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Claes Ahlrot	Öppen	Ingrid Widell	

Title

Technical requirements Surge arresters

E.ON Energidistribution AB

Technical Requirements

Surge arresters

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1 General

1.1 Scope

These requirements cover the general demands of E.ON Energidistribution AB in respect of surge arresters of the type metal oxide arrester without spark gap. The requirements apply to the system voltage of 12-170 kV, rated frequency 50 Hz and for indoor or outdoor designs.

These requirements are complement to the requirements set out in the Facility Directive Regional Network.

These requirements are a translation to the Swedish requirements D10-0015664. If the content of this document differs from the Swedish version, the Swedish requirements shall prevail.

1.2 Standards

The surge arresters shall be designed, manufactured and tested in accordance with the most recent edition of applicable Swedish standards. In the absence of such standards, the European Standard (EN) and IEC publications apply. The following standards are specified in this document.

- **SS-EN 60099-4** Metal-oxide surge arresters without gaps for A.C. system
- **SS-EN 50341** Overhead electrical lines exceeding AC 45 kV

In the event of disparities between this document and the relevant standard, these Technical Requirements shall apply.

2 Changes relative to previous issue

Changes since the previous issue are marked with a vertical line in the margin. Only tables 1 and 2 are updated with 6 kV and adjusted levels of U_r and U_c for impedance earthed networks.

3 Electrical and mechanical requirements

3.1 Voltage levels

The **phase** arresters shall have the following minimum voltage:

Nominal system voltage (kV)	Highest voltage for equipment (kV)	Min. arrester continuous operating voltage (U_c) (kV)	Min. Rated voltage (U_r) (kV)
130	170	91	114
130	145	87	108
70	82,5	82	102
60	72,5	62	77
50	72,5	57	72
45	52	48	60
40	52	45	56
30	36	35	43
20	24	23	29
10	12	11	14
6	7,2	7	8

Table 1. Minimum voltages for phase arresters.

The **neutral** arresters shall have the following minimum voltage:

Nominal system voltage (kV)	Highest voltage for equipment (kV)	Min. Rated voltage (U_r) (kV)
130	170	60
130	145	57
70	82,5	59
60	72,5	44
50	72,5	41
45	52	35
40	52	33
30	36	25
20	24	17
10	12	8
6	7,2	5

Table 2. Rated voltage for neutral arrester.

3.2 Nominal discharge current

The rated discharge current shall be at least 10 kA for highest voltage for equipment ≤ 170 kV.

3.3 Arrester classification

Arresters shall, at least, conform to the requirements for line discharge class according to the table below:

Highest voltage for equipment (kV)	Arrester classification according to SS-EN 60099-4:2014	Therma energy rating Wth [kJ / kV]	Repetitive charge transfer rating Qrs [C]	Thermal charge transfer rating Qth [C]
145-170	SM	7,0	1,6	--
36-82,5	SL	4,0	1,0	--
≤ 24	DH	--	0,4	1,1

Table 3 Arrester classification

3.4 Residual voltages

The maximum residual voltages of the arresters shall not exceed the values set out in the following table.

Highest voltage for equipment (kV)	Discharge current (kA)	Max residual voltage (kV/U _r)		
		Steep front/ FOW ¹⁾ (10 kA)	Fast front/ lightning ²⁾ (10 kA)	Slow front/ switching ³⁾ (0.5 kA)
≤ 170	10	3.1	2.8	2.2

Table 4 Rated residual voltages

- 1) Steep front/FOW 1/(2-20) μ s
- 2) Fast front/lightning 8/20 μ s
- 3) Slow front/switching 30/60 μ s

3.5 Short-circuit capability

Arrester with silicone rubber housing does not need to be equipped with pressure release device but shall however fulfill following short-circuit capability:

Highest voltage for equipment (kV)	Short-circuit capability (kA, 0.2 s)
$\geq 82,5$	40
$\leq 72,5$	20

Table 5 Short-circuit capability

3.6 Creepage distance

The creepage distance shall be in accordance with the Facility directive Regional network.

Creepage distances for surge arresters placed on power lines shall be according to SS-EN 50341-2-18.

3.7 Mechanical design

Surge arresters shall be designed to fulfil static and dynamic forces in the most unfavourable direction.

4 Functional requirements

4.1 Insulation

Surge arrester insulator shall be made of silicon rubber (composite).

4.2 Primary terminal

The primary terminal shall be designed for the connection of copper or aluminium conductors with a conductor diameter of 6-13 mm for highest voltage for equipment 12-24 kV and with conductor diameter 20-32 mm for highest voltage for equipment 52-170 kV.

4.3 Earthing terminal

The earthing terminal shall be designed for the connection of copper or aluminium conductors with a conductor diameter of 6-13 mm.

When surge arresters are used as phase arresters on power lines, they must be equipped with a Strain relief system, so that earth conductors are not exposed to stresses that can lead to failure.

4.4 Insulated base

Surge arresters placed in substations for highest voltage for equipment 52-170 kV shall be equipped with an insulated base for leakage current measurement.

4.5 Disconnecting device

Surge arresters placed on overhead power lines, shall be equipped with a disconnecting device easily detected from ground level.

5 Testing**5.1 Type tests**

The surge arrester shall have passed type tests (design test) in accordance with the requirements given in IEC 60099-4:2014, §10.

5.2 Routine tests

The routine test shall be included according to SS-EN 60099-4:2014 §9.