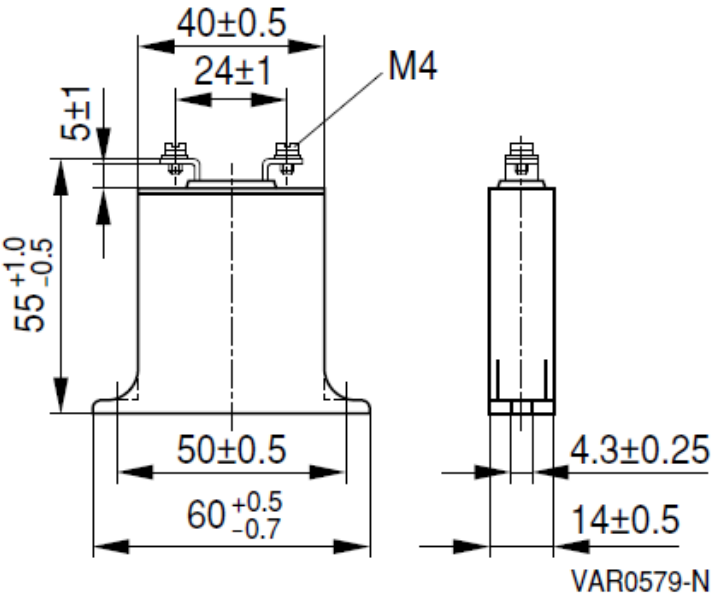
Specification available from: Österreichischer Verband für Elektrotechnik (ÖVE) A-1010 Wien, Eschenbachgasse 9	**IEC 61051-2-2 AT0005** Issue 2 / 2024-06 QC 420102 AT0005
Electronic components of assessed quality in accordance with: IEC 61051-1: 2018-10 IEC 61051-2: 2021-11 IEC 62368-1: 2018-10 Annex G.8.1 IEC 62368-1: 2023-05 Annex G.8.1 QC 42000025	IEC 61051-2-2: 1991-01 QC 420102
Outline and dimensions for Standard types series B40  	ZINC OXYDE SURGE SUPPRESSION VARISTORS Insulated -Varistor element potted in plastic housing, screw terminals. Assessment level 'E'

NOTES

1 - Different voltage class in same size housing.
2 - The undimensioned details do not affect the performance of the device.
3 - The terminations are suitable for screwing..

SECTION ONE – GENERAL DATA

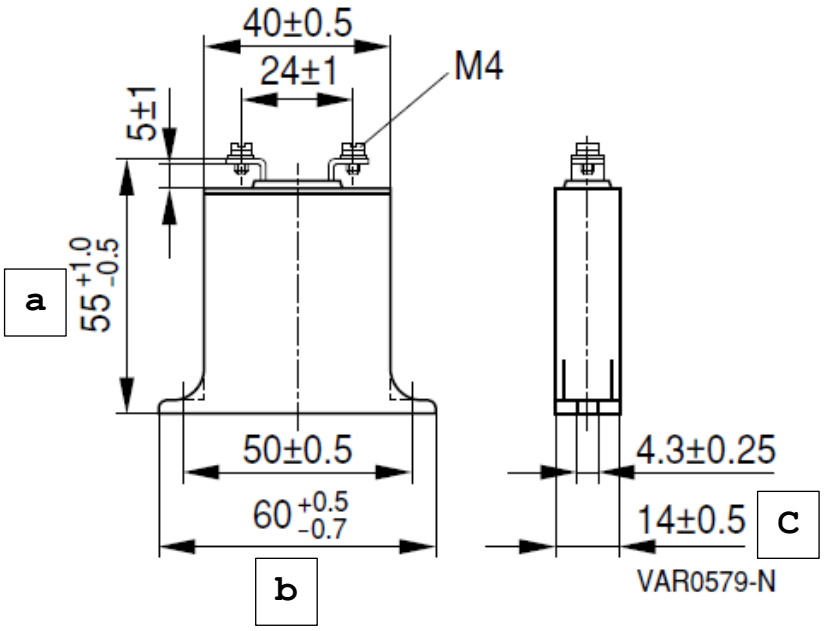
1 General data

1.1 Recommended method(s) of mounting

The varistors shall be mounted by their normal means in such a manner that there shall be no parasitic vibration (Screw terminals M4).

1.2 Dimensions, ratings and characteristics

1.2.1. Dimensions (All dimensions are in millimeters)

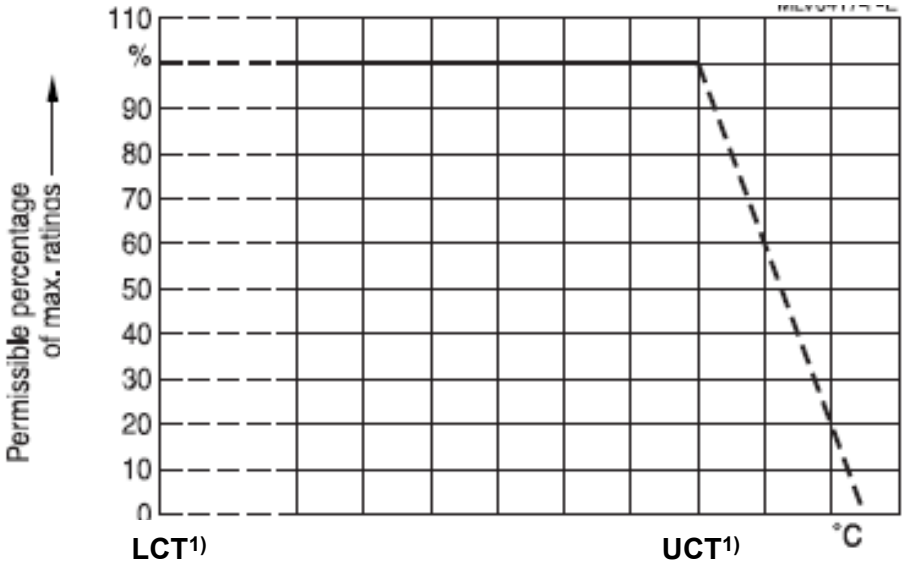


1.2.2 Ratings and characteristics (at 25 ℃)

LCT/UCT (Lower/Upper category temperature) 1)		-40/85°C
Maximum continuous a.c. voltage:	:	see table 1
Maximum continuous d.c. voltage:	:	see table 1
Voltage at specified current (1 mA):	:	see table 1
Voltage at class current (protection level):	:	see table 1
Maximum surge current:	:	see table 1
Maximum energy absorption (2 ms square wave):	:	see table 1
Maximum capacitance:	:	see table 1
Average power dissipation:		see table 1
Maximum temperature coefficient of the voltage at reference current	:	$-(0.05\ \%\ /\ K)_{max.}$
Isolation voltage:	:	2500 V (a.c.)
Climatic category	:	40/85/56
Dimensions (detailed)		See 1.2.1

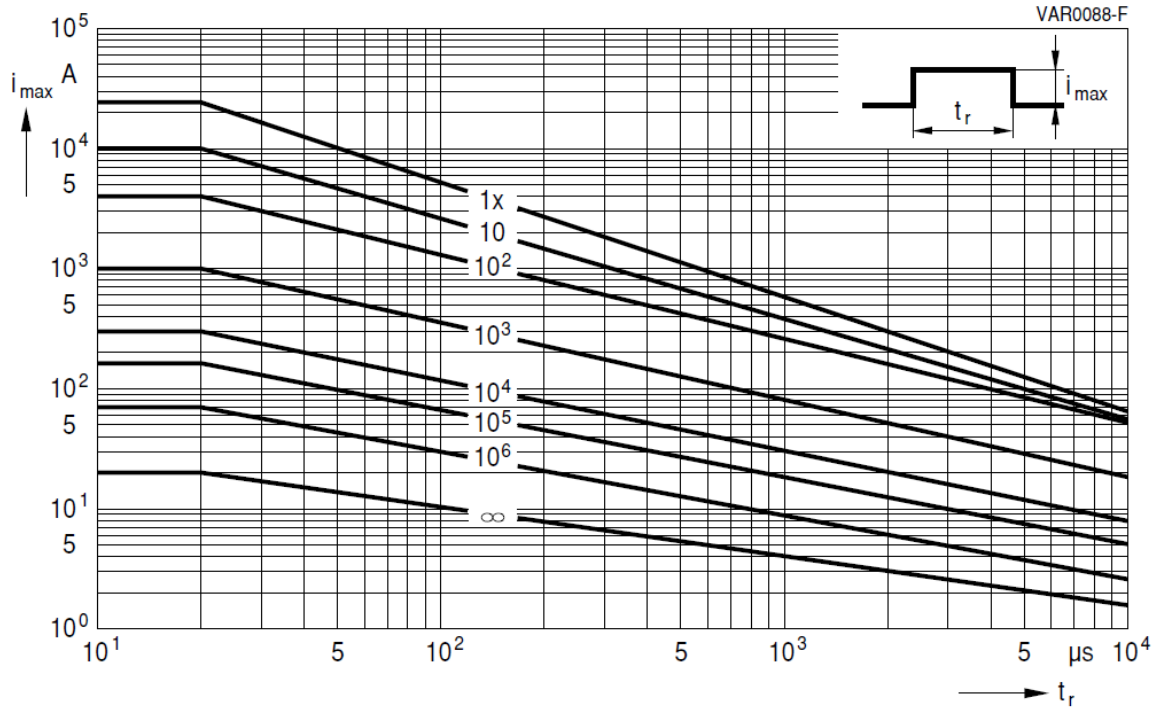
1.2.3 Derating Curves

Maximum continuous a.c. or d.c. voltage with temperature

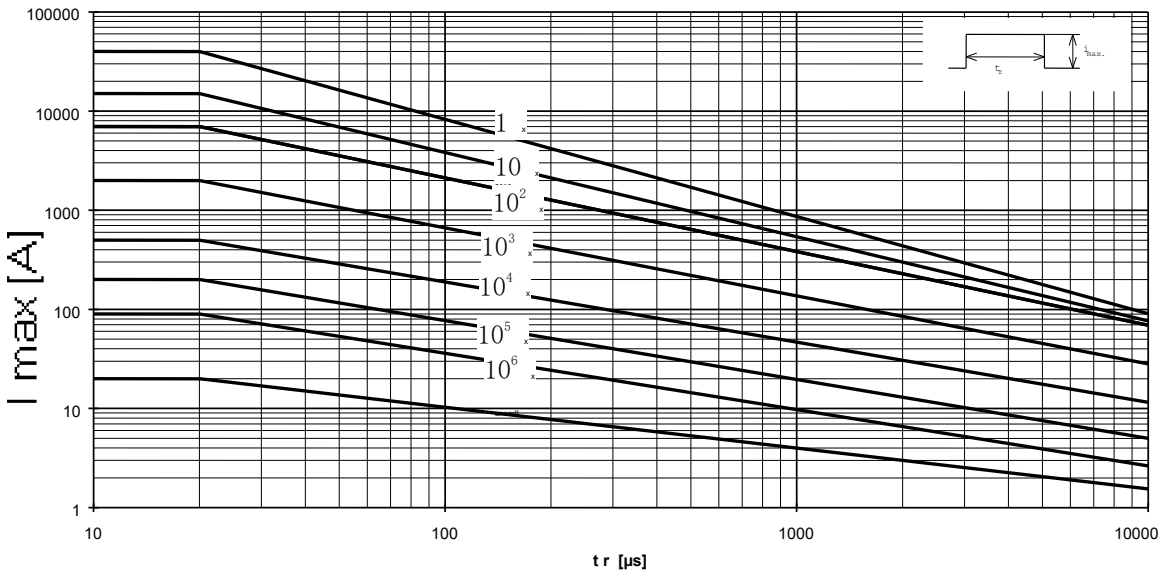


Reduction factor of maximum peak current for various numbers of pulses versus pulse duration.

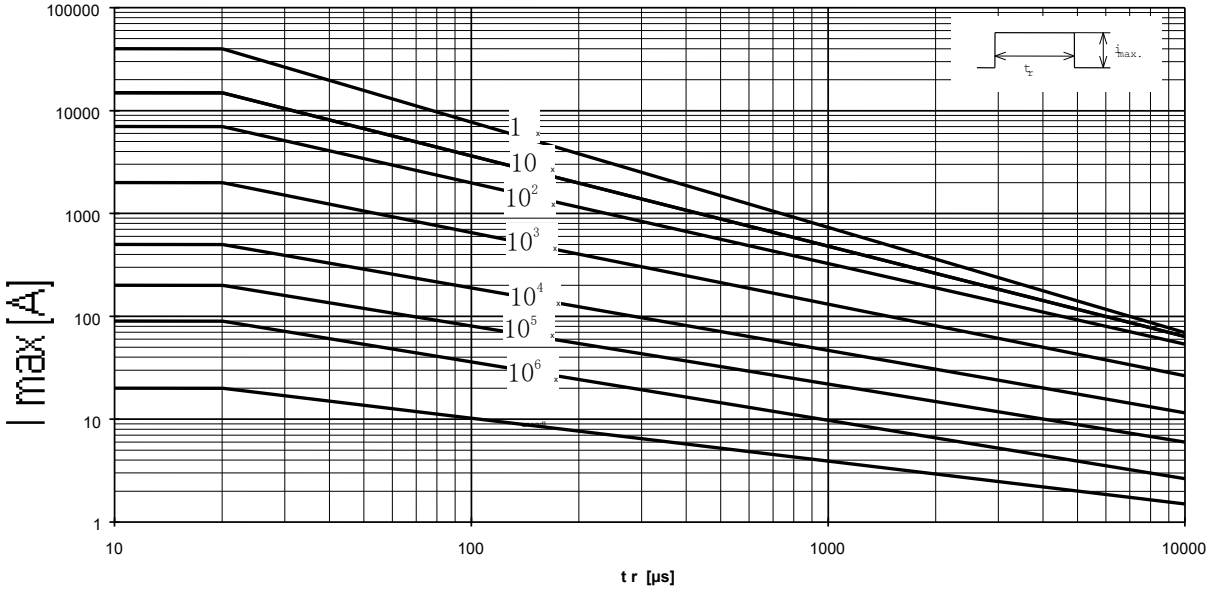
B40K75:



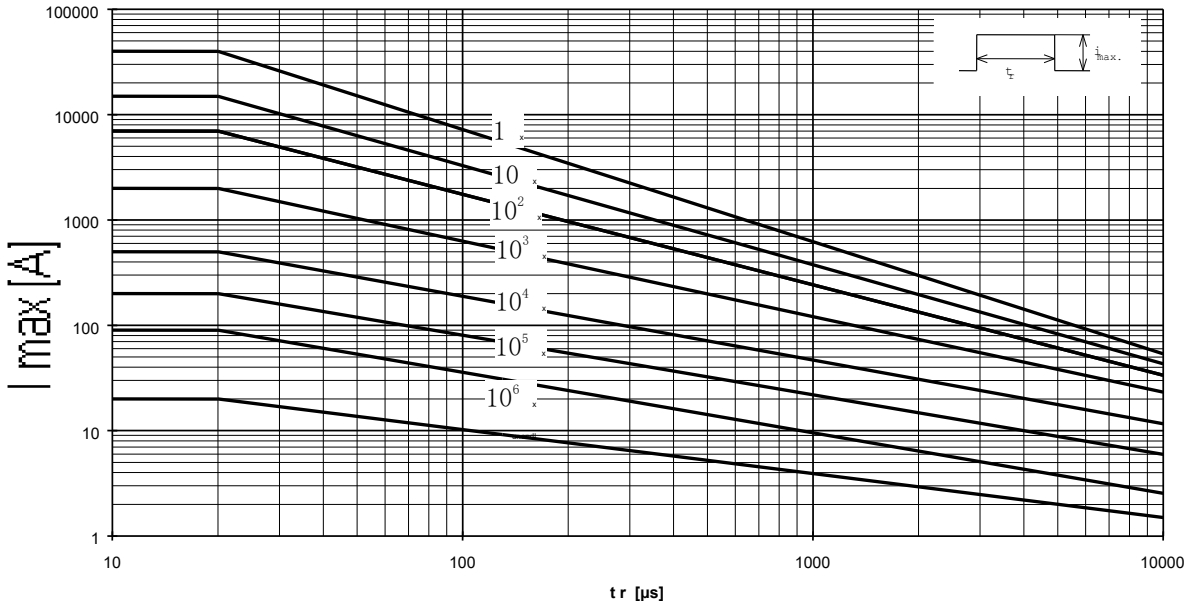
B40K130~K150:



B40K230~K460:



B40K550~K750:



1.3 Related documents

Generic specification:	IEC Publication 61051-1: Varistors for Use in Electronic Equipment. Part 1: Generic Specification.
Sectional specification:	IEC Publication 61051-2: Varistors for Use in Electronic Equipment. Part 2: Sectional Specification for Surge Suppression Varistors.

Table 1

Style	Supply Voltage	Maximum continuous voltage		Voltage at 1 mA ± 10%	Voltage at class current (8/20µs)		Max. surge current (8/20 µs, 1 time)	Max. peak current (8/20µs, combination pulse, 10 times)	Rated energy (2 ms, 1 time)	Maximum capacitance	Average power dissipation
(1)	(2)										
	(Vac)	r.m.s. (V)	(V_{DC})	(V)	Class current(A)	Max. volt (V)	(kA)	(-)	(J)	(pF)	(W)
B40K75	60	75	100	120	300	220	25	6kV/3kA	190	26000	1.4
B40K130		130	170	205	300	340	40	6kV/3kA	310	11200	1.4
B40K150		150	200	240	300	395	40	6kV/3kA	360	9600	1.4
B40K230	140	230	300	360	300	595	40	6kV/3kA	460	6400	1.4
B40K250		250	320	390	300	650	40	6kV/3kA	490	5800	1.4
B40K275		275	350	430	300	710	40	6kV/3kA	550	5500	1.4
B40K320	240	320	420	510	300	840	40	6kV/3kA	640	4600	1.4
B40K385		385	505	620	300	1025	40	6kV/3kA	800	3800	1.4
B40K420		420	560	680	300	1120	40	6kV/3kA	910	3600	1.4
B40K440		440	585	715	300	1180	40	6kV/3kA	950	3400	1.4
B40K460		460	615	750	300	1240	40	6kV/3kA	1000	3200	1.4
B40K550	380	550	745	910	300	1500	40	6kV/3kA	960	2800	1.4
B40K680		680	895	1100	300	1815	40	6kV/3kA	1100	2200	1.4
B40K750		750	970	1200	300	2000	40	6kV/3kA	1200	2000	1.4

(1) For explanation of style reference number, see clause 1.5.
(2) Acc. to IEC 62368-1 **G.8.1**: Maximum continuous voltage of the Varistors should be at least 1.25 times rated voltage of equipment/ rated voltage range. Only typical AC Mains Supply voltages are indicated.

1.4 Marking

The varistors are marked with their:

- manufacturer's code or trade mark
- Varistor type name : B40KXXX (Maximum continious voltage AC)
- Certification logo: UL CSA
- date of manufacture (YY, WW)

e. g.
EPCOS
B40K275
UL CSA
16 15

1.5 Ordering information

Orders for varistors covered by this specification shall contain the following information:

SIOV-	B	40	K	275
I	II	III	IV	V

I. Series Prefix: Optional:
SIOV

II. Fixing:
B= Block Varistor

III. Nominal Disc Dimensions:
40 = 40 mm disc diameter

IV. Tolerance of Varistor Voltage at 1 mA:

K = ±10%

V. Maximum Rated Operating Voltage (RMS).

1.6 Certified records or released lots

Not required.

1.7 Additional information (not for inspection purposes)

The voltage indicated on the component is the maximum allowable steady state sinusoidal voltage at 50 - 60 Hz. When use is made of a supply voltage, the maximum continuous a.c. r.m.s. voltage = 1.1 x supply voltage. Should the varistor be subjected to voltage above the indicated voltage, it may fail by package rupture or expulsion material, causing a major problem in the equipment

1.8 Additional or increased severities or requirements to those specified in the generic and/or sectional specification

None.

SECTION TWO - INSPECTION REQUIREMENTS

2. Inspection requirements

2.1 Procedures

2.1.1 For Qualification Approval the procedure shall be in accordance with the Sectional Specification, IEC Publication 61051-2, Sub-clause 3.2.
2.1.2 For Quality Conformance Inspection the test schedule (Table II) includes sampling, peridicity, severities and requirements. The formation of inspection lots is covered by Sub-clause 3.3.1 of the Sectional Specification.

TABLE II

Notes

1. - Sub-clause numbers of tests and performance requirements refer to the Generic Specification, IEC Publication 61051-1.
2. - Number to be tested: sample size as directly allotted to the code letter for IL of IEC 61193-2 (Single sampling plan for normal inspection).
3. - In this table:
   P = periodicity (in months)
   N = sample size
   C = acceptance criterion (permitted number of defectives)
   D = destructive
   ND = non-destructive
   IL = inspection level
4. - The bump test and shock test are considered to be alternative. The detail specification shall indicate which test is to be performed.
5. - Where d.c. has been applied to the varistor, the reference voltage shall be measured in the same direction.
6. - The manufacturer shall only be required to perform one of these tests.
7. - The varistors shall be mounted by their normal means in such a manner that there shall be no parasitic vibration.
8. - 100% testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million (x 10-6). The sampling level shall be established by the manufacturer. For the calculation of x 10-6 values any parametric failure shall be counted as a non-conforming items. In case one or more non-conforming items occur in a sample, this lot shall be rejected
9. - The dimensions are decided by the outsourced plastic housing, IQC sampling check according to incoming inspection plan: C=0.
   The dimensions are formed by housing, which has stable dimensions. The reasons are as following:
   1. The housing material is PBT which has excellent thermal stability, and the shrinkage rate of the material during moulding is also very small, only 1.4~2.0%.
   2. The tolerance of each moulding cavity had considered the shrinkage rate and can meet the box dimension tolerance requirement, and the shape of the product is mainly decided by the moulding cavity and the material.
10. - Tensile test, solderability, and resistance to soldering heat tests are not applicable as the block varisters have screw terminals.
11. - Solvent resistance of the marking test is not applicable as block varistors have laser engraved marking.
12. - According to sample size IL S-2, and the manufacturer production lot size will not be bigger than 35000, the corresponding sample size should not be bigger than 8.

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3) IL	n	c	Performance requirements (see Note 1)
GROUP A INSPECTION (lot-by-lot) Sub-group A1 6.4.1 Visual examination 6.4.2 Marking	ND		II	2)	0	As in 6.4.1 Legible marking and as specified in 1.4 of this specification
Sub-group A2 6.6 Voltage	ND	Voltage at specified current	100% see Note 8)			As specified in 1.2.2 of this specification
Sub-group A3 6.4.3 Dimensions (gauging)	ND	Not applicable, See Note 9)	Not applicable See Note 9)			As specified in 1.2.1 of this specification
GROUP B INSPECTION (lot-by-lot) Sub-group B1 6.17.2 Robustness of terminations		IEC 60068-2-21, Test Ua1: tensile F=40N Not applicable, see Note 10 Test Ud: torque M=1Nm Visual examination Voltage at specified current	S-3	Notes 2) 10)	0	Not applicable, see Note 10 No visible damage $\left\|\frac{\Delta U}{U}\right\| \le 10\%$
6.19 Solderability (if applicable)		IEC 60068-2-20,Test Ta,Method 1 Soldering bath conditions: Pb- free solder: 245±3°C, 3s Not applicable, see Note 10)	Not applicable See Note 10)			The terminations shall be uniformly tinned Not applicable, s. Note 10)
6.27 Solvent resistance of the marking (if applicable)		IEC 60068-2-45,Test XA (3.1.1, Method 1): T = 23±5°C, t = 5±0,5 min Solvent mixture (70±5% Diethylenglycoldibutylether, 30±5% 2-propanol). Rubbing material: Cotton wool F = 5±0,5 N, 10 strokes. Visual examination Not applicable, see Note 11)	Not applicable See Note 11)			Legible marking Not applicable, s. Note 11)

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			IL	n	c	
Sub-group B2 6.11 Clamping voltage	D	At class current: See table 1.	100% see Note 8)			As specified in 1.2.2 of this specification
6.9 Voltage proof		Metal balls method (6.9.3) 2500 V, 60 s	S-2 See Note 12)		0	As in 6.9

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size & criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
GROUP C INSPECTION (periodic) Sub-group C1 6.13 Maximum peak current	D	Combination pulse 10 pulses (combination pulse), in one direction, 1 per min Visual examination Leakage current or voltage at specified current	6	13	1	No visible damage $\left\|\frac{\Delta U}{U}\right\| \leq 10\%$
Sub-group C2 6.15 Rated Energy	D	Single current pulse with 2 ms rectangular wave shape or 10 µs /1 000 µs wave shape (current according table 1 and 1.2.3) Visual examination Voltage at specified current	12	13	1	No visible damage $\left\|\frac{\Delta U}{U}\right\| \leq 10\%$

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size & criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Sub-group C3A Part of sample of Sub-group C3	D		12	7	0	
6.8 Capacitance		f = 1 kHz Signal level ≤ 1V Zero bias				As specified in 1.2.2 of this specification
6.18 Resistance to soldering heat (if applicable)		IEC 60068-2-20,Test Tb, Method 1A T = 260±5°C, d = 10±1s Visual examination Voltage at specified current Not applicable, see Note 10)				No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 5\%$ Not applicable, s. Note 10)
6.28 Component solvent resistance (if applicable)		IEC 60068-2-45,Test XA (3.1.1, Method 2): T = 23±5°C t = 5±0,5 min Solvent mixture: 70±5% Diethylenglycoldibutylether, 30±5% 2-propanol. Recovery: 48h Visual examination Voltage at specified current Not applicable, see Note 11)				No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 5\%$ Not applicable, s. Note 11)
6.20 Rapid change of temperature		IEC 60068-2-14,Test Na N = 5 cycles, d = 30 min θA = -40±3°C θB = 85±2°C Visual examination Voltage at specified current				No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 5\%$

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size & criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Sub-group C3B Other part of sample of Sub-group C3			12	6	0	
6.21 Shock		IEC 60068-2-27,Test Ea Pulse shape: half-sine a = 500 m/s2 , d = 11ms N = 6 x 3 shocks. (The mounting shall be such that there shall be no parasitic vibration) Visual examination Voltage at specified current				No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 5\%$
6.21 Repetitive Shock		ICL 60068-2-27, Test Ea Not specified				
6.22 Vibration		IEC 60068-2-6,Test Fc, Method B4 Frequency range: 10 Hz to 55 Hz a = 0,75 mm or 98 m/s^2 (whichever is the less) d = 3x2 h Visual examination Voltage at specified current				No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 5\%$

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size & criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Sub-group C3 Combined sample of specimens of Sub-groups C3A and C3B 6.23 Climatic sequence - Dry heat - Damp heat, cyclic, Test Db, first cycle - Cold - Damp heat, cyclic, Test Db, remaining cycles - Final measurement	D	(Low air pressure test not applicable) IEC 60068-2-2,Test Ba 16±2h, T = 85±2°C; IEC 60068-2-30,Test Db 24h, T = 55±2°C; IEC 60068-2-1,Test Aa 2h, T = -40±3°C; IEC 60068-2-30,Test Db 24h, T = 55±2°C; Visual examination Voltage at specified current Insulation resistance U = 500V (Insulated varistors only) Voltage proof (Insulated varistors only)	12	13	1	 No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 10\%$ ≥ 100 MΩ No breakdown or flashover
Sub-group C4 6.26 Endurance at upper category temperature	D	T = 85±2°C, Duration: 1000 h Voltage: max. a.c. voltage Examination at 48 h, 500 h and 1000 h: Visual examination Voltage at specified current Examination at 1000 h: Voltage at class current Insulation resistance U = 500V (Insulated varistors only)	12	13	1	 No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 10\%$ 1,1 x the initial limit ≥ 1 GΩ

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size & criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
GROUP D INSPECTION Sub-group D1 6.24 Damp heat, steady state	D	IEC 60068-2-78, Test Ca T = 40±2°C, RH = 93(±2)%, 56d 4 specimens: No voltage applied Other 4 specimens: Applied voltage: 10% of the max. d.c. voltage Visual examination Voltage at specified current Insulation resistance U = 500V (Insulated varistors only)	24	8	1	 No visible damage Legible marking $\left\|\frac{\Delta U}{U}\right\| \leq 10\%$ ≥ 100 MΩ
Sub-group D2 6.4.4 Dimensions (detail) 6.6 Voltage (if applicable)	ND	 At specified current 1mA At following temperatures: LCT (+3/-0°C) and UCT (+0/-3°C)	24	8	1	 As specified in 1.2.2 of this specification As specified in 1.2.2 of this specification $\frac{U_{25°C} - U_{LCT}}{\Delta T} \cdot \frac{100\%}{U_{25°C}} \leq 0{,}09\% K^{-1}$ $\frac{U_{25°C} - U_{UCT}}{\Delta T} \cdot \frac{100\%}{U_{25°C}} \leq 0{,}09\% K^{-1}$
Sub-group D3 6.25 Fire hazard (Needle flame test)	D	 IEC 60695-11-5 Severity: Vertical 10 s	24	5	0	 Duration of burning: 5 s max.