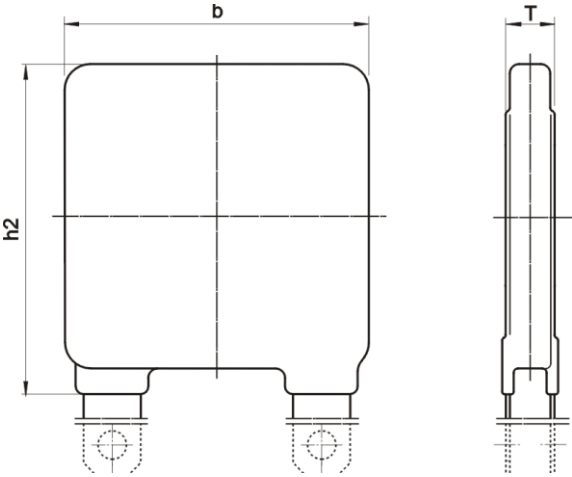


<p>Specification available from: Österreichischer Verband für Elektrotechnik (ÖVE)</p> <p>A-1010 Wien, Eschenbachgasse 9</p>	<p>IEC 61051-2-2 AT0003 Issue 2 / 2015-09</p> <p>QC 420102 AT0003</p>
<p>Electronic components of assessed quality in accordance with:</p> <p>IEC 61051-1: 2007-04 IEC 61051-2: 1991-01 IEC 61051-2 Amendment 1: 2009-05 IEC 60950-1: 2013-05 Annex Q</p> <p>QC 420000</p>	<p>IEC 61051-2-2: 1991-01</p> <p>QC 420102</p>
<p>Outline and dimensions for Standard types L(S)40*QPK* and L40(41)*QLK*</p>  <p>Outline and dimensions for special types: See 1.2.1</p>	<p>ZINC OXYDE SURGE SUPPRESSION VARISTORS</p> <p>L(S)40*QPK (Epoxy coating): Insulated</p> <p>L40(41)*QLK (Silicate coating): Not insulated</p> <p>Exceptions for special types see 1.2.1</p> <p>Assessment level 'S'</p>

NOTES

- 1 - Other shapes and/or terminations are permitted within the dimensions given.
- 2 - The undimensioned details do not affect the performance of the device.
- 3 - The terminations are suitable for soldering.
- 4 - The terminations are suitable for printed wiring applications.
- 5 - The terminations are rigid.

SECTION ONE – GENERAL DATA

1 General data

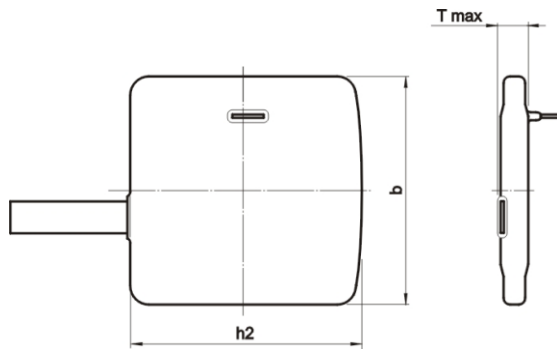
1.1 Recommended method(s) of mounting

The varistors shall be mounted by their normal means in such a manner that there shall be no parasitic vibration.

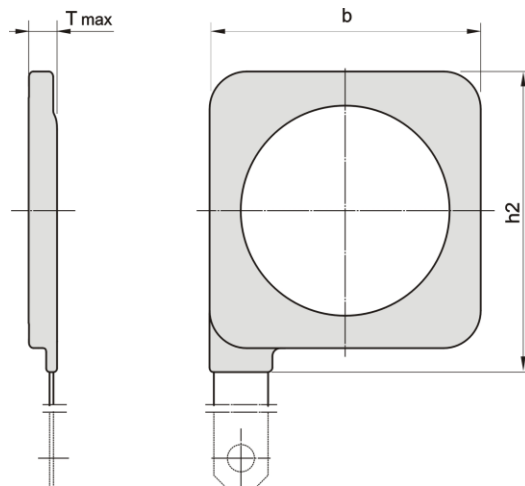
1.2 Dimensions, ratings and characteristics (see table 1)

1.2.1. Dimensions (All dimensions are in millimeters)

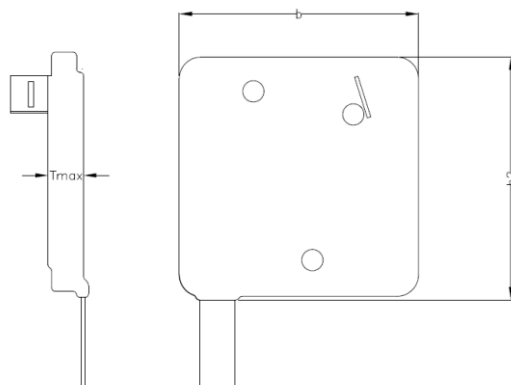
Type A: Type with Customer specific connectors / shape:



Type B: Type with milled coating (not insulated):



Type C: Customer specific *QLK30 type with milled coating (not insulated):

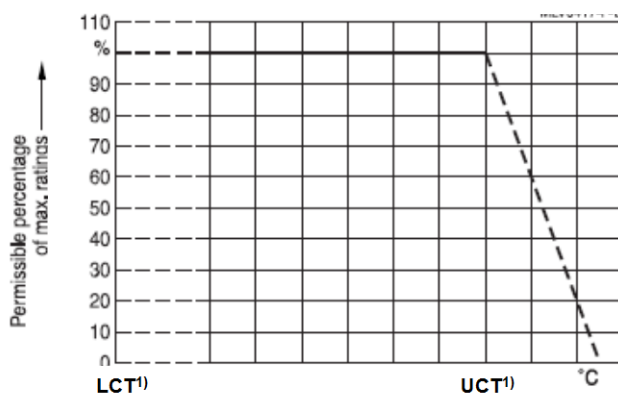


1.2.2 Ratings and characteristics (at 25 °C)

Supply voltage (where applicable):	:	see table 1
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	:	$-(0.09 \% / \text{K})_{\text{max}}$.
Isolation voltage: Only for L(S)40*QPK* (types with Epoxy coating, except type B, see 1.2.1)	:	2500 V (a.c.)
Climatic category	:	40/85/56
LCT/UCT (Lower/Upper category temperature) ¹⁾		-40/85°C
Dimensions of T	:	see table 1
Dimensions of h ₂	:	46 mm (max.)
Dimensions of b	:	37,5 mm (max.)

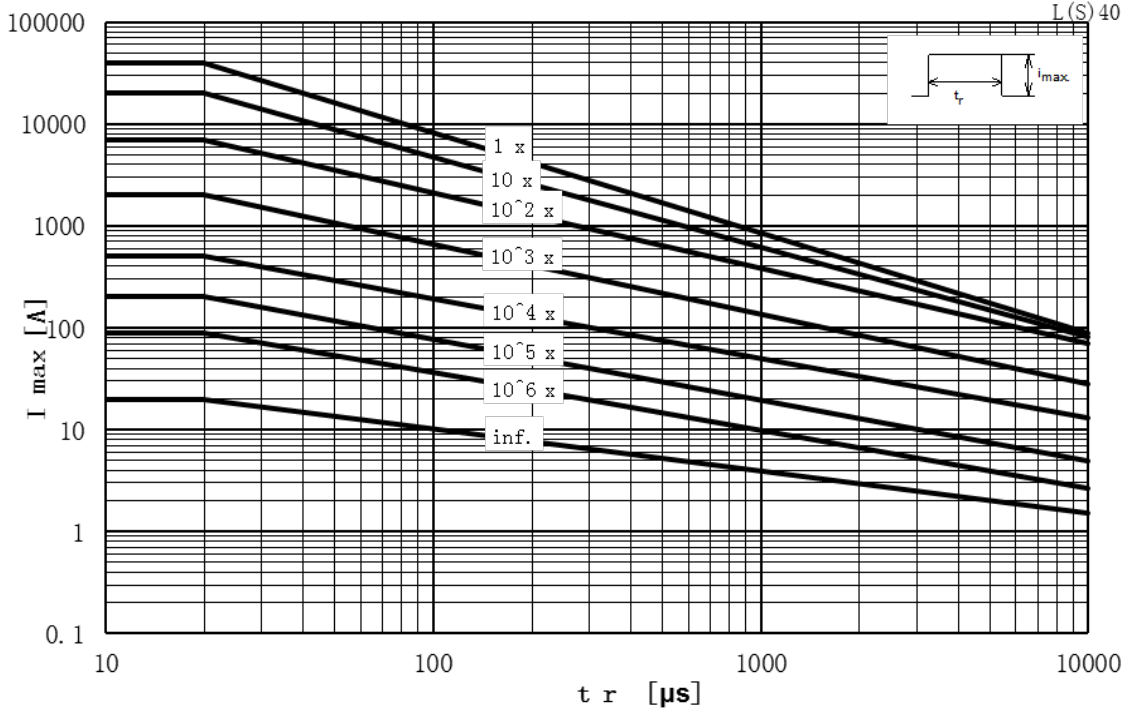
1.2.3 Derating Curves

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

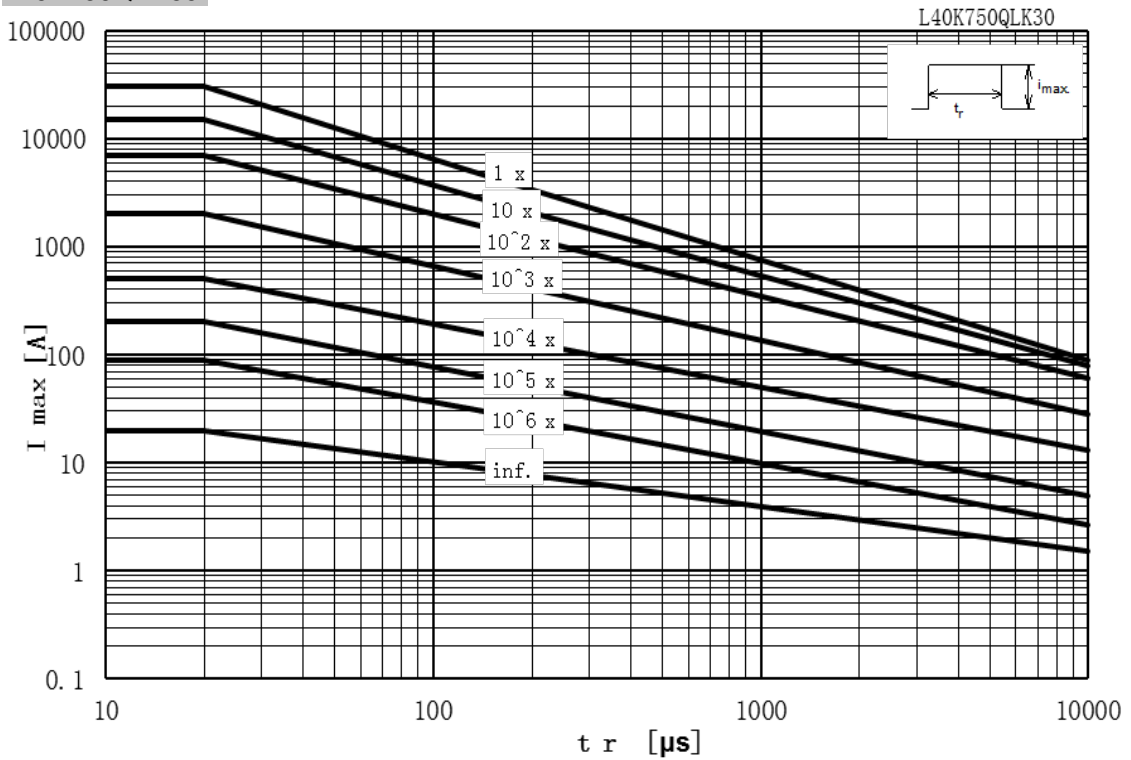


Reduction factor of maximum peak current for various numbers of pulses versus pulse duration

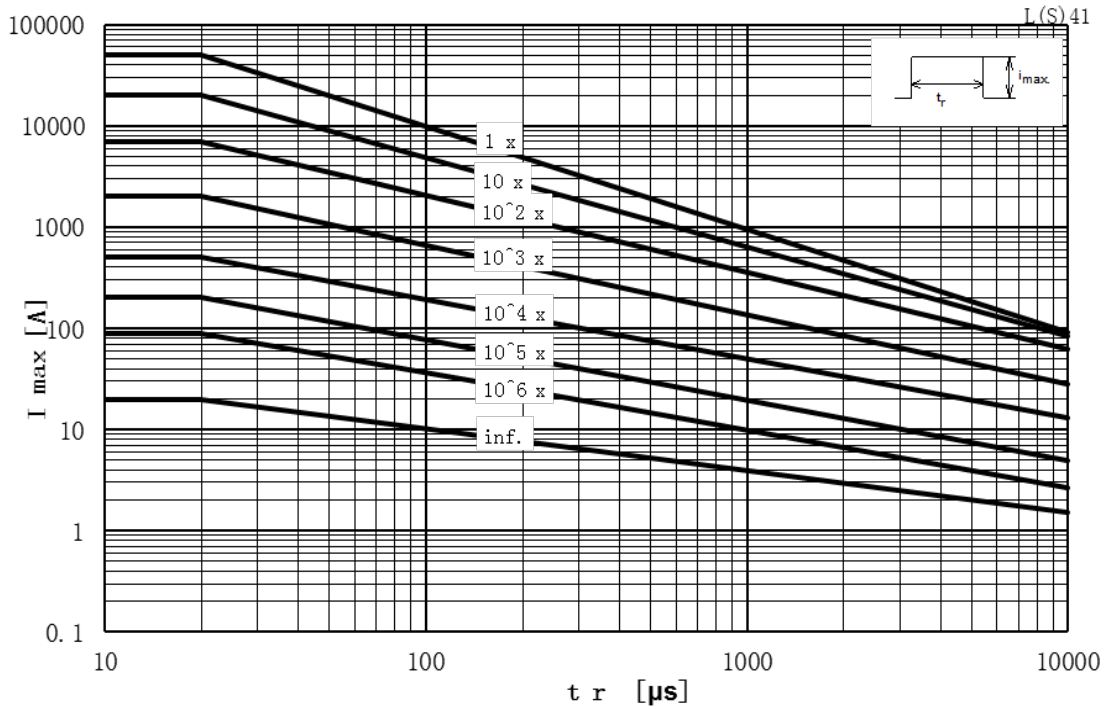
L(S)40-75~750, except 750QLK30:



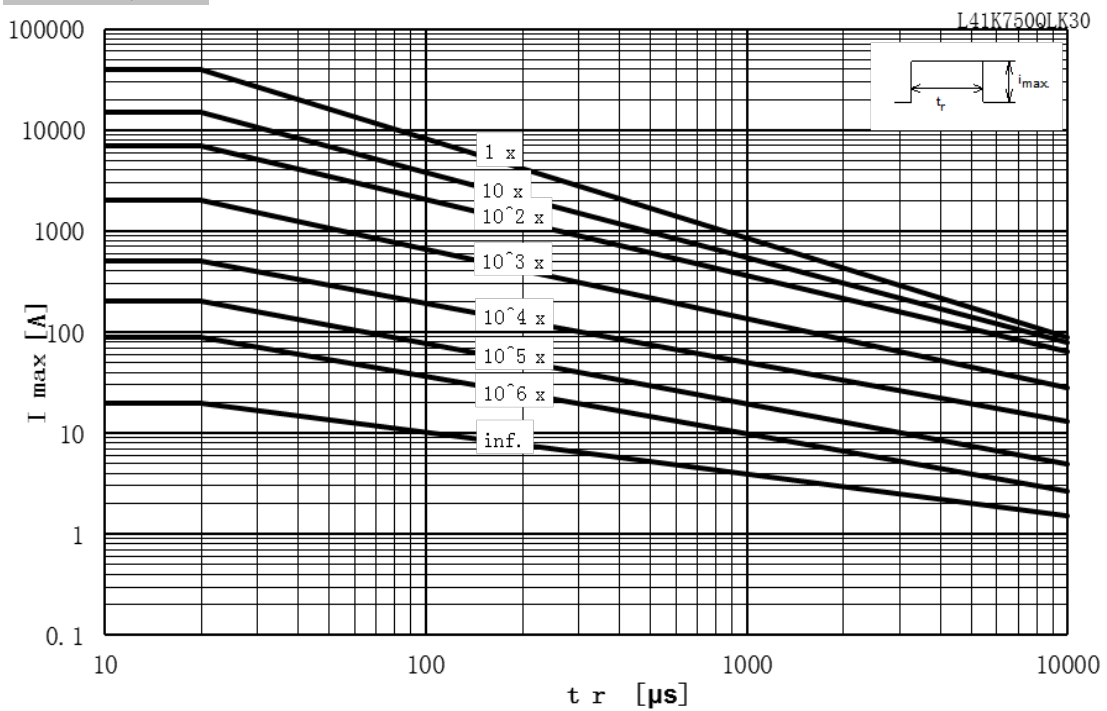
L40K750QLK30:



L(S)41-75~750, except 750QLK30:



L41K750QLK30:



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	Voltage at class current (8/20µs)		Max. surge current (8/20 µs, 1 time)	Max. peak current (8/20µs, combination pulse, 10 times)	Maximum energy absorption	Maximum capacitance	Dimension
				± 10%					(2 ms, 1 time)		
(1), (2)	(3)										Tmax
	(V)	r.m.s. (V)	(V _{DC})	(V)	Class current(A)	Max. volt (V)	(kA)	(-)	(J)	(pF)	(mm)
L(S)40/41_75	120	75	100	120	300	220	40/50	6kV/3kA	190	26000	5.3
L(S)40/41_150		150	200	240	300	395	40/50	6kV/3kA	360	9600	8,3
L(S)40/41S150C		150	200	265	300	450	40/50	6kV/3kA	415	9600	8,3
L(S)40/41_175		175	220	270	300	455	40/50	6kV/3kA	425	8600	8,7
L(S)40/41_180		180	230	280	300	470	40/50	6kV/3kA	430	8600	8.8
L(S)40/41_230		230	300	360	300	595	40/50	6kV/3kA	460	6400	9,0
L(S)40/41_250		250	320	390	300	650	40/50	6kV/3kA	490	5800	9,2
L(S)40/41_270		270	345	425	300	700	40/50	6kV/3kA	540	5500	9,4
L(S)40/41_275		275	350	430	300	710	40/50	6kV/3kA	550	5400	9.5
L(S)40/41_320	240	320	420	510	300	840	40/50	6kV/3kA	640	4600	9.6
L(S)40/41_350		350	450	565	300	900	40/50	6kV/3kA	650	4500	10,3
L(S)40/41_360		360	480	580	300	960	40/50	6kV/3kA	700	4200	10,4
L(S)40/41_385		385	505	620	300	1025	40/50	6kV/3kA	800	3800	10.7
L(S)40/41_390		390	510	625	300	1030	40/50	6kV/3kA	810	3600	10,7
L(S)40/41_440		440	585	715	300	1180	40/50	6kV/3kA	950	3400	11.3
L(S)40/41_460		460	615	750	300	1240	40/50	6kV/3kA	960	3200	11.3
L(S)40/41_510	380	510	675	830	300	1350	40/50	8kV/4kA	960	3000	11.5
L(S)40/41_550		550	745	910	300	1500	40/50	8kV/4kA	960	2800	11.5
L(S)40/41_600		600	790	965	300	1590	40/50	8kV/4kA	1000	2500	11.8
L(S)40/41_750 (except QLK30)		750	970	1200	300	2000	40/50	8kV/4kA	1200	2000	11.8
L(S)40/41_750QLK30		750	970	1200	300	2000	30/40	8kV/4kA	1200	2000	9.8

(1) L41* types: Same ratings as L40*, except max. surge current rating. For explanation of style reference number, see clause 1.5.

(2) All types are covering IEC 60950-1 Annex Q requirements.

(3) In acc. to IEC60950-1 Annex Q (Maximum continuous voltage of the Varistors shall 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:

- style reference (includes – L40(41)&L(S)40 (for strap terminals) - followed by the rated diameter of varistor disk, tolerance of varistor voltage, max. continuous r.m.s. voltage / max. r.m.s operating voltage and the suffix "QL&QP")
- manufacturer's code or trade mark
- date of manufacture (JJKW)

e. g.

EPCOS L(S)40K150QP
0209

1.5 Ordering information

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

<u>SIOV-</u>	<u>L(S)</u>	<u>40(41)</u>	<u>J</u>	<u>250</u>	<u>A</u>	<u>Q</u>	<u>L (P)</u>	<u>K00</u>
I	II	III	IV	V	VI	VII	VIII	IX

- I. Series Prefix: Optional:
SIOV
- II. Fixing:
LS = Soldered or screwed fixing
L = Soldered fixing only
- III. Nominal Disc Dimensions:
40 = 40 mm disc diameter
41 = 41 mm disc diameter
- IV. Varistor Tolerance at 1 mA:
J = 5%
K = 10%
L = 15%
M = 20%
S = Customer specific
- V. Maximum Rated Voltage (RMS).
- VI. Customer Specific Tolerance of the Varistor Voltage: Optional.
A, B or C
- VII. Style:
Q = Square disc
- VIII. Coating:
L = Silicate lacquer coating
P = Epoxy resin coating
- IX. Customer specific properties not defined with other codes (not effecting IECQ specifications): Optional.
K00-K99 or K000-K999

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.

Coating information:

Material: Epoxy,
Ref. No.: PCE-282
Supplier: Pelnox

Material: Silcate,
Ref. No.: AF490C-098
Supplier: Namics

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, periodicity, 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. - Inspection Levels and AQL's are selected from IEC Publication 60410: Sampling Plans and Procedures for Inspection by Attributes.
 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
 - AQL = acceptable quality 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.
 7. - The manufacturer shall only be required to perform one of these tests.
 8. - The varistors shall be mounted by their normal means in such a manner that there shall be no parasitic vibration.
 9. - Exceptions in the testing program for the following types:
 - 4.16, 4.17: Only applicable for Standard types (with standard connectors).
 - 4.9: Only applicable for insulated types L(S)40*QPK (Epoxy coating, except type B milled coating)

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	IL	AQL	Performance requirements (see Note 1)
			(see Note 2)		
<u>GROUP A INSPECTION</u> (lot-by-lot) <u>Sub-group A1</u> 4.4.1 Visual examination 4.4.2 Marking	ND		II	1,0%	As in 4.3.1 Legible marking and as specified in 1.4 of this specification
<u>Sub-group A2</u> 4.5 Voltage	ND	Voltage at specified current	II	0,65%	As specified in 1.2.2 of this specification
<u>Sub-group A3</u> 4.4.3 Dimensions (gauging)	ND	Gauging: Not applicable. Measuring dimensions: T, b, h	S-4	1,0%	As specified in 1.2.2 of this specification
<u>GROUP B INSPECTION</u> (lot-by-lot) <u>Sub-group B1</u> 4.11 Robustness of terminations 4.13 Solderability (if applicable) 4.22 Solvent resistance of the marking (if applicable)	D	IEC 60068-2-21, Test Ua1 F=40N Visual examination Voltage at specified current IEC 60068-2-20, Test Ta, Method 1 Soldering bath conditions: Pb- free solder: 245±3°C, 3s 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	S-3	2,5%	No visible damage $\left \frac{\Delta U}{U} \right \leq 10\%$ The terminations shall be uniformly tinned Legible marking

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	IL	AQL	Performance requirements (see Note 1)
			(see Note 2)		
<u>Sub-group B2</u>	D	At class current: See table 1.	S-2	1,0%	As specified in the detail specification
4.7 Voltage under pulse condition					
4.9 Voltage proof (Exceptions: See note 9)		Metal balls method (4.8.1.2) 2500V, 60 s			As in 4.8

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	
<u>GROUP C INSPECTION</u> (periodic)	D		6	13	1	
<u>Sub-group C1</u>						
4.6 Pulse current		<u>Pulse current</u> Combination pulse 10 pulses (combination pulse), in one direction, 1 per min Visual examination Voltage at specified current				No visible damage $\left \frac{\Delta U}{U} \right \leq 10\%$
<u>Sub-group C2</u>	D		12	13	1	
4.6 Pulse current		10 pulses 2ms square wave in one direction, 1 pulse per 2 min, at the maximum surge current (see derating curve) Visual examination Voltage at specified current				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	
<u>Sub-group C3A</u> Part of sample of Sub-group C3 4.8 Capacitance 4.12 Resistance to soldering heat (if applicable) 4.23 Component solvent resistance (if applicable) 4.14 Rapid change of temperature	D	f = 1 kHz Signal level ≤ 1V Zero bias IEC 60068-2-20, Test Tb, Method 1A T = 260±5°C, d = 10±1s Visual examination Voltage at specified current IEC 60068-2-45, Test XA (3.1.1, Method 2): T = 23±5°C t = 5±0,5 min Solvent mixture (70±5% Diethylglycoldibutylether, 30±5% 2-propanol). Recovery: 48h Visual examination Voltage at specified current IEC 60068-2-14, Test Na N = 5 cycles, d = 30 min θ _A = -40±3°C θ _B = 85±2°C Visual examination Voltage at specified current	12	7		As specified in 1.2.2 of this specification No visible damage Legible marking $\left \frac{\Delta U}{U} \right \leq 5\%$ No visible damage Legible marking $\left \frac{\Delta U}{U} \right \leq 5\%$ 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	
<p><u>Sub-group C3B</u></p> <p>Other part of sample of Sub-group C3</p> <p>4.16 Shock (only applicable for types with standard connectors: Note 9)</p> <p>4.15 Bump (or shock)</p> <p>4.17 Vibration (only applicable for types with standard connectors: Note 9)</p>	D	<p>IEC 60068-2-27, Test Ea</p> <p>Pulse shape: half-sine $a = 490 \text{ m/s}^2$, $d = 11 \text{ ms}$ $N = 6 \times 3$ shocks. (mounting method acc. to application/clamped at strap terminals)</p> <p>Visual examination</p> <p>Voltage at specified current</p> <p>IEC 60068-2-29, Test Eb</p> <p>Not specified</p> <p>IEC 60068-2-6, Test Fc, Method B4</p> <p>Frequency range: 10 Hz to 55 Hz $a = 0,75 \text{ mm}$ or 98 m/s^2 (whichever is the less) $d = 3 \times 2 \text{ h}$ (mounting method acc. to application/clamped at strap terminals)</p> <p>Visual examination</p> <p>Voltage at specified current</p>	12	6		<p>No visible damage Legible marking</p> $\left \frac{\Delta U}{U} \right \leq 5\%$ <p>No visible damage Legible marking</p> $\left \frac{\Delta U}{U} \right \leq 5\%$

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	
<u>Sub-group C3</u> Combined sample of specimens of Sub-groups C3A and C3B 4.18 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 (only for insulated types, see Note 9) Voltage proof (only for insulated types, see Note 9)	12	13	1	No visible damage Legible marking $\left \frac{\Delta U}{U} \right \leq 10\%$ $\geq 100 \text{ M}\Omega$ No breakdown or flashover
<u>Sub-group C4</u> 4.21 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 (only for insulated types, see Note 9)	12	13	1	No visible damage Legible marking $\left \frac{\Delta U}{U} \right \leq 10\%$ 1,1 x the initial limit $\geq 1 \text{ G}\Omega$

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	
<u>GROUP D INSPECTION</u> <u>Sub-group D1</u> 4.19 Damp heat, steady state	D	IEC 60068-2-78, Test Ca T = 40±2°C, RH = 93(+2/-3)%, 56d <u>4 specimens:</u> No voltage applied <u>Other 4 specimens:</u> Applied voltage: 10% of the max. d.c. voltage Visual examination Voltage at specified current Insulation resistance U = 500V (only for insulated types, see Note 9)	24	8	1	No visible damage Legible marking $\left \frac{\Delta U}{U} \right \leq 10\%$ $\geq 100 \text{ M}\Omega$
<u>Sub-group D2</u> 4.4.4 Dimensions (detail) 4.5 Voltage (if applicable)	ND	At specified current 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 $\frac{U_{25^\circ\text{C}} - U_{\text{LCT}}}{\Delta T} \cdot \frac{100\%}{U_{25^\circ\text{C}}} \leq 0,09\%K^{-1}$ $\frac{U_{25^\circ\text{C}} - U_{\text{UCT}}}{\Delta T} \cdot \frac{100\%}{U_{25^\circ\text{C}}} \leq 0,09\%K^{-1}$
<u>Sub-group D3</u> 4.20 Fire hazard (Needle flame test)	D	IEC 60695-11-5 Severity: Vertical 10 s	24	5	0	Duration of burning: 5 s max.