

VGL · Screw-Terminal · 12000 h/105°C

Long Life · Bottom cooling design

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

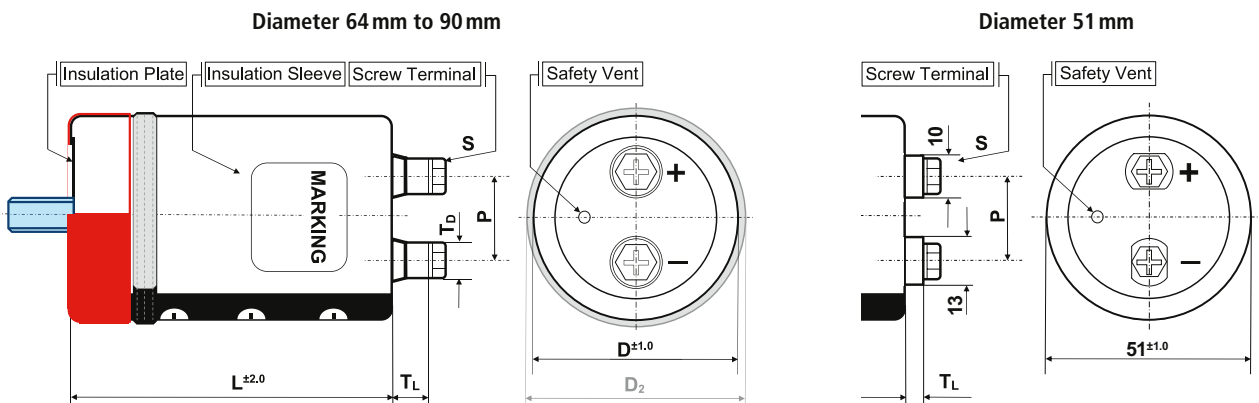
Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance (at 20°C)	Standard +/- 20%, -10/+30% on request
Surge voltage / Ripple voltage	Repetitive max. 30 sec per 6 Minutes / ≤ 50V
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V _r [μA] or 5 mA, which is smaller.
Useful life	12 000 hours at 105°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 + suffix WC blank bottom + seating ring	N standard
outer insulation sleeve	•	•	•	•
insulation plate	•	•		•
stud bolt	•			
bottom double sleeve		•		
integrated seating ring			•	

diameter code	ØD	available shape	P	S	T _L	T _D	Cap material
C	51	B, N, I, Y	22.0	M5x10	4.5	13/10	PH
D	64	B, N, I, Y	28.6	M5x10	8.0	11	PH
E	77	B, N, I, Y, WC	31.5	M5x10	8.0	11	PH
				M6x12	9.0	12	PH
F	90	B, N, I, Y, WC	31.5	M5x10	7.0	11	PH
				M6x12	8.0	12	PH

Size in mm. First listed terminal is standard.

> Product Code · Bestellbezeichnung

Example: Series VGL · 15000 µF +/- 20 % · 400 V · D=90 mm · L= 190 mm with Y-Bracket

VGL	2G	153	Y	F	190
Series name	Capacitance code		Shape code	Diameter code	Specific features (e.g. M6 ...)
Rated voltage code					
Code	Voltage	Code	Voltage	Capacitance tolerance	
2V	350	2W	450	Ø : ± 20 %	
2G	400	2H	500	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 105°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 $\tan \delta$	DxL [mm]	Product Code # = variable value, see fixing code in the product code
350 VDC Code: 2V Surge Voltage 400 VDC	1 800	5.6	15.2	59	70	17	0.20	51x75	VGL2V182#C075
	2 200	6.5	17.6	48	57	17	0.20	51x96	VGL2V222#C096
	2 700	7.5	20.3	39	47	17	0.20	51x109	VGL2V272#C109
	3 300	8.6	23.3	32	38	17	0.20	51x125	VGL2V332#C125
	3 900	10.5	28.4	27	32	18	0.20	64x94	VGL2V392#D094
	4 700	11.9	32.1	22	23	18	0.20	64x107	VGL2V472#D107
		13.0	35.1	20	21	18	0.20	64x123	VGL2V562#D123
		14.6	39.4	20	21	20	0.20	77x95	VGL2V562#E095
	6 800	14.1	38.1	18	18	18	0.20	64x147	VGL2V682#D147
		16.0	43.2	18	18	20	0.20	77x108	VGL2V682#E108
		18.5	50.0	18	18	20	0.20	90x97	VGL2V682#F097
	8 200	15.9	42.9	15	17	18	0.20	64x187	VGL2V822#D187
		18.0	48.6	15	17	20	0.20	77x124	VGL2V822#E124
		20.2	54.5	15	17	20	0.20	90x110	VGL2V822#F110
	10 000	19.5	52.7	12	15	20	0.20	77x148	VGL2V103#E148
		22.1	59.7	12	15	20	0.20	90x126	VGL2V103#F126
	12 000	21.8	58.9	10	13	20	0.20	77x188	VGL2V123#E188
		24.1	65.1	10	13	20	0.20	90x150	VGL2V123#F150
	15 000	25.2	68.0	8	11	20	0.20	77x228	VGL2V153#E228
		26.9	72.6	8	11	20	0.20	90x150	VGL2V153#F150
18 000	29.3	79.1	6	9	20	0.20	90x190	VGL2V183#F190	
22 000	31.5	85.1	5	7	20	0.20	90x230	VGL2V223#F230	
27 000	34.4	92.9	4	6	20	0.20	90x268	VGL2V273#F268	
400 VDC Code: 2G Surge Voltage 450 VDC	1 200	4.7	12.7	83	97	17	0.20	51x75	VGL2G122#C075
	1 500	5.6	15.2	66	77	17	0.20	51x96	VGL2G152#C096
	1 800	6.2	16.8	55	65	17	0.20	51x109	VGL2G182#C109
	2 200	7.0	18.9	45	53	17	0.20	51x125	VGL2G222#C125
	3 300	9.7	26.2	30	35	18	0.20	64x94	VGL2G332#D094
	3 900	10.8	29.2	27	32	18	0.20	64x107	VGL2G392#D107
	4 700	11.9	32.1	22	23	18	0.20	64x123	VGL2G472#D123
13.3		35.9	22	23	20	0.20	77x95	VGL2G472#E095	

Additional designs on request · Weitere Designs auf Anfrage

Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [μF]	Ripple Current at 105°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	5 600	12.8	34.6	20	21	18	0.20	64x147	VGL2G562#D147	
		14.5	39.2	20	21	20	0.20	77x108	VGL2G562#E108	
		16.8	45.4	20	21	20	0.20	90x97	VGL2G562#F097	
	6 800	14.5	39.2	18	18	18	0.20	64x187	VGL2G682#D187	
		16.4	44.3	18	18	20	0.20	77x124	VGL2G682#E124	
		18.4	49.7	18	18	20	0.20	90x110	VGL2G682#F110	
	8 200	18.0	48.6	15	17	20	0.20	77x165	VGL2G822#E165	
		20.0	54.0	15	17	20	0.20	90x126	VGL2G822#F126	
		19.9	53.7	12	15	20	0.20	77x188	VGL2G103#E188	
	10 000	22.0	59.4	12	15	20	0.20	90x150	VGL2G103#F150	
		12 000	23.7	64.0	10	13	20	0.20	90x167	VGL2G123#F167
		15 000	26.7	72.1	8	11	20	0.20	90x190	VGL2G153#F190
18 000	28.5	77.0	7	9	20	0.20	90x230	VGL2G183#F230		
	22 000	31.1	84.0	6	7	20	0.20	90x268	VGL2G223#F268	
450 VDC Code: 2W Surge Voltage 500 VDC	1 000	4.2	11.4	93	93	17	0.20	51x75	VGL2W102#C075	
		1 200	5.0	13.5	77	77	17	0.20	51x96	VGL2W122#C096
	1 500	5.9	16.0	62	62	17	0.20	51x109	VGL2W152#C109	
		1 800	6.6	17.9	52	52	17	0.20	51x125	VGL2W182#C125
	2 200	8.1	21.9	42	42	18	0.20	64x94	VGL2W222#D094	
		2 700	9.2	24.8	42	42	18	0.20	64x107	VGL2W272#D107
	3 300	10.2	27.5	35	40	18	0.20	64x123	VGL2W332#D123	
		11.4	30.8	35	40	20	0.20	77x95	VGL2W332#E095	
	3 900	10.9	29.4	27	32	18	0.20	64x147	VGL2W392#D147	
		12.4	33.5	27	32	20	0.20	77x108	VGL2W392#E108	
	4 700	12.2	32.9	24	27	18	0.20	64x164	VGL2W472#D164	
		13.9	37.5	24	27	20	0.20	77x124	VGL2W472#E124	
		15.8	42.7	24	27	20	0.20	90x97	VGL2W472#F097	
	5 600	13.5	36.5	24	23	18	0.20	64x187	VGL2W562#D187	
		14.9	40.2	22	23	20	0.20	77x148	VGL2W562#E148	
		17.1	46.2	22	23	20	0.20	90x110	VGL2W562#F110	
	6 800	16.8	45.4	20	20	20	0.20	77x165	VGL2W682#E165	
		18.7	50.5	20	20	20	0.20	90x126	VGL2W682#F126	
	8 200	18.5	50.0	18	18	20	0.20	77x188	VGL2W822#E188	
		20.4	55.1	18	18	20	0.20	90x150	VGL2W822#F150	
10 000	20.4	55.1	15	15	20	0.20	77x188	VGL2W103#E188		
	22.2	59.9	15	15	20	0.20	90x167	VGL2W103#F167		
12 000	24.5	66.2	13	12	20	0.20	90x190	VGL2W123#F190		
	15 000	26.6	71.8	11	10	20	0.20	90x230	VGL2W153#F230	
18 000	28.8	77.8	9	8	20	0.20	90x268	VGL2W183#F268		
	500 VDC Code: 2H Surge Voltage 550 VDC	560	3.0	8.1	199	215	17	0.20	51x75	VGL2H561#C075
680		3.3	8.9	164	177	17	0.20	51x75	VGL2H681#C075	
820		3.9	10.5	136	147	17	0.20	51x96	VGL2H821#C096	
1 000		4.4	11.9	111	120	17	0.20	51x109	VGL2H102#C109	
1 200		5.0	13.5	93	100	17	0.20	51x125	VGL2H122#C125	

Additional designs on request · Weitere Designs auf Anfrage

Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [μF]	Ripple Current at 105°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
500 VDC Code: 2H Surge Voltage 550 VDC	1 500	6.5	17.6	74	80	18	0.20	64x107	VGL2H152#D107
	1 800	7.1	19.2	62	50	18	0.20	64x107	VGL2H182#D107
		8.0	21.6	62	50	20	0.20	77x95	VGL2H182#E095
	2 200	7.9	21.3	53	50	18	0.20	64x123	VGL2H222#D123
		8.9	24.0	53	50	20	0.20	77x95	VGL2H222#E095
	2 700	8.6	23.2	40	35	18	0.20	64x147	VGL2H272#D147
		9.8	26.5	40	35	20	0.20	77x108	VGL2H272#E108
		11.4	30.8	40	35	20	0.20	90x97	VGL2H272#F097
	3 300	9.8	26.5	38	32	18	0.20	64x164	VGL2H332#D164
		11.1	30.0	38	32	20	0.20	77x124	VGL2H332#E124
		12.6	34.0	38	32	20	0.20	90x97	VGL2H332#F097
	3 900	10.7	28.9	30	27	18	0.20	64x187	VGL2H392#D187
		12.1	32.7	30	27	20	0.20	77x124	VGL2H392#E124
		13.6	36.7	30	27	20	0.20	90x110	VGL2H392#F110
	4 700	13.0	35.1	25	20	20	0.20	77x148	VGL2H472#E148
		14.8	40.0	25	20	20	0.20	90x126	VGL2H472#F126
	5 600	14.5	39.2	20	17	20	0.20	77x165	VGL2H562#E165
		16.1	43.5	20	17	20	0.20	90x150	VGL2H562#F150
	6 800	16.1	43.5	17	17	20	0.20	77x188	VGL2H682#E188
		17.4	47.0	17	17	20	0.20	90x167	VGL2H682#F167
8 200	19.3	52.1	14	14	20	0.20	90x190	VGL2H822#F190	
10 000	20.7	55.9	12	12	20	0.20	90x230	VGL2H103#F230	
12 000	21.5	58.1	10	10	20	0.20	90x268	VGL2H123#F268	

Additional designs on request · Weitere Designs auf Anfrage

> Ripple Current Multiplier · Wechselstrommultiplikator

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

Ta (°C)	40	50	60	65	70	75	80	85	90	95	100	105
Multiplier	2.7	2.5	2.3	2.2	2.2	2.1	2.0	2.0	1.7	1.4	1.2	1.0

Forced cooling – Wind speed [m/sec]	v < 0.25	v ≥ 0.25	v ≥ 0.5	v ≥ 1.0	v ≥ 2.0	v ≥ 3.0
Multiplier	1.00	1.07	1.15	1.25	1.30	1.35

> Life Time Table · Brauchbarkeitsdauer – Tabelle

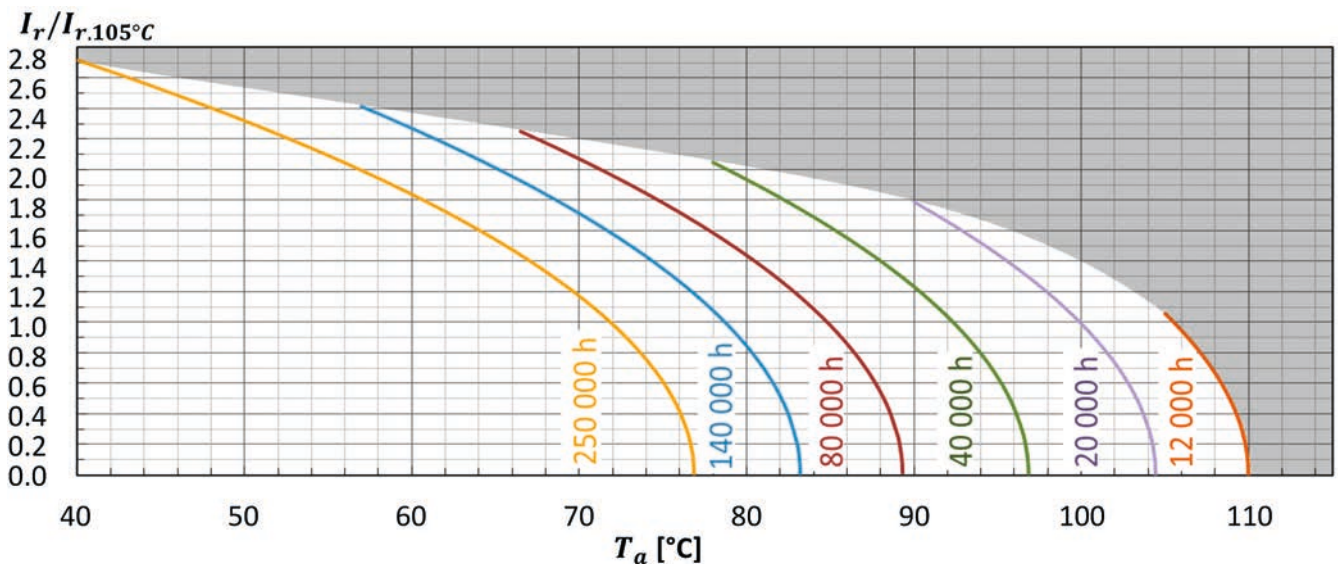
VGL	Useful life as function of ambient temperature and ripple current											
	x 1.0	x 1.2	x 1.4	x 1.7	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
$T_a = 40^\circ\text{C}$	250	250	250	250	250	250	250	250	250	250	250	250
$T_a = 45^\circ\text{C}$	250	250	250	250	250	250	250	250	250	250	250	250
$T_a = 50^\circ\text{C}$	250	250	250	250	250	250	250	250	250	222		
$T_a = 55^\circ\text{C}$	250	250	250	250	250	250	250	209	172			
$T_a = 60^\circ\text{C}$	250	250	250	250	225	190	159	132				
$T_a = 65^\circ\text{C}$	250	250	250	225	142	120	100					
$T_a = 70^\circ\text{C}$	250	250	208	142	90	76	63					
$T_a = 75^\circ\text{C}$	196	163	132	90	56	48						
$T_a = 80^\circ\text{C}$	124	103	83	56	36							
$T_a = 85^\circ\text{C}$	78	65	52	36	22							
$T_a = 90^\circ\text{C}$	49	41	33	22								
$T_a = 95^\circ\text{C}$	31	26	21									
$T_a = 100^\circ\text{C}$	19	16										
$T_a = 105^\circ\text{C}$	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 $I_r, 105^\circ\text{C}, 120\text{Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorie-temperatur $I_r, 105^\circ\text{C}, 120\text{Hz}$



> Life Time Tests and Requirements · Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	$T_a = 105^\circ\text{C}$; 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	$T_a = 105^\circ\text{C}$; 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