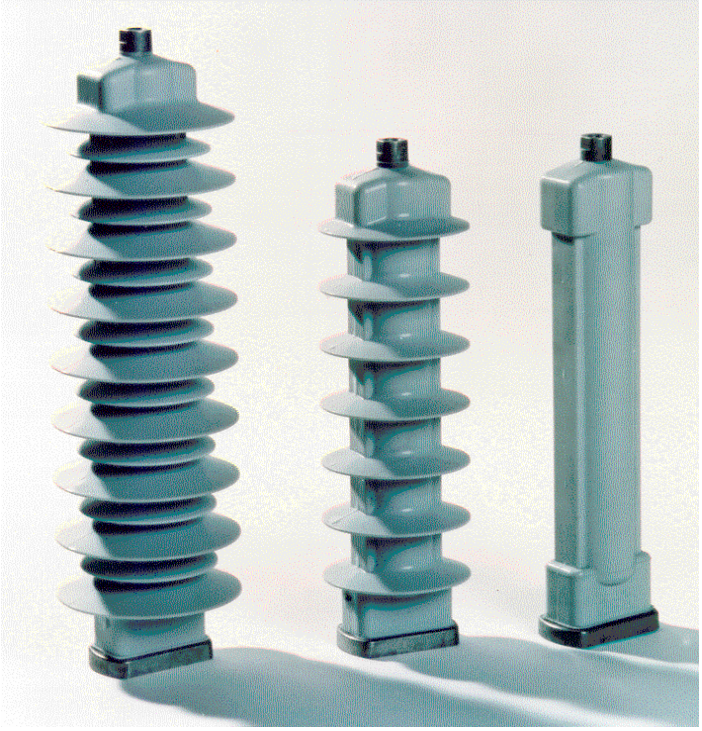
Operating instructions

Publication No. 1HC0040013 AA

Surge arrester
Type MWK, MWD

With ABB metal-oxide resistors and
silicone housing
Without gaps
For indoor and outdoor use

Mounting and installation, maintenance,
transportation, storage and disposal



We reserve the right to make changes.

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1. ABOUT THIS DOCUMENT

These operating instructions are part of the MWK, MWD surge arrester and describe safe and proper use for all phases of operation.

We reserve the right to make changes in the interest of further development.

1.1. Validity

These operating instructions are valid only for the MWK, MWD 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.

1.3. Copyright

2. SAFETY

2.1. Symbols and advices

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.

⦸ **Impermissible** actions appear here.

▶ Measures for avoiding the danger appear here.

2.2. Basic safety precautions

2.2.1. Product safety

The MWK, MWD 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 MWK, MWD and other property could occur while the MWK, MWD is in use, however.

- The MWK, MWD 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 MWK, MWD 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 MWK, MWD using the operating instructions.
- Personnel being trained, instructed or provided with general education may only work with the MWK, MWD under constant supervision by an experienced high-voltage technology professional.

2.2.3. Organisational measures

- Observe all safety- and danger-related information regarding the MWK, MWD.
- 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 MWK, MWD. 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 MWK, MWD.
- 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 MWK, MWD is a surge arrester intended for use in high- and medium-voltage applications. Surge arresters protect the insulation of high voltage and medium voltage devices against overvoltages which are caused by lightning or switching operations.

The MWD surge arrester is intended for use indoors, only. The surge arrester MWK is intended for use outdoors and indoors.

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

3.2. Structure and function

The MWK, MWD 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 strong strips made of fiberglass-reinforced plastic. The directly molded silicone housing with sheds protects it from all environmental and weather influences. This design has proven to be the best solution in every environment for years. For indoor applications without pollution sheds are not required.

Thanks to its high energy absorbing capability and low protective level, the MWK, MWD is especially suited for overvoltage protection of:

- Transformers
- cables, motors
- other high- and medium-voltage apparatuses and systems

3.3. Technical data

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

- surge arrester MWK for applications in a.c. systems in the CHHOS/AR3205/6 pamphlet
- surge arrester MWD for applications in a.c. systems in the CHHOS/AR3209 pamphlet
- MWK, MWD dimensional drawings

3.3.1. Technical data on the surge arrester

The rating plate molded into the silicone housing contains the following data:

Data	Meaning
MWK, MWD	Type designation
IEC-P-CL .. kA	Rated short-circuit current for 0.2 sec.
f ... Hz	Power system frequencies .. Hz

Additional data is etched in or located on signs.

Data	Meaning
MWK .. MWD ..	Complete type designation with specification of the maximum permissible continuous operating voltage U_c
Uc = .. kV	Maximum permissible continuous operating voltage U_c
Ur = .. kV	Rated voltage
In = .. kA	Nominal discharge current
IEC-L-CI..	Line discharge class (if specified)
Dat.	Date of manufacture
No. HA …	Serial number

3.3.2. Application guidelines

The following guidelines apply for the use of MWK, MWD surge arresters:

- "Application guidelines" for medium-voltage systems, pamphlet CHHOS/AR 3257

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	48	18	23.5
M12	Foot end	48	18	23.5

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, and the oxygen index (LOI), measured in accordance with ASTM D 2863 and EN ISO 4589 is greater than 35.

4. TRANSPORTATION, UNPACKING AND STORAGE

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.

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.

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 high- and 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 head end is generally intended for connexion to the high voltage and the foot end/floor plate is generally to be connected to the system ground.

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:

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

▶ Carefully clean contact surfaces before mounting and lubricate with acid-free contact grease.

▶ Ensure selection of suitable material pairs.

5.4.1. Transportation during mounting

Depending on weight and installation location of the surge arrester, a crane may be necessary for mounting. The crane rope can be fastened directly or by means of an eyenut to the surge arrester head end.

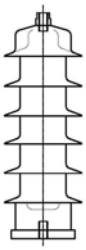
5.4.2. Installation position

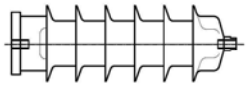
CAUTION

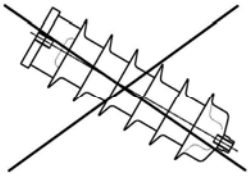
Deposits on the undersides of sheds

Conductivity of deposits hinders protective function of the MWK, MWD .

▶ 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.

5.4.4. Earthed installation

If no surge counters and/or milliammeters were supplied, the MWK, MWD surge arrester is to be mounted earthed.

- ▶ Bolt surge arresters directly to the earthed frame or foundation. Depending on the type of mounting plate centring washers are used.
- ▶ Connect the ground connection of the surge arrester to its base plate tab.

5.4.5. Insulated installation

If surge counters and/or milliammeters were supplied, the MWK, MWD surge arrester is to be mounted insulated.

- ▶ Mount surge arresters with the included loose insulators made of cast resin on the earthed frame or foundation according to the dimensional drawing.
- ▶ Mount surge counters/milliammeters according to the respective mounting instructions.

Surge counters/milliammeters with analogue display

Surge counters/Milliammeters with analogue display are connected in series to the surge arrester between the floor plate and the ground connection.

- ▶ Attach the cable connector of the surge counter/milliammeter to the base plate tab of the surge arrester.
- ▶ Select a cable or conductor for the connector cable with the same diameter and material as used for earth connection.
- ▶ Connect the earth connection to the earth tab of the surge counter/milliammeter.

Digital surge counters/milliammeters

Digital surge counters/milliammeters need separate current sensors which connected to the base plate tap of the surge arrester by means of a long bolt.

- ▶ Connect the earth connection at the bolt of the sensor according to the mounting instruction of the surge counter/milliammeter.

5.5. Earthing

- ▶ Observe national regulations and the requirements of the system owner.
- ▶ Connect surge arresters to the system ground via the shortest path. Carefully clean contact surfaces before mounting and lubricate with acid-free contact grease
- ▶ Observe recommended minimum diameters:
  Copper dia. 20 mm^2
  Aluminum dia. 40 mm^2

6. MAINTENANCE, UPKEEP

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.

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.

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

MWK, MWD 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

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 up to 90% of ZnO. The following additions are also contained within:

- percent by weight over 1%: 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).

The substances are present as an 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.