

VFR · Screw-Terminal · 6000 h/85 °C

High Ripple Current · Bottom cooling design · Low ESR

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

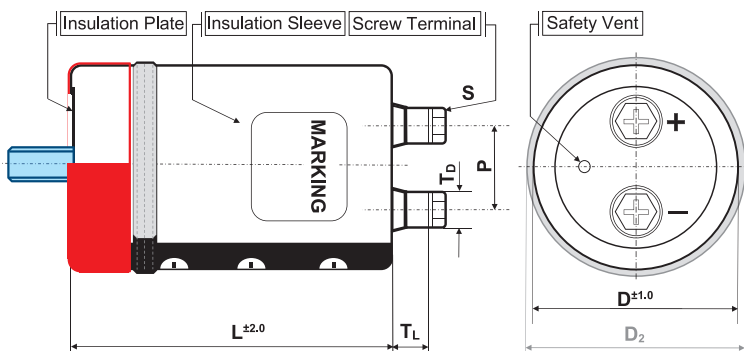
Items	Characteristics
Temperature range	-40°C ~ +85°C
Capacitance tolerance (at 20°C)	Standard +/- 20%, -10/+30% on request
Surge voltage / Ripple voltage	Repetitive max. 30 sec per 6 Minutes / ≤ 70V
Leakage current max. I _l (20°C, 5 min)	0.01 • C • V _r [μA] or 5 mA, which is smaller.
Useful life	6 000 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	N+WC
outer sleeve	•	•	•	•
insulation plate	•	•	•	
stud bolt	•			
bottom double sleeve		•		
integrated seating ring				•

ØD	available shape	P	S	T _L	T _D	Cap material
64	B, N, I, Y	28.6	M5x10	8.0	11	PH
77	B, N, I, Y, WC	31.5	M6x12	9.0	12	PH
90	B, N, I, Y, WC	31.5	M6x12	8.0	12	PH

Size in mm

> Product Code · Bestellbezeichnung

Example: Series VFR · 12000 μF +/- 20 % · 400 V · D=90 mm · L=167 mm with Y-Bracket

VFR	2G	123	Y	F	167								
Type of series	Capacitance code		Fixing symbol code	Case code diameter	Specific features								
	The first two digits are significant. The last digit indicates the number of following zeros in μF.		B : Bolt N : single outer sleeve I : 2 Stoppers Bracket Y : 3 Stoppers Bracket N + suffix WC: blank bottom + seating ring	<table border="1"> <thead> <tr> <th>ØD</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>64</td> <td>D</td> </tr> <tr> <td>77</td> <td>E</td> </tr> <tr> <td>90</td> <td>F</td> </tr> </tbody> </table>	ØD	Code	64	D	77	E	90	F	Case Code length Length in mm (3 digits)
ØD	Code												
64	D												
77	E												
90	F												
Rated voltage code				Capacitance tolerance									
Code	Voltage	Code	Voltage	Ø : ±20 % Q : -10% ~ +30%									
2V	350	2W	450										
2G	400	2H	500										

VFR · Screw-Terminal · 6000 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
350 VDC Code: 2V Surge Voltage 400 VDC	3 900	17.0	35.7	14	16	18	0.20	64x107	VFR2V392#D107
	4 700	19.2	40.3	11	13	18	0.20	64x123	VFR2V472#D123
	5 600	20.6	43.3	10	11	18	0.20	64x147	VFR2V562#D147
		23.5	49.4	10	11	20	0.20	77x108	VFR2V562#E108
	6 800	23.3	48.9	8	10	18	0.20	64x164	VFR2V682#D164
		26.5	55.7	8	10	20	0.20	77x124	VFR2V682#E124
	8 200	25.8	54.2	7	8	18	0.20	64x187	VFR2V822#D187
		28.5	59.9	7	8	20	0.20	77x148	VFR2V822#E148
		32.6	68.5	7	8	20	0.20	90x110	VFR2V822#F110
	10 000	32.1	67.4	5	7	20	0.20	77x165	VFR2V103#E165
		35.9	75.4	5	7	20	0.20	90x126	VFR2V103#F126
	12 000	35.3	74.1	5	5	20	0.20	77x188	VFR2V123#E188
		39.1	82.1	5	5	20	0.20	90x150	VFR2V123#F150
	15 000	40.8	85.7	4	5	20	0.20	77x228	VFR2V153#E228
43.3		90.9	4	5	20	0.20	90x167	VFR2V153#F167	
18 000	47.1	98.9	3	4	20	0.20	90x190	VFR2V183#F190	
22 000	51.2	107.5*	3	4	20	0.20	90x230	VFR2V223#F230	
400 VDC Code: 2G Surge Voltage 450 VDC	3 300	15.7	33.0	16	19	18	0.20	64x107	VFR2G332#D107
	3 900	17.1	35.9	14	16	18	0.20	64x95	VFR2G392#D095
		17.5	36.8	14	16	18	0.20	64x123	VFR2G392#D123
	4 700	18.9	39.7	11	13	18	0.20	64x147	VFR2G472#D147
		21.5	45.2	11	13	20	0.20	77x108	VFR2G472#E108
	5 600	21.2	44.5	10	11	18	0.20	64x164	VFR2G562#D164
		24.0	50.4	10	11	20	0.20	77x124	VFR2G562#E124
	6 800	23.5	49.4	8	10	18	0.20	64x187	VFR2G682#D187
		26.0	54.6	8	10	20	0.20	77x148	VFR2G682#E148
		29.7	62.4	8	10	20	0.20	90x110	VFR2G682#F110
	8 200	28.4	59.6	7	8	20	0.20	77x148	VFR2G822#E148
		29.1	61.1	7	8	20	0.20	77x165	VFR2G822#E165
		32.5	68.3	7	8	20	0.20	90x126	VFR2G822#F126
	10 000	32.2	67.6	5	7	20	0.20	77x188	VFR2G103#E188
		35.7	75.0	5	7	20	0.20	90x150	VFR2G103#F150
	12 000	36.5	76.7	5	5	20	0.20	77x228	VFR2G123#E228
		38.7	81.3	5	5	20	0.20	90x167	VFR2G123#F167
	15 000	43.0	90.3	4	5	20	0.20	90x190	VFR2G153#F190
18 000	46.3	97.2	3	4	20	0.20	90x230	VFR2G183#F230	
450 VDC Code: 2W Surge Voltage 500 VDC	2 700	14.5	30.5	20	23	18	0.20	64x107	VFR2W272#D107
	3 300	16.5	34.7	16	19	18	0.20	64x123	VFR2W332#D123
	3 900	17.6	37.0	14	16	18	0.20	64x147	VFR2W392#D147
		20.1	42.2	14	16	20	0.20	77x108	VFR2W392#E108
	4 700	19.9	41.8	11	13	18	0.20	64x164	VFR2W472#D164
		22.6	47.5	11	13	20	0.20	77x124	VFR2W472#E124
	5 600	21.9	46.0	10	11	18	0.20	64x187	VFR2W562#D187
		24.1	50.6	10	11	20	0.20	77x148	VFR2W562#E148
		27.6	58.0	10	11	20	0.20	90x110	VFR2W562#F110
	6 800	27.1	56.9	8	10	20	0.20	77x165	VFR2W682#E165
		30.3	63.6	8	10	20	0.20	90x126	VFR2W682#F126
	8 200	29.9	62.8	7	8	20	0.20	77x188	VFR2W822#E188
		33.1	69.5	7	8	20	0.20	90x150	VFR2W822#F150

Additional designs on request · Weitere Designs auf Anfrage

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	
450 VDC Code: 2W Surge Voltage 500 VDC	10 000	34.1	71.6	5	7	20	0.20	77x228	VFR2W103#E228	
		36.2	76.0	5	7	20	0.20	90x167	VFR2W103#F167	
	12 000	39.4	82.7	5	5	20	0.20	90x190	VFR2W123#F190	
		15 000	43.3	90.9	4	5	20	0.20	90x230	VFR2W153#F230
		17 000	44.5	93.4	4	5	20	0.20	90x230	VFR2W173#F230
500 VDC Code: 2H Surge Voltage 550 VDC	1 800	11.3	23.7	32	38	18	0.20	64x107	VFR2H182#D107	
		2 200	12.8	26.9	26	31	18	0.20	64x123	VFR2H222#D123
	2 700	13.9	29.2	22	26	18	0.20	64x147	VFR2H272#D147	
		15.9	33.4	22	26	20	0.20	77x108	VFR2H272#E108	
	3 300	15.8	33.2	18	21	18	0.20	64x164	VFR2H332#D164	
		18.0	37.8	18	21	20	0.20	77x124	VFR2H332#E124	
	3 900	17.3	36.3	15	18	18	0.20	64x187	VFR2H392#D187	
		19.1	40.1	15	18	20	0.20	77x148	VFR2H392#E148	
		21.9	46.0	15	18	20	0.20	90x110	VFR2H392#F110	
	4 700	21.4	44.9	13	15	20	0.20	77x165	VFR2H472#E165	
		24.0	50.4	13	15	20	0.20	90x126	VFR2H472#F126	
	5 600	23.5	49.4	11	13	20	0.20	77x188	VFR2H562#E188	
		26.0	54.6	11	13	20	0.20	90x150	VFR2H562#F150	
	6 800	26.7	56.1	9	10	20	0.20	77x228	VFR2H682#E228	
		28.4	59.6	9	10	20	0.20	90x167	VFR2H682#F167	
8 200	31.0	65.1	8	8	20	0.20	90x190	VFR2H822#F190		
	10 000	33.6	70.6	6	7	20	0.20	90x230	VFR2H103#F230	

* 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 < 0.5	v ≥ 0.5	v ≥ 2.0	v ≥ 3.0
Multiplier	0.80	1.00	1.18	1.34	1.45	Multiplier	1.00	1.10	1.20	1.25

Ta (°C)	40	45	50	55	60	65	70	75	80	85
Multiplier	2.1	2.1	2.0	1.9	1.8	1.6	1.5	1.3	1.1	1.0

> Life Time Table · Brauchbarkeitsdauer – Tabelle

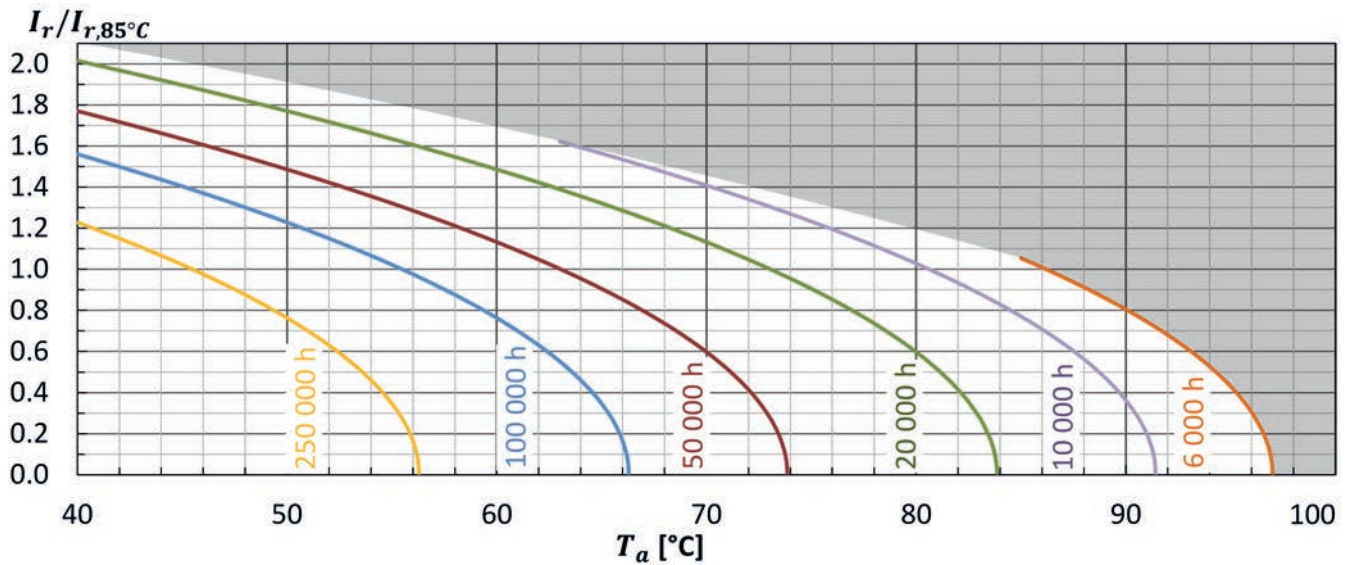
VFR	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
T _a = 40°C	250	250	250	208	159	120	88	63	45	31	21	14
T _a = 45°C	250	212	169	132	101	75	55	40	28	19	13	8
T _a = 50°C	165	134	107	83	63	48	35	25	18	12	8	
T _a = 55°C	104	85	67	52	40	30	22	16	11	7		
T _a = 60°C	66	53	42	33	25	19	14	10	7			
T _a = 65°C	41	34	27	21	16	12	8					
T _a = 70°C	26	21	17	13	10	7						
T _a = 75°C	16	13	10	8								
T _a = 80°C	10	8										
T _a = 85°C	6											

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 4000 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 6000 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