400 kV AC Substation

Outdoor AIS AC Substations
High-voltage Components
Surge arrester, metal oxide
ETS-50-06-12-C1 Rev. 0
## REVISION VIEW

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<th>Document no.:</th>
<th>222166/13</th>
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<td>Version</td>
<td>0</td>
</tr>
<tr>
<td>Author</td>
<td>TEB</td>
</tr>
<tr>
<td>Document status/change</td>
<td>JLY, JAS, BEJ, THO, EHN, EOM, CUM, BMP, HRH</td>
</tr>
<tr>
<td>Reviewer</td>
<td>JSO</td>
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<td>Approver</td>
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<td>Date</td>
<td>2013.06.17</td>
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Doc. no. 222166/13, case 10/5371 - ETS-50-06-12-C1 v. 0
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1. **Introduction**

This standard specifies the minimum requirements for metal oxide surge arresters for outdoor AIS substations for the 400 kV voltage level.

2. **Standards and regulations**

Surge arresters shall comply with the latest version of following standards and regulations.

- Outdoor AIS AC substations common conditions and technical requirements for high voltage apparatus, ETS-50-00
- Metal-Oxide surge arresters without gaps for a.c. systems, IEC 60099
- Selection and dimensioning of high-voltage insulators intended for use in polluted conditions, IEC 60815
- Artificial pollution tests on high-voltage insulators to be used on a.c. systems, IEC 60507
- Other standards referred to in the above standards

3. **Technical requirements**

The surge arrester shall be gapless.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Maximum system voltage $U_m^\text{rms}$</td>
<td>420 kV</td>
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<tr>
<td>Rated voltage $U_r^\text{rms}$</td>
<td>360 kV</td>
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<tr>
<td>Continuous operating voltage $U_c^\text{rms}$</td>
<td>$\geq$ 260 kV</td>
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<tr>
<td>Pressure relief capability</td>
<td>$\geq$ 40 kA</td>
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3.1 **Discharge class**

The line discharge class of the surge arrester shall be a class 4 (Nominal discharge current $20 \text{ kA}_{\text{peak}}$), in accordance with IEC 60099-4.

3.2 **Test**

The surge arrester shall be tested in accordance with IEC 60099-4, and a declaration of type conformity shall be available from the manufacturer. A test protocol for each surge arrester shall also be available.

4. **Design requirements**

4.1 **Corrosion protection**

External parts shall be made of corrosion-resistant materials. Steel components shall be stainless or hot-dip galvanized. If surfaces are processed, they shall be protected in a permanent way. Combination of materials with different electrochemical potential shall be avoided, unless sufficiently protected from moisture.

4.2 **Insulating base**

The surge arrester shall have an insulating base.

No surge counter is required.
4.3 **High-Voltage terminals**
Ø30 mm tap placed centrally on the equipment. See appendix 1
Material: Aluminium or aluminium alloy.

4.4 **Mechanical strength**
The minimum requirements for mechanical strength are:

- Long-term load (static load) 700 N
- Short-term load (dynamic load) 1000 N

5. **Documentation**
The surge arrester shall be accompanied by the following documentation: data sheets for unit and equipment stating manufacture, type, description, drawings, including:

- Detailed drawings
- Electrical data according to IEC
  - TOV/time curve
  - Residual voltage crest at LI and SI surge
  - \( U_c \)
  - Energy absorption kJ/kV
  - Line discharge class
  - Discharge current withstand strength
  - Instructions for measuring leakage current
- Instruction for handling and installation
- Maintenance manuals
- Mechanical data, strength, deflection etc.
- Storage information
- Disposal information

6. **Appendix**

6.1 **Appendix 1 High-voltage terminals**
High-voltage connection terminal for surge arrester:

\[ \text{Figure 1 \ Ø30 tap} \]