

FX2 · Screw-Terminal · 12000 h/85 °C

Long Life · Compact

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

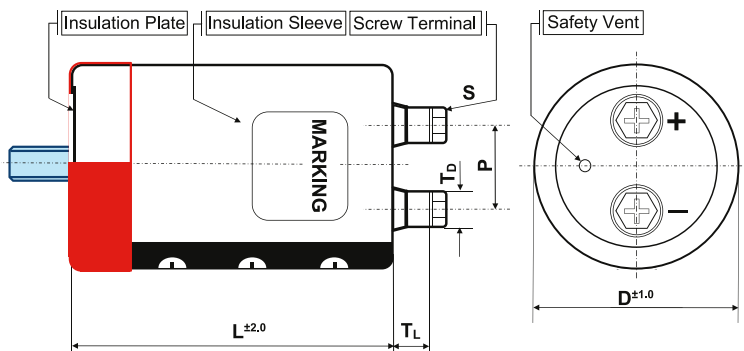
Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance (at 20°C)	Standard +/- 20%, -10/+30% on request
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I _L (20°C, 5 min)	0.01 • C • V, [μA] or 3 mA, which is smaller.
Useful life	12 000 hours at 85°C
Field failure rate	0.5 FIT = 0.5 • 10 ⁻⁹ Failures/hour
Reference standards	IEC 60384-4, JIS C 5101-4
Vibration	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*
Product Compliance	RoHS, REACH, Conflict Minerals a.o. – refer to p. 12–13

* Typical value



> Shape designation · Formbezeichnung

- additional information on p. 10–11 · Zusatzinformationen auf S. 10–11
- mounting accessories from p. 189 · Montagezubehör ab S. 189



Shape code Features	B Bolt	I/Y double sleeve for 2/3 points metal Bracket	N standard
outer insulation sleeve	•	•	•
insulation plate	•	•	•
stud bolt	•		
bottom double sleeve		•	

diameter code	ØD	available shape	P	S	T _L	T _D	Cap material
C	51	B, N, I, Y	22.0	M5x10	5.5	10	PH
D	64	B, N, I, Y	28.6	M5x10	5.5	10	PH
E	77	B, N, I, Y	31.5	M5x10	5.0	10	PH
				M6x12	4.5	17.2	PH
F	90	B, N, I, Y	31.5	M5x10	5.0	10	PH
				M6x12	5.0	17.2	PH
G	101	B, N, Y	41.5	M8x16	11.0	14	PH
			31.5	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
Series name	Capacitance code		Shape code	Diameter code	Capacitance tolerance	Specific features (e.g. M6 ...)
Rated voltage code						
Code	Voltage	Code	Voltage	Code	Voltage	
2V	350	2W	450	2L	550	
2G	400	2H	500	600V	600	
					∅ : ± 20 %	
					Q : -10 % ~ +30 %	
Case length code – length in mm (3 digits)						

Rated Voltage Code (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]	Z _{max} 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	20.6	43.3	12	15	20	0.15	77x115	FX22V682#E115
		23.7	49.8	12	15	20	0.15	77x130	FX22V822#E130
	8 200	25.4	53.3	12	15	20	0.15	77x145	FX22V822#SE145
		27.1	56.9	10	15	20	0.15	77x143	FX22V103#E143
	10 000	28.1	59.0	10	15	20	0.15	77x155	FX22V103#E155
		12 000	32.1	67.4	8	13	20	0.15	77x171
			30.7	64.5	8	13	20	0.15	90x131
		15 000	37.7	79.2	6	10	20	0.15	77x195
			39.6	83.2	6	10	20	0.15	77x220
		18 000	36.7	77.1	6	10	20	0.15	90x157
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
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		8.7	18.3	46	48	17	0.15	51x83	FX22G222#C083
		9.7	20.4	46	48	17	0.15	51x105	FX22G222#C105
2 400		10.1	21.2	46	48	17	0.15	51x115	FX22G222#C115
		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

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
400 VDC Code: 2G Surge Voltage 450 VDC	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	FX22W152#QC096
	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
		10.9	22.9	38	40	18	0.15	64x96	FX22W272#D096
	2 700	12.0	25.1	38	40	18	0.15	64x106	FX22W272#D106
		12.9	27.1	30	35	18	0.15	64x115	FX22W332#D115
	3 300	12.1	25.4	30	35	20	0.15	77x96	FX22W332#E096
		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
		26.4	55.4	16	16	20	0.15	77x195	FX22W822#E195
	8 200	27.8	58.4	16	16	20	0.15	77x220	FX22W822#E220
		24.2	50.8	16	16	20	0.15	90x131	FX22W822#F131
	8 800	26.0	54.6	12	16	20	0.15	77x171	FX22W882#E171
		30.9	64.9	10	15	20	0.15	77x222	FX22W103#E222
	10 000	29.6	62.2	10	15	20	0.15	90x171	FX22W103#F171
		34.2	71.8	9	12	20	0.15	90x196	FX22W123#F196
12 000	33.7	70.8	9	12	29	0.15	101x175*	FX22W123#G175	
	38.2	80.2	7	12	20	0.15	90x196	FX22W153#F196	
15 000	41.3	86.7	7	10	20	0.15	90x236	FX22W153#F236	
	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	

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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
	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	27.1	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

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Rated Voltage Code (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
550 VDC Code: 2L Surge Voltage 600 VDC	6 000	24.5	51.4	19	17	20	0.20	77x235	FX22L602#E235
	6 800	25.6	53.8	17	17	20	0.20	90x196	FX22L682#F196
		27.7	58.2	17	17	20	0.20	90x236	FX22L682#F236
	8 200	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	18	0.20	64x96	FX2600V102#D096
	1 200	5.6	11.8	122	125	18	0.20	64x115	FX2600V122#D115
	1 500	6.3	13.2	111	114	20	0.20	77x96	FX2600V152#E096
	1 800	7.3	15.5	99	102	20	0.20	77x115	FX2600V182#E115
	2 200	8.5	17.9	85	87	20	0.20	77x130	FX2600V222#E130
	2 700	10.1	21.2	66	68	20	0.20	77x155	FX2600V272#E155
	3 300	11.3	23.7	44	45	20	0.20	90x131	FX2600V332#F131
	3 900	13.1	27.5	22	22	20	0.20	90x157	FX2600V392#F157

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

Additional designs on request · Weitere Designs auf Anfrage

** Please contact us if load condition exceeds terminals related $I_{r,max}$ referred on page 11

> Ripple Current Multiplier · Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	$\geq 10k$
Multiplier	0.80	1.00	1.18	1.34	1.45

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

Forced cooling – Wind speed [m/sec]	$v < 0.25$	$v \geq 0.25$	$v \geq 0.5$	$v \geq 1.0$	$v \geq 2.0$	$v \geq 3.0$
Multiplier	1.00	1.05	1.10	1.15	1.20	1.25

> Life Time Table · Brauchbarkeitsdauer – Tabelle

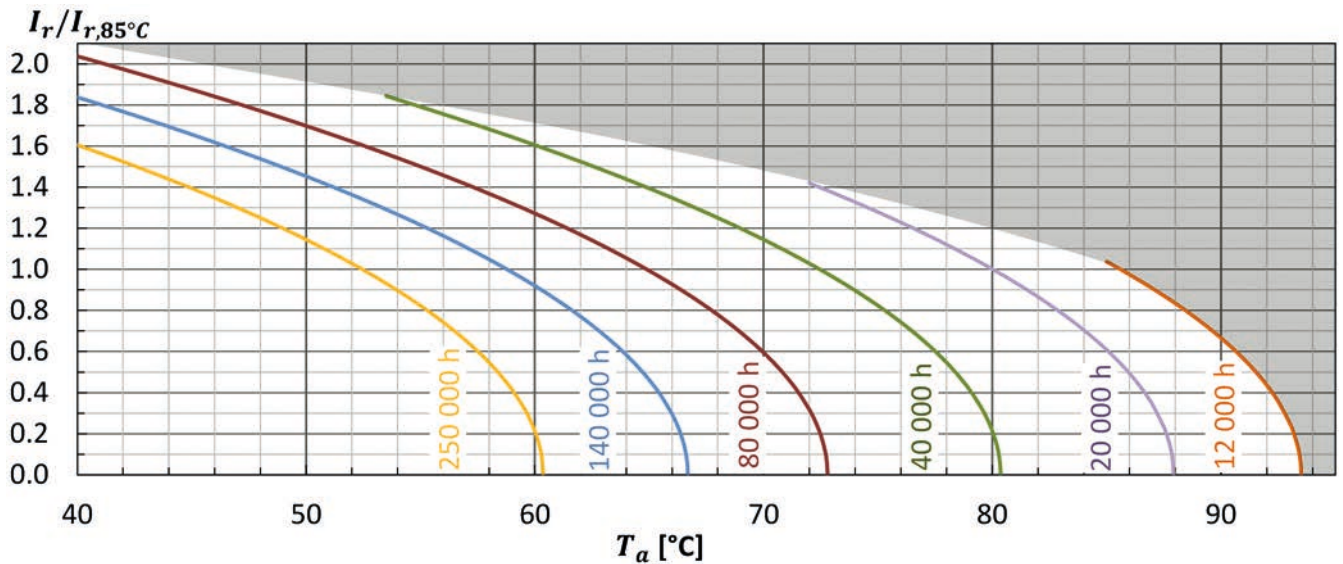
FX2 I_r at 85°C	Useful life as function of ambient temperature and ripple current											
	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
$T_a = 40^\circ\text{C}$	250	250	250	250	250	250	250	199	154	118	89	66
$T_a = 45^\circ\text{C}$	250	250	250	250	247	200	160	126	97	74	56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

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