Operating instructions

Surge arrester
Typ POLIM ® -C

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ABB

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1 About this document

These operating instructions are part of the POLIM ® -C 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 ® -C surge arrester.

1.2 Target group

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

The POLIM ® -C 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®-C 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®-C and other property could occur while the POLIM®-C is in use, however.

- The POLIM®-C 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®-C 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®-C using the operating instructions.
- Personnel being trained, instructed or provided with general education may only work with the POLIM®-C 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®-C.
- 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®-C. 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®-C.
- 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®-C is a surge arrester intended for use in low- and medium-voltage applications. Surge arresters protect the insulation of 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®-C outside of its intended application range as specified in this document.

3.2 Structure and function

The POLIM®-C surge arrester is constructed from one or more 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 over-voltage 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.

Thanks to its high energy absorbing capability and mechanical strength, the POLIM®-C is especially suited for overvoltage protection of

- transformers
- cables and cable sheat
- capacitors
- rotating machines
- apparatuses in railway applications
- other low- and medium-voltage apparatuses and systems

Variants of the surge arrester POLIM®-C suitable for the use in a.c. and d.c. systems are available. The variants for d.c. systems differ from POLIM®-C surge arresters for a.c. systems by the appendix **D** as second letter in the complete term of classification (e.g. POLIM®-C 2.0 N**D**, POLIM®-C 2.0 H**D**).

3.3 Technical data

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

- surge arrester POLIM®-C .. N for applications in a.c. systems in the pamphlet 1HC0075874
- surge arrester POLIM®-C .. LB for applications in a.c. systems in the pamphlet PTHA 3272
- surge arrester POLIM®-C .. ND for applications in d.c. systems in the pamphlet 1HC0075875
- surge arrester POLIM®-C .. HD for applications in d.c. systems in the pamphlet 1HC0093986
- dimensional drawings of POLIM®-C

3.3.1 Technical data on the surge arrester

The rating plate, molded in silicone, on labels or engraved, contains the following data:

Data	**Meaning**
POLIM®-C	Type designation
I_n 10 kA	Nominal discharge current I_n
I_s .. kA	Rated short-circuit current I_s for 0.2 sec
POLIM®-C .. N	Version for a.c. applications
POLIM®-C .. I POLIM®-C .. LB	Complete type designation with specification of the maximum permissible continuous operating voltage U_c
POLIM®-C .. ND	Version for d.c. applications
POLIM®-C .. ID POLIM®-C .. HD	Complete type designation with specification of the maximum permissible continuous operating voltage U_c
U_c .. kV	Maximum permissible continuous operating voltage U_c
U_r .. kV	Rated voltage U_r
xx-20xx	Date of manufacture: month - year
1 …	Fabrication number

3.3.2 Application guidelines

The following guidelines apply for the use of POLIM ® -C surge arresters:

- „Application guidelines - Overvoltage protection“
  Dimensioning, testing and application of metal-oxide surge arrresters in medium voltage systems, pamphlet 1HC0075561
- „Application guidelines - Overvoltage pRotection“
  Dimensioning, testing and application of metal-oxide surge arrresters in railway facilities, pamphlet 1HC0075573

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	Maximum torque [Nm]	Minimum screw-in depth [mm]	Maximum screw-in depth [mm]
M12	Head end terminal	42	18	22
M12	Foot end terminal	42	18	22

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.

4.2 Unpacking

The surge arresters provided are packaged in stable cardboard boxes or wooden crates.

The routine test report for the final electrical inspection is 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.

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 with overloading of 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“.

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.
- 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.

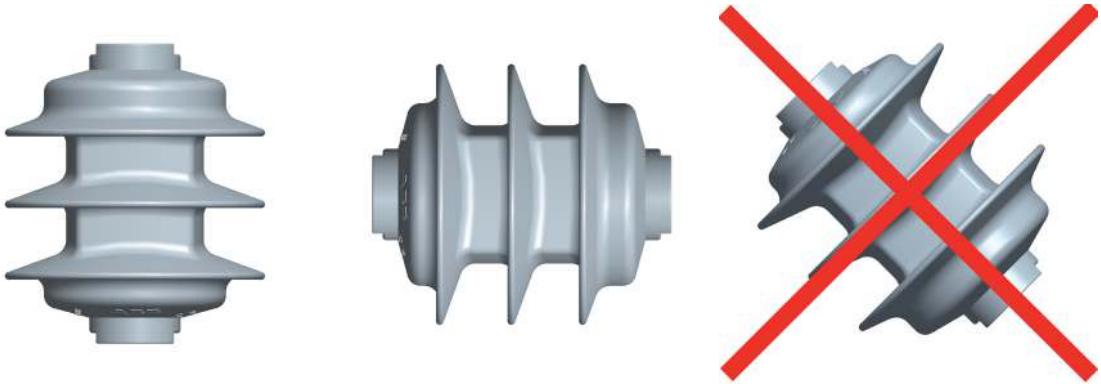
5.4.2 Installation position

CAUTION!

Deposits on the undersides of sheds.

Conductivity of deposits hinders protective function of the POLIM® -C.

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



5.4.3 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 regarding minimum permissible distances between the surge arresters and the earth.

5.4.4 Connections

The base 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:

- bolts
- nuts
- bolt locks

▶ The design of the surge arrester POLIM ® -C is symmetrical. The high voltage cable shall be either connected to the head end terminal while the food end terminal is earthed or vise versa.

▶ Mount the surge arresters directly to the base. Connect the terminal of the surge arrester with earth.

▶ Connect the high voltage connection with the other 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 top end 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.

▶ Observe recommended minimum diameters:

- POLIM ® -C .. N/ND
  - copper 35 mm^2
  - aluminum 50 mm^2
- POLIM ® -C .. HD
  - copper 65 mm^2
  - aluminum 95 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 maintenance-free. Replacement parts are not needed.

6.2 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 damaged surge arresters.

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

6.3 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® -C 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
- terminals and other parts made of aluminium
- metal-oxide varistors
- fibreglass-reinforced plastic straps
- mounting hardware and spring washers from steel

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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