SIOV Metal Oxide Varistors

Energy varistors – block arresters

Series/Type:	**B722**E**
Ordering code:	**B722**E0***S074**
Date:	Aug 2021
Version:	

Applications

- Gapless arresters for station class low, medium and high

Features

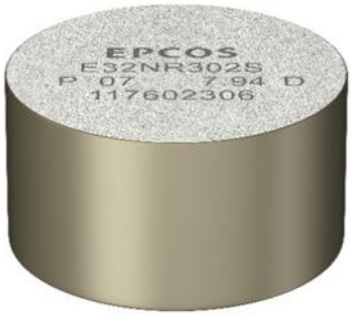
- Wide operating voltage range
- High energy absorption capability
- High current impulse up to 100 kA
- Long-term stability

Construction

- Based on IEC 60099-4, Ed. 3

Delivery mode

- Bulk



Picture for reference only.

General technical data

Nominal discharge current 8/20 µs	10.0 … 20.0	kA
Suggested rated voltage (max)	0.385 · U_{res} … 0.450 · U_{res}	kV
Normal service temperature	-40 … +40	°C
Response time	< 25	ns

Electrical specification and ordering codes

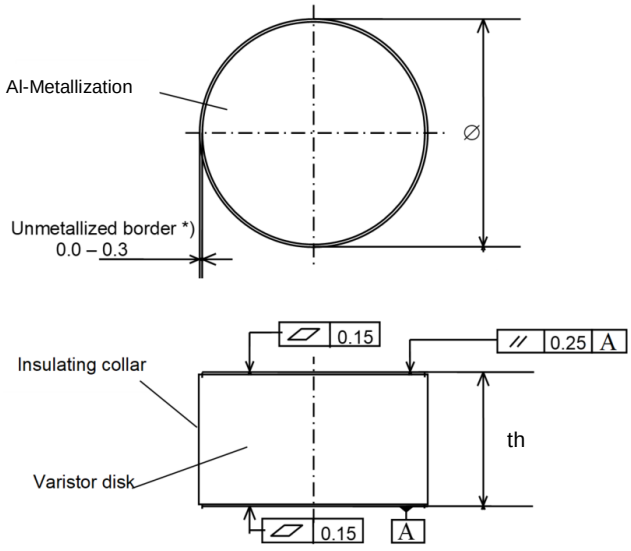
The peak value of voltage that appears between the terminals of an arrester during the passage of discharge current is defined as residual voltage at nominal discharge current (8/20 µs) or U_{res} according to IEC 60099-4 Edition 3.0 2014-06, Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems.

Ordering code	Type	Nominal discharge current 8/20 µs	Suggested rated voltage max	Residual voltage at nominal discharge current 8/20 µs or U_{res}	Continuous operating voltage (max)	Max. resistive power dissipation at continuous operating voltage (max)	Reference current	Reference voltage (min)	High impulse current 4/10 µs	Repetitive charge transfer rating 8/20 µs
		kA	kV	kV	kV	W	mA	kV	kA	C
B72248E0113S074	E48NR113E	10	0.385·U_{res}	10.65 … 12.55	U_{res} ÷3.2	0.26	2	0.385·U_{res}	100	1.2
B72248E0133S074	E48NR133E	10	0.385 ·U_{res}	12.65 … 14.25	U_{res} ÷3.2	0.30	2	0.385·U_{res}	100	1.2
B72248E0153S074	E48NR153E	10	0.385·U_{res}	14.05 … 16.05	U_{res} ÷3.2	0.34	2	0.385·U_{res}	100	1.2
B72258E0133S074	E58NR133E	10	0.400·U_{res}	12.15 … 13.75	U_{res} ÷3.0	0.40	3	0.400·U_{res}	100	2.0
B72258E0163S074	E58NR163E	10	0.400·U_{res}	15.15 … 17.15	U_{res} ÷3.0	0.50	3	0.400·U_{res}	100	2.0
B72264E0133S074	E64NR133E	20	0.425·U_{res}	12.15 … 13.75	U_{res} ÷3.0	0.45	5	0.425·U_{res}	100	2.4
B72264E0163S074	E64NR163E	20	0.425·U_{res}	14.85 … 16.95	U_{res} ÷3.0	0.56	5	0.425·U_{res}	100	2.4
B72270E0133S074	E70NR133E	20	0.425·U_{res}	11.85 … 13.45	U_{res} ÷3.0	0.50	5	0.425·U_{res}	100	2.8
B72278E0123S074	E78NR123E	20	0.431·U_{res}	11.65 … 13.25	U_{res} ÷3.0	0.60	5	0.431·U_{res}	100	3.6
B72299E0702S074	E99NR702E	20	0.450·U_{res}	6.85 … 7.85	U_{res} ÷3.0	0.65	5	0.450·U_{res}	100	6.0

Dimensions, weight and packing units

Ordering code	Type	Diameter Ø mm	Thickness th mm	Weight w g	Packing units pcs.
B72248E0113S074	E48NR113E	48.0 ±1.0	30.5 ±0.6	300	12
B72248E0133S074	E48NR133E	48.0 ±1.0	35.4 ±0.6	350	12
B72248E0153S074	E48NR153E	48.0 ±1.0	40.4 ±0.6	400	12
B72258E0133S074	E58NR133E	59.7 ±1.0	35.4 ±0.6	543	8
B72258E0163S074	E58NR163E	59.7 ±1.0	44.0 ±0.6	642	8
B72264E0133S074	E64NR133E	64.5 ±0.7	35.4 ±0.6	640	8
B72264E0163S074	E64NR163E	64.5 ±0.7	44.0 ±0.6	780	8
B72270E0133S074	E70NR133E	70.0 ±1.0	35.4 ±0.6	745	5
B72278E0123S074	E78NR123E	78.0 ±1.0	35.4 ±0.6	940	5
B72299E0702S074	E99NR702E	99.0 ±1.0	21.4 ±0.6	912	8

Dimensional drawings in mm

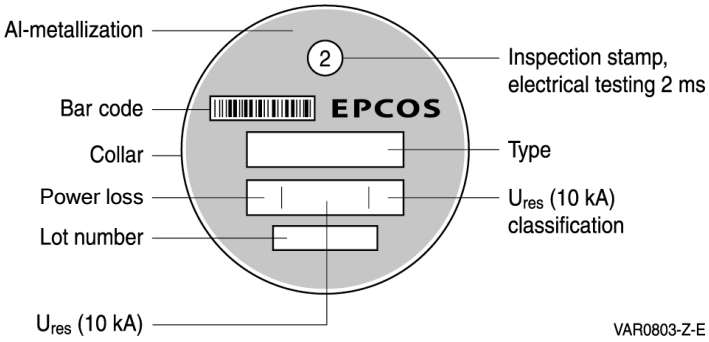


Diameter Ø	48.0 … 99.0 ±1.0 mm
Thickness th	21.4 … 44.0 ±0.6 mm
Al-Metallization	Al - electrodes
Unmetallized border	0.0 … 0.3 mm
Flatness	0.15 mm
Parallelism	0.25 mm

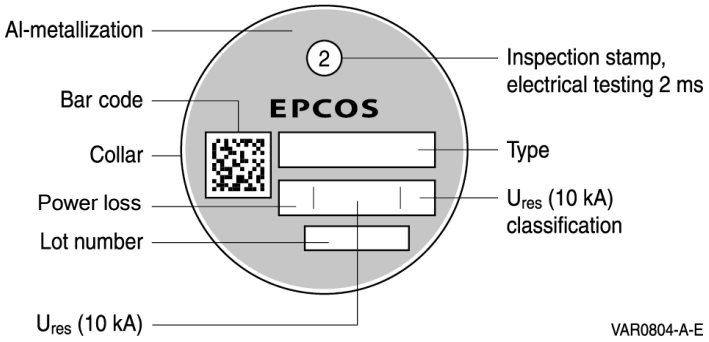
Marking

- “2” stamp – not mandatory
- Product brand
- Type name
- Power dissipation
- Residual voltage
- Barcode or QR code
- Lot number

E48 series marking layout



E58, E64, E70, E78 and E99 series marking layout



Power loss	Resistive power dissipation at max continuous operating voltage and 25 °C in 10^{-2} W. i.e.: P 22 ... Power loss = $22*10^{-2}$ W = 0.22 W
U_{res} (10 kA)	Residual voltage at nominal discharge current 8/20 µs in kV. i.e.: 16.15 = 16.15 kV
U_{res} (10 kA) classification	Residual voltage is classified in 100 V steps and identified by a letter. i.e.: A
Bar code	One dimensional bar code 128 acc. ISO/IEC 15417: 2000 or Data Matrix 2D acc. to ISO/IEC 16022. Content of information: type, Ures, Pcov, Ures class, lot number (as above), running number (1 … 99999)

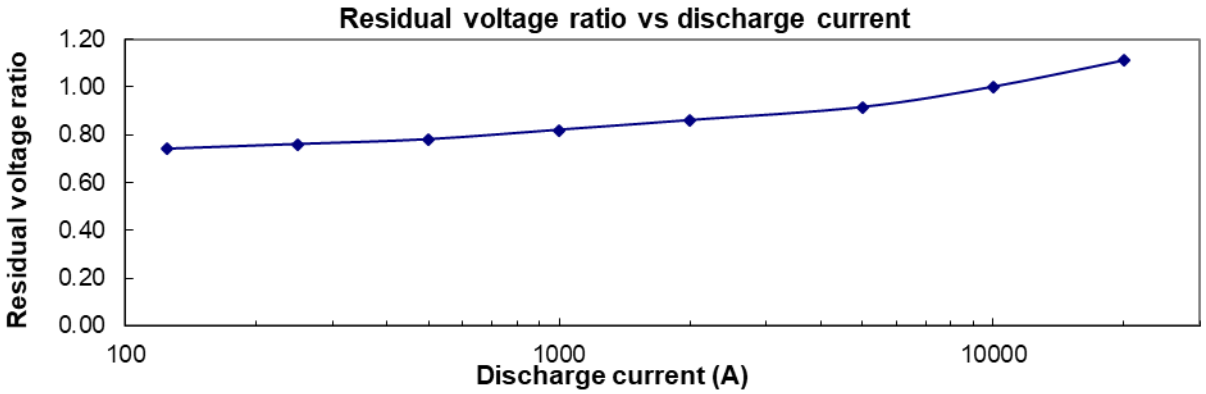
Reliability data

Test	Standard	Test conditions	Sample size	Requirements
Residual voltage at nominal discharge current (8/20 µs)	IEC 60099-4, Ed. 3	Peak value of voltage that appears during the passage of nominal discharge current (8/20 µs).	100%	To meet the specified value
Reference voltage (min)	IEC 60099-4, Ed. 3	Peak value of power-frequency voltage divided by √2, when the reference current is applied.	6 pcs	To meet the specified value
Repetitive charge transfer test	IEC 60099-4, Ed. 3	Wave shape of impulse: 8/20 µs Test value: refer to data sheet Groups of impulses: 10 Number of impulses / group: 2 Impulse interval: 50 … 60 s Group interval: cooling down to ambient temperature	5, 10, 20 parts/lot	Admissible number of rejects: 0/5, 1/10, 2/20 No flashover, puncture, crack Change of reference voltage (min) within 5%
Accelerated ageing type release	IEC 60099-4, Ed. 3	Temperature: 115 ±4 °C Surrounding medium: N_2 Test voltage: continuous operating voltage (max) Frequency: 50 Hz Time: >1000 h	≥ 3	$P_{end} \leq 1.1 \cdot P_{start}$
Accelerated ageing lot release	IEC 60099-4, Ed. 3	Temperature: 115 ±4 °C Surrounding medium: N_2 Test voltage: continuous operating voltage (max) Frequency: 50 Hz Time: 200 h	2	Decreasing resistive power dissipation
High current impulse test	IEC 60099-4, Ed. 3	Wave shape of impulse: 4/10 µs Test value: refer to data sheet 2 impulses, cool down to ambient temperature between impulses	2	No indication of flashover, puncture, crack
Pull-off strength of metallization	-		8 pcs/lot	≥ 3 N/mm²
Dimensions	-		10 pcs/lot	To meet the specified value

V/I characteristics

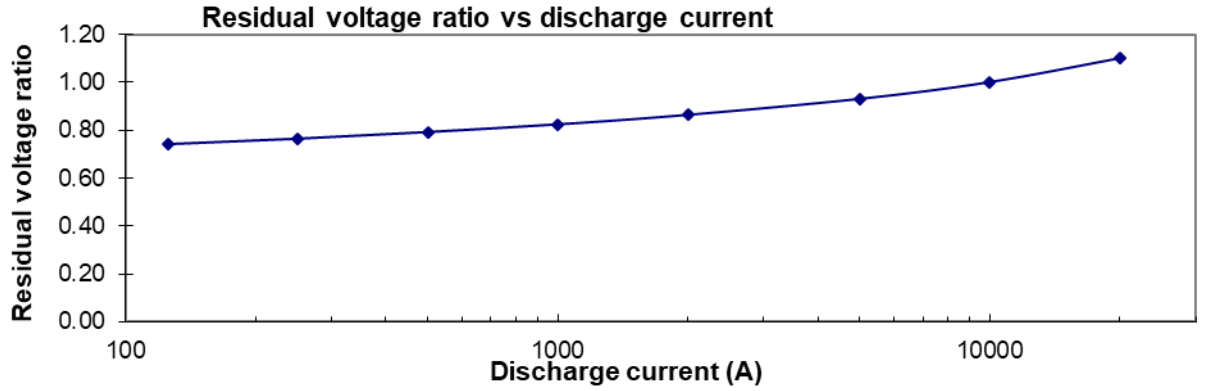
E48 series

Impulse	Steep current	Switching impulse residual voltage ratio					Lightning impulse residual voltage ratio		
I	10 kA	125 A	250 A	500 A	1 kA	2 kA	5 kA	10 kA	20 kA
typ	-	0.74	0.76	0.78	0.82	0.86	0.915	1	1.11
max	1.15	-	-	-	-	-	0.94	1	1.13
min	-	-	0.70	-	0.76	-	-	-	-



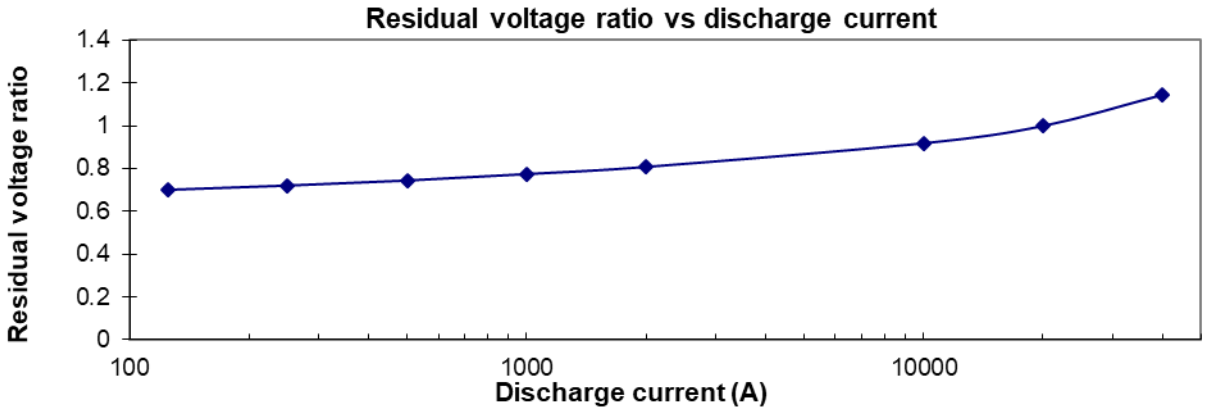
E58 series

	Steep current	Switching impulse residual voltage ratio					Lightning impulse residual voltage ratio		
	10 kA	125 A	250 A	500 A	1 kA	2 kA	5 kA	10 kA	20 kA
typ	-	0.74	0.763	0.791	0.823	0.863	0.93	1	1.10
max	1.15	-	-	-	-	-	0.95	1	1.12
min	-	-	0.705	-	0.76	-	-	-	-



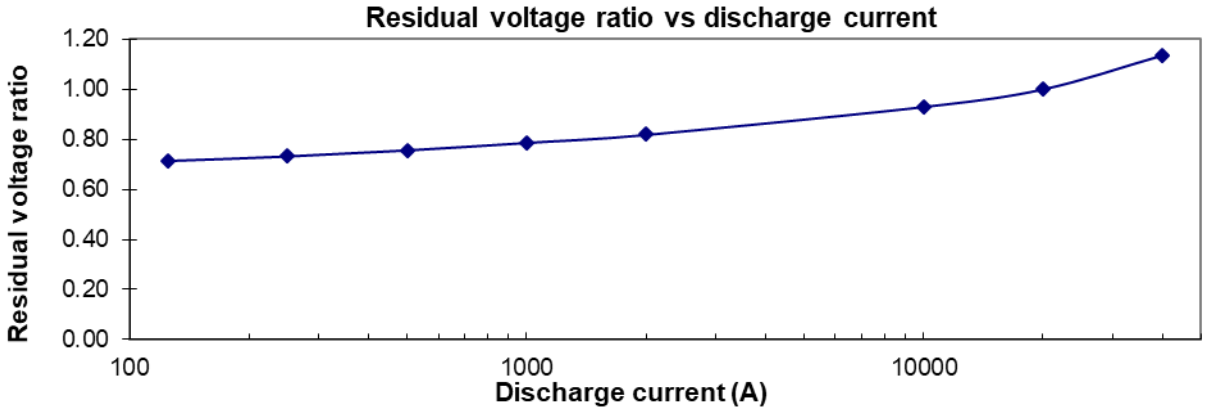
E64 series

Impulse	Steep current	Switching impulse residual voltage ratio					Lightning impulse residual voltage ratio		
I	20 kA	125 A	250 A	500 A	1 kA	2 kA	10 kA	20 kA	40 kA
typ	-	0.700	0.720	0.744	0.774	0.808	0.919	1	1.146
max	1.15	-	-	-	-	-	0.94	1	1.17
min	-	-	0.682	-	0.736	-	-	-	-



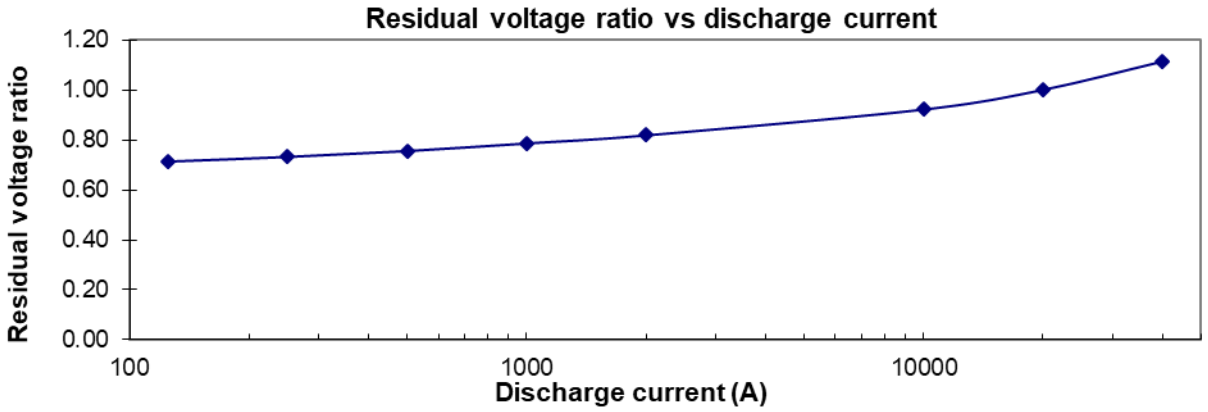
E70 series

Impulse	Steep current	Switching impulse residual voltage ratio					Lightning impulse residual voltage ratio		
I	20 kA	125 A	250 A	500 A	1 kA	2 kA	10 kA	20 kA	40 kA
typ	-	0.715	0.733	0.757	0.787	0.819	0.93	1	1.135
max	1.15	-	-	-	-	-	0.95	1	1.15
min	-	-	-	0.713	-	0.771	-	-	-



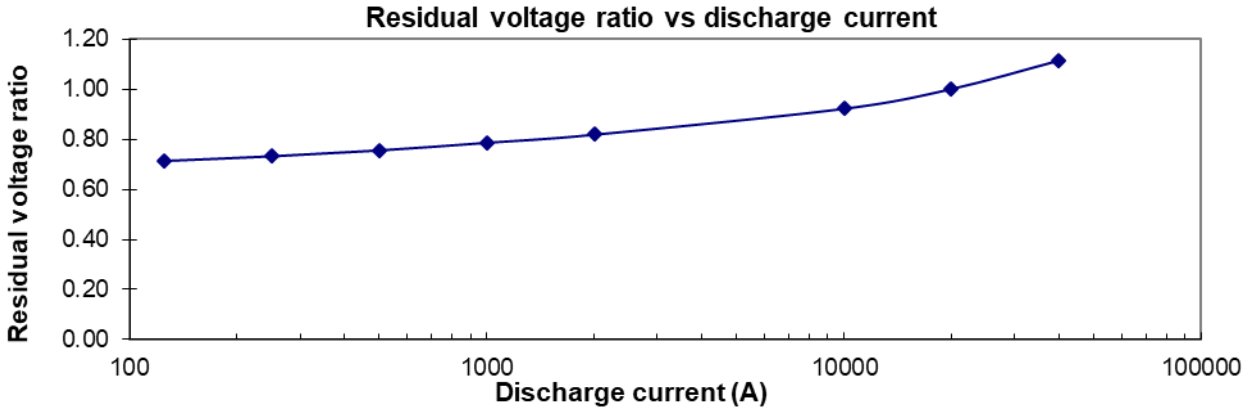
E78 series

Impulse	Steep current	Switching impulse residual voltage ratio					Lightning impulse residual voltage ratio		
I	20 kA	125 A	250 A	500 A	1 kA	2 kA	10 kA	20 kA	40 kA
typ	-	0.715	0.733	0.757	0.787	0.819	0.922	1	1.113
max	1.15	-	-	-	-	-	0.945	1	1.135
min	-	-	0.713	-	0.771	-	-	-	-

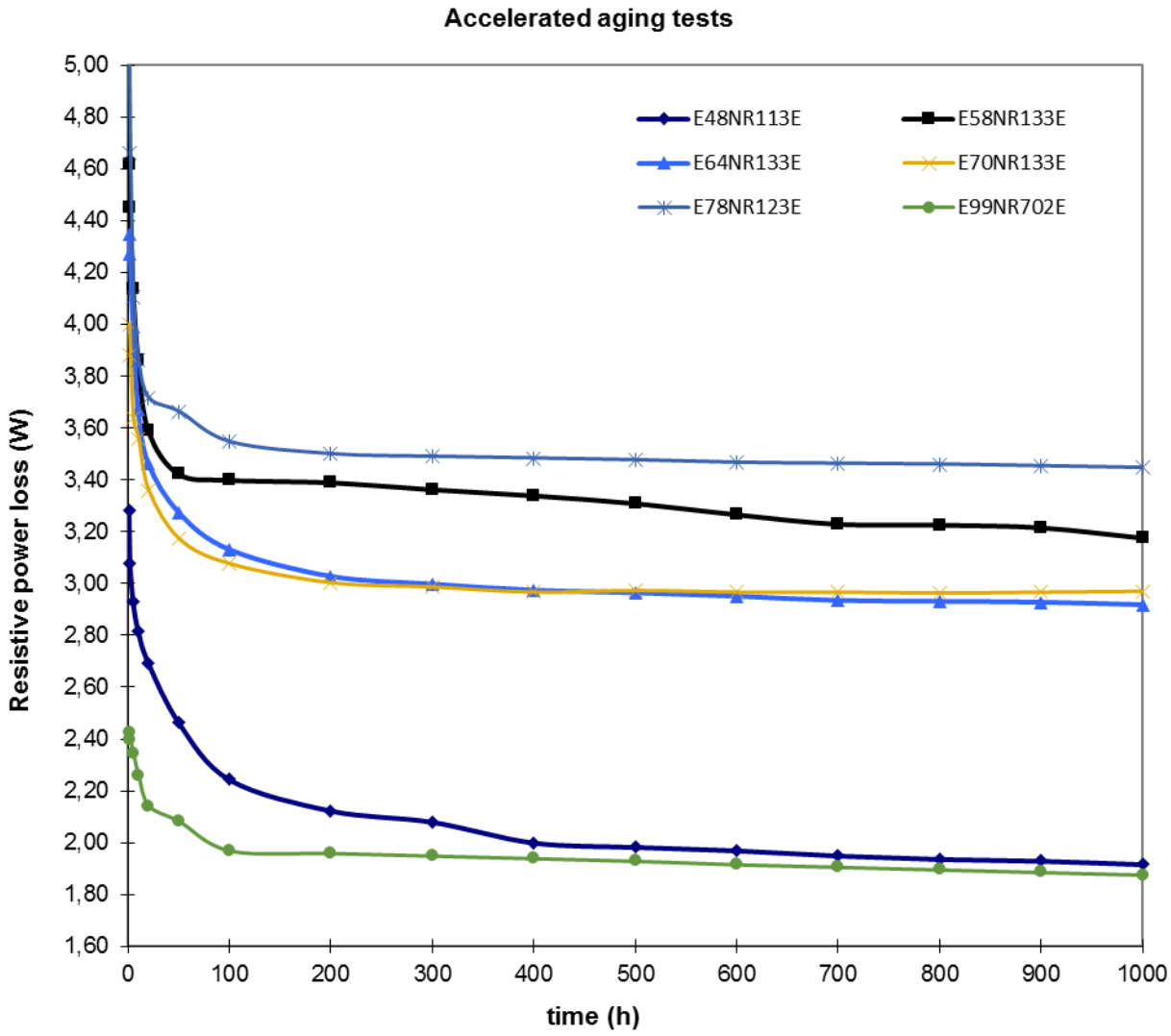


E99 series

Impulse	Steep current	Switching impulse residual voltage ratio					Lightning impulse residual voltage ratio		
I	20 kA	125 A	250 A	500 A	1 kA	2 kA	10 kA	20 kA	40 kA
typ	-	0.733	0.751	0.771	0.802	0.834	0.929	1	1.106
max	1.15	-	-	-	-	-	-	-	-
min	-	-	0.726	-	0.785	-	-	-	-



Accelerated aging test for E48, E58, E64, E70, E78 and E99 series



Symbols and terms

Nominal discharge current (8/20 µs)
Peak value of lightning current impulse.

Suggested rated voltage (max)
Maximum permissible 10 s power frequency root mean square overvoltage that can be applied between the arrester. Suggested rated voltage is used as a reference parameter for the specification of operating characteristics.

Residual voltage at nominal discharge current (8/20 µs)
Peak value of voltage that appears between the terminals of an arrester during the passage of discharge current.

Continuous operating voltage (max)
Designated permissible root mean square value of power-frequency voltage that may be applied continuously between the arrester terminals in accordance with thermal equivalency between complete arrester and arrester section.

Power loss
Resistive power dissipation at continuous operating voltage (max).

Reference current
Peak value the resistive component of a power-frequency current used to determine the reference voltage of the arrester.

Reference voltage (min)
Peak value of power-frequency voltage divided by √2, which is obtained when the reference current flows through the arrester.

High impulse current of an arrester 4/10 µs
Peak value of discharge current having a 4/10 impulse shape which is used to test the stability of the arrester on direct lightning strokes.

Repetitive charge transfer rating (8/20 µs)
Maximum specified charge transfer capability of an arrester, in the form of a single event or group of surges that may be transferred through an arrester without causing mechanical failure or unacceptable electrical degradation to the metal oxide resistors.

Terms and definitions extracted from IEC 60099-4 Edition 3.0 2014-06, Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems.

Cautions and warnings

General

- Metal oxide varistors SIOVs from TDK are designed for specific applications and should not be used for purposes not identified in our specifications, application notes and data sheets unless otherwise agreed with TDK during the design-in-phase.
- Ensure suitability of SIOVs through reliability testing during the design-in phase. The SIOVs should be evaluated taking into consideration worst-case conditions.
- For applications of SIOVs in line-to ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

Storage

- Store SIOVs only in original packaging. Do not open the package before storage.
- Storage conditions in original packaging.
- Storage temperature: -25 °C … +45 °C
- Relative humidity: <75% annual average, <95% on maximum 30 days a year.
- Dew precipitation: Is to be avoided.
- Avoid contamination of SIOVs surface during storage, handling and processing.
- Avoid storage of SIOVs in harmful environments which can affect the function during long-term operation examples given under operation precautions.

Handling

- SIOVs must not be dropped.
- Components must not be touched with bare hands. Gloves are recommended.
- Avoid contamination of the surface of SIOV electrodes during handling, be careful of the sharp edge of SIOV electrodes.

Mounting

- Potting, sealing or adhesive compounds can produce chemical reactions in the SIOV ceramic that will degrade the component's electrical characteristics.
- Overloading SIOVs may result in ruptured packages and expulsion of hot materials. For this reason the SIOVs should be physically shielded from adjacent components.

Operation

- Use SIOVs only within the specified temperature operating range.
- Use SIOVs only within the specified voltage and current ranges.
- Environmental conditions must not harm the SIOVs. Use SIOVs only in normal atmospheric conditions. Avoid use in the presence of deoxidizing gases chlorinegas, hydrogen sulfidegas, ammoniagas, sulfuricacidgas,etc., corrosive agents, humid or salty conditions. Avoid contact with any liquids and solvents.

Display of ordering codes for TDK Electronics products

The ordering code for one and the same product can be represented differently in data sheets, data books, other **codes are due to different processes employed and do not affect the specifications of the respective products**. Detailed information can be found on the Internet under www.tdk-electronics.tdk.com/orderingcodes.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

   We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to our General Terms and Conditions of Supply.**
7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard.** The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System.** For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

Important notes

8. The trade names EPCOS, CarXield, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, ModCap, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap, XieldCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

Release 2020-06