



Film Capacitors

Metallized Polyester Film Capacitors (MKT)

Series/Type: B32591 ... B32594
Date: August 2004

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General purpose (stacked/wound)
Typical applications

- Compact fluorescent lamps (CFL)
- Generators

Climatic

- Max. operating temperature: 125 °C
- Climatic category (IEC 60068-1): 55/100/56

Features

- High pulse strength
- High contact reliability

Construction

- Dielectric: polyethylene terephthalate (polyester, PET)
- Stacked-film technology for lead spacing 10 and 15 mm (100 ... 400 VDC); Wound capacitor technology for lead spacing 10 and 15 mm (630 VDC) as well as for lead spacing 22.5 and 27.5 mm
- Epoxy resin coating (UL 94 V-0)

Terminals

- Crimped wire leads, lead-free tinned, lead length 6 – 1 mm or min. 20 mm
- Straight wire leads, lead-free tinned, lead length 17 ±3 mm
- Different lead spacings (reduced and enlarged) available, lead length 6 – 1 mm

Marking

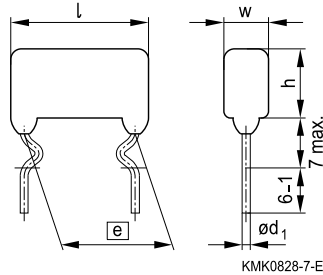
Manufacturer's logo,
 rated capacitance (coded),
 capacitance tolerance (code letter),
 rated DC voltage,
 additional for lead spacing ≥15 mm:
 style, type, date of manufacture (coded)

Delivery mode

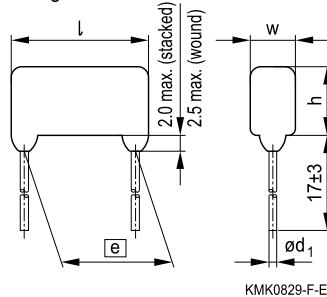
Bulk (untaped)
 Taped (Ammo pack or reel) for lead spacing ≤22.5 mm.
 For notes on taping, refer to chapter "Taping and packing".

Dimensional drawing

Crimped leads



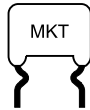
Straight leads



Dimensions in mm

Lead spacing $e \pm 0.8$	Lead diameter d_1	Type
10.0	0.6 ¹⁾	B32591
15.0	0.6	B32592
22.5	0.8	B32593
27.5	0.8	B32594





 1) 0.5 mm for capacitor width $w \leq 5$ mm

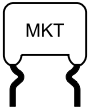

Overview of available types

Lead spacing	10.0 mm				15.0 mm				22.5 mm			
Type	B32591				B32592				B32593			
Page	5				6				7			
Technology	s	s	s	w	s	s	s	w	w	w	w	w
V_R (VDC)	100	250	400	630	100	250	400	630	100	250	400	630
V_{rms} (VAC)	63	160	200	200	63	160	200	200	63	160	200	200
C_R (μ F)												
0.010												
0.015												
0.022												
0.033												
0.047												
0.068												
0.10												
0.15												
0.22												
0.33												
0.47												
0.68												
1.0												
1.5												
2.2												
3.3												
4.7												
6.8												

Technology: s = Stacked-film technology / w = Wound capacitor technology

Lead configurations

Series	Standard	Reduced	Enlarged	Straight
				
B32591	10 mm	5 / 7.5 mm	–	10 mm
B32592	15 mm	7.5 / 10 / 12.5 mm	17.5 mm	15 mm
B32593	22.5 mm	17.5 / 20 mm	25 mm	22.5 mm
B32594	27.5 mm	25 mm	–	27.5 mm



B32591 ... B32594





General purpose (stacked/wound)

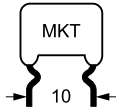
Overview of available types

Lead spacing	27.5 mm			
Type	B32594			
Page	8			
Technology	w	w	w	w
V_R (VDC)	100	250	400	630
V_{rms} (VAC)	63	160	200	220
C_R (μ F)				
0.33				
0.47				
0.68				
1.0				
1.5				
2.2				
3.3				
4.7				
6.8				
10				

Technology: s = Stacked-film technology / w = Wound capacitor technology

Lead configurations

Series	Standard	Reduced	Enlarged	Straight
				
B32591	10 mm	5 / 7.5 mm	–	10 mm
B32592	15 mm	7.5 / 10 / 12.5 mm	17.5 mm	15 mm
B32593	22.5 mm	17.5 / 20 mm	25 mm	22.5 mm
B32594	27.5 mm	25 mm	–	27.5 mm


Ordering codes and packing units (lead spacing 10 mm)

V_R	V_{rms} $f \leq 60$ Hz	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
VDC	VAC	μF					
100	63	0.10	$5.0 \times 9.0 \times 13.0$	B32591C1104+***	900	1500	1500
		0.15	$5.0 \times 9.0 \times 13.0$	B32591C1154+***	900	1500	1500
		0.22	$5.0 \times 9.0 \times 13.0$	B32591C1224+***	900	1500	1500
		0.33	$5.5 \times 9.0 \times 13.0$	B32591C1334+***	680	1300	1500
		0.47	$6.0 \times 9.5 \times 13.0$	B32591C1474+***	600	1300	1000
		0.68	$7.0 \times 10.5 \times 13.0$	B32591C1684+***	500	1000	1000
		1.0	$8.0 \times 15.0 \times 13.0$	B32591C1105+***	450	900	500
250	160	0.033	$5.0 \times 9.0 \times 13.0$	B32591C3333+***	900	1500	1500
		0.047	$5.0 \times 9.0 \times 13.0$	B32591C3473+***	900	1500	1500
		0.068	$5.0 \times 9.0 \times 13.0$	B32591C3683+***	900	1500	1500
		0.10	$5.0 \times 9.0 \times 13.0$	B32591C3104+***	900	1500	1000
		0.15	$5.5 \times 10.0 \times 13.0$	B32591C3154+***	680	1300	1000
		0.22	$6.0 \times 10.5 \times 13.0$	B32591C3224+***	680	1300	1000
		0.33	$6.5 \times 11.0 \times 13.0$	B32591C3334+***	580	1100	1000
0.47	$8.0 \times 13.5 \times 13.0$	B32591C3474+***	450	900	500		
400	200	0.010	$5.0 \times 9.0 \times 13.0$	B32591C6103+***	830	1500	1500
		0.015	$5.0 \times 9.0 \times 13.0$	B32591C6153+***	830	1500	1500
		0.022	$5.0 \times 9.0 \times 13.0$	B32591C6223+***	830	1500	1500
		0.033	$5.0 \times 9.0 \times 13.0$	B32591C6333+***	830	1500	1500
		0.047	$5.0 \times 10.5 \times 13.0$	B32591C6473+***	830	1500	1000
		0.068	$5.5 \times 10.5 \times 13.0$	B32591C6683+***	830	1300	1000
		0.10	$6.0 \times 11.5 \times 13.0$	B32591C6104+***	780	1300	1000
630	200	0.010 ▽	$6.5 \times 10.5 \times 13.0$	B32591C8103+***	600	1100	500
		0.015 ▽	$6.5 \times 10.5 \times 13.0$	B32591C8153+***	600	1100	500
		0.022 ▽	$7.5 \times 11.5 \times 13.0$	B32591C8223+***	500	1000	500

▽ Wound capacitor technology

Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:

 M = $\pm 20\%$

 K = $\pm 10\%$

 J = $\pm 5\%$

*** = Packaging code:

289 = Ammo pack

189 = Reel

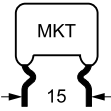
010 = Untaped (lead length 6 – 1 mm)

011 = Untaped (lead length min. 20 mm)

 008 = Untaped (straight, lead length 17 ± 3 mm)

Packaging codes for further lead configurations (untaped):

Reduced lead configuration (lead length 6 – 1 mm)	Reduced	Reduced
Lead spacing (mm) / Packaging code	5 / 035	7.5 / 030


B32592
General purpose (stacked/wound)
Ordering codes and packing units (lead spacing 15 mm)

V_R VDC	V_{rms} $f \leq 60$ Hz VAC	C_R μF	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
100	63	0.47	$5.0 \times 9.5 \times 18.0$	B32592C1474+***	1170	1500	1000
		0.68	$5.5 \times 10.5 \times 18.0$	B32592C1684+***	1000	1300	1000
		1.0	$6.5 \times 10.5 \times 18.0$	B32592C1105+***	830	1100	500
		1.5	$7.5 \times 14.0 \times 18.0$	B32592C1155+***	780	930	500
		2.2	$9.0 \times 14.0 \times 18.0$	B32592C1225+***	640	830	250
		3.3	$11.0 \times 17.5 \times 18.0$	B32592C1335+***	500	640	250
		4.7	$11.0 \times 17.5 \times 18.0$	B32592C1475+***	500	640	250
250	160	0.22	$5.5 \times 9.0 \times 18.0$	B32592C3224+***	1000	1300	1000
		0.33	$6.0 \times 10.0 \times 18.0$	B32592C3334+***	930	1300	500
		0.47	$7.0 \times 11.0 \times 18.0$	B32592C3474+***	780	1000	500
		0.68	$8.0 \times 11.5 \times 18.0$	B32592C3684+***	680	900	500
		1.0	$9.5 \times 13.0 \times 18.0$	B32592C3105+***	580	780	500
400	200	0.068	$5.0 \times 9.0 \times 18.0$	B32592C6683+***	1170	1500	1000
		0.10	$5.0 \times 10.0 \times 18.0$	B32592C6104+***	1170	1500	1000
		0.15	$6.0 \times 10.5 \times 18.0$	B32592C6154+***	930	1300	1000
		0.22	$7.0 \times 11.0 \times 18.0$	B32592C6224+***	780	1000	500
		0.33	$8.0 \times 12.0 \times 18.0$	B32592C6334+***	680	900	500
		0.47	$9.5 \times 13.0 \times 18.0$	B32592C6474+***	580	780	250
		0.68	$10.0 \times 16.0 \times 18.0$	B32592C6684+***	550	700	250
630	200	0.033 ▽	$6.5 \times 10.5 \times 18.0$	B32592C8333+***	830	1100	1000
		0.047 ▽	$7.0 \times 12.0 \times 18.0$	B32592C8473+***	780	1000	500
		0.068 ▽	$7.5 \times 14.0 \times 18.0$	B32592C8683+***	780	930	500
		0.10 ▽	$8.5 \times 15.0 \times 18.0$	B32592C8104+***	640	830	500

▽ Wound capacitor technology

Further E series and intermediate capacitance values on request.

Composition of ordering code

+= Capacitance tolerance code:

 M = $\pm 20\%$

 K = $\pm 10\%$

 J = $\pm 5\%$

*** = Packaging code:

289 = Ammo pack

189 = Reel

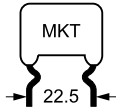
010 = Untaped (lead length 6 – 1 mm)

011 = Untaped (lead length min. 20 mm)

 008 = Untaped (straight, lead length 17 ± 3 mm)

Packaging codes for further lead configurations (untaped):

Lead configuration (lead length 6 – 1 mm)	Reduced	Reduced	Reduced	Enlarged
Lead spacing (mm)	7.5	10	12.5	17.5
Packaging code	030	040	050	060


Ordering codes and packing units (lead spacing 22.5 mm)

V_R	V_{rms} $f \leq 60$ Hz	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
VDC	VAC	μF					
100	63	1.5	$7.0 \times 14.0 \times 26.5$	B32593C1155+***	500	700	500
		2.2	$8.5 \times 15.0 \times 26.5$	B32593C1225+***	450	600	500
		3.3	$10.0 \times 16.5 \times 26.5$	B32593C1335+***	380	540	200
		4.7	$11.5 \times 18.5 \times 26.5$	B32593C1475+***	300	450	200
		6.8	$13.0 \times 21.5 \times 26.5$	B32593C1685+***	280	380	200
250	160	0.68	$7.0 \times 13.0 \times 26.5$	B32593C3684+***	500	700	500
		1.0	$7.0 \times 15.5 \times 26.5$	B32593C3105+***	500	700	500
		1.5	$8.5 \times 17.0 \times 26.5$	B32593C3155+***	400	580	200
		2.2	$10.0 \times 18.5 \times 26.5$	B32593C3225+***	350	500	200
400	200	0.22	$6.5 \times 13.0 \times 26.5$	B32593C6224+***	550	800	500
		0.33	$7.0 \times 14.0 \times 26.5$	B32593C6334+***	550	800	500
		0.47	$7.0 \times 16.5 \times 26.5$	B32593C6474+***	500	700	500
630	200	0.10	$7.0 \times 14.0 \times 26.5$	B32593C8104+***	500	700	500
		0.15	$7.5 \times 16.0 \times 26.5$	B32593C8154+***	450	650	250
		0.22	$8.5 \times 17.0 \times 26.5$	B32593C8224+***	400	580	250

Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

K = $\pm 10\%$

J = $\pm 5\%$

*** = Packaging code:

289 = Ammo pack

189 = Reel

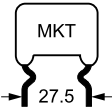
010 = Untaped (lead length 6 – 1 mm)

011 = Untaped (lead length min. 20 mm)

008 = Untaped (straight, lead length 17 ± 3 mm)

Packaging codes for further lead configurations (untaped):

Lead configuration (lead length 6 – 1 mm)	Reduced	Reduced	Enlarged
Lead spacing (mm)	17.5	20	25
Packaging code	060	070	080


B32594
General purpose (wound)
Ordering codes and packing units (lead spacing 27.5 mm)

V_R	V_{rms} $f \leq 60$ Hz VAC	C_R μF	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Untaped pcs./unit
100	63	4.7	10.5 × 18.5 × 31.5	B32594C1475+***	200
		6.8	12.5 × 21.0 × 31.5	B32594C1685+***	200
		10	17.0 × 22.0 × 31.5	B32594C1106+***	200
250	160	1.5	8.5 × 16.0 × 31.5	B32594C3155+***	500
		2.2	10.0 × 17.5 × 31.5	B32594C3225+***	500
		3.3	12.0 × 19.5 × 31.5	B32594C3335+***	200
		4.7	14.0 × 21.5 × 31.5	B32594C3475+***	200
		6.8	15.0 × 25.0 × 31.5	B32594C3685+***	200
400	200	0.68	8.0 × 16.0 × 31.5	B32594C6684+***	250
		1.0	9.5 × 18.0 × 31.5	B32594C6105+***	250
		1.5	11.5 × 20.0 × 31.5	B32594C6155+***	250
		2.2	13.5 × 22.0 × 31.5	B32594C6225+***	200
630	220	0.33	8.0 × 15.0 × 31.5	B32594C8334+***	250
		0.47	10.0 × 16.0 × 31.5	B32594C8474+***	200
		0.68	10.5 × 18.0 × 31.5	B32594C8684+***	200

Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:

M = ±20%

K = ±10%

J = ±5%

*** = Packaging code:

010 = Untaped (lead length 6 – 1 mm)

011 = Untaped (lead length min. 20 mm)

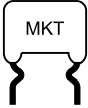
008 = Untaped (straight, lead length 17±3 mm)

Packaging codes for further lead configurations (untaped):

Lead configuration (lead length 6 – 1 mm)	Reduced
Lead spacing (mm)	25
Packaging code	090

Technical data

Operating temperature range	Max. operating temperature $T_{op,max}$ +125 °C			
	Upper category temperature T_{max} +100 °C			
	Lower category temperature T_{min} -55 °C			
	Rated temperature T_R +85 °C			
Dissipation factor $\tan \delta$ (in 10^{-3}) at 20 °C (upper limit values)	at	$C_R \leq 0.1 \mu F$	$0.1 \mu F < C_R \leq 1 \mu F$	$C_R > 1 \mu F$
	1 kHz	8	10	10
	10 kHz	15	20	—
	100 kHz	30	—	—
Insulation resistance R_{ins} or time constant $\tau = C_R \cdot R_{ins}$ at 20 °C, rel. humidity $\leq 65\%$ (minimum as-delivered values)	V_R	$C_R \leq 0.33 \mu F$		$C_R > 0.33 \mu F$
	100 VDC	3750 M Ω		1250 s
	≥ 250 VDC	7500 M Ω		2500 s
DC test voltage	$1.4 \cdot V_R, 2$ s			
Category voltage V_C (continuous operation with V_{DC} or V_{AC} at $f \leq 60$ Hz)	T_A (°C)	DC voltage derating		AC voltage derating
	$T_A \leq 85$ $85 < T_A \leq 100$	$V_C = V_R$ $V_C = V_R \cdot (165 - T_A)/80$		$V_{C,rms} = V_{rms}$ $V_{C,rms} = V_{rms} \cdot (165 - T_A)/80$
Operating voltage V_{op} for short operating periods (V_{DC} or V_{AC} at $f \leq 60$ Hz)	T_A (°C)	DC voltage (max. hours)		AC voltage (max. hours)
	$T_A \leq 100$ $100 < T_A \leq 125$	$V_{op} = 1.25 \cdot V_C$ (2000 h) $V_{op} = 1.25 \cdot V_C$ (1000 h)		$V_{op} = 1.0 \cdot V_{C,rms}$ (2000 h) $V_{op} = 1.0 \cdot V_{C,rms}$ (1000 h)
Damp heat test Limit values after damp heat test	56 days/40 °C/93% relative humidity			
	Capacitance change $ \Delta C/C $		$\leq 5\%$	
	Dissipation factor change $\Delta \tan \delta$		$\leq 5 \cdot 10^{-3}$ (at 10 kHz)	
	Insulation resistance R_{ins} or time constant $\tau = C_R \cdot R_{ins}$		$\geq 50\%$ of minimum as-delivered values	
Reliability: Failure rate λ Service life t_{SL}	2 fit ($\leq 2 \cdot 10^{-9}/h$) at $0.5 \cdot V_R, 40$ °C 200 000 h at $1.0 \cdot V_R, 40$ °C For conversion to other operating conditions and temperatures, refer to chapter "Quality assurance", page .			
Failure criteria: Total failure Failure due to variation of parameters	Short circuit or open circuit			
	Capacitance change $ \Delta C/C $		$> 10\%$	
	Dissipation factor $\tan \delta$		$> 2 \cdot$ upper limit value	
	Insulation resistance R_{ins} or time constant $\tau = C_R \cdot R_{ins}$		< 150 M Ω ($C_R \leq 0.33 \mu F$) < 50 s ($C_R > 0.33 \mu F$)	



B32591 ... B32594

General purpose (stacked/wound)

Pulse handling capability

"dV/dt" represents the maximum permissible voltage change per unit of time for non-sinusoidal voltages, expressed in V/ μ s.

"k₀" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in V²/ μ s.

Note:

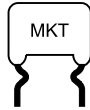
The values of dV/dt and k₀ provided below must not be exceeded in order to avoid damaging the capacitor.

dV/dt values

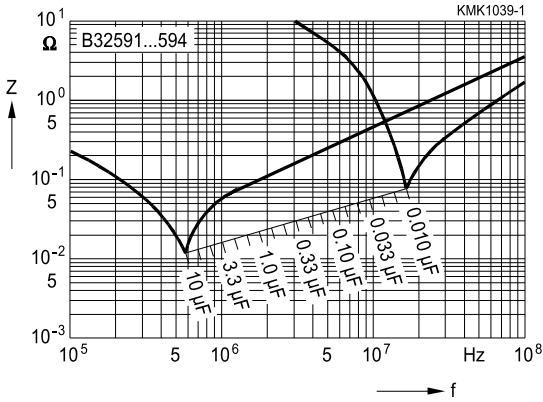
Lead spacing		10 mm		15 mm		22.5 mm	27.5 mm
Technology		Stacked	Wound	Stacked	Wound	Wound	Wound
V _R VDC	V _{rms} VAC	dV/dt in V/ μ s					
100	63	75	–	50	–	2.5	2
250	160	150	–	100	–	4	3
400	200	175	–	125	–	7	5
630	200	–	20	–	15	10	–
630	220	–	–	–	–	–	8

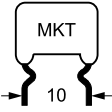
k₀ values

Lead spacing		10 mm		15 mm		22.5 mm	27.5 mm
Technology		Stacked	Wound	Stacked	Wound	Wound	Wound
V _R VDC	V _{rms} VAC	k ₀ in V ² / μ s					
100	63	15 000	–	10 000	–	500	400
250	160	75 000	–	50 000	–	2 000	1 500
400	200	140 000	–	100 000	–	5 600	4 000
630	200	–	25 000	–	19 000	12 600	–
630	220	–	–	–	–	–	10 000



Impedance Z versus frequency f
(typical values)





B32591

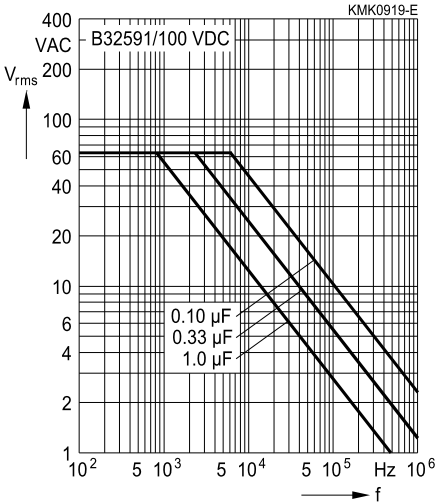
General purpose (stacked/wound)

Permissible AC voltage V_{rms} versus frequency f (for sinusoidal waveforms, $T_A \leq 55^\circ C$)

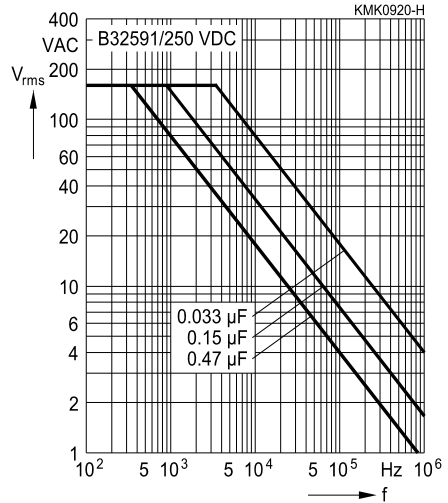
For $T_A > 55^\circ C$, please refer to "General technical information", section 3.2.3.

Lead spacing 10 mm

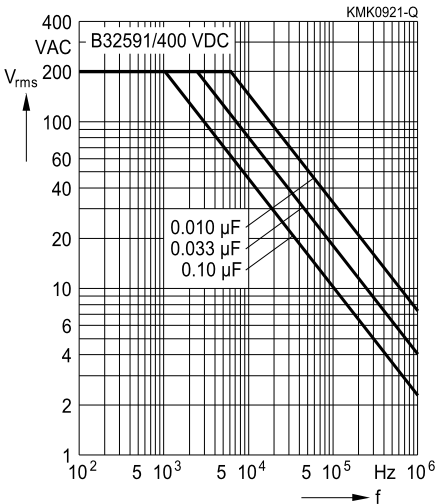
100 VDC/63 VAC



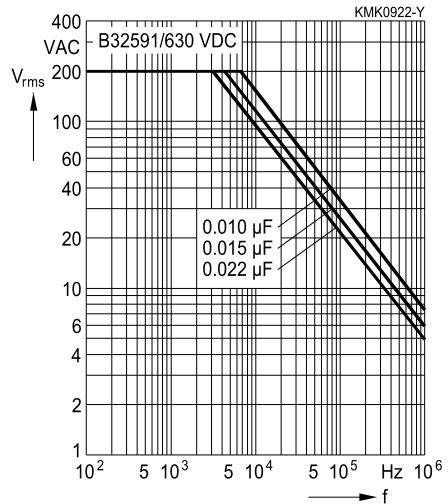
250 VDC/160 VAC



400 VDC/200 VAC



630 VDC/200 VAC

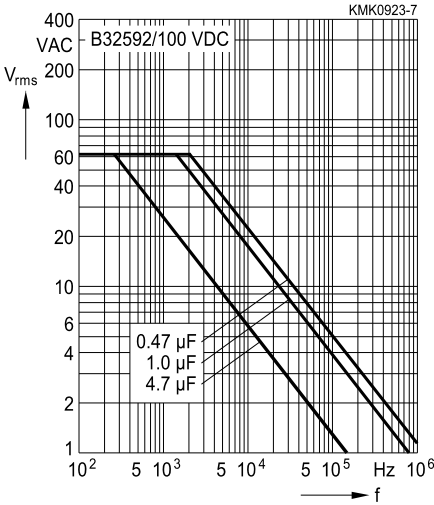


Permissible AC voltage V_{rms} versus frequency f (for sinusoidal waveforms, $T_A \leq 55^\circ C$)

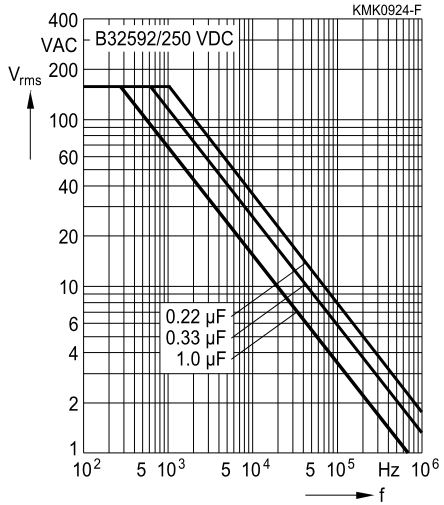
For $T_A > 55^\circ C$, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

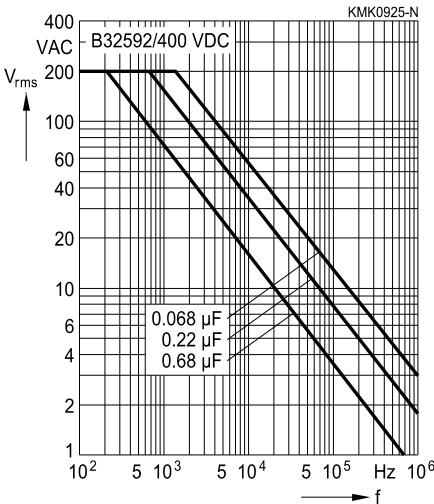
100 VDC/63 VAC



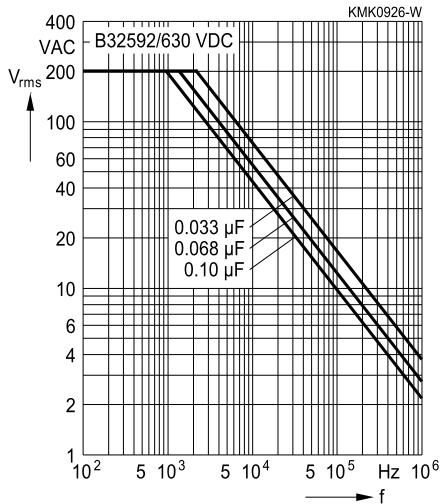
250 VDC/160 VAC

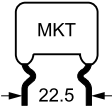


400 VDC/200 VAC



630 VDC/200 VAC





B32593

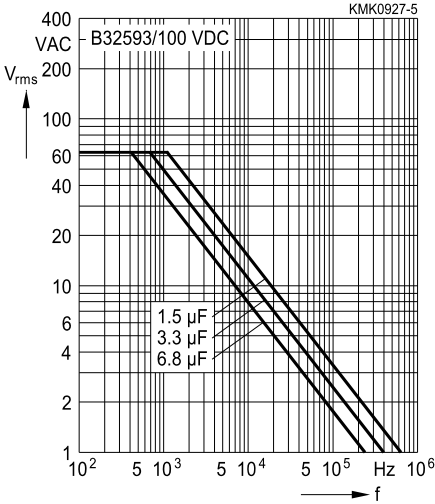
General purpose (wound)

Permissible AC voltage V_{rms} versus frequency f (for sinusoidal waveforms, $T_A \leq 55^\circ\text{C}$)

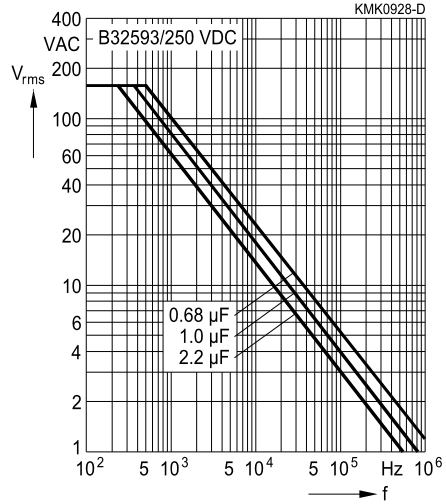
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 22.5 mm

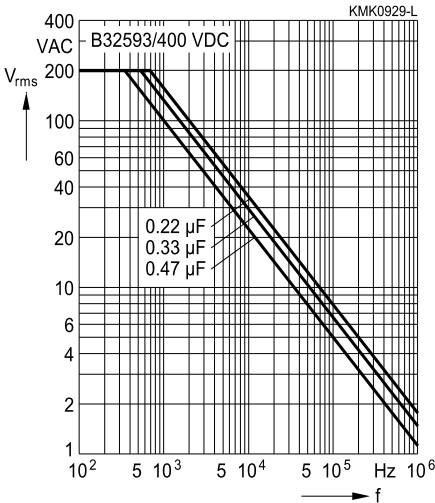
100 VDC/63 VAC



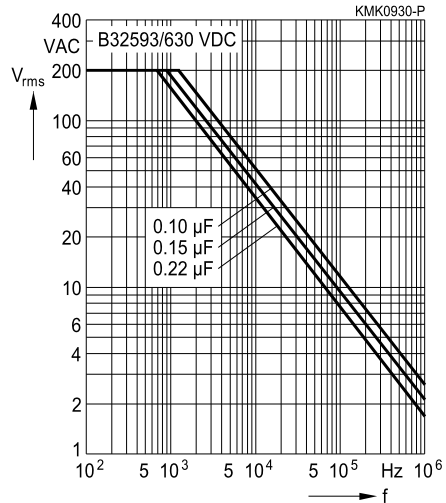
250 VDC/160 VAC



400 VDC/200 VAC



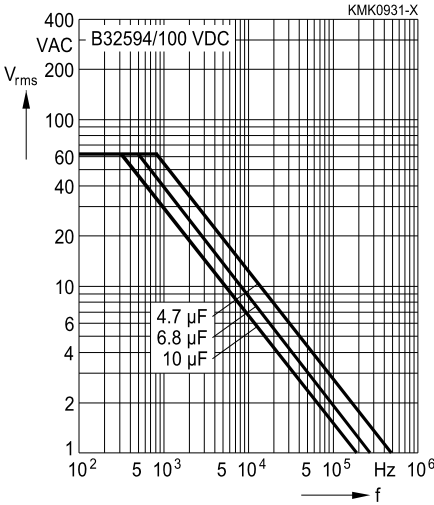
630 VDC/200 VAC



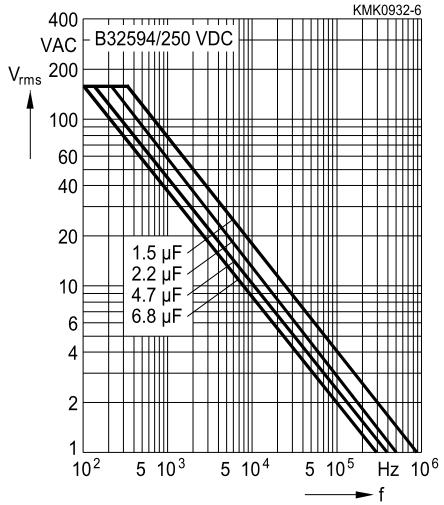
Permissible AC voltage V_{rms} versus frequency f (for sinusoidal waveforms, $T_A \leq 55^\circ C$)
 For $T_A > 55^\circ C$, please refer to "General technical information", section 3.2.3.

Lead spacing 27.5 mm

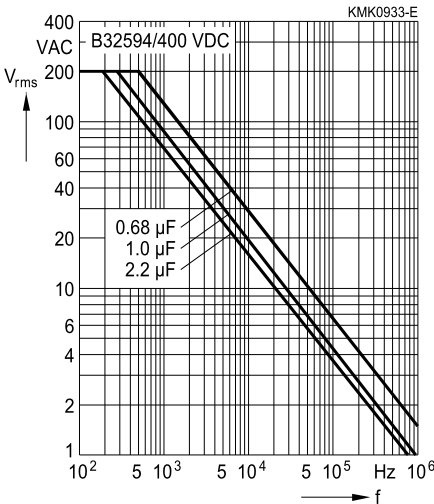
100 VDC/63 VAC



250 VDC/160 VAC



400 VDC/200 VAC



630 VDC/220 VAC

