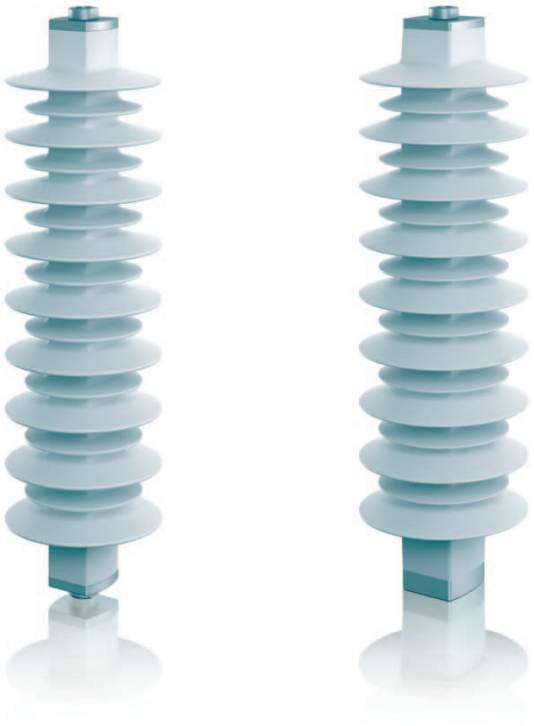
Operating instructions

Surge arrester

Type POLIM® -D
Type POLIM® -K



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Content

1 About this document

These operating instructions are part of the POLIM® -D, POLIM® -K surge arrester and describe safe and proper use for all phases of operation.

Language of the original operating instructions: German

1.1 Validity

These operating instructions are valid only for the POLIM® -D, POLIM® -K surge arrester.

1.2 Target group

The target group of these operating instructions is professionals in the field of high-voltage technology.

The MWK, MWD may only be commissioned and maintained by persons instructed in proper use and handling.

2 Safety

2.1 Symbols and advices

Important information and technical notes are emphasised in order to illustrate the correct operation.

Symbol	Meaning
	This is a safety sign. It warns you of the danger of injury and material damage. Follow all measures marked with the safety sign to avoid injuries, death and damage to materials.
	This safety sign warns you of the danger of death or serious injury from electric shocks. Follow all measures marked with the safety sign to avoid injuries and death.
▶	This mark indicates that an action is to be performed.

Warnings in these operating instructions indicate special dangers and list measures for prevention of the danger. There are three levels of warning:

Warning word	Meaning
DANGER	Immediate, impending endangerment of your life and health
WARNING	Possible impending endangerment of your life and health
CAUTION	Possible impending danger of light injuries or damage to materials

Warnings are structured as follows:

WARNING WORD!

The type and source of danger appear here.

Possible consequences, which could occur if the measures are not followed, appear here.

▶ Measures for avoiding the danger appear here.

2.2 Basic safety precautions

2.2.1 Product safety

The POLIM®-D, -K has been constructed using state-of-the-art technology and officially recognised safety-related rules. Danger to life and health of the user or third parties could arise or damage of the POLIM®-D, -K and other property could occur while the POLIM®-D, -K is in use, however.

- The POLIM®-D, -K is only to be used when it is in technically sound condition, for the intended purpose, and with safety and the possible dangers in mind while observing the operating instructions.
- Keep the operating instructions intact and fully readable, and store them in such a way that they are accessible to operating personnel at all times.
- Decommission and replace overloaded or damaged POLIM®-D, -K units.

2.2.2 Personnel-related measures

- Train personnel in professional and safe working with high-voltage technology.
- Train and instruct personnel in working on the POLIM®-D, -K using the operating instructions.
- Personnel being trained, instructed or provided with general education may only work with the POLIM®-D, -K under constant supervision by an experienced high-voltage technology professional.

2.2.3 Organisational measures

- Observe all safety- and danger-related information regarding the POLIM®-D, -K.
- The safety rules of the owner of the high- and medium-voltage system and all regulations of the respective national safety authorities are to be observed.
- Only trained and instructed professionals may be authorised.
- Clearly assign areas of responsibility for working with the POLIM®-D, -K. Make them known and adhere to them.
- Only personnel who have read and understood the operating instructions, especially the „Basic safety precautions“ section may be allowed to carry out activities with the POLIM®-D, -K.
- Check to ensure that work is being performed in a safety-conscious way with awareness of possible dangers and while observing the operating instructions.

3 Description

3.1 Intended use

The POLIM®-D, -K is a surge arrester intended for use in high- and mediumvoltage applications. Surge arresters protect the insulation of high voltage and medium voltage devices against unacceptable overvoltages which are caused by lightning or switching operations.

The manufacturer is not liable for resulting damages from further, unintended use. The operator accepts all responsibility for using the POLIM®-D, -K outside of its intended application range as specified in this document.

3.2 Structure and function

The POLIM®-D, -K surge arrester is constructed from serially connected, non-linear metal-oxide (MO) resistors. These MO resistors have an extremely non-linear resistance property. At the maximum operating voltage of U_c, only a small capacitive current will flow in the mA range. With an increase in voltage, the MO resistors enter a highly-conductive state practically without delay. Thus any further increase in voltage is limited to the specified residual voltage values. After the decline of the overvoltage the arrester immediately turns back to the non- or slightly-conductive state. The MO arrester converts the energy of the surge into heat, which it transfers to the surrounding air.

The stack of MO resistors and connection equipment is held together with loops made of fiberglass-reinforced plastic. The directly molded silicone housing protects it from all environmental and weather influences. This design has proven to be the best solution in every environment for years.

The POLIM®-D, -K surge arrester is optionally equipped with a disconnecting device (disconnector). This device disconnects the POLIM®-D, -K surge arrester from the power network, when it has been overloaded and destroyed. Disconnecting is done by firing of a small propellant charge in the disconnecting device.

The POLIM®-D and POLIM®-K is especially suited for overvoltage protection of:

- transformers
- cables, capacitors
- generators, motors
- other medium-voltage and high-voltage apparatuses and systems

The POLIM®-K has a larger energy absorption capability and lower protection level.

3.3 Technical data

The technical data, dimensions, weights and installation distances are specified in the following documents:

- surge arrester POLIM®-D for applications in a.c. systems in the pamphlet 1HC0075853 / CHABB-103
- surge arrester POLIM®-K for applications in a.c. systems in the pamphlet 1HC0075855 / CHABB-104
- POLIM®-D, -K dimensional drawings
- Drawings of accessories

3.3.1 Technical data on the surge arrester

The technical data are partly molded into the silicone housing and engraved in the electrodes:

Data	Meaning
POLIM®-D .. POLIM®-K ..	Type designation
Is .. kA IEC-P-CL .. kA	Rated short-circuit current I_s for 0.2 sec
Uc = .. kV	Maximum permissible continuous operating voltage U_c
Ur = .. kV	Rated voltage U_r
In = .. kA	Nominal discharge current I_n
xxxxxxxx	Serial number
20xx	Date of manufacture, year

3.3.2 Application guidelines

The following guidelines apply for the use of POLIM®-D, -K surge arresters:

- “Application guidelines Overvoltage protection”
  Dimensioning, testing and application of metal oxide surge arresters in medium voltage systems, pamphlet 1HC0075561

Additionally for surge arresters equipped with disconnecing devices applies:

- ▶ Use POLIM®-D, -K surge arrester equipped with a disconnecting device in outdoor installations, only.
- ▶ Use the disconnecting device with POLIM®-D, -K surge arrester, only. The disconnecting devices for POLIM®-D are different from disconnecting devices for POLIM®-K.

3.3.3 Recommended torques and screw-in depths

The specified values in the table below apply for steel bolts of strength class 8.8 in aluminum nut threads.

Thread	Position	Torque [Nm]	Minimum screw-in depth [mm]	Maximum screw-in depth [mm]
M12	top connection	48	18	25
M12	top connection without socket POLIM® -D, only	48	18	20.5
M12	bottom connection	48	18	20.5
M12	bottom connection without socket POLIM® -D, only	48	12	12.5

The specified values in the table below apply for POLIM® -D, -K surge arrester equipped with a disconnecting device.

Thread	Position	Torque [Nm]
M12	bolt between disconnecting device and bottom connection of surge arrester	20
M10	bolt of the disconnecting device	20

The specified values in the following table apply for steel bolts & nuts of strength class 8.8, which are used in some clamping accessories.

Thread	Maximum torque [Nm]
M6	8.8
M8	21.4
M10	44
M12	74
M14	119
M16	183

3.3.4 Behaviour in fire

The silicone housing of the surge arrester is self-extinguishing.

4 Transportation, unpacking and storage

4.1 Transportation

CAUTION!

Surge arresters not secured during transportation.

Damage to surge arresters that have fallen during transport.

- Secure surge arresters against sliding or falling before transportation.
- Observe safety precautions printed on the packaging for proper handling during transportation and storage.
- Don’t expose disconnectors or surge arresters with equipped disconnecting devices to temperatures above +60 °C .

4.2 Unpacking

The surge arresters provided are packaged in stable cardboard boxes or wooden crates. The accessories, packaged in plastic bags, are either included in the carton or wooden crate or supplied separately in case of large quantities.

The surge arresters are supplied with accessories installed, unless specifically ordered otherwise. The routine test reports for the final electrical inspection are included in the packaging material.

- After receiving the shipment, compare the order and delivery documents immediately to check for completeness and accuracy of the shipment. In case of incompleteness or deviations, inform the supplier and shipper immediately.

WARNING!

Damaged surge arresters.

Material damage and personal injury due to the installation and commissioning of damaged surge arresters.

- Do not use damaged surge arresters.
- Examine shipment immediately to check for damage.
- Notify the insurance company, the shipper and the supplier of the damage immediately and create a damage log.

4.3 Storage

The original packaging materials can be used for storage.

- Store surge arresters in a well-ventilated, clean room.
- Remove plastic film to prevent the formation of condensation water.
- Storage temperature: -40 .. 70°C
- Storage temperature for disconnectors or surge arresters with equipped disconnecting devices: -40 .. 60 °C.

5 Commissioning

5.1 Safety

DANGER!

System uses high voltage.

Death, serious bodily harm and damage to the switching gear may result from an electric shock.

- Allow only authorised professionals to perform work on the surge arrester.
- Observe the safety rules of EN 50110-1 before working on the system:
  - Disconnect the system from the power supply.
  - Secure the system against being switched on again.
  - Ensure that the system is de-energised.
  - Earth the system and short-circuit it.
  - Cover or cordon off neighbouring energised parts.

5.2 Electrical check before commissioning

Each surge arrester is tested by the manufacturer. The routine test report is included with the packaging. Additional electrical testing before commissioning is not necessary.

5.3 Installation location and protective distance

DANGER!

Danger of fire and injury via arc and flying parts with overloading of the surge arrester and when disconnecting device is disconnecting the surge arrester.

Ignition of flammable materials by an arc and flying burning parts.

- Do not store flammable materials near the surge arrester.
- When working near the surge arrester, do not wear easily flammable clothing.

Surge arresters only protect medium-voltage apparatuses when they are located within the protective distance The protective distance is only a few meters.

- Always mount surge arresters as close as possible to the apparatus to be protected within the protective distance. The length of the connecting cables are decisive here.
- In cases of doubt, calculate the protective distance according to the formulas in the „Application guidelines“.
- Use POLIM® -D, -K surge arrester equipped with a disconnecting device in outdoor installations, only.

5.4 Mounting

5.4.1 System voltage

CAUTION!

Incorrect system voltage.

Damage to the switching gear and the surge arrester.

- Do not use surge arresters intended for a.c. systems in d.c. systems.
  - The test voltage applied to the switchgear during insulation test may damage the surge arrester.
- Observe the „Application guidelines“ from ABB Switzerland Ltd.
- Before mounting, ensure that the characteristic data on the rating plate of the surge arrester matches the requirements of the power system.
- Ensure that system voltage applied at the terminals of the arrester does not exceed the maximum permissible continuous operating voltage of the surge arrester.
- Disconnect surge arrester from switchgear during insulation tests.

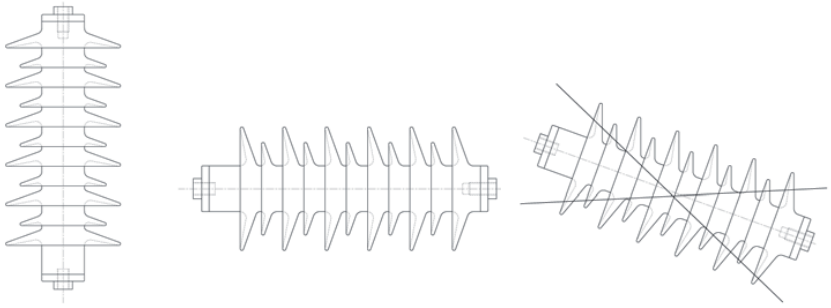
5.4.2 Installation position

CAUTION!

Deposits on the undersides of sheds.

Conductivity of deposits hinders protective function of the POLIM-D, -K.

- Always mount surge arresters in such a way that the sheds point downward.



5.4.3 Transportation during mounting

Depending on weight and installation location of the surge arrester, a crane may be necessary for mounting. The crane ropes can be fastened directly of via a ring bolt at the top connection.

5.4.4 Minimum distances between surge arresters and earth

The minimum permissible distances between the surge arresters and the earth are specified on the data sheets supplied with the offer or order confirmation. The values are based on calculations for unfavourable conditions and include safety margins.

- Observe national regulations and the rules of the system owner.
- The mounting position of a surge arrester with equipped disconnecting device shall be such, that disconnected earth wire can swing freely and in this case no flash over will occur between the bottom connection and earth.

5.4.5 Connections

The base or foundation for the surge arrester must be flat, clean and suitable for the loads that arise.

The following materials made of stainless or galvanised steel are to be provided by the customer depending on the application:

- bolts
- nuts
- bolt locks
- any required balancing washers

The ordered mounting accessory is already mounted to the surge arrester in most cases. If the mounting accessory hase been ordered and delivered separately, it shall be mounted according to the enclosed instruction, drawing, data sheet or dimensional drawing.

- Surge arrester with disconnecting device:
  Mount insulating bracket at vertical surface (wall, column, tower). Connect earth wire to the stud of the disconnecting device. Use a stranded cable.
- Surge arrester without disconnecting device:
  Mount the ground plate of the surge arresters directly to the frame or by means of a metalllic mounting bracket. Connect earth wire to the ground plate of the surge arrester.
- Connect the high voltage connection cable to the head end terminal of the surge arrester. Use a stranded cable.
- Observe recommended torques (Clause 3.3.3).
- When tightening the bolt, the torque shall be countered by a spanner at the same terminal.
- Carefully clean contact surfaces before mounting and lubricate with acid-free contact grease.
- Ensure selection of suitable material pairs.

5.5 Earthing

- Observe national regulations and the requirements of the system owner.
- Connect surge arresters to the system ground via the shortest path.
- Surge arresters equipped with disconnecting device shall be connected to earth by a stranded wire. One side of the earth wire shall be connected to the disconnecting device the other side shall be connected to earth nearby the mounting position of the insulating bracket.
- Observe recommended minimum diameters for POLIM® -D:
  - Copper Ø 20 mm^2
  - Aluminum Ø 40 mm^2
- Observe recommended minimum diameters for POLIM® -K:
  - Copper Ø 55 mm^2
  - Aluminum Ø 100 mm^2

6 Maintenance, upkeep

6.1 Safety

DANGER!

System uses high voltage.

Death, serious bodily harm and damage to the switching gear may result from an electric shock.

- Allow only authorised professionals to perform work on the surge arrester.
- Observe the safety rules of EN 50110-1 before working on the system:
  - Disconnect the system from the power supply.
  - Secure the system against being switched on again.
  - Ensure that the system is de-energised.
  - Earth the system and short-circuit it.
  - Cover or cordon off neighbouring energised parts.

The surge arresters do not contain wearing parts and are therefore maintenancefree. Replacement parts are not needed.

6.2 Disconnecting device

DANGER!

Tripping of disconnecting device.

Risk of injury due to inappropriate handling.

- Do not expose the disconnecting device to temperatures above 60 °C.
- Never try to open the disconnecting device.
- Do not connect any voltage/energy source to the terminals of the disconnecting device.

The disconnecting device does not need any maintenance.

6.3 Replacement after overloading or damages caused by animals

Overloading during operation can lead to damaging (e.g. traces of fire, fractures) of the surge arrester from arcs.

Minimal animal bites on the sheds of the silicone housing (e.g. by birds, martens, mice etc.) do not hinder the functioning of the surge arrester. Heavy bites do reduce the insulation capacity of the silicone housing, however.

CAUTION!

Damage to the surge arrester.

Damaged surge arresters no longer protect the switchgear.

- Check the surge arresters visually on a regular basis to ensure that they are in sound condition.
- Replace surge arresters, when disconnecting device has operated.
- Replace damaged surge arresters.

- Keep a small percentage of installed surge arresters in reserve.

6.4 Cleaning in case of heavy pollution

Thanks to the hydrophobicity of the silicone housing, normal pollution does not affect the insulation capacity of the housing. If pollution exceeding this is present (heavy deposit layer) the surge arrester should be cleaned.

CAUTION!

Solvents and abrasive equipment.

Damage to the silicone housing.

- Do not use cleaning agents containing solvents besides isopropanol.
- Do not use abrasive equipment for cleaning.
- Do not use silicone grease or silicone oil after the cleaning.
- Clean surge arresters either with:
  - warm water and soft, lint-free cloths.
  - water spray with a maximum pressure of 10 bar.
  - soft, lint-free cloths moistened with isopropanol (isopropyl alcohol).
- Apply on the whole silicone surface.

7 Disposal

POLIM® -D, -K surge arresters are environmentally-friendly products which must be disposed of based on the respective applicable regional regulations in an environmentally-friendly manner. The materials should be given up for recycling.

Constituent components are:

- silicone rubber (not halogenated) for the external insulation
- mounting sections and other parts made of aluminium
- metal-oxide varistors
- fibreglass-reinforced plastic lugs
- steel mounting hardware

Constituent components of the disconnecting device:

- terminals and metallic parts from aluminium
- enclosure from thermoset material
- small propellant charge

If disconnecting device has not been damaged it can be assumed that the small propellant charge had not been tripped. In this case disconnecting device shall be disposed according to the local laws and regulations. Do not open disconnecting device.

The remaining parts of a disconnecting device, which has tripped, can be recycled.

Silicone rubber (not halogenated)

The silicone rubber can break down into SiO_2 and CO_2, thus uncovering the encased metal-oxide varistors.

Metal-oxide varistors

The metal-oxide varistors are sintered ceramics consisting of about 90 % of ZnO. The following additions are also contained within:

- percent by weight between 1 % and 4 %: Bi_2O_3 and Sb_2O_3, which are considered to be dangerous substances according to EU ordinances.
- percent by weight between 0.1 and 1 %: NiO and Cr_2O_3, which are considered poisonous and dangerous materials pursuant to EU guideline 91/689/EEC.

Metal-oxide varistors are coated with a thin glass coating containing lead-oxide (<0.1 % of the weight of the metal-oxide varistor).

The substances are ligated as a mixed oxide in metal-oxide varistors. A wash-out test in accordance with an EPA specification (Federal Register/vol. 45, No 98 /Rules and regulations) has shown that the sintered metal-oxide varistors can be disposed of as industrial waste without infringing on EEC guidelines.

No danger to personal health or the environment is present during normal operation.

For more information please contact:

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