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1 About this document
These operating instructions are part of the SAM 3.0 Monitoring System for surge arresters and describe safe and proper use in all phases of operation.
Language of the original operating instructions: German

1.1 Validity
These operating instructions are valid only for the SAM 3.0 Monitoring System for surge arresters.

1.2 Target group
The target group of these operating instructions is professionals in the field of high-voltage technology.
The SAM 3.0 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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>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.</td>
</tr>
<tr>
<td>!</td>
<td>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.</td>
</tr>
<tr>
<td>▶</td>
<td>This mark indicates that an action is to be performed.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Warning word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td>Immediate, impending endangerment of your life and health</td>
</tr>
<tr>
<td>WARNING</td>
<td>Possible impending endangerment of your life and health</td>
</tr>
<tr>
<td>CAUTION</td>
<td>Possible impending danger of light injuries or damage to materials</td>
</tr>
</tbody>
</table>

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 SAM 3.0 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 SAM 3.0 and other property could occur while the SAM 3.0 is in use.

- The SAM 3.0 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 damaged SAM 3.0 systems.

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 SAM 3.0 using the operating instructions.
- Personnel being trained, instructed or provided with general education may only work with the SAM 3.0 under constant supervision by an experienced high-voltage technology professional.

2.2.3 Organizational measures

- Observe all safety- and danger-related information regarding the SAM 3.0.
- 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 SAM 3.0. 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 SAM 3.0.
- 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 SAM 3.0 is used to monitor surge arresters in medium- and high-voltage systems with power system frequencies of 16.7 Hz and higher. It consists of a counter of surge events that classifies the current peaks into three leakage current groups (see Tab. 1). These pulse values are stored together with the date and time in SAM 3.0. In addition the SAM 3.0 measures the current peak of the leakage current flowing through the connected surge arrester.

<table>
<thead>
<tr>
<th>Group</th>
<th>Leakage current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100 A ... 1 kA</td>
</tr>
<tr>
<td>2</td>
<td>1 kA ... 10 kA</td>
</tr>
<tr>
<td>3</td>
<td>10 kA ... 100 kA</td>
</tr>
</tbody>
</table>

Tab. 1: Classification of the leakage currents
3.2 Structure and function

The SAM 3.0 (see Fig. 1) consists of a sensor with a sensor cable (4) and the display unit (1). Various cable lengths are available for the sensor cable. The complete system has an IP 65 degree of protection and can be used indoors and outdoors. The system is supplied by a 3.6 V lithium battery that is inserted into the battery compartment (5) and that can be replaced. An additional support is available for applications outdoors and in gas-insulated switching systems (see Section "Mounting with support", Page 17).

The display unit is controlled with a magnetic key. The display (2) is activated when the Enter button (3) is touched with the magnetic key (6).

As a rule one SAM 3.0 is used per phase. If a single device is installed in the combined earth lead to monitor three surge arresters, a leakage current of 0 mA results in a balanced system through the vectorial addition of all the phase currents.

When used outdoors the measured current values at rain or a soiled surge arrester do not correspond exactly to the leakage currents since additional creeping currents can flow via the isolation. In this case the SAM 3.0 measures the leakage currents and also creeping currents.

Fig. 1: Monitoring System SAM 3.0
1 Display unit (housing)  4 Sensor with sensor cable
2 Display  5 Battery compartment
3 Enter button  6 Magnetic key

**Fig. 1:** Monitoring System SAM 3.0

- Display unit (housing)
- Display
- Enter button
- Sensor with sensor cable
- Battery compartment
- Magnetic key

The SAM 3.0 (see Fig. 1) consists of a sensor with a sensor cable (4) and the display unit (1). Various cable lengths are available for the sensor cable. The complete system has an IP 65 degree of protection and can be used indoors and outdoors. The system is supplied by a 3.6 V lithium battery that is inserted into the battery compartment (5) and that can be replaced. An additional support is available for applications outdoors and in gas-insulated switching systems (see Section "Mounting with support", Page 17).

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When used outdoors the measured current values at rain or a soiled surge arrester do not correspond exactly to the leakage currents since additional creeping currents can flow via the isolation. In this case the SAM 3.0 measures the leakage currents and also creeping currents.
3.3 Technical data

The technical data, dimensions and weights are specified in the following documents:
- SAM 3.0 dimensional drawings
- Data sheet SAM 3.0 in the document 1HC0076312
- "Surge protection guidelines" dimensioning, testing and usage of metal-oxide surge arresters in medium-voltage systems, document 1HC0075561

3.3.1 Rating plate

![SAM 3.0 rating plate](image)

Fig. 2: SAM 3.0 rating plate

<table>
<thead>
<tr>
<th>Information</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA XXXXXX</td>
<td>Serial number</td>
</tr>
<tr>
<td>20XX</td>
<td>Production year</td>
</tr>
</tbody>
</table>

3.4 Inserting and replacing the battery

The battery is not inserted on delivery by ABB.

Voltage supply of the SAM 3.0:
- High-energy lithium battery, Type SL 360, voltage: 3.6 V

Checking the charging state of the battery: see Chapter 3.5.5

**CAUTION!**

Faulty display when a partially discharged battery is inserted.
- Open the battery cover only to insert a new battery.
- Use only a completely charged battery.
Inserting and replacing the battery

**Note:**
When the battery compartment is opened, the battery charge display is reset to 100%.
The current date and the set time are deleted when the battery is replaced.
The counted events in the memory are retained despite a battery change.

- Ensure that the correct battery type is used and that the battery is charged completely.
- Turn the battery cover 90° anticlockwise (see Fig. 3).

![Battery cover, left: open, right: closed](image)

*Fig. 3: Battery cover, left: open, right: closed*

If a battery is inserted, the cover is automatically moved upward.
- Remove the battery cover.
- When changing the battery: Remove the old battery and dispose it in an environmentally correct manner.
- Insert the new battery. Ensure that the polarity is correct: The plus pole points out of the housing (see Fig. 4). The contact of the battery cover has a "+" mark as identification.

![Correct polarity of the battery](image)

*Fig. 4: Correct polarity of the battery*

- Put the battery cover back on, press it downward and turn it 90° clockwise. The battery cover has locked in.
- When changing the battery: Set the date and time (see Chapter 3.5.6).
3.5 Operation of the SAM 3.0

The SAM 3.0 is operated with a magnetic key (see [Fig. 1]) and the magnet-sensitive buttons on the display unit. A button is operated when it is touched by the magnetic key.

- Use only magnetic keys authorised by ABB.

**Buttons**

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Down" /></td>
<td>Down</td>
</tr>
<tr>
<td><img src="image" alt="Up" /></td>
<td>Up</td>
</tr>
<tr>
<td><img src="image" alt="Enter" /></td>
<td>Enter</td>
</tr>
</tbody>
</table>

**Operating buttons with the magnetic key**

- Move the magnetic key toward the desired button.

- Touch the button marking lightly.

- Remove the magnetic key from the button.

- Repeat the steps to navigate in the menu structure (see Chapter 3.5.7).
3.5.1 Activating the display
In normal operation the display is switched off to save energy. The display unit is in stand-by mode. Only the monitoring electronics in the housing is active in order to record the surge events.

**Button functions**

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Button" /></td>
<td>Activate and change to the start mode</td>
</tr>
<tr>
<td><img src="image" alt="Button" /></td>
<td>No function</td>
</tr>
<tr>
<td><img src="image" alt="Button" /></td>
<td>No function</td>
</tr>
</tbody>
</table>

3.5.2 Start mode

**Display**

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Display" /></td>
<td>Line 1: Product name</td>
</tr>
<tr>
<td><img src="image" alt="Display" /></td>
<td>Line 2: Software version</td>
</tr>
</tbody>
</table>

**Button functions**

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Button" /></td>
<td>Change to the leakage current measuring mode</td>
</tr>
<tr>
<td><img src="image" alt="Button" /></td>
<td>No function</td>
</tr>
<tr>
<td><img src="image" alt="Button" /></td>
<td>No function</td>
</tr>
</tbody>
</table>

3.5.3 Leakage current measuring mode

**Display**

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Display" /></td>
<td>Line 1: Date &amp; time (YYYY:MM:DD hh:mm)</td>
</tr>
<tr>
<td><img src="image" alt="Display" /></td>
<td>Line 2: Measured value leakage current (peak)</td>
</tr>
</tbody>
</table>

**Button functions**

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Button" /></td>
<td>Change to the counter of surge events</td>
</tr>
<tr>
<td><img src="image" alt="Button" /></td>
<td>No function</td>
</tr>
<tr>
<td><img src="image" alt="Button" /></td>
<td>No function</td>
</tr>
</tbody>
</table>

The measurement is updated in a second cycle.
3.5.4 Counter of surge events

Display in the supply state:

```
2000.01.01 00:00
No surge (0000)
```

Events from tests in the factory may already be stored in the factory.

Display when surge events have occurred:

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010.06.07 11:20 100A..1kA (0023)</td>
<td>Line 1: Date and time of the event Line 2: Classification of the surge in accordance with the table Tab. 1; memory address of the event (in brackets)</td>
</tr>
</tbody>
</table>

Button functions

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change to the battery mode</td>
<td></td>
</tr>
<tr>
<td>Change to the next surge event</td>
<td></td>
</tr>
<tr>
<td>Change to the previous surge event</td>
<td></td>
</tr>
</tbody>
</table>

Memory address

The device can store a maximum of 2176 events. All the events are stored with a time stamp. When the mode is selected the most recent event is displayed first. The value in brackets displays the memory address, not the number of events.

3.5.5 Battery mode

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery 95%</td>
<td>Line 1: Text “Battery” Line 2: Percentage of the total durability of the battery</td>
</tr>
</tbody>
</table>

Button functions

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change to the date and time setting</td>
<td></td>
</tr>
<tr>
<td>No function</td>
<td></td>
</tr>
<tr>
<td>No function</td>
<td></td>
</tr>
</tbody>
</table>

**Durability of the battery – display value and stand-by mode**

The device is designed so that in stand-by mode the battery lasts for at least two years with occasional readings. 100% corresponds to a durability of two years. After two minutes without magnetic key usage the display switches back automatically to the stand-by mode.
Charge state display
The charge state of the battery is calculated using the time since the battery has been inserted and the number of activations. The charge state of the battery is not measured.

CAUTION!
Faulty display when a partially discharged battery is inserted.
▷ Open the battery cover only to insert a new battery.
▷ Use only a completely charged battery.

3.5.6 Setting the date and time

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| Set date & time? | Line 1: Text "Set date & time?"
| Yes | Line 2: Press 🔄 for "Yes" and 🔄 for "No" |
| No |

Button functions

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</td>
<td>Change to exit mode</td>
</tr>
<tr>
<td>🔄</td>
<td>No function</td>
</tr>
<tr>
<td>🔄</td>
<td>Change to changing the date and time</td>
</tr>
</tbody>
</table>

Changing the date and time

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| 2011.05.23 17:34 DOWN UP YEARS | Line 1: Current date and time
| Line 2: Setting the year, month, day, hours and minutes using 🔄 or 🔄. In the example the year can be set. |

Button functions

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</td>
<td>Switch between Year &gt; Month &gt; Day &gt; Hours &gt; Minutes &gt; Exit mode</td>
</tr>
<tr>
<td>🔄</td>
<td>Increasing the date or time setting</td>
</tr>
<tr>
<td>🔄</td>
<td>Decreasing the date or time setting</td>
</tr>
</tbody>
</table>
Setting the date and time

Only one position of the date or time can be changed respectively.

- Change to the next position: Press [button].
- Exiting setting: After the last position (Minute) press [button].

The exit mode is displayed.

3.5.7 Exit mode

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit?</td>
<td>Line 1: Text &quot;Exit?&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Line 2: Press [button] for &quot;No&quot; and [button] for &quot;Yes&quot;</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Button functions

<table>
<thead>
<tr>
<th>Button</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</td>
<td>Change to stand-by mode</td>
</tr>
<tr>
<td>🔄</td>
<td>No function</td>
</tr>
<tr>
<td>🔄</td>
<td>Change to the leakage current measuring mode</td>
</tr>
</tbody>
</table>
3.5.8 Overview of the menu structure

1 Start mode

2 Leaking current measuring

3 Counter of surge events
   a Previous surge event
   b Next surge event

4 Battery mode

5 Setting the date and time

6 Changing the date and time
   c Reducing the date and time
   d Increasing the date and time

7 Change from Year to Minute, then Exit

8 Exit mode

9 Stand-by mode

---

Fig. 5: SAM 3.0 menu structure
4 Transportation, unpacking and storage

4.1 Transportation

**CAUTION!**

**SAM 3.0 not secured during transportation.**
Damage to the SAM 3.0 through falling.
- Secure the SAM 3.0 against falling before transportation.
- Observe safety precautions printed on the packaging for proper handling during transportation and storage.

4.2 Unpacking

The SAM 3.0 is packed in a stable cardboard box. The accessories packaged in a plastic bag are included in the cardboard box.
- After receiving the shipment, compare the order and delivery documents immediately.
- Check the delivery for completeness, correctness and intactness.
- In case of incompleteness, deviations or damage, inform the supplier and shipper immediately.

**CAUTION!**

**Damaged SAM 3.0.**
Damage through installation and commissioning of a damaged SAM 3.0.
- Do not use a damaged SAM 3.0.
- 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 the SAM 3.0 in a well-ventilated, dry and clean room.
  - Storage temperature: −40 ... 70 °C
5 Commissioning

5.1 Safety

DANGER!
System uses high voltage.
Death, serious bodily harm and damage to the switching system may result from an electric shock.

- Allow only authorised professionals to perform work on the SAM 3.0.
- Observe the safety rules of EN 50110-1 before working on the system:
  - De-energise the system.
  - 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 SAM 3.0 was tested by the manufacturer. Additional electrical testing before commissioning is not necessary.

5.3 Mounting

CAUTION!
Sealed housing.
Damage to the device by opening the closed housing.
- Do not open the housing to ensure the sealed state.

Required fastening material:
- Nuts (stainless steel)
- Any washers that may be required (stainless steel)
- Clean contact areas thoroughly and lubricate with acid-free grease.
- Ensure selection of suitable material pairs.

5.3.1 Display unit

- Fasten the display unit on a flat, firm, electrically conductive surface with earth potential.
- Align the display unit so that the side with the connection of the sensor cable and the battery compartment points downward.
- Mount the display unit so that it is protected during operation against mechanical stresses, shocks and vibrations.

DANGER!
System uses high voltage.
Death, serious bodily harm and damage to the switching system may result from an electric shock.
- Earth the housing.
Earthing the housing

There are two possibilities for earthing the housing:

- Fastening the earthing cable with an M4 earthing screw directly to the right-hand side of the housing (see Fig. 6).
- Fastening the earthing cable with the two integrated M4 screws on a earthed mounting panel (see Fig. 7).

Mounting without support

![Diagram of mounting without support]

Fig. 6: Display unit with M4 earthing connection (right)

![Diagram of fastening and earthing screws]

Fig. 7: Fastening and earthing screws

A drilling grid with the distances between the holes is drawn on the rear of the housing. The housing is fastened with the integrated M4 screws (see Fig. 7).

- Tighten the screws using a screw wrench (tightening torque: max. 3 Nm).
- After mounting, insert the enclosed blinding plugs to protect the screw holes.
Mounting with support

Fig. 8: Mounting the SAM 3.0 with support

▶ Use a support in the following cases:
  ▶ Use of the SAM 3.0 outdoors as a weather protection
  ▶ Use in gas-insulated switching systems

The optionally available support is pushed from the rear onto the display unit. The distance between the holes in the support corresponds to the M4 screws on the rear of the display unit.

▶ Fasten the support with the enclosed nuts and washers onto the housing (tightening torque: max. 3 Nm).
▶ Insert the enclosed blinding plugs.
▶ Attach the display unit at the tabs with the Ø11.5 mm holes at the desired position.

The distance between the holes of 230 mm corresponds to the dimension of the surge counters of the Type SCE, SCF and SCM.

5.3.2 Mounting the sensor cable connection

▶ Plug the sensor cable with the plug into the fitting socket of the display unit.
In order to ensure that the plug does not slip out and ensure strain relief:
▶ Screw tight the coupling ring (1).

Shortening the sensor cable

![Diagram of cable connector parts]

Fig. 9: Parts of the cable connector

1 Coupling ring
2 Pin insert
3 Strain relief
4 Strain relief
5 Protective sleeve
6 Seal
7 Pressure ring
8 Screw plug
Dismantle the cable connector (see Fig. 9):

- Loosen the screw plug (8).
- Screw apart the coupling ring (1) and protective sleeve (5).
- Carefully remove the pin insert (2) with cable.
- Loosen the strain relief (3, 4) and unsolder the wires.
- Pull out the protective sleeve (5), seal (6), pressure ring (7) and screw plug (8) toward the sensor. Then adapt the cable length.

**Mounting the sensor cable connection**

![Diagram of cable connection](image)

**Fig. 10: Plug connections**

<table>
<thead>
<tr>
<th>Color</th>
<th>Connection No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>1</td>
</tr>
<tr>
<td>Yellow</td>
<td>2</td>
</tr>
<tr>
<td>Green</td>
<td>3</td>
</tr>
<tr>
<td>Brown</td>
<td>4</td>
</tr>
<tr>
<td>Shield</td>
<td>Fastened to the strain relief</td>
</tr>
</tbody>
</table>

- Observe the connection diagram (Fig. 10).
- Strip the cable (approx. 23 mm), remove the conductor insulation (approx. 5 mm), shorten the shield (approx. 10 mm).
- Solder on the conductors as shown in the connection diagram.
- Mount the shield to the strain relief (see Fig. 9, Item (3), (4)). Tighten the screws with approx. 0.4 Nm.
- Screw the coupling ring (1) to the protective sleeve (5).
- Reassemble the parts in accordance with Fig. 9.
5.3.3 Sensor installation

**DANGER!**

**System uses high voltage.**

Death, serious bodily harm and damage to the switching system may result from an electric shock.
The earth terminal of a surge arrester is at line voltage, if disconnected from earth connection.

- Dismantle the earth connection of the surge arrester only when the system is in a switched-off de-energised state.

**DANGER!**

**System uses high voltage.**

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

- Allow only authorised professionals to perform work on the SAM 3.0.
- 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.

Surge arresters in outdoor and indoor systems

![Diagram of sensor installation](image)

**Fig. 11: Connection of the sensor to an air-insulated arrester**

1. Sensor with sensor cable (length: 1; 7; 10; 20 m)
2. Threaded bolt M12x115 mm
3. Nut 0.5D-M12
4. Washer Ø13/24x2.5 mm
x Dashed line: Current flow

- Take into account for mounting:
  - Set up the surge arrester in an isolated manner, so that the sensor can be installed between the isolated surge arrester and the earth connection (see **Fig. 11**).
  - Lay the sensor cable near a surface with earth potential (transformer housing, supports, supporting frame).
  - Avoid induction loops (in particular by winding up excessive wire).
- Fasten the threaded bolt (2) with three nuts (3) and two washers (4) onto the base plate.
- Slide the sensor (1) over it.
- Fasten the earthing connection with the two nuts (3) and the two washers (4) to the threaded bolt (2). Ensure that the sensor for the SAM 3.0 can be moved on the threaded bolt. Tighten the nuts (3) against each other with a maximum tightening torque of 42 Nm.
Gas-insulated arrester

Fig. 12: Connection of the sensor to a gas-insulated arrester

1  Sensor with sensor cable  
   (length: 1; 7; 10; 20 m)  
2  Threaded bolt M12x95 mm  
3  Coupling piece M12/M12  
4  Nut M12  
5  Washer Ø13/24x2.5 mm  
6  Hexagon screw M10x20 mm  
7  Washer Ø10.5/20x2 mm  
8  Earthing cable  
9  Earth side bushing  
a  Floor plate  
b  Silicone hood  
c  Penetration body  
x  Dashed line: Current flow

The earth side bushing is connected with the MO resistors and carries the leakage current that is to be monitored with the display unit. The earth side bushing (9) is isolated from the aluminium housing of the surge arrester and has to be earthed.

- Use the supplied earthing cable (8) to earth the surge arrester.
- Turn the coupling piece (3) with a washer onto the earth side bushing (9) and fasten with a nut (4).
- Tighten the nuts (4) and coupling piece (3) against each other with a maximum tightening torque of 35 Nm.
- Turn the threaded bolt (2) into the coupling piece (3) and slide the sensor (1) over it.
- Fasten the earthing cable with the two nuts (4) and the two washers (5) to the threaded bolt (2). Ensure that the sensor for the SAM 3.0 can be moved on the threaded bolt. Tighten the nuts (4) against each other with a maximum tightening torque of 42 Nm.
- Fasten the earthing cable with the hexagon screw (6) and the washer (5) to the foot plate (a) with a maximum tightening torque of 24 Nm.
- Ensure that only the self-weight of the earthing cable and no additional forces act on the earth side bushing.
Plug arresters POLIM®-D..PI-2 and POLIM®-D..PI-3

![Diagram of POLIM®-D..PI-2 and POLIM®-D..PI-3 arrester connection]

**Fig. 13: Connection of the sensor to a POLIM-D..PI-2 arrester**

1. Sensor with sensor cable (length: 1; 7; 10; 20 m)
2. Threaded bolt M12x95 mm
3. Coupling piece
4. Nut 0.5D-M12
5. Washer Ø13/24x2.5 mm
x. Dashed line: Current flow

The earthing connection bolt is connected with the MO resistors and carries the leakage current that is to be monitored with the display unit. The earthing connection bolt is isolated from the aluminium pipe of the surge arrester and has to be earthed.

- To earth the surge arrester use a flexible earthing cable with sufficient length so that no strain can act on the earth side bushing.

- **POLIM®-D..PI-2:**
  - Unscrew the nuts M12 from the earthing connection bolt of the surge arrester and keep with the washers for fastening the sensor.
  - Turn the fitting coupling piece (3) with a washer (5) onto the earthing connection bolt and screw on with a nut 0.5D-M12 for POLIM-D..PI-2 so that a minimum distance of 5 mm between the aluminium pipe and the coupling piece is observed.
  - Tighten the nuts against each other with a maximum tightening torque of 42 Nm.

- **POLIM®-D..PI-3:**
  - Unscrew the nuts M16 from the earthing connection bolt of the surge arrester and keep with the washers for fastening the sensor.
  - Turn the fitting coupling piece (3) with the washer (5) onto the earthing connection bolt and screw on with a nut 0.5D-M16 for POLIM-D..PI-3 so that a minimum distance of 5 mm between the aluminium pipe and the coupling piece is observed.
  - Tighten the nuts against each other with a maximum tightening torque of 42 Nm.

- Turn the threaded bolt (2) into the coupling piece (3) and slide the sensor (1) over it.
- Fasten the earthing cable with the two nuts M12 and the two washers (5) to the threaded bolt (2) (outer nut: Type 0.5D-M12 (4)). Ensure that the sensor for the SAM 3.0 can be moved on the threaded bolts. Tighten the nuts against each other with a maximum tightening torque of 42 Nm.
- Ensure that only the self-weight of the earthing cable and no additional forces act on the earth side bushing.
6 Maintenance, upkeep

**DANGER!**
System uses high voltage.

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

- Allow only authorised professionals to perform work on the SAM 3.0.
- 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 SAM 3.0 is maintenance-free.

- Battery change: Every two years (see Chapter 3.4)
7 Disposal

The SAM 3.0 is an environmentally-friendly product.

- Dispose of components and materials in an environmentally-friendly manner in accordance with local regulations.
- Recycle materials as far as possible.

Components and materials:

- Display unit
  - RoHS-conform electronic components
  - Mounting parts: Stainless steel
  - Lithium battery
- Sensor with cable
  - Polyurethane (PUR)
  - Copper
  - Non-magnetic metal
  - Ferrite core