SLOVENSKI STANDARD
SIST EN 60099-4:1998/A1:2002

01-november-2002

Prenapetostni odvodniki - 4. del: Kovinsko-oksidni prenapetostni odvodniki brez iskriģļ za sisteme z izmeniļ no napetostjo (IEC 60099-4:1991/A1:1998)

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

Überspannungsableiter -- Teil 4: Metalloxidableiter ohne Funkenstrecken für Wechselspannungsnetze

Parafoudres -- Partie 4: Parafoudres à oxyde métallique sans éclateur pour réseaux à courant alternatif

Ta slovenski standard je istoveten z: EN 60099-4:1993/A1:1998

ICS:

29.120.50	Varovalke in druga medtokovna zaģļ ita	Fuses and other overcurrent protection devices
29.240.10	Transformatorske postaje. Prenapetostni odvodniki	Substations. Surge arresters

SIST EN 60099-4:1998/A1:2002 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60099-4/A1

April 1998

ICS 29.120.50; 29.240.10
UDC 621.316.933:620.1

Descriptors: Surge arresters, metal-oxide surge arresters without gaps, a.c. systems

English version

Surge arresters
Part 4: Metal-oxide surge arresters without gaps for a.c. systems
(IEC 60099-4:1991/A1:1998)

Parafoudres
Partie 4: Parafoudres à oxyde métallique sans éclateur pour réseaux à courant alternatif
(CEI 60099-4:1991/A1:1998)

Überspannungsableiter
Teil 4: Metalloxidableiter ohne Funkenstrecken für Wechselspannungsnetze
(IEC 60099-4:1991/A1:1998)

This amendment A1 modifies the European Standard EN 60099-4:1993;it was approved by CENELEC on 1998-04-01.CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60099-4:1993/A1:1998 E

Foreword

The text of document 37/192/FDIS, future amendment 1 to IEC 60099-4:1991, prepared by IEC TC 37, Surge arresters, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60099-4:1993 on 1998-04-01.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	1999-01-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	2001-01-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:1998 to the International Standard IEC 60099-4:1998 was approved by CENELEC as an amendment to the European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

Addition:

Publication	Year	Title	EN/HD	Year
IEC 60507	1991	Artificial pollution tests on high-voltage insulators to be used on a.c. systems	EN 60507	1993

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60099-4

1991

AMENDEMENT 1
AMENDMENT 1

1998-04

Amendement 1

Parafoudres –

Partie 4:
Parafoudres à oxyde métallique sans éclateur pour réseaux à courant alternatif

Amendment 1

Surge arresters –

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

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International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE Q

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FOREWORD

This amendment has been prepared by IEC technical committee 37: Surge arresters.

The text of this amendment is based on the following documents:

FDIS	Report on voting
37/192/FDIS	37/198/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

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CONTENTS

Replace the existing title of annex F by the following new title:

Artificial pollution test with respect to the thermal stress on porcelain-housed multi-unit metal-oxide surge arresters

Page 13

1.2 Normative references

Insert, in the existing list, the title of the following standard:

IEC 60507:1991, *Artificial pollution tests on high-voltage insulators to be used in a.c. systems*

Page 43

7.1 General

Replace the existing item 7) by the following new item:

7) Artificial pollution test for porcelain-housed multi-unit surge arresters (see annex F)

   This test is made to evaluate the temperature rise of the internal parts due to a non-linear and transient voltage grading caused by the pollution layer on the surface of the arrester housing.

   A preliminary calculation of the maximum theoretical temperature rise shall be performed according to clause F.5. If the result of the calculation is less than 40 K, no test is required. If the result of the calculation is 40 K or higher, a test according to annex F shall be performed unless, by agreement between user and manufacturer (for example, based on service experience in specified environments), the test can be omitted.

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Annex F

Replace the existing title and text of annex F by the following:

Annex F
(normative)

Artificial pollution test with respect to the thermal stress on porcelain-housed multi-unit metal-oxide surge arresters

F.1 Glossary

F.1.1 Measured quantities

q_z [C/hm] Mean external charge flowing on the surface of insulators and surge arrester housings during pollution events in service, relevant to a pollution event lasting a time t_z. This parameter is used for the classification of the pollution severity of a site.

t_z [h] Duration of a pollution event in service.

Q_e [C] Charge flowing on the surface of the units of the surge arrester during the pollution test.

Q_i [C] Charge flowing in the internal parts of the units of the surge arrester during the pollution test.

ΔT_k [K] Temperature rise relevant to unit k.

β [K/C] Ratio between the temperature rise of the internal parts of the arrester and the relevant charge flowing internally as determined in the preliminary heating test.

τ [h] Equivalent thermal time constant of the arrester as determined in the preliminary heating test.

F.1.2 Calculated quantities

D_m [m] Average diameter of the surge arrester housing: it is calculated according to the method reported in IEC 60815.

Q_{tot} [C] Total charge relevant to the surge arrester: it is the sum of Q_i and Q_e and it is measured at the earth terminal of the surge arrester.

$\Delta T_{z\,max}$ [K] Maximum theoretical temperature rise in service calculated as a function of β, q_z, t_z, D_m and τ.

WU Weighted unbalance of the arrester calculated as a function of the electrical and geometrical characteristic of each unit of the surge arrester. This parameter is used to select the most critical design to be submitted to the pollution test.

K_{ie} Ratio between the maximum external charge and the maximum internal charge flowing in the surge arrester units during the pollution test.

ΔT_z [K] Expected temperature rise in service calculated as a function of β, q_z, t_z, D_m, K_{ie} and τ.

T_{OD} [°C] Starting temperature to be used for the operating duty test.

F.2 General

Pollution on external insulation of a metal-oxide surge arrester should be considered regarding three possible effects:

a) risk of external flashover;

b) partial discharges inside the surge arrester due to radial fields between the external surface and the internal active elements;

c) temperature rise of the internal active elements due to a non-linear and transient voltage grading caused by the pollution layer on the surface of the arrester housing.

This test procedure considers only the third possible effect.

Laboratory tests and service experience have shown that the heating of the internal active parts of the surge arrester under pollution conditions is related to the charge absorbed: this parameter is therefore considered essential in the evaluation of the pollution performance of surge arresters.

A classification of the pollution severity of representative sites has been set up considering the mean external charge flowing on the surface of different insulators and surge arresters.

The procedures described in this annex refer only to surge arresters with a porcelain housing; the procedures for polymeric type surge arresters may require further investigation and are presently under consideration.

This annex describes the procedure for the determination of the preheating to be applied to the test sample before the operating duty test, in order to take into account the heating effect of the pollution; this procedure is synthesized in the flow-chart of figure F.1. In particular:

– the pollution severity of different representative sites is expressed in terms of q_z. Relevant data are given in table F.1;

– the thermal characteristics of the surge arrester are determined according to a procedure derived from that of annex B. This procedure allows the determination of the equivalent thermal time constant τ and the calculation of the parameter β by means of the criteria described in section 4;

– the knowledge of the thermal characteristics of the surge arrester and of the expected pollution severity of the site in which the surge arrester is going to be installed allows a preliminary calculation of the maximum temperature rise in the most conservative conditions in which all the charge relevant to the pollution event would flow internally into the surge arrester;

- if the calculation of the maximum temperature rise $\Delta T_{z\ max}$ results in values less than 40 K, the pollution tests are not required and the starting temperature of the operating duty test shall be 60 °C. If the calculation of the maximum temperature rise $\Delta T_{z\ max}$ results in values of 40 K or higher, a test according to the procedure described in this annex shall be carried out unless, by agreement between user and manufacturer (for example, based on service experience in specified environments), the pollution test can be omitted. Moreover, at the decision of the manufacturer, even if the calculation of $\Delta T_{z\ max}$ results in values higher than 40 K, the pollution test may be avoided using as starting temperature for the operating duty test the value $(20 + \Delta T_{z\ max})$ °C;
- laboratory pollution tests, when deemed necessary, are carried out on a surge arrester representative of a certain type and design. During the pollution test, the external and internal charges Q_e and Q_i shall be measured for each surge arrester unit. Alternatively, the total charge Q_{tot} and the temperature rise ΔT of the internal parts may be measured. A statistical analysis of the test results is necessary to take into account the stochastic behaviour of the surge arrester heating under pollution conditions. The elaboration of the test results, described in detail in the following clauses, gives the factor K_{ie} which expresses the tendency of the charge to flow internally and therefore to heat the active parts. This factor is a characteristic value for a given surge arrester type and design;
- the expected temperature rise ΔT_z in service is calculated as a function of q_z, K_{ie}, D_m, t_z, β and τ;
- the starting temperature T_{OD} of the operating duty test is calculated on the basis of the following criteria:
  - if ΔT_z is greater than 40 K, T_{OD} = 20 °C + ΔT_z;
  - if ΔT_z is lower than or equal to 40 K, T_{OD} = 60 °C;
- the operating duty test is performed according to the procedure described in 7.5 with a starting temperature equal to T_{OD}.