

# FX2 · Screw-Terminal · 12000 h/85 °C

Compact design · Long Life  
Suited for optional permanent Charge-Discharge Design

Special charge-discharge proof design available upon request.

Auf Anfrage spezielles Design für Lade-, Entladeanwendungen erhältlich.

## > Specifications · Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance (at 20°C)	Standard +/- 20%, -10/+30% on request
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I <sub>L</sub> (20°C, 5 min)	0.01 · C · V <sub>r</sub> [μA] or 3 mA, which is smaller.
Useful life	12 000 hours at 85°C
Field failure rate	0.5 FIT = 0.5 · 10 <sup>-9</sup> Failures/hour
RoHS conform	Directive 2011/65/EU & (EU)2015/863
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h



## > Outline Drawings · Bauformen

Shape: B (ØD = 51-101)  
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

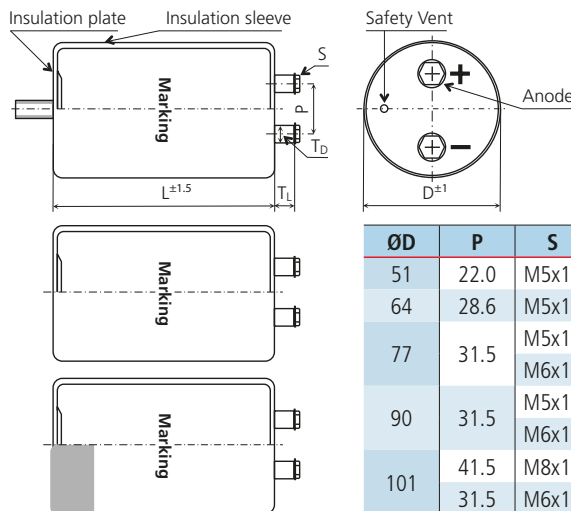
Form: B (ØD = 51-101)  
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-101 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-101 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-101)  
(double sleeve, Y-bracket free of charge)

Form: Y (ØD = 51-101)  
(mit doppelter Isolierung, Y-Schelle wird kostenlos mitgeliefert)



ØD	P	S	T <sub>L</sub>	T <sub>D</sub>	Cap material
51	22.0	M5x10	5.5	10	PH
64	28.6	M5x10	5.5	10	PH
77	31.5	M5x10	5.0	10	PH
		M6x12	4.5	17	PH
90	31.5	M5x10	5.0	10	PH
		M6x12	5.0	17	PH
101	31.5	M8x16	11.0	14	PH
		M6x12	3.0	14	PPS

Size in mm. First listed terminal is standard.

## > Product Code · Bestellbezeichnung

**Example:** Series FX2 · 4700 μF +/- 20 % · 400 V · D=64 mm · L= 130 mm with Y-Bracket

Type of series	Capacitance code	Fixing symbol code	Case code diameter	Customers' specification																			
<b>FX2</b>	<b>2G</b>	<b>Y</b>	<b>D</b>	<b>130 (PHM6)</b>																			
The first two digits are significant. The last digit indicates the number of following zeros in μF.		B : Bolt ØD = 51 - 101	ØD   Code	Case Code length Length in mm (3 digits)																			
<table border="1"> <thead> <tr> <th colspan="4">Rated voltage code</th> </tr> <tr> <th>Code</th> <th>Voltage</th> <th>Code</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>2V</td> <td>350</td> <td>2H</td> <td>500</td> </tr> <tr> <td>2G</td> <td>400</td> <td>2L</td> <td>550</td> </tr> <tr> <td>2W</td> <td>450</td> <td>575V</td> <td>575</td> </tr> </tbody> </table>		Rated voltage code				Code	Voltage	Code	Voltage	2V	350	2H	500	2G	400	2L	550	2W	450	575V	575	N : No double sleeve (PBT-Safety-holder or press ring)	51   C
Rated voltage code																							
Code	Voltage	Code	Voltage																				
2V	350	2H	500																				
2G	400	2L	550																				
2W	450	575V	575																				
		Y : 3 Stoppers Bracket ØD = 51 - 101	64   D																				
			77   E																				
			90   F																				
			101   G																				

# FX2 · Screw-Terminal · 12000 h/85°C

Rated VoltageCode (Surge Voltage) $V_r$ [V DC]	Capacitance $C_r$ [μF]	Ripple Current at 85°C/120Hz $I_r$ [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	Dissipation Factor at 20°C/120Hz Tan δ	DxL [mm]	Product Code  # = variable value, see fixing code in the product code
<b>350 VDC</b> Code: 2V  Surge Voltage 400 VDC	2 700	11.2	23.5	25	25	17	0.2	51x115	FX22V272#C115PH
	3 300	13.0	27.3	22	22	17	0.2	51x130	FX22V332#C130PH
	3 900	13.8	29.0	19	21	18	0.2	64x96	FX22V392#D096PH
	4 700	16.1	33.8	16	20	18	0.2	64x115	FX22V472#D115PH
	5 600	18.5	38.8	14	18	18	0.2	64x130	FX22V562#D130PH
	6 800	20.6	43.3	12	15	20	0.2	77x115	FX22V682#E115PH
	8 200	23.7	49.8	12	15	20	0.2	77x130	FX22V822#E130PH
		25.4	53.3	12	15	20	0.2	77x145	FX22V822#SE145PH
	10 000	27.0	56.7	11	15	20	0.2	77x143	FX22V103#E143PH
		28.1	59.0	11	15	20	0.2	77x155	FX22V103#E155PH
	12 000	32.1	67.4	8	13	20	0.2	77x171	FX22V123#E171PH
		30.7	64.5	8	13	20	0.2	90x131	FX22V123#F131PH
	15 000	37.7	79.2	6	10	20	0.2	77x195	FX22V153#E195PH
		39.6	83.2	6	10	20	0.2	77x220	FX22V153#E220PH
		36.7	77.1	6	10	20	0.2	90x157	FX22V153#F157PH
		43.8	92.0	5	9	20	0.2	90x196	FX22V183#F196PH
		52.3	109.8	5	8	20	0.2	90x236	FX22V223#F236PH
27 000	59.8	125.6	5	8	29	0.2	101x237*	FX22V273#G237PH	
<b>400 VDC</b> Code: 2G  Surge Voltage 450 VDC	1 100	6.0	12.6	60	64	17	0.2	51x75	FX22G112#C075PH
	1 800	7.7	16.2	51	54	17	0.2	51x96	FX22G182#C096PH
		8.6	18.1	51	54	17	0.2	51x100	FX22G182#C100PH
	2 200	9.7	20.4	46	48	17	0.2	51x105	FX22G222#C105PH
		10.1	21.2	46	48	17	0.2	51x115	FX22G222#C115PH
	2 700	11.5	24.2	38	40	17	0.2	51x115	FX22G272#SC115PH
	3 300	12.6	26.5	30	32	18	0.2	64x96	FX22G332#D096PH
	3 900	13.1	27.5	30	32	18	0.2	64x104	FX22G392#D104PH
		14.7	30.9	26	28	18	0.2	64x115	FX22G392#D115PH
	4 400	15.2	31.9	23	25	18	0.2	64x106	FX22G442#D106PH
	4 700	17.0	35.7	21	22	18	0.2	64x130	FX22G472#D130PH
		16.0	33.6	21	22	20	0.2	77x96	FX22G472#E096PH
	5 600	18.6	39.1	18	19	20	0.2	77x115	FX22G562#E115PH
	6 800	21.5	45.2	15	15	20	0.2	77x130	FX22G682#E130PH
	8 200	24.6	51.7	12	15	20	0.2	77x145	FX22G822#E145PH
		25.3	53.1	12	15	20	0.2	77x155	FX22G822#E155PH
	10 000	29.1	61.1	10	15	20	0.2	77x171	FX22G103#E171PH
		30.7	64.5	10	15	20	0.2	77x195	FX22G103#E195PH
		27.8	58.4	10	15	20	0.2	90x131	FX22G103#F131PH
	12 000	35.3	74.1	8	13	20	0.2	77x220	FX22G123#E220PH
		32.8	68.9	8	13	20	0.2	90x157	FX22G123#F157PH
	15 000	40.0	84.0	7	10	20	0.2	90x196	FX22G153#F196PH
	18 000	46.1	96.8	6	9	20	0.2	90x221	FX22G183#F221PH
		47.4	99.5	6	9	20	0.2	90x236	FX22G183#F236PH
	19 000	48.6	102.2	6	9	20	0.2	90x236	FX22G193#F236PH
	22 000	54.0	113.4	5	8	29	0.2	101x237*	FX22G223#G237PH
	25 000	58.9	123.6	5	8	29	0.2	101x250*	FX22G253#G250PH
27 000	64.4	135.2	5	7	29	0.2	101x283	FX22G273#G283PH	
<b>450 VDC</b> Code: 2W  Surge Voltage 500 VDC	1 100	5.8	12.2	80	70	17	0.2	51x75	FX22W112#C075PH
	1 500	7.7	16.2	67	70	17	0.2	51x105	FX22W152#C105PH
		7.9	16.6	67	60	17	0.2	51x96	FX22W152QC096PH
	1 800	8.7	18.3	56	56	17	0.2	51x115	FX22W182#C115PH
	2 000	10.6	22.2	50	52	17	0.2	51x115	FX22W202#C115PH
	2 200	10.1	21.2	46	45	17	0.2	51x130	FX22W222#C130PH

Additional designs on request · Weitere Designs auf Anfrage

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Rated VoltageCode (Surge Voltage) $V_r$ [V DC]	Capacitance $C_r$ [μF]	Ripple Current at 85°C/120Hz $I_r$ [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	Dissipation Factor at 20°C/120Hz Tan δ	DxL [mm]	Product Code  # = variable value, see fixing code in the product code
<b>450 VDC</b> Code: 2W  Surge Voltage 500 VDC	2 700	10.9	22.9	38	40	18	0.2	64x96	FX22W272#D096PH
		12.0	25.1	38	40	18	0.2	64x106	FX22W272#D106PH
	3 300	12.9	27.1	30	35	18	0.2	64x115	FX22W332#D115PH
		12.1	25.4	30	35	20	0.2	77x96	FX22W332#E096PH
	3 900	14.7	30.9	27	32	18	0.2	64x130	FX22W392#D130PH
	4 700	17.4	36.5	21	23	18	0.2	64x155	FX22W472#D155PH
		16.2	34.0	21	23	20	0.2	77x115	FX22W472#E115PH
	5 600	18.6	39.1	20	22	20	0.2	77x130	FX22W562#E130PH
	6 600	22.1	46.4	18	19	20	0.2	77x143	FX22W662#E143PH
	6 800	22.0	46.2	15	18	20	0.2	77x155	FX22W682#E155PH
	8 200	26.4	55.4	14	16	20	0.2	77x195	FX22W822#E195PH
		27.8	58.4	14	17	20	0.2	77x220	FX22W822#E220PH
		24.2	50.8	14	17	20	0.2	90x131	FX22W822#F131PH
	8 800	26.0	54.6	12	16	20	0.2	77x171	FX22W882#E171PH
		30.9	64.9	10	15	20	0.2	77x222	FX22W103#E222PH
	10 000	29.6	62.2	10	15	20	0.2	90x171	FX22W103#F171PH
		34.2	71.8	9	12	20	0.2	90x196	FX22W123#F196PH
	12 000	33.7	70.8	9	12	29	0.2	101x175*	FX22W123#G175PH
		38.2	80.2	7	12	20	0.2	90x196	FX22W153#F196PH
	15 000	41.3	86.7	7	10	20	0.2	90x236	FX22W153#F236PH
45.3		95.2	6	10	20	0.2	90x236	FX22W183#F236PH	
20 000	53.0	111.3	5	8	29	0.2	101x237*	FX22W203#G237PH	
23 000	53.8	113.0	5	9	29	0.2	101x250*	FX22W233#G250PH	
<b>500 VDC</b> Code: 2H  Surge Voltage 550 VDC	820	4.9	10.3	140	151	17	0.2	51x75	FX22H821#C075PH
	1 000	6.3	13.2	112	120	17	0.2	51x105	FX22H102#C105PH
	1 200	7.1	14.9	93	100	17	0.2	51x115	FX22H122#C115PH
		7.2	15.1	93	100	18	0.2	64x96	FX22H122#D096PH
	1 500	7.9	16.6	74	80	17	0.2	51x115	FX22H152#C115PH
		8.2	17.2	74	80	18	0.2	64x96	FX22H152#D096PH
	1 800	9.5	20.0	53	53	18	0.2	64x115	FX22H182#D115PH
		9.4	19.8	53	53	20	0.2	77x96	FX22H182#E096PH
	2 200	10.9	22.9	40	40	18	0.2	51x155	FX22H222#C155PH
		11.0	23.1	40	40	18	0.2	64x130	FX22H222#D130PH
		10.4	21.7	40	40	20	0.2	77x96	FX22H222#E096PH
	2 500	12.3	25.8	38	40	18	0.2	64x144	FX22H252#D144PH
		11.0	23.1	38	40	20	0.2	77x96	FX22H252#E096PH
	2 700	12.3	25.8	37	37	20	0.2	77x115	FX22H272#E115PH
	3 300	14.3	30.0	36	36	20	0.2	77x130	FX22H332#E130PH
	3 900	16.1	33.8	27	29	20	0.2	77x145	FX22H392#E145PH
		16.6	34.9	27	29	20	0.2	77x155	FX22H392#E155PH
	4 700	18.2	38.2	25	25	20	0.2	77x155	FX22H472#E155PH
		19.0	39.9	25	25	20	0.2	77x171	FX22H472#E171PH
		18.2	38.2	25	25	20	0.2	90x131	FX22H472#F131PH
5 600	21.8	45.8	23	21	20	0.2	77x195	FX22H562#E195PH	
	21.4	44.9	23	21	20	0.2	90x157	FX22H562#F157PH	
6 800	24.4	51.2	20	20	20	0.2	90x171	FX22H682#F171PH	
8 200	28.2	59.2	17	16	20	0.2	90x196	FX22H822#F196PH	
	27.8	58.4	17	16	29	0.2	101x175*	FX22H822#G175PH	
9 400	30.1	63.2	15	15	20	0.2	90x196	FX22H942#F196PH	

Additional designs on request · Weitere Designs auf Anfrage

# FX2 · Screw-Terminal · 12000 h/85°C

Rated VoltageCode (Surge Voltage) $V_r$ [V DC]	Capacitance $C_r$ [µF]	Ripple Current at 85°C/120Hz $I_r$ [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	Dissipation Factor at 20°C/120Hz Tan δ	DxL [mm]	Product Code  # = variable value, see fixing code in the product code
<b>500 VDC</b> Code: 2H Surge Voltage 550 VDC	10 000	33.7	70.8	14	14	20	0.2	90x236	FX22H103#F236PH
		32.1	67.4	14	14	29	0.2	101x195*	FX22H103#G195PH
	12 000	36.8	77.3	12	12	20	0.2	90x236	FX22H123#F236PH
		38.1	80.0	11	11	29	0.2	101x237*	FX22H123#G237PH
<b>550 VDC</b> Code: 2L Surge Voltage 600 VDC	680	5.1	10.7	165	177	17	0.2	51x105	FX22L681#C105PH
	1 000	6.8	14.3	112	120	17	0.2	51x130	FX22L102#C130PH
	1 200	7.8	16.4	93	100	18	0.2	64x115	FX22L122#D115PH
	1 500	9.2	19.3	74	80	18	0.2	64x130	FX22L152#D130PH
	1 800	10.0	21.0	61	50	20	0.2	77x115	FX22L182#E115PH
	2 200	11.6	24.4	53	40	20	0.2	77x130	FX22L222#E130PH
	2 700	12.9	27.0	40	35	20	0.2	77x130	FX22L272#E130PH
	3 300	15.3	32.1	38	32	20	0.2	77x155	FX22L332#E155PH
	3 900	17.8	37.4	30	27	20	0.2	90x157	FX22L392#F157PH
	4 200	17.9	37.6	28	27	20	0.2	77x171	FX22L422#E171PH
		20.4	42.8	25	20	20	0.2	77x203	FX22L472#E203PH
	4 700	20.2	42.4	25	20	20	0.2	90x171	FX22L472#F171PH
		22.4	47.0	24	20	20	0.2	77x235	FX22L502#E235PH
	5 600	22.1	46.4	20	17	20	0.2	90x171	FX22L562#F171PH
		23.3	48.9	20	17	20	0.2	90x196	FX22L562#F196PH
	6 000	24.5	51.4	19	17	20	0.2	77x235	FX22L602#E235PH
25.6		53.8	17	17	20	0.2	90x196	FX22L682#F196PH	
6 800	27.7	58.2	17	17	20	0.2	90x236	FX22L682#F236PH	
	30.4	63.8	15	15	20	0.2	90x236	FX22L822#F236PH	
9 200	32.2	67.6	13	13	20	0.2	90x236	FX22L922#G236PH	
<b>575 VDC</b> Code: 575V Surge Voltage 625 VDC	1 200	7.7	16.2	121	125	18	0.2	64x96	FX2575V122#D096PH
	1 300	9.2	19.3	112	115	18	0.2	64x103	FX2575V132#D103PH
	1 500	9.3	19.5	97	100	18	0.2	64x115	FX2575V152#D115PH
	1 800	10.1	21.2	81	83	20	0.2	77x96	FX2575V182#E096PH
	2 200	12.0	25.2	66	67	20	0.2	77x115	FX2575V222#E115PH
	2 700	13.9	29.2	54	56	20	0.2	77x130	FX2575V272#E130PH
	3 000	15.6	32.8	49	51	20	0.2	77x155	FX2575V302#E155PH
	3 300	16.4	34.4	44	45	20	0.2	90x131	FX2575V332#F131PH
4 700	21.0	44.1	31	32	20	0.2	90x157	FX2575V472#F157PH	
<b>600 VDC</b> Code: 600V Surge Voltage 650 VDC	1 000	4.8	10.1	129	133	22	0.2	64x96	FX2600V102#D096PH
	1 200	5.6	11.8	122	125	22	0.2	64x115	FX2600V122#D115PH
	1 500	6.3	13.2	111	114	24	0.2	77x96	FX2600V152#E096PH
	1 800	7.3	15.5	99	102	24	0.2	77x115	FX2600V182#E115PH
	2 200	8.5	17.9	85	87	24	0.2	77x130	FX2600V222#E130PH
	2 700	10.1	21.2	66	68	24	0.2	77x155	FX2600V272#E155PH
	3 300	11.3	23.7	44	45	24	0.2	90x131	FX2600V332#F131PH
	3 900	13.1	27.5	22	22	24	0.2	90x157	FX2600V392#F157PH

\* For Bolt - Mounting length dimensions are plus 5mm (101x180, 101x200, 101x242mm or 101x255).

## > Ripple Current Multiplier · Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k	Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
Multiplier	0.80	1.00	1.18	1.34	1.45	Multiplier	1.0	1.1

Temperature (°C)	40	45	50	55	60	65	70	75	80	85
Multiplier	2.1	2.0	1.9	1.8	1.7	1.5	1.4	1.3	1.1	1.0

Additional designs on request · Weitere Designs auf Anfrage

> Life Time Table · Brauchbarkeitsdauer – Tabelle

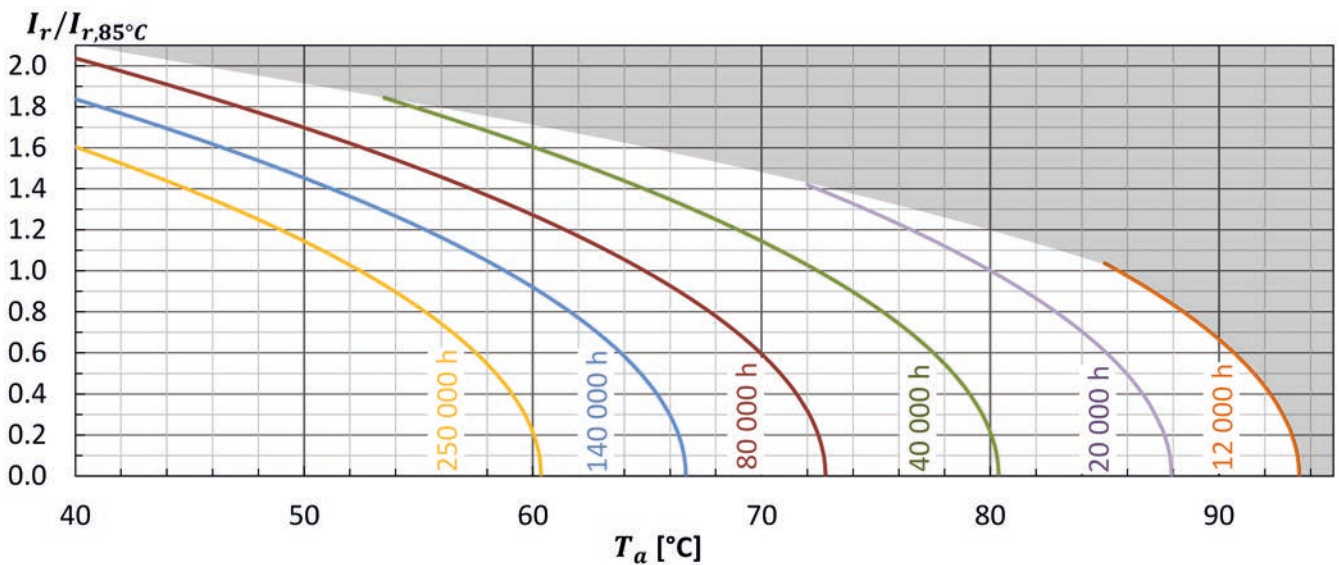
FX2 $I_r$ at 85°C	Useful life as function of ambient temperature and ripple current											
	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
$T_a = 40^\circ\text{C}$	250	250	250	250	250	250	250	199	154	118	89	66
$T_a = 45^\circ\text{C}$	250	250	250	250	247	200	160	126	97	74	56	
$T_a = 50^\circ\text{C}$	250	250	227	190	156	126	101	79	61	47		
$T_a = 55^\circ\text{C}$	198	170	144	120	98	80	64	50	39			
$T_a = 60^\circ\text{C}$	125	107	91	76	62	50	40	31				
$T_a = 65^\circ\text{C}$	79	68	57	48	39	32						
$T_a = 70^\circ\text{C}$	50	43	36	30	25							
$T_a = 75^\circ\text{C}$	31	27	23	19								
$T_a = 80^\circ\text{C}$	20	17										
$T_a = 85^\circ\text{C}$	12											

khrs      Max. value limited to 250 000 hours.

> Life Time Graph · Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature  $T_a$  and ripple current operating conditions  $I_r$  versus rated ripple current at the upper category temperature  $I_r, 85^\circ\text{C}, 120\text{Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur  $T_a$  und Wechselstrombelastung  $I_r$  im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorie-temperatur  $I_r, 85^\circ\text{C}, 120\text{Hz}$



> Life Time Tests and Requirements · Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	$T_a = 85^\circ\text{C}$ ; $V_r$ , $I_r$ applied 8000 hours	$\Delta C/C \leq 15\%$ (of initial value) $\text{Tan}\delta \leq 175\%$ (of specified value) $I_L \leq$ specified value
Useful life	$T_a = 85^\circ\text{C}$ ; $V_r$ , $I_r$ applied 12000 hours	$\Delta C/C \leq 20\%$ (of initial value) $\text{Tan}\delta < 200\%$ (of specified value) $I_L \leq$ specified value

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4