

VGL · Screw-Terminal · 12000 h/105°C

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

> 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
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)

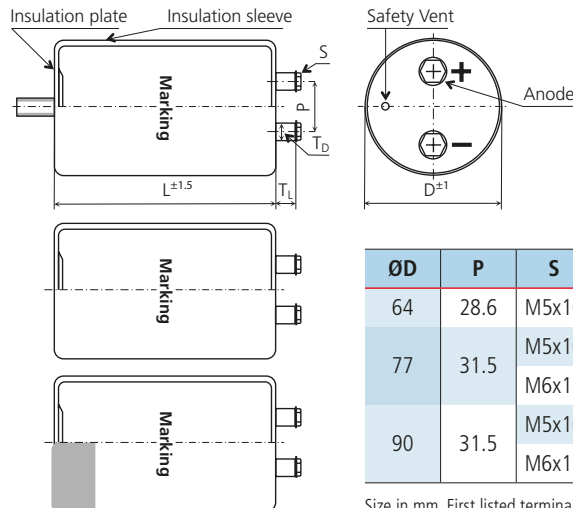
Form: B (ØD = 51-101)
(für Bolzenbefestigung, M12x16,
Bolzen nicht isoliert)

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 _L	T _D	Cap material
64	28.6	M5x10	8.0	11	PH
77	31.5	M5x10	8.0	11	PH
		M6x12	9.0	12	PH
90	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

Type of series		Capacitance code		Fixing symbol code		Case code diameter		Customers' specification													
VGL	2G	153		Y		F		190 ()													
The first two digits are significant. The last digit indicates the number of following zeros in μF.		Rated voltage code		B : Bolt ØD = 51 - 101 N : No double sleeve (PBT-Safety-holder or press ring) Y : 3 Stoppers Bracket ØD = 64 - 90 For bolt: Case length +1mm		<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																				
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90	F																				
<table border="1"> <thead> <tr> <th>Code</th> <th>Voltage</th> <th>Code</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>2V</td> <td>350</td> <td>2W</td> <td>450</td> </tr> <tr> <td>2G</td> <td>400</td> <td>2H</td> <td>500</td> </tr> </tbody> </table>		Code	Voltage	Code	Voltage	2V	350	2W	450	2G	400	2H	500								
Code	Voltage	Code	Voltage																		
2V	350	2W	450																		
2G	400	2H	500																		

Rated VoltageCode (Surge Voltage) V_r [V DC]	Capacitance C_r [μ F]	Ripple Current at 105°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
350 VDC Code: 2V Surge Voltage 400 VDC	3 900	10.5	28.4	27	32	18	0.2	64x94	VGL2V392#D094
	4 700	11.9	32.1	22	23	18	0.2	64x107	VGL2V472#D107
	5 600	13.0	35.1	20	21	18	0.2	64x123	VGL2V562#D123
		14.6	39.4	20	21	20	0.2	77x95	VGL2V562#E095
	6 800	14.1	38.1	18	18	18	0.2	64x147	VGL2V682#D147
		16.0	43.2	18	18	20	0.2	77x108	VGL2V682#E108
		18.5	50.0	18	18	20	0.2	90x97	VGL2V682#F097
	8 200	15.9	42.9	15	17	18	0.2	64x187	VGL2V822#D187
		18.0	48.6	15	17	20	0.2	77x124	VGL2V822#E124
		20.2	54.5	15	17	20	0.2	90x110	VGL2V822#F110
	10 000	19.5	52.7	12	15	20	0.2	77x148	VGL2V103#E148
		22.1	59.7	12	15	20	0.2	90x126	VGL2V103#F126
	12 000	21.8	58.9	10	13	20	0.2	77x188	VGL2V123#E188
		24.1	65.1	10	13	20	0.2	90x150	VGL2V123#F150
	15 000	25.2	68.0	8	11	20	0.2	77x228	VGL2V153#E228
		26.5	71.6	8	11	20	0.2	90x167	VGL2V153#F167
18 000	29.3	79.1	6	9	20	0.2	90x190	VGL2V183#F190	
22 000	31.5	85.1	5	7	20	0.2	90x230	VGL2V223#F230	
400 VDC Code: 2G Surge Voltage 450 VDC	3 300	9.7	26.2	30	35	18	0.2	64x94	VGL2G332#D094
	3 900	10.8	29.2	27	32	18	0.2	64x107	VGL2G392#D107
	4 700	11.9	32.1	22	23	18	0.2	64x123	VGL2G472#D123
		13.3	35.9	22	23	20	0.2	77x95	VGL2G472#E095
	5 600	12.8	34.6	20	21	18	0.2	64x147	VGL2G562#D147
		14.5	39.2	20	21	20	0.2	77x108	VGL2G562#E108
		16.8	45.4	20	21	20	0.2	90x97	VGL2G562#F097
	6 800	14.5	39.2	18	18	18	0.2	64x187	VGL2G682#D187
		16.4	44.3	18	18	20	0.2	77x124	VGL2G682#E124
		18.4	49.7	18	18	20	0.2	90x110	VGL2G682#F110
	8 200	18.0	48.6	15	17	20	0.2	77x165	VGL2G822#E165
		20.0	54.0	15	17	20	0.2	90x126	VGL2G822#F126
	10 000	19.9	53.7	12	15	20	0.2	77x188	VGL2G103#E188
		22.0	59.4	12	15	20	0.2	90x150	VGL2G103#F150
	12 000	23.7	64.0	10	13	20	0.2	90x167	VGL2G123#F167
	15 000	26.7	72.1	8	11	20	0.2	90x190	VGL2G153#F190
18 000	28.5	77.0	7	9	20	0.2	90x230	VGL2G183#F230	
450 VDC Code: 2W Surge Voltage 500 VDC	2 200	8.1	21.9	42	42	18	0.2	64x94	VGL2W222#D094
	2 700	9.2	24.8	42	42	18	0.2	64x107	VGL2W272#D107
	3 300	10.2	27.5	35	40	18	0.2	64x123	VGL2W332#D123
		11.4	30.8	35	40	20	0.2	77x95	VGL2W332#E095
	3 900	10.9	29.4	27	32	18	0.2	64x147	VGL2W392#D147
		12.4	33.5	27	32	20	0.2	77x108	VGL2W392#E108
	4 700	12.2	32.9	24	27	18	0.2	64x164	VGL2W472#D164
		13.9	37.5	24	27	20	0.2	77x124	VGL2W472#E124
15.8	42.7	24	27	20	0.2	90x97	VGL2W472#F097		

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
450 VDC Code: 2W Surge Voltage 500 VDC	5 600	13.5	36.5	24	23	18	0.2	64x187	VGL2W562#D187
		14.9	40.2	22	23	20	0.2	77x148	VGL2W562#E148
		17.1	46.2	22	23	20	0.2	90x110	VGL2W562#F110
	6 800	16.8	45.4	20	20	20	0.2	77x165	VGL2W682#E165
		18.7	50.5	20	20	20	0.2	90x126	VGL2W682#F126
		18.5	50.0	18	18	20	0.2	77x188	VGL2W822#E188
	8 200	20.4	55.1	18	18	20	0.2	90x150	VGL2W822#F150
		10 000	22.2	59.9	15	15	20	0.2	90x167
	12 000	24.5	66.2	13	12	20	0.2	90x190	VGL2W123#F190
	15 000	26.6	71.8	11	10	20	0.2	90x230	VGL2W153#F230
500 VDC Code: 2H Surge Voltage 550 VDC	1 500	6.5	17.6	74	80	18	0.2	64x107	VGL2H152#D107
		7.2	19.4	62	50	18	0.2	64x123	VGL2H182#D123
	1 800	8.0	21.6	62	50	20	0.2	77x95	VGL2H182#E095
		7.8	21.1	53	50	18	0.2	64x147	VGL2H222#D147
	2 200	8.9	24.0	53	50	20	0.2	77x108	VGL2H222#E108
		8.8	23.8	40	35	18	0.2	64x164	VGL2H272#D164
	2 700	11.4	30.8	40	35	20	0.2	90x97	VGL2H272#F097
		9.8	26.5	38	32	18	0.2	64x187	VGL2H332#D187
	3 300	11.1	30.0	38	32	20	0.2	77x124	VGL2H332#E124
		12.5	33.8	38	32	20	0.2	90x110	VGL2H332#F110
	3 900	11.9	32.1	30	27	20	0.2	77x148	VGL2H392#E148
		13.5	36.5	30	27	20	0.2	90x126	VGL2H392#F126
	4 700	13.3	35.9	25	20	20	0.2	77x165	VGL2H472#E165
		14.7	39.7	25	20	20	0.2	90x150	VGL2H472#F150
	5 600	14.6	39.4	20	17	20	0.2	77x188	VGL2H562#E188
		15.8	42.7	20	17	20	0.2	90x167	VGL2H562#F167
	6 800	17.5	47.3	17	17	20	0.2	90x190	VGL2H682#F190
	8 200	18.8	50.8	14	14	20	0.2	90x230	VGL2H822#F230

> 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	50	60	65	70	75	80	85	90	95	100	105
Multiplier	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.8	1.4	1.2	1.0

Additional designs on request · Weitere Designs auf Anfrage

> Life Time Table · Brauchbarkeitsdauer – Tabelle

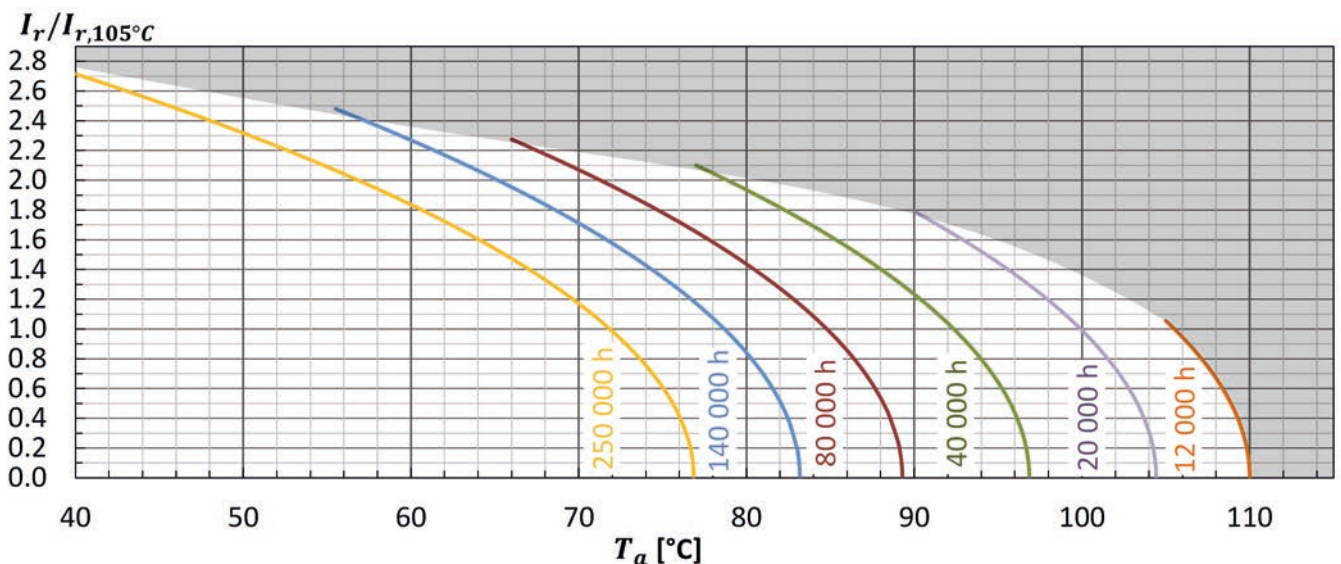
VGL	Useful life as function of ambient temperature and ripple current											
	$x 1.0$	$x 1.2$	$x 1.4$	$x 1.7$	$x 2.0$	$x 2.1$	$x 2.2$	$x 2.3$	$x 2.4$	$x 2.5$	$x 2.6$	$x 2.7$
$T_a = 40^\circ\text{C}$	250	250	250	250	250	250	250	250	250	250	250	250
$T_a = 45^\circ\text{C}$	250	250	250	250	250	250	250	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	$\Delta C/C \leq 15\%$ (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	$\Delta C/C \leq 20\%$ (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