SLOVENSKI

PREDSTANDARD

SIST EN 60099-4:200X/OprA1:2004

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/OprA1:2004(en)

37/306/CDV

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

	Project number Numéro de projet IEC 60099-4-A1-f1 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 37/273A/CD and 37/280B/CC	
Functions concerned Fonctions concernées ☐ Safety / Sécurité ☐ EMC / CEM ☐ Environment / Environnement ☐ Quality assurance / Assurance qualité		

Titre : Amendment no 1-f1 a la CEI 60099-4 Ed 2.0 Parafoudres - Parte 4: Parfoudres áoxyde meétallique sans éclaterures pour reeaux á courant alternatif

Title : Amendment 1-f1 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**

37/298/FDIS is to be used in conjunction with these proposed additions to these documents

CHANGES TO 37/298/FDIS (IEC 60099-4 ED 2)

Amendment I, fragment 1 to IEC 60099-4 Ed 2.0

ACCELERATED AGEING

TEST PROCEDURE FOR SURGE ARRESTERS STRESSED ABOVE THE REFERENCE VOLTAGE

Add, after 8.5.2.2. the following new subclauses

8.5.2.3 Test procedure for resistor elements stressed at or above the reference voltage

If U_{ct} is close to or above the reference voltage it may not be possible to perform an accelerated ageing test at U_{ct} due to the extreme voltage dependence for the power losses and stability of available voltage source. If $U_{ct} \geq 0{,}95 * U_{ref}$ and if it is not possible to perform an accelerated ageing test per clause 8.5.2.1 this alternative test procedure shall apply and replaces clauses 8.5.2.1 and 8.5.2.2.

8.5.2.3.1 Determination of test parameters

Calculate the power losses, P_{ct}, per resistor element at the maximum ambient temperature of 40 °C with the arrester energised at U_c, for the highest voltage stressed resistor per Annex L including the effect of the resistive current.

NOTE For deadfront and liquid-immersed arresters 65 °C and 95 °C respectively apply as maximum ambient temperatures.

Select one of the 3 following test procedures to determine the steady state temperature, T_{st}, of the most stressed part of the arrester at maximum ambient temperature:

NOTE The test procedures are considered to be conservative in increasing order from 1 to 3.

1. At an ambient temperature of 25 °C ± 10 K, energise the complete arrester at the claimed U_c until steady state temperature conditions have been attained. The temperature shall be measured on resistor elements, at 5 points as evenly spaced as possible over the most highly stressed 20% portion of the length of each column of the arrester. If this 20 % portion contains less than 5 resistor elements, the number of measuring points may be limited to one point on each resistor element. The average temperature rise above ambient of the resistor elements shall be added to the maximum ambient temperature to obtain the temperature T_{st}.

2. At the maximum ambient temperature, energise a thermally prorated section representative for the arrester type at a voltage level, which results in the same power losses per resistor element as determined above. Keep the power losses constant by adjusting the voltage if necessary. Measure the temperature of the resistors in steady state condition and calculate the average steady state temperature, which is set equal to $T_{st.}$

3. At an ambient temperature of 25 °C ± 10 K, energise a thermally prorated section representative for the arrester type at a voltage level which results in the same power losses per resistor element as

determined above. Keep the power losses constant by adjusting the voltage if necessary. Measure the temperature of the resistors in steady state condition and calculate the average steady state temperature rise, ΔT_{st}, above ambient. Determine the temperature $T_{st.}$ by adding ΔT_{st} to the maximum ambient temperature.

The prorated section shall represent the steady state thermal behaviour of the complete arrester.

NOTE: The section may not necessarily be the same as used for the operating duty test.

At a voltage U_{ct}, determine the ratio, k_x, of power losses at 115 °C to power losses at T_{st} for the type of resistor elements used. For this test the voltage source shall fulfil the requirements as per clause 8.5.1.

8.5.2.3.2 Test procedure

Three resistor samples shall be subjected to constant power losses equal to $k_x * P_{ct}$ (tolerances +30 %, -0 %) for 1000 h. During the test the temperature shall be controlled to keep the surface temperature of the resistor at the required test temperature $T_t \pm 4$ K. The applied test voltage at start of the test must be not less than $0{,}95 * U_{ct}$.

If the temperature T_{st} is equal to or below 60 °C T_t shall be 115 °C. If T_{st} is above 60 °C either the test temperature or the testing time shall be increased as follows:

1. Increase of the test temperature

$T_t = 115 + (T_{st} - T_{a,max} - \Delta T_n)$

where:
T_t = test temperature in °C
T_{st} = steady state temperature of the resistors in °C

$T_{a,max}$ = maximum ambient temperature in °C
ΔT_n = 20 °C

NOTE For liquid-immersed arresters ΔT_n = 25 °C, which results from the requirement that the operating duty test starting temperature for these arresters (120 °C) is 25 °C above the maximum ambient temperature (95 °C), while for other arresters the difference between operating duty test starting temperature and maximum ambient temperature is 20 °C.

2. Increase of the testing time

$t = t_0 * 2{,}5^{\Delta T/10}$

where:
t = testing time in h
t_0 = 1000h
ΔT = temperature above 60 °C

NOTE For deadfront and liquid-immersed arresters t_0 is 2000 h and 7000 h respectively and ΔT is the temperature above 85 °C and 120 °C respectively.

8.5.2.3.3 Determination of elevated rated and continuous operating voltages

The three test samples shall be heated to $T_t \pm 4$ K and subjected to the constant power losses $k_x{}^*P_{ct}$. One to two hours after the voltage application the voltage is adjusted to a voltage in the range 0, 95* U_{ct} to U_{ct} and the power losses, P_{1ct}, are measured. During the test, after 30 %, 50% and 70 % of the testing time the measurement of power losses is repeated under the same conditions with respect to temperature and voltage. The minimum power loss values at these times are designated P_{3ct}. At the end of the ageing test, under the same conditions with regard to block temperature and at the same voltage, the power losses P_{2ct} are determined.

- If P_{2ct} is equal to or below 1,1 times P_{3ct}, then the test according to 8.5.4.2 and 8.5.5.2 shall be performed on new resistors:
  - if P_{2ct} is equal to or less than P_{1ct}, U_{sc} and U_{sr} are used without any modification;
  - if $P_{2ct} > P_{1ct}$, the ratio P_{2ct} / P_{1ct} is determined for each sample. The highest of these ratios is called K_{ct}. On three new resistors at ambient temperature, the power losses P_{1c} and P_{1r} are measured at U_{sc} and U_{sr} respectively. Thereafter, the voltages are increased so that the corresponding power losses P_{2c} and P_{2r} fill the relation:

$$\frac{P_{2c}}{P_{1c}} = K_{ct}; \qquad \frac{P_{2r}}{P_{1r}} = K_{ct}$$

    $U_c{}^*$ and $U_r{}^*$ are the highest of the three increased voltages obtained. As an alternative, aged resistors may also be used after agreement between the user and the manufacturer.

- If P_{2ct} is greater than 1,1 times P_{3ct}, and P_{2ct} is greater than or equal to P_{1ct} then aged resistors shall be used for the following test of 8.5.4.2 and 8.5.5.2. New resistors with corrected values $U_c{}^*$ and $U_r{}^*$ can be used, but only after agreement between the user and the manufacturer.

Aged resistors are, by definition, resistors tested according to 8.5.2.3.2.

These cases are summarised in Table 7.

Where aged resistors are used in the operating duty test, it is recommended that the time delay between the ageing test and the operating duty test be not more than 24 h.

The measuring time should be short enough to avoid increased power loss due to heating