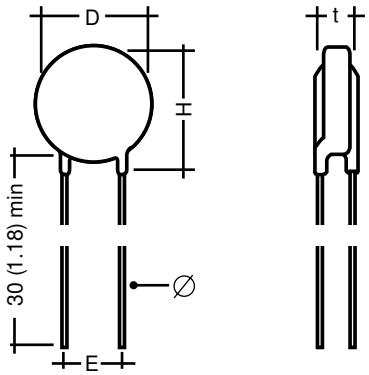
Zinc Oxide Varistors

VE/VF Types for Heavy Duty Applications ("P Series")

FEATURES

- "P Series" are especially dedicated to heavy duty applications encountered in the AC power network. Higher surge current and energy ratings provide an improved protection and a better reliability
- Radial lead varistors
- Operating voltage range from 130 V to 625 V (V_{rms} for VE types) or 205 V to 1000 V (V_{1mA} for VF types)
- Available in tape and reel for use with automatic insertion equipment (see pages 31 to 33 for details).



PARTICULAR CHARACTERISTICS

UL (USA and Canadian Standards)	VE Series P/N codification using (D_{max} , V_{rms})	VF Series P/N codification using ($d_{ceramic}$, V_{1mA})	Maximum operating voltage		Nominal voltage at 1 mA dc		
			V_{rms}	V_{DC}	$V_{1mA\ mini}$	$V_{1mA\ nominal}$	$V_{1mA\ maxi}$
★	VE07P00131K _ _	VF05P12050K _ _	130	170	184	205	226
★	VE09P00131K _ _	VF07P12050K _ _					
★	VE13P00131K _ _	VF10P12050K _ _					
★	VE17P00131K _ _	VF14P12050K _ _					
★	VE24P00131K _ _	VF20P12050K _ _					
★	VE07P00141K _ _	VF05P10221K _ _	140	180	198	220	242
★	VE09P00141K _ _	VF07P10221K _ _					
★	VE13P00141K _ _	VF10P10221K _ _					
★	VE17P00141K _ _	VF14P10221K _ _					
★	VE24P00141K _ _	VF20P10221K _ _					
★	VE07P00151K _ _	VF05P10241K _ _	150	200	216	240	264
★	VE09P00151K _ _	VF07P10241K _ _					
★	VE13P00151K _ _	VF10P10241K _ _					
★	VE17P00151K _ _	VF14P10241K _ _					
★	VE24P00151K _ _	VF20P10241K _ _					
★	VE07P01750K _ _	VF05P10271K _ _	175	225	243	270	297
★	VE09P01750K _ _	VF07P10271K _ _					
★	VE13P01750K _ _	VF10P10271K _ _					
★	VE17P01750K _ _	VF14P10271K _ _					
★	VE24P01750K _ _	VF20P10271K _ _					
★	VE07P00211K _ _	VF05P10331K _ _	210	275	297	330	363
★	VE09P00211K _ _	VF07P10331K _ _					
★	VE13P00211K _ _	VF10P10331K _ _					
★	VE17P00211K _ _	VF14P10331K _ _					
★	VE24P00211K _ _	VF20P10331K _ _					
★	VE07P00231K _ _	VF05P10361K _ _	230	300	324	360	396
★	VE09P00231K _ _	VF07P10361K _ _					
★	VE13P00231K _ _	VF10P10361K _ _					
★	VE17P00231K _ _	VF14P10361K _ _					
★	VE24P00231K _ _	VF20P10361K _ _					

Zinc Oxide Varistors

VE/VF Types for Heavy Duty Applications ("P Series")

DIMENSIONS millimeters (inches)

Type	Type	D		H	t	ø	E
		Ceramic diameter	Maximum coated diameter	max.	max.	+10% –0.05 (.002)	± 0.8
VE07	VF05	5 (.196)	7 (.275)	10 (.394)	see table	0.6 (.024)	5.08 (0.20)
VE09	VF07	7 (.275)	9 (.354)	12 (.472)		0.6 (.024)	5.08 (0.20)
VE13*	VF10*	10 (.393)	13* (.512)	16 (.630)		0.8* (.031)	7.62*(0.30)
VE17	VF14	14 (.551)	17 (.669)	20 (.787)		0.8 (.031)	7.62 (0.30)
VE24**	VF20**	20 (.787)	24 (.945)	27 (1.06)		0.8** (.031)	7.62 (0.30)

* VE13 / VF10: For models with $V_{RMS} \leq 320$ V
other version/suffixes available with:
E = 5.08 (0.20) Suffix:
Ø = 0.6 (.024) Bulk: HB
D = 12.5 (.492) max Tape: DA, DB, DC, DD, DQ, ...

**VE24 / VF20: For lead diameter = 1.0 (.039), please consult us.

GENERAL CHARACTERISTICS

Storage temperature:	-40°C to +125°C
Max. operating temperature:	+85°C
Response time:	< 25 ns
Voltage coefficient temp.:	$\|K\|$ < 0.09%/°C
Voltage proof:	2500 V
Epoxy coating:	Flame retardant UL94-VO

MARKING

Type
AC nominal voltage (EIA coding) for VE types
V_{1mA} varistor voltage (EIA coding) for VF types
Logo
UL logo (when approved)
Lot number (VE13/17/24 and VF10/14/20 only)

Max. clamping voltage (8 x 20 µs)		Max. energy absorption (10 x 1000 µs) W (J) Number of surges	Max. permissible peak current (8 x 20 µs) Ip (A)		Typical capacitance f = 1kHz	Mean power dissipation	Maximum thickness t	V/I characteristic	Derating curves
Vp (V)	Ip (A)	1 surge	1 surge	2 surges	pF	W	mm (inches)	Page	Page
340	5	8.5	800	600	90	0.1	4.1 (.161)	34	24
340	10	17.5	1750	1250	250	0.2	4.1 (.161)	34	25
340	25	35	3500	2500	450	0.4	4.7 (.185)	34	26
340	50	70	6000	4500	1000	0.6	4.7 (.185)	35	27
340	100	140	10000	7000	2500	0.8	5.1 (.201)	35	28
360	5	9	800	600	85	0.1	4.2 (.165)	34	24
360	10	19	1750	1250	235	0.2	4.2 (.165)	34	25
360	25	39	3500	2500	425	0.4	4.8 (.189)	34	26
360	50	78	6000	4500`	930	0.6	4.8 (.189)	35	27
360	100	155	10000	7000	2250	0.8	5.2 (.205)	35	28
400	5	10.5	800	600	80	0.1	4.3 (.169)	34	24
400	10	21	1750	1250	220	0.2	4.3 (.169)	34	25
400	25	42	3500	2500	400	0.4	4.9 (.193)	34	26
400	50	85	6000	4500	850	0.6	4.9 (.193)	35	27
400	100	170	10000	7000	2000	0.8	5.3 (.209)	35	28
445	5	11	800	600	70	0.1	4.5 (.177)	34	24
445	10	24	1750	1250	190	0.2	4.5 (.177)	34	25
445	25	50	3500	2500	340	0.4	5.1 (.201)	34	26
445	50	100	6000	4500	750	0.6	5.1 (.201)	35	27
445	100	190	10000	7000	2000	0.8	5.5 (.217)	35	28
545	5	13	800	600	60	0.1	4.9 (.193)	34	24
545	10	28	1750	1250	155	0.2	4.9 (.193)	34	25
545	25	60	3500	2500	275	0.4	5.5 (.217)	34	26
545	50	115	6000	4500	600	0.6	5.5 (.217)	35	27
545	100	230	10000	7000	1650	0.8	5.9 (.232)	35	28
595	5	16	800	600	55	0.1	5.1 (.201)	34	24
595	10	32	1750	1250	140	0.2	5.1 (.201)	34	25
595	25	65	3500	2500	250	0.4	5.7 (.224)	34	26
595	50	130	6000	4500	550	0.6	5.7 (.224)	35	27
595	100	250	10000	7000	1500	0.8	6.1 (.240)	35	28

Zinc Oxide Varistors

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UL (USA and Canadian Standards)	VE Series P/N codification using (D_{max} , V_{rms})	VF Series P/N codification using ($d_{ceramic}$, V_{1mA})	Maximum operating voltage		Nominal voltage at 1 mA dc		
			V_{rms}	V_{DC}	$V_{1mA\ mini}$	$V_{1mA\ nominal}$	$V_{1mA\ maxi}$
★	VE07P00251K _ _	VF05P10391K _ _	250	320	351	390	429
★	VE09P00251K _ _	VF07P10391K _ _					
★	VE13P00251K _ _	VF10P10391K _ _					
★	VE17P00251K _ _	VF14P10391K _ _					
★	VE24P00251K _ _	VF20P10391K _ _					
★	VE07P02750K _ _	VF05P10431K _ _	275	350	387	430	473
★	VE09P02750K _ _	VF07P10431K _ _					
★	VE13P02750K _ _	VF10P10431K _ _					
★	VE17P02750K _ _	VF14P10431K _ _					
★	VE24P02750K _ _	VF20P10431K _ _					
★	VE07P00301K _ _	VF05P10471K _ _	300	385	423	470	517
★	VE09P00301K _ _	VF07P10471K _ _					
★	VE13P00301K _ _	VF10P10471K _ _					
★	VE17P00301K _ _	VF14P10471K _ _					
★	VE24P00301K _ _	VF20P10471K _ _					
★	VE09P00321K _ _	VF07P10511K _ _	320	420	459	510	561
★	VE13P00321K _ _	VF10P10511K _ _					
★	VE17P00321K _ _	VF14P10511K _ _					
★	VE24P00321K _ _	VF20P10511K _ _					
★	VE09P00351K _ _	VF07P10561K _ _	350	460	504	560	616
★	VE13P00351K _ _	VF10P10561K _ _					
★	VE17P00351K _ _	VF14P10561K _ _					
★	VE24P00351K _ _	VF20P10561K _ _					
★	VE09P03850K _ _	VF07P10621K _ _	385	505	558	620	682
★	VE13P03850K _ _	VF10P10621K _ _					
★	VE17P03850K _ _	VF14P10621K _ _					
★	VE24P03850K _ _	VF20P10621K _ _					
★	VE09P00421K _ _	VF07P10681K _ _	420	560	612	680	748
★	VE13P00421K _ _	VF10P10681K _ _					
★	VE17P00421K _ _	VF14P10681K _ _					
★	VE24P00421K _ _	VF20P10681K _ _					
★	VE13P00441K _ _	VF10P17150K _ _	440	585	643	715	787
★	VE17P00441K _ _	VF14P17150K _ _					
★	VE24P00441K _ _	VF20P17150K _ _					
★	VE13P00461K _ _	VF10P10751K _ _	460	615	675	750	825
★	VE17P00461K _ _	VF14P10751K _ _					
★	VE24P00461K _ _	VF20P10751K _ _					
★	VE13P00511K _ _	VF10P10821K _ _	510	670	738	820	902
★	VE17P00511K _ _	VF14P10821K _ _					
★	VE24P00511K _ _	VF20P10821K _ _					
★	VE13P00551K _ _	VF10P10861K _ _	550	715	774	860	946
★	VE17P00551K _ _	VF14P10861K _ _					
★	VE24P00551K _ _	VF20P10861K _ _					
★	VE13P05750K _ _	VF10P10911K _ _	575	730	819	910	1001
★	VE17P05750K _ _	VF14P10911K _ _					
★	VE24P05750K _ _	VF20P10911K _ _					
★	VE13P06250K _ _	VF10P10102K _ _	625	825	900	1000	1100
★	VE17P06250K _ _	VF14P10102K _ _					
★	VE24P06250K _ _	VF20P10102K _ _					

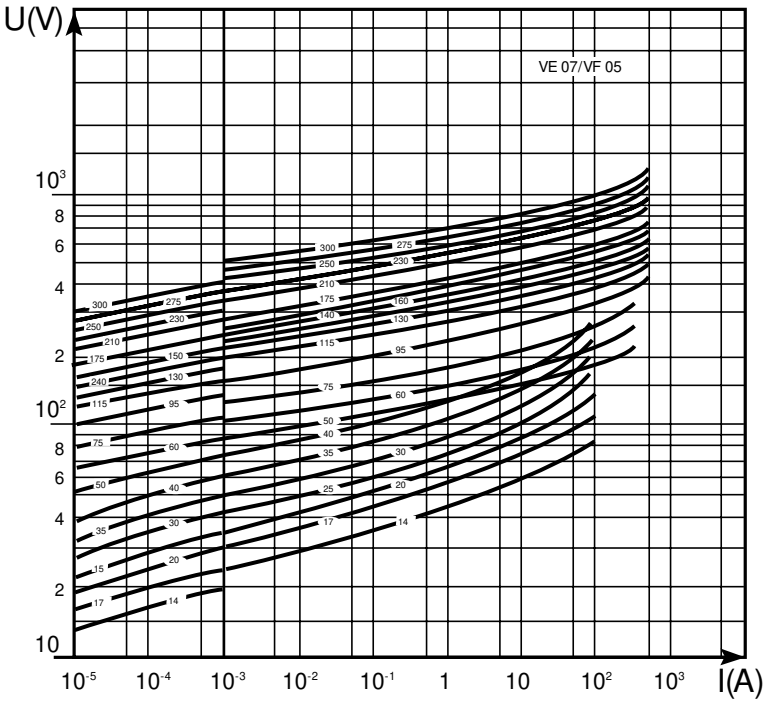
Zinc Oxide Varistors

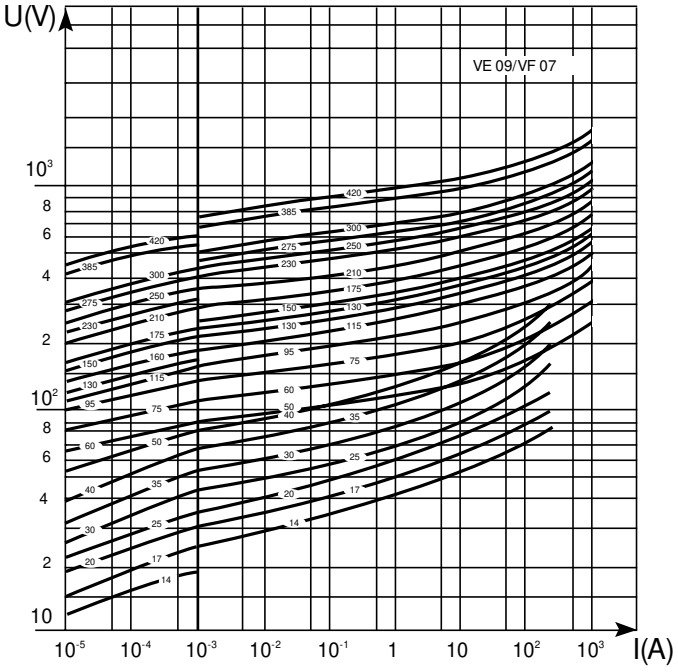
VE/VF Types for Heavy Duty Applications ("P Series")

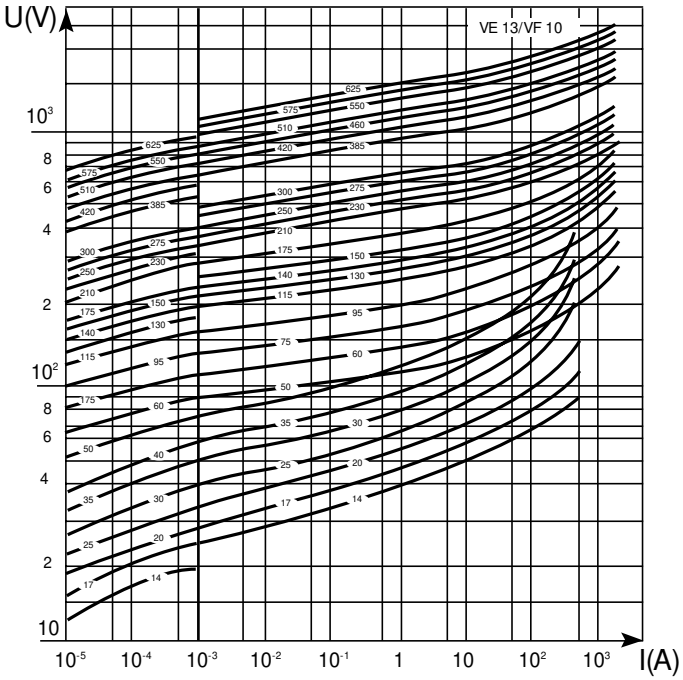
Max. clamping voltage (8 x 20 µs) Vp (V)	Ip (A)	Max. energy absorption (10 x 1000 µs) W (J) Number of surges 1 surge	Max. permissible peak current (8 x 20 µs) Ip (A) 1 surge	2 surges	Typical capacitance f = 1kHz pF	Mean power dissipation W	Maximum thickness t mm (inches)	V/I characteristic Page	Derating curves Page
645	5	17	800	600	50	0.1	5.4 (.213)	34	24
645	10	35	1750	1250	130	0.2	5.4 (.213)	34	25
645	25	70	3500	2500	230	0.4	5.9 (.232)	34	26
645	50	140	6000	4500	500	0.6	5.9 (.232)	35	27
645	100	280	10000	7000	1300	0.8	6.3 (.248)	35	28
710	5	20	800	600	45	0.1	5.7 (.224)	34	24
710	10	40	1750	1250	120	0.2	5.7 (.224)	34	25
710	25	80	3500	2500	210	0.4	6.3 (.248)	34	26
710	50	160	6000	4500	450	0.6	6.3 (.248)	35	27
710	100	310	10000	7000	1200	0.8	6.7 (.264)	35	28
775	5	21	800	600	40	0.1	6.0 (.236)	34	24
775	10	42	1750	1250	100	0.2	6.0 (.236)	34	25
775	25	85	3500	2500	180	0.4	6.6 (.260)	34	26
775	50	170	6000	4500	400	0.6	6.6 (.260)	35	27
775	100	340	10000	7000	1000	0.8	7.0 (.276)	35	28
840	10	45	1750	1250	100	0.2	6.4 (.252)	34	25
840	25	90	3500	2500	170	0.4	7.0 (.276)	34	26
840	50	180	5000	4000	380	0.6	7.0 (.276)	35	27
840	100	360	8000	6000	950	0.8	7.5 (.295)	35	28
910	10	47	1750	1250	95	0.2	6.6 (.260)	34	25
910	25	95	3500	2500	160	0.4	7.3 (.287)	34	26
910	50	190	5000	4000	365	0.6	7.3 (.287)	35	27
910	100	380	8000	6000	900	0.8	7.8 (.307)	35	28
1025	10	50	1750	1250	95	0.2	7.0 (.276)	34	25
1025	25	100	3500	2500	150	0.4	7.7 (.303)	34	26
1025	50	200	5000	4000	350	0.6	7.7 (.303)	35	27
1025	100	400	8000	6000	850	0.8	8.1 (.319)	35	28
1120	10	52	1750	1250	80	0.2	7.4 (.291)	34	25
1120	25	105	3500	2500	120	0.4	8.2 (.323)	34	26
1120	50	210	5000	4000	300	0.6	8.2 (.323)	35	27
1120	100	420	8000	6000	700	0.8	8.6 (.339)	35	28
1180	25	105	3500	2500	115	0.4	8.4 (.331)	34	26
1180	50	210	5000	4000	275	0.6	8.4 (.331)	35	27
1180	100	420	8000	6000	650	0.8	8.8 (.346)	35	28
1240	25	105	3500	2500	110	0.4	8.5 (.335)	34	26
1240	50	210	5000	4000	250	0.6	8.5 (.335)	35	27
1240	100	420	8000	6000	600	0.8	9.0 (.354)	35	28
1350	25	110	3500	2500	100	0.4	9.0 (.354)	34	26
1350	50	225	5000	4000	220	0.6	9.0 (.354)	35	27
1350	100	450	7500	6000	550	0.8	9.4 (.370)	35	28
1420	25	120	3500	2500	90	0.4	9.3 (.366)	34	26
1420	50	240	5000	4000	200	0.6	9.3 (.366)	35	27
1420	100	480	7500	6000	500	0.8	9.7 (.382)	35	28
1500	25	125	3500	2500	80	0.4	9.7 (.382)	34	26
1500	50	250	5000	4000	180	0.6	9.7 (.382)	35	27
1500	100	500	7500	6000	450	0.8	10.1 (.398)	35	28
1650	25	140	3500	2500	74	0.4	10.5 (.413)	34	26
1650	50	230	5000	4000	165	0.6	10.5 (.413)	35	27
1650	100	560	7500	6000	410	0.8	11.0 (.433)	35	28

VOLTAGE-CURRENT CHARACTERISTICS

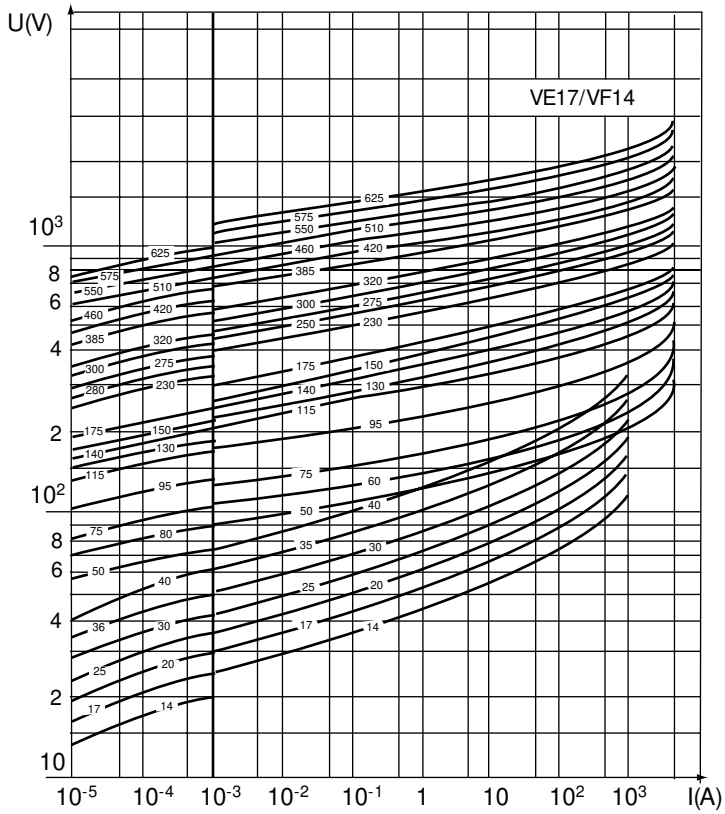
V/I characteristics give:
- for I below 1 mA the maximum leakage current under V_{dc}
- for I above 1 mA the maximum clamping voltage

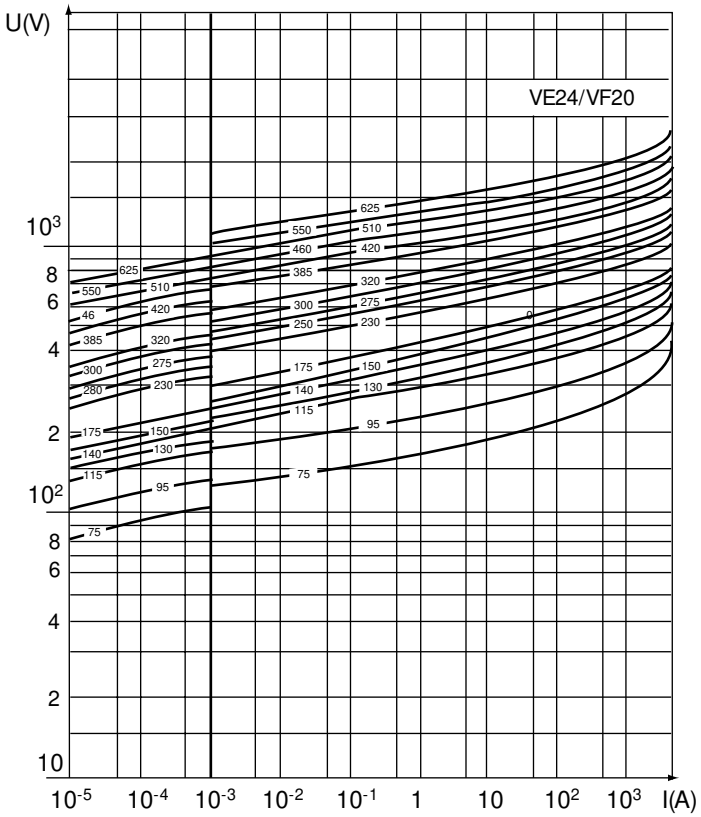




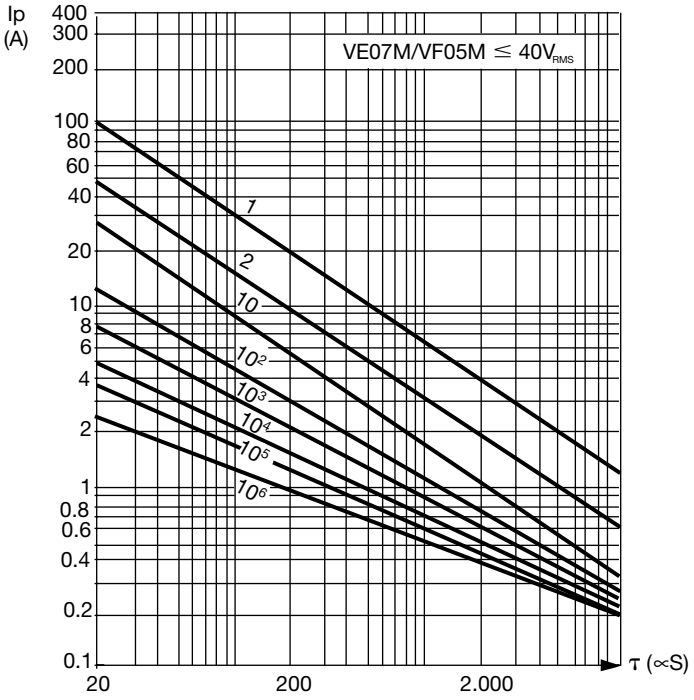


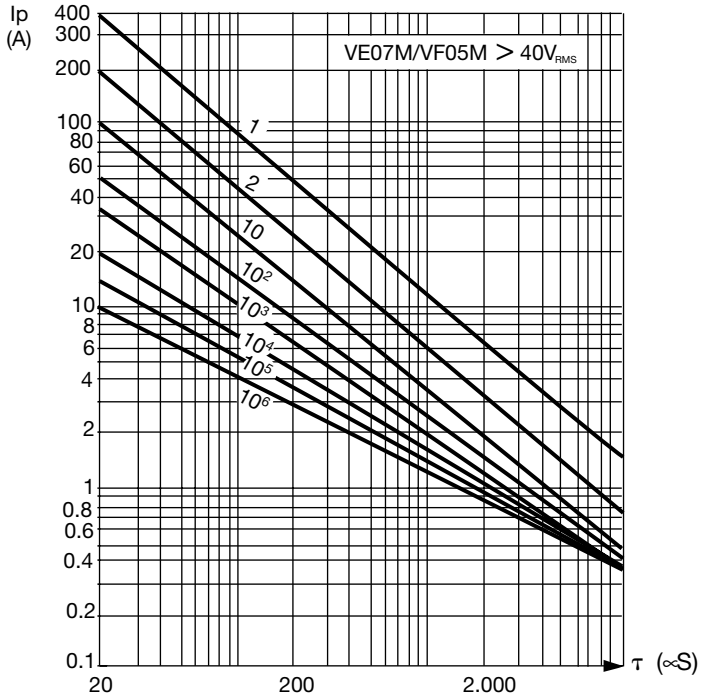
VOLTAGE-CURRENT CHARACTERISTICS

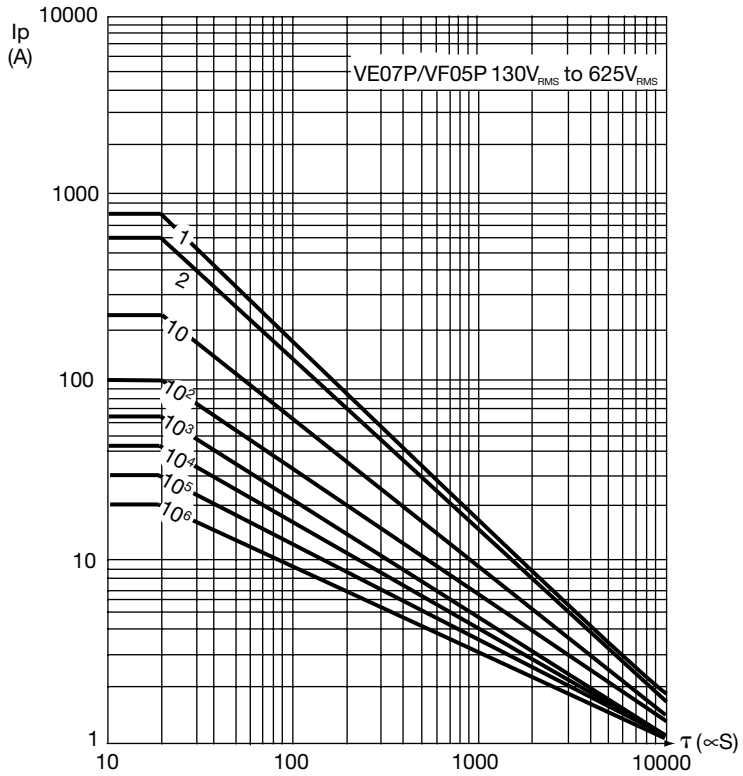




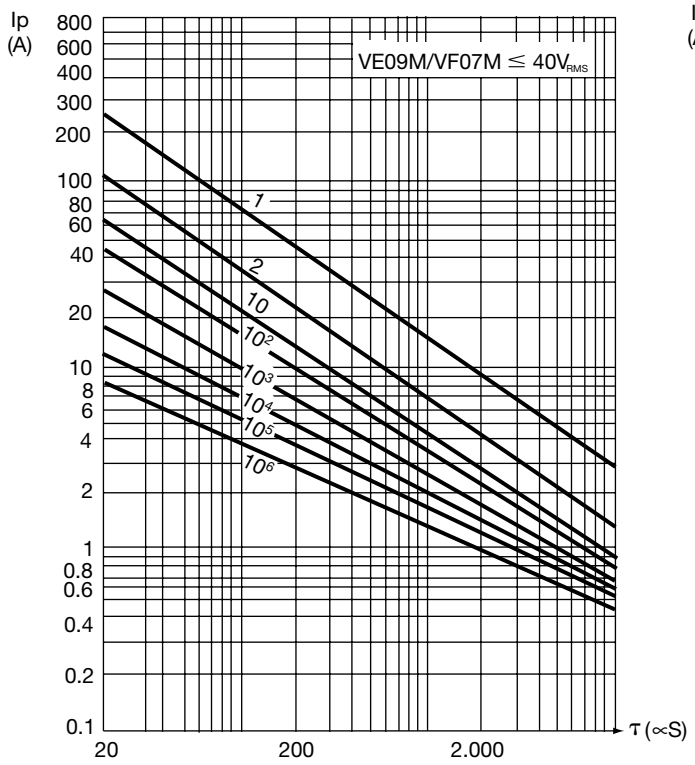
MAXIMUM SURGE CURRENT (Ip)
DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

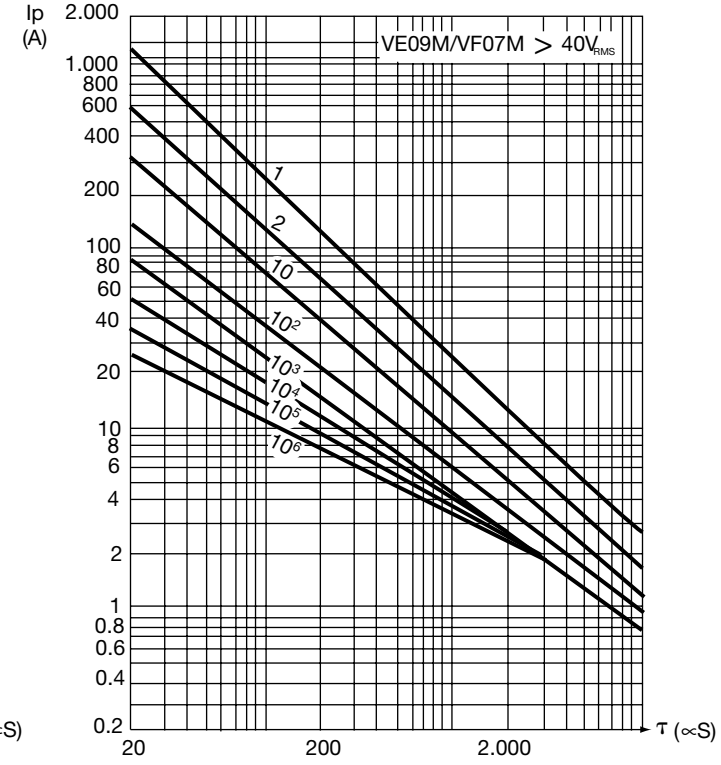


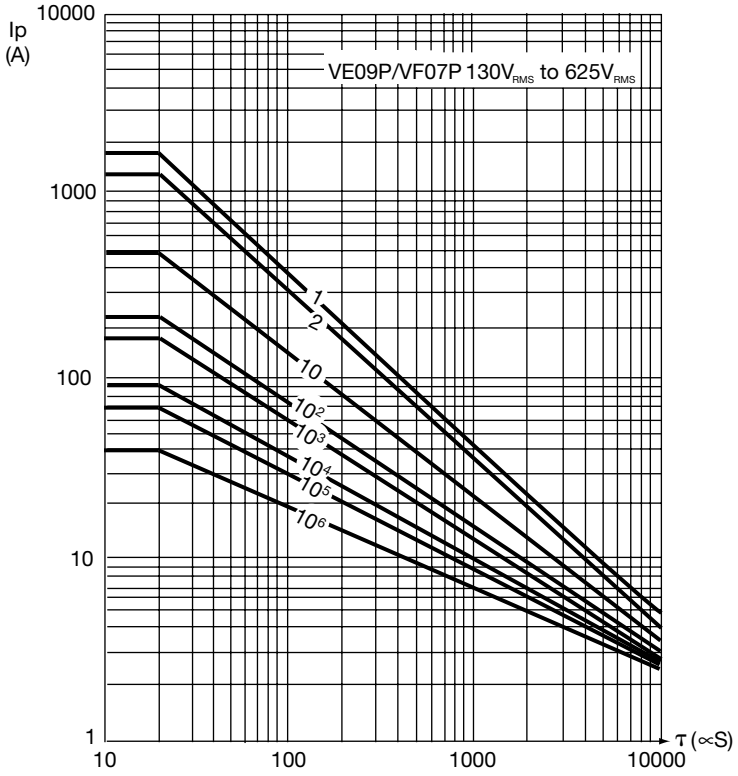




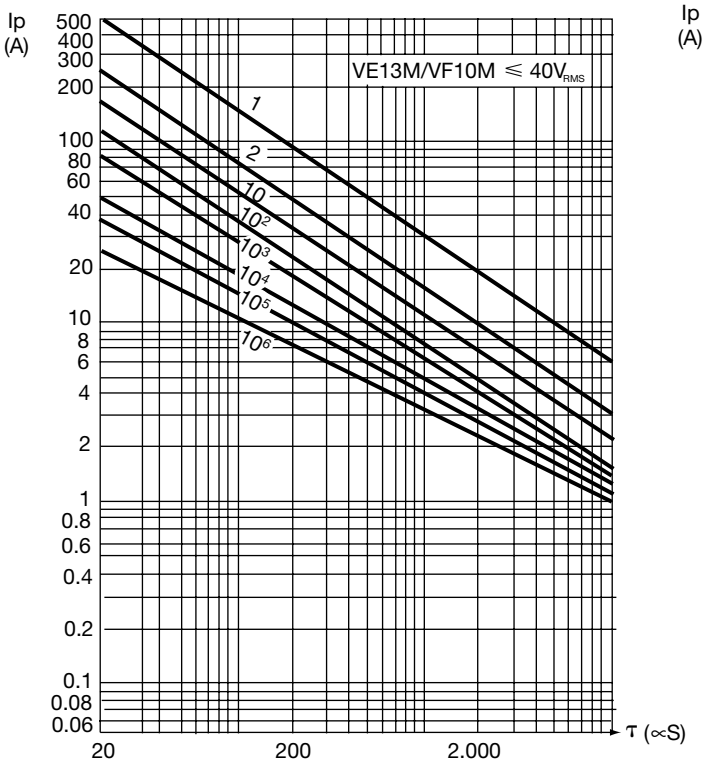
MAXIMUM SURGE CURRENT (Ip)
DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

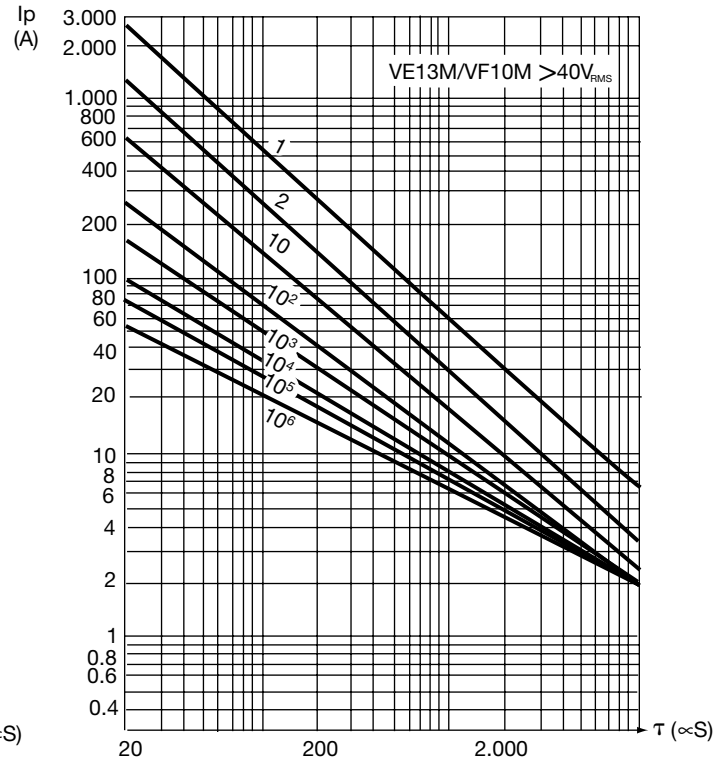


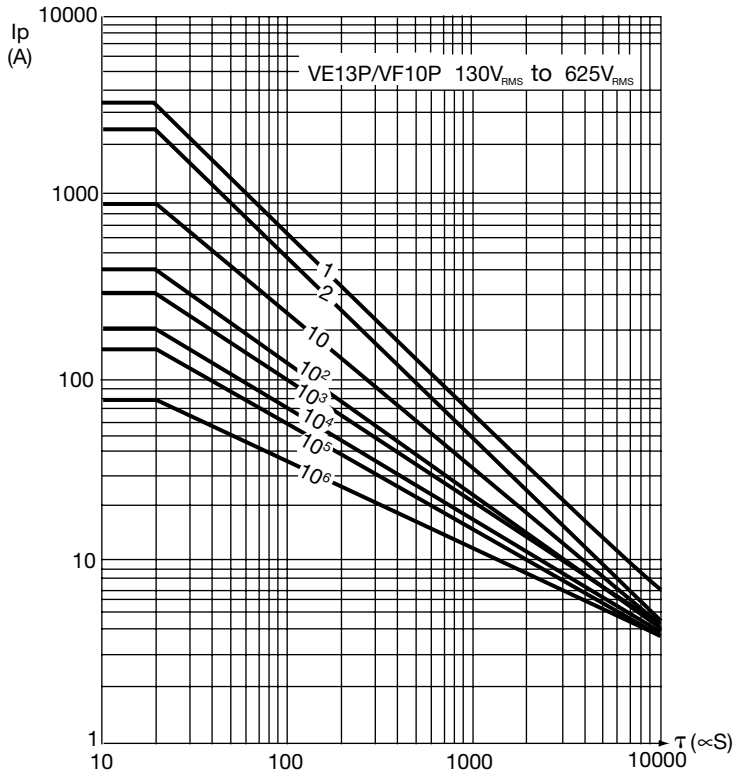




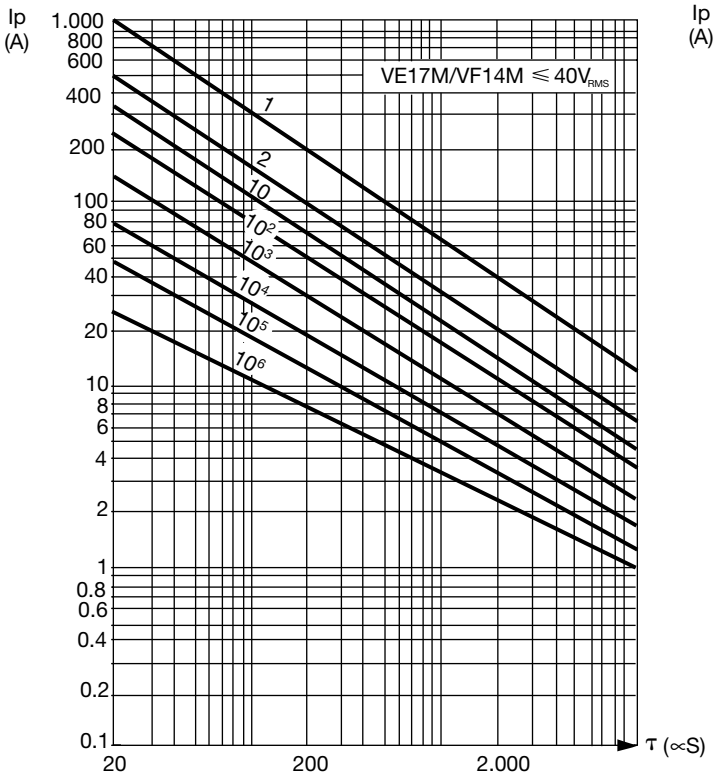
MAXIMUM SURGE CURRENT (Ip)
DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

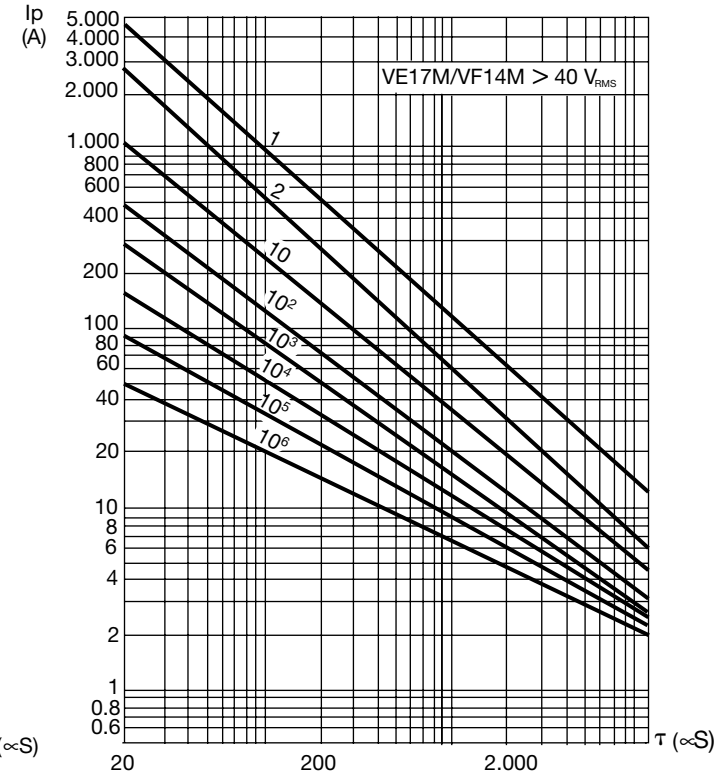


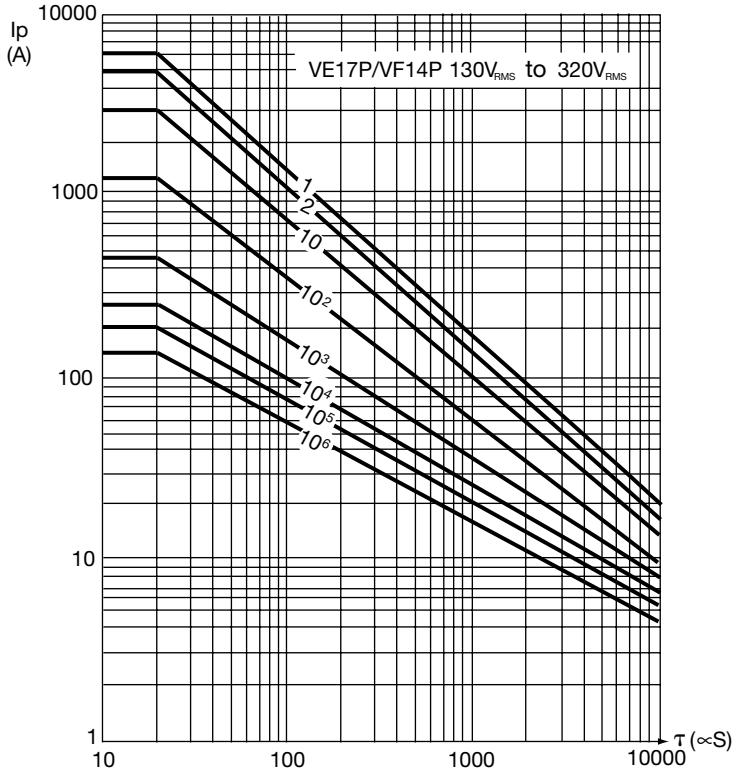




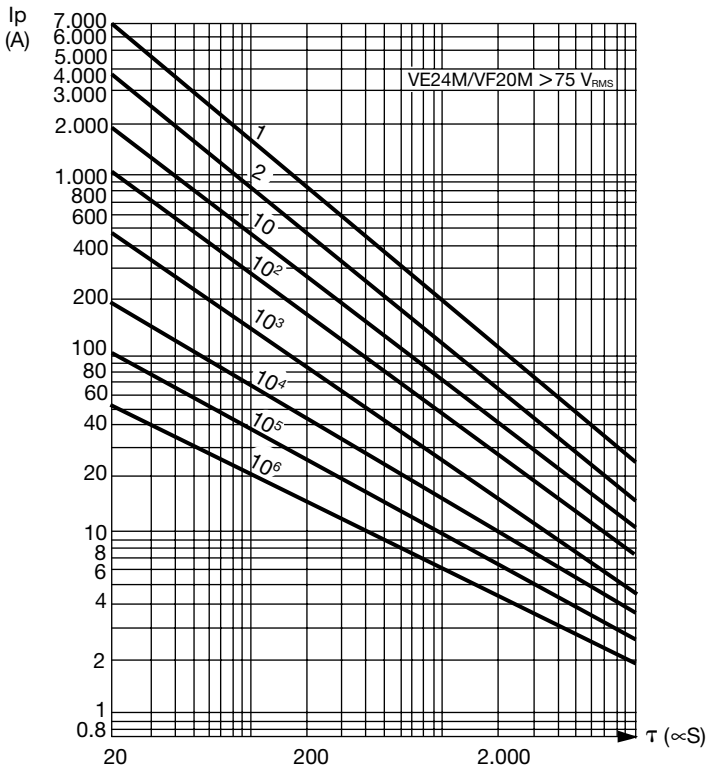
MAXIMUM SURGE CURRENT (Ip)
DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

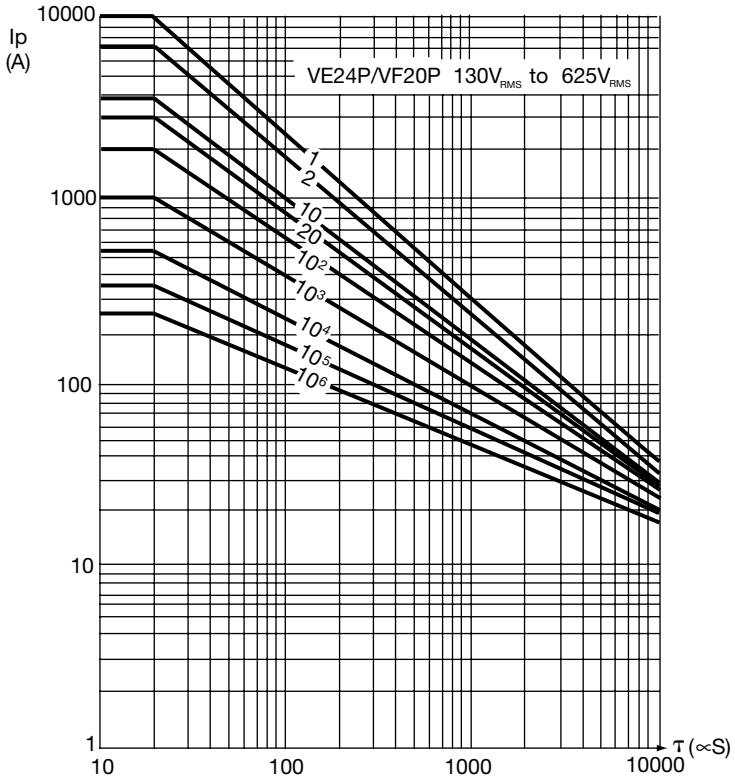






MAXIMUM SURGE CURRENT (Ip)
DERATING CURVES WITH PULSE WIDTH (τ) AND FREQUENCY

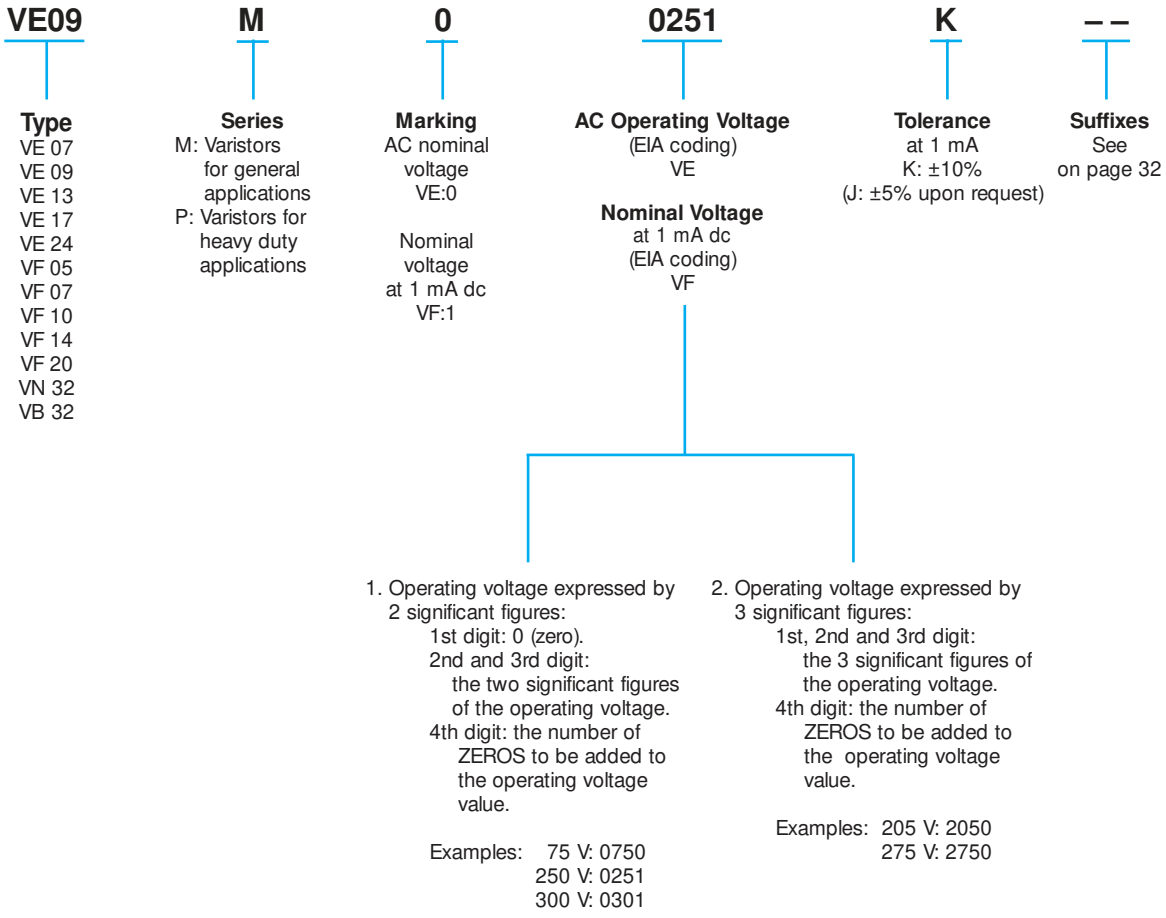




Zinc Oxide Varistors

Ordering Code

HOW TO ORDER

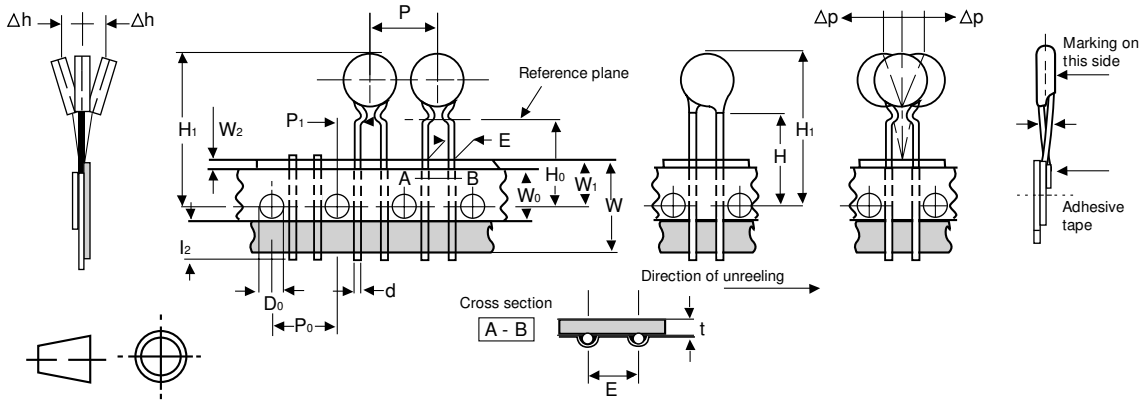


Zinc Oxide Varistors

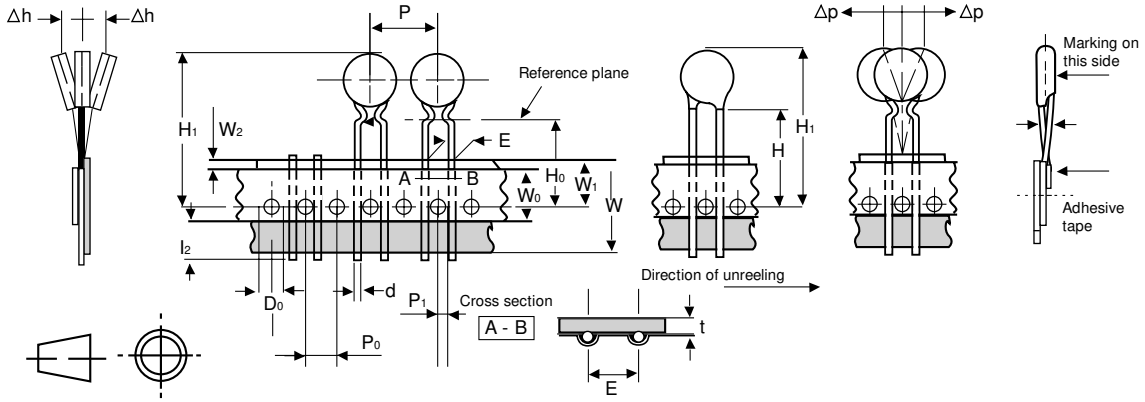
Taping Characteristics

TAPING OF OUR VARISTORS IS MADE ACCORDING TO IEC 286-2

Types: VE07/09 - VF05/07



Types: VE13/17 - VF10/14



DIMENSIONS: millimeters (inches)

Dimension Characteristics	Value		Tolerance	
Leading tape width	18 (.709)		+1/-0.5	W
Adhesive tape width	The hold down tape shall not protrude beyond the carrier tape			W_0
Sprocket hole position	9 (.354)		+0.75/-0.5	W_1
Distance between the tops of the tape and the adhesive	3 (.118) max			W_2
Diameter of sprocket hole	4 (.157)		±0.2	D_0
Distance between the tape axis and the bottom plane of component body	16/ (.630)/ or 18 (.709)		±0.5/ -0/+2	H
Distance between the tape axis and the kink	16/ (.630)/ or 18 (.709)		±0.5/ -0/+2	H_0
Distance between the tape axis and the top of component body VE 07/09 - VF 05/07 VE 13/17 - VF 10/14	33.0 (1.30) max 45.0 (1.77) max			H_1
Lead diameter	0.6 (.024)	0.8 (.031)	+10% -0.05	d
Protrusions beyond the lower side of the hold down tape	5 (.197) max			I_2
Lead spacing	5.08 (0.20)	7.62 (0.30)	±0.8	E
Components pitch	12.7 (0.50)	25.4 (0.10)	±0.3	p

DIMENSIONS: millimeters (inches)

Dimension Characteristics	Value	Tolerance	
Sprocket holes pitch	12.7 (0.50)	±0.3	P_0
Distance between the sprocket hole axe and the lead axe	3.8 (.150)	±0.7	P_1
Total thickness of tape	0.9 (.035) max		t
Verticality of components	0	±2	Δp
Alignment of components	0	±2	Δh

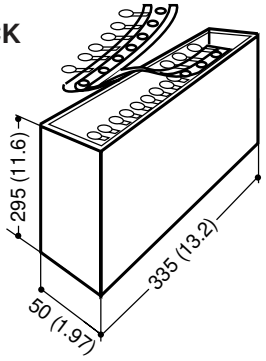
Zinc Oxide Varistors

Taping Characteristics

PACKAGING

For automatic insertion, the following types can be ordered on tape either in AMMOPACK (fan folder) or on REEL in accordance to IEC 286-2.

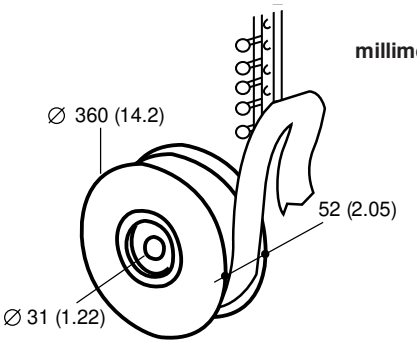
AMMOPACK **millimeters (inches)**



MISSING COMPONENTS

A maximum of 3 consecutive components may be missing from the bandolier, surrounded by at least 6 filled positions. The number of missing components may not exceed 0.5% of the total per packing module.

REEL **millimeters (inches)**



LEADS CONFIGURATION AND PACKAGING SUFFIXES

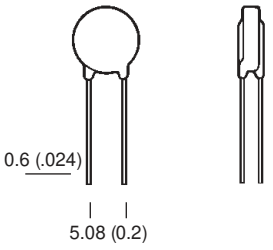
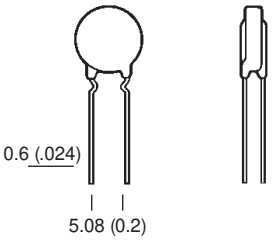
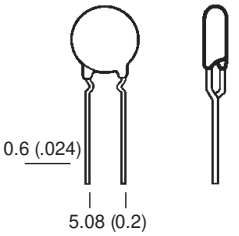
The tables below indicate the suffixes to be specified when ordering kink and packaging types. For devices on tape, it is necessary to specify the height (H or Ho) which is the distance between the tape axis (sprocket holes) and the sitting plane on the printed circuit board.

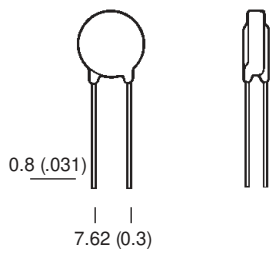
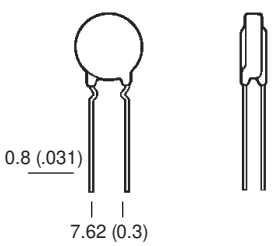
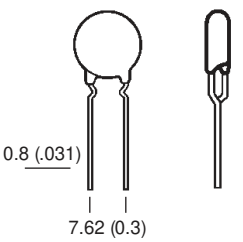
– Straight leads

H represents the distance between the sprocket holes axis and the bottom plane of component body (base of resin or base of stand off).

– Kinked leads

Ho represents the distance between the sprocket holes axis and the base of the knee.

Types	VE 07/09 - VF 05/07 (VE13 - VF10 ≤ 320 V_{rms} upon request)					
Leads	Straight		Kinked (type 1)		Kinked (type 2)	
Dimensions						
Packaging	AMMOPACK	REEL	AMMOPACK	REEL	AMMOPACK	REEL
H/Ho = 16 ± 0.5	DA(*)	DB(*)	DQ(**)	DR(**)	D7(**)	D5(**)
H/Ho = 18 -0/+2	DC(**)	DD(**)	DS	DT	D8	D6

Types	VE 13/17 - VF 10/14					
Leads	Straight		Kinked (type 1)		Kinked (type 2)	
Dimensions						
Packaging	AMMOPACK	REEL	AMMOPACK	REEL	AMMOPACK	REEL
H/Ho = 16 ± 0.5	EA(*)	EN(*)	EC(**)	EF(**)	EQ(**)	ER(**)
H/Ho = 18 -0/+2	EB(**)	ED(**)	EG	EH	ES	ET

(*) DA, DB, EA, EN suffixes are not available for varistors with V_{RMS} 300V are available only upon request for other types.
(**) Preferred versions according to IEC 286-2

> 300 VRMS

Zinc Oxide Varistors

Packaging

PACKAGING QUANTITIES

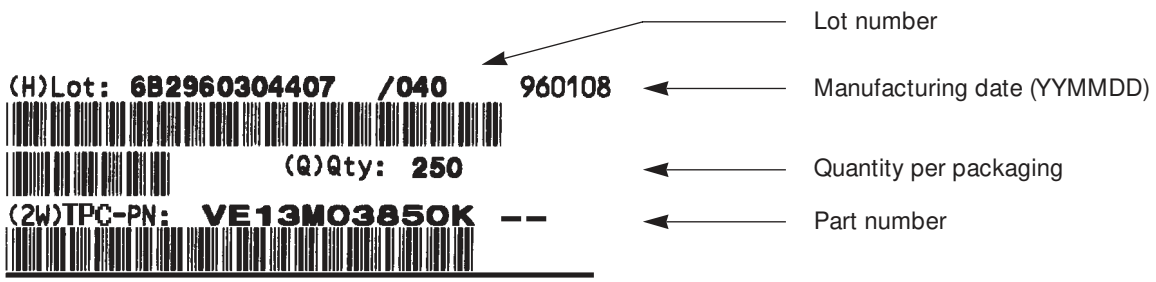
Type		Bulk	AMMOPACK	REEL
VE07 - VF05 all		1500	1500	1500
VE09 - VF07	< 230 V_{RMS}	1000	1500	1500
VE09 - VF07	≥ 230 V_{RMS} ≤ 300 V_{RMS}	1000	1000	1000
VE09 - VF07	> 300 V_{RMS}	750	1000	1000
VE13 - VF10	≤ 230 V_{RMS}	500	750	750
VE13 - VF10	> 230 V_{RMS} ≤ 300 V_{RMS}	500	500	500
VE13 - VF10	> 300 V_{RMS}	500	—	—
VE17 - VF14	≤ 230 V_{RMS}	500	750	750
VE17 - VF14	> 230 V_{RMS} ≤ 300 V_{RMS}	500	500	500
VE17 - VF14	> 300 V_{RMS}	500	—	—
VE24 - VF20		250	—	—

IDENTIFICATION - TRACEABILITY

On the packaging of all shipped varistors, you will find a bar code label.

This label gives systematic information on the type of product, part number, lot number, manufacturing date and quantity.

An example is given below:



This information allows complete traceability of the entire manufacturing process, from raw materials to final inspection.

This is extremely useful for any information request.