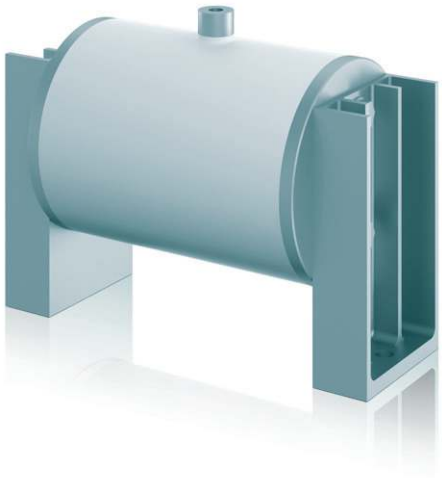
Operating instructions

Surge arrester
Type POLIM® 4.5 ID



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Content

1 About this document

These operating instructions are part of the POLIM ® 4.5 ID 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 ® 4.5 ID surge arrester.

1.2 Target group

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

The POLIM ® 4.5 ID 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 ® 4.5 ID 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 ® 4.5 ID and other property could occur while the POLIM ® 4.5 ID is in use, however.

- The POLIM ® 4.5 ID 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 ® 4.5 ID 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 ® 4.5 ID using the operating instructions.
- Personnel being trained, instructed or provided with general education may only work with the POLIM ® 4.5 ID 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 ® 4.5 ID.
- 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 ® 4.5 ID. 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 ® 4.5 ID.
- 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 ® 4.5 ID is a surge arrester intended for use in medium-voltage applications. Surge arresters protect the insulation of medium voltage devices against 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 ® 4.5 ID outside of its intended application range as specified in this document.

3.2 Structure and function

The POLIM ® 4.5 ID surge arrester is constructed from two parallely 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 strong straps 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 extra high energy absorbing capability, the POLIM® 4.5 ID is especially suited for over-voltage protection of

- locomotives and other apparatuses in railway applications

The POLIM® 4.5 ID is intended to be used indoors.

3.3 Technical data

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

- Surge arrester POLIM® 4.5 ID for applications in d.c. systems in the pamphlet 1HC0075852.
- POLIM® 4.5 ID dimensional drawing HAWA 380212

3.3.1 Technical data on the surge arrester

The rating plate contains the following data:

Data	Meaning
POLIM® 4.5 ID	Complete type designation with specification of the maximum permissible continuous operating voltage U_c
I_n = 40 kA	Nominal discharge current
U_c = ... kV_{dc}	Maximum permissible continuous operating voltage (d.c. voltage)
U_r = ... kV_{dc}	Rated voltage (d.c. voltage)
HA ...	Serial number
xx-20xx	Date of manufacture: month-year

3.3.2 Application guidelines

The following guidelines apply for the use of POLIM® 4.5 ID surge arresters:

- „Application guidelines“ for railway systems, 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 / High voltage terminal	48	18	25

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 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.

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

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.

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

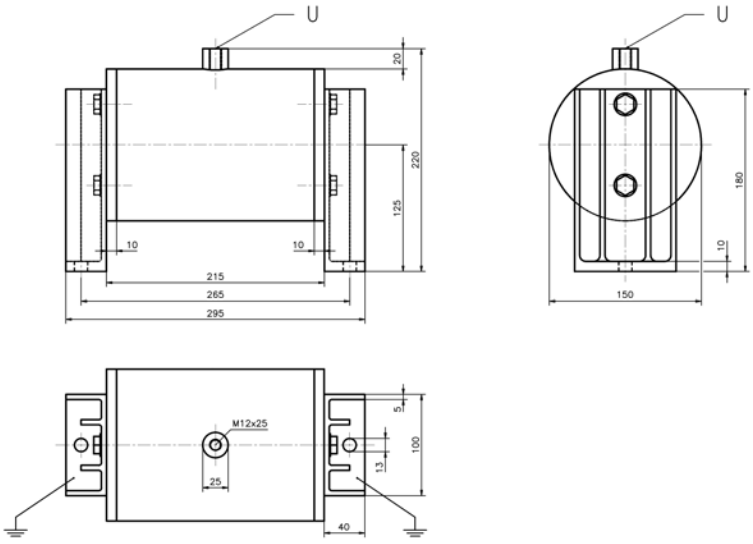
5.4.1 Minimum distances between surge arresters and earth

- ▶ Observe national regulations and the rules of the system owner regarding minimum permissible distances between the surge arresters and the earth.

5.4.2 Connections

The POLIM ® 4.5 ID surge arrester is to be mounted earthed.

- ▶ Mount the metallic side bars of the surge arresters directly to the earthed frame.
- ▶ Connect both side bars of the surge arrester with earth.
- ▶ Connect the high voltage connection with the head terminal U of the surge ar-rester. Use stranded cable.
- ▶ Observe recommended torques (Clause 3.3.3)
- ▶ Carefully clean contact surfaces before mounting and lubricate with acid-free contact grease.
- ▶ Ensure selection of suitable material pairs.



5.4.3 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:
  - copper Ø 40 mm^2
  - aluminum Ø 80 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

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

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.

7 Disposal

POLIM® 4.5 ID 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 aluminum
- metal-oxide varistors
- fibreglass-reinforced plastic straps
- steel mounting hardware

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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Document-ID: 1HC0075079 AB | EN

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