



FTCAP
FISCHER & TAUSCHE
CAPACITORS

FTCAP IS NOW MERSEN



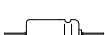

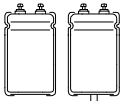
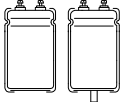
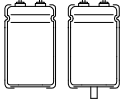
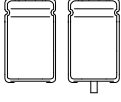
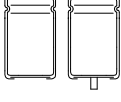



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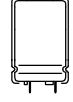
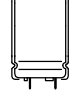
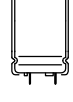






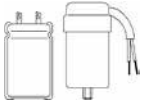
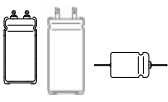
ELECTROLYTIC CAPACITORS

PRODUCT RANGE



Aluminium Electrolytic Capacitors

Series	Design	Application	Page
A		Axial leaded, 85°C	10
AH		Axial leaded, 105°C	14
AG		Axial leaded, 125°C	18
ATBI/ ATBIG		Axial leaded, bipolar, HIFI	20
GM		High currents / small dimensions, 85°C	24
GMX		High currents long - life type, 85°C	30
G		High currents, 105°C	36
GG		High currents, 125°C	42
GF		Self extinguishing electrolyte, 85°C	44
GW		Highest currents, 105°C	48
SI		Snap-in, 85°C	52
SIH		Snap-in, 105°C	60

Series	Design	Application	Page
SIG		Snap-in, 125°C	66
GS		DIN terminals, 85°C	70
GSH		DIN terminals, 105°C	76
GSG		DIN terminals, 125°C	82
LF		High currents with solder lugs, 85°C	86
LFH		High currents with solder lugs, 105°C	92
S		Central mounting, 85°C	98
SZ		Central mounting double capacitance, 85°C	98
SH		Central mounting, 105°C	102
MDK		Motor start	106
MEK		Motor start	108
E-Type		Flash capacitors	110

On the following pages you can find a detailed index.

This brochure replaces the previous edition. Updated information may be published on [ftcap website](http://ftcap.com). This brochure describes typical product characteristics that shall not be considered as guaranteed values. Although the text is accurate to the best of our knowledge when printed, we reserve the right to make change without prior notice.

Stand: 12/2019

Aluminium Electrolytic Capacitors

GENERAL INFORMATION.....	4
1. Construction of Aluminium Electrolytic Capacitors	4
2. Different types of foil	5
3. Parameter	6
3.1 Rated Voltage	6
3.2 Surge Voltage	6
3.3 Ripple Voltage.....	6
3.4 Maximum Reverse Voltage.....	6
3.5 Rated Capacitance	6
3.6 DC and AC Capacitance.....	6
3.7 Capacitance vs Temperature and Frequency	6
3.8 ESR	7
3.9 ESL	7
3.10 Dissipation factor $\tan \delta$ (DF)	7
3.11 Impedance Z	7
4. Mounting	7
5. Thermal Model.....	8
6. Quality.....	9
6.1 Certification.....	9
7. Safety Precautions-Environmental aspects	9
7.1 Charged Capacitors.....	9
7.2 Misapplication	9
7.3 Operating Electrolytes	9
7.4 RoHS	9
7.5 Disposal	9
Axial Capacitors.....	10
Type A.....	10
Type AH.....	14
Type AG.....	18
Type ATBI / ATBIG.....	20
Screw Terminal Capacitors	24
Type GMA / GMB.....	24
Type GMXA / GMXB	30
Type GA / GB.....	36
Type GGA / GGB	42
Type GFA / GFB	44
Type GW.....	48
Snap-in Capacitors	52
Type SI / SI4P.....	52
Type SIH / SI4PH	60
Type SIG / SI4PG.....	66
Capacitors for PCB mounted (DIN-Type)	70
Type GS.....	70
Type GSH.....	76
Type GSG.....	82
Solder Lug Capacitors	86
Type LF.....	86
Type LFH.....	92
Central mounted Capacitors	98
Type S / SZ.....	98
Type SH.....	102
Motor - Start Capacitors	106
Type MDK.....	106
Type MEK.....	108
Photoflash Capacitors	110
Accessory equipment	112
Insulating disks and nuts	112
Discharge / Balancing Resistor	113
Nylon Clamps	113

Aluminium Electrolytic Capacitors

■ GENERAL INFORMATION

FTCap GmbH, Fischer und Tausche Capacitors has been a manufacturer of capacitors since 1948. Many years of experience, continuous research & development and the latest state of the art production machinery guarantees products of the highest quality.

■ ALUMINIUM ELECTROLYTIC CAPACITORS

Polarized capacitors

- general industrial
- inverter
- telecommunications
- switch mode power supplies
- photovoltaic
- wind power plants
- medical
- smoothing and filtering
- welding and photo flash applications

Non polarized capacitors

- audio-video applications

Charging capacitors for photo flash capacitor banks

- single phase motor starting

■ 1. CONSTRUCTION OF ALUMINIUM ELECTROLYTIC CAPACITORS

High gain etched anode foil with the thick oxide layer, which is produced by the forming-process, is shown at the top of figure 2. The cathode foil with a much thinner oxide layer is arranged at the bottom. Layers of papers are separating both foils. The electrolyte fills up the pores of the aluminium foils and contacts the anode and cathode surface to establish the capacitance. The dielectric consists of the oxide layers of the anode foil respectively the cathode foil. This construction builds two capacitances: the anode and the cathode capacitances. Because of the thicker oxide layer the anode capacitance is normally much smaller than the cathode capacitance.

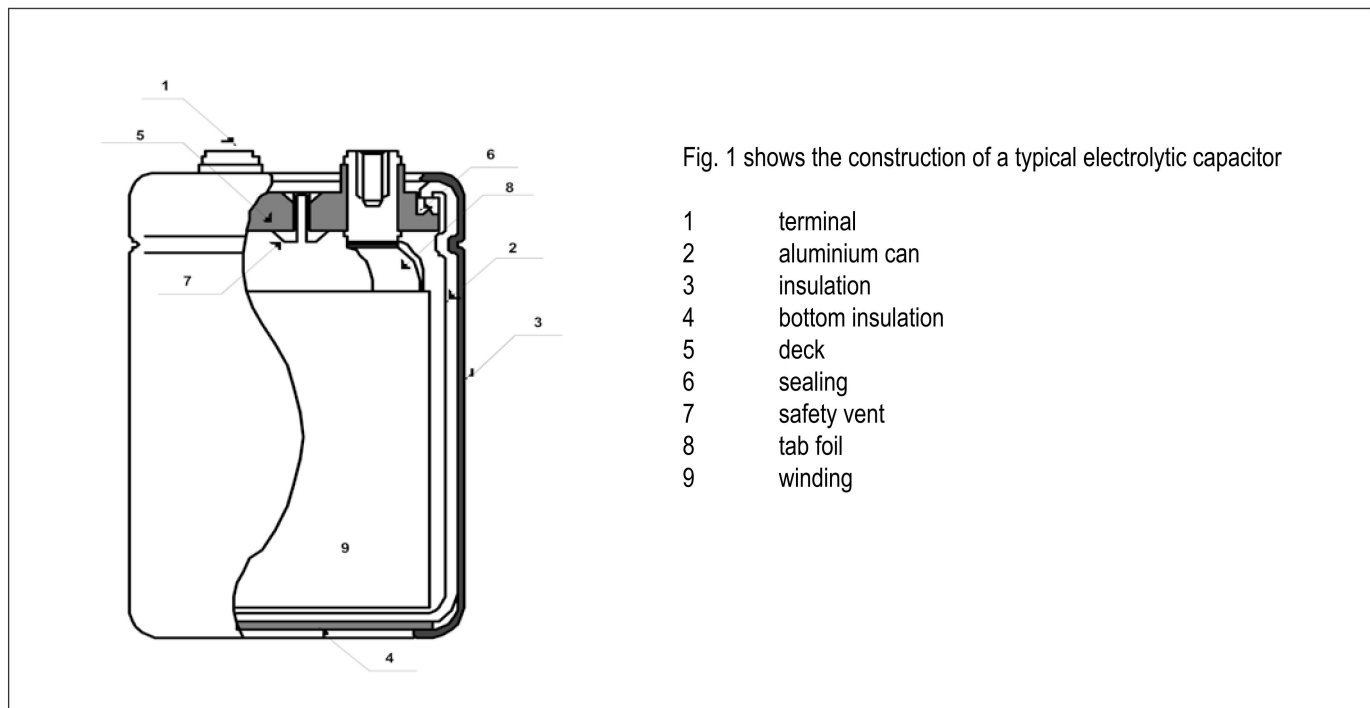
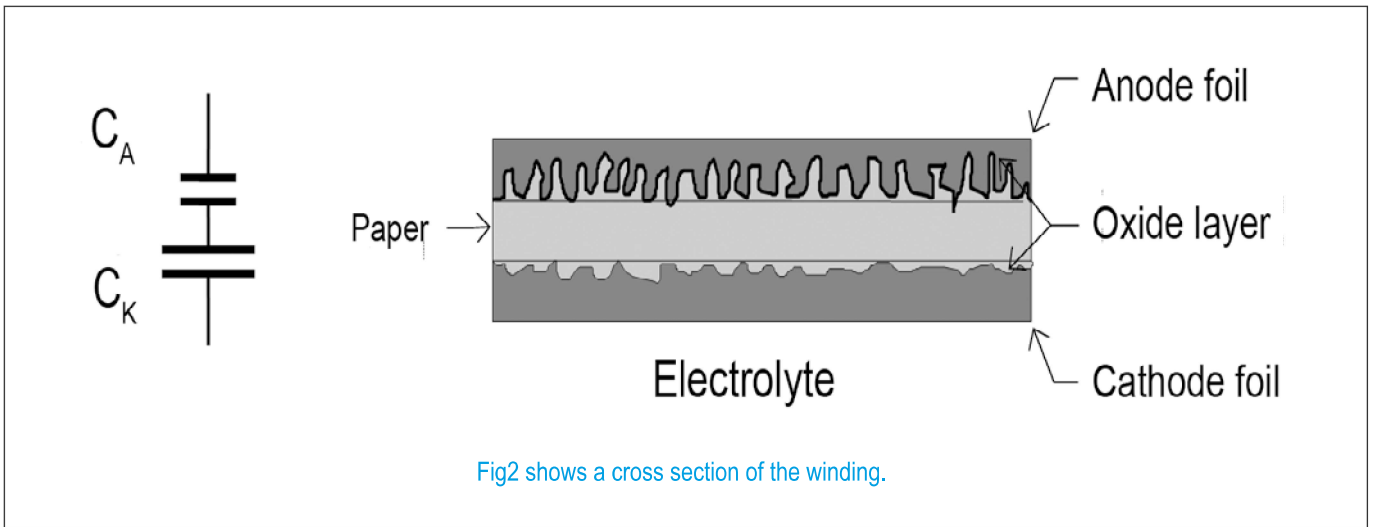


Fig. 1 shows the construction of a typical electrolytic capacitor

- | | |
|---|-------------------|
| 1 | terminal |
| 2 | aluminium can |
| 3 | insulation |
| 4 | bottom insulation |
| 5 | deck |
| 6 | sealing |
| 7 | safety vent |
| 8 | tab foil |
| 9 | winding |

Aluminium Electrolytic Capacitors



If two capacitors are connected in series, the total capacitance results from the relationship

$$C_G = C_A \cdot C_K / (C_A + C_K)$$

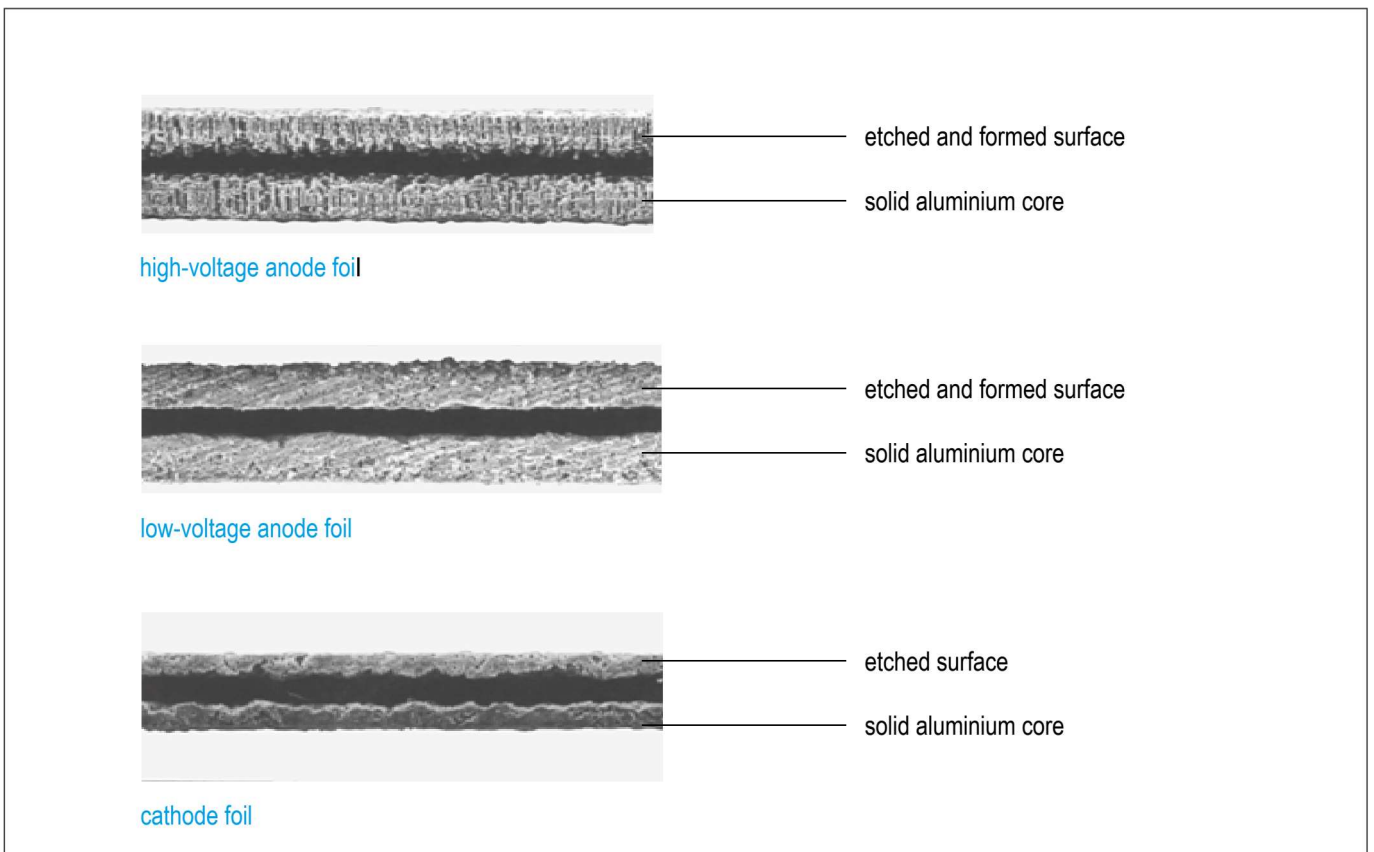
If $C_A \ll C_K$ it follows $C_G \approx C_A$. (aspired normal case)

This means the anode capacitance determines the capacitance of the whole capacitor (the cathode foil slightly decreases the capacitance). To accomplish that, highly etched cathode foils are necessary.

Nonpolarized electrolytic capacitors use the same foil for anode and cathode ($C_A = C_K$) Therefore the capacitance of these capacitors are given by $C_G = 0,5 \cdot C_A$.

It is obvious that a nonpolarized electrolytic capacitor needs two times the space of a polarized capacitor.

2. DIFFERENT TYPES OF FOIL



Aluminium Electrolytic Capacitors

3. PARAMETER

3.1. RATED VOLTAGE

The rated voltage (UR) is the voltage the capacitor is designed for. This voltage may be applied continuously to the capacitor over the full temperature range.

3.2. RIPPLE VOLTAGE

In many applications the voltage applied to capacitors is a combination of direct and alternating voltage. Pay attention to the following points:

- The superposition of AC and DC must not exceed the rated voltage
- Reverse voltage is not allowed
- The applied ripple current must not exceed the rated ripple current

1.4. MAXIMUM REVERSE VOLTAGE

The Aluminium Electrolytic Capacitor is a polar component. Diodes with a max. conducting state voltage of 0.8 V could be used to prevent reverse polarity voltage. Single short time reverse polarity of $V < 1.5 V$ for $t < 1 s$ is tolerated.

1.5. RATED CAPACITANCE

The rated capacitance is usually determined at 100 Hz and 20 °C . In general the rated capacitance is marked on the capacitor in μF .

1.6. DC AND AC CAPACITANCE

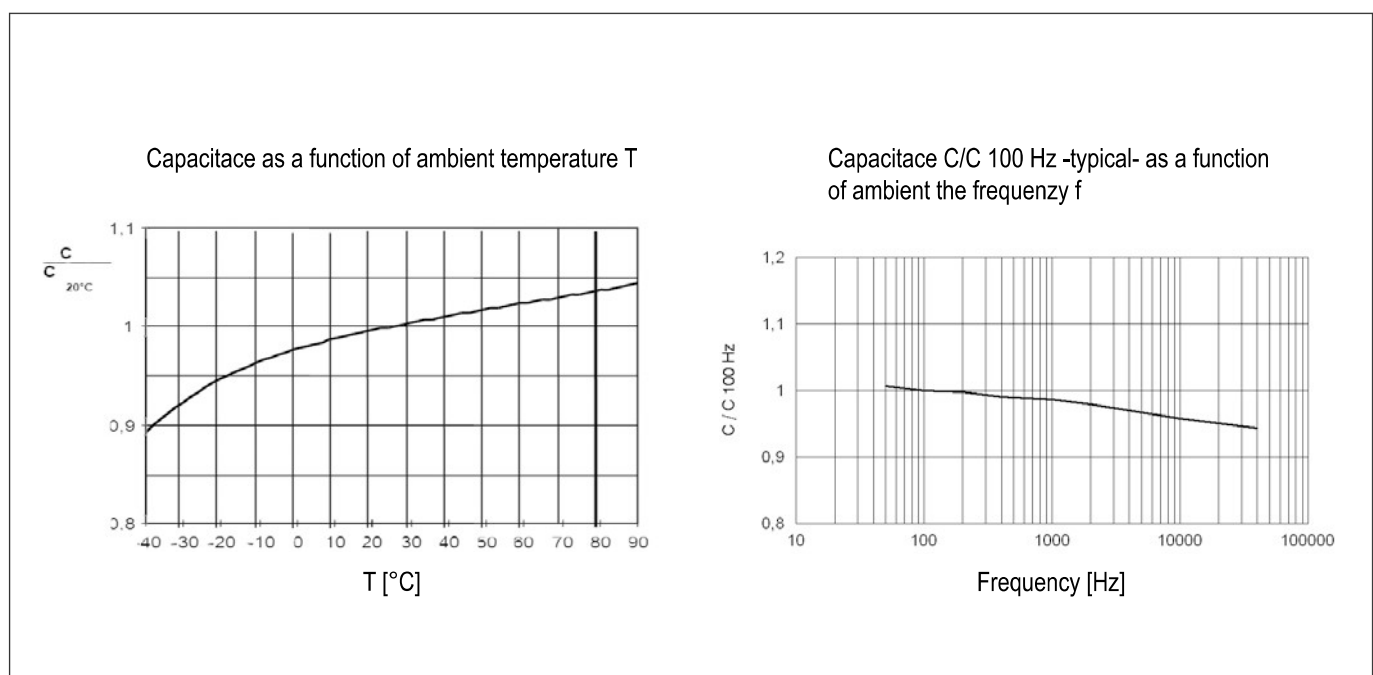
The capacitance determined by AC measurements is smaller than the capacitance determined by charge / discharge measurements. In most applications the capacitor is applied to an alternating voltage so in general the capacitance is measured with the AC method.

1.7. CAPACITANCE VS TEMPERATURE AND FREQUENCY

The capacitance varies with temperature and frequency

- The capacitance increases with increasing temperature
- The capacitance decreases with increasing frequency

The following diagrams illustrate these interdependent relationships.



Stand: 12/2019

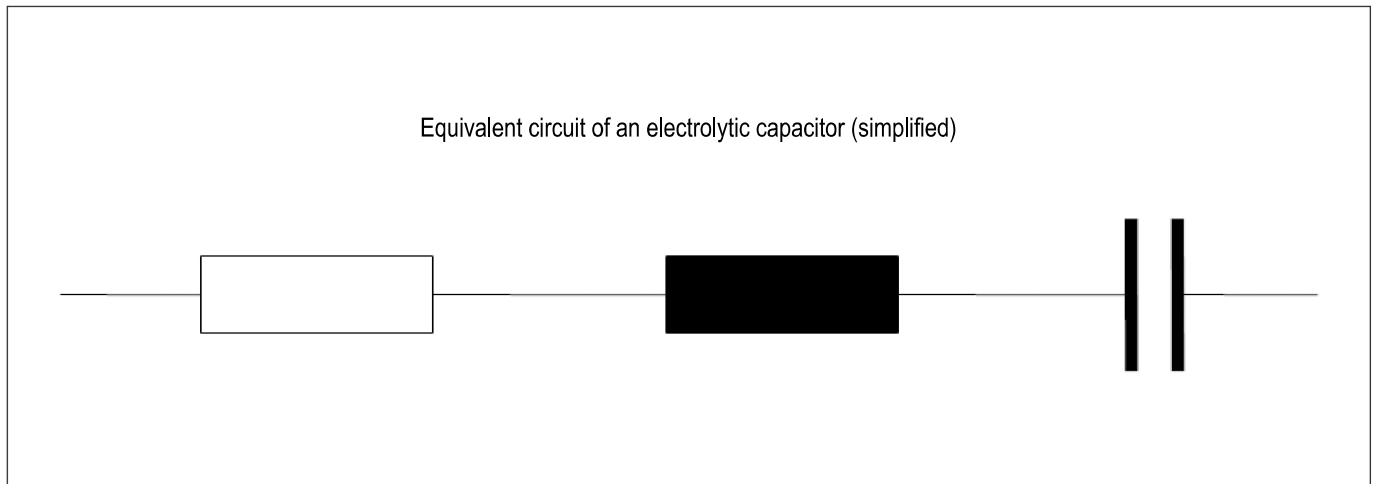
Aluminium Electrolytic Capacitors

3.8. ESR

The equivalent series resistance represents the losses of a capacitor (the resistance of the foil, electrolyte, terminals). The ESR depends on frequency and temperature.

3.9. ESL

The equivalent series inductance represents the inductive part of the capacitor (leads, foil). The ESL depends mainly on the frequency.



3.10. DISSIPATION FACTOR TAN Δ (DF)

The dissipation factor is defined as the power loss of the capacitor divided by the reactive power of the capacitor.

$$\tan \delta = ESR \cdot \omega \cdot CS$$

In general the DF is measured at 100 Hz and 20 °C.

3.11. IMPEDANCE Z

The impedance of the capacitor is given by the ESR, ESL and the capacitance.

The impedance depends on the temperature and the frequency. The impedance is normally measured at 10 kHz.

4. MOUNTING

Position for screw terminal capacitors

Upright position is recommended to prevent electrolyte leakage in case of vent opening.

Horizontal mounting is also possible but the vent must face upwards.

TERMINALS / MOUNTING STUD

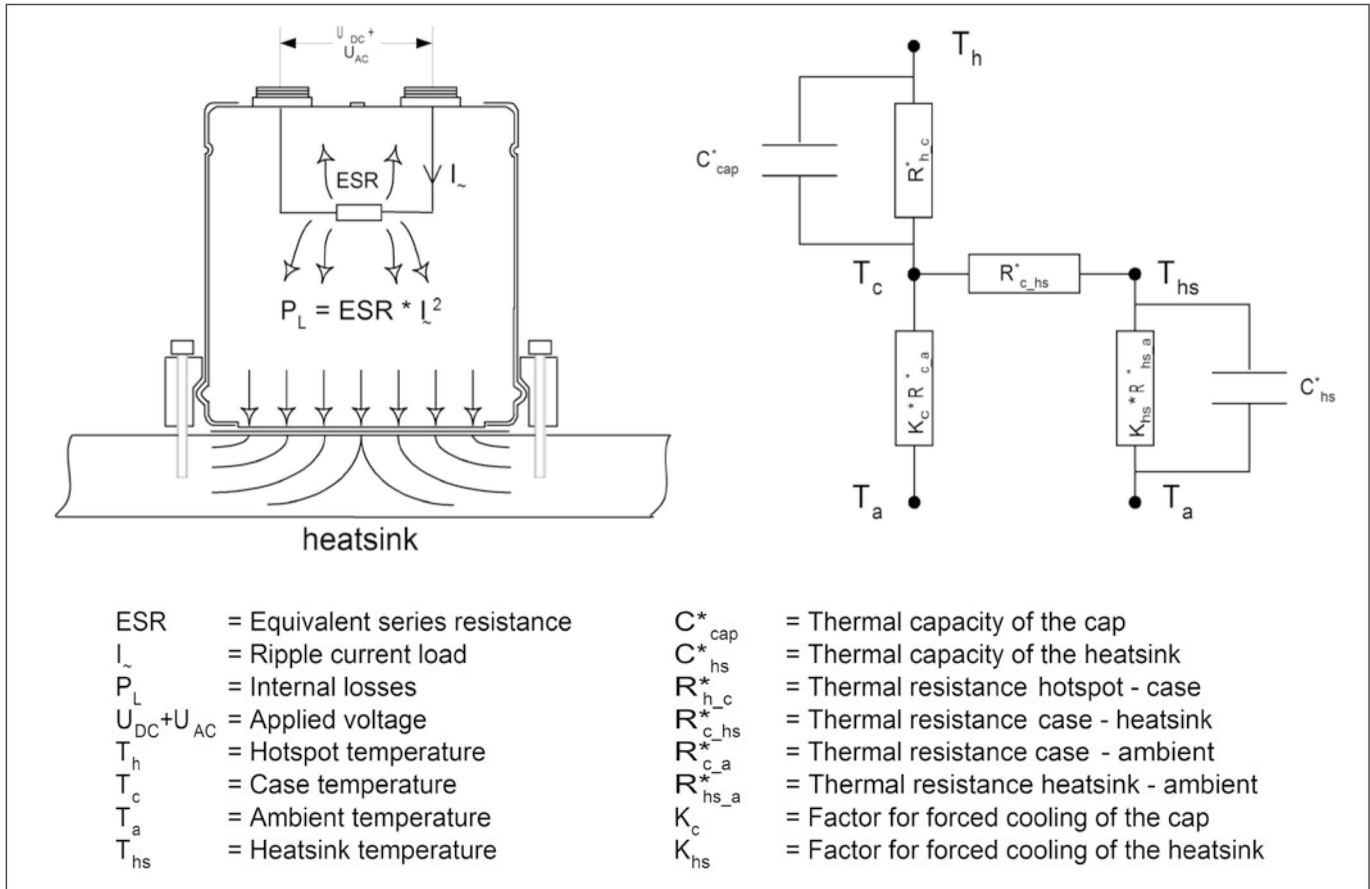
These maximum torque values should not be exceeded.

Screw thread	Maximum torque in Nm
M4	2,0
M5	2,0
M6	2,5
M8	4,0
M12	10,0

Stand: 12/2019

Aluminum Electrolytic Capacitors

5. THERMAL MODEL



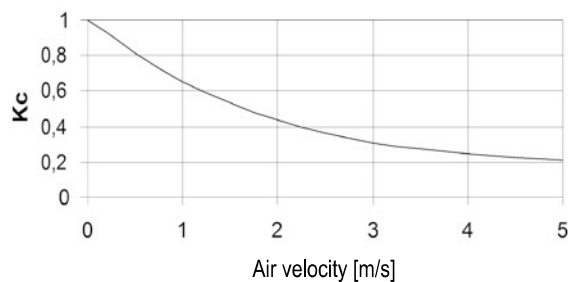
INTERNAL LOSSES

$$P_L = ESR * I_{\sim}^2$$

THERMAL RESISTANCE HOTSPOT-AMBIENT

$$R_{h_a}^* = R_{h_c}^* \frac{K_c * R_{c_a}^* * R_{c_{hs}}^*}{K_c * R_{c_a}^*} + \frac{K_{hs} * R_{hs_a}^*}{K_{hs} * R_{hs_a}^*}$$

FACTOR KC FOR FORCED COOLING OF THE CAP



VALUES FOR SERIE GW

	Ca 50*69	Ca 75*69	Can 90*69	Can 90*98
$R_{h_c}^*$	0,6 / W	0,6 / W	0,6 / W	0,7 / W
$R_{c_a}^*$	5,3 / W	3,3 / W	2,6 / W	2,2 / W

HOTSPOT TEMPERATURE OVER TIME (CURRENTSTEP FUNCTION)

$$T_{h(t)} - T_{h(w)} = P_L * R_{h_a}^* * (1 - e^{-\frac{t}{\tau}})$$

with

$$\tau = R_{h_a}^* * C_{cap}^* + C_{hs}^*$$

if $R_{c_{hs}}^* = 0$

P_L Transient losses

Aluminum Electrolytic Capacitors

■ 6. QUALITY

■ 6.1. CERTIFICATION

Quality is the main reason of our success. Without ignoring the importance of price of course, customers choose and remain with Fischer & Tausche Capacitors to satisfy their needs for top quality capacitors. It is therefore our pledge to continue producing and delivering top quality capacitors as efficiently as possible.

In addition to our commitment to quality, we are also committed to a healthy environment. That is why each and every one of our employees, from top management down to the workshop, accepts his or her environmental responsibilities and strives to work as effectively and efficiently as possible.

Intermediate testing is carried out through the entire production process in addition to the 100% final testing of each capacitor before shipment. All of our employees know that quality is the top priority for our customers. Workers participate in the process of continued improvement, quite often by anticipating. The result is uninterrupted flow production. Fischer & Tausche Capacitors are certified 9001:2008. The company certificate is available on the Fischer & Tausche Capacitors website www.ftcap.de.

■ 7. SAFETY

■ 7.1. CHARGED CAPACITORS

Electrolytic capacitors may store high amounts of energy (especially photo flash and high voltage capacitors). To avoid electrical shocks and sparks always discharge electrolytic capacitors before handling. For higher voltage it is recommended to shorten the terminals during handling.

■ 7.2. DANGER OF USE AND ABUSE

Explosions of electrolytic capacitors may occur if the capacitor is exposed to

- reverse voltage above specified limit
- voltage above specified limit
- ripple currents above specified limit
- ambient temperatures above specified limit
- high mechanical impact

■ 7.3. OPERATING ELECTROLYTES

Principally operating electrolytes used in Fischer & Tausche Capacitors products do not contain dangerous substances. However, in rare exceptional cases it is necessary to use certain substances to achieve certain physical chemical or electrical properties. In these cases the concentration is reduced to an absolute minimum.

Generally the following safety hints should be respected using operating electrolytes:

Avoid skin and eye contact. Should the electrolyte come into contact with skin, immediately rinse with abundant amounts of fresh water. Eyes must be rinsed at least 15 min under flowing cold water. Consult your doctor immediately with complaints. Inhaling electrolyte steams or vapors must be avoided. Work area must be well ventilated. Clothes coming into contact with electrolyte should be washed and cleaned.

■ 7.4. ROHS

All Fischer & Tausche Capacitors products are fully compliant with the RoHS Directive 2005/618/EC.

■ 7.5. DISPOSAL

Aluminium Electrolytic Capacitors can be disposed or recycled. The disposal rules are governed by the national and local authorities and and have to be taken into consideration. The European Waste Code No. is 160214



AXIAL TERMINALS

LOW MOUNTING HEIGHT

HIGH CV PRODUCT

LONG LIFE 5000 H @ 85 °C

■ FEATURES

- All contacts welded
- High CV product
- Welded axial leads
- High reliability

■ APPLICATIONS

- HiFi
- Industrial
- Tube amplifier

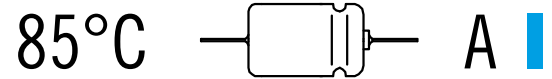
RoHS compliant
REACH compliant

■ GENERAL SPECIFICATIONS

Items	Characteristics
Rated capacitance range C_R	4,7... 82.000 μ F
Capacitance tolerance	\pm 20%
Rated voltage range U	16 ... 500 V
Surge voltage U_s	$U_R \leq 315$ V: $U_s = 1,15 U_R$; $U_R > 315$ V: $U_s = 1,10 U_R$
Max. reverse voltage	2 V
Category temperature range	- 40°C ... + 85 °C
Leakage current I_L after 5 min @ U_R	$\leq 0,008 * C_R [\mu F] * U_R [V] + 6 \mu A [\mu A]$
Useful life 5000 h @ 85 °C ; U_R ; I_R	Requirements $\Delta C/C \leq 30$ % of initial value ; ESR ≤ 300 % of specified ; limit $I_L \leq$ specified limit
Endurance test 2000 h @ 85 °C , U_R	Requirements $\Delta C/C \leq 20$ % of initial value ; ESR ≤ 130 % of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/085/56
Voltage proof of the external insulation	D ≤ 25 mm: ≥ 1000 V AC ; D > 25 mm: ≥ 2500 V AC
Sectional specification	IEC 60384-4
\varnothing leads	Up to 25 mm \varnothing : 0,8 mm ; more than 25 mm \varnothing : 1,0 mm

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand: 12/2019



ELECTRICAL DATA AND ORDERING CODE FOR SERIES A

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 85°C [A]	Order code A...	
16	2200	10x30	203	0,6	22201610030	
	3300	12x30	135	0,8	33201612030	
	4700t	14x30	95	1,0	47201614030	
	4700	14x37	95	1,1	47201614037	
	5600	16x30	80	1,2	56201616030	
	8200	16x39	54	1,7	82201616039	
	8200	18x30	54	1,6	82201618030	
	10000	18x39	45	2,0	10301618039	
	12000	21x36	37	2,3	12301621036	
	18000	25x38	25	3,1	18301625038	
	33000	25x49	14	4,6	33301625049	
	47000	30x50	9	6,0	47301630050	
	56000	35x50	8	7,2	56301635050	
	82000	35x66	6	9,6	82301635066	
25	1200	10x30	372	0,4	12202510030	
	1800	12x30	248	0,6	18202512030	
	2700	14x30	165	0,8	27202514030	
	3300	14x37	135	0,9	33202514037	
	3300	16x30	135	0,9	33202516030	
	4700	16x39	95	1,3	47202516039	
	4700	18x30	95	1,2	47202518030	
	5600	18x39	80	1,5	56202518039	
	6800	21x36	66	1,7	68202521036	
	10000	25x38	45	2,3	10302525038	
	18000	25x49	25	3,4	18302525049	
	27000	30x50	17	4,6	27302530050	
	33000	35x50	14	5,5	33302535050	
	47000	35x66	10	7,2	47302535066	
40	560	10x30	682	0,3	56104010030	
	1000	12x30	382	0,5	10204012030	
	1500	14x30	255	0,6	15204014030	
	1800	14x37	212	0,8	18204014037	
	1800	16x30	212	0,8	18204016030	
	2200	16x39	174	0,9	22204016039	
	2200	18x30	174	0,9	22204018030	
	3300	18x39	116	1,2	33204018039	
	3900	21x36	98	1,4	39204021036	
	5600	25x38	68	1,9	56204025038	
	10000	25x49	38	2,7	10304025049	
	15000	30x50	25	3,7	15304030050	
	22000	35x50	17	4,9	22304035050	
	27000	35x66	14	6,0	27304035066	
	63	330	10x30	869	0,3	33106310030
		470	12x30	610	0,4	47106312030
680		14x30	422	0,5	68106314030	
820		14x37	350	0,6	82106314037	

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 85°C [A]	Order code A...	
63	1000	16x30	287	0,6	10206316030	
	1200	16x39	239	0,8	12206316039	
	1200	18x30	239	0,8	12206318030	
	1500	18x39	191	0,9	15206318039	
	2200	21x36	130	1,2	22206321036	
	3300	25x38	87	1,6	33206325038	
	5600	25x49	51	2,4	56206325049	
	8200	30x50	35	3,1	82206330050	
	10000	30x50	29	3,6	10306330050	
	12000	35x50	24	4,2	12306335050	
	15000	35x66	19	5,2	15306335066	
	80	220	10x30	1448	0,2	22108010030
		330tt	12x30	965	0,3	33108012030
		470	14x30	678	0,4	47108014030
680		14x37	468	0,5	68108014037	
680		16x30	468	0,5	68108016030	
1000		16x39	318	0,7	10208016039	
1000		18x30	318	0,7	10208018030	
1200		18x39	265	0,8	12208018039	
1500		21x36	212	1,0	15208021036	
2200		25x38	145	1,3	22208025038	
3900		25x49	82	1,9	39208025049	
5600		30x50	57	2,5	56208030050	
8200	35x50	39	3,3	82208035050		
12000	35x66	27	4,4	12308035066		
100	150	10x30	1062	0,3	15110010030	
	220	12x30	724	0,4	22110012030	
	330	14x30	483	0,5	33110014030	
	390	14x37	408	0,5	39110014037	
	470	16x30	339	0,6	47110016030	
	560	16x39	284	0,7	56110016039	
	560	18x30	284	0,7	56110018030	
	680	18x39	234	0,9	68110018039	
	1000	21x36	159	1,1	10210021036	
	1500	25x38	106	1,5	15210025038	
	2200	25x49	72	2,0	22210025049	
	3300	30x50	48	2,7	33210030050	
	4700	35x50	34	3,5	47210035050	
	6800	35x66	23	4,7	68210035066	
160	56	10x30	1990	0,2	56016010030	
	100	12x30	1115	0,3	10116012030	
	120	14x30	929	0,3	12116014030	
	150	14x37	743	0,4	15116014037	
	150	16x30	743	0,4	15116016030	
	220	16x39	507	0,5	22116016039	
220	18x30	507	0,5	22116018030		

Stand: 12/2019

85°C

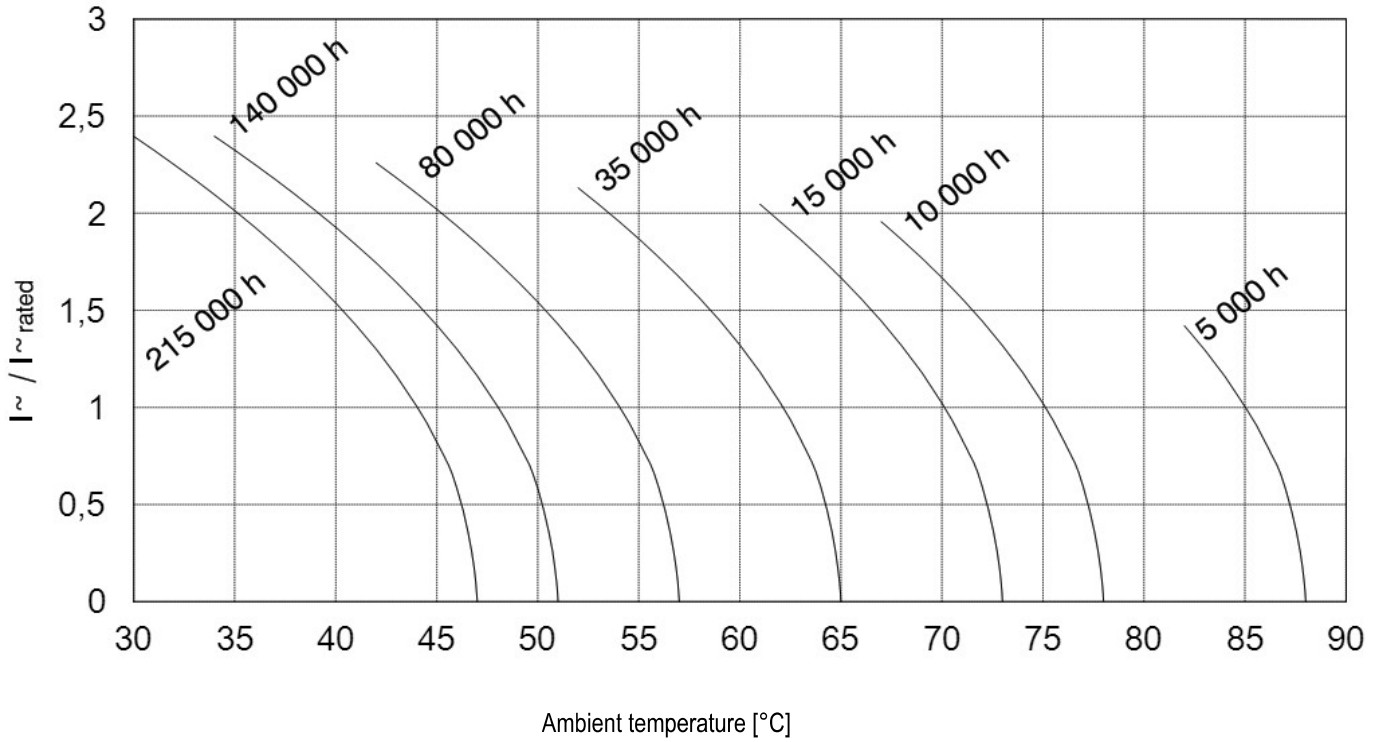



A

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 85°C [A]	Order code A...
160	270	18x39	413	0,6	27116018039
	330	21x36	338	0,8	33116021036
	560	25x38	199	1,1	56116025038
	1000	25x49	111	1,6	10216025049
	1500	30x50	74	2,1	15216030050
	1800	35x50	62	2,6	18216035050
	2700	35x66	41	3,5	27216035066
250	33	10x30	2895	0,2	33025010030
	56	12x30	1706	0,2	56025012030
	82	14x30	1165	0,3	82025014030
	100	14x37	955	0,4	10125014037
	100	16x30	955	0,4	10125016030
	150	16x39	637	0,5	15125016039
	150	18x30	637	0,5	15125018030
	180	18x39	531	0,6	18125018039
	220	21x36	434	0,7	22125021036
	390	25x38	245	1,0	39125025038
	680	25x49	141	1,4	68125025049
	820	30x50	117	1,7	82125030050
	1200	35x50	80	2,3	12225035050
1800	35x66	53	3,1	18225035066	
350	22	10x30	4343	0,1	22035010030
	33	12x30	2895	0,2	33035012030
	47	14x30	2033	0,2	47035014030
	56	14x37	1706	0,3	56035014037
	56	16x30	1706	0,3	56035016030
	68	16x39	1405	0,3	68035016039
	68	18x30	1405	0,3	68035018030
	100	18x39	955	0,4	10135018039
	120	21x36	796	0,5	12135021036
	220	25x38	434	0,7	22135025038
	330	25x49	290	1,0	33135025049
	470	30x50	203	1,3	47135030050
	680	35x50	141	1,7	68135035050
	820	35x66	117	2,1	82135035066
	400	18	10x30	7077	0,1
27		12x30	4718	0,1	27040012030
39		14x30	3266	0,2	39040014030
47		14x37	2710	0,2	47040014037

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 85°C [A]	Order code A...
400	47	16x30	2710	0,2	47040016030
	56	16x39	2275	0,3	56040016039
	56	18x30	2275	0,2	56040018030
	68	18x39	1873	0,3	68040018039
	100	21x36	1274	0,4	10140021036
	150	25x38	849	0,5	15140025038
	220	25x49	579	0,7	22140025049
	330	30x50	386	0,9	33140030050
	470	35x50	271	1,2	47140035050
	680	35x66	187	1,7	68140035066
450	10	10x30	11146	0,1	10045010030
	15	12x30	7431	0,1	15045012030
	22	14x30	5067	0,1	22045014030
	33	14x37	3378	0,2	33045014037
	39	16x30	2858	0,2	39045016030
	47	16x39	2372	0,3	47045016039
	47	18x30	2372	0,2	47045018030
	56	18x39	1990	0,3	56045018039
	100	21x36	1115	0,4	10145021036
	150	25x38	743	0,6	15145025038
	220	25x49	507	0,8	22145025049
	330	30x50	338	1,0	33145030050
	470	35x50	237	1,3	47145035050
	560	35x66	199	1,6	56145035066
	500	4,7	10x30	23716	0,1
6,8		10x30	14043	0,1	6,850010030
10		12x30	11146	0,1	10050012030
12		14x30	9289	0,1	12050014030
15		14x37	7431	0,1	15050014037
15		16x30	7431	0,1	15050016030
22		16x39	5067	0,2	22050016039
22		18x30	5067	0,2	22050018030
33		18x39	3378	0,2	33050018039
47		21x36	2372	0,3	47050021036
82		25x38	1359	0,4	82050025038
120		25x49	929	0,6	12150025049
180		30x50	619	0,7	18150030050
220		35x50	507	0,9	22150035050
330		35x66	338	1,2	33150035066

■ USEFUL LIFE AS A FUNCTION OF AMBIENT TEMPERATURE AND ACTUAL RIPPLE CURRENT



105°C  AH



AXIAL TERMINALS

LOW MOUNTING HEIGHT

HIGH CV PRODUCT

LONG LIFE 3000 H @ 105 °C

FEATURES

- All contacts welded
- High ripple current
- Welded axial leads
- High reliability

APPLICATIONS

- HiFi
- Industrial
- Telecommunications

RoHS compliant
REACH compliant

GENERAL SPECIFICATIONS

Items	Characteristics
Rated capacitance range C_R	10... 82.000 μ F
Capacitance tolerance	\pm 20%
Rated voltage range U	16 ... 450 V
Surge voltage U_s	$U_R \leq 315$ V: $U_s = 1,15 U_R$; $U_R > 315$ V: $U_s = 1,10 U_R$
Max. reverse voltage	2 V
Category temperature range	- 40°C ... + 105 °C
Leakage current I_L after 5 min @ U_R	$\leq 0,008 * C_R [\mu F] * U_R [V] + 6 \mu A [\mu A]$
Useful life 3000 h @ 105 °C ; U_R ; I_R	Requirements $\Delta C/C \leq 30$ % of initial value ; ESR ≤ 300 % of specified ; limit $I_L \leq$ specified limit
Endurance test 2000 h @ 105 °C , U_R	Requirements $\Delta C/C \leq 20$ % of initial value ; ESR ≤ 130 % of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/105/56
Voltage proof of the external insulation	D ≤ 25 mm: ≥ 1000 V AC ; D > 25 mm: ≥ 2500 V AC
Sectional specification	IEC 60384-4
\varnothing leads	Up to 25 mm \varnothing : 0,8 mm ; more than 25 mm \varnothing : 1,0 mm

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand-12/2019

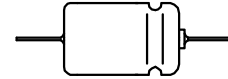
ELECTRICAL DATA AND ORDERING CODE FOR SERIES AH

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 105°C [A]	Order code AH...
16	2200	10x30	203	0,6	22201610030
	3300	12x30	135	0,8	33201612030
	4700	14x30	95	1,0	47201614030
	4700	14x37	95	1,1	47201614037
	5600	16x30	80	1,2	56201616030
	8200	16x39	54	1,7	82201616039
	8200	18x30	54	1,6	82201618030
	10000	18x39	45	2,0	10301618039
	12000	21x36	37	2,3	12301621036
	18000	25x38	25	3,1	18301625038
	33000	25x49	14	4,6	33301625049
	47000	30x50	9	6,0	47301630050
	56000	35x50	8	7,2	56301635050
	82000	35x66	6	9,6	82301635066
25	1200	10x30	372	0,4	12202510030
	1800	12x30	248	0,6	18202512030
	2700	14x30	165	0,8	27202514030
	3300	14x37	135	0,9	33202514037
	3300	16x30	135	0,9	33202516030
	4700	16x39	95	1,3	47202516039
	4700	18x30	95	1,2	47202518030
	5600	18x39	80	1,5	56202518039
	6800	21x36	66	1,7	68202521036
	10000	25x38	45	2,3	10302525038
	18000	25x49	25	3,4	18302525049
	27000	30x50	17	4,6	27302530050
	33000	35x50	14	5,5	33302535050
	47000	35x66	10	7,2	47302535066
40	560	10x30	682	0,3	56104010030
	1000	12x30	382	0,5	10204012030
	1500	14x30	255	0,6	15204014030
	1800	14x37	212	0,8	18204014037
	1800	16x30	212	0,8	18204016030
	2200	16x39	174	0,9	22204016039
	2200	18x30	174	0,9	22204018030
	3300	18x39	116	1,2	33204018039
	3900	21x36	98	1,4	39204021036
	5600	25x38	68	1,9	56204025038
	10000	25x49	38	2,7	10304025049
	15000	30x50	25	3,7	15304030050
	22000	35x50	17	4,9	22304035050
	27000	35x66	14	6,0	27304035066
63	330	10x30	869	0,3	33106310030
	470	12x30	610	0,4	47106312030
	680	14x30	422	0,5	68106314030
	820	14x37	350	0,6	82106314037

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 105°C [A]	Order code AH...	
63	1000	16x30	287	0,6	10206316030	
	1200	16x39	239	0,8	12206316039	
	1200	18x30	239	0,8	12206318030	
	1500	18x39	191	0,9	15206318039	
	2200	21x36	130	1,2	22206321036	
	3300	25x38	87	1,6	33206325038	
	5600	25x49	51	2,4	56206325049	
	8200	30x50	35	3,1	82206330050	
	10000	30x50	29	3,6	10306330050	
	12000	35x50	24	4,2	12306335050	
	15000	35x66	19	5,2	15306335066	
	80	220	10x30	1448	0,2	22108010030
		330	12x30	965	0,3	33108012030
		470	14x30	678	0,4	47108014030
680		14x37	468	0,5	68108014037	
680		16x30	468	0,5	68108016030	
1000		16x39	318	0,7	10208016039	
1000		18x30	318	0,7	10208018030	
1200		18x39	265	0,8	12208018039	
1500		21x36	212	1,0	15208021036	
2200		25x38	145	1,3	22208025038	
3900		25x49	82	1,9	39208025049	
5600		30x50	57	2,5	56208030050	
8200		35x50	39	3,3	82208035050	
12000		35x66	27	4,4	12308035066	
100	150	10x30	1062	0,3	15110010030	
	220	12x30	724	0,4	22110012030	
	330	14x30	483	0,5	33110014030	
	390	14x37	408	0,5	39110014037	
	470	16x30	339	0,6	47110016030	
	560	16x39	284	0,7	56110016039	
	560	18x30	284	0,7	56110018030	
	680	18x39	234	0,9	68110018039	
	1000	21x36	159	1,1	10210021036	
	1500	25x38	106	1,5	15210025038	
	2200	25x49	72	2,0	22210025049	
	3300	30x50	48	2,7	33210030050	
	4700	35x50	34	3,5	47210035050	
	6800	35x66	23	4,7	68210035066	
160	56	10x30	1990	0,2	56016010030	
	100	12x30	1115	0,3	10116012030	
	120	14x30	929	0,3	12116014030	
	150	14x37	743	0,4	15116014037	
	150	16x30	743	0,4	15116016030	
	220	16x39	507	0,5	22116016039	
	220	18x30	507	0,5	22116018030	

Stand: 12/2019

105°C

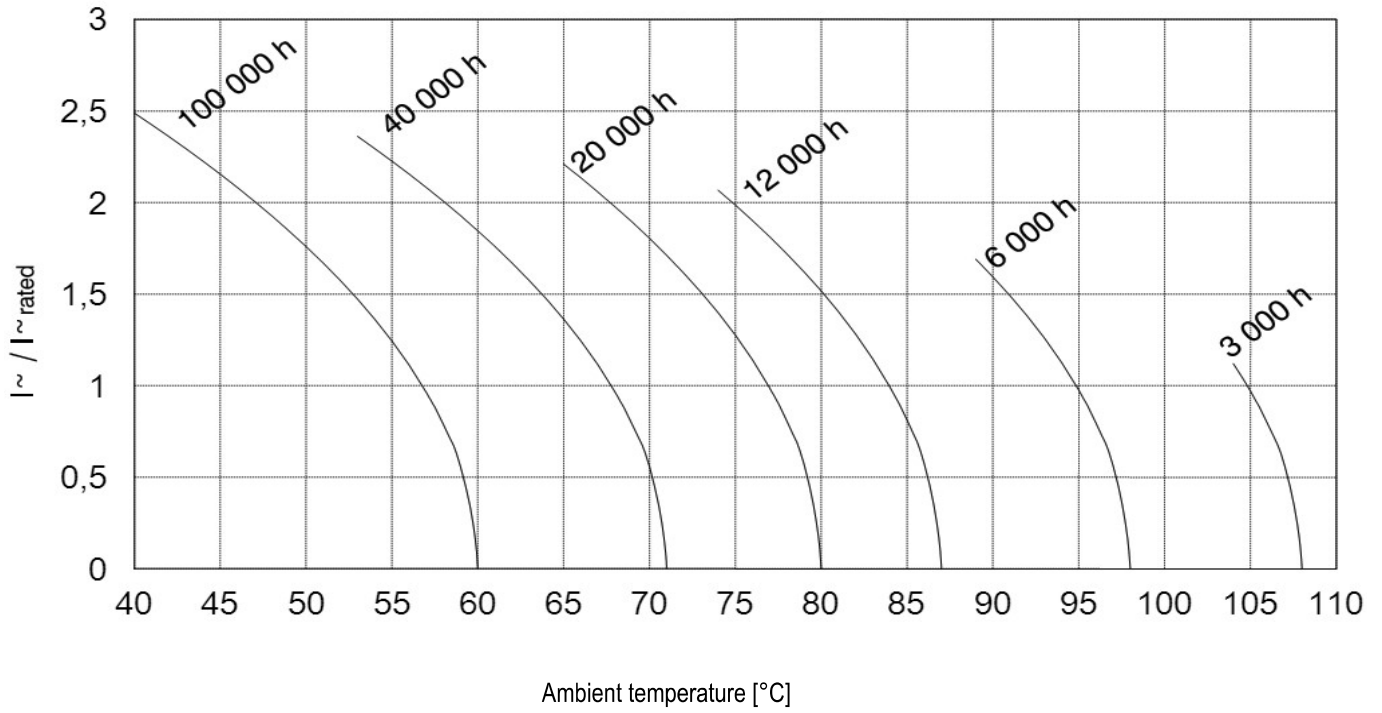


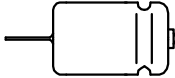
AH

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 105°C [A]	Order code AH...
160	270	18x39	413	0,6	27116018039
	330	21x36	338	0,8	33116021036
	560	25x38	199	1,1	56116025038
	1000	25x49	111	1,6	10216025049
	1500	30x50	74	2,1	15216030050
	1800	35x50	62	2,6	18216035050
2700	35x66	41	3,5	27216035066	
250	33	10x30	2895	0,2	33025010030
	56	12x30	1706	0,2	56025012030
	82	14x30	1165	0,3	82025014030
	100	14x37	955	0,4	10125014037
	100	16x30	955	0,4	10125016030
	150	16x39	637	0,5	15125016039
	150	18x30	637	0,5	15125018030
	180	18x39	531	0,6	18125018039
	220	21x36	434	0,7	22125021036
	390	25x38	245	1,0	39125025038
	680	25x49	141	1,4	68125025049
	820	30x50	117	1,7	82125030050
	1200	35x50	80	2,3	12225035050
	1800	35x66	53	3,1	18225035066
350	22	10x30	4343	0,1	22035010030
	33	12x30	2895	0,2	33035012030
	47	14x30	2033	0,2	47035014030
	56	14x37	1706	0,3	56035014037
	56	16x30	1706	0,3	56035016030
	68	16x39	1405	0,3	68035016039
	68	18x30	1405	0,3	68035018030
	100	18x39	955	0,4	10135018039
	120	21x36	796	0,5	12135021036
	120	21x36	796	0,5	12135021036
	220	25x38	434	0,7	22135025038

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 105°C [A]	Order code AH...
350	330	25x49	290	1,0	33135025049
	470	30x50	203	1,3	47135030050
	680	35x50	141	1,7	68135035050
	820	35x66	117	2,1	82135035066
400	18	10x30	7077	0,1	18040010030
	27	12x30	4718	0,1	27040012030
	39	14x30	3266	0,2	39040014030
	47	14x37	2710	0,2	47040014037
	47	16x30	2710	0,2	47040016030
	56	16x39	2275	0,3	56040016039
	56	18x30	2275	0,2	56040018030
	68	18x39	1873	0,3	68040018039
	100	21x36	1274	0,4	10140021036
	150	25x38	849	0,5	15140025038
	220	25x49	579	0,7	22140025049
	330	30x50	386	0,9	33140030050
	470	35x50	271	1,2	47140035050
	680	35x66	187	1,7	68140035066
450	10	10x30	11146	0,1	10045010030
	15	12x30	7431	0,1	15045012030
	22	14x30	5067	0,1	22045014030
	33	14x37	3378	0,2	33045014037
	39	16x30	2858	0,2	39045016030
	47	16x39	2372	0,3	47045016039
	47	18x30	2372	0,2	47045018030
	56	18x39	1990	0,3	56045018039
	100	21x36	1115	0,4	10145021036
	150	25x38	743	0,6	15145025038
	220	25x49	507	0,8	22145025049
	330	30x50	338	1,0	33145030050
	470	35x50	237	1,3	47145035050
	560	35x66	199	1,6	56145035066

■ USEFUL LIFE AS A FUNCTION OF AMBIENT TEMPERATURE AND ACTUAL RIPPLE CURRENT



125°C  AG



AXIAL TERMINALS

LOW MOUNTING HEIGHT

HIGH CV PRODUCT

LONG LIFE 2000 H @ 125 °C

LOW TEMPERATURE -55°C

■ FEATURES

- All contacts welded
- High temp 125°C
- Long useful life

■ APPLICATIONS

- Automotive
- Inverter/drives
- Laser
- Industrial

RoHS compliant
REACH compliant

■ GENERAL SPECIFICATIONS

Items	Characteristics
Rated capacitance range C_R	150... 82.000 μF
Capacitance tolerance	$\pm 20\%$
Rated voltage range U	16 ... 63 V
Surge voltage U_S	$U_S = 1,15 U_R$
Max. reverse voltage	2 V
Category temperature range	- 55°C ... + 125 °C
Leakage current I_L after 5 min @ U_R	$\leq 0,004 * C_R [\mu\text{F}] * U_R [\text{V}] + 6 \mu\text{A} [\mu\text{A}]$
Useful life 2000 h @ 125 °C ; U_R ; I_R	Requirements $\Delta C/C \leq 30\%$ of initial value ; ESR $\leq 300\%$ of specified ; limit $I_L \leq$ specified limit
Endurance test 1000 h @ 125 °C , U_R	Requirements $\Delta C/C \leq 20\%$ of initial value ; ESR $\leq 130\%$ of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/125/56
Voltage proof of the external insulation	D ≤ 25 mm: ≥ 1000 V AC ; D > 25 mm: ≥ 2500 V AC
Sectional specification	IEC 60384-4
\emptyset leads	Up to 25 mm \emptyset : 0,8 mm ; more than 25 mm \emptyset : 1,0 mm

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand: 12/2019

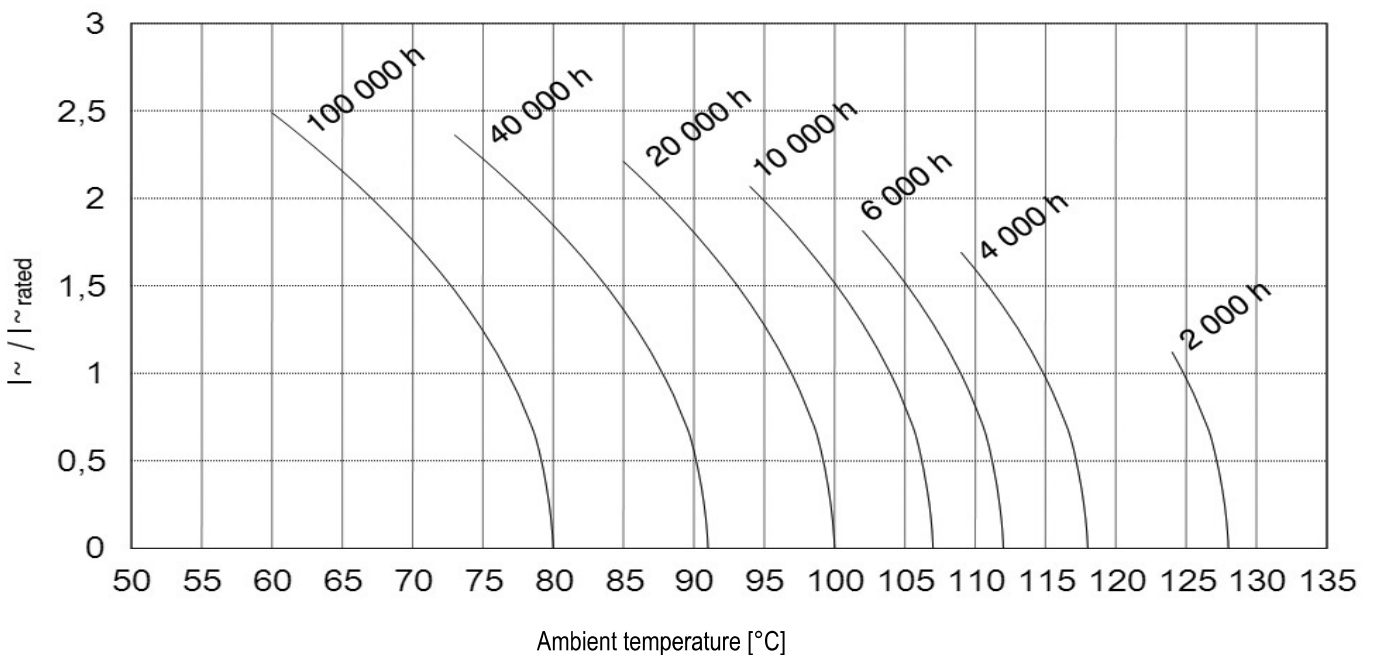


ELECTRICAL DATA AND ORDERING CODE FOR SERIES AG

Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 125°C [A]	Order code AG...
16	1000	10x30	223	0,6	10201610030
	1200	12x30	186	0,7	12201612030
	1500	14x30	149	0,8	15201614030
	2200	14x37	101	1,1	22201614037
	2200	16x30	101	1,1	22201616030
	3300	16x39	68	1,5	33201616039
	3300	18x30	68	1,4	33201618030
	3900	18x39	57	1,7	39201618039
	4700	21x36	47	2,0	47201621036
	8200	25x38	27	2,9	82201625038
25	470	10x30	474	0,4	47102510030
	680	12x30	328	0,5	68102512030
	1200	14x30	186	0,7	12202514030
	1500	14x37	149	0,9	15202514037
	1500	16x30	149	0,9	15202516030
	1800	16x39	124	1,1	18202516039
	1800	18x30	124	1,1	18202518030
	2200	18x39	101	1,3	22202518039
	3300	21x36	68	1,7	33202521036
	4700	25x38	47	2,2	47202525038

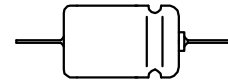
Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 125°C [A]	Order code AG...
40	270	10x30	708	0,3	27104010030
	470	12x30	407	0,5	47104012030
	560	14x30	341	0,5	56104014030
	680	14x37	281	0,7	68104014037
	680	16x30	281	0,7	68104016030
	1000	16x39	191	0,9	10204016039
	1000	18x30	191	0,9	10204018030
	1200	18x39	159	1,0	12204018039
	1500	21x36	127	1,2	15204021036
	2200	25x38	87	1,6	22204025038
63	150	10x30	1062	0,3	15106310030
	220	12x30	724	0,4	22106312030
	330	14x30	483	0,5	33106314030
	470	14x37	339	0,6	47106314037
	470	16x30	339	0,6	47106316030
	560	16x39	284	0,7	56106316039
	560	18x30	284	0,7	56106318030
	820	18x39	194	0,9	82106318039
	1000	21x36	159	1,1	10206321036
	1500	25x38	106	1,5	15206325038

USEFUL LIFE AS A FUNCTION OF AMBIENT TEMPERATURE AND ACTUAL RIPPLE CURRENT



Stand: 12/2019

85°C



ATBI



AXIAL TERMINALS

BIPOLAR CONSTRUCTION

FOR CROSSOVER NETWORKS

■ FEATURES

- All contacts welded
- Bipolar

■ APPLICATIONS

- HiFi
- Consumer

RoHS compliant
REACH compliant

■ GENERAL SPECIFICATIONS

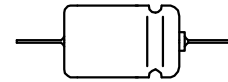
Items	Characteristics
Rated capacitance range C_R	1... 100 μ F
Capacitance tolerance	$\pm 20\%$; $\pm 10\%$ on request
U_R bipolar (rated voltage DC)	63 V dc @ 23 V ac ; 100 V dc @ 35 V ac
Max. peak voltage (AC)	May not exceed rated voltage (DC)
Category temperature range	- 40°C ... + 85 °C
Useful life > 5000 h @ 85 °C > 1000 h @ 105°C	Requirements $\Delta C/C \leq 30\%$ of initial value ; ESR $\leq 300\%$ of specified ; limit $I_L \leq$ specified limit
Endurance test 100.000 h @ 40 °C	Requirements $\Delta C/C \leq 20\%$ of initial value ; ESR $\leq 130\%$ of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/085/56
Voltage proof of the external insulation	D ≤ 25 mm: ≥ 1000 V AC ; D > 25 mm: ≥ 2500 V AC
\emptyset leads	Up to 25 mm \emptyset : 0,8 mm ; more than 25 mm \emptyset : 1,0 mm

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand: 12/2019



85°C



ATBI

ELECTRICAL DATA AND ORDERING CODE FOR SERIES AG

Rated voltage U_R [V]	Rated capacitance (other values available on request) C_R [μF]	Case size D x L [mm]	Order code ATBI...
23 Vac @ 50 Hz	1,0	10x20	1,002310020
	2,2	10x20	2,202310020
	3,3	10x20	3,302310020
	4,7	10x20	4,702310020
	6,8	10x20	6,802310020
	10	10x30	10002310030
	15	10x30	15002310030
	22	12x30	22002312030
	33	12x30	33002312030
	47	14x37	47002314037
	68	16x39	68002316039
	100	18x39	10102318039
	220	25x38	22102325038
	330	25x38	33102325038
	470	25x38	47102325038
	560	25x38	56102325038
	680	25x38	68102325038
880	25x49	80102325049	
1000	25x49	10202325049	
35 Vac @ 50 Hz	1,0	10x20	1,003510020
	2,2	10x30	2,203510030
	3,3	10x30	3,303510030
	4,7	10x30	4,703510030
	6,8	10x30	6,803510030
	10	10x30	10003510030
	15	10x30	15003510030
	22	12x30	22003512030
	33	12x30	33003512030
	47	14x37	47003514037
	68	16x39	68003516039
	100	18x39	10103518039
	220	25x38	2203525038

Stand: 12/2019

85°C



ATBIG



AXIAL TERMINALS

BIPOLAR CONSTRUCTION

PLAIN FOIL

FOR CROSSOVER NETWORKS

FEATURES

- All contacts welded
- Bipolar

APPLICATIONS

- HiFi
- Consumer

RoHS compliant
REACH compliant

GENERAL SPECIFICATIONS

Items	Characteristics
Rated capacitance range C_R	1... 200 μ F
Capacitance tolerance	$\pm 20\%$; $\pm 5\%$ on request
U_R bipolar (rated voltage DC)	35 V dc @ 23 V ac ; 50 V dc @ 35 V ac ; 70V dc @ 50 V ac
Max. peak voltage (AC)	May not exceed rated voltage (DC)
Category temperature range	- 40°C ... + 85 °C
Useful life > 5000 h @ 85 °C > 1000 h @ 105°C	Requirements $\Delta C/C \leq 30\%$ of initial value ; ESR $\leq 300\%$ of specified ; limit $I_L \leq$ specified limit
Endurance test 100.000 h @ 40 °C	Requirements $\Delta C/C \leq 20\%$ of initial value ; ESR $\leq 130\%$ of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/085/56
Voltage proof of the external insulation	D ≤ 25 mm : ≥ 1000 V AC ; D > 25 mm : ≥ 2500 V AC
\emptyset leads	Up to 25 mm \emptyset : 0,8 mm ; more than 25 mm \emptyset : 1,0 mm

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand: 12/2019

85°C



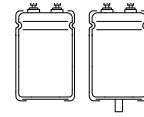
ATBIG

ELECTRICAL DATA AND ORDERING CODE FOR SERIES AG

Rated voltage U_R [V]	Rated capacitance (other values available on request) C_R [μF]	Case size D x L [mm]	Order code ATBIG...
23 Vac @ 50 Hz	1,0	10x20	1,002310020
	2,2	10x30	2,202310030
	3,3	10x30	3,302310030
	4,7	10x30	4,702310030
	6,8	10x30	6,802310030
	10	10x30	10002310030
	15	14x37	15002314037
	22	14x37	22002314037
	33	18x39	33002318039
	47	21x36	47002321036
	68	25x36	68002325036
	100	25x36	10102325036
	120	25x49	12102325049
	150	25x49	15102325049
200	30x49	20102330049	
35 Vac @ 50 Hz	1,0	10x20	1,003510020
	2,2	10x30	2,203510030
	3,3	10x30	3,303510030
	4,7	12x30	4,703512030
	6,8	12x30	6,803512030
	10	14x37	10003514037
	15	16x39	15003516039
	22	18x39	22003518039
	33	25x36	33003525036
	47	25x36	47003525036
	68	25x49	68003525049
	100	30x49	10103530049
	120	30x49	12103530049
	150	35x66	15103535066
200	35x66	20103535066	
50 Vac @ 50 Hz	1	10x25	1,105010025
	2,2	10x30	2,205010030
	3,3	10x30	3,305010030
	4,7	12x30	4,705012030
	6,8	14x30	6,805014030
	10	14x37	10005014037
	15	18x39	15005018039
	22	25x36	22005018039
	33	25x36	33005025036
	47	25x49	47005025049
	68	30x49	68005030049
	100	35x49	10105035049

Stand: 12/2019

85°C



GM



SCREW TERMINALS

HIGH CV PRODUCT

LONG LIFE 8000 H @ 85 °C

■ FEATURES

- All internal contacts welded
- High capacitance
- High CV product
- Low inductance ESL

■ APPLICATIONS

- Computer
- Inverter/drives
- Traction
- Welding

RoHS compliant
REACH compliant

■ GENERAL SPECIFICATIONS

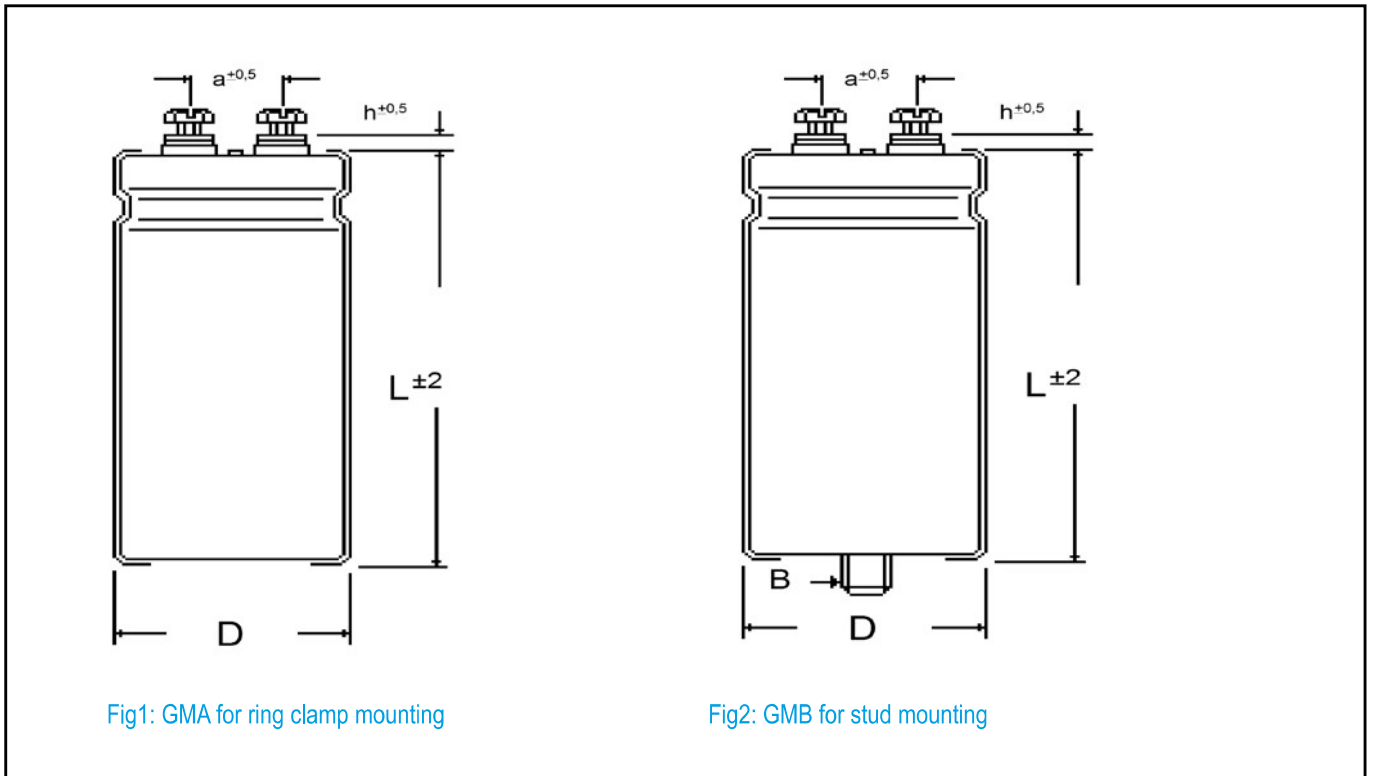
Items	Characteristics
Rated capacitance range C_R	390... 3.300.000 μ F
Capacitance tolerance	\pm 20%
Rated voltage range U	16 ... 500 V
Surge voltage U_S	$U_R \leq 315$ V: $U_S = 1,15 U_R$; $U_R > 315$ V: $U_S = 1,10 U_R$
Max. reverse voltage	2 V / 20 nH
Category temperature range	- 40°C ... + 85 °C
Leakage current I_L after 5 min @ U_R	$\leq 0,008 * C_R [\mu F] * U_R [V] + 6 \mu A [\mu A]$
Useful life 8000 h @ 85 °C ; U_R ; I_R	Requirements $\Delta C/C \leq 30$ % of initial value ; ESR ≤ 300 % of specified ; limit $I_L \leq$ specified limit
Endurance test 4000 h @ 85 °C , U_R	Requirements $\Delta C/C \leq 20$ % of initial value ; ESR ≤ 130 % of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/085/56
Voltage proof of the external insulation	≥ 2500 V AC
Sectional specification	IEC 60384-4

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand-12/2019



■ DRAWINGS FOR SERIES GMA AND GMB



■ DIMENSIONS AND MECHANICAL DATA

Dimensions, case with insulation sleeve				Connecting terminals		Mounting stud, GMB only	
D [mm]	Case length L available in 5 mm [mm]	h [mm]	a [mm]	Thread	Max. torque [Nm]	B	Max. torque [Nm]
35	40 ... 120	6	13	M5	2,0	M8 x 12	4,0
40	40 ... 120	5	18	M5	2,0	M8 x 12	4,0
50	40 ... 120	5	22	M5	2,0	M12 x 16	10,0
65	40 ... 180	5	28,5	M5	2,0	M12 x 16	10,0
75	40 ... 230	5	31,7	M5 ; M6	2,0 ; 2,5	M12 x 16	10,0
90	40 ... 230	5	31,7	M6	2,5	M12 x 16	10,0

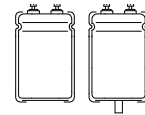
GMA: connecting screws M5 or M6

GMB: connecting screws M5 or M6 + mounting nut M8 or M12

Remarks: Further mounting accessories like clamps, nylon cup nuts and insulation disks on request, see "accessory equipment".

Stand: 12/2019

85°C



GM

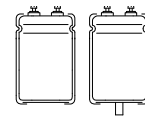
ELECTRICAL DATA AND ORDERING CODE FOR SERIES GM

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
16	82000	35x55	6	9,0	82301635055
	120000	35x70	4	12,0	12401635070
	120000	40x55	4	11,1	12401640055
	150000	35x80	3	14,2	15401635080
	150000	40x70	3	13,7	15401640070
	180000	35x100	3	17,0	18401635100
	180000	40x80	3	15,8	18401640080
	180000	45x70	3	15,0	18401645070
	220000	40x100	2	19,1	22401640100
	220000	50x70	2	17,7	22401650070
	270000	45x100	2	21,1	27401645100
	270000	50x80	2	20,6	27401650080
	390000	50x100	1	27,0	39401650100
	470000	65x80	1	35,6	47401665080
	560000	65x100	1	42,1	56401665100
	820000	65x130	1	56,5	82401665130
	820000	75x100	1	44,1	82401675100
	1000000	75x115	1	46,5	10501675115
	1200000	75x145	1	50,8	12501675145
	1500000	75x165	1	53,5	15501675165
	1800000	90x148	1	57,3	18501690148
	2200000	75x225	1	61,0	22501675225
	2200000	90x170	1	60,4	22501690170
2700000	90x220	1	67,1	27501690220	
3300000	90x230	1	68,3	33501690230	
25	33000	35x55	14	5,9	33302535055
	47000	35x70	9	7,8	47302535070
	47000	40x55	9	7,2	47302540055
	56000	35x80	8	9,0	56302535080
	68000	40x70	7	9,5	68302540070
	82000	35x100	5	11,9	82301635100
	68000	40x80	7	10,0	68302540080
	82000	45x70	5	10,5	82302545070
	68000	40x100	7	11,0	68302540100
	100000	50x70	4	12,3	10402550070
	120000	45x100	4	14,6	12402545100
	120000	50x80	4	14,2	12402550080
	150000	50x100	3	17,3	15402550100
	180000	65x80	3	22,4	18402565080
	270000	65x100	2	29,8	27402565100
	330000	75x100	1	28,5	33402575100
	330000	65x130	1	36,4	33402565130
	390000	75x115	1	32,6	39402575115
	560000	75x145	1	42,7	56402575145
	560000	75x165	1	45,0	56402575165
	820000	90x148	1	58,2	82402590148
	820000	75x225	1	62,0	82402575225

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
25	820000	90x170	1	61,5	82402590170
	1200000	90x220	1	82,6	12502590220
	1500000	90x230	1	94,0	15502590230
40	18000	35x55	21	4,7	18304035055
	22000	40x55	17	5,3	22304040055
	27000	35x70	14	6,4	27304035070
	33000	35x80	12	7,4	33304035080
	33000	40x70	12	7,2	33304040070
	39000	35x100	10	8,9	39304035100
	39000	40x80	10	8,2	39304040080
	39000	45x70	10	7,8	39304045070
	56000	50x70	7	10,0	56304050070
	56000	40x100	7	10,8	56304040100
	68000	50x80	6	11,6	68304050080
	68000	45x100	6	11,8	68304045100
	82000	50x100	5	13,8	82304050100
	100000	65x80	4	18,3	10404065080
	150000	65x100	3	24,4	15404065100
	180000	75x100	2	23,1	18404075100
	180000	65x130	2	29,6	18404065130
	220000	75x115	2	26,9	22404075115
	270000	75x145	1	32,6	27404075145
	330000	75x165	1	38,0	33404075165
	470000	90x148	1	48,5	47404090148
	470000	75x225	1	51,6	47404075225
	560000	90x170	1	55,8	56404090170
680000	90x220	1	68,3	68404090220	
680000	90x230	1	69,6	68404090230	
63	8200	35x55	35	3,7	82206335055
	12000	40x55	24	4,6	12306340055
	15000	35x70	19	5,5	15306335070
	18000	35x80	16	6,3	18306335080
	18000	40x70	16	6,1	18306340070
	18000	35x100	16	6,9	18306335100
	22000	40x80	13	7,1	22306340080
	22000	45x70	13	6,8	22306345070
	27000	50x70	11	8,0	27306350070
	27000	40x100	11	8,6	27306340100
	33000	50x80	9	9,3	33306350080
	33000	45x100	9	9,5	33306345100
	39000	50x100	7	11,0	39306350100
	47000	65x80	6	14,5	47306365080
	68000	65x100	4	19,0	68306365100
	82000	75x100	3	18,0	82306375100
	100000	65x130	3	25,5	10406365130
	120000	75x115	2	22,9	12406375115
	150000	75x145	2	28,1	15406375145

Stand: 12/2019

85°C



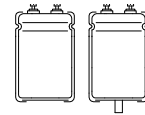
GM

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
63	180000	75x165	2	32,4	18406375165
	220000	90x148	1	38,3	22406390148
	220000	75x225	1	40,8	22406375225
	270000	90x170	1	44,8	27406390170
	330000	90x220	1	54,9	33406390220
	390000	90x230	1	60,9	39406390230
80	6800	35x55	47	3,2	68208035055
	8200	40x55	39	3,8	82208040055
	10000	35x70	32	4,2	10308035070
	12000	35x80	27	4,6	12308035080
	12000	40x70	27	4,7	12308040070
	15000	35x100	21	6,0	15308035100
	15000	40x80	21	5,6	15308040080
	15000	45x70	21	5,3	15308045070
	18000	40x100	18	6,2	18308040100
	18000	50x70	18	6,2	18308050070
	22000	45x100	14	7,9	22308045100
	22000	50x80	14	7,2	22308050080
	27000	50x100	12	8,7	27308050100
	39000	65x80	8	12,6	39308065080
	47000	65x100	7	15,0	47308065100
	68000	65x130	5	15,7	68308065130
	68000	75x100	5	19,7	68308075100
	82000	75x115	4	18,0	82308075115
	100000	75x145	3	21,7	10408075145
	120000	75x165	3	25,1	12408075165
	150000	90x148	2	30,0	15408090148
	180000	75x225	2	35,0	18408075225
	180000	90x170	2	34,7	18408090170
	220000	90x220	1	42,6	22408090220
270000	90x230	1	48,0	27408090230	
100	3300	35x55	48	3,1	33210035055
	4700	35x70	34	4,1	47210035070
	4700	40x55	34	3,8	47210040055
	5600	35x80	28	4,7	56210035080
	5600	40x70	28	4,6	56210040070
	6800	35x100	23	5,7	68210035100
	6800	40x80	23	5,3	68210040080
	8200	45x70	19	5,5	82210045070
	10000	50x70	16	6,5	10310050070
	10000	40x100	16	7,1	10310040100
	12000	45x100	13	7,7	12310045100
	12000	50x80	13	7,5	12310050080
	15000	50x100	11	9,2	15310050100
	18000	65x80	9	12,1	18310065080
	22000	65x100	7	14,5	22310065100
	27000	75x100	6	13,9	27310075100
	33000	65x130	5	19,6	33310065130
	39000	75x115	4	17,6	39310075115

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
100	47000	75x145	3	21,1	47310075145
	56000	75x165	3	24,2	56310075165
	68000	90x148	2	28,6	68310090148
	82000	75x225	2	33,4	82310075225
	82000	90x170	2	33,1	82310090170
	120000	90x220	1	44,5	12410090220
	120000	90x230	1	45,3	12410090230
	160	1800	35x55	62	2,8
2200		35x70	51	3,4	22216035070
2200		40x55	51	3,1	22216040055
2700		35x80	41	3,9	27216035080
3300		40x70	34	4,2	33216040070
3900		35x100	29	5,2	39216035100
3900		40x80	29	4,8	39216040080
3900		45x70	29	4,6	39216045070
4700		40x100	24	5,4	47216040100
4700		50x70	24	5,7	47216050070
5600		50x80	20	6,1	56201605080
6800		45x100	16	6,9	68216045100
8200		50x100	14	8,1	82216050100
8200		65x80	14	9,7	82216065080
12000		65x100	9	12,8	12316065100
18000		65x130	6	13,7	18316065130
18000		75x100	6	17,1	18316075100
18000		75x115	6	14,3	18316075115
27000		75x145	4	19,1	27316075145
27000		75x165	4	20,1	27316075165
39000		90x148	3	25,9	39316090148
47000		75x225	2	30,2	47316075225
47000		90x170	2	30,0	47316090170
56000		90x220	2	36,3	56316090220
68000	90x230	2	40,7	68316090230	
250	1200	35x55	80	2,4	12225035055
	1500	35x70	64	3,0	15225035070
	1500	40x55	64	2,8	15225040055
	1800	35x80	53	3,5	18225035080
	1800	40x70	53	3,3	18225040070
	2200	40x80	43	4,1	22225040080
	2700	35x100	35	4,4	27225035100
	2700	45x70	35	4,1	27225045070
	3300	40x100	29	4,9	33225040100
	3300	50x70	29	5,2	33225050070
	3900	50x80	24	5,5	39225050080
	3900	45x100	24	5,7	39225045100
	5600	50x100	17	7,2	56225050100
	5600	65x80	17	8,7	56225065080
	8200	65x100	12	11,4	82225065100
	12000	65x130	8	12,1	12325065130
	12000	75x100	8	15,1	12325075100

Stand: 12/2019

85°C



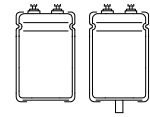
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Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
250	15000	75x115	6	14,1	15325075115
	18000	75x145	5	16,8	18325075145
	18000	75x165	5	17,7	18325075165
	27000	90x148	4	23,2	27325090148
	27000	75x225	4	24,7	27325075225
	27000	90x170	4	24,5	27325090170
	39000	90x220	2	32,7	39325090220
	39000	90x230	2	33,3	39325090230
350	680	35x55	141	1,8	68135035055
	1000	35x70	96	2,3	10235035070
	1000	40x55	96	2,4	10235040055
	1200	35x80	80	2,8	12235035080
	1200	40x70	80	2,7	12235040070
	1500	35x100	64	3,0	15235035100
	1500	40x80	64	3,4	15235040080
	1500	45x70	64	3,3	15235045070
	1800	40x100	53	3,6	18235040100
	1800	50x70	53	3,8	18235050070
	2200	50x80	43	4,2	22235050080
	2200	45x100	43	4,3	22235045100
	2700	50x100	35	5,0	27235050100
	3900	65x80	24	7,2	39235065080
	4700	65x100	20	8,6	47235065100
	5600	75x100	17	8,2	56235075100
	6800	65x130	14	11,5	68235065130
	6800	75x115	14	9,5	68235075115
	8200	75x145	12	11,4	82235075145
	400	10000	75x165	10	13,2
12000		90x148	8	15,5	12335090148
15000		75x225	6	18,4	15335075225
15000		90x170	6	18,3	15335090170
18000		90x220	5	22,2	18335090220
18000		90x230	5	22,6	18335090230
560		35x55	227	1,4	56140035055
680		40x55	187	1,7	68140040055
820		35x70	155	1,8	82140035070
1000		35x80	127	2,2	10240035080
1000		40x70	127	2,2	10240040070
1200		35x100	106	2,5	12240035100
1200		40x80	106	2,7	12240040080
1200		45x70	106	2,4	12240045070
1500		40x100	85	2,8	15240040100
1500		50x70	85	3,0	15240050070
1800		50x80	71	3,3	18240050080
1800		45x100	71	3,3	18240045100
2200	50x100	58	3,9	22240050100	
3300	65x80	39	5,8	33240065080	
3900	65x100	33	6,8	39240065100	
5600	65x130	23	7,1	56240065130	

Rated voltage U_R [V]	Rated cap. C_R [μF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
400	5600	75x100	23	8,9	56240075100
	6800	75x115	19	8,2	68240075115
	8200	75x145	16	9,8	82240075145
	10000	75x165	13	11,4	10340075165
	12000	90x148	11	13,4	12340090148
	15000	75x225	8	16,0	15340075225
	15000	90x170	8	15,8	15340090170
	18000	90x220	7	19,2	18340090220
	18000	90x230	7	19,6	18340090230
	470	35x55	237	1,4	47145035055
450	560	35x70	199	1,7	56145035070
	560	40x55	199	1,7	56145040055
	680	35x80	164	2,0	68145035080
	820	40x70	136	2,1	82145040070
	820	35x100	136	2,2	82145035100
	1000	40x80	111	2,4	10245040080
	1000	45x70	111	2,3	10245045070
	1200	40x100	93	2,9	12245040100
	1200	50x70	93	2,7	12245050070
	1500	50x80	74	3,2	15245050080
	1500	45x100	74	3,3	15245045100
	1800	50x100	62	3,8	18245050100
	2200	65x80	51	5,0	22245065080
	2700	65x100	41	6,1	27245065100
	3900	65x130	29	8,1	39245065130
	3900	75x100	29	6,3	39245075100
	4700	75x115	24	7,3	47245075115
	5600	75x145	20	8,7	56245075145
	6800	75x165	16	10,1	68245075165
	8200	90x148	14	11,9	82245090148
	10000	75x225	11	13,9	10345075225
	12000	90x170	9	15,1	12345090170
	15000	90x220	7	18,8	15345090220
	15000	90x230	7	19,1	15345090230
	390	35x55	286	1,3	39150035055
	470	40x55	237	1,5	47150040055
	560	35x70	199	1,7	56150035070
	680	35x80	164	2,0	68150035080
680	40x70	164	1,9	68150040070	
820	35x100	136	2,2	82150035100	
820	40x80	136	2,2	82150040080	
820	45x70	136	2,1	82150045070	
1000	50x70	111	2,7	10250050070	
1200	40x100	93	2,7	12250040100	
1200	50x80	93	2,8	12250050080	
1200	45x100	93	2,9	12250045100	
1800	50x100	62	3,8	18250050100	
2200	65x80	51	5,0	22250065080	
2700	65x100	41	6,1	27250065100	

Stand: 12/2019

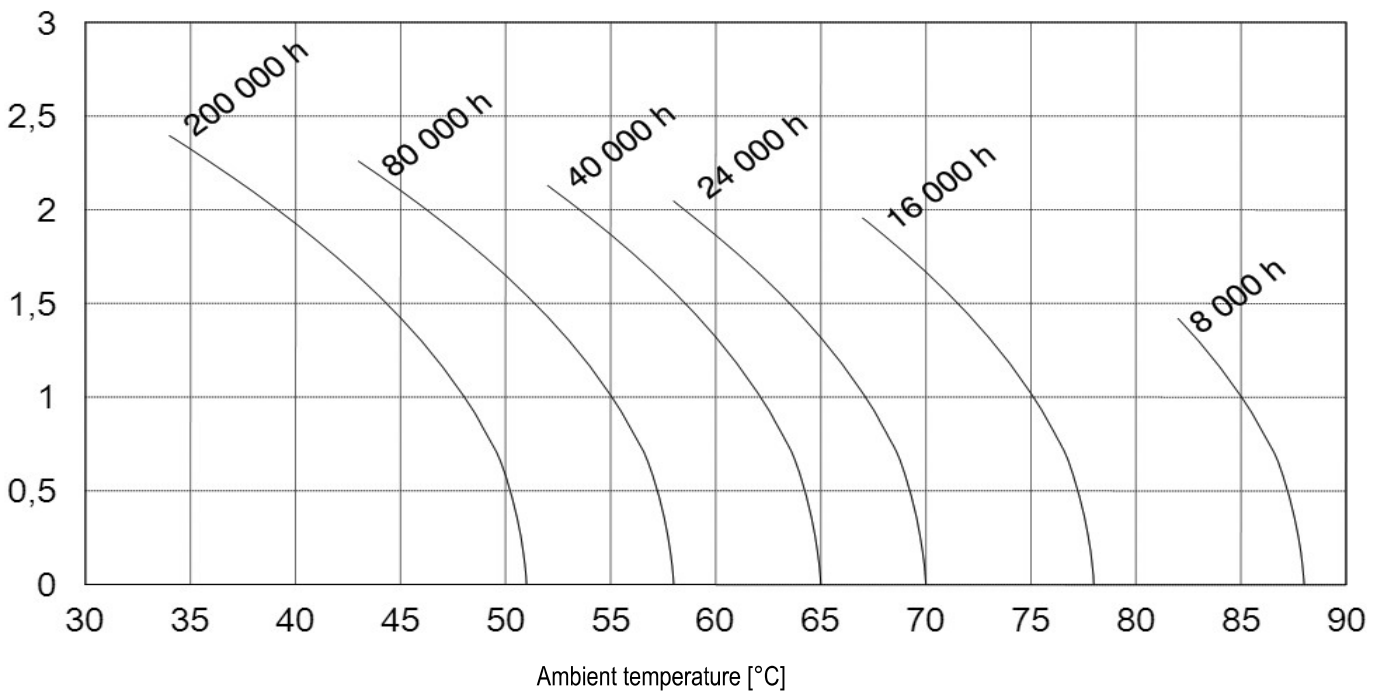
85°C



GM

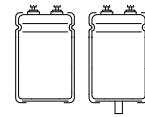
Rated voltage U_R [V]	Rated cap. C_R [μ F]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [m Ω]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMA...
					Stud mounting: GMB...
500	3300	75x100	34	7,3	33250075100
	3900	65x130	29	6,4	39250065130
	4700	75x115	24	7,3	47250075115
	5600	75x145	20	8,7	56250075145
	6800	75x165	16	10,1	68250075165
	8200	90x148	14	11,9	82250090148
	10000	75x225	11	13,9	10350075225
	10000	90x170	11	13,8	10350090170
	15000	90x220	7	18,8	15350090220
	15000	90x230	7	19,1	15350090230

■ USEFUL LIFE AS A FUNCTION OF AMBIENT TEMPERATURE AND ACTUAL RIPPLE CURRENT



Stand: 12/2019

85°C



GMX



SCREW TERMINALS

HIGH CV PRODUCT

LONG LIFE 12000 H @ 85 °C

■ FEATURES

- All internal contacts welded
- High capacitance
- High CV product
- Long useful life

■ APPLICATIONS

- Computer
- Industrial
- Inverter/drives
- Laser

RoHS compliant
REACH compliant

■ GENERAL SPECIFICATIONS

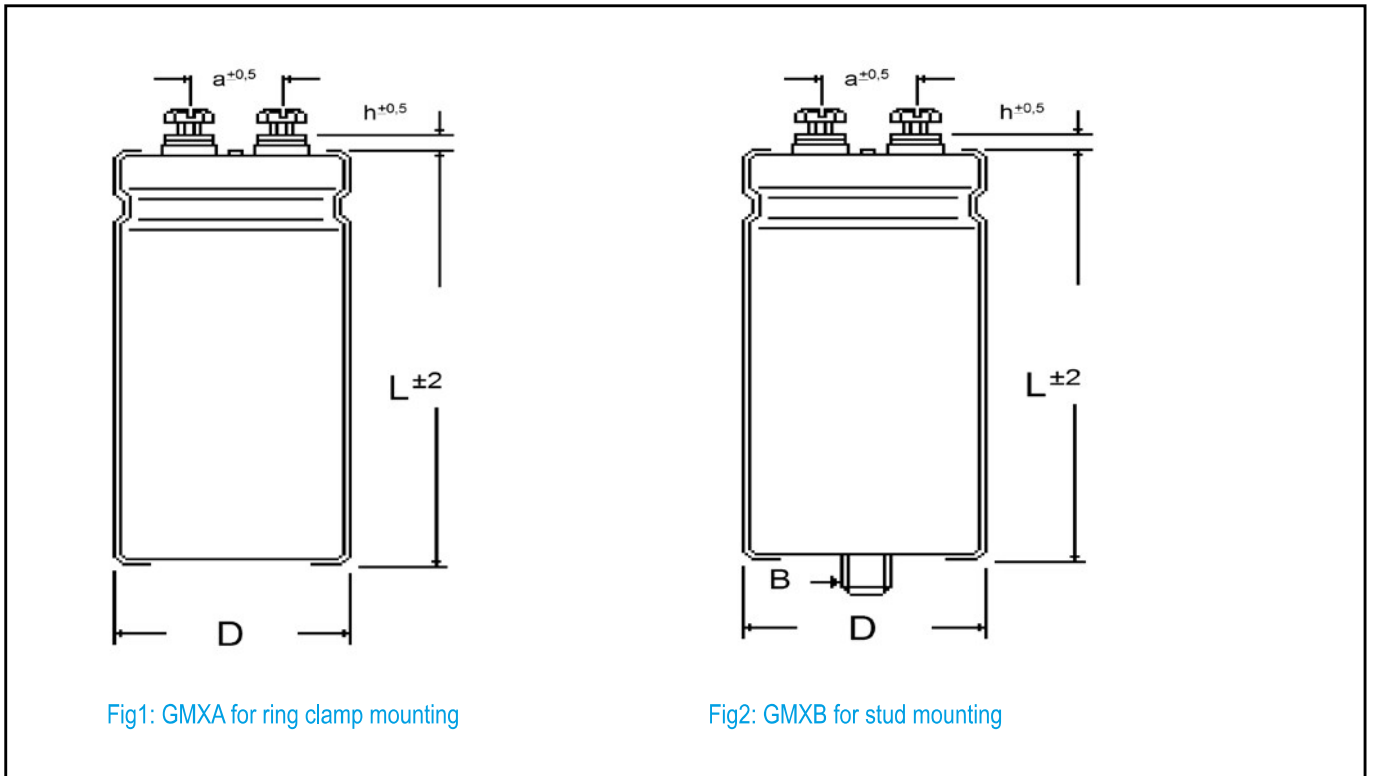
Items	Characteristics
Rated capacitance range C_R	390... 3.300.000 μ F
Capacitance tolerance	$\pm 20\%$
Rated voltage range U	16 ... 450 V
Surge voltage U_S	$U_R \leq 315$ V: $U_S = 1,15 U_R$; $U_R > 315$ V: $U_S = 1,10 U_R$
Max. reverse voltage	2 V / 20 nH
Category temperature range	- 40°C ... + 85 °C
Leakage current I_L after 5 min @ U_R	$\leq 0,008 * C_R [\mu F] * U_R [V] + 6 \mu A [\mu A]$
Useful life 12000 h @ 85 °C ; U_R ; I_R	Requirements $\Delta C/C \leq 30\%$ of initial value ; ESR $\leq 300\%$ of specified ; limit $I_L \leq$ specified limit
Endurance test 4000 h @ 85 °C , U_R	Requirements $\Delta C/C \leq 20\%$ of initial value ; ESR $\leq 130\%$ of specified ; limit $I_L \leq$ specified limit
Climatic category IEC 60068	40/085/56
Voltage proof of the external insulation	≥ 2500 V AC
Sectional specification	IEC 60384-4

Different voltages and capacitance combinations are available on request. Also in small lots.

Stand-12/2019



■ DRAWINGS FOR SERIES GMXA AND GMXB



■ DIMENSIONS AND MECHANICAL DATA

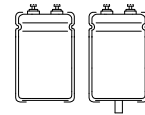
Dimensions, case with insulation sleeve				Connecting terminals		Mounting stud, GMB only	
D [mm]	Case length L available in 5 mm [mm]	h [mm]	a [mm]	Thread	Max. torque [Nm]	B	Max. torque [Nm]
35	40 ... 120	6	13	M5	2,0	M8 x 12	4,0
40	40 ... 120	5	18	M5	2,0	M8 x 12	4,0
50	40 ... 120	5	22	M5	2,0	M12 x 16	10,0
65	40 ... 180	5	28,5	M5	2,0	M12 x 16	10,0
75	40 ... 230	5	31,7	M5 ; M6	2,0 ; 2,5	M12 x 16	10,0
90	40 ... 230	5	31,7	M6	2,5	M12 x 16	10,0

GMA: connecting screws M5 or M6

GMB: connecting screws M5 or M6 + mounting nut M8 or M12

Remarks: Further mounting accessoires like clamps, nylon cup nuts and insulation disks on request, see "accessory equipment".

85°C



GMX

ELECTRICAL DATA AND ORDERING CODE FOR SERIES GMX

Rated voltage U_R [V]	Rated cap. C_R [µF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMXA...
					Stud mounting: GMXB...
16	82000	35x55	6	9,0	82301635055
	120000	35x70	4	12,0	12401635070
	120000	40x55	4	11,1	12401640055
	150000	35x80	3	14,2	15401635080
	150000	40x70	3	13,7	15401640070
	180000	35x100	3	17,0	18401635100
	180000	40x80	3	15,8	18401640080
	180000	45x70	3	15,0	18401645070
	220000	40x100	2	19,1	22401640100
	220000	50x70	2	17,7	22401650070
	270000	45x100	2	21,1	27401645100
	270000	50x80	2	20,6	27401650080
	390000	50x100	1	27,0	39401650100
	470000	65x80	1	35,6	47401665080
	560000	65x100	1	42,1	56401665100
	820000	65x130	1	56,5	82401665130
	820000	75x100	1	44,1	82401675100
	1000000	75x115	1	46,5	10501675115
	1200000	75x145	1	50,8	12501675145
	1500000	75x165	1	53,5	15501675165
1800000	90x148	1	57,3	18501690148	
2200000	75x225	1	61,0	22501675225	
2200000	90x170	1	60,4	22501690170	
2700000	90x220	1	67,1	27501690220	
3300000	90x230	1	68,3	33501690230	
25	22000	35x55	20	4,8	22302535055
	33000	35x70	14	6,5	33302535070
	33000	40x55	14	6,1	33302540055
	39000	35x80	11	7,5	39302535080
	47000	40x70	9	7,9	47302540070
	56000	35x100	8	9,8	56302535100
	56000	40x80	8	9,1	56302540080
	56000	45x70	8	8,6	56302545070
	68000	40x100	7	11,0	68302540100
	68000	50x70	7	10,2	68302550070
	68000	45x100	7	11,0	68302545100
	82000	50x80	5	11,7	82302550080
	120000	50x100	4	15,5	12402550100
	120000	65x80	4	18,3	12402565080
	180000	65x100	3	24,3	18402565100
	220000	75x100	2	23,2	22402575100
	270000	65x130	2	33,0	27402565130
	270000	75x115	2	27,1	27402575115
	390000	75x145	1	35,7	39402575145
	470000	75x165	1	41,2	47402575165
560000	90x148	1	48,1	56402590148	
680000	75x225	1	56,5	68402575225	

Rated voltage U_R [V]	Rated cap. C_R [µF]	Case size D x L [mm]	Typ. ESR 100 Hz, 20°C [mΩ]	Ripple current IR~ 100 Hz, 85°C [A]	Order code
					Plain base: GMXA...
					Stud mounting: GMXB...
25	680000	90x170	1	56,0	68402590170
	820000	90x220	1	68,2	82402590220
	1000000	90x230	1	76,8	10502590230
40	15000	35x55	25	4,3	15304035055
	18000	40x55	21	4,8	18304040055
	22000	35x70	17	5,7	22304035070
	27000	35x80	14	6,7	27304035080
	27000	40x70	14	6,5	27304040070
	33000	35x100	12	8,1	33304035100
	33000	40x80	12	7,5	33304040080
	33000	45x70	12	7,2	33304045070
	39000	50x70	10	8,3	39304050070
	47000	40x100	8	9,9	47304040100
	47000	50x80	8	9,6	47304050080
	56000	45x100	7	10,7	56304045100
	68000	50x100	6	12,6	68304050100
	82000	65x80	5	16,6	82304065080
	120000	65x100	3	21,8	12404065100
	150000	75x100	3	21,1	15404075100
	150000	65x130	3	27,0	15404065130
	180000	75x115	2	24,3	18404075115
	220000	75x145	2	29,4	22404075145
	270000	75x165	1	34,3	27404075165
330000	90x148	1	40,6	33404090148	
390000	75x225	1	47,0	39404075225	
390000	90x170	1	46,6	39404090170	
560000	90x220	1	62,0	56404090220	
560000	90x230	1	63,1	56404090230	
63	6800	35x55	42	3,4	68206335055
	8200	40x55	35	3,8	82206340055
	10000	35x70	29	4,5	10306335070
	12000	35x80	24	5,2	12306335080
	12000	40x70	24	5,0	12306340070
	15000	35x100	19	6,3	15306335100
	15000	40x80	19	5,9	15306340080
	15000	45x70	19	5,6	15306345070
	18000	50x70	16	6,5	18306350070
	18000	40x100	16	7,1	18306340100
	22000	50x80	13	7,6	22306350080
	22000	45x100	13	7,8	22306345100
	27000	50x100	11	9,2	27306350100
	39000	65x80	7	13,2	39306365080
	47000	65x100	6	15,8	47306365100
	68000	75x100	4	16,4	68306375100
	68000	65x130	4	21,0	68306365130
	82000	75x115	3	19,0	82306375115
	100000	75x145	3	22,9	10406375145

Stand: 12/2019