

Förderverein für Elektrotechnische Normung (FEN) e. V.
Cenelec Electronic Components Committee

CECC



Système Harmonisé d'Assurance de la Qualité des Composants Electroniques

SPECIFICATION INTERMEDIAIRE:

VARISTANCES POUR LIMITATION DES SURTENSIONS TRANSITOIRES

Harmonized System of Quality Assessment for Electronic Components

SECTIONAL SPECIFICATION:

SURGE SUPPRESSION VARISTORS

Harmonisiertes Gütebestätigungssystem für Bauelemente der Elektronik

RAHMENSPEZIFIKATION: VARISTOREN FÜR DEN ÜBERSPANNUNGSSCHUTZ

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FOREWORD

The CENELEC Electronic Components Committee (CECC) is composed of those member countries of the European Committee for Electrotechnical Standardization (CENELEC) who wish to take part in a harmonized System for electronic components of assessed quality.

The object of the System is to facilitate international trade by the harmonization of specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognized Mark, or Certificate, of Conformity. The components produced under the System are thereby accepted by all member countries without further testing.

This specification has been formally approved by the CECC and has been prepared for those countries taking part in the System who wish to issue detail specifications for SURGE SUPPRESSION VARISTORS. It should be read in conjunction with the current regulations for the CECC System.

At the date of printing of this specification the member countries of the CECC are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom and copies of it can be obtained from the addresses shown on the blue fly sheet.

PREFACE

This sectional specification was prepared by CECC Working Group 4: 'Resistors'.

This is one of a series of sectional specifications, all relating to the generic specification printed as CECC 42 000.

It is based, wherever possible, on the Publications of the International Electrotechnical Commission.

The text of this sectional specification was circulated to the CECC for voting in the documents listed below and was ratified by the President of the CECC for printing as a CECC Specification.

<u>Document</u>	<u>Voting Date</u>	<u>Report on the Voting</u>
CECC(Secretariat)1227	13 December 1982	CECC(Secretariat)1344
CECC(Secretariat)1228	8 October 1982	CECC(Secretariat)1344
CECC(Secretariat)1229	8 October 1982	CECC(Secretariat)1344

SECTION ONE - SCOPE

This sectional specification prescribes the preferred values for characteristics and ratings and the test severities for varistors intended to protect electronic and other sensitive equipment from surges and operating from a d.c. supply or an a.c. supply having a frequency not greater than 400 Hz.

Varistors which are the subject of this sectional specification will not necessarily give primary protection against lightning surges.

SECTION TWO - PREFERRED CHARACTERISTICS, RATINGS AND SEVERITIES FOR ENVIRONMENTAL TESTS

2.1 Climatic severities

The varistors covered by this document are classified into climatic categories according to the general rules given in the appendix to IEC 68-1.

The standard severities for the cold, dry heat, and damp heat steady state tests are within the following ranges:

Cold (test A) (IEC 68-2-1)	-10 °C to -55 °C
Dry heat (test B) (IEC 68-2-2)	+70 °C to +155 °C
Damp heat, steady state (test C) (IEC 68-2-3)	4, 10, 21 or 56 days (not applicable to uncoated types which have a -/-/00 category)

The severities for the cold and dry heat tests are the lower and upper category temperatures. For some varistors, these temperatures will occur between two of the preferred temperatures given in IEC 68-2. In this case, the nearest preferred temperature within the category temperature range of the varistors shall be chosen for this severity.

2.2 Ratings and characteristics

The values given in detail specifications shall preferably be taken from the following:

2.2.1 Maximum voltages

The maximum continuous a.c. voltage shall be selected from the values listed in table 1 ensuring that the maximum continuous d.c. voltage, which is inter-dependent, is not exceeded.

NOTE - The relationship between the voltages is:

Maximum continuous a.c. r.m.s. voltage = $1,1 \times$ supply voltage

Maximum continuous d.c. voltage = $1,1 \times 1,3 \times$ supply voltage
(for metal oxide types)

Maximum continuous d.c. voltage = $1,1 \times 1,15 \times$ supply voltage
(for silicon carbide types)

TABLE 1

Supply voltage (V r.m.s.)	Maximum continuous a.c. voltage (V r.m.s.)	Maximum continuous d.c. voltage Zn O	Maximum continuous d.c. voltage Si C
60	66	86	76
80	88	114	101
110	121	157	139
120	132	172	152
150	165	215	190
220	242	315	278
230	253	329	291
240	264	343	304
280	308	400	354
380	418	543	481
400	440	572	506
415	456	592	525
440	484	629	557
480	528	686	607
500	550	715	633
660	726	944	835
1000	1100	1430	1265

2.2.2 Surge ratings

Values in amperes shall be selected from the R 10 series of ISO 3.

2.2.3 Voltage at class current (protection levels)

Values shall be selected from the R 40 series of ISO 3.

2.2.4 Class current

Values shall be selected from the R 10 series of ISO 3 with decimal multiples and sub-multiples.

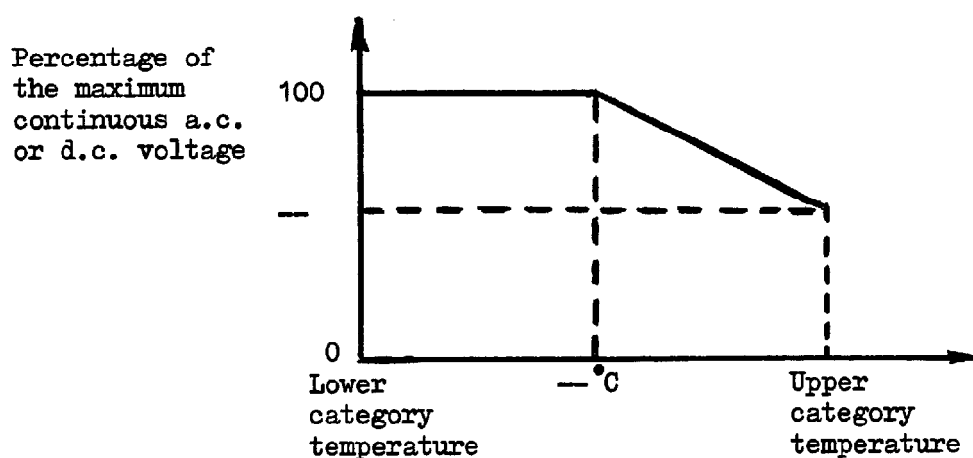
2.2.5 Leakage current

Values shall be taken from the R 10 series in ISO 3. The specified voltage for leakage current shall be the maximum continuous d.c. voltage. For metal oxide varistors the leakage current shall be $< 315\mu\text{A}$.

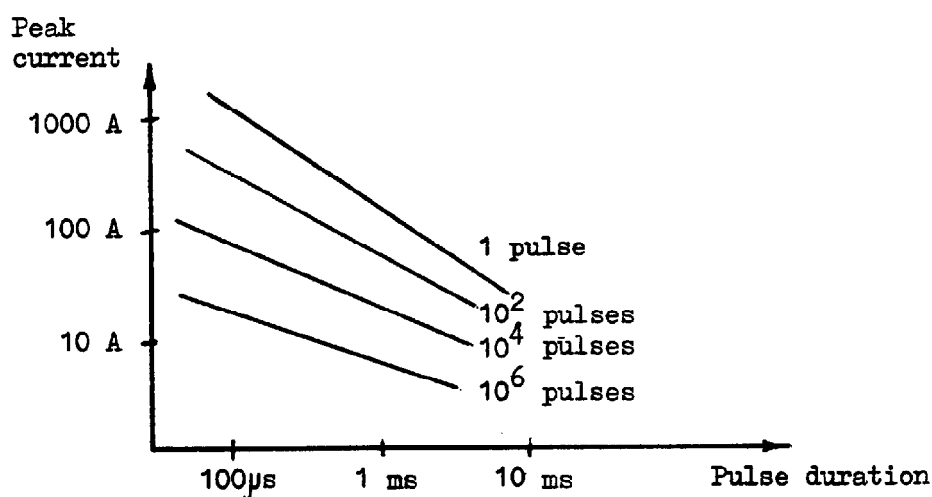
2.2.6 Derating curves

The following curves shall be applied:

a) Maximum continuous a.c. or d.c. voltages



b) Maximum peak current



2.3 Severities for environmental tests

2.3.1 Solderability

Solder bath method : Test Ta (IEC 68-2-20) 235 ± 5 °C

2.3.2 Resistance to soldering heat

As in test Tb method 1A (IEC 68-2-20)

2.3.3 Shock

Test Ea (IEC 68-2-27)

Acceleration : 490 m/s^2

Pulse duration: 11 ms

2.3.4 Bump

Test Eb (IEC 68-2-29)

Acceleration : 390 m/s^2

Number of bumps: 4000 ± 10

2.3.5 Vibration

Procedure : B4

Amplitude : 0,75 mm or acceleration: 98 m/s^2 (whichever is less severe)

Frequency range: 10 Hz to 55 Hz

Sweep endurance: Total duration: 6 h

2.4 Information to be given in a detail specification

The following information shall be given in each detail specification and the values shall preferably be selected from those given in the appropriate clause of this specification.

NOTE - The information given in 2.4.1 to 2.4.8 may, for convenience, be presented in tabular form.

2.4.1 Maximum continuous a.c. voltage(B.2.1 of CECC 42 000)

(See 2.2.1 and table 1)

2.4.2 Supply voltage(B.2.2 of CECC 42 000)

(See 2.2.1 and table 1)

2.4.3 Maximum continuous d.c. voltage(B.2.3 of CECC 42 000)

(See 2.2.1 and table 1)

2.4.4 Leakage current(B.2.6 of CECC 42 000)

(See 2.2.5)

2.4.5 Surge rating (B.2.5 and B.2.8 of CECC 42 000)

The detail specification shall specify the class current and/or the energy surge rating.

(See 2.2.2.)

2.4.6 Voltage at class current (Protection level)(B.2.7 of CECC 42 000)

(See 2.2.3.)

2.4.7 Isolation voltage

(Insulated varistors only.) The isolation voltage shall be 2,5 times the maximum continuous a.c. voltage. The duration of the voltage proof test shall be 10 s.

2.4.8 Insulation resistance (insulated varistors only)

The insulation resistance shall be $> 10 \text{ M}\Omega$ before humidity tests and $> 1 \text{ M}\Omega$ after the humidity tests.

2.4.9 Marking

The marking shall be in accordance with 2.4 of CECC 42 000 except that the following requirements shall replace those given in 2.4.1.1.

- a) Supply voltage.
- b) Number of the detail specification and, if appropriate, style reference.
- c) Date of acceptance.
- d) Manufacturer's name or trade mark.

2.4.10 Dimensions

The numerical value in millimetres shall be given for such of the following dimensions as are applicable, and it shall be stated which dimensions are suitable for gauging.

Body diameter	: D
Body thickness, including terminations of styles with wire terminations	: W
Diameter of wire terminations	: d
Length of wire termination	: l
Distance between wire terminations	: A

The detail specification shall state such other dimensional information as will adequately describe the varistor.

SECTION THREE - INSPECTION

3.1 Formation of inspection lots

An inspection lot shall consist of varistors of the same style. It should be representative of those extremes of rated voltages which have been produced during the period. The samples for Groups C and D shall be collected over the last 13 weeks of the inspection period.

Where a lot is formed from specimens of different termination variants, the lot shall contain an equal portion of each termination variant.

3.1.1 Structural similarity

Varistors within the scope of this sectional specification may be grouped as structurally similar for the purpose of forming inspection lots provided that the following requirements are met:

- a) They have been produced by one manufacturer on one site using essentially the same design, materials, processes and methods.
- b) For electrical tests, devices having the same electrical characteristics may be grouped provided that the element determining the characteristics is similar for all the devices concerned.
- c) For environmental tests, devices having the same encapsulation, basic internal structure and finishing processes may be grouped.
- d) For visual inspection (except marking) devices may be grouped if they have been made on the same production line, have the same dimensions, encapsulation and external finish.

The grouping may also be used for robustness of terminations and soldering tests where it is convenient to group devices with different internal structures (see "c" above).

- e) For endurance tests, devices may be grouped if they have been made with the same production process in the same location using the same design and differing only in electrical characteristics. If it can be shown that one type from the group is more heavily stressed than the others then tests on this type may be accepted for the remaining members of the group.

NOTE - The sample taken shall be determined from the total lot size of the grouped devices. For periodic tests the average value of such lot size shall be used.

Structurally similar devices should preferably be included in one detail specification but the details of all claims to structural similarity shall be declared in the qualification approval test reports.

3.2 Test methods

Test methods shall be selected from those given in CECC 42 000 or shall be described in the detail specification.

3.3 Qualification approval

When it is desired to obtain qualification approval by adopting the fixed sample size procedure (see 3.3.3 of CECC 42 000), use shall be made of the following test schedules. The conditions of test and the performance requirements shall be identical to those prescribed for quality conformance inspection in the detail specification.

All specimens which are to be submitted to Group 3 inspection onwards shall previously have passed Groups 1 and 2 inspection.

TABLE 1

Fixed sample size qualification approval test schedule

Clause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Performance requirements (see Note 1)	Defectives permitted (see Note 2)		
				n	c	t
GROUP 0	ND			56 +3	1	1
4.2.1 Visual examination			As in 4.2.1			
4.2.2 Marking			As in 4.2.2			
4.2.3 Dimensions (gauging)			As specified in the detail specification			
4.3 Voltage		at 1 mA	As specified in the detail specification			
C2.1.4 Voltage under pulse conditions		8/20 pulse Class current Protection level	< --- V			
4.3 Current		At maximum continuous d.c. voltage				
		Leakage current (see Note 3)	As specified in the detail specification			
GROUP 1	D			8	1	3
C2.1 Pulse current		100 pulses at 8/20 in the same direction at 2 pulses per minute at maximum peak current				
		Visual examination	No visible damage			
		Leakage current (see Note 3)	≤ 2 x the initial limits			
4.7 Voltage proof (Insulated varistors only)			As in 4.7.3			

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Clause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Performance requirements (see Note 1)	Defectives permitted (see Note 2)		
				n	c	t
GROUP 2	D			8	1	
4.11 Robustness of terminations		Tests appropriate to the type of terminations				
		Visual examination	As in 4.11.6			
		Leakage current (see Note 3)	Within the initial limits			
4.10.1 Soldering -Solderability (see Note 4)		Test Ta Solder bath method: 235 ± 5 °C	The terminations shall be uniformly tinned			
GROUP 3	D			8	1	
4.2.4 Dimensions (detail)			As specified in the detail specification			
4.5.1.1 Temperature coefficient of current (if appropriate)		At maximum continuous d.c. voltage. At the lower category temperature, +25 °C and the upper category temperature	LCT/25 25/UCT			
			As specified in the detail specification			
C2.1 Pulse current		100 pulses at 10/1000 or 2 ms square wave in the same direction. One pulse every 2 minutes at maximum peak current				
		Visual examination	No visible damage			
		Leakage current (see Note 3)	$\leq 2 \times$ the initial limits			

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Clause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Performance requirements (see Note 1)	Defectives permitted (see Note 2)		
				n	c	t
GROUP 4	D	<u>8 specimens</u>		8	1	
4.8 Insulation resistance (for insu- lated varis- tors only) (s. Note 8)			$R: \geq 10 \text{ M}\Omega$			
4.17 Damp heat steady state		<u>4 specimens</u> No applied voltage <u>Other 4 specimens: 10 %</u> of the max. continuous d.c. voltage				
		Visual examination	As in 4.17.3.1			
		Leakage current (see Note 3)	$\leq 2 \times$ the initial limits			
		Insulation resistance (Insulated varistors only)	$R: \geq 1 \text{ M}\Omega$			
GROUP 5	D	<u>Half of the sample</u>		16	1	
4.10.2 Soldering - Resistance to solder heat (see Note 4)		Test Tb(method 1A of IEC 68-2-20)				
		Visual examination	As in 4.10.2.4			
		Leakage current (see Note 3)	Within the initial limits			
4.12 Rapid change of temperature		T_A : LCT T_B : UCT				
		Visual examination	As in 4.12.4			
		Leakage current (see Note 3)	Within the initial limits			

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Clause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Performance requirements (see Note 1)	Sample size and criterion of acceptability (see Note 2)		
				n	c	t
GROUP 5 (cont.)						
		<u>Other half of the sample</u>				
4.14 Shock (See Note 5)		Pulse shape : Half sine Acceleration : 490 m/s ² Pulse duration: 11 ms (see Note 6) Visual examination Leakage current (see Note 3)	As in 4.14.3. Within the initial limits			
<u>or</u>						
4.13 Bump (See Note 5)		Number of bumps: 4000 Acceleration : 390 m/s ² (see Note 6) Visual examination Leakage current (see Note 3)	As in 4.13.3. Within the initial limits			
4.15 Vibration		Procedure : B4 Frequency range: 10 Hz to 55 Hz Amplitude : 0,75 mm or acceleration 98 m/s ² (whichever is the less severe) Total duration: 6 h (see Note 6) Visual examination Leakage current (see Note 3)	No visible damage Within the initial limits			

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