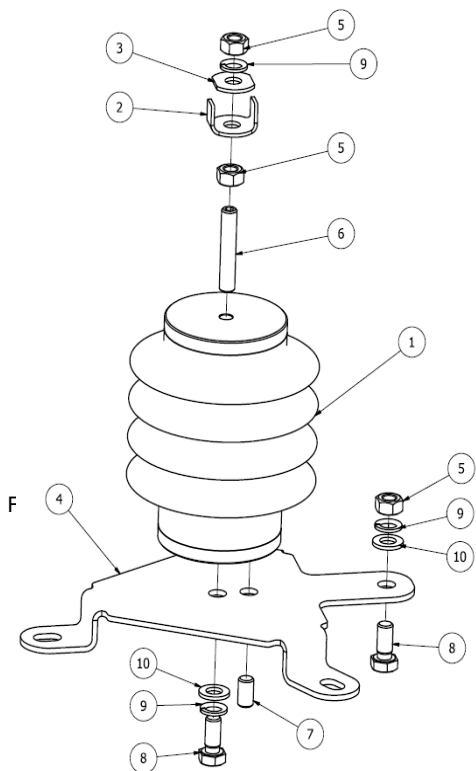


Fig.6 Correctly mounting of surge arrester

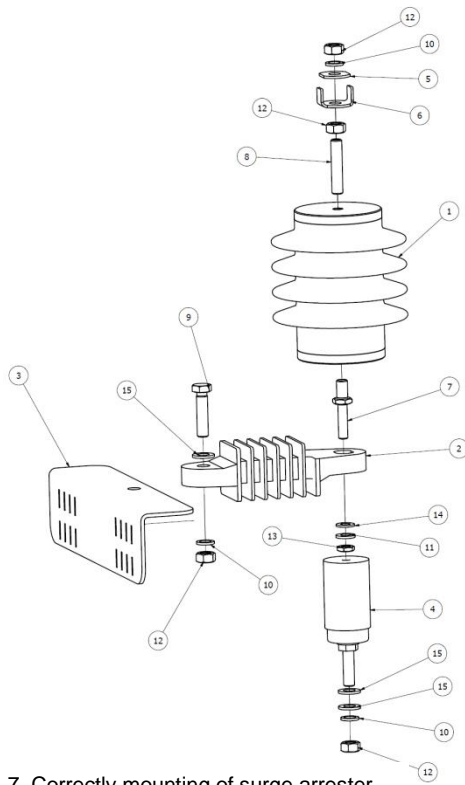


Fig. 7. Correctly mounting of surge arrester with insulation bracket and disconnector

Figure 7 shows a examples mounting of surge arrester equipped with disconnector. At first in top hole screw the pressure screw M12 with a torque 30 Nm pos 8. On the pressure screw mounting others items of line terminal pos. 5; 6; 10; 12. A nut with the number 12 in this unit screw with torque 50 Nm. (Operation of mounting the nut do after connecting a cabel from surge arrester to security object). Next in bottom hole of electrode screw the screw pos. 7 with torque 30 Nm. After that mounting a surge arrester on the insulating bracket pos. 2, then slide a pad pos. 14 and 11 on pin M10 and screw the nut with torque 30 Nm. To protruding pin M10 screw the disconnector pos. 4 with torque 20 Nm. In the bottom part of disconnector there is a pin with thread M12, on that pin mounting the elastic cable with ring tip with a nut pos. 12 and pad pos. 15 and 10 to grounded structure with torque 20 Nm. On that prepare unit after mounting the mounting base pos. 3 on pole structure (for example with mounting tape MTMN-G402) allows the final assembly the surge arrester with the insulating bracket on the base pos. 3. To mounting the insulation bracket pos. 2 on base pos. 3 used the bolt M12 with the pad pos. 15; 10 and a nut pos. 12, with torque 25 Nm for the nut. To this kind of construction it is possibility to connect the grounded and line cable.

**Attention:**

Disconnector with grounded structure connect with the line which could fly away after activation the disconnector and made permanent break between the damaged surge arrester and grounded structure connected with the above-mentioned connection. It is recommended that the line is ending with ring tip.

The maximum bending moment for the insulating bracket is 50 Nm.

**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. The manufacturer recommends the possible shortest connecting wires line and ground terminal with min. of 150 mm<sup>2</sup> (Al) and 95 mm<sup>2</sup> (Cu). 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. Line and ground terminals should be tightened with a wrench "19" with adequate torque. Disconnector and items associated with it tighten the max. torque of 20Nm.

It is required that all installation works were carried out in a non-voltage protected system.

In the case when the arrester is installed under tension, must be strictly followed safety guidelines for this type of work. Surge arrester PROXAR – IVN DC is a “symmetrical” apparatus. According it, there is possibility that we can change pole’s “+” and “-“ to terminals without effecting the quality and reliability of surge arrester.

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



## 7. DISASSEMBLY

When removing the arrester, make be sure that it is disconnected in an effective voltage applied to the terminal of arrester. Must reckon with the danger of the emergence of voltage on the electrode due to short circuit during damage of arrester. In view of this, the first must be disconnected terminal from the line. It is required that any disassembling work was done in a non-voltage protected system. When removing observe the same safety rules as the installation.

## 8. SERVICE

Surge arresters type PROXAR-IVN DC does not require any particular maintenance. Sufficient periods of inspection, under the inspection of other devices operating of the place of installation of arresters. External insulation does not require cleaning during operation due to the hydrophobic properties of silicone cover, however, if the surge arrester is working in the area is very high pollution cover can be cleaned using the soft cloth and clean water (the line has to be switch off during cleaning process). Equipment as well disconnecter does not require any maintenance.

## 9. IDENTIFICATION OF NAMEPLATE

The nameplate is shown below in Figure 8. Description of the symbols (Description made by the micropoint method):

A – nominal voltage for example 6.3

B – continuous operating voltage for example 4.5

C – intended for DC system



Figure 8. Nameplate for surge arrester type PROXAR-IVN DC

## 10. DISPOSAL OF WASTE PRODUCT

Surge arrester type PROXAR-IVN DC 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. Aluminium
3. Ceramics - varistors based on zinc oxide
4. Glass fiber bonded with adhesive
5. Steel - supporting structure

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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**Piłsudskiego 92 str.**

**PL 06-300 Przasnysz**

**Poland**

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### ATTENTION

The manufacturer reserves the right to change technical data or designee without prior notice.

**PROXAR®** is a registered trademark newest family of surge arresters produced by Protektel