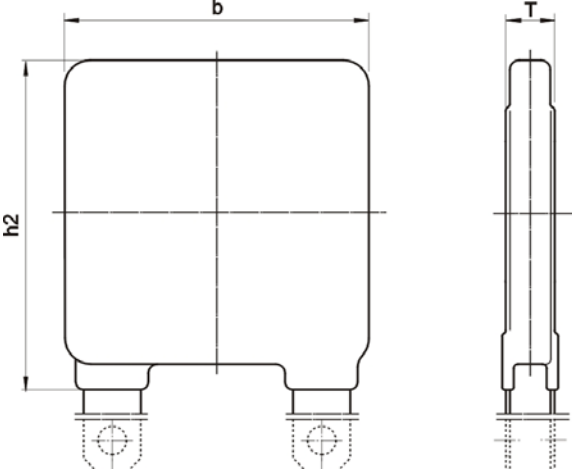


<p>Specification available from:  Österreichischer Verband für Elektrotechnik (ÖVE)  A-1010 Wien, Eschenbachgasse 9</p>	<p><b>IEC 61051-2-2 AT0003</b>  <b>Issue 3 / 2015-11</b></p> <p>QC 420102 AT0003</p>
<p>Electronic components of assessed quality in accordance with:  IEC 61051-1: 2007-04  IEC 61051-2: 1991-01  IEC 61051-2 Amendment 1: 2009-05  IEC 60950-1: 2013-05 Annex Q  IEC 62368-1: 2014-02 Annex G.8.2</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><b>ZINC OXYDE SURGE SUPPRESSION VARISTORS</b></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**

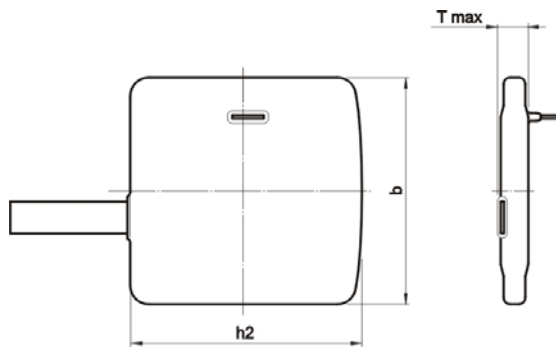
**1.1 Recommended method(s) of mounting**

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

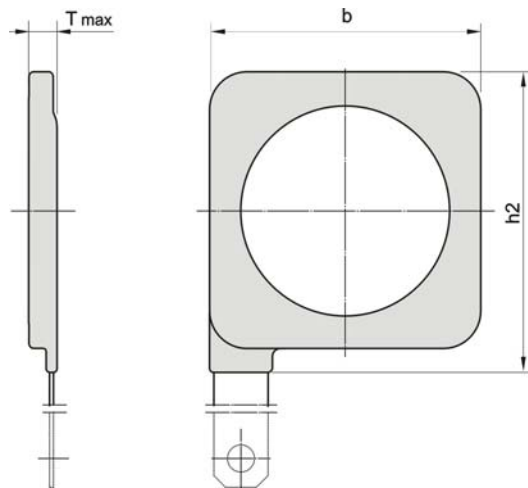
**1.2 Dimensions, ratings and characteristics (see table 1)**

**1.2.1. Dimensions (All dimensions are in millimeters)**

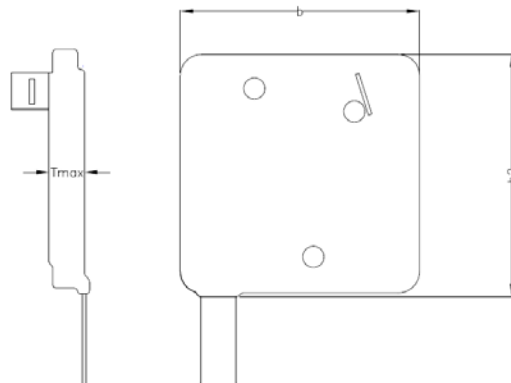
**Type A:** Type with Customer specific connectors / shape:



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



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

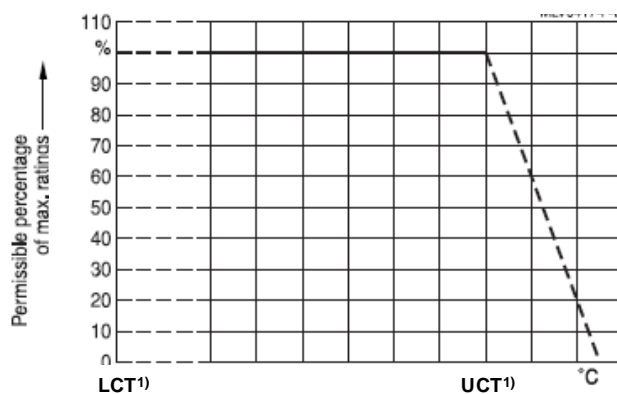


### 1.2.2 Ratings and characteristics (at 25 °C)

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	:	$-(0.09 \% / K)_{\max.}$
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) <sup>1)</sup>		-40/85°C
Dimensions of T	:	see table 1
Dimensions of h <sub>2</sub>	:	46 mm (max.)
Dimensions of b	:	37,5 mm (max.)

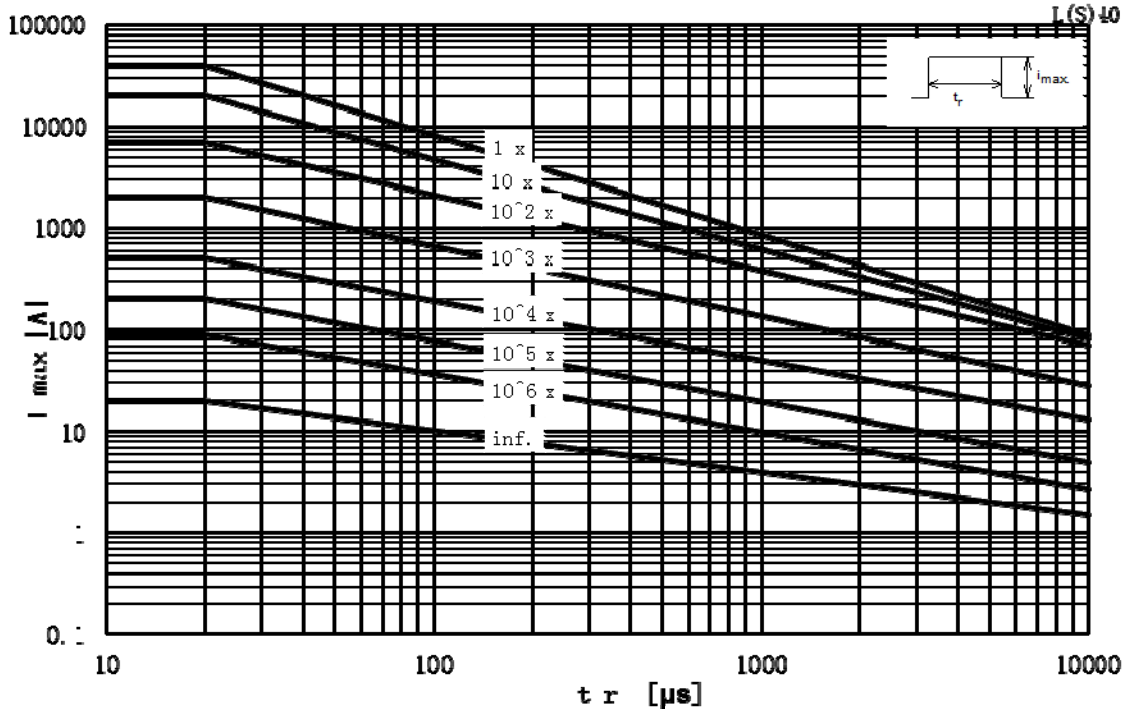
### 1.2.3 Derating Curves

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

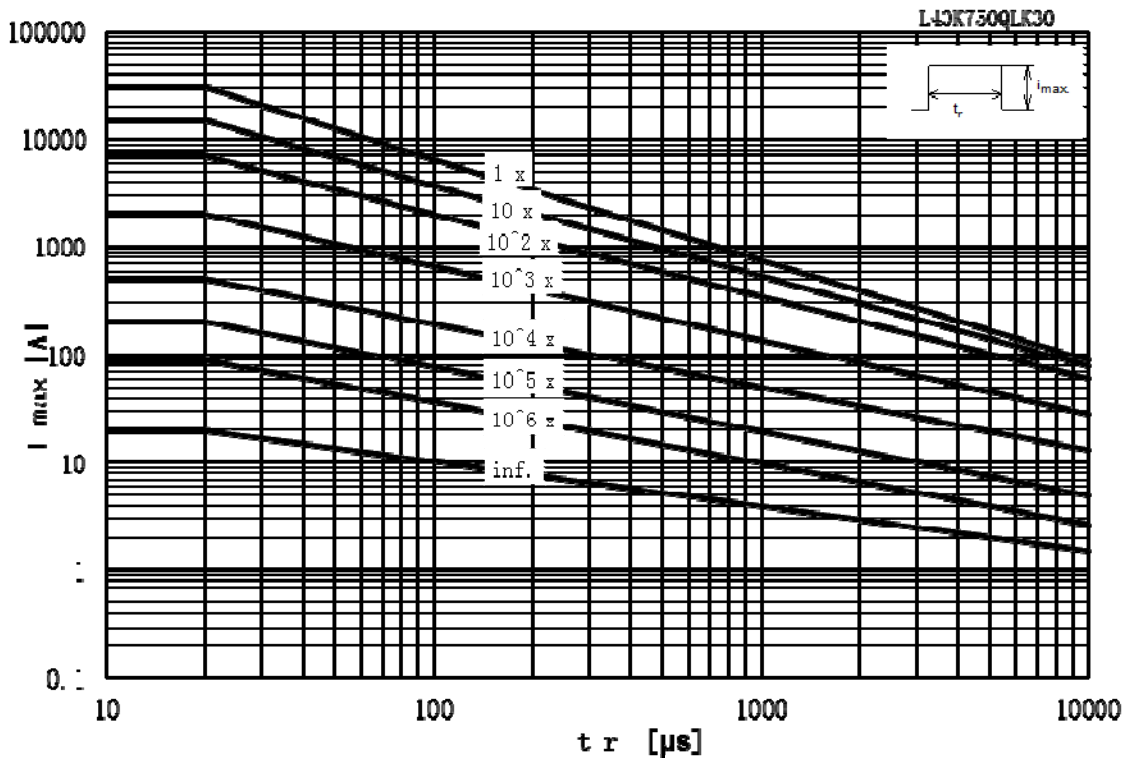


Reduction factor of maximum peak current for various numbers of pulses versus pulse duration

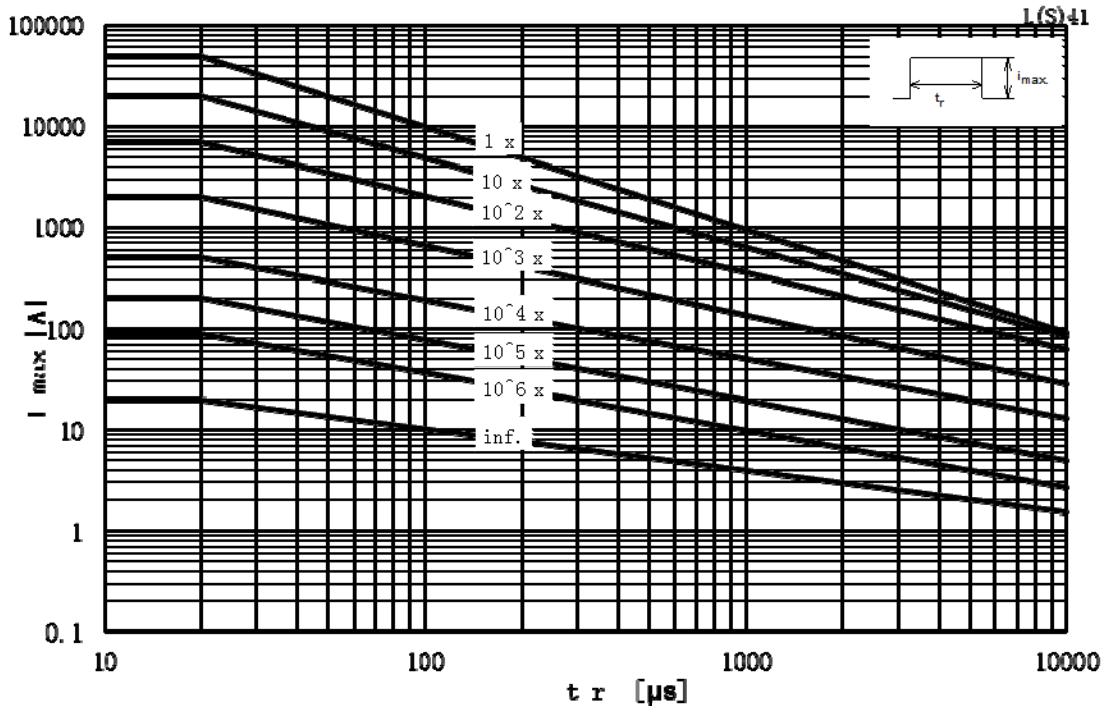
L(S)40-75~750, except 750QLK30:



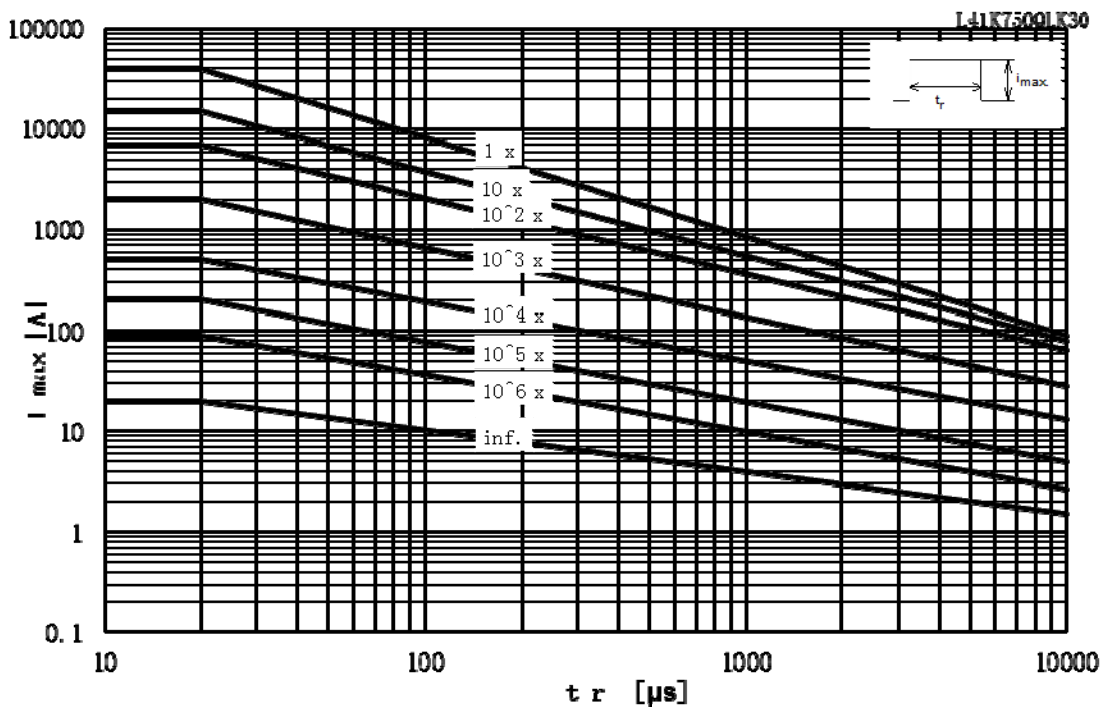
L40K750QLK30:



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) L(S)40/41	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)	(VDC)	(V)	Class current(A)	Max. volt (V)	(kA)	(-)	(J)	(pF)	(mm)
L(S)40/41_75	60	75	100	120	300	220	40/50	6kV/3kA	190	26000	5.3
L(S)40/41_150	120	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
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_420	420		560	680	300	1120	40/50	6kV/3kA	910	3600	11.0
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	11.4
L(S)40/41_510	380		510	675	820	300	1350	40/50	8kV/4kA	960	3000
L(S)40/41_550		550	745	910	300	1500	40/50	8kV/4kA	960	2800	12.3
L(S)40/41_600		600	790	965	300	1590	40/50	8kV/4kA	1000	2500	12.8
L(S)40/41_680		680	895	1100	300	1815	40/50	8kV/4kA	1100	2200	13.5
L(S)40/41_750 (except QLK30)		750	970	1200	300	2000	40/50	8kV/4kA	1200	2000	14.1
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 62368-1 G.8.2 and IEC 60950-1 Annex Q requirements

(3) In acc. to IEC 62368-1 G.8.2 and 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	Measuring dimensions: 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% Diethylglycoldibutylether, 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% Diethylenglycoldibutylether, 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 <sub>A</sub> = -40±3°C θ <sub>B</sub> = 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	
<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	
<b>GROUP D INSPECTION</b>						
<b>Sub-group D1</b>						
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  $\left  \frac{\Delta U}{U} \right  \leq 10\%$  $\geq 100 \text{ M}\Omega$
<b>Sub-group D2</b>						
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  $\frac{U_{25^\circ\text{C}} - U_{\text{LCT}}}{\Delta T} \cdot \frac{100\%}{U_{25^\circ\text{C}}} \leq 0,09\%K^{-1}$  $\frac{U_{25^\circ\text{C}} - U_{\text{UCT}}}{\Delta T} \cdot \frac{100\%}{U_{25^\circ\text{C}}} \leq 0,09\%K^{-1}$
<b>Sub-group D3</b>						
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.