

FX2 · Screw-Terminal · 12000 h/85 °C

Long Life

Optional design for permanent and deep charge-discharge application with high voltage hub and pulsed operation mode upon request.

Spezielles Design für häufige und tiefe Lade-, Entladeanwendungen mit hohem Spannungshub und Impulsbetrieb auf Anfrage erhältlich.

> Specifications · Spezifikationen

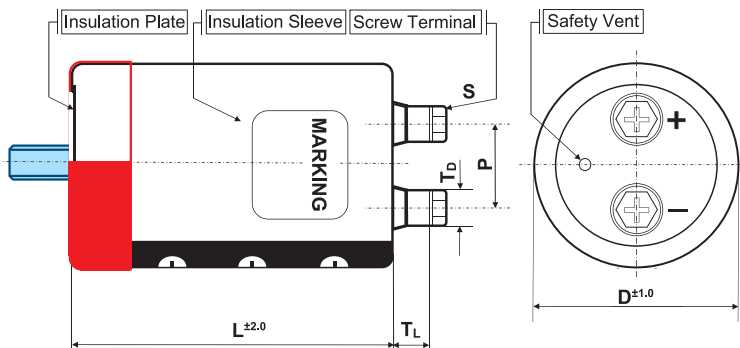
Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance (at 20°C)	Standard +/- 20%, -10/+30% on request
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I _L (20°C, 5 min)	0.01 • C • V _r [μA] or 3 mA, which is smaller.
Useful life	12 000 hours at 85°C
Field failure rate	0.5 FIT = 0.5 • 10 ⁻⁹ Failures/hour
RoHS conform	Directive 2011/65/EU & (EU)2015/863
Specification / Vibration	JIS C 5101-4/0.75mm, 10...55Hz, 10g, 3x2h
Outer materials	UL94-V0/UL224-VW1 certified (cap/sleeve)
Sleeve withstanding voltage	4000 Vac/ 1min between terminals bundled and plate*

* Typical value



> Shape designation · Formbezeichnung

- for details refer to p. 8–9 · technische Details siehe S. 8–9
- for mounting options refer to p. 149ff · Montageoptionen siehe S. 149ff



	B	I/Y	N
outer sleeve	•	•	•
insulation plate	•	•	•
stud bolt	•		
bottom double sleeve		•	

ØD	available shape	P	S	T _L	T _D	Cap material
51	B, N, I, Y	22.0	M5x10	5.5	10	PH
64	B, N, I, Y	28.6	M5x10	5.5	10	PH
77	B, N, I, Y	31.5	M5x10	5.0	10	PH
			M6x12	4.5	17.2	PH
90	B, N, I, Y	31.5	M5x10	5.0	10	PH
			M6x12	5.0	17.2	PH
101	B, N, Y	41.5	M8x16	11.0	14	PH
			M6x12	3.0	14	PH

Size in mm. First listed terminal is standard.

> Product Code · Bestellbezeichnung

Example: Series FX2 · 10.000 μF +/- 20 % · 400 V · D=77 mm · L= 195 mm with stud bolt & M6

FX2		2G		103		B		E		195		PHM6																											
Type of series		Capacitance code		Rated voltage code		Fixing symbol code		Case code diameter		Specific features (e.g. M6 ...)		Case Code length																											
		The first two digits are significant. The last digit indicates the number of following zeros in μF.		Code Voltage Code Voltage		B : Bolt N : single outer sleeve I : 2 Stoppers Bracket Y : 3 Stoppers Bracket		ØD Code				Length in mm (3 digits)																											
				<table border="1"> <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>600V</td><td>600</td></tr> </table>		2V	350	2H	500	2G	400	2L	550	2W	450	600V	600	<table border="1"> <tr><th colspan="2">Capacitance tolerance</th></tr> <tr><td>Ø : ± 20 %</td><td></td></tr> <tr><td>Q : -10 % ~ + 30 %</td><td></td></tr> </table>		Capacitance tolerance		Ø : ± 20 %		Q : -10 % ~ + 30 %		<table border="1"> <tr><td>51</td><td>C</td></tr> <tr><td>64</td><td>D</td></tr> <tr><td>77</td><td>E</td></tr> <tr><td>90</td><td>F</td></tr> <tr><td>101</td><td>G</td></tr> </table>		51	C	64	D	77	E	90	F	101	G		
2V	350	2H	500																																				
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101	G																																						

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	
350 VDC Code: 2V Surge Voltage 400 VDC	2 700	11.2	23.5	25	25	17	0.15	51x115	FX22V272#C115	
	3 300	13.0	27.3	22	22	17	0.15	51x130	FX22V332#C130	
	3 900	13.8	29.0	19	21	18	0.15	64x96	FX22V392#D096	
	4 700	16.1	33.8	16	20	18	0.15	64x115	FX22V472#D115	
	5 600	18.5	38.8	14	18	18	0.15	64x130	FX22V562#D130	
	6 800	8 200	20.6	43.3	12	15	20	0.15	77x115	FX22V682#E115
			23.7	49.8	12	15	20	0.15	77x130	FX22V822#E130
	10 000	12 000	25.4	53.3	12	15	20	0.15	77x145	FX22V822#SE145
			27.0	56.7	11	15	20	0.15	77x143	FX22V103#E143
	15 000	18 000	28.1	59.0	11	15	20	0.15	77x155	FX22V103#E155
			32.1	67.4	8	13	20	0.15	77x171	FX22V123#E171
			30.7	64.5	8	13	20	0.15	90x131	FX22V123#F131
			37.7	79.2	6	10	20	0.15	77x195	FX22V153#E195
			39.6	83.2	6	10	20	0.15	77x220	FX22V153#E220
36.7			77.1	6	10	20	0.15	90x157	FX22V153#F157	
22 000	43.8	92.0	5	9	20	0.15	90x196	FX22V183#F196		
27 000	52.3	109.8**	5	8	20	0.15	90x236	FX22V223#F236		
	59.8	125.6**	5	8	29	0.15	101x237*	FX22V273#G237		
400 VDC Code: 2G Surge Voltage 450 VDC	1 100	6.0	12.6	60	64	17	0.15	51x75	FX22G112#C075	
	1 800	7.7	16.2	51	54	17	0.15	51x96	FX22G182#C096	
		8.6	18.1	51	54	17	0.15	51x100	FX22G182#C100	
	2 200	9.7	20.4	46	48	17	0.15	51x105	FX22G222#C105	
		10.1	21.2	46	48	17	0.15	51x115	FX22G222#C115	
	2 400	10.5	22.1	43	44	17	0.15	51x115	FX22G242#C115	
	2 700	11.5	24.2	38	40	17	0.15	51x115	FX22G272#SC115	
	3 300	12.6	26.5	30	32	18	0.15	64x96	FX22G332#D096	
	3 900	13.1	27.5	30	32	18	0.15	64x104	FX22G392#D104	
		14.7	30.9	26	28	18	0.15	64x115	FX22G392#D115	
	4 400	15.2	31.9	23	25	18	0.15	64x106	FX22G442#D106	
	4 700	17.0	35.7	21	22	18	0.15	64x130	FX22G472#D130	
		16.0	33.6	21	22	20	0.15	77x96	FX22G472#E096	
	5 600	18.6	39.1	18	19	20	0.15	77x115	FX22G562#E115	
	6 800	21.5	45.2	15	15	20	0.15	77x130	FX22G682#E130	
	8 200	24.6	51.7	12	15	20	0.15	77x145	FX22G822#E145	
		25.3	53.1	12	15	20	0.15	77x155	FX22G822#E155	
	10 000	29.1	61.1	10	15	20	0.15	77x171	FX22G103#E171	
		30.7	64.5	10	15	20	0.15	77x195	FX22G103#E195	
		27.8	58.4	10	15	20	0.15	90x131	FX22G103#F131	
12 000	35.3	74.1	8	13	20	0.15	77x220	FX22G123#E220		
	32.8	68.9	8	13	20	0.15	90x157	FX22G123#F157		
15 000	40.0	84.0	7	10	20	0.15	90x196	FX22G153#F196		
18 000	46.1	96.8	6	9	20	0.15	90x221	FX22G183#F221		
	47.4	99.5	6	9	20	0.15	90x236	FX22G183#F236		
19 000	48.6	102.2**	6	9	20	0.15	90x236	FX22G193#F236		
22 000	54.0	113.4	5	8	29	0.15	101x237*	FX22G223#G237		
25 000	58.9	123.6**	5	8	29	0.15	101x250*	FX22G253#G250		
27 000	64.4	135.2**	5	7	29	0.15	101x283*	FX22G273#G283		
450 VDC Code: 2W Surge Voltage 500 VDC	1 100	5.8	12.2	80	70	17	0.15	51x75	FX22W112#C075	
	1 500	7.7	16.2	67	70	17	0.15	51x105	FX22W152#C105	
		7.9	16.6	67	60	17	0.15	51x96	FX22W152QC096	
	1 800	8.7	18.3	56	56	17	0.15	51x115	FX22W182#C115	
	2 000	10.6	22.2	50	52	17	0.15	51x115	FX22W202#C115	
2 200	10.1	21.2	46	45	17	0.15	51x130	FX22W222#C130		

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 [μ F]	Ripple Current at 85°C/120Hz I_r [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [m Ω]	Zmax at 20°C/10kHz [m Ω]	ESL (typ) [nH]	Dissipation Factor at 20°C/120Hz Tan δ	DxL [mm]	Product Code # = variable value, see fixing code in the product code
450 VDC Code: 2W Surge Voltage 500 VDC	2 700	10.9	22.9	38	40	18	0.15	64x96	FX22W272#D096
		12.0	25.1	38	40	18	0.15	64x106	FX22W272#D106
	3 300	12.9	27.1	30	35	18	0.15	64x115	FX22W332#D115
		12.1	25.4	30	35	20	0.15	77x96	FX22W332#E096
	3 900	14.7	30.9	27	32	18	0.15	64x130	FX22W392#D130
	4 700	17.4	36.5	21	23	18	0.15	64x155	FX22W472#D155
		16.2	34.0	21	23	20	0.15	77x115	FX22W472#E115
	5 600	18.6	39.1	20	22	20	0.15	77x130	FX22W562#E130
	6 600	22.1	46.4	18	19	20	0.15	77x143	FX22W662#E143
	6 800	22.0	46.2	15	18	20	0.15	77x155	FX22W682#E155
	8 200	26.4	55.4	16	16	20	0.15	77x195	FX22W822#E195
		27.8	58.4	16	16	20	0.15	77x220	FX22W822#E220
	8 800	24.2	50.8	16	16	20	0.15	90x131	FX22W822#F131
		26.0	54.6	12	16	20	0.15	77x171	FX22W882#E171
	10 000	30.9	64.9	10	15	20	0.15	77x222	FX22W103#E222
		29.6	62.2	10	15	20	0.15	90x171	FX22W103#F171
	12 000	34.2	71.8	9	12	20	0.15	90x196	FX22W123#F196
		33.7	70.8	9	12	29	0.15	101x175*	FX22W123#G175
	15 000	38.2	80.2	7	12	20	0.15	90x196	FX22W153#F196
		41.3	86.7	7	10	20	0.15	90x236	FX22W153#F236
18 000	45.3	95.2	6	10	20	0.15	90x236	FX22W183#F236	
20 000	53.0	111.3**	5	8	29	0.15	101x237*	FX22W203#G237	
23 000	53.8	113.0**	5	9	29	0.15	101x250*	FX22W233#G250	
500 VDC Code: 2H Surge Voltage 550 VDC	820	4.9	10.3	140	151	17	0.20	51x75	FX22H821#C075
	1 000	6.3	13.2	112	120	17	0.20	51x105	FX22H102#C105
	1 200	7.1	14.9	93	100	17	0.20	51x115	FX22H122#C115
		7.2	15.1	93	100	18	0.20	64x96	FX22H122#D096
	1 500	7.9	16.6	74	80	17	0.20	51x115	FX22H152#C115
		8.2	17.2	74	80	18	0.20	64x96	FX22H152#D096
	1 800	9.5	20.0	53	53	18	0.20	64x115	FX22H182#D115
		9.4	19.8	53	53	20	0.20	77x96	FX22H182#E096
	2 200	10.9	22.9	40	40	18	0.20	51x155	FX22H222#C155
		11.0	23.1	40	40	18	0.20	64x130	FX22H222#D130
		10.4	21.7	40	40	20	0.20	77x96	FX22H222#E096
	2 500	12.3	25.8	38	40	18	0.20	64x144	FX22H252#D144
		11.0	23.1	38	40	20	0.20	77x96	FX22H252#E096
	2 700	12.3	25.8	37	37	20	0.20	77x115	FX22H272#E115
	3 300	14.3	30.0	36	36	20	0.20	77x130	FX22H332#E130
	3 900	16.1	33.8	27	29	20	0.20	77x145	FX22H392#E145
		16.6	34.9	27	29	20	0.20	77x155	FX22H392#E155
	4 700	18.2	38.2	25	25	20	0.20	77x155	FX22H472#E155
		19.0	39.9	25	25	20	0.20	77x171	FX22H472#E171
		18.2	38.2	25	25	20	0.20	90x131	FX22H472#F131
5 600	21.8	45.8	23	21	20	0.20	77x195	FX22H562#E195	
	21.4	44.9	23	21	20	0.20	90x157	FX22H562#F157	
6 800	24.4	51.2	20	20	20	0.20	90x171	FX22H682#F171	
8 200	28.2	59.2	17	16	20	0.20	90x196	FX22H822#F196	
	27.8	58.4	17	16	29	0.20	101x175*	FX22H822#G175	
9 400	30.1	63.2	15	15	20	0.20	90x196	FX22H942#F196	

Additional designs on request · Weitere Designs auf Anfrage

Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [μ F]	Ripple Current at 85°C/120Hz I_r [A RMS]	Ripple Current at 40°C/120Hz [A RMS]	ESR (typ) at 20°C/100Hz [m Ω]	Zmax at 20°C/10kHz [m Ω]	ESL (typ) [nH]	Dissipation Factor at 20°C/120Hz Tan δ	DxL [mm]	Product Code # = variable value, see fixing code in the product code
500 VDC Code: 2H Surge Voltage 550 VDC	10 000	33.7	70.8	14	14	20	0.20	90x236	FX22H103#F236
		32.1	67.4	14	14	29	0.20	101x195*	FX22H103#G195
	12 000	36.8	77.3	12	12	20	0.20	90x236	FX22H123#F236
		38.1	80.0	11	11	29	0.20	101x237*	FX22H123#G237
550 VDC Code: 2L Surge Voltage 600 VDC	680	5.1	10.7	165	177	17	0.20	51x105	FX22L681#C105
	1 000	6.8	14.3	112	120	17	0.20	51x130	FX22L102#C130
	1 200	7.8	16.4	93	100	18	0.20	64x115	FX22L122#D115
	1 500	9.2	19.3	74	80	18	0.20	64x130	FX22L152#D130
	1 800	10.0	21.0	61	50	20	0.20	77x115	FX22L182#E115
	2 200	11.6	24.4	53	40	20	0.20	77x130	FX22L222#E130
	2 700	12.9	27.0	40	35	20	0.20	77x130	FX22L272#E130
	3 300	15.3	32.1	38	32	20	0.20	77x155	FX22L332#E155
	3 900	17.8	37.4	30	27	20	0.20	90x157	FX22L392#F157
	4 200	17.9	37.6	28	27	20	0.20	77x171	FX22L422#E171
	4 700	20.4	42.8	25	20	20	0.20	77x203	FX22L472#E203
		20.2	42.4	25	20	20	0.20	90x171	FX22L472#F171
	5 000	22.4	47.0	24	20	20	0.20	77x235	FX22L502#E235
	5 600	22.1	46.4	20	17	20	0.20	90x171	FX22L562#F171
		23.3	48.9	20	17	20	0.20	90x196	FX22L562#F196
	6 000	24.5	51.4	19	17	20	0.20	77x235	FX22L602#E235
25.6		53.8	17	17	20	0.20	90x196	FX22L682#F196	
6 800	27.7	58.2	17	17	20	0.20	90x236	FX22L682#F236	
	30.4	63.8	15	15	20	0.20	90x236	FX22L822#F236	
9 200	32.2	67.6	13	13	20	0.20	90x236	FX22L922#F236	
600 VDC Code: 600V Surge Voltage 650 VDC	1 000	4.8	10.1	129	133	22	0.20	64x96	FX2600V102#D096
	1 200	5.6	11.8	122	125	22	0.20	64x115	FX2600V122#D115
	1 500	6.3	13.2	111	114	24	0.20	77x96	FX2600V152#E096
	1 800	7.3	15.5	99	102	24	0.20	77x115	FX2600V182#E115
	2 200	8.5	17.9	85	87	24	0.20	77x130	FX2600V222#E130
	2 700	10.1	21.2	66	68	24	0.20	77x155	FX2600V272#E155
	3 300	11.3	23.7	44	45	24	0.20	90x131	FX2600V332#F131
	3 900	13.1	27.5	22	22	24	0.20	90x157	FX2600V392#F157

* For Bolt mounting, length dimensions increase by +3 mm for M6 items and by +2 mm for M8 items

** Please contact us if load condition exceeds terminals related $I_{r,max}$ referred on page 9

Additional designs on request · Weitere Designs auf Anfrage

> 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

FX2 · Screw-Terminal · 12000 h/85°C

> Life Time Table · Brauchbarkeitsdauer – Tabelle

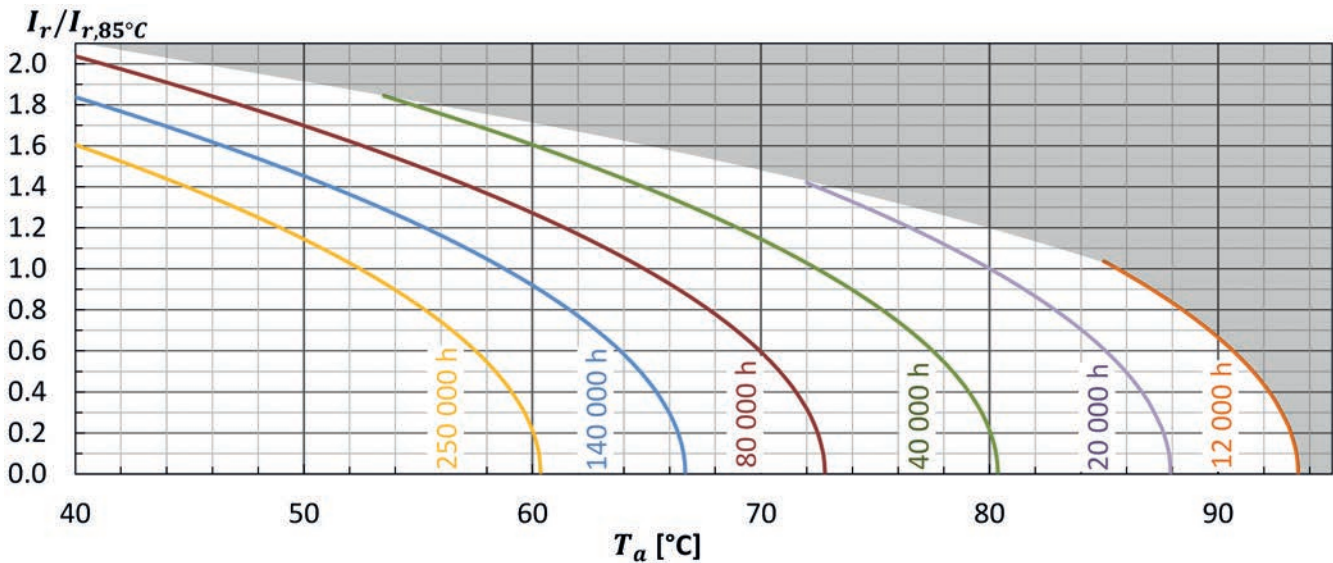
FX2 I_r at 85°C	Useful life as function of ambient temperature and ripple current											
	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
$T_a = 40^\circ\text{C}$	250	250	250	250	250	250	250	199	154	118	89	66
$T_a = 45^\circ\text{C}$	250	250	250	250	247	200	160	126	97	74	56	
$T_a = 50^\circ\text{C}$	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	$\Delta C/C \leq 10\%$ (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	$\Delta C/C \leq 15\%$ (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