



## Film Capacitors - Power Electronic Capacitors

General purpose applications

<b>Series/Type:</b>	<b>FilterCap MKD AC – Single phase</b>
<b>Ordering code:</b>	<b>B3237X Series</b>
Date:	2019-05-14
Version:	03

For new design

**Construction and general data**

General data	
Dielectric	Metallized polypropylene film
Resin filling	Non PCB, soft polyurethane
Safety device	Overpressure disconnecter, self-healing technology
Mounting and grounding	Stud on bottom of aluminum can
Cooling	Naturally air-cooled (or forced air cooling)
Degree of protection	IP00 (B32370, B32371 and B32373 series), IP20 (B32374 series), IP54 upon request
Discharge resistor	Upon request
Reference standards	IEC 61071, GB/T 17702, optional IEC 60831, UL 810
Safety approvals	<p><b>For B32370, B32371, B32373 type A and B32374:</b> UL 810, CSA C22.2, No 190, Max. 600 V<sub>RMS</sub>, 50/60Hz, “Protected”, 10k AFC, max. +70 °C.</p> <p><b>For B32373 type B:</b> UL 810, CSA C22.2, No 190, Max.1000 V RMS. 50/60Hz, “Protected”, 10k AFC, max. +70 °C.</p> <p><b>File no.: E487229, CCN:CYWT2/8</b></p>
Terminals	B32370 series: Fast-on terminals B32371 (M6) and B32373 (M10) series: Screw terminals B32374 series: Clamp terminals


**Figure 1:** Capacitor MKD-AC series B32370\*, B32371\*, B32373\* and B32374\*

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### Specifications and characteristics

Rated capacitance  $C_R$ : 5 ... 600  $\mu\text{F}$  (for  $\geq 400 \mu\text{F}$  customized design), Tolerance:  $\pm 5\%$

Voltage $V_{\text{RMS}}$ (line to line)	Rated AC voltage $V_R$ (line to line)	DC voltage $V_{\text{RDC}}$
250	350	675
330	460	900
420	590	1050
480	680	1200
530	750	1350
600	850	1500
660	935	1650
720	1020	1800
780	1100	1950
850	1200	2100
1000	1415	2475

### Test data

Voltage between terminals $V_{\text{TT}}$	$2.15 \cdot V_{\text{RMS}}, 2 \text{ s}$
Voltage between terminals and Case $V_{\text{TC}}$	4000 V AC, 10 s
Dissipation factor $\tan \delta$ at 100Hz	$\leq 1.0 \cdot 10^{-3}$
Life test	According to IEC 61071
Life expectancy*	100000 hours for $V_{\text{RMS}},  \Delta C/C  \leq 3\%$

### Climatic category 40/70/21

$T_{\text{stg}}^{**}$	-40 ... +85 °C
$T_{\text{min}}$	-40 °C
$T_{\text{max}}^{***}$	+70 °C
$T_{\text{hs}}^{****}$	+85 °C
Max. permissible humidity	95% (test = 21 days)
Max. permissible altitude	2000 m above sea level

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<b>Mechanical characteristics</b>	
Terminal cross section	Fast-on terminals - B32370 series: 5 mm <sup>2</sup> Screw terminals - B32371 (M6): 25 mm <sup>2</sup> Screw terminals - B32373 (M10) series: 100 mm <sup>2</sup> Clamp terminals - B32374 series: 25 mm <sup>2</sup>
Max. torque (case)	M12: 12 Nm
Max. torque (for screw terminal)	M6: 4 Nm (B32371 series) M10: 10 Nm (B32373 series) Screw clamp terminal: 2Nm (B32374 series)

\* Note that this life expectancy occurs for the worst case with a maximum temperature hot-spot of +85° Celsius degree. For other operation temperatures please check the life time curve for further details.

\*\*: $T_{stg}$  – Storage temperature.

\*\*\*: $T_{max}$ – Maximum operation ambient temperature.

\*\*\*\*: $T_{hs}$ – Maximum temperature allowed at the capacitors hot spot. Considering mounting position with terminals to the top. For other mounting positions, please request evaluation.

<b>Design data</b>	
Dimensions (D x H)	According to specification table
Weight approx.	According to specification table
Max. terminal current	Fast-on terminal: 15 A (B32370) M6: 30 A (B32371) M10: 60 A (B32373) Screw clamp terminal: 50 A (B32374)

**Electrical characteristics: Clearance and creepage distances**

Series	Diameter mm	Terminal to terminal		Terminal to case	
		Min. clearance Mm	Min. creepage mm	Min. clearance mm	Min. creepage Mm
B32370	50/63.5	10	36	16	19
B32371	63.5	23	34	13	14
B32373 Type A	75/85/96/116/136	15	28	15	20
B32373 Type B	75/85/96/116/136	15	39	20.5	25.6
B32374	75/85/96/116/136	Not applicable	12.7	9.6	12.7

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**Capacitor catalog number (type or series designation)**

FilterCap MKD AC series					A	B	C	D	E	F	G	H	I	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	3	2	3	7	3	A	3	4	0	7	J	0	3	0

**A. Indicates termination type**

0 = 6.3 mm x 0.8 mm (2 x) Fast-on terminals

1 = M6 (2 x) screw terminals

3 = M10 (2 x) screw terminals

4 = M5 (2 x) clamp terminals

**B. Indicates revision status (any letter), in case of S letter it means customized design**
**C. Indicates first number of voltage  $V_{RMS}$  value (any digit)**
**D. Indicates first and second figure of capacitance value (any two digits)**
**E. Indicates exponent used as multiplier (any digit)**
**F. Indicates capacitor tolerance for PEC AC capacitor**

 J =  $\pm 5\%$ ; K =  $\pm 10\%$ ;

**G. Indicates coded capacitance value**
**H. Indicates second number of voltage  $V_{RMS}$  value (any digit)**
**I. Indicates Accessories (any digit)**

**B32373A2507J050**

500 $\mu$ F	$\pm 5\%$
$U_{RMS}$	250V~
$U_N$	350V~
$I_s$	16.2kA
IEC 61071	50/60Hz
No PCB	-40...+70°C

Overpressure disconnectors SH  
 Protected 10k AFC UL File E487229  
 Maximum torque of terminals:10Nm  
 Discharge capacitor before handling  
 Made by EPCOS 45 Z 2018

123456789001

**Label information**
**Date code explanation**
**WW Z YYYY**
**WW Z YYYY:** production weeks (e.g.: 45)

**WW Z YYYY:** produced in Zhuhai (China)

**WW Z YYYY:** production year (e.g.: 2018)

**Bar code explanation**

Bar code consists of batch number and serial number.

Batch number: 9 digits (e.g.: 123456789)

Serial number: 3 digits (e.g.: 001)

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Dimensional drawings

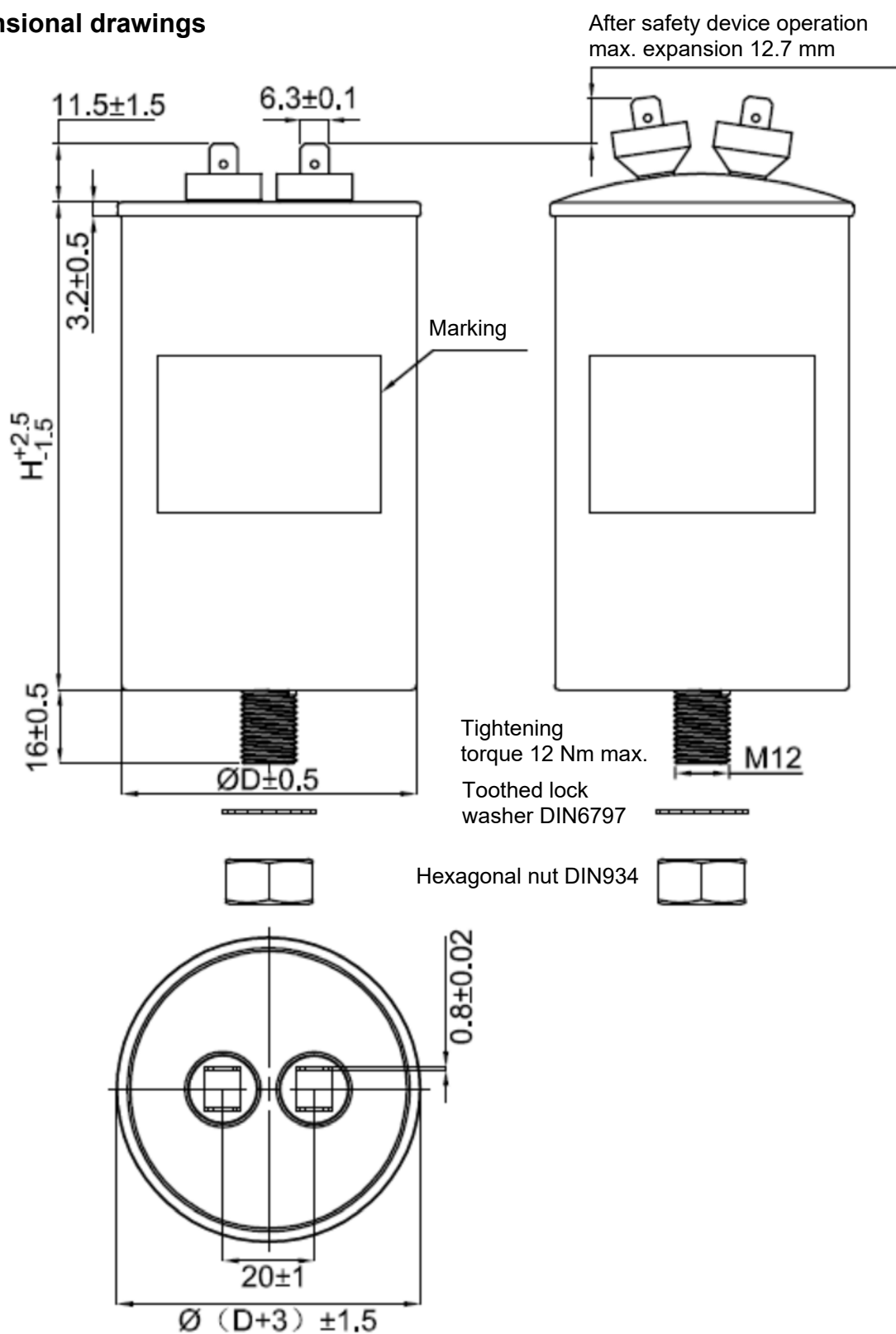
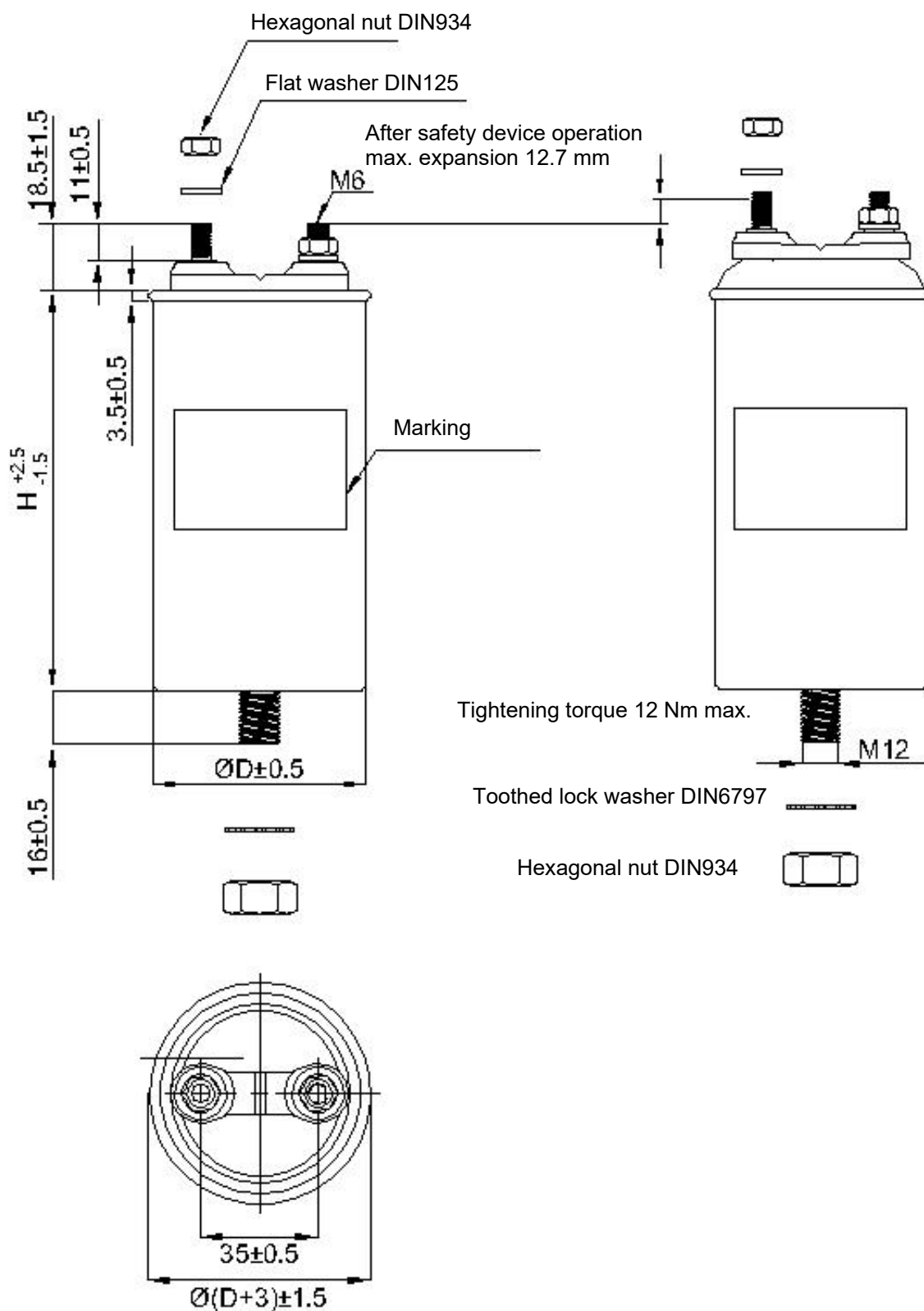


Figure 2: Series B32370 – fast on terminal

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**Figure 3:** B32371 series – M6 screw terminal

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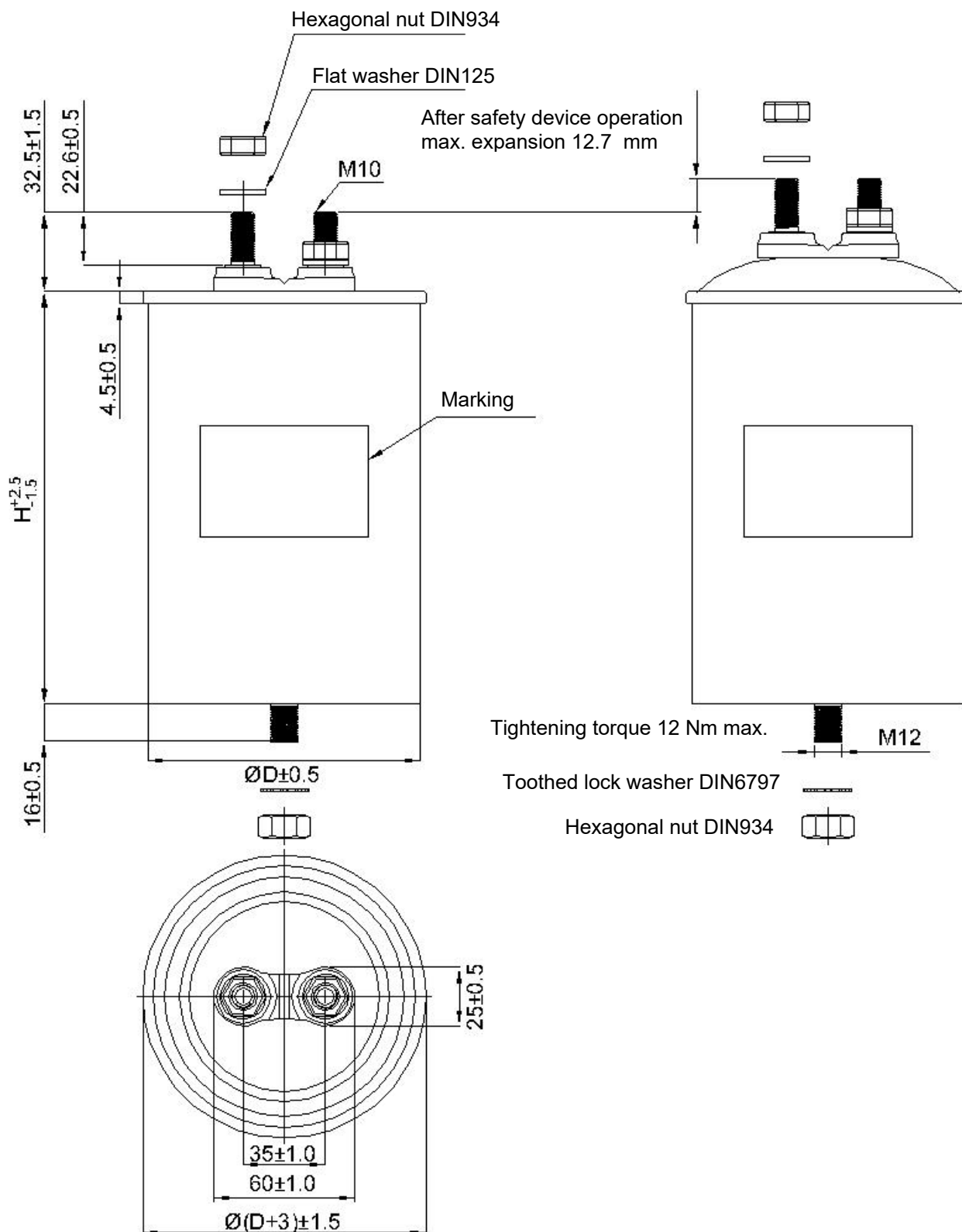


Figure 4: B32373 series – M10 screw terminal type A



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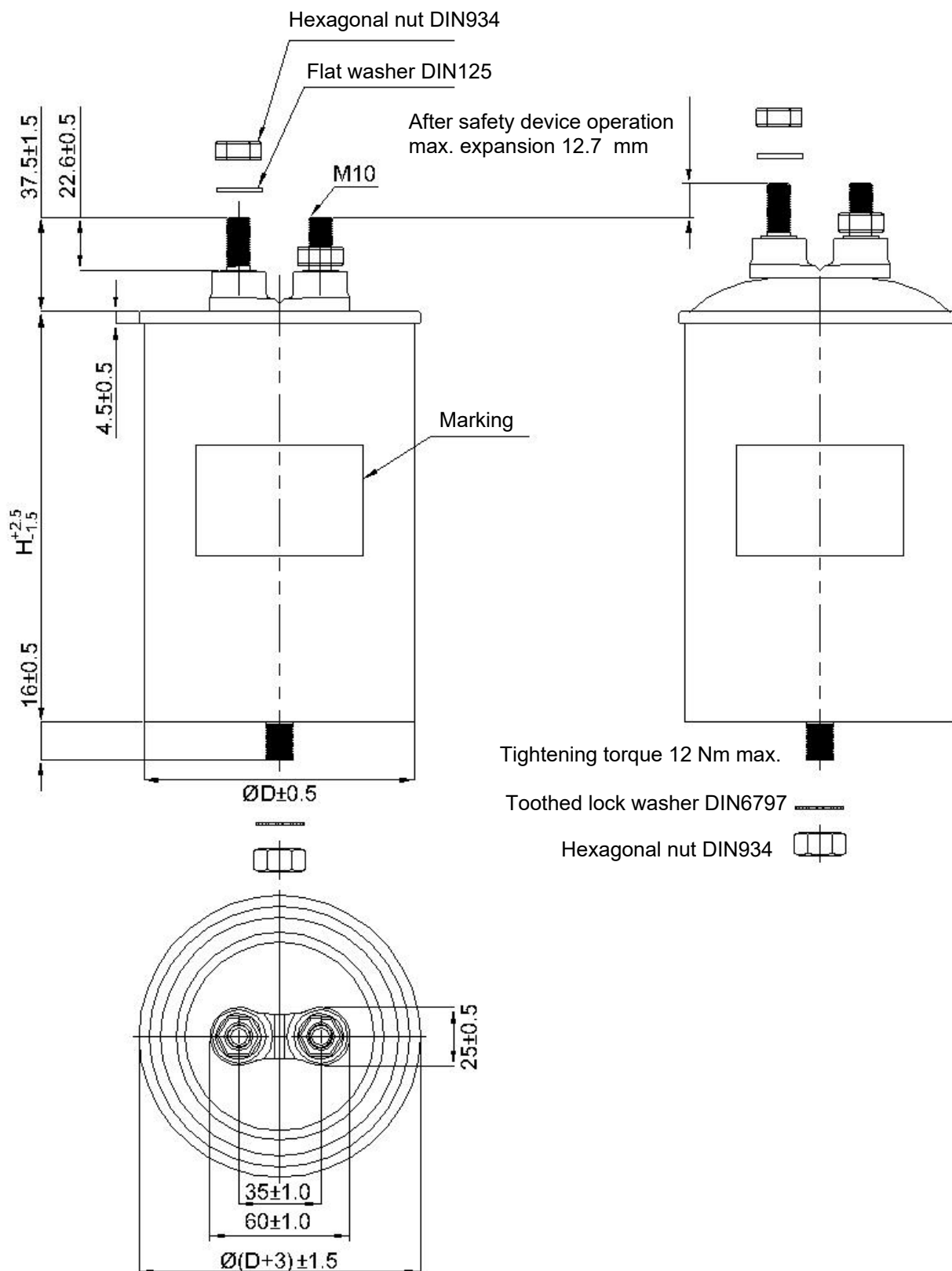


Figure 5: Series B32373 series – M10 screw terminal type B

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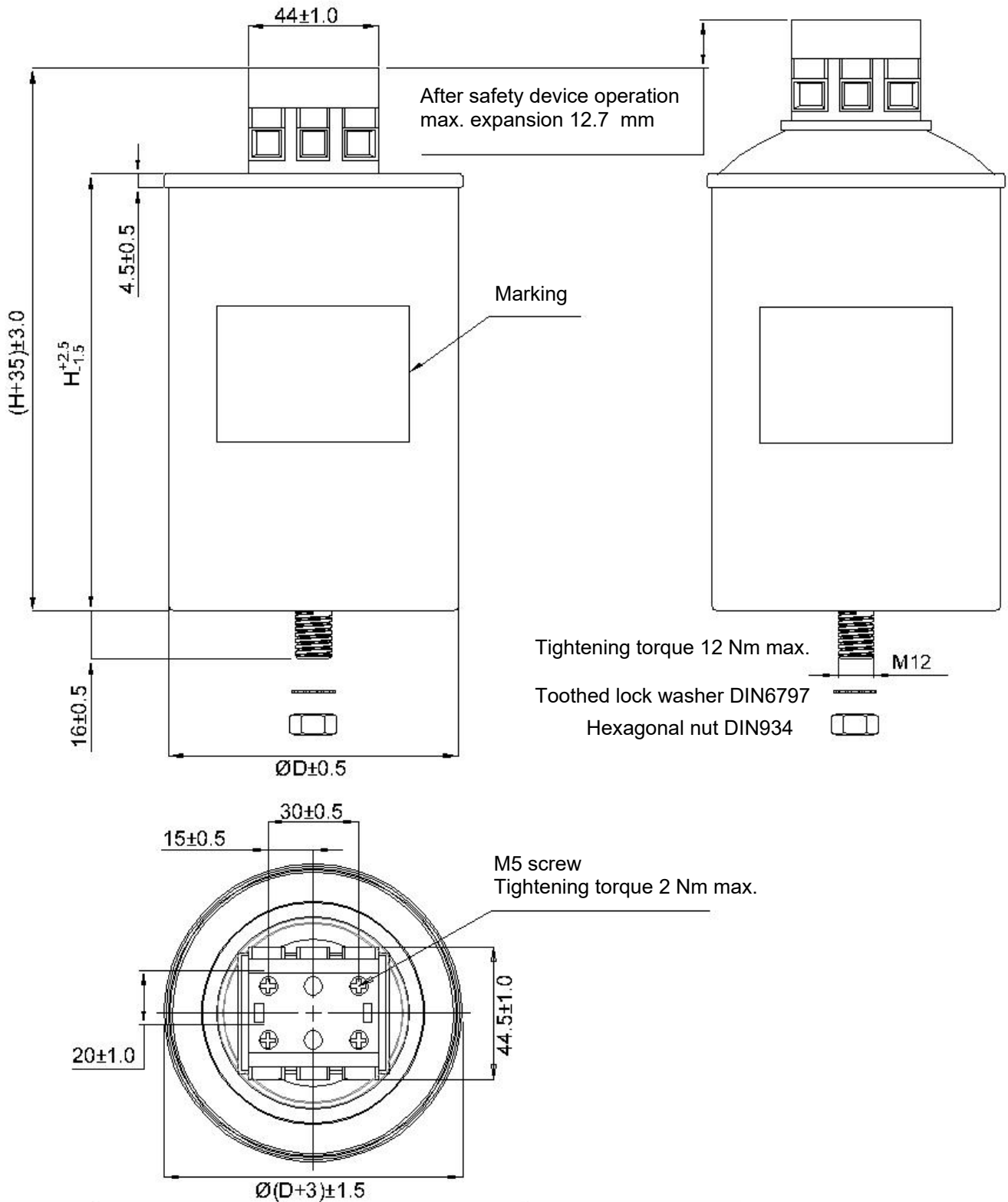
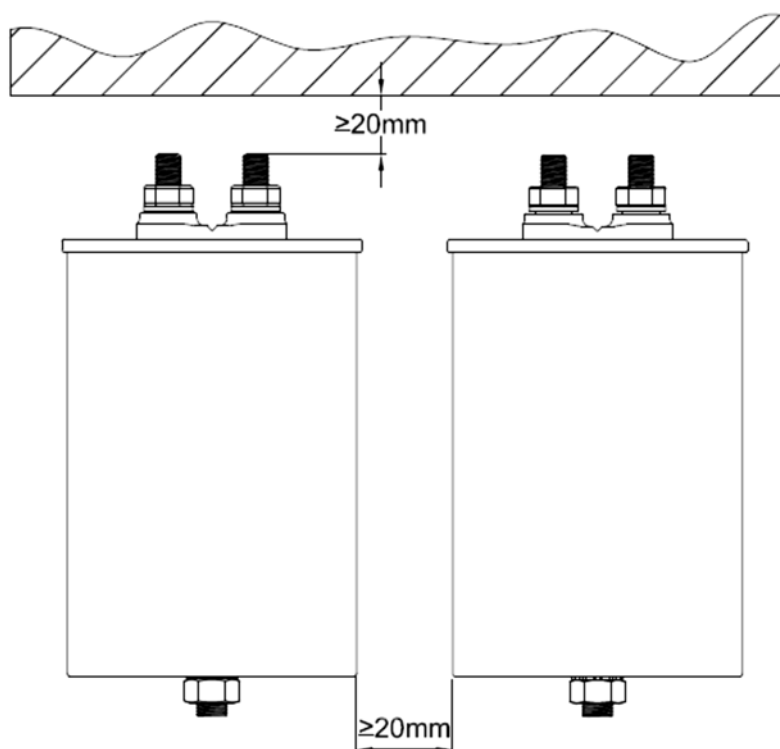


Figure 6: Series B32374 series – M5 screw clamp terminal

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### Installation space requirements

- 1) A minimum distance of 20 mm between the capacitors is necessary to maintain sufficient cooling.
- 2) Keep at least 20 mm space above the capacitor and do not attach any mounting components at the crimp or on top. This gap will allow a longitudinal extension of the can in order to ensure that the over-pressure disconnecter can fully extend.



**Figure 7:** Installation space requirements

**Note:** For further details, please check installation manual for MKD-AC capacitors.

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**Technical data of standard products**
**B32370 series – fast-on terminals**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit	
350 / 250	30	B32370A2306J050	15	750	50	64.5	0.17	50	
	40	B32370A2406J050	15	900	50	64.5	0.17	50	
	50	B32370A2506J050	15	900	50	77.5	0.19	50	
	60	B32370A2606J050	15	1000	50	77.5	0.19	50	
	70	B32370A2706J050	15	1300	63.5	77.5	0.30	12	
	75	B32370A2756J050	15	1340	63.5	77.5	0.30	12	
	80	B32370A2806J050	15	1500	63.5	77.5	0.30	12	
	100	B32370A2107J050	15	1600	63.5	77.5	0.30	12	
	120	B32370A2127J050	15	1500	63.5	92.5	0.33	12	
	140	B32370A2147J050	15	1520	63.5	102.5	0.35	12	
	150	B32370A2157J050	15	1600	63.5	102.5	0.35	12	
	160	B32370A2167J050	15	1280	63.5	127.5	0.45	12	
460 / 330	20	B32370A3206J030	14	600	50	64.5	0.17	50	
	25	B32370A3256J030	15	750	50	64.5	0.17	50	
	30	B32370A3306J030	15	650	50	77.5	0.19	50	
	40	B32370A3406J030	15	800	50	92.5	0.23	50	
	50	B32370B3506J030	15	840	50	92.5	0.23	50	
	60	B32370A3606J030	15	790	50	102.5	0.25	50	
	70	B32370A3706J030	15	1000	63.5	92.5	0.33	12	
	80	B32370A3806J030	15	1150	63.5	102.5	0.35	12	
	100	B32370A3107J030	15	1050	63.5	127.5	0.45	12	
	120	B32370A3127J030	15	1150	63.5	137.5	0.47	12	
	590 / 420	20	B32370A4206J020	14	520	50	77.5	0.19	50
		30	B32370A4306J020	15	1150	63.5	64.5	0.25	12
40		B32370A4406J020	15	1030	63.5	77.5	0.30	12	
50		B32370A4506J020	15	1060	63.5	87.5	0.32	12	
60		B32370A4606J020	15	1000	63.5	102.5	0.35	12	
70		B32370A4706J020	15	870	63.5	127.5	0.45	12	
80		B32370A4806J020	15	990	63.5	127.5	0.45	12	
100		B32370A4107J020	15	1120	63.5	137.5	0.47	12	
680 / 480		10	B32370A4106J080	10.5	400	50	64.5	0.17	50
	15	B32370A4156J080	12.5	600	50	77.5	0.19	50	
	20	B32370A4206J080	14	600	50	87.5	0.21	50	
	25	B32370A4256J080	15	500	50	102.5	0.25	50	
	30	B32370A4306J080	15	600	50	102.5	0.25	50	
	40	B32370A4406J080	15	750	63.5	102.5	0.35	12	
	50	B32370A4506J080	15	950	63.5	102.5	0.35	12	
	60	B32370A4606J080	15	850	63.5	127.5	0.45	12	
	70	B32370A4706J080	15	1000	63.5	137.5	0.47	12	

For new design

**B32370 series – fast on terminals**

$V_R/V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
750 / 530	10	B32370A5106J030	10.5	450	50	64.5	0.17	50
	20	B32370A5206J030	15	910	63.5	77.5	0.30	12
	30	B32370A5306J030	15	650	63.5	102.5	0.35	12
	40	B32370A5406J030	15	850	63.5	102.5	0.35	12
	50	B32370A5506J030	15	800	63.5	127.5	0.45	12
	60	B32370A5606J030	15	870	63.5	137.5	0.47	12
850 / 600	10	B32370A6106J000	12.5	520	63.5	64.5	0.25	12
	20	B32370A6206J000	15	750	63.5	77.5	0.28	12
	30	B32370A6306J000	15	730	63.5	102.5	0.35	12
	40	B32370A6406J000	15	720	63.5	127.5	0.45	12
	45	B32370A6456J000	15	800	63.5	127.5	0.45	12

**B32371 series - M6 screw terminals**

$V_R/V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
350 / 250	50	B32371A2506J050	23	1250	63.5	70.5	0.28	12
	60	B32371A2606J050	24	1500	63.5	70.5	0.28	12
	70	B32371A2706J050	25	1600	63.5	70.5	0.28	12
	75	B32371A2756J050	25.5	1400	63.5	70.5	0.28	12
	80	B32371A2806J050	26	1450	63.5	82.5	0.31	12
	100	B32371A2107J050	27.5	1650	63.5	82.5	0.31	12
	130	B32371A2137J050	28	1500	63.5	107.5	0.40	12
	150	B32371A2157J050	30	1600	63.5	132.5	0.48	12
460 / 330	200	B32371A2207J050	30	1750	63.5	132.5	0.48	12
	30	B32371A3306J030	19.5	940	63.5	70.5	0.28	12
	40	B32371A3406J030	21.5	1250	63.5	70.5	0.28	12
	50	B32371A3506J030	23	1100	63.5	82.5	0.31	12
	60	B32371A3606J030	24	1095	63.5	92.5	0.33	12
	70	B32371A3706J030	24.5	1000	63.5	107.5	0.40	12
	80	B32371A3806J030	25	1150	63.5	107.5	0.40	12
	100	B32371A3107J030	25.5	1050	63.5	132.5	0.48	12
590 / 420	120	B32371A3127J030	27.5	1160	63.5	142.5	0.50	12
	10	B32371A4106J020	12.5	350	63.5	70.5	0.28	12
	15	B32371A4156J020	15	530	63.5	70.5	0.28	12
	20	B32371A4206J020	17	710	63.5	70.5	0.28	12
	25	B32371A4256J020	18.5	890	63.5	70.5	0.28	12
	30	B32371A4306J020	20	1050	63.5	70.5	0.28	12
	40	B32371A4406J020	22	760	63.5	82.5	0.31	12
	50	B32371A4506J020	23	1230	63.5	97.5	0.35	12
60	60	B32371A4606J020	24	1000	63.5	107.5	0.40	12
	70	B32371A4706J020	25	1030	63.5	117.5	0.41	12

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**B32371 series - M6 screw terminals**

$V_R/V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
590 / 420	80	B32371A4806J020	25	990	63.5	132.5	0.48	12
	100	B32371A4107J020	26	1120	63.5	142.5	0.50	12
680 / 480	10	B32371A4106J080	13	400	63.5	70.5	0.28	12
	15	B32371A4156J080	15.5	600	63.5	70.5	0.28	12
	20	B32371A4206J080	17	800	63.5	70.5	0.28	12
	25	B32371A4256J080	18.5	750	63.5	82.5	0.31	12
	30	B32371A4306J080	20	880	63.5	82.5	0.31	12
	40	B32371A4406J080	21.5	760	63.5	107.5	0.40	12
	50	B32371A4506J080	23	960	63.5	107.5	0.40	12
	60	B32371A4606J080	23.5	850	63.5	132.5	0.48	12
750 / 530	70	B32371A4706J080	24	900	63.5	142.5	0.50	12
	10	B32371A5106J030	13	470	63.5	70.5	0.30	12
	20	B32371A5206J030	18	680	63.5	82.5	0.31	12
	30	B32371A5306J030	20	650	63.5	107.5	0.40	12
	40	B32371A5406J030	21.5	760	63.5	117.5	0.41	12
850 / 600	50	B32371A5506J030	23	800	63.5	132.5	0.48	12
	10	B32371A6106J000	13	520	63.5	70.5	0.28	12
	20	B32371A6206J000	17.5	695	63.5	92.5	0.33	12
	30	B32371A6306J000	20	730	63.5	107.5	0.40	12
	40	B32371A6406J000	21.5	720	63.5	132.5	0.48	12

**B32373 series - M10 screw terminals (terminal type A)**

$V_R/V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
350 / 250	150	B32373A2157J050	41.5	1800	75	117	0.65	9
	200	B32373A2207J050	45	2160	75	117	0.65	9
	250	B32373A2257J050	45	2000	75	142	0.75	6
	300	B32373A2307J050	60	3770	75	175	0.95	6
	330	B32373A2337J050	60	3560	75	195	1.05	9
	400	B32373A2407J050	60	3790	75	215	1.25	6
	500	B32373A2507J050	60	5400	85	195	1.30	9
	600	B32373A2607J050	60	4800	85	245	1.55	4
460 / 330	100	B32373A3107J030	36	1440	75	117	0.65	9
	120	B32373A3127J030	39	1720	75	117	0.65	9
	150	B32373A3157J030	40	1600	75	142	0.75	6
	200	B32373A3207J030	48	2130	85	142	0.95	4
	250	B32373A3257J030	60	3600	85	195	1.30	9
	300	B32373A3307J030	60	4320	85	195	1.30	9
	330	B32373A3337J030	60	4160	85	215	1.40	4
	400	B32373A3407J030	60	4260	85	245	1.55	4

For new design

**B32373 series - M10 screw terminals (terminal type A)**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
460 / 330	500	B32373A3507J030	60	5330	96	245	2.00	4
590 / 420	60	B32373A4606J020	32	1270	75	102	0.60	6
	70	B32373A4706J020	33	1175	75	117	0.65	9
	80	B32373A4806J020	35	1340	75	117	0.65	9
	100	B32373A4107J020	35.5	1245	75	142	0.75	6
	120	B32373A4127J020	51	2550	75	165	0.90	6
	150	B32373A4157J020	59	3195	85	165	1.15	4
	200	B32373A4207J020	60	3360	85	195	1.30	9
	250	B32373A4257J020	60	3110	85	245	1.55	4
	300	B32373A4307J020	60	3730	85	245	1.55	4
	350	B32373A4357J020	60	4350	96	245	2.00	4
400	B32373A4407J020	60	6720	116	195	2.25	4	
680 / 480	60	B32373A4606J080	32	1150	75	117	0.65	9
	66	B32373A4666J080	33	1260	75	117	0.65	9
	68	B32373A4686J080	38	1655	85	102	0.65	4
	70	B32373A4706J080	43	2050	75	145	0.75	6
	80	B32373A4806J080	46	2360	75	145	0.75	6
	86	B32373A4866J080	50	3400	85	120	0.80	4
	100	B32373B4107J080	50	2430	75	165	0.90	6
	120	B32373A4127J080	52	2300	75	195	1.05	9
	150	B32373A4157J080	60	2880	85	195	1.30	9
	166	B32373A4167J680	60	3200	85	195	1.30	9
	180	B32373A4187J080	60	4400	96	165	1.35	4
	200	B32373A4207J080	60	2840	85	245	1.55	4
	250	B32373A4257J080	60	3550	96	245	2.00	4
	280	B32373A4287J080	60	6250	116	175	2.05	4
300	B32373A4307J080	60	5840	116	195	2.25	4	
350	B32373A4357J080	60	5970	116	215	2.45	4	
750 / 530	30	B32373A5306J030	25.5	938	75	102	0.60	6
	33	B32373A5336J030	29	1100	85	92	0.60	4
	47	B32373A5476J030	36	2210	75	120	0.65	9
	50	B32373A5506J030	40	2280	75	120	0.65	9
	60	B32373A5606J030	43	2740	85	120	0.80	4
	65	B32373A5656J030	44	2960	85	120	0.80	4
	70	B32373A5706J030	37	1325	85	127	0.85	4
	75	B32373A5756J030	43	1880	96	107	0.85	4

For new design

**B32373 series - M10 screw terminals (terminal type A)**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
750 / 530	80	B32373A5806J030	41	1280	85	142	1.00	4
	100	B32373A5107J030	60	3330	96	145	1.15	4
	105	B32373B5107J530	60	3670	96	145	1.15	4
	110	B32373A5117J030	60	3750	96	145	1.15	4
	116	B32373A5117J630	60	3860	96	145	1.15	4
	120	B32373A5127J030	60	2590	85	195	1.30	9
	150	B32373A5157J030	60	5100	116	145	1.70	4
	200	B32373A5207J030	60	5570	116	165	1.90	4
	220	B32373A5227J030	60	5530	116	175	2.05	4
	250	B32373A5257J030	60	5480	116	195	2.15	4
	300	B32373A5307J030	60	4850	116	245	2.85	4
	330	B32373B5337J030	60	5200	116	245	2.85	4
	350	B32373A5357J030	60	5650	116	245	2.85	4
	850 / 600	33	B32373A6336J000	27	930	75	107	0.60
41		B32373A6416J000	29	1000	75	117	0.65	9
47		B32373A6476J000	34	1330	85	107	0.65	4
50		B32373A6506J000	34	1220	85	117	0.80	4
53		B32373A6536J000	35	1230	85	117	0.80	4
60		B32373A6606J000	37.5	1700	96	107	0.85	4
70		B32373A6706J000	48.5	2430	85	165	1.15	4
80		B32373A6806J000	50.5	2130	85	195	1.30	9
94		B32373A6946J000	54	3130	96	165	1.35	4
100		B32373A6107J000	58	2660	96	195	1.60	4
120		B32373A6127J000	60	3195	96	195	1.60	4
130		B32373A6137J000	60	3170	96	195	1.60	4
150		B32373A6157J000	60	2875	96	245	2.00	4
180		B32373A6187J000	60	4800	116	195	2.15	4
200		B32373B6207J000	60	3830	116	245	2.85	4
250		B32373A6257J000	60	4790	116	245	2.85	4
270		B32373A6277J000	60	5175	116	245	2.85	4
300	B32373A6307J000	60	5750	136	245	3.80	4	



For new design

**B32373 series - M10 screw terminals (terminal type B)**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$I$ A	D Mm	H mm	Weight kg	Packing unit
930 / 660	20	B32373A6206J060	22	910	75	92	0.55	6
	22	B32373A6226J060	23	810	75	102	0.60	6
	25	B32373A6256J060	24	840	75	107	0.60	6
	33	B32373A6336J060	29.5	1100	85	107	0.65	4
	41	B32373A6416J060	32	1165	85	117	0.80	4
	50	B32373A6506J060	33	1030	85	142	1.00	4
	68	B32373B6686J060	40	1400	96	142	1.15	4
	80	B32373A6806J060	55.5	2940	96	165	1.35	4
	90	B32373A6906J060	58	3000	96	175	1.45	4
	100	B32373A6107J060	60	2840	96	195	1.55	4
	120	B32373B6127J060	60	4240	116	165	1.90	4
	150	B32373A6157J060	60	4260	116	195	2.15	4
	200	B32373A6207J060	60	4120	116	245	2.85	4
	220	B32373A6227J060	60	4530	116	245	2.85	4
	250	B32373A6257J060	60	5150	136	245	3.8	4
300	B32373A6307J060	60	6180	136	245	3.8	4	
1020 / 720	20	B32373A7206J020	24	800	75	102	0.60	6
	22	B32373B7226J020	26.5	1100	85	92	0.60	4
	25	B32373A7256J020	28.5	1000	85	102	0.65	4
	31	B32373A7316J020	31.5	960	85	117	0.80	4
	33	B32373A7336J020	34.5	1320	96	102	0.85	4
	36	B32373A7366J020	33.5	1115	85	117	0.80	4
	45	B32373A7456J020	36.5	1010	85	142	1.00	4
	50	B32373A7506J020	38	1125	85	142	1.00	4
	60	B32373A7606J020	44	1350	96	142	1.15	4
	65	B32373A7656J020	54.5	2600	96	165	1.35	4
	70	B32373A7706J020	53.5	1860	85	195	1.30	9
	80	B32373A7806J020	60	2480	96	195	1.60	4
	90	B32373A7906J020	60	2020	85	245	1.55	4
	100	B32373A7107J020	60	2250	85	245	1.55	4
	120	B32373A7127J020	60	2670	96	245	2.00	4
150	B32373A7157J020	60	4000	116	215	2.45	4	
180	B32373A7187J020	60	4050	116	245	2.85	4	

For new design

**B32373 series - M10 screw terminals (terminal type B)**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
1100 / 780	15	B32373A7156J080	21	650	75	102	0.60	6
	20	B32373A7206J080	24	740	75	107	0.60	6
	22	B32373A7226J080	25	700	75	117	0.65	9
	33	B32373B7336J080	32	800	85	142	1.00	4
	47	B32373A7476J080	40	1150	96	142	1.15	4
	53	B32373B7536J080	42	1290	96	142	1.15	4
	68	B32373A7686J080	55	2280	96	195	1.60	4
	75	B32373A7756J080	57	2520	96	195	1.60	4
	82	B32373A7826J080	58	2000	85	245	1.55	4
	100	B32373A7107J080	60	2440	96	245	2.00	4
	120	B32373A7127J080	60	4030	116	195	2.15	4
150	B32373A7157J080	60	3660	116	245	2.85	4	
180	B32373A7187J080	60	4390	136	245	3.80	4	
1200 / 850	20	B32373A8206J050	26	935	85	102	0.65	4
	25	B32373A8256J050	29	900	85	117	0.80	4
	33	B32373A8336J050	38	1920	85	145	1.00	4
	40	B32373A8406J050	42	1870	85	165	1.15	4
	47	B32373A8476J050	48.5	2200	96	165	1.35	4
	53	B32373A8536J050	48.5	1920	85	195	1.30	9
	60	B32373B8606J050	55	2170	96	195	1.60	4
	68	B32373A8686J050	55	1785	85	245	1.55	4
	80	B32373B8806J050	60	2890	116	175	2.05	4
	82	B32373B8826J050	60	2965	116	175	2.05	4
	100	B32373B8107J050	60	3615	116	195	2.15	4
	150	B32373A8157J050	60	5420	136	195	2.95	4
180	B32373A8187J050	60	4720	136	245	3.80	4	
200	B32373A8207J050	60	5250	136	245	3.80	4	
1415 / 1000	15	B32373A1156J000	22	2175	75	142	0.75	6
	20	B32373A1206J000	27	2900	85	142	1.00	4
	22	B32373A1226J000	28	3190	85	142	1.00	4
	30	B32373A1306J000	34.5	4360	96	142	1.15	4
	45	B32373A1456J000	47	6500	85	245	1.55	4
	60	B32373A1606J000	57	8700	96	245	2.00	4

For new design

**B32374 series - clamp terminals**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
350 / 250	100	B32374A2107J050	38	1850	75	92	0.55	6
	120	B32374A2127J050	40	2150	75	92	0.55	6
	150	B32374A2157J050	42.5	2050	75	102	0.60	6
	200	B32374A2207J050	44.5	2160	75	117	0.65	9
	250	B32374A2257J050	45	2000	75	142	0.75	6
	300	B32374A2307J050	46	2400	75	152	0.80	6
	330	B32374A2337J050	47.5	3560	75	195	1.05	6
	400	B32374A2407J050	50	4300	75	195	1.05	6
	500	B32374A2507J050	50	4690	85	245	1.55	4
460 / 330	100	B32374A3107J030	37	1800	75	107	0.60	6
	120	B32374A3127J030	39	1585	75	117	0.65	6
	150	B32374A3157J030	40	1600	75	142	0.75	6
	200	B32374A3207J030	50	2850	75	195	1.05	6
	250	B32374A3257J030	50	2650	75	245	1.25	6
	300	B32374A3307J030	50	3500	75	245	1.25	6
590 / 420	60	B32374A4606J020	32.5	1270	75	102	0.60	6
	70	B32374A4706J020	33.5	1175	75	117	0.65	6
	80	B32374A4806J020	35	1340	75	117	0.65	6
	100	B32374A4107J020	35.5	1245	75	142	0.75	6
	120	B32374A4127J020	50	2550	75	165	0.90	6
	150	B32374A4157J020	50	1690	85	152	0.90	4
	200	B32374A4207J020	50	3360	85	195	1.30	4
680 / 480	40	B32374A4406J080	28	1070	75	102	0.60	6
	50	B32374A4506J080	30.5	1030	75	107	0.60	6
	60	B32374A4606J080	32	1150	75	117	0.65	6
	70	B32374A4706J080	38	1550	85	107	0.65	4
	80	B32374A4806J080	39	1540	85	117	0.80	4
	100	B32374B4107J080	46	2370	96	117	1.05	4
	150	B32374A4157J080	50	2050	96	142	1.15	4
	200	B32374A4207J080	50	3750	116	142	1.70	4
	250	B32374A4257J080	50	3450	116	165	1.80	4

For new design

**B32374 series - clamp terminals**

$V_R / V_{RMS}$ V	$C_R$ $\mu F$	Ordering code	$I_{max}$ A	$\hat{i}$ A	D mm	H mm	Weight kg	Packing unit
750 / 530	50	B32374A5506J030	30.5	1100	75	117	0.65	6
	60	B32374B5606J030	33	1315	75	117	0.65	6
	100	B32374A5107J030	50	3400	96	145	1.15	4
	120	B32374A5127J030	50	3050	85	175	1.10	4
	150	B32374A5157J030	50	5100	116	145	1.70	4
	200	B32374A5207J030	50	5570	116	165	1.90	4
850 / 600	100	B32374A6107J000	50	2660	96	195	1.60	4
	120	B32374A6127J000	50	3195	96	195	1.60	4
	150	B32374A6157J000	50	2875	96	245	2.00	4

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For new design

## Terms

### Design

The winding element of the MKD capacitor consists of metallized polypropylene film. This winding construction achieves low losses and a high pulse-current withstand capability. Soft PU resin is used for impregnation of the capacitor.

### Contacting

The end faces of the windings are contacted by metal spraying to ensure a reliable and low-inductance connection between the leads and layers. The leads are welded or soldered to these end faces, brought out through insulating elements (plastic) and soldered to the terminals.

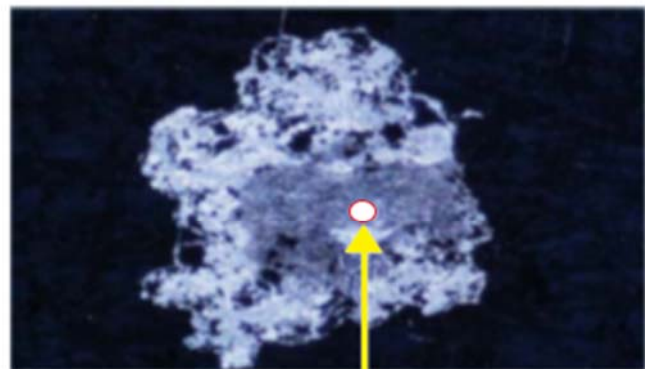
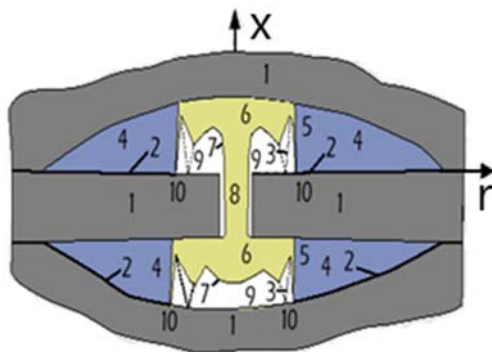
### Impregnation

All hollows between the windings and between the windings and the case are filled with an impregnating agent. Besides increasing dielectric strength, this improves heat dissipation from inside a capacitor. The impregnating agents that we use are free of PCB and halogens.

### Self-healing

All MKD capacitors are self-healing, i. e. voltage breakdowns heal in a matter of microseconds and hence do not produce a short circuit.

Breakdowns can occur under heavy electrical load as a result of weaknesses or pores in the dielectric. The integrity of self-healing capacitors is not affected by such breakdowns.



Breakdown

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. Dielectric (Polypropylene)</li> <li>2. Metallization</li> <li>3. Material-displacing shock wave</li> <li>4. Air gap with metal vapor</li> <li>5,6. Plasma zone</li> </ul> | <ul style="list-style-type: none"> <li>7. Boundary layer between gas-phase dielectric and plasma zones</li> <li>8. Puncture channel</li> <li>9. Gas-phase dielectric</li> <li>10. Zone of displaced metallization and dielectric</li> </ul> |
|---|---|

**Figure 8:** Description of Self-healing technology

**For new design**

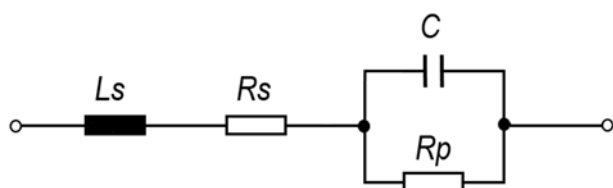
When a breakdown occurs, the dielectric in a breakdown channel is broken down into its atomic components by the electric arc that forms between the electrodes. At the high temperatures of as much as 6000 K, a plasma is created that explodes out of the channel region and pushes the dielectric layers apart. The actual self-healing process starts with the continuation of the electric arc in the propagating plasma. Here the metal layers are removed from the metal edges by evaporation. Insulation areas are formed. The rapid expansion of the plasma beyond the areas of insulation and its cooling in the areas of less field strength allow the discharge to extinguish after a few microseconds.

The area of insulation that is created is highly resistive and voltage-proof for all operating requirements of the capacitor. The self-healing breakdown is limited in current and so it does not represent a short circuit. The self-healing process is so brief and low in energy that the capacitor also remains fully functional during the breakdown.

## Characteristics

### Equivalent circuit diagram

Any real capacitor can be modelled by the following schematic:



**Figure 9:** Equivalent circuit diagram

Symbol	Description	Unit
$L_s$	series inductance	H
$R_s$	series resistance, due to contacts(leads, sprayed metal and film metallization	$\Omega$
$R_p$	parallel resistance, due to insulation resistance	$\Omega$
$C$	capacitance	F

$C$ ,  $R_s$  and  $L_s$  are magnitudes that vary in the frequency domain (AC).

$R_p$  is a magnitude defined in DC (insulation resistance).

### Rated capacitance $C_R$

It is referred to a test temperature of +20 °C and a measuring frequency range of 50 Hz to 1 kHz.

### Capacitance tolerance range

It is the range within which the actual capacitance may differ from rated capacitance. The actual capacitance is to be measured at a temperature of +20 °C. This range results from variances in materials and manufacturing processes. The standard manufacturing tolerance for PP film capacitors is  $\pm 10\%$  or 'K' tolerance or  $\pm 5\%$ , 'J' tolerance.

For new design

### Temperature dependence of capacitance

The capacitance variation in the permissible temperature range is not linear, but it is reversible, the characteristic change in capacitance  $\Delta C/C$  as a function of test temperature is shown as follows:

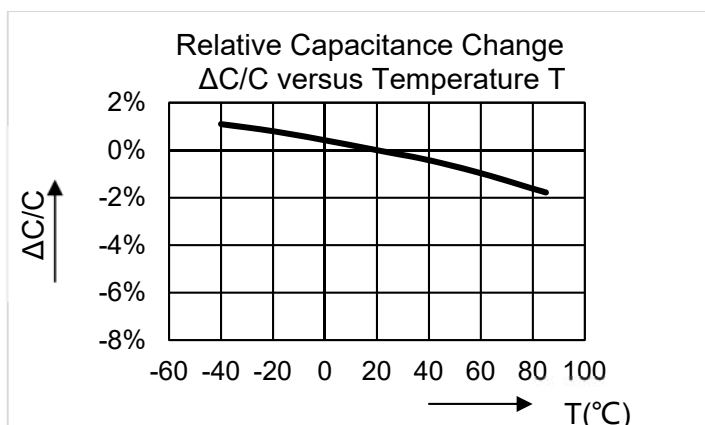


Figure 10: Temperature dependence of capacitance

### Capacitance drift

Capacitance is subject to irreversible in addition to reversible changes, i.e. capacitance drift, the sum of all time-dependent, irreversible changes of capacitance during operating life. This variation is stated in percent of the value at delivery. The typical figure is +1/-3%.

### Rated AC voltage $V_R$

The maximum operating peak recurrent voltage of either polarity of a reversing type waveform for which the capacitor has been designed.

Unlike what is common in other standard (e.g. B32304\* 3-phase capacitor series for PFC application) therefore, the rated voltage  $V_R$  is not the RMS value, but the maximum or peak value of the capacitor voltage. The voltage at which the capacitor may be operated is dependent on other factors (especially current and frequency) besides rated voltage.

### Voltage $V_{RMS}$

It is the Root Mean Square (RMS) voltage of maximum permissible value of sinusoidal AC voltage in continuous operation.

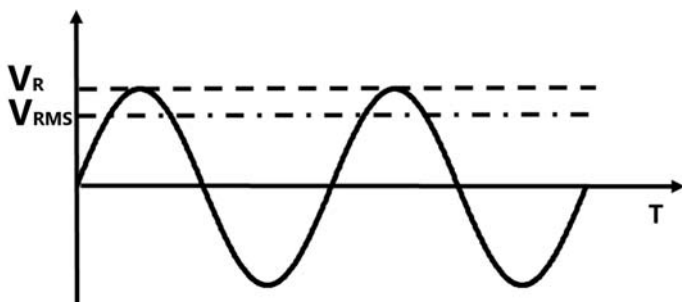


Figure 11: Voltage  $V_{RMS}$

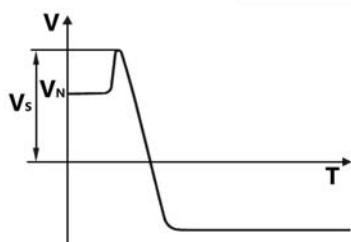
For new design

### Rated DC voltage $V_{RDC}$

It is the maximum operating peak voltage of either polarity but of non-reversing type waveform, for which the capacitor has been designed, for continuous operation.

### Non-recurrent surge voltage $V_s$

A peak voltage induced by a switching or any other disturbance of the system which is allowed for a limited number of times and for durations shorter than the basic period.



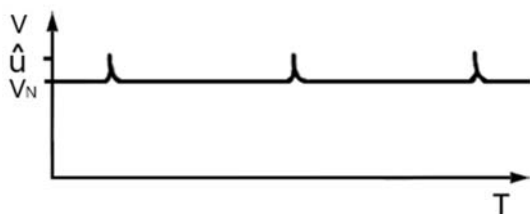
**Figure 12:** Non-recurrent surge voltage  $V_s$

Maximum duration: 50 ms/pulse

Maximum number of occurrences: 1000 (during load)

### Max. Recurrent peak voltage $\hat{u}$

This is the permissible, max. Recurrent peak voltage that may appear for max.1% of the period.



**Figure 13:** Max. Recurrent peak voltage  $\hat{u}$

### Symmetric alternating voltage $\hat{u}_{ac}$

The peak values of a symmetrical alternating voltage applied to the capacitor is a decisive factor for the dielectric losses.

$$\text{For AC capacitors: } \hat{u}_{ac} = V_R$$

### Insulation voltage $V_i$

It is the rms rated value of the insulation voltage of capacitive elements and terminals to case or earth. If not specified, the rms value of the insulating voltage is equivalent to the rated voltage divided by  $\sqrt{2}$ .

### Maximum current $I_{max}$

It is the maximum rms current for continuous operation, but could not be higher than maximum terminal current. A higher current than proposal  $I_{max}$  value could be possible in lower ambient temperature.



For new design

### Maximum peak current $\hat{I}$

It is the maximum current amplitude which occurs instantaneously during continuous operation. The maximum peak current and the maximum rate of voltage rise  $(dV/dt)_{max}$  on a capacitor are related as follows:

$$\hat{I} = C_R \cdot \left( \frac{dV}{dt} \right)_{max}$$

### Maximum surge current $I_s$

It is the peak non-repetitive current induced by switching or any other disturbance of the system permitted for a limited number of times, at durations shorter than the basic period.

$$I_s = C_R \cdot \left( \frac{dV}{dt} \right)_s$$

Maximum duration: 50 ms/pulse

Maximum number of occurrences: 1000 (during load)

### Self-inductance $L_{self}$

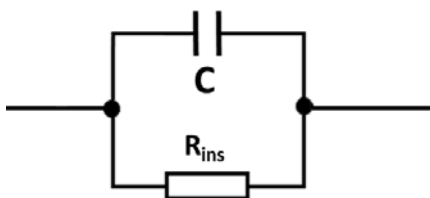
The self-inductance is produced by the inductance of the terminals and the windings. Because of the special kind of contacting in self-healing capacitors (large area metal spraying covering all windings), the self-inductance is particularly low. It allows the resonance frequency to be determined:

$$f = \frac{1}{2\pi\sqrt{L_{self} \cdot C_R}}$$

The resonance frequency is high for all capacitors accordingly.

### Insulation Resistance ( $R_{ins}$ )

The dielectric of a capacitor has a large area and a short length. Even if the material is a good isolator there always flows a certain current between the charged electrodes (the current increases exponentially with the temperature). This leakage can be described as a parallel resistance with a high value, an Insulation Resistance.



**Figure 14:** Insulation Resistance ( $R_{ins}$ )

For new design

### Insulation resistance and self-discharge time constant

The insulation values for the individual components according to the capacitance are stated as an insulation resistance  $R_{ins}$  in  $M\Omega$  or a self-discharge time constant  $\tau$  in seconds.

$$\tau = R_{ins} \cdot C_R$$

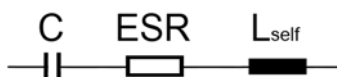
### Series resistance $R_s$

Resistive losses occur in the electrodes in the contacting and in the inner wiring. These are comprised in the series resistance  $R_s$  of a capacitor.

The series resistance  $R_s$  generates the ohmic losses ( $I^2 \times R_s$ ) in a capacitor. It is largely independent of frequency. The figures stated in selection charts apply to  $+20^\circ\text{C}$  capacitor temperature.

### Dissipation factor $\tan \delta$

The equivalent circuit diagram used for the losses in a capacitor can be shown as follows:



**Figure 15:** Simplified equivalent circuit diagram of a capacitor

Symbol	Description	Unit
C	Capacitor	F
$L_{self}$	Self-inductance	H
ESR	Equivalent series resistance, representing the entire active power in capacitor	$\Omega$

The self-inductance and capacitance of a capacitor produce its resonance frequency (natural frequency).

$$\tan \delta(f) = \tan \delta_0 + R_s \cdot \omega \cdot C$$

From the frequency dependence of the equivalent series resistance can be derived:

$$ESR = \frac{\tan \delta}{\omega \cdot C} = R_s + \frac{\tan \delta_0}{\omega \cdot C}$$

Symbol	Description	Unit
$\tan \delta$	Dissipation factor of capacitor	-
$\tan \delta_0$	Dissipation factor of dielectric	-
$R_s$	Series resistance	$\Omega$

For new design

### Dielectric dissipation factor $\tan \delta_0$

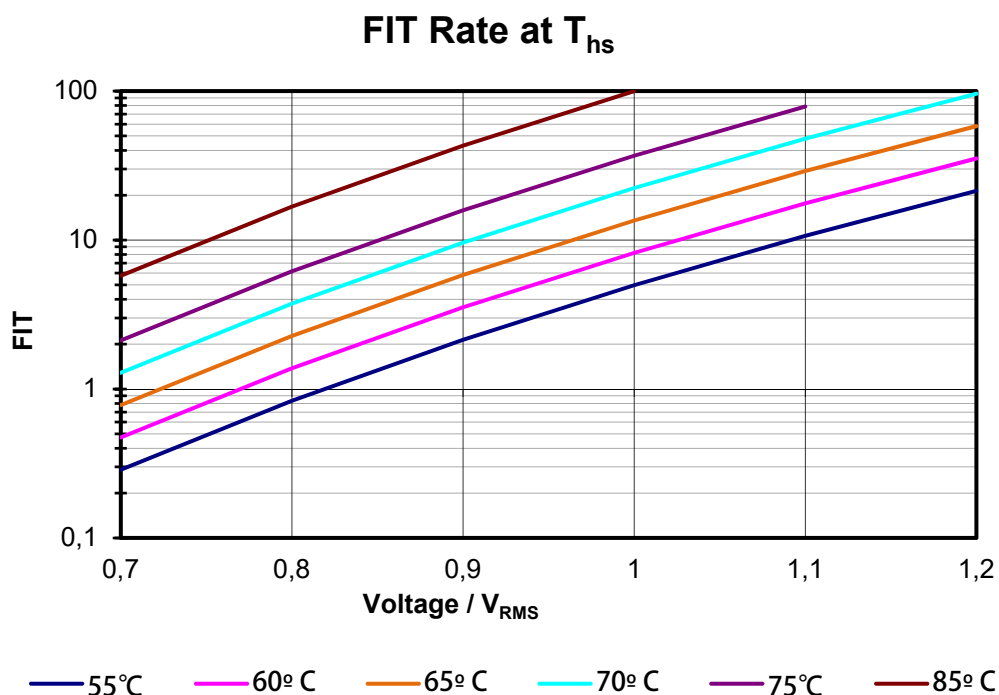
The dissipation factor  $\tan \delta_0$  of the dielectric is assumed to be constant for all capacitors in their frequency range of use. The figures stated in data sheets apply to rated operation.

### Expected Fit rate $\lambda$

The FIT (Failure In Time) of a component is defined as the number of expected failures in  $10^9$  hours of operation.

The FIT rate is calculated on the basis of the number of components operating in the field and the estimated hours of operation. All the reports of failures are taken into consideration for this calculation, which is updated every year. The other values in the graph are given as indication and calculated based on acceleration factors.

The failure criterion is capacitance drop higher than 3%.



**Figure 16:** Expected Fit rate  $\lambda$

### Thermal design

In order to scale a capacitor correctly for a particular application, the permissible ambient temperature has to be determined. This can be taken from the diagram “Permissible ambient temperature  $T_A$  vs total power dissipation  $P$ ” after calculating the power dissipation (for further details please check individual data sheets).

For new design

### Calculation of power dissipation P

The total power dissipation P is composed of the dielectric losses ( $P_D$ ) and the resistive losses ( $P_R$ ): Generally a secondary sinusoidal AC voltage can be used for calculating with sufficient accuracy.

$$P = P_D + P_R$$

$$P_D = \hat{u}_{ac}^2 \cdot \pi \cdot f_0 \cdot C \cdot \tan \delta_0$$

Symbol	Description	Unit
$\hat{u}_{ac}$	Peak value of symmetrical AC voltage applied to capacitor	V
$f_0$	Fundamental frequency	Hz
C	Capacitance	F
$\tan \delta_0$	Dissipation factor of dielectric	

$$P_R = I^2 \cdot R_S$$

Symbol	Description	Unit
I	RMS value of capacitor current	A
$R_S$	Series resistance at maximum hot-spot temperature	$\Omega$

The  $R_S$  figure at maximum hot-spot temperature is used to calculate the resistive losses. In selection charts and data sheets the figure is stated for 20°C capacitor temperature. The conversion factor is as follows:

$$R_{S85^\circ} = 1.25 \cdot R_{S20^\circ}$$

### Thermal resistance $R_{th}$

The thermal resistance is defined as the ratio of a temperature difference and the power dissipation produced in a capacitor. The decisive factor here is  $\Delta T_{cap}$  where the temperature difference between an external reference point of the coolant (e.g. air) surrounding the capacitor and the hot spot (zone with highest temperature occurring in the component). In a steady state:

$$R_{th} = \frac{\Delta T_{cap}}{P}$$

Symbol	Description	Unit
$R_{th}$	Thermal resistance	K/W
$\Delta T_{cap}$	Temperature difference between hot-spot and ambient	K
P	Power dissipation	W

**For new design**

The temperature difference depends on a large number of different factors. The thermal resistance is a function of several parameters such as the working temperature and the power dissipation of the capacitor.

After installation of the capacitor, it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions. For detail calculations, please refer to single datasheet part number for further details.

**Life expectancy  $t_{LD}$** 

The life expectancy  $t_{LD}$  is based on the exclusive effect of Voltage and Temperature (hot-spot  $T_{hs}$ ) applied to the capacitor dielectric and electrodes (other factors are not considered in the model such as environmental or mechanical effects).

Hot Spot Temperature ( $T_{hs}$ ): as the sum of ambient temperature plus the heating induced by the current ( $I_{RMS}$ ) in the dielectric which is measured inside of capacitor. Current is an indirect parameter under consideration which affects the temperature  $T_{hs}$ .

Lifetime estimation formula as follows:

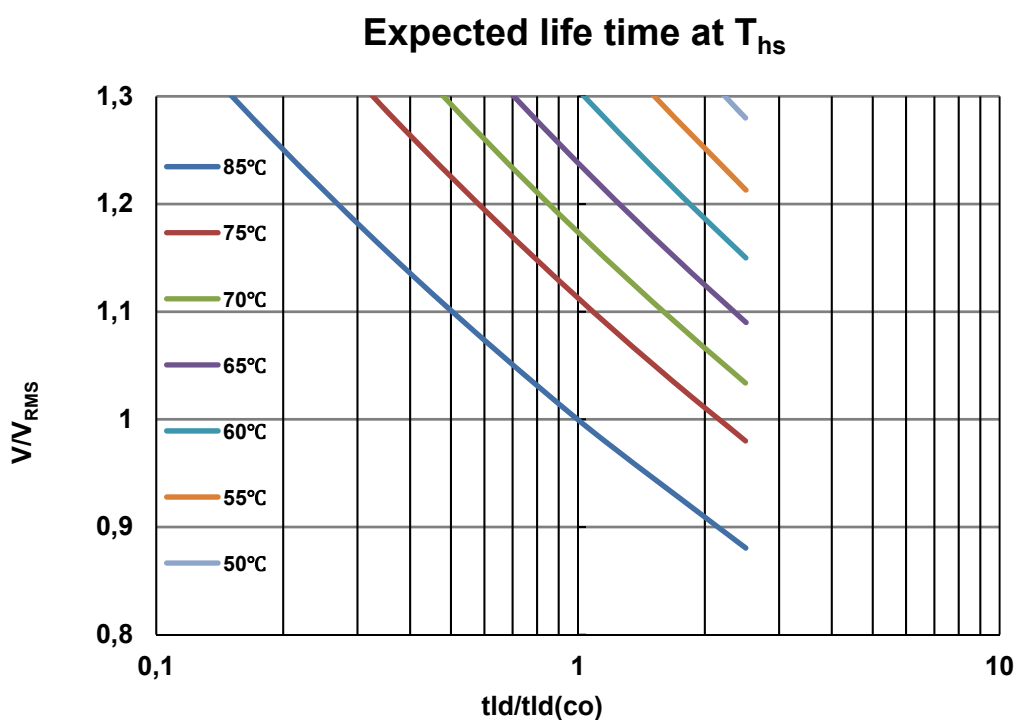
$$t_2 = t_1 \cdot e^{(T_1 - T_2)/A} \left( \frac{V_1}{V_2} \right)^n$$

Symbol	Description	Unit
$t_2$	Estimated lifetime at temperature $T_2$ and Voltage $V_2$	hour
$t_1$	Reference life expectancy (e.g. 100,000 hours for $V_R$   $\Delta C/C$   $\leq 3\%$ )	hour
$V_2$	Variable Voltage (Rated AC voltage)	VAC
$V_1$	Reference Voltage (Rated AC voltage)	VAC
$T_1$	Reference temperature (e.g. 70°C)	°C
$T_2$	Variable temperature	°C
A	Acceleration factor of temperature	-
n	Acceleration factor of voltage	-

For new design

**Lifetime Expectancy Graphs**

The lifetime estimations below shows the standard expected lifetime of 100,000 hours (at +85 °C hot-spot) are only theoretical calculations based on endurance test results performed according to IEC61071 standard.



**Figure 17:** Service life  $t_{LD}$  at different hot-spot temperature ( $T_{hs}$ ) and voltage  $V_{RMS}$

### For new design

## Cautions and warnings

- Capacitors with dents of more than 1 mm depth or any other mechanical damage must not be used.
- Check the tightness of the connections / terminals periodically.
- The energy stored in capacitors may be lethal. To prevent any risk of shock, the capacitors must be discharged and short-circuited before handling.
- Failure to follow cautions may result in the worst case in premature failure, bursting and fire.

## Safety

- Electrical or mechanical misapplication of capacitors may be hazardous. Personal injury or property damage may result from bursting of the capacitor or expulsion of molten material due to mechanical disruption of the capacitor.
- Ensure good, effective grounding for capacitor enclosures.
- Observe appropriate safety precautions during operation (self-recharging phenomena and the high energy stored in capacitors).
- Handle capacitors carefully, as they may still be charged even after disconnection.
- The terminals of capacitors, connected busbars and cables as well as other devices may also be energized.
- Follow good engineering practice.
- The maximum permissible fault current (AFC) of 10 kA in accordance with the UL 810 standard must be assured by the application.

## Thermal load

- After installing the capacitor, verify that the maximum hot-spot temperature is not exceeded under extreme operating conditions.

## Mechanical protection

- The capacitor has to be installed to assure that no mechanical damage or dents in the case occur.

## Storage and operating conditions

- Do not use or store capacitors in corrosive atmospheres, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. In dusty environments, regular maintenance and cleaning, especially of the terminals, is required to avoid creating a conductive path between phases and/or phases and ground.

## Overpressure disconnecter

- To ensure full functionality of an overpressure safety disconnecter, the following points must be observed:
  1. The elastic elements must not be hindered, i.e.
    - Connecting lines must be flexible leads (cables)
    - There must be sufficient space (min. 15 mm) for expansion above the connections
    - The metal cover must not be retained by rigid parts such as busbars.
  2. The stress parameters of the capacitor must be within the IEC 61071 specification.

## Service life expectancy

- Electrical components do not have an unlimited service life expectancy: this also applies to self-healing capacitors. The maximum service life expectancy may vary depending on the application in which the capacitor is used.

## Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.
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## Important notes

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Release 2018-10

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