

SLOVENSKI
PREDSTANDARD

**SIST EN 60099-
4:200X/OprAA:2004**

september 2004

**Prenapetostni odvodniki - 4. del: Kovinsko-oksidni prenapetostni odvodniki
brez iskrišč za sisteme z izmenično napetostjo**

Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems

ICS 29.120.50; 29.240.10

Referenčna številka
SIST EN 60099-4:200X/OprAA:2004(en)



37/307/CDV

**COMMITTEE DRAFT FOR VOTE (CDV)
PROJET DE COMITÉ POUR VOTE (CDV)**

Project number Numéro de projet		IEC 60099-4-A1-f2 Ed 2.0	
IEC/TC or SC: TC 37 CEI/CE ou SC:	Date of circulation Date de diffusion 2004-06-04	Closing date for voting (Voting mandatory for P-members) Date de clôture du vote (Vote obligatoire pour les membres (P)) 2004-11-05	
Titre du CE/SC: Parafoudres		TC/SC Title: Surge Arresters	
Secretary: J. L. Koepfinger Secrétaire:			
Also of interest to the following committees Intéresse également les comités suivants		Supersedes document Remplace le document 37/274A/CD and 37/284B/CC	
Functions concerned Fonctions concernées <input type="checkbox"/> Safety Sécurité <input type="checkbox"/> EMC CEM <input type="checkbox"/> Environment Environnement <input type="checkbox"/> Quality assurance Assurance qualité			

CE DOCUMENT EST TOUJOURS À L'ÉTUDE ET SUSCEPTIBLE DE MODIFICATION. IL NE PEUT SERVIR DE RÉFÉRENCE.

LES RÉCIPIENDAIRES DU PRÉSENT DOCUMENT SONT INVITÉS À PRÉSENTER, AVEC LEURS OBSERVATIONS, LA NOTIFICATION DES DROITS DE PROPRIÉTÉ DONT ILS AURAIENT ÉVENTUELLEMENT CONNAISSANCE ET À FOURNIR UNE DOCUMENTATION EXPLICATIVE.

THIS DOCUMENT IS STILL UNDER STUDY AND SUBJECT TO CHANGE. IT SHOULD NOT BE USED FOR REFERENCE PURPOSES.

RECIPIENTS OF THIS DOCUMENT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

Titre : Amendment no 1-f2 a la CEI 60099-4 Ed 2.0 Parafoudres - Parte 4: Parafoudres áoxyde meéallique sans éclaterures pour reeaux á courant alternatif

Title : Amendment 1-f2 to IEC 60099-4 Ed 2.0 - Surge Arresters - Part 4: Metal-oxide surge arresters without faps for a.c. systems

Note d'introduction

Introductory note The material is base upon the comments of the National Committees to 37/273/CD and 37/274/CD. At the time of the preparation of this CDV the final published version of IEC 60099-4 Ed 2.0 was not available. Clauses are numbered according to 37/298/FDIS.

ATTENTION	ATTENTION
CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)	Parallel IEC CDV/CENELEC Enquiry

Copyright © 2004 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

LIGHTNING IMPULSE DISCHARGE CAPABILITY OF A METAL-OXIDE SURGE ARRESTER

Amendment 1 Fragment 2 to IEC 60099-4 Ed 2.0

Add new clause to 37/298/FDIS (60099-4, Ed. 2)

6.17 Impulse lightning discharge capability

When required, the lightning impulse discharge capability shall be demonstrated by tests and procedures of Annex O.

Add new Annex O to 37/298/FDIS (60099-4, Ed. 2)

Annex O

(normative)

TEST PROCEDURE TO DETERMINE THE LIGHTNING IMPULSE DISCHARGE CAPABILITY

O.1 General

This procedure applies to surge arresters used on lines with system voltages exceeding 52 kV to improve the lightning performance of such lines. In general, these arresters are subjected to higher energy and current stresses caused by lightning than arresters installed in stations with effective lightning protection on incoming lines. In addition, the anticipated current waveform for decisive cases, with a duration of several tens of microseconds for arresters applied on shielded lines and several hundreds of microseconds for arresters on unshielded lines, considerably differs from waveforms specified in the operating duty test and in the long duration current impulse test.

An impulse duration of 200 microseconds has been considered as a suitable compromise to cover both the typical applications and the effect of multiple strokes.

Arresters intended for this application, therefore, shall be tested in accordance with the lightning impulse discharge capability test to verify the rated lightning impulse discharge capability of the arrester.

O.1.1 Selection of test samples

Three samples shall be tested. These samples shall include complete arresters, arrester sections or resistive elements. They shall not have been subjected to any previous tests except as necessary for evaluation purposes of this test.

The samples to be chosen for the lightning impulse discharge capability test shall have a residual voltage at nominal discharge current at the highest end of the variation range declared by the manufacturer. Furthermore, in case of multi-column arresters the highest value of uneven current distribution shall be considered. In order to comply with these demands the following shall be fulfilled:

a) The ratio between the rated voltage of the complete arrester to the rated voltage of the section is defined by n . The volume of the resistor elements used as test samples shall not be greater than the minimum volume of all resistor elements used in the complete arrester divided by n .

b) The residual voltage of the test section should be equal to $k \cdot U_r / n$, where k is the ratio between the maximum residual voltage at standard nominal discharge current of the arrester and its rated voltage. In case $U_{res} > k \cdot U_r / n$ for an available test sample the factor n has to be decreased correspondingly. If $U_{res} < k \cdot U_r / n$ the section is not allowed to be used.

c) For multi-column arresters the distribution of the current between the columns shall be measured at the impulse current used for current distribution test (Clause 9.1e). For each test sample, the ratio of maximum current in any column to the average current, K_a , is determined and compared with the maximum ratio, K_m , specified by the manufacturer. The highest current value in any of the columns shall not be higher than given by K_m .

O.1.2 Test procedure

Before the tests, the lightning impulse residual voltage at nominal discharge current of each test sample shall be measured for evaluation purposes.

Each lightning impulse discharge capability test shall consist of 18 discharge operations divided into six groups of three operations. Intervals between operations shall be 50 s to 60 s and between groups such that the sample cools to near ambient temperature.

Following the 18 discharge operations and after the sample has cooled to near ambient temperature the residual voltage tests, which were made before the test, shall be repeated for comparison with the values obtained before the test, and the values shall not have changed by more than 5%.

Visual examination of the test samples after the test shall reveal no evidence of puncture, flashover, cracking or other significant damage of the metal-oxide resistors.

In case of a design where the resistors cannot be removed for inspection an additional impulse shall be applied after the sample has cooled to ambient. If the sample has withstood this 19th impulse without damage (checked by the oscillographic records) then the sample is considered to have passed the test.

NOTE With respect to possible changes in the low current range due to lightning discharges, this is considered to be sufficiently covered by present operating duty tests.

O.1.3 Test parameters for the lightning impulse discharge capability test

The current peak value is selected by the manufacturer to obtain a particular discharge energy and charge. The energy shall not be higher than the total energy in two line discharges of the classifying class (for line discharge class 2 to 5 arresters) or the energy due to one high current impulse, 100 kA, 4/10 μ s (for line discharge class 1 arresters). If this is not the case the operating duty test must be repeated with an increased energy to cover the claimed energy.

The current impulse shape shall be approximately sinusoidal. The duration of time during which the instantaneous value of the impulse current is greater than 5% of its peak value shall be within 200 μ s to 230 μ s.

The peak of any opposite polarity current wave shall be less than 5% of the peak value of the current.

The current peak value of each impulse on each test sample shall lie between 100 % to 110 % of the selected peak value.

NOTE An increased energy in the operating duty test could be obtained by increased current (for line discharge class 2 to 5 arresters) and increased impulse duration (for line discharge class 1 arresters).

O.1.4 Measurements during the lightning impulse discharge capability test

The energy, charge and peak current shall be reported for each impulse as well as the duration of time during which the instantaneous value of the impulse current is greater than 5% of its peak value. Oscillograms of the typically applied voltage and current waveforms and dissipated energy shall be supplied on the same time base.

O.1.5 Rated lightning impulse discharge capability

The average peak current, charge and energy shall be calculated from the 18 discharge operations. The average energy shall be divided by the rated voltage of the sample to obtain the specific energy. For multicolumn arresters, the peak current, charge and energy for each test sample shall be multiplied by the factor K_a/K_m before the average value is determined.

The rated lightning impulse discharge capability of the arrester is the combination of the following:

- a) The lowest average peak current for any of the 3 test samples.
- b) An energy value selected from Table O.1 lower than or equal to the lowest specific energy for any of the 3 test samples.
- c) A charge value selected from Table O.2 lower than or equal to the lowest average charge for any of the 3 test samples.

Table O.1 – Steps of rated energy values in kJ/kV of rated voltage

1	1,5	2	2,5	3	3,5	4	4,5	5	6	7	8
9	10	11	12	13	14	15	16	17	18	19	20

Table O.2 – Steps of rated charge values in C

0,4	0,6	0,8	1	1,2	1,4	1,6	1,8	2	2,4	2,8	3,2	3,6	4	4,4
4,8	5,2	5,6	6	6,4	6,8	7,2	7,6	8	8,4	8,8	9,2	9,6	10	