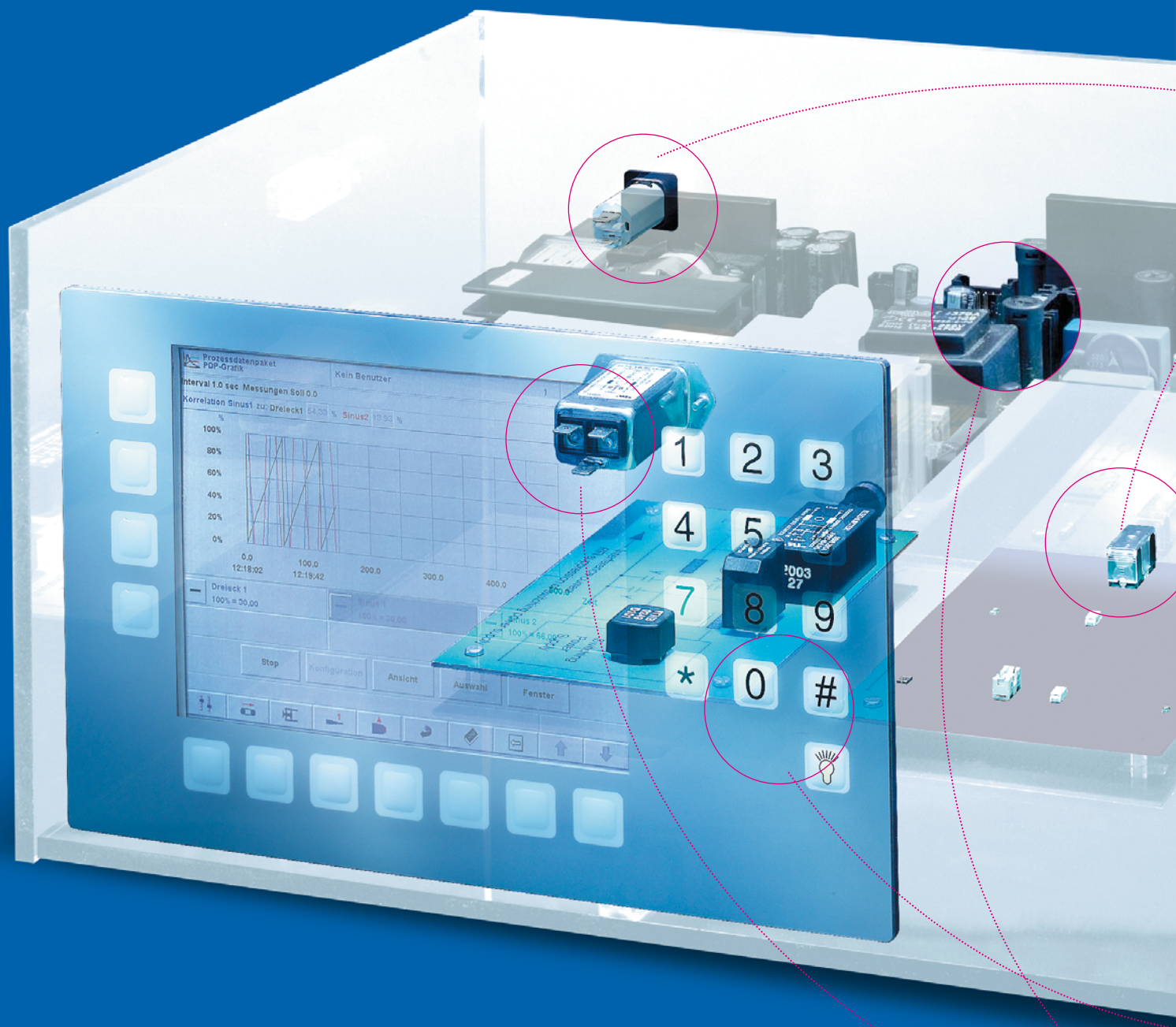


Varistors

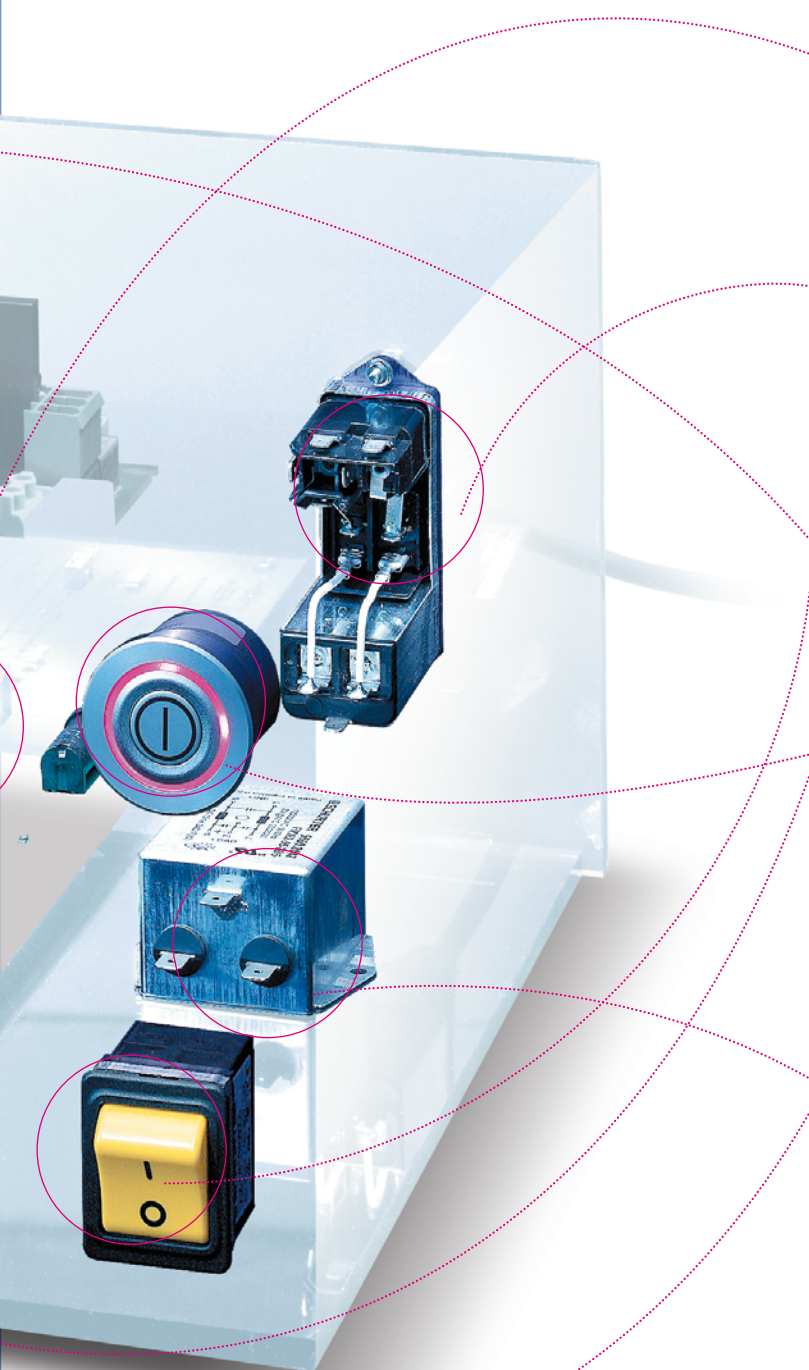


Intro Information	4
Varistors	6
Selector Chart	6
Product Datasheets	8
General Product Information	31
Product Standard / Definitions / CE-Marking / Conformity	32
National approvals	32
Varistors	33
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Index by Order Numbers	38



> the Schurter Range at the Glance

SCHURTER is a progressive innovator and manufacturer of fuses, connectors, circuit breakers, input systems, EMC products and manufacturing services for the electronics industry. We focus on components that ensure safe supply of power and make the interface between human and machine easier.



■ fuses

- non resettable fuses
- telecom fuses
- resettable fuses
- fuseholders
- fuseholders blocks & clips

■ connectors

- power entry modules without line filter
- power entry modules with line filter
- appliance couplers
- cord connectors (rewireable)
- distribution units
- cord sets

■ circuit breakers

- thermal (t- and ta-line)
- thermal-magnetic (tm- and as-line)
- undervoltage protection
- power entry modules with CBE

■ input systems

- printmount switches
- frontpanel switches
- public transport switch
- metal line switches
- sensor switches
- membrane keypads
- sensor keypad
- metal line keypads
- touch panel / touch screen
- housing systems and front panels

■ EMC products

- power entry modules with line filter
- 1-phase line filters
- 3-phase line filters
- chokes
- pulse transformers
- power stage driver modules

■ other products

- voltage selector
- test jacks & probes
- indicators
- data & signal, audio, dc/ din connectors

■ EMS

- Electronic Manufacturing Services



Rated Voltage AC	Rated Voltage DC	Disc Size	Peak Current 8/20 μ s, 1 Pulse	Energy, 10/1000 μ s	Web Reference or Type
11 - 95 VAC	14 - 127 VDC	5 - 20 mm	250 - 10000 A	0.6 - 106 J	AVTS
120 - 360 VAC	160 - 470 VDC	5 - 25 mm	800 - 13000 A	8 - 440 J	AVTP
390 - 1000 VAC	500 - 1200 VDC	10 - 25 mm	3500 - 13000 A	25 - 875 J	AVTT

General Product Information see Varistors page 31 --



Mission Statement

SCHURTER fulfills the most stringent requirements, thanks to its comprehensive quality, environment and personnel management systems according to ISO 9001, ISO 14001, OHSAS 18001, SIX SIGMA and EFQM.

A market leader's statement

With the development, production and sales of active and passive components for electronic and electromechanical applications SCHURTER is a leading global industry partner. The SCHURTER Group leads the way in its four strategic business areas, using its innovative strength and cutting-edge technology to provide customers with intelligent practical solutions.

Surge Protection for Primary and Secondary Power Supplies

Radial leaded varistors (MOV) supports equipment manufacturers to pass the Surge Test Condition according to IEC 61000-4-5.

Radial Leaded Varistor (MOV), 11 - 95 VAC, 14 - 127 VDC

new



Disc Size: 5 mm



Disc Size: 10 mm



Disc Size: 20 mm

11 - 95 VAC · 250 - 10000 A · 5 - 20 mm

**Description**

- Radial leaded varistor
- Short reaction time
- Low leakage current

Standards

- UL 1449 - Transient Voltage Surge Suppressors

Approvals

- UL File Number: E189323 (UL 1449)

Applications

- Overvoltage Protection
- Secondary Protection DC and AC
- Automotive applications

References

General Product Information see page 31
Packaging Details see page 29

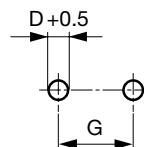
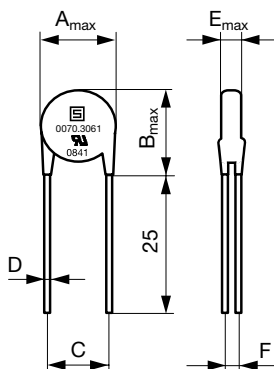
Weblinks

Approvals: <http://www.schurter.com/approvals>
RoHS: <http://www.schurter.com/rohs>
CHINA-RoHS: <http://www.schurter.com/china-rohs>
e-Store: <http://www.schurterinc.com/estore/merchant.ihml>
SCHURTER-Stock-Check: <http://www.schurter.com/stockcheck>
Distributor-Stock-Check: <http://www.schurter.ch/catalog/querydist.asp>

Technical Data

Rated Voltage	11 - 95 VAC, 14 - 127 VDC
Disc Size	5 - 20 mm
Peak Current 8/20 μ s, 1 Pulse	250 - 10000 A
Max. Energy Absorption 10/1000 μ s	0.6 - 106 J
Current/Energy Derating above 85 °C	- 2.5% / °C
Voltage/Temperature Coefficient	- 0.05% / °C
Admissible Ambient Air Temp.	- 40 °C to 125 °C
Material: Terminals	Tin-Plated Copper Alloy
Material: Tube	Zinc Oxide
Storage Conditions	0 °C to 60 °C max. 70% r.h.
Product Marking	 Order Number, Approvals, Date code

Soldering Methods	Wave
Solderability	235 °C / 2 sec acc. to IEC 60068-2-20, Test Ta, method 1
Resistance to Soldering Heat	260 °C / 5 sec acc. to IEC 60068-2-20, Test Tb, method 1A
Insulation Resistance	> 10'000 M Ω
HiPot Encapsulation	2500 VDC
Impulse Response Time	< 50 ns
DC Leakage Current	< 200 μ A
Flammability	UL 94V-0

Dimensions

Drilling Diagram

Dimensions

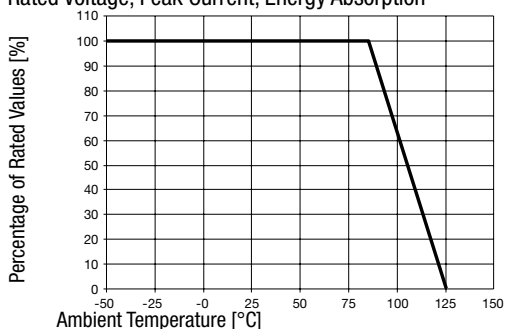
Rated Voltage	Disc Size	A max	B max	C	D	E	F	G	Order Number
[VAC]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
11	5	7	8.5	5	0.6	3.3	1.2	5.1	0070.1111.xx
11	7	9	11	5	0.6	3.4	1.2	5.1	0070.1121.xx
11	10	12	14.5	7.5	0.8	4	1.4	7.6	0070.1141.xx
11	14	15.5	18.5	7.5	0.8	4	1.4	7.6	0070.1161.xx
11	20	21.5	25.5	10	1	4.5	1.5	10.1	0070.1181.xx
14	5	7	8.5	5	0.6	3.4	1.3	5.2	0070.1411.xx
14	7	9	11	5	0.6	3.5	1.3	5.2	0070.1421.xx
14	10	12	14.5	7.5	0.8	4.2	1.5	7.6	0070.1441.xx
14	14	15.5	18.5	7.5	0.8	4.2	1.5	7.6	0070.1461.xx
14	20	21.5	25.5	10	1	4.6	1.6	10.1	0070.1481.xx
17	5	7	8.5	5	0.6	3.5	1.4	5.2	0070.1711.xx
17	7	9	11	5	0.6	3.6	1.4	5.2	0070.1721.xx
17	10	12	14.5	7.5	0.8	4.4	1.6	7.7	0070.1741.xx
17	14	15.5	18.5	7.5	0.8	4.4	1.7	7.7	0070.1761.xx
17	20	21.5	25.5	10	1	4.8	1.8	10.2	0070.1781.xx
20	5	7	8.5	5	0.6	3.5	1.2	5.1	0070.2011.xx
20	7	9	11	5	0.6	3.6	1.2	5.1	0070.2021.xx
20	10	12	14.5	7.5	0.8	4.5	1.8	7.7	0070.2041.xx
20	14	15.5	18.5	7.5	0.8	4.6	1.9	7.7	0070.2061.xx
20	20	21.5	25.5	10	1	5.1	2.1	10.2	0070.2081.xx
25	5	7	8.5	5	0.6	3.6	1.3	5.2	0070.2511.xx
25	7	9	11	5	0.6	3.7	1.3	5.2	0070.2521.xx
25	10	12	14.5	7.5	0.8	4.2	1.6	7.7	0070.2541.xx
25	14	15.5	18.5	7.5	0.8	4.2	1.7	7.7	0070.2561.xx
25	20	21.5	25.5	10	1	4.7	1.8	10.2	0070.2581.xx
30	5	7	8.5	5	0.6	3.6	1.5	5.2	0070.3011.xx
30	7	9	11	5	0.6	3.7	1.5	5.2	0070.3021.xx
30	10	12	14.5	7.5	0.8	4.4	1.7	7.7	0070.3041.xx
30	14	15.5	18.5	7.5	0.8	4.4	1.8	7.7	0070.3061.xx
30	20	21.5	25.5	10	1	4.9	2	10.2	0070.3081.xx
35	5	7	8.5	5	0.6	3.7	1.6	5.2	0070.3511.xx
35	7	9	11	5	0.6	3.9	1.6	5.2	0070.3521.xx
35	10	12	14.5	7.5	0.8	4.4	1.8	7.7	0070.3541.xx
35	14	15.5	18.5	7.5	0.8	4.5	2	7.8	0070.3561.xx
35	20	21.5	25.5	10	1	5.1	2.2	10.2	0070.3581.xx
40	5	7	8.5	5	0.6	3.9	1.8	5.3	0070.4011.xx
40	7	9	11	5	0.6	4.1	1.8	5.3	0070.4021.xx
40	10	12	14.5	7.5	0.8	4.8	2.1	7.8	0070.4041.xx
40	14	15.5	18.5	7.5	0.8	4.9	2.2	7.8	0070.4061.xx
40	20	21.5	25.5	10	1	5.4	2.4	10.3	0070.4081.xx
50	5	7	8.5	5	0.6	3.3	1.2	5.1	0070.5011.xx
50	7	9	11	5	0.6	3.3	1.2	5.1	0070.5021.xx
50	10	12	14.5	7.5	0.8	3.9	1.4	7.6	0070.5041.xx
50	14	15.5	18.5	7.5	0.8	3.9	1.4	7.6	0070.5061.xx
50	20	21.5	25.5	10	1	4.3	1.5	10.1	0070.5081.xx
60	5	7	8.5	5	0.6	3.3	1.2	5.1	0070.6011.xx
60	7	9	11	5	0.6	3.3	1.2	5.1	0070.6021.xx
60	10	12	14.5	7.5	0.8	4	1.4	7.6	0070.6041.xx
60	14	15.5	18.5	7.5	0.8	4	1.5	7.6	0070.6061.xx
60	20	21.5	25.5	10	1	4.4	1.6	10.1	0070.6081.xx
75	5	7	8.5	5	0.6	3.4	1.3	5.2	0070.7511.xx
75	7	9	11	5	0.6	3.6	1.3	5.2	0070.7521.xx
75	10	12	14.5	7.5	0.8	4.2	1.5	7.6	0070.7541.xx
75	14	15.5	18.5	7.5	0.8	4.2	1.5	7.6	0070.7561.xx

Rated Voltage	Disc Size	A max	B max	C	D	E	F	G	Order Number
[VAC]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
75	20	21.5	25.5	10	1	4.6	1.6	10.1	0070.7581.xx
95	5	7	8.5	5	0.6	3.4	1.3	5.2	0070.9511.xx
95	7	9	11	5	0.6	3.4	1.3	5.2	0070.9521.xx
95	10	12	14.5	7.5	0.8	4	1.5	7.6	0070.9541.xx
95	14	15.5	18.5	7.5	0.8	4	1.5	7.6	0070.9561.xx
95	20	21.5	25.5	10	1	4.5	1.6	10.1	0070.9581.xx

Electrical parameters can be found in the table of variants below.

Temperature Derating Curves

Rated Voltage, Peak Current, Energy Absorption



Variants

Rated Voltage	Rated Voltage	Disc Size	Peak Current, 8/20 µs, 1 Pulse	Peak Current, 8/20 µs, 2 Pulses	Energy, 10/1000 µs	Min. Voltage @ 1 mA DC	Max. Voltage @ 1 mA DC	Max. Clamping Voltage	Peak Current, 8/20 µs, Clamping	Typ. Capacity @ 1 kHz		Order Number
[VAC]	[VDC]	[mm]	[A]	[A]	[J]	[V]	[V]	[V]	[A]	[pF]		
11	14	5	250	125	0.6	16	20	40	1	2200	●	0070.1111.xx
11	14	7	500	250	1.1	16	20	36	2.5	3500	●	0070.1121.xx
11	14	10	1000	500	2.6	16	20	36	5	7500	●	0070.1141.xx
11	14	14	2000	1000	5.2	16	20	36	10	18000	●	0070.1161.xx
11	14	20	3000	2000	13	16	20	36	20	37000	●	0070.1181.xx
14	18	5	250	125	0.7	20	24	48	1	2000	●	0070.1411.xx
14	18	7	500	250	1.3	20	24	43	2.5	2800	●	0070.1421.xx
14	18	10	1000	500	3.2	20	24	43	5	6000	●	0070.1441.xx
14	18	14	2000	1000	6.3	20	24	43	10	15000	●	0070.1461.xx
14	18	20	3000	2000	16	20	24	43	20	30000	●	0070.1481.xx
17	22	5	250	125	0.9	24	30	60	1	1600	●	0070.1711.xx
17	22	7	500	250	1.6	24	30	53	2.5	2000	●	0070.1721.xx
17	22	10	1000	500	3.9	24	30	53	5	4000	●	0070.1741.xx
17	22	14	2000	1000	7.8	24	30	53	10	10000	●	0070.1761.xx
17	22	20	3000	2000	19	24	30	53	20	22000	●	0070.1781.xx
20	26	5	250	125	1.1	30	36	73	1	1675	●	0070.2011.xx
20	26	7	500	250	2	30	36	65	2.5	3614	●	0070.2021.xx
20	26	10	1000	500	4.8	30	36	65	5	6655	●	0070.2041.xx
20	26	14	2000	1000	9.5	30	36	65	10	14447	●	0070.2061.xx
20	26	20	3000	2000	24	30	36	65	20	33064	●	0070.2081.xx
25	31	5	250	125	1.2	35	43	86	1	1417	●	0070.2511.xx
25	31	7	500	250	2.4	35	43	77	2.5	3058	●	0070.2521.xx
25	31	10	1000	500	5.6	35	43	77	5	5632	●	0070.2541.xx
25	31	14	2000	1000	11	35	43	77	10	12225	●	0070.2561.xx
25	31	20	3000	2000	28	35	43	77	20	27977	●	0070.2581.xx
30	38	5	250	125	1.5	42	52	99	1	1176	●	0070.3011.xx
30	38	7	500	250	2.5	42	52	93	2.5	2537	●	0070.3021.xx
30	38	10	1000	500	6.8	42	52	93	5	4673	●	0070.3041.xx

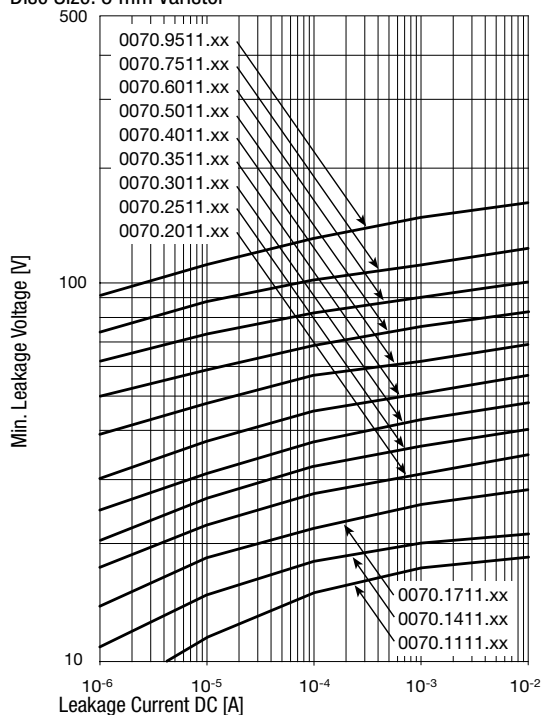
Rated Voltage	Rated Voltage	Disc Size	Peak Current, 8/20 μ s, 1 Pulse	Peak Current, 8/20 μ s, 2 Pulses	Energy, 10/1000 μ s	Min. Voltage @ 1 mA DC	Max. Voltage @ 1 mA DC	Max. Clamping Voltage	Peak Current, 8/20 μ s, Clamping	Typ. Capacity @ 1 kHz		Order Number
[VAC]	[VDC]	[mm]	[A]	[A]	[J]	[V]	[V]	[V]	[A]	[pF]		
30	38	14	2000	1000	14	42	52	93	10	10144	●	0070.3061.xx
30	38	20	3000	2000	34	42	52	93	20	23215	●	0070.3081.xx
35	45	5	250	125	1.8	50	62	117	1	987	●	0070.3511.xx
35	45	7	500	250	3.4	50	62	110	2.5	2130	●	0070.3521.xx
35	45	10	1000	500	8.1	50	62	110	5	3922	●	0070.3541.xx
35	45	14	2000	1000	16	50	62	110	10	8514	●	0070.3561.xx
35	45	20	3000	2000	41	50	62	110	20	19484	●	0070.3581.xx
40	56	5	250	125	2.2	61	75	138	1	438	●	0070.4011.xx
40	56	7	500	250	5.2	61	75	135	2.5	945	●	0070.4021.xx
40	56	10	1000	500	13	61	75	135	5	1627	●	0070.4041.xx
40	56	14	2000	1000	20	61	75	135	10	3285	●	0070.4061.xx
40	56	20	3000	2000	49	61	75	135	20	7517	●	0070.4081.xx
50	66	5	800	600	3.5	74	90	163	5	364	●	0070.5011.xx
50	66	7	1750	1250	7	74	90	157	10	767	●	0070.5021.xx
50	66	10	3500	2500	14	74	90	147	25	1375	●	0070.5041.xx
50	66	14	6000	5000	28	74	90	147	50	2829	●	0070.5061.xx
50	66	20	10000	7000	56	74	90	147	100	5041	●	0070.5081.xx
60	81	5	800	600	4.5	90	110	190	5	299	●	0070.6011.xx
60	81	7	1750	1250	9	90	110	180	10	629	●	0070.6021.xx
60	81	10	3500	2500	18	90	110	175	25	1128	●	0070.6041.xx
60	81	14	6000	5000	36	90	110	175	50	2319	●	0070.6061.xx
60	81	20	10000	7000	72	90	110	175	100	5264	●	0070.6081.xx
75	102	5	800	600	5.5	108	132	220	5	249	●	0070.7511.xx
75	102	7	1750	1250	11	108	132	220	10	524	●	0070.7521.xx
75	102	10	3500	2500	22	108	132	210	25	940	●	0070.7541.xx
75	102	14	6000	5000	44	108	132	210	50	1933	●	0070.7561.xx
75	102	20	10000	7000	88	108	132	210	100	4387	●	0070.7581.xx
95	127	5	800	600	6.6	135	165	240	5	118	●	0070.9511.xx
95	127	7	1750	1250	13	135	165	255	10	255	●	0070.9521.xx
95	127	10	3500	2500	25	135	165	255	25	469	●	0070.9541.xx
95	127	14	6000	5000	53	135	165	255	50	1019	●	0070.9561.xx
95	127	20	10000	7000	106	135	165	255	100	2331	●	0070.9581.xx

Packaging Unit

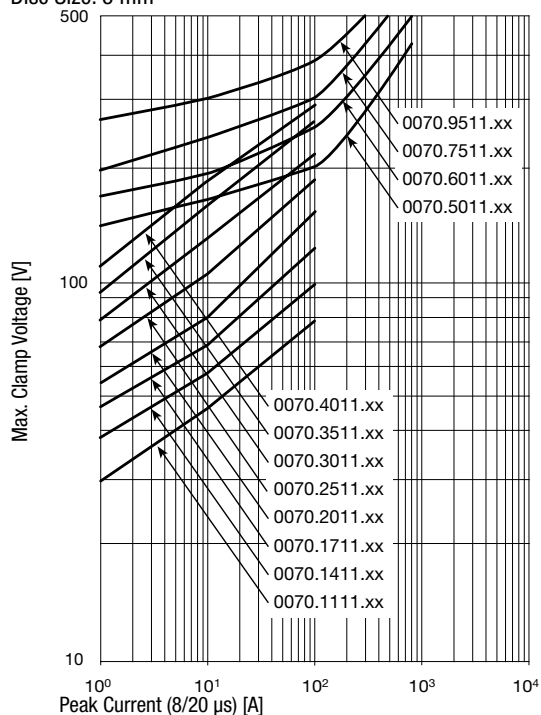
- .xx = .B1 Plastic Bag (100 pcs.)
 .xx = .T2 Tape&Reel:
 11 - 95 VAC: 5 + 7 mm Disc Size 1500 pieces
 11 - 95 VAC: 10 mm Disc Size 1000 pieces
 11 - 95 VAC: 14 mm Disc Size 1000 pieces
 11 - 95 VAC: 20 mm Disc Size 500 pieces
 .xx = .A2 Ammo Pack
 11 - 95 VAC: 5 + 7 mm Disc Size 1500 pieces
 11 - 95 VAC: 10 mm Disc Size 1000 pieces
 11 - 95 VAC: 14 mm Disc Size 1000 pieces
 11 - 95 VAC: 20 mm Disc Size 500 pieces

Voltage-Current Curves

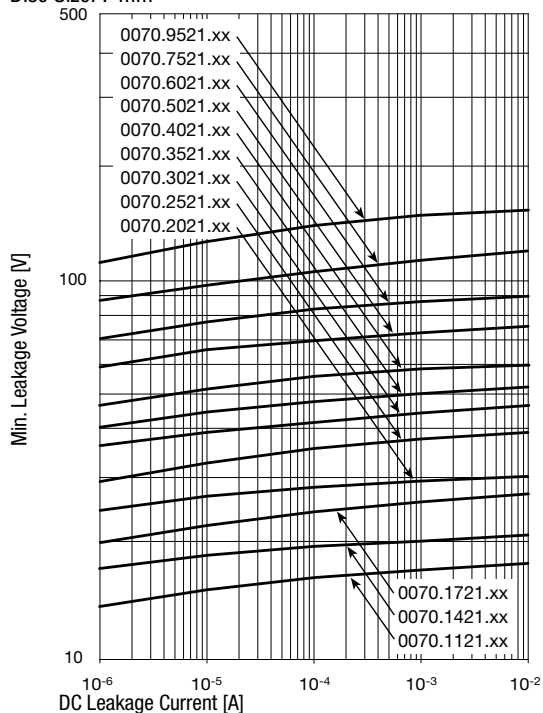
Disc Size: 5 mm Varistor



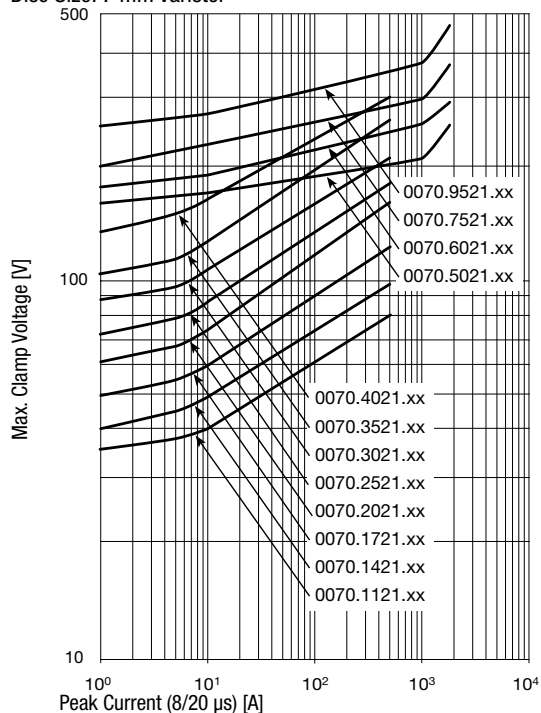
Disc Size: 5 mm



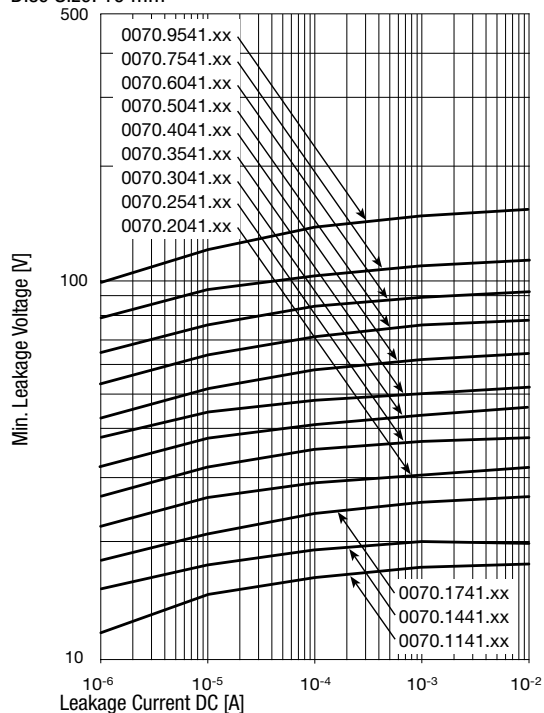
Disc Size: 7 mm



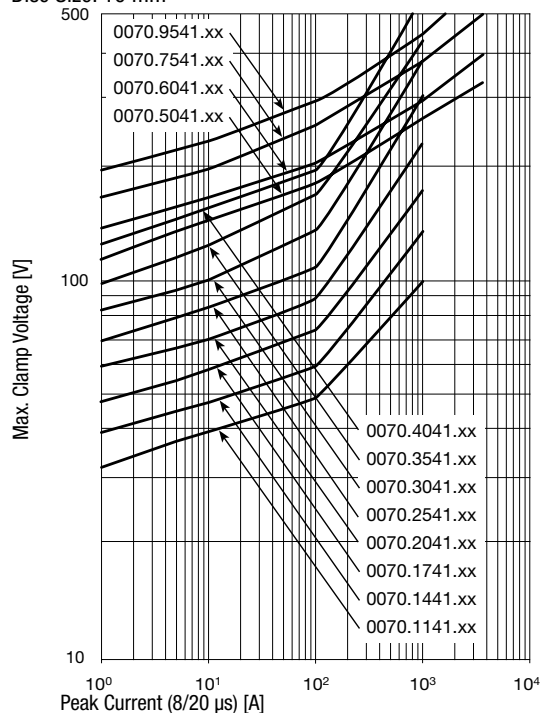
Disc Size: 7 mm Varistor



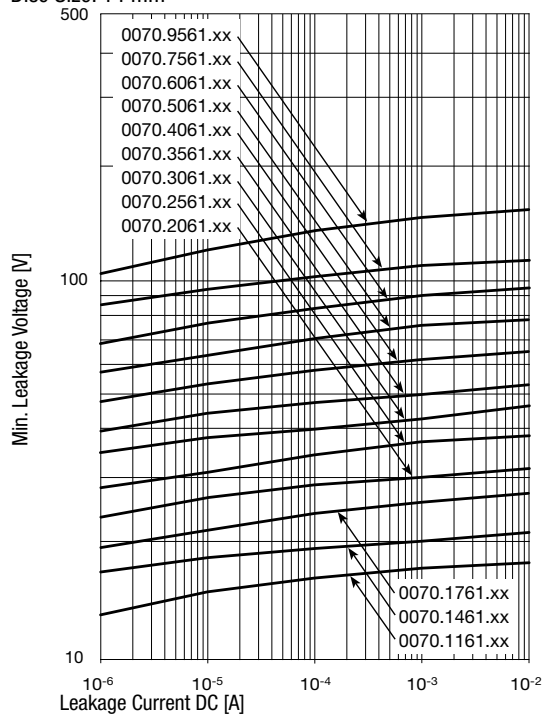
Disc Size: 10 mm



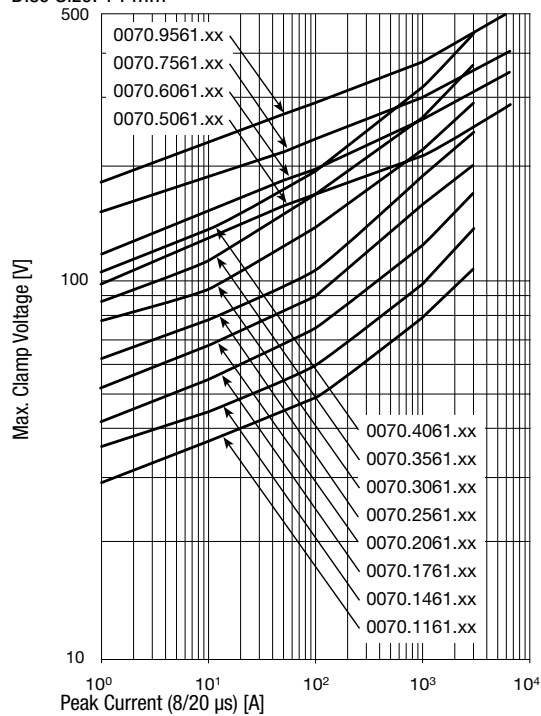
Disc Size: 10 mm



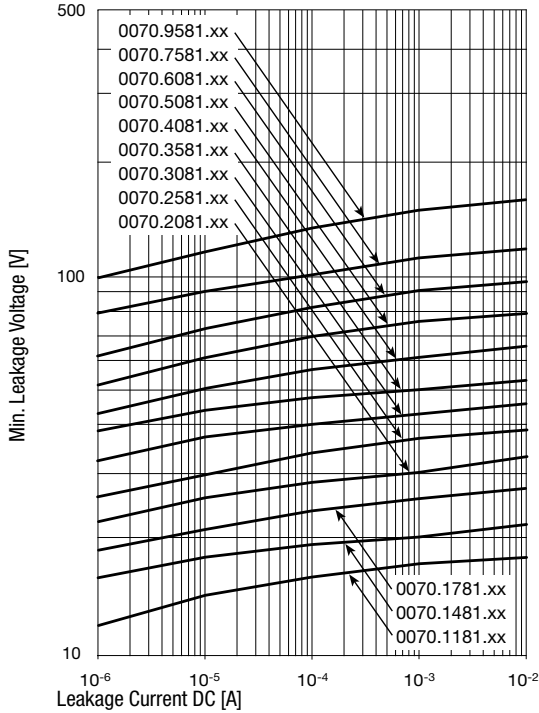
Disc Size: 14 mm



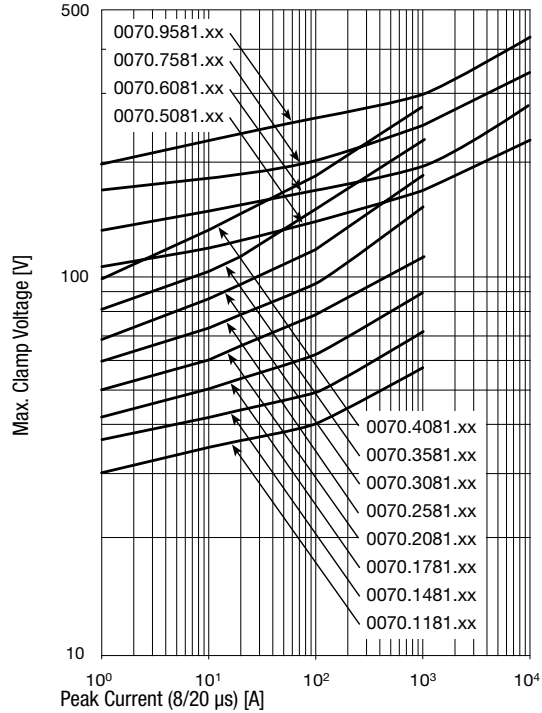
Disc Size: 14 mm



Disc Size: 20 mm



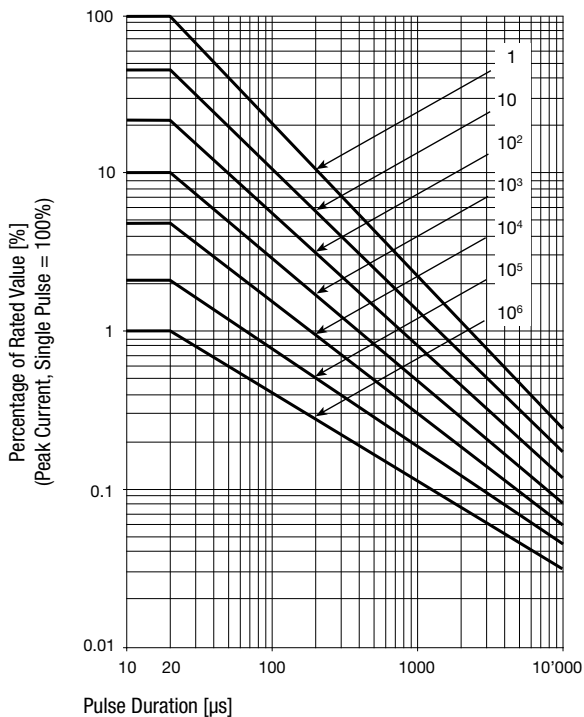
Disc Size: 20 mm Varistor



Pulse Derating Curves

Derating at Quantity of Pulses and Pulse Duration

1, 10, ... = Quantity of Pulses



Radial Leaded Varistor (MOV), 120 - 360 VAC, 160 - 470 VDC

new



Disc Size: 7 mm



Disc Size: 14 mm



Disc Size: 25 mm

120 - 360 VAC · 800 - 13000 A · 5 - 25 mm

**Description**

- Radial leaded varistor
- Low leakage current
- VDE, UL, CSA approvals

Standards

- IEC 61051 - Varistors for Use in Electronic Equipment
- UL 1414 - Across-the-Line Components
- UL 1449 - Transient Voltage Surge Suppressors
- CSA C22.2 - Accessories and Parts for Electronic Equipment

Approvals

- VDE License Number: 40026011
- UL File Number: E189323 (UL 1449), E325083 (UL 1414)

Applications

- Overvoltage Protection
- Primary Protection Single-Phase
- Surge Protection according to IEC 61000-4-5

References

General Product Information see page 31
Packaging Details see page 29

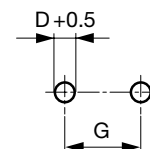
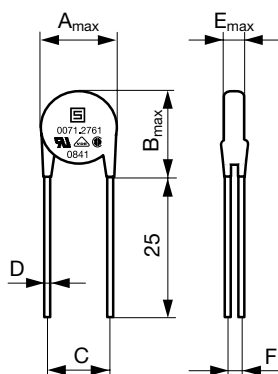
Weblinks

Approvals: <http://www.schurter.com/approvals>
RoHS: <http://www.schurter.com/rohs>
CHINA-RoHS: <http://www.schurter.com/china-rohs>
e-Store: <http://www.schurterinc.com/estore/merchant.ihtml>
SCHURTER-Stock-Check: <http://www.schurter.com/stockcheck>
Distributor-Stock-Check: <http://www.schurter.ch/catalog/querydist.asp>

Technical Data

Rated Voltage	120 - 360 VAC, 160 - 470 VDC
Disc Size	5 - 25 mm
Peak Current 8/20 μ s, 1 Pulse	800 - 13000 A
Max. Energy Absorption 10/1000 μ s	8 - 440 J
Current/Energy Derating above 85 °C	- 2.5% / °C
Voltage/Temperature Coefficient	- 0.05% / °C
Admissible Ambient Air Temp.	- 40 °C to 85 °C
Material: Terminals	Tin-Plated Copper Alloy
Material: Tube	Zinc Oxide
Storage Conditions	0 °C to 60 °C max. 70% r.h.
Product Marking	 , Order Number, Approvals, Date code

Soldering Methods	Wave
Solderability	235 °C / 2 sec acc. to IEC 60068-2-20 Test Ta, method 1
Resistance to Soldering Heat	260 °C / 5 sec acc. to IEC 60068-2-20, Test Tb, method 1A
Insulation Resistance	>10'000 M Ω
HiPot Encapsulation	2500 VDC
Impulse Response Time	< 50 ns
DC Leakage Current	< 200 μ A
Flammability	UL 94V-0

Dimensions

Drilling Diagram

Dimensions

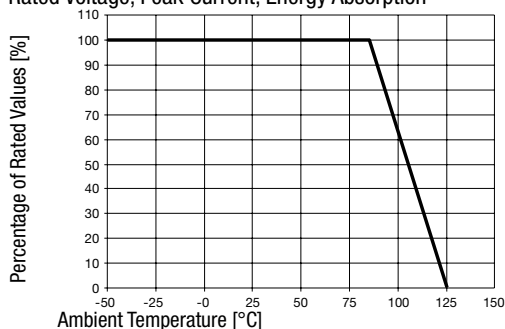
Rated Voltage	Disc Size	A max	B max	C	D	E	F	G	Order Number
[VAC]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
120	5	7	8.5	5	0.6	3.6	1.5	5.2	0071.1211.xx
120	7	9	11	5	0.6	3.6	1.5	5.2	0071.1221.xx
120	10	12	14.5	7.5	0.8	4.2	1.6	7.7	0071.1241.xx
120	14	15.5	18.5	7.5	0.8	4.2	1.6	7.7	0071.1261.xx
120	20	21.5	25.5	10	1	4.6	1.8	10.2	0071.1281.xx
130	5	7	8.5	5	0.6	3.6	1.6	5.2	0071.1311.xx
130	7	9	11	5	0.6	3.6	1.6	5.2	0071.1321.xx
130	10	12	14.5	7.5	0.8	4.2	1.8	7.7	0071.1341.xx
130	14	15.5	18.5	7.5	0.8	4.2	1.9	7.7	0071.1361.xx
130	20	21.5	25.5	10	1	4.7	2	10.2	0071.1381.xx
130	25	27.9	31.8	10	1	4.7	2	10.2	0071.1391.xx
140	5	7	8.5	5	0.6	3.7	1.7	5.3	0071.1411.xx
140	7	9	11	5	0.6	3.7	1.7	5.3	0071.1421.xx
140	10	12	14.5	7.5	0.8	4.3	1.9	7.7	0071.1441.xx
140	14	15.5	18.5	7.5	0.8	4.3	2	7.8	0071.1461.xx
140	20	21.5	25.5	10	1	4.8	2.1	10.2	0071.1481.xx
140	25	27.9	31.8	10	1	4.8	2.1	10.2	0071.1491.xx
150	5	7	8.5	5	0.6	3.8	1.8	5.3	0071.1511.xx
150	7	9	11	5	0.6	3.8	1.8	5.3	0071.1521.xx
150	10	12	14.5	7.5	0.8	4.4	2	7.8	0071.1541.xx
150	14	15.5	18.5	7.5	0.8	4.4	2.1	7.8	0071.1561.xx
150	20	21.5	25.5	10	1	4.9	2.2	10.2	0071.1581.xx
150	25	27.9	31.8	10	1	4.9	2.2	10.2	0071.1591.xx
180	5	7	8.5	5	0.6	3.9	2	5.4	0071.1811.xx
180	7	9	11	5	0.6	4	2	5.4	0071.1821.xx
180	10	12	14.5	7.5	0.8	4.6	2.2	7.8	0071.1841.xx
180	14	15.5	18.5	7.5	0.8	4.6	2.2	7.8	0071.1861.xx
180	20	21.5	25.5	10	1	5	2.3	10.3	0071.1881.xx
230	5	7	8.5	5	0.6	4	1.8	5.3	0071.2311.xx
230	7	9	11	5	0.6	4	1.8	5.3	0071.2321.xx
230	10	12	14.5	7.5	0.8	4.7	2	7.8	0071.2341.xx
230	14	15.5	18.5	7.5	0.8	4.7	2	7.8	0071.2361.xx
230	20	21.5	25.5	10	1	5.1	2.1	10.2	0071.2381.xx
250	5	7	8.5	5	0.6	4.2	1.8	5.3	0071.2511.xx
250	7	9	11	5	0.6	4.2	1.8	5.3	0071.2521.xx
250	10	12	14.5	7.5	0.8	4.8	2	7.8	0071.2541.xx
250	14	15.5	18.5	7.5	0.8	4.8	2	7.8	0071.2561.xx
250	20	21.5	25.5	10	1	5.3	2.2	10.2	0071.2581.xx
250	25	27.9	31.8	10	1	5.3	2.2	10.2	0071.2591.xx
270	5	7	8.5	5	0.6	4.3	2	5.4	0071.2711.xx
270	7	9	11	5	0.6	4.4	2	5.4	0071.2721.xx
270	10	12	14.5	7.5	0.8	4.4	2.2	7.8	0071.2741.xx
270	14	15.5	18.5	7.5	0.8	5	2.2	7.8	0071.2761.xx
270	20	21.5	25.5	10	1	5.4	2.3	10.3	0071.2781.xx
270	25	27.9	31.8	10	1	5.4	2.3	10.3	0071.2791.xx
300	5	7	8.5	5	0.6	4.5	2.1	5.4	0071.3011.xx
300	7	9	11	5	0.6	4.5	2.1	5.4	0071.3021.xx
300	10	12	14.5	7.5	0.8	5.1	2.3	7.8	0071.3041.xx
300	14	15.5	18.5	7.5	0.8	5.2	2.3	7.8	0071.3061.xx
300	20	21.5	25.5	10	1	5.6	2.4	10.3	0071.3081.xx
300	25	27.9	31.8	10	1	5.6	2.4	10.3	0071.3091.xx
320	10	12	14.5	7.5	0.8	5.4	2.4	7.9	0071.3241.xx
320	14	15.5	18.5	7.5	0.8	5.4	2.4	7.9	0071.3261.xx
320	20	21.5	25.5	10	1	5.8	2.6	10.3	0071.3281.xx

Rated Voltage	Disc Size	A max	B max	C	D	E	F	G	Order Number
[VAC]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
320	25	27.9	31.8	10	1	5.8	2.6	10.3	0071.3291.xx
360	10	12	15	7.5	0.8	5.8	2.7	8.0	0071.3641.xx
360	14	15.5	19	7.5	0.8	5.9	2.7	8.0	0071.3661.xx
360	20	21.5	26	10	1	6.3	2.8	10.4	0071.3681.xx
360	25	27.9	31.8	10	1	6.3	2.8	10.4	0071.3691.xx

Electrical parameters can be found in the table of variants below.

Temperature Derating Curves

Rated Voltage, Peak Current, Energy Absorption



Variants

Rated Voltage	Rated Voltage	Disc Size	Peak Current, 8/20 µs, 1 Pulse	Peak Current, 8/20 µs, 2 Pulses	Energy, 10/1000 µs	Min. Voltage @ 1 mA DC	Max. Voltage @ 1 mA DC	Max. Clamping Voltage	Peak Current, 8/20 µs, Clamping	Typ. Capacity @ 1 kHz	VDE	UL	SF	Order Number
[VAC]	[VDC]	[mm]	[A]	[A]	[J]	[V]	[V]	[V]	[A]	[pF]		1)	2)	
120	160	5	800	600	8	170	207	310	5	118		●		0071.1211.xx
120	160	7	1750	1250	16	170	207	320	10	225		●	●	0071.1221.xx
120	160	10	3500	2500	33	170	207	320	25	469		●	●	0071.1241.xx
120	160	14	6000	5000	52	170	207	320	50	1019		●	●	0071.1261.xx
120	160	20	10000	7000	130	170	207	320	100	2331		●	●	0071.1281.xx
130	175	5	800	600	8.5	184	224	350	5	116	●	●	●	0071.1311.xx
130	175	7	1750	1250	17.5	184	224	340	10	250	●	●	●	0071.1321.xx
130	175	10	3500	2500	45	184	224	340	25	438	●	●	●	0071.1341.xx
130	175	14	6500	5000	70	184	224	340	50	890	●	●	●	0071.1361.xx
130	175	20	12000	9000	150	184	224	340	100	2001	●	●	●	0071.1381.xx
130	175	25	18000	13000	170	184	224	340	100	3634		●	●	0071.1391.xx
140	180	5	800	600	9	198	242	380	5	111	●	●		0071.1411.xx
140	180	7	1750	1250	20	198	242	360	10	232	●	●	●	0071.1421.xx
140	180	10	3500	2500	50	198	242	360	25	407	●	●	●	0071.1441.xx
140	180	14	6500	5000	78	198	242	360	50	825	●	●	●	0071.1461.xx
140	180	20	12000	9000	160	198	242	360	100	1855	●	●	●	0071.1481.xx
140	180	25	18000	13000	180	198	242	360	100	3370		●	●	0071.1491.xx
150	200	5	800	600	10.5	212	259	430	5	101	●	●		0071.1511.xx
150	200	7	1750	1250	21	212	259	395	10	212	●	●	●	0071.1521.xx
150	200	10	3500	2500	55	212	259	395	25	373	●	●	●	0071.1541.xx
150	200	14	6500	5000	84	212	259	395	50	756	●	●	●	0071.1561.xx
150	200	20	12000	9000	170	212	259	395	100	1701	●	●	●	0071.1581.xx
150	200	25	18000	13000	190	212	259	395	100	3089		●	●	0071.1591.xx
180	230	5	800	600	11	255	311	510	5	87	●	●		0071.1811.xx
180	230	7	1750	1250	24	255	311	445	10	182	●	●	●	0071.1821.xx
180	230	10	3500	2500	60	255	311	465	25	319	●	●	●	0071.1841.xx
180	230	14	6000	5000	100	255	311	465	50	648	●	●	●	0071.1861.xx
180	230	20	10000	7000	190	255	311	465	100	1548	●	●	●	0071.1881.xx
230	300	5	800	600	16	326	397	595	5	68		●		0071.2311.xx

Rated Voltage	Rated Voltage	Disc Size	Peak Current, 8/20 μ s, 1 Pulse	Peak Current, 8/20 μ s, 2 Pulses	Energy, 10/1000 μ s	Min. Voltage @ 1 mA DC	Max. Voltage @ 1 mA DC	Max. Clamping Voltage	Peak Current, 8/20 μ s, Clamping	Typ. Capacity @ 1 kHz				Order Number
[VAC]	[VDC]	[mm]	[A]	[A]	[J]	[V]	[V]	[V]	[A]	[pF]		1)	2)	
230	300	7	1750	1250	32	326	397	595	10	141	●	●	●	0071.2321.xx
230	300	10	3500	2500	65	326	397	595	25	248	●	●	●	0071.2341.xx
230	300	14	6000	4500	135	326	397	595	50	504	●	●	●	0071.2361.xx
230	300	20	10000	6500	270	326	397	595	100	1134	●	●	●	0071.2381.xx
250	330	5	800	600	17	354	432	675	5	62		●		0071.2511.xx
250	330	7	1750	1250	35	354	432	650	10	131	●	●	●	0071.2521.xx
250	330	10	3500	2500	70	354	432	650	25	229	●	●	●	0071.2541.xx
250	330	14	6000	4500	145	354	432	650	50	465	●	●	●	0071.2561.xx
250	330	20	10000	6500	300	354	432	650	100	1047	●	●	●	0071.2581.xx
250	330	25	13000	9000	315	354	432	650	100	1901		●	●	0071.2591.xx
270	360	5	800	600	20	382	466	740	5	58		●		0071.2711.xx
270	360	7	1750	1250	40	382	466	710	10	121	●	●	●	0071.2721.xx
270	360	10	3500	2500	80	382	466	710	25	213	●	●	●	0071.2741.xx
270	360	14	6000	4500	160	382	466	710	50	432	●	●	●	0071.2761.xx
270	360	20	10000	6500	325	382	466	710	100	972	●	●	●	0071.2781.xx
270	360	25	13000	9000	340	382	466	710	100	1765		●	●	0071.2791.xx
300	390	5	800	600	21	425	518	810	5	52		●		0071.3011.xx
300	390	7	1750	1250	42	425	518	790	10	108	●	●	●	0071.3021.xx
300	390	10	3500	2500	85	425	518	790	25	190	●	●	●	0071.3041.xx
300	390	14	6000	4500	175	425	518	790	50	386	●	●	●	0071.3061.xx
300	390	20	10000	6500	350	425	518	790	100	869	●	●	●	0071.3081.xx
300	390	25	13000	9000	360	425	518	790	100	1577		●	●	0071.3091.xx
320	420	10	3500	2500	92	453	553	850	25	179	●	●	●	0071.3241.xx
320	420	14	6000	4500	190	453	553	850	50	363	●	●	●	0071.3261.xx
320	420	20	10000	6500	385	453	553	850	100	816	●	●	●	0071.3281.xx
320	420	25	13000	9000	430	453	553	850	100	1483		●	●	0071.3291.xx
360	470	10	3500	2500	97	522	638	960	25	154	●	●	●	0071.3641.xx
360	470	14	6000	4500	205	522	638	960	50	313	●	●	●	0071.3661.xx
360	470	20	10000	6500	410	522	638	960	100	704	●	●	●	0071.3681.xx
360	470	25	13000	9000	440	522	638	960	100	1278		●	●	0071.3691.xx

1) UL 1449 - Transient Voltage Surge Suppressors - Component

2) UL 1414 - Across-the-line Capacitors, Antenna-coupling and Line-bypass Components

Packaging Unit

.xx = .B1 Plastic Bag (100 pcs.)

.xx = .T2 Tape&Reel:

120 - 300 VAC, 5 + 7 mm Disc Size 1500 pieces

120 - 180 VAC, 10 mm Disc Size 1000 pieces

230 - 300 VAC, 10 mm Disc Size 500 pieces

120 - 180 VAC, 14 mm Disc Size 1000 pieces

230 - 300 VAC, 14 mm Disc Size 500 pieces

120 - 180 VAC, 20 mm Disc Size 500 pieces

230 - 300 VAC, 20 mm Disc Size 400 pieces

.xx = .A2 Ammo Pack:

120 - 300 VAC, 5 + 7 mm Disc Size 1500 pieces

120 - 180 VAC, 10 mm Disc Size 1000 pieces

230 - 300 VAC, 10 mm Disc Size 500 pieces

120 - 180 VAC, 14 mm Disc Size 1000 pieces

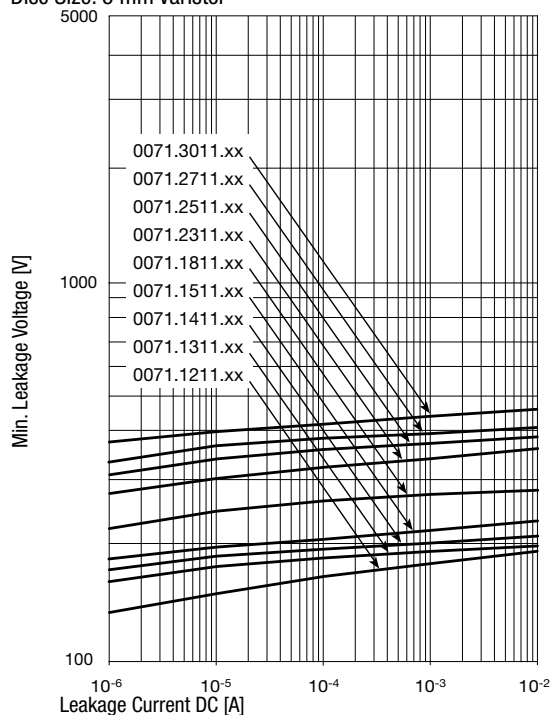
230 - 300 VAC, 14 mm Disc Size 500 pieces

120 - 180 VAC, 20 mm Disc Size 500 pieces

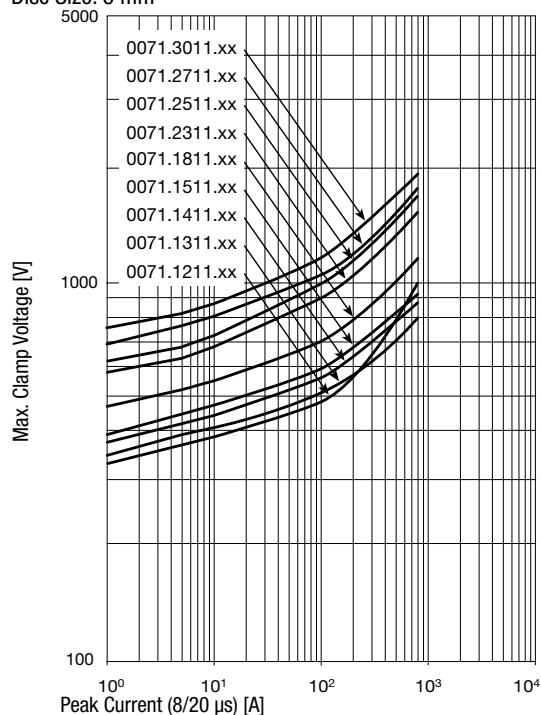
230 - 300 VAC, 20 mm Disc Size 400 pieces

Voltage-Current Curves

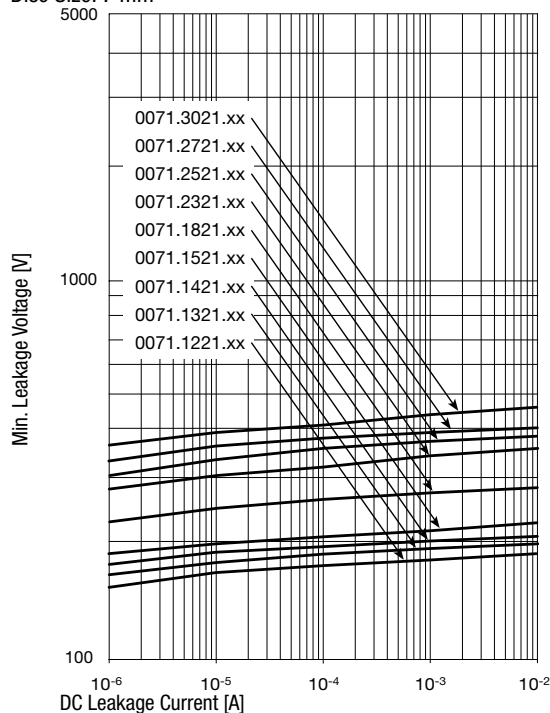
Disc Size: 5 mm Varistor



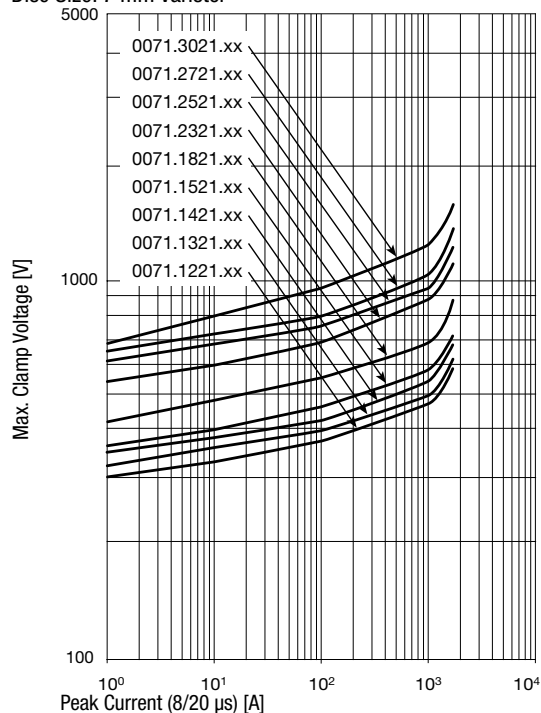
Disc Size: 5 mm



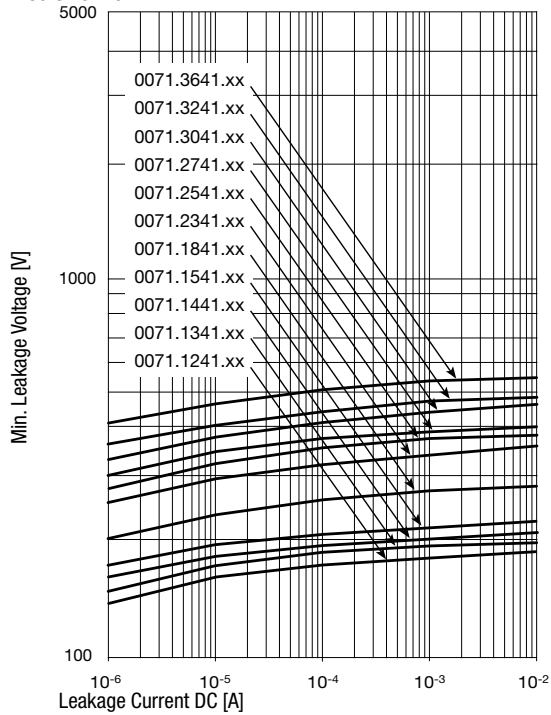
Disc Size: 7 mm



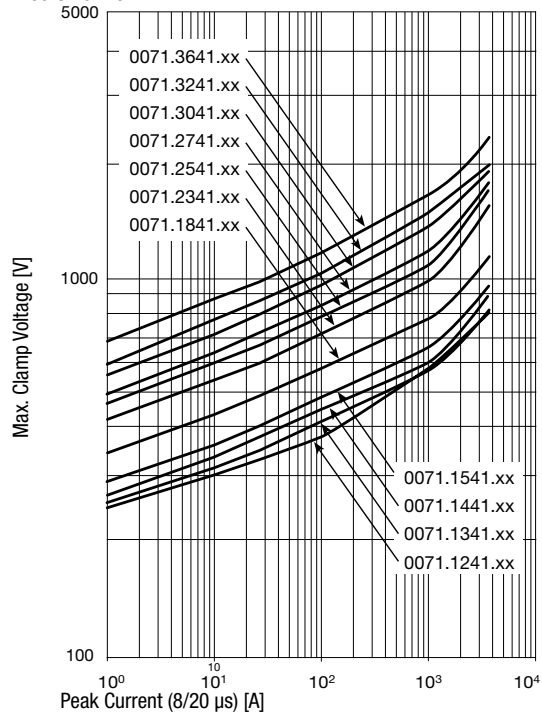
Disc Size: 7 mm Varistor



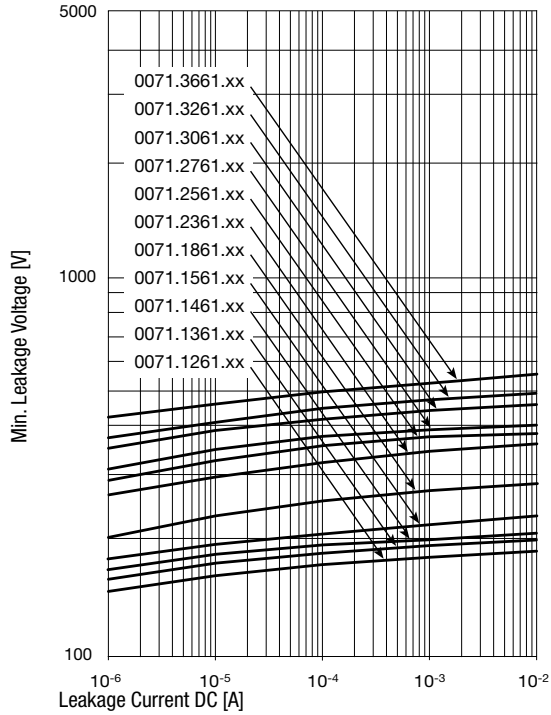
Disc Size: 10 mm



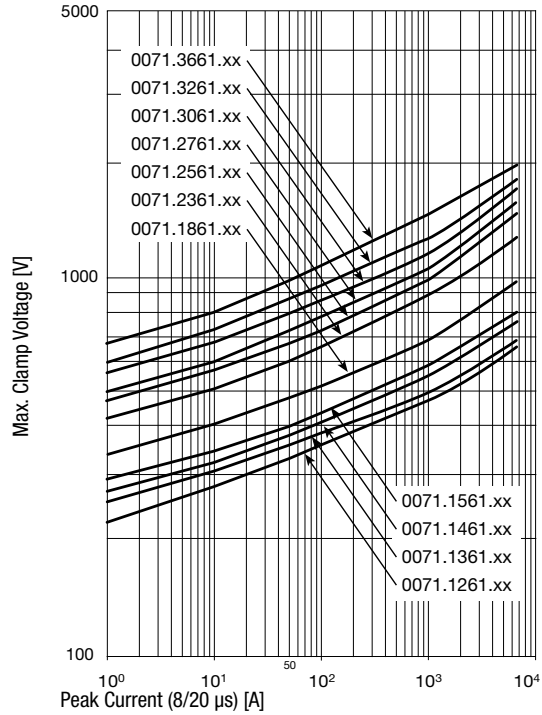
Disc Size: 10 mm



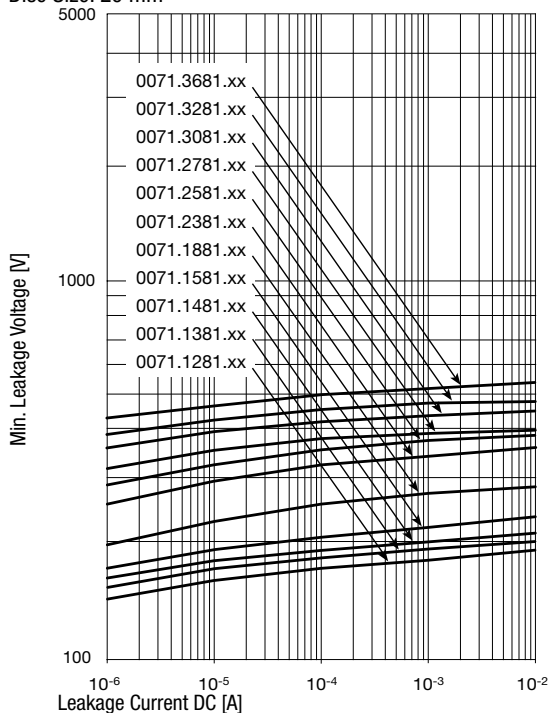
Disc Size: 14 mm



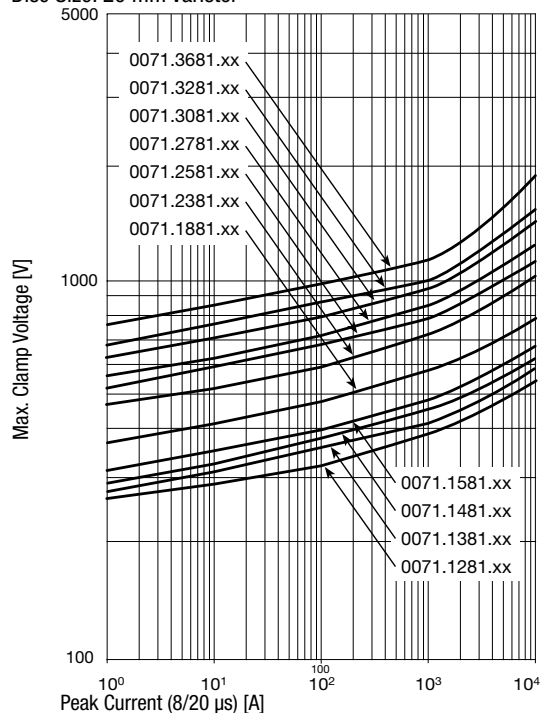
Disc Size: 14 mm



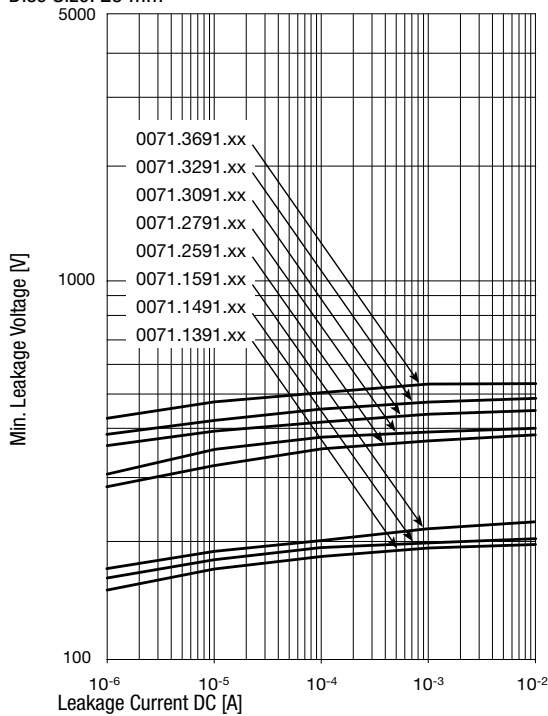
Disc Size: 20 mm



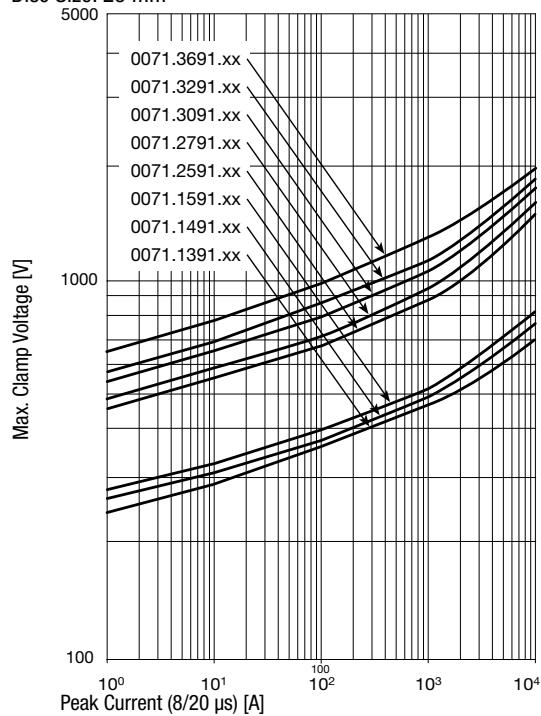
Disc Size: 20 mm Varistor



Disc Size: 25 mm



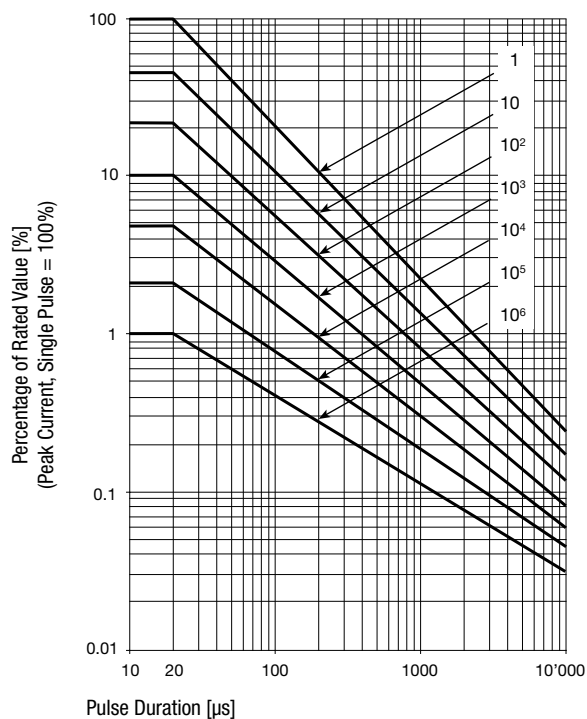
Disc Size: 25 mm



Pulse Derating Curves

Derating at Quantity of Pulses and Pulse Duration

1, 10, ... = Quantity of Pulses



Radial Leaded Varistor (MOV), 390 - 1000 VAC, 500 - 1200 VDC

new



Disc Size: 10 mm



Disc Size: 20 mm



Disc Size: 25 mm

390 - 1000 VAC · 3500 - 13000 A · 10 - 25 mm

**Description**

- Radial leaded varistor
- Low leakage current
- VDE, UL, CSA approvals

Standards

- IEC 61051 - Varistors for Use in Electronic Equipment
- UL 1414 - Across-the-Line Components
- UL 1449 - Transient Voltage Surge Suppressors
- CSA C22.2 - Accessories and Parts for Electronic Equipment

Approvals

- VDE License Number: 40026011
- UL File Number: E189323 (UL 1449), E325083 (UL 1414)

Applications

- Overvoltage Protection for three-phase applications
- Surge Protection according to IEC 61000-4-5

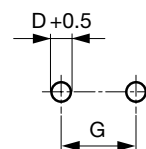
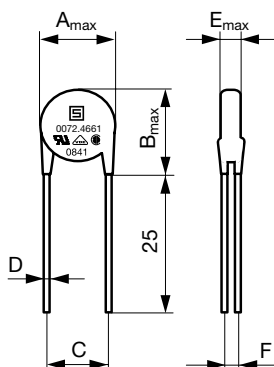
References

General Product Information see page 31

WeblinksApprovals: <http://www.schurter.com/approvals>RoHS: <http://www.schurter.com/rohs>CHINA-RoHS: <http://www.schurter.com/china-rohs>e-Store: <http://www.schurterinc.com/estore/merchant.ihtml>SCHURTER-Stock-Check: <http://www.schurter.com/stockcheck>Distributor-Stock-Check: <http://www.schurter.ch/catalog/querydist.asp>**Technical Data**

Rated Voltage	390 - 1000 VAC, 500 - 1200 VDC
Disc Size	10 - 25 mm
Peak Current 8/20 μ s, 1 Pulse	3500 - 13000 A
Max. Energy Absorption 10/1000 μ s	25 - 875 J
Current/Energy Derating above 85 °C	- 2.5% / °C
Voltage/Temperature Coefficient	- 0.05% / °C
Admissible Ambient Air Temp.	- 40 °C to 85 °C
Material: Terminals	Tin-Plated Copper Alloy
Material: Tube	Zinc Oxide
Storage Conditions	0 °C to 60 °C max. 70% r.h.
Product Marking	 , Order Number, Approvals, Date code

Soldering Methods	Wave
Solderability	235 °C / 2 sec IEC 60068-2-20, Test Ta, method 1
Resistance to Soldering Heat	260 °C / 5 sec acc. to IEC 60068-2-20, Test Tb, method 1A
Insulation Resistance	>10'000 M Ω
HiPot Encapsulation	2500 VDC
Impulse Response Time	< 50 ns
DC Leakage Current	< 200 μ A
Flammability	UL 94V-0

Dimensions

Drilling Diagram

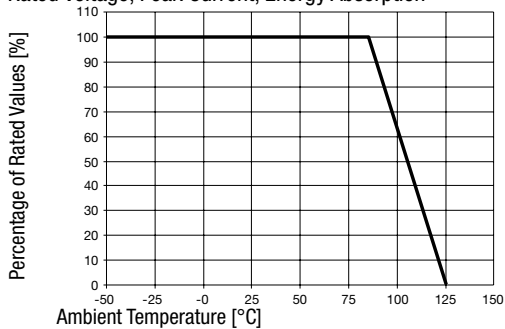
Dimensions

Rated Voltage	Disc Size	A max	B max	C	D	E	F	G	Order Number
[VAC]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
390	10	12	15	7.5	0.8	5.8	2.7	8.0	0072.3941.xx
390	14	15.5	19	7.5	0.8	5.9	2.7	8.0	0072.3961.xx
390	20	21.5	26	10	1	6.3	2.8	10.4	0072.3981.xx
390	25	27.9	31.8	10	1	6.3	2.8	10.4	0072.3991.xx
420	10	12	15	7.5	0.8	6.1	2.9	8.0	0072.4241.xx
420	14	15.5	19	7.5	0.8	6.1	2.9	8.0	0072.4261.xx
420	20	21.5	26	10	1	6.5	3.1	10.5	0072.4281.xx
420	25	27.9	31.8	10	1	6.5	3.1	10.5	0072.4291.xx
460	10	12	15	7.5	0.8	6.3	3.1	8.1	0072.4641.xx
460	14	15.5	19	7.5	0.8	6.4	3.1	8.1	0072.4661.xx
460	20	21.5	26	10	1	6.8	3.3	10.5	0072.4681.xx
460	25	27.9	31.8	10	1	6.8	3.3	10.5	0072.4691.xx
480	10	12	15	7.5	0.8	6.3	3.1	8.1	0072.4841.xx
480	14	15.5	19	7.5	0.8	6.4	3.1	8.1	0072.4861.xx
480	20	21.5	26	10	1	6.8	3.3	10.5	0072.4881.xx
480	25	27.9	31.8	10	1	6.8	3.3	10.5	0072.4891.xx
510	10	12	15	7.5	0.8	6.7	3.4	8.2	0072.5141.xx
510	14	15.5	19	7.5	0.8	6.8	3.4	8.2	0072.5161.xx
510	20	21.5	26	10	1	7.1	3.5	10.6	0072.5181.xx
510	25	27.9	31.8	10	1	7.1	3.5	10.6	0072.5191.xx
550	10	12	15	7.5	0.8	7.1	3.7	8.4	0072.5541.xx
550	14	15.5	19	7.5	0.8	7.2	3.7	8.4	0072.5561.xx
550	20	21.5	26	10	1	7.5	3.9	10.7	0072.5581.xx
550	25	27.9	31.8	10	1	7.5	3.9	10.7	0072.5591.xx
620	10	12	15	7.5	0.8	7.5	4	8.5	0072.6241.xx
620	14	15.5	19	7.5	0.8	7.5	4	8.5	0072.6261.xx
620	20	21.5	26	10	1	7.9	4.2	10.8	0072.6281.xx
620	25	27.9	31.8	10	1	7.9	4.2	10.8	0072.6291.xx
680	10	12	15	7.5	0.8	7.9	4.4	8.7	0072.6841.xx
680	14	15.5	19	7.5	0.8	8	4.4	8.7	0072.6861.xx
680	20	21.5	26	10	1	8.4	4.5	11.0	0072.6881.xx
680	25	27.9	31.8	10	1	8.4	4.5	11.0	0072.6891.xx
1000	14	15.5	19	7.5	0.8	11	6.7	10.1	0072.1061.xx
1000	20	21.5	26	10	1	11.4	6.9	12.1	0072.1081.xx
1000	25	27.9	31.8	10	1	11.4	6.9	12.1	0072.1091.xx

Electrical parameters can be found in the table of variants below.

Temperature Derating Curves

Rated Voltage, Peak Current, Energy Absorption



Variants

Rated Voltage	Rated Voltage	Disc Size	Peak Current, 8/20 μ s, 1 Pulse	Peak Current, 8/20 μ s, 2 Pulses	Energy, 10/1000 μ s	Min. Voltage @ 1 mA DC	Max. Voltage @ 1 mA DC	Max. Clamping Voltage	Peak Current, 8/20 μ s, Clamping	Typ. Capacity @ 1 kHz				Order Number
[VAC]	[VDC]	[mm]	[A]	[A]	[J]	[V]	[V]	[V]	[A]	[pF]		1)	2)	
390	500	10	3500	2500	107	552	674	1025	25	146	●	●	●	0072.3941.xx
390	500	14	6000	4500	215	552	674	1025	50	297	●	●	●	0072.3961.xx
390	500	20	10000	6500	420	552	674	1025	100	667	●	●	●	0072.3981.xx
390	500	25	13000	9000	460	552	674	1025	100	1211		●	●	0072.3991.xx
420	560	10	3500	2500	110	594	725	1120	25	136	●	●	●	0072.4241.xx
420	560	14	6000	4500	225	594	725	1120	50	275	●	●	●	0072.4261.xx
420	560	20	10000	6500	430	594	725	1120	100	618	●	●	●	0072.4281.xx
420	560	25	13000	9000	480	594	725	1120	100	1123		●	●	0072.4291.xx
460	615	10	3500	2500	115	651	795	1240	25	124	●	●	●	0072.4641.xx
460	615	14	6000	4500	230	651	795	1240	50	251	●	●	●	0072.4661.xx
460	615	20	10000	6500	450	651	795	1240	100	565	●	●	●	0072.4681.xx
460	615	25	13000	9000	500	651	795	1240	100	1025		●	●	0072.4691.xx
480	640	10	3500	2500	120	679	829	1300	25	119	●	●	●	0072.4841.xx
480	640	14	6000	4500	235	679	829	1300	50	242	●	●	●	0072.4861.xx
480	640	20	10000	6500	460	679	829	1300	100	544	●	●	●	0072.4881.xx
480	640	25	13000	9000	510	679	829	1300	100	989		●	●	0072.4891.xx
510	675	10	3500	2500	125	722	881	1350	25	112	●	●	●	0072.5141.xx
510	675	14	6000	4500	240	722	881	1350	50	227	●	●	●	0072.5161.xx
510	675	20	10000	6500	470	722	881	1350	100	510	●	●	●	0072.5181.xx
510	675	25	13000	9000	525	722	881	1350	100	927		●	●	0072.5191.xx
550	700	10	3500	2500	130	778	950	1400	25	104	●	●	●	0072.5541.xx
550	700	14	6000	4500	255	778	950	1400	50	211	●	●	●	0072.5561.xx
550	700	20	10000	6500	510	778	950	1400	100	475	●	●	●	0072.5581.xx
550	700	25	13000	9000	540	778	950	1400	100	862		●	●	0072.5591.xx
620	800	10	3500	2500	145	877	1071	1650	25	92	●	●	●	0072.6241.xx
620	800	14	6000	4500	290	877	1071	1650	50	186	●	●	●	0072.6261.xx
620	800	20	10000	6500	565	877	1071	1650	100	419	●	●	●	0072.6281.xx
620	800	25	13000	9000	600	877	1071	1650	100	761		●	●	0072.6291.xx
680	860	10	3500	2500	155	962	1175	1800	25	84	●	●	●	0072.6841.xx
680	860	14	6000	4500	310	962	1175	1800	50	170	●	●	●	0072.6861.xx
680	860	20	10000	6500	620	962	1175	1800	100	382	●	●	●	0072.6881.xx
680	860	25	13000	9000	655	962	1175	1800	100	694		●	●	0072.6891.xx
1000	1200	14	6000	4500	510	1414	1728	2700	50	115	●	●	●	0072.1061.xx
1000	1200	20	10000	6500	860	1414	1728	2700	100	259	●	●	●	0072.1081.xx
1000	1200	25	13000	9000	875	1414	1728	2700	100	471		●	●	0072.1091.xx

1) UL 1449 - Transient Voltage Surge Suppressors - Component

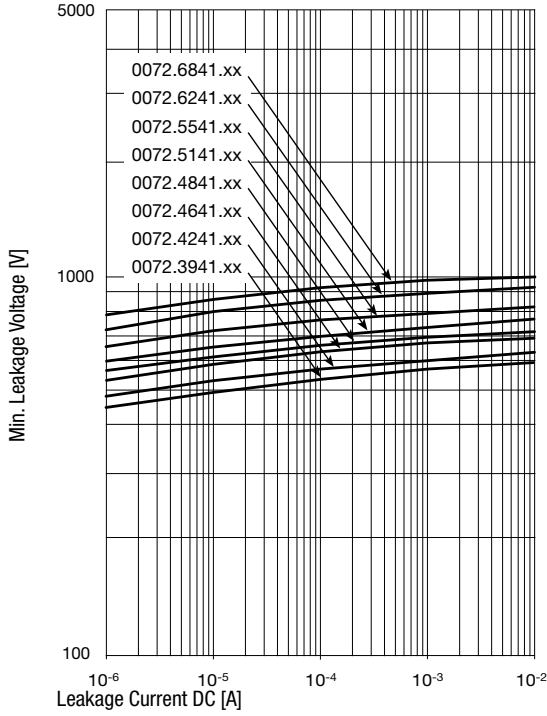
2) UL 1414 - Across-the-line Capacitors, Antenna-coupling and Line-bypass Components

Packaging Unit

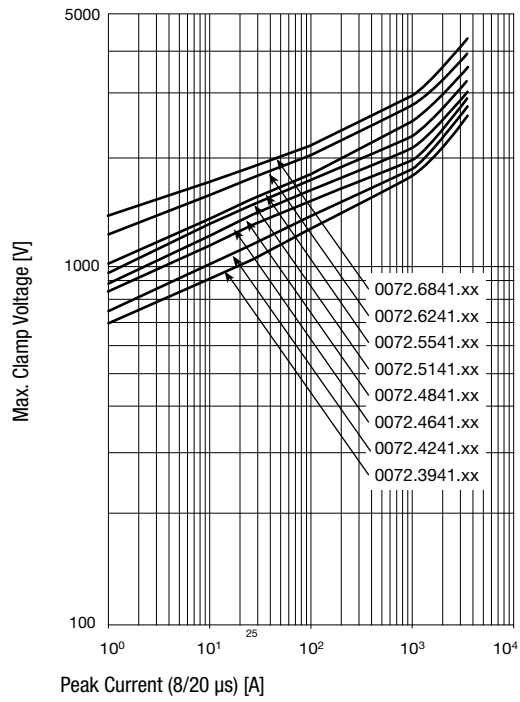
.xx = .B1 Plastic Bag (100 pcs.)
Tape&Reel and Ammo Pack not available

Voltage-Current Curves

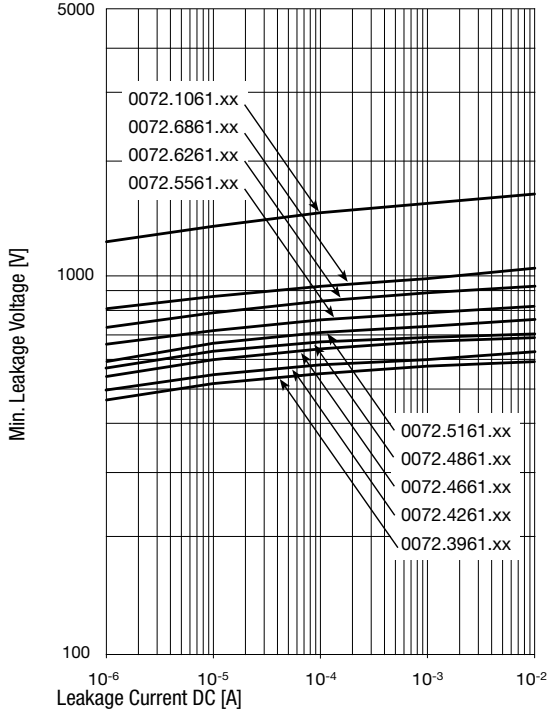
Disc Size: 10 mm



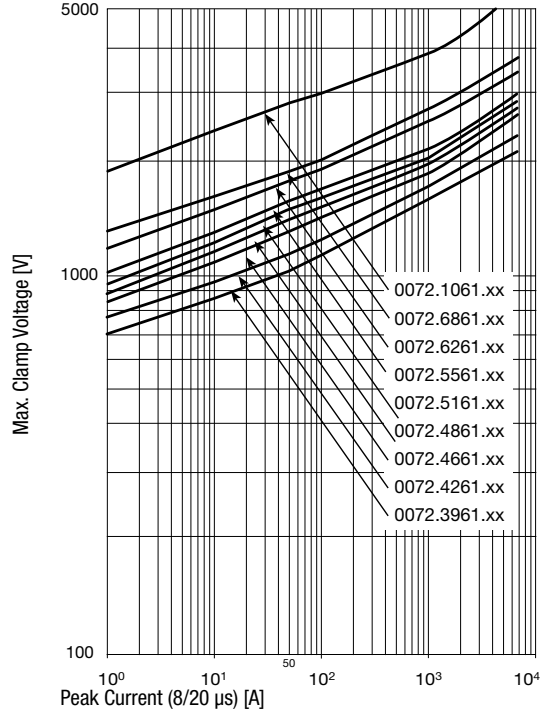
Disc Size: 10 mm



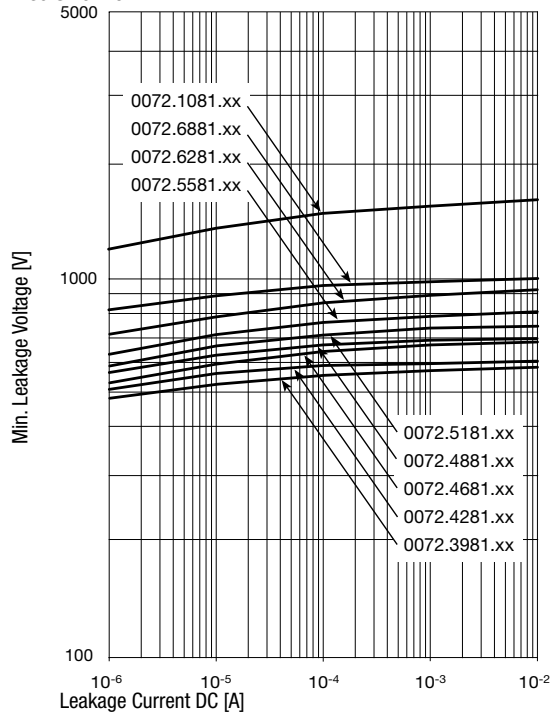
Disc Size: 14 mm



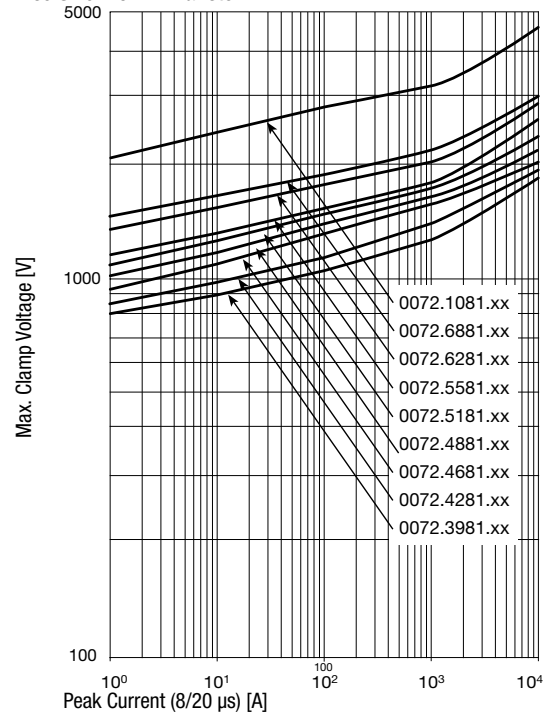
Disc Size: 14 mm



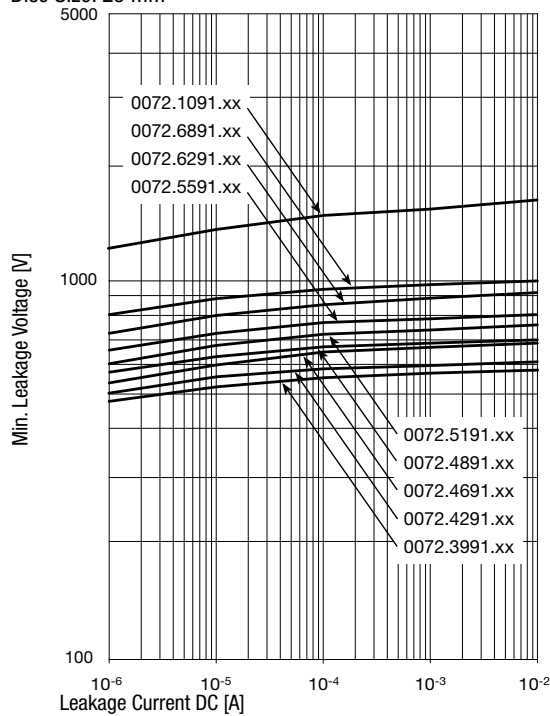
Disc Size: 20 mm



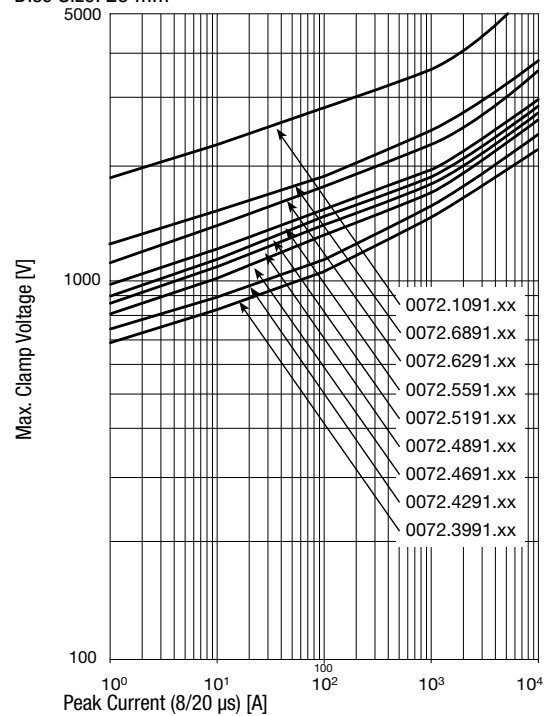
Disc Size: 20 mm Varistor



Disc Size: 25 mm



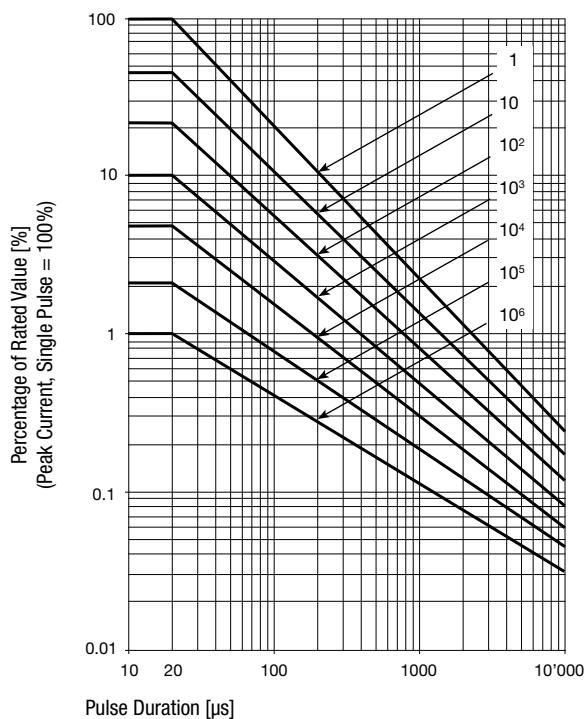
Disc Size: 25 mm



Pulse Derating Curves

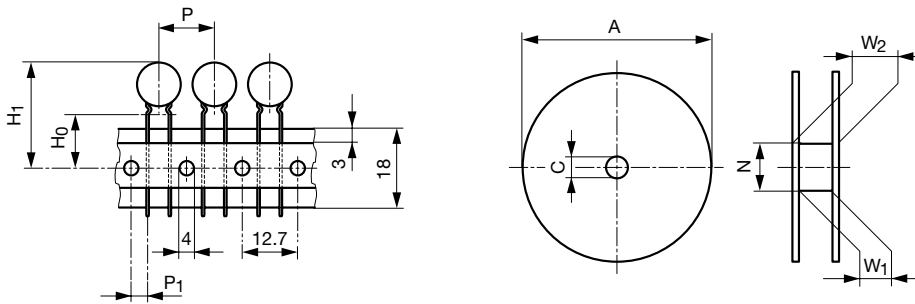
Derating at Quantity of Pulses and Pulse Duration

1, 10, ... = Quantity of Pulses





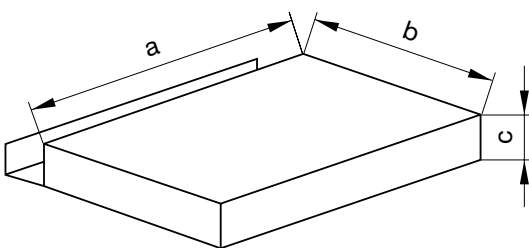
packaging details



Tape and Reel Dimensions

according to IEC 60286-2

Type	P [mm]	P1 [mm]	H1 [mm]	H0 [mm]	H [mm]	N [mm]	W1 [mm]	W2 [mm]	C [mm]	A 400 Pcs.	A 500 Pcs.	A 750 Pcs.	A 1000 Pcs.	A 1500 Pcs.	A 3000 Pcs.
AVTS, 5 + 7 mm	12.7						45	52	30.5						340 mm
AVTS, 10 mm	25.4		32.2				52	59	30.5					340 mm	
AVTS, 14 mm	25.4		36.2				52	59	30.5					340 mm	
AVTS, 20 mm	25.4		45				54.5	61.5	30.5		340 mm				
AVTP, 5 + 7 mm	12.7						45	52	30.5						340 mm
AVTP, 10 mm, 120 - 180 VAC	25.4		32.2				52	59	30.5					340 mm	
AVTP, 10 mm, 230 - 300 VAC	25.4		32.2				52	59	30.5		340 mm				
AVTP, 14 mm, 120 - 180 VAC	25.4		36.2				52	59	30.5					340 mm	
AVTP, 14 mm, 230 - 300 VAC	25.4		36.2				52	59	30.5		340 mm				
AVTP, 20 mm, 120 - 180 VAC	25.4		45				54.5	61.5	30.5		340 mm				
AVTP, 20 mm, 230 - 300 VAC	25.4		45				54.5	61.5	30.5	340 mm					



Ammo Pack Dimensions

Type	a [mm]	b [mm]	c [mm]
AVTS	335	230	60
AVTP	335	230	60



Best Products Worldwide

"Both, now and in the future, our customers are guaranteed the best products world-wide; products which perfectly correspond to their individual needs. SCHURTER is permanently committed to the excellent quality of its products and business practices which are ecologically sound."

Hans-Rudolf Schurter, Schurter Holding AG



Process improvement with SIX SIGMA

We deploy SIX SIGMA's systematic problem-solving method DMAIC to improve our processes. At the same time, this involves eliminating waste of any kind consequently.



Intensive Customer Interaction

"So what made this thing happen was our good teamwork with their technical department and the close and continuous overall development cooperation with the customer."

Raimund Hüglin / Martin Zarges

Product Standard / Definitions / CE-Marking / Conformity	32
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Varistors	33



general product information

Product standard equipment standard

The product standard only contains minimum requirements. Attention is drawn to the fact that appliance specifications might contain requirements additional to or deviating from those specified in the relevant product standards.

Comments on definitions used

Please be aware that the specifications nominal value used in the German part of the Schurter catalogue and the data sheets, is synonymous with rated value.
The difference between these two values is a pure matter of definition. In order to avoid any unnecessary complications we will continue to use the specifications nominal value.

CE marking acc. to EU-directives

CE marking is the only marking which indicates that a product conforms to the relevant EU-directive.
This means that the CE-mark is no quality or standard conformity mark but only an administration mark.
SCHURTER products are covered by the low voltage directives 72/23/EEC and 93/68/EEC. Those are valid for equipment and appliances with rated voltage values between AC 50 V to AC 1000 V as well as DC 75 V to DC 1500 V.
The CE marking of SCHURTER parts will be found on the label of the smallest packing unit. On request we will submit a CE conformity statement for each component. CE conformity statements and approvals can also be retrieved from the internet under www.schurter.com.

Conformity to component standards, national approvals

National testing institutions are testing according to national and international standards or other generally recognized rules of technology. Their certification/approval-marks confirm the observance of the safety requirements which electric appliances must fulfil.

National approvals

	(Mark)	European Norms Electrical Certification
	(Mark)	VDE Verband Deutscher Elektrotechniker
		(Certificate of conformity with factory surveillance)
	UMF	Universal Modular Fuse meets the standard IEC 60127-4
	(Recognition) UL	Underwriters Laboratories (USA, Canada)
	(Listing) UL	Underwriters Laboratories (USA, Canada)
	(Recognition) UL	Underwriters Laboratories (USA)
	(Listing) UL	Underwriters Laboratories (USA, Canada)
	CSA	Canadian Standard Association, Component Acceptance Service
	CSA	Canadian Standard Association
	CCC	China Compulsory Certification
	PSE	Japan Electrical Safety & Environment technology Laboratories
	KTL	Korea Testing Laboratory
	TÜV	Technischer Überwachungs Verein
	NF	Norme française
	NNO	Numéro de nomenclature Otan (OTAN = NATO = North Atlantic Treaty Organisation)
	GAM T1	Liste interarmées AIR MER TERRE de composants électroniques

In addition to the combined UL/CSA approvals, most of the SCHURTER components are also approved by one of the European Certification Bodies like VDE (Germany), Electrosuisse (Switzerland) or SEMKO (Sweden). The safety testing of all these European Certification Bodies are based on the common European Safety Standards. With the harmonisation effort in Europe, the different National European Certification Bodies have lost their importance and SCHURTER has decided to maintain only one European approval (e.g. VDE, SEV or SEMKO) in future. The others will not be renewed once they have expired.

Because UL and CSA are not members of the CENELEC, the standards of UL and CSA are not harmonised yet with the European Standards. However, UL and CSA are trying to harmonize their standards with each other. Where possible, SCHURTER will apply for the combined cULus or cURus approval.

Further to development in Asia, SCHURTER has obtained national approvals from China, Japan and Korea.



Varistors

Introduction

Varistors (Variable Resistors) are voltage-dependent, nonlinear resistors with a symmetrical current-voltage characteristic curve (Figure 1) where the impedance decreases when the voltage decreases. Varistors are often also referred to as MOV (Metal Oxide Varistors), ZnO (Zinc Oxide Varistors), VDR (Voltage Dependent Resistors) and TVSS (Transient Voltage Surge Suppressors).

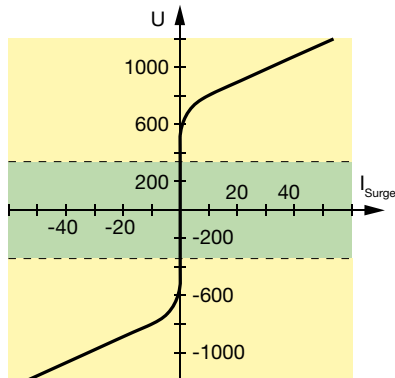


Figure 1: Voltage/current curve, green: Normal operation, yellow: Conductive in the event of high voltages

Varistors come into operation when a power surge occurs, which may be caused by a lightning strike or by inductive load switching. Parallel-connected to the protective circuit, they keep the surge from exceeding a predefined level and thus prevent the downstream-connected components from being exposed to large voltage spikes (Figure 2).

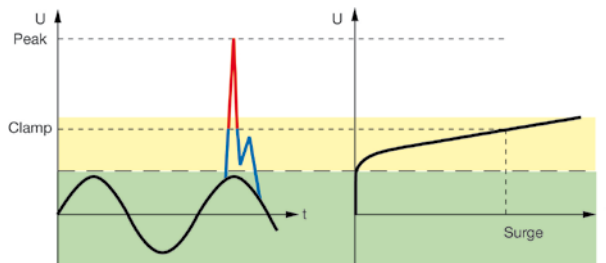


Figure 2: Voltage peak, red: Absorbed by the varistor, blue: Absorbed by downstream-connected components

A varistor's current flow during normal operation (high-impedance state) and its current flow when a malfunction caused by voltage transient occurs (low-impedance state) are shown in Figures 3 and 4.

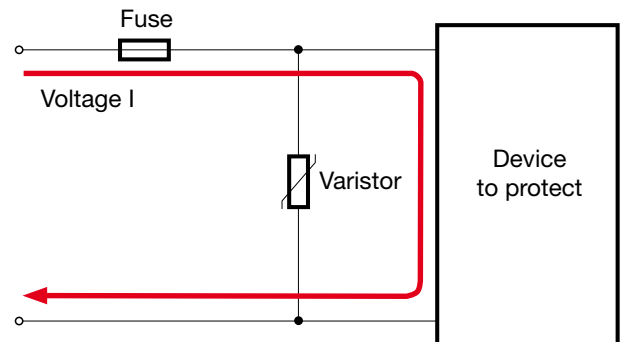


Figure 3: Current flow during normal operation (high impedance)

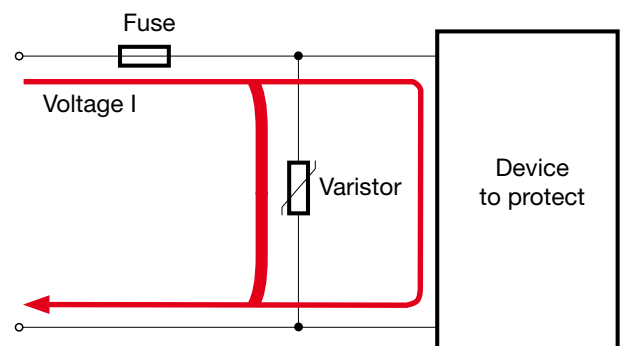


Figure 4: Current flow when a malfunction caused by voltage transient occurs (low impedance)

Working Principle

Varistors are made from a polycrystalline ceramic material, mainly zinc oxide and a number of metal oxides, sintered at a temperature of approx. 1250 °C. Their impedance changes depending on the voltage applied. The dependency is not linear, but symmetrical, and the impedance, within a small voltage range, changes abruptly from a high-impedance (MΩ) to a low-impedance (a few Ω) state

Technical Properties

High nonlinearity	Very low leakage current
Short response time	A highly important property with regard to protecting semiconductor circuits
Broad coverage	Varistors are available for a wide range of voltage and energy absorption applications.

Parameters

Operating Voltage:

The catalogue data sheet's table of variants specifies a maximal AC and DC rated voltage which should not be exceeded when in operation; hence the voltage supply's tolerance range needs also to be taken into account when selecting a component.

Max. Clamping Voltage when Transients/Surges Occurs:

This parameter defines the maximal voltage when a spike occurs. The voltage/current curves (Figure 5) show the maximal clamp voltage on a standard surge (8/20 μs) according to IEC 60060. The downstream-connected components must be capable of withstanding this voltage level with a tolerance of between 10 and 20%.

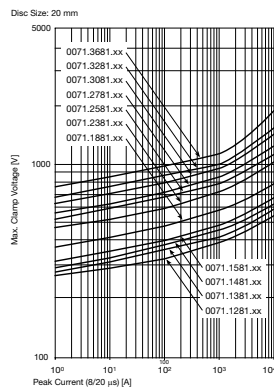


Figure 5: Voltage/current curves for maximal clamping voltage, shown on the example of the AVTP, 20 mm disc size

Permissible Peak Current:

The number of peak currents (surges, transients) that a varistor can absorb over its lifespan depends on the amplitude and the surge duration. The catalogue data sheet's table of variants specifies how many one-time and two-time non-repeated standard surges (8/20 μ s) according to IEC 60060 a varistor can withstand. Longer and/or repeated surges require an appropriate derating, as shown in Figure 6.

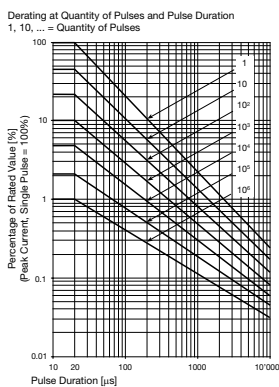


Figure 6: Derating curve for quantity of surges and pulse duration

Energy Absorption Capability:

Energy absorption correlates to the permissible peak current. This parameter is stated in the catalogue data sheet using the standard surge waveform (10/1000 μ s) according to IEC 60060. This value supports the selection process, when e.g. for a protection of a choke a varistor needs to be chosen. The energy of a choke can be directly calculated by the inductance and the current.

Minimal Leakage Current:

Figure 7 represents the varistor's behavior during normal operation (high-impedance state), showing the minimal leakage current at a given voltage.

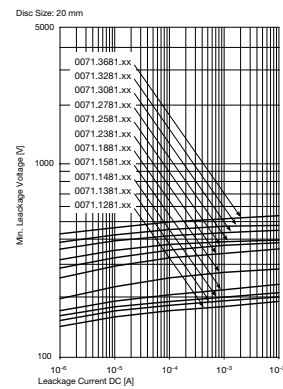


Figure 7: Voltage/current curves for leakage voltage, shown on the example of the AVTP, 20 mm disc size

Varistor Voltage at the 1 mA Point:

The catalogue data sheet states minimal and maximal voltage values for when a 1 mA current is flowing through the varistor. This parameter, a standard by now, permits the comparison of varistors. If it deviates by more than 10% from the original value, the varistor is deemed defective. The term used in such cases is degradation.

Average Power Dissipation:

This parameter is negligible under normal operating conditions. Power dissipation becomes meaningful where there is not enough time for the varistor to cool down between two surges. When temperature rises, the varistor voltage at the 1 mA point decreases and the power dissipation is getting more. When this is the case, the varistor becomes defective.

Operation at High Temperatures:

If a varistor operates at more than 85 °C, voltage, current and energy must be derated as shown in Figure 8.

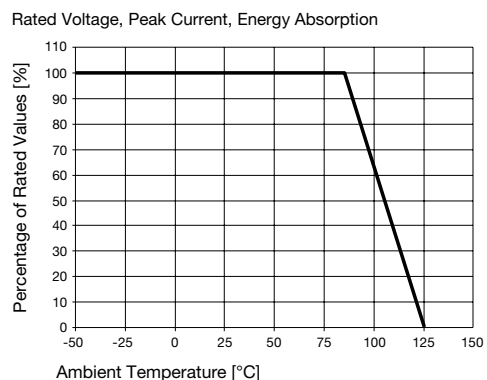


Figure 8: Temperature derating curve

Response Time:

Radial leaded varistors typically feature response times of 50 ns or less.

Varistor Voltage Tolerance Range:

All SCHURTER varistors have a tolerance range of 10%.

Intrinsic Capacitance:

The catalogue data sheet shows information on the capacitance at 1 kHz, which increases along with disc size, while it decreases in proportion to the rise in nominal voltage. This shows that varistors are not suitable for protection in high frequency circuits. Varistors work in a very efficient way at line frequency of 50/60 Hz.

Approvals

The following component standards apply to zinc oxide varistors:

IEC 61051	Varistors for Use in Electronic Equipment	
UL 1449	Transient Voltage Surge Suppressors	
UL 1414	Across-the-Line Components	
CSA C22.2	Accessories and Parts for Electronic Equipment	

Typical Application Circuit Diagrams

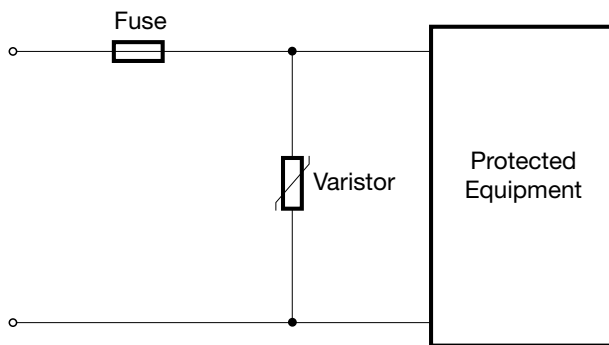


Figure 9: AC or DC circuit

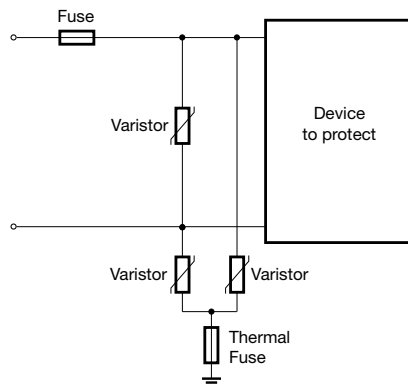


Figure 10: AC or DC circuit with thermal fuse

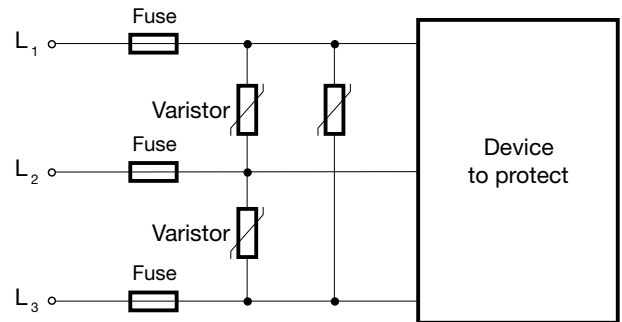


Figure 11: AC 3-phase circuit

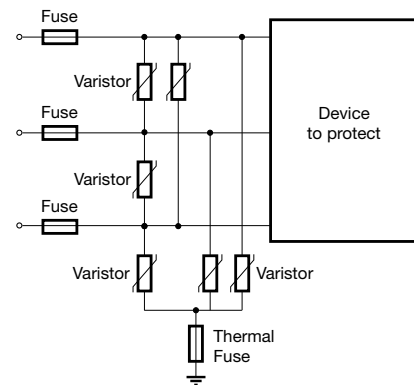


Figure 12: AC 3-phase circuit with thermal fuse

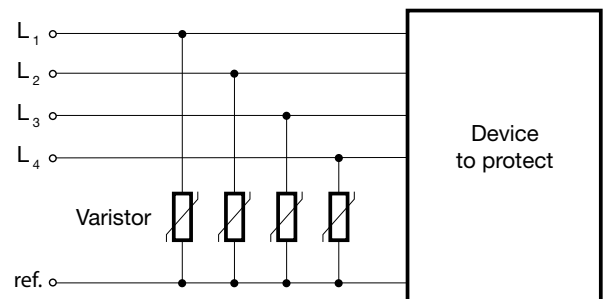


Figure 13: Data lines

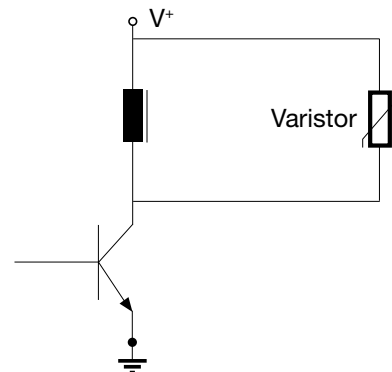


Figure 14: Switch-off protection



general product information

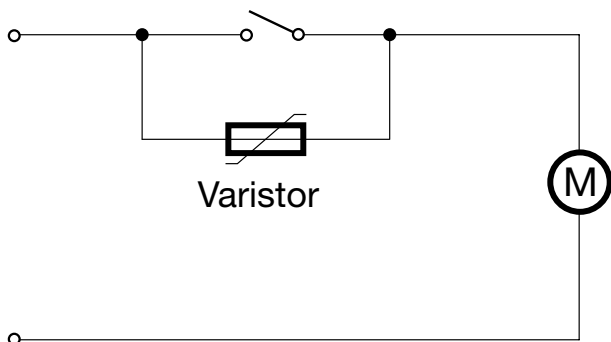


Figure 15: Switch protection (arc suppression)

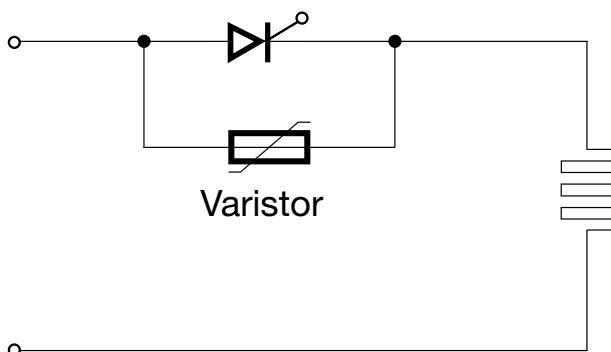


Figure 16: Semiconductor protection

EMC, Surge Test, IEC 61000-4-5

Varistors are typically used to enable appliance to pass the surge test according to IEC 61000-4-5. To give an example: An appliance must withstand ten 2 kV surges at 2 Ω line impedance and meet the required criterion B, i.e. the appliance may be temporarily impaired in terms of its purpose and/or properties as a result of the test, but it must reset itself autonomously. No permanent or temporary shutoff is permitted. Varistors make it possible, for instance, to reduce the 2 kV surges to a lower level (Figure 17), which in turn allows manufacturers to include less expensive components offering lower surge voltage resistance in their circuits.

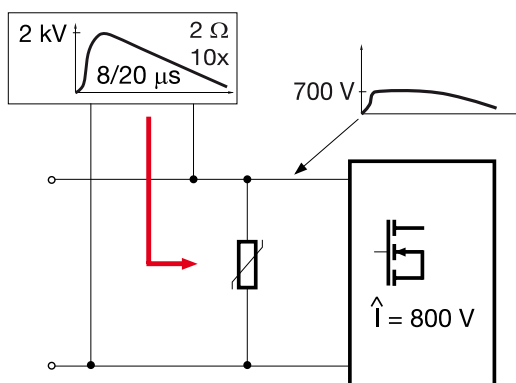


Figure 17: Test circuit for surge test according to IEC 61000-4-5.

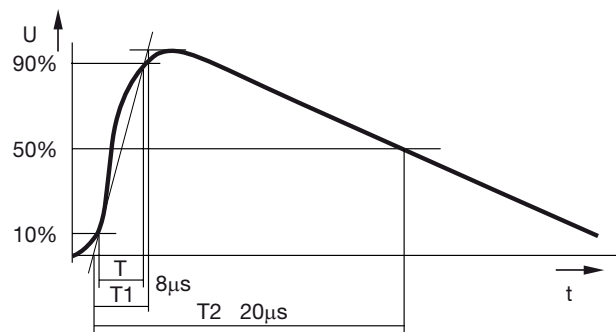


Figure 18: Standard Waveform (8/20 μ s) according to IEC 60060

Selection Procedure

Step 1: Establishing the varistor's voltage

The lowest varistor voltage depends on the highest AC or DC voltage applied. Usually, the tolerance range is assumed to be between ± 10 and 20%, by which the voltage supply may fluctuate. The following varistor voltages are commonly used:

- 24 VDC secondary voltage
Recommended varistor voltage:
26 VDC (AVTS, 0070.20xx.xx)
31 VDC (AVTS, 0070.25xx.xx)
38 VDC (AVTS, 0070.30xx.xx)
- 120 VAC line voltage (USA)
Recommended varistor voltage:
130 VAC (AVTP, 0071.13xx.xx)
140 VAC (AVTP, 0071.14xx.xx)
150 VAC (AVTP, 0071.15xx.xx)
- 230 VAC line voltage (EU)
Recommended varistor voltage:
270 VAC (AVTP, 0071.27xx.xx)
300 VAC (AVTP, 0071.30xx.xx)
- 400 VAC 3-phase line voltage (EU)
Recommended varistor voltage:
460 VAC (AVTT, 0072.46xx.xx)
- 480 VAC 3-phase line voltage (USA)
Recommended varistor voltage:
550 VAC (AVTT, 0072.55xx.xx)

Another approach leading to the same result is to check whether the minimal voltage at the 1 mA point exceeds the peak value of the applied voltage including tolerance, such as is the case in Europe, where the line voltage is $230 \text{ V} \cdot 1.1 \cdot \sqrt{2} = 358 \text{ VAC}$. The 270 VAC (AVTP, 0071.27xx.xx) version, according to the catalogue data sheet, has a minimal voltage at the 1 mA point of 382 VAC and therefore meets the requirement.

If a varistor operates at temperatures of up to 85 $^{\circ}\text{C}$, a voltage temperature derating of $-0.05\% / ^{\circ}\text{C}$ is to be taken into account in addition to the above. The catalogue data sheet parameters apply to an operating temperature of 25 $^{\circ}\text{C}$. Ambient temperatures above 85 $^{\circ}\text{C}$ and up to 125 $^{\circ}\text{C}$ necessitate the use of the temperature derating curve (Figure 8).

Once the varistor voltage has been established, the maximal clamping voltage, which depends on the expected peak current, can be determined using the voltage/current curve (Figure 6) as a reference. The circuit to be protected will require components capable of withstanding this level of interference voltage. The relevant data are usually available from the manufacturer. And again, a safety margin of between 10 and 20% needs to be maintained here as well.



general product information

Step 2: Establishing the maximum permissible peak current

Step 3: Establishing energy absorption

Step 4: Establishing power dissipation

Step 5: Testing the protective performance in practice

All important information regarding steps 2 to 4 can be found in the section on "Parameters".



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"Europe is still our main market. Other markets such as the US and the Far East deal with entirely different issues and requirements."

Hans-Rudolf Schurter

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AVTP

Overvoltage Protection for Primary Circuits



Radial leaded varistors (MOV) as protection against voltage transients in electronic equipments.

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SCHURTER Electronics Shenzhen Ltd.
Tel: ++86 755 2994 0066
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CHI LICK SCHURTER Ltd.
Hong Kong SAR
Tel: ++852 2408 7798
fuse@chilickschurter.com

Czech Republic

SCHURTER spol. s.r.o.
Tel: ++42 +0483 392 080
firma@schurter.cz

France

SCHURTER SAS
Tel: ++33 +3 2502 5049
contact@schurter.fr

Germany

SCHURTER GmbH
Tel: ++49 +7642 6820
info@schurter.de

SCHURTER Otto Heil GmbH
Tel: ++49 +6171 506 10
sales@schurter-heil.de

India

SCHURTER Electronics (India) Pvt. Ltd.
Tel: ++91 +2667 264753/4
info@schurter.co.in

Italy

KEVIN-SCHURTER S.p.a
Tel: ++39 +02 3046 5311
info@kevin.it

Japan

SCHURTER K. K.
Tel: ++81 +3 5465 2062
info@schurter.co.jp

Singapore

SCHURTER (S) Pte. Ltd. (APAC HQs)
Tel: ++65 6291 2111
info@schurter.com.sg

Slovakia

SCHURTER (SK) s.r.o.
Tel: ++42 138 539 84 80

Sweden

SCHURTER Nordic AB
Tel: ++46 +8 447 35 60
info@schurter.se

UK

SCHURTER Ltd.
Tel: ++44 +1243 810 810
sales@schurter.co.uk

USA

SCHURTER Inc.
Tel: ++1 +707 636 3000
info@schurterinc.com

> INPUT SYSTEMS

Germany

SCHURTER GmbH
Tel: ++49 +7642 6820
info@schurter.de

Switzerland

MEIERHOFER AG
Tel: ++41 +56 481 90 00
info@meierhofer.ch

> EMS

ELECTRONIC MANUFACTURING SERVICES

Romania

INTERELEKTRONIC SRL
Tel: +402 135 08 100
info@interelektronic.ro

Switzerland

TICOMEL SA
Tel: ++41 +91 640 44 10
contact@ticomel.ch