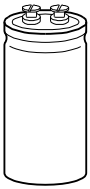
Aluminum electrolytic capacitors

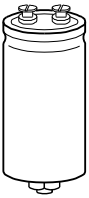
Capacitors with screw terminals

Series/Type: **B43750, B43770**

Date: November 2012

Long-life grade capacitors





B43750 B43770

Applications

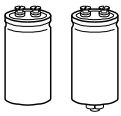
- Traction
- Power electronics
- Professional power supplies

Features

- Extremely high ripple current capability (up to 110 A)
- High reliability
- Long useful life
- Wide temperature range
- All-welded construction ensures reliable electrical contact
- No base insulation for max. cooling
  (insulated solution "heat sink mounting" upon request)
- Version with low-inductance design available for
  diameter ≥ 76.9 mm
- Self-extinguishing electrolyte
- RoHS-compatible

Construction

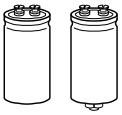
- Charge-discharge proof, polar
- Aluminum case, partially insulated
- Poles with screw terminal connections
- Mounting with ring clips, clamps or threaded stud



Specifications and characteristics in brief

Rated voltage V_R Surge voltage V_S	350 ... 450 V DC 1.1 · V_R		
Rated capacitance C_R Capacitance tolerance	560 ... 5300 µF ±20% ≙ M		
Dissipation factor tan δ (20 °C, 120 Hz)	≤ 0.20		
Leakage current I_{leak} (20 °C, 5 min)	$I_{leak} \leq 0.018\ \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{V_R}{V}\right)^{0.85} + 4\ \mu A$		
Self-inductance ESL	d = 64.3 mm: approx. 14 nH d ≥ 76.9 mm: approx. 18 nH Capacitors with low-inductance design: d ≥ 76.9 mm: approx. 13 nH		
Useful life[1)]		Requirements:	
105 °C; V_R; $I_{AC,R}$	> 8000 h	ΔC/C	≤ ±15% of initial value
85 °C; V_R; $I_{AC,R}$	> 40000 h	tan δ	≤ 1.75 times initial specified limit
40 °C; V_R; 3 · $I_{AC,R}$	> 250000 h	I_{leak}	≤ initial specified limit
Voltage endurance test		Post test requirements:	
105 °C, V_R; $I_{AC,R}$	2000 h	ΔC/C	≤ ±10% of initial value
		tan δ	≤ 1.3 times initial specified limit
		I_{leak}	≤ initial specified limit
Vibration resistance test	To IEC 60068-2-6, test Fc: Frequency range 10 ... 55 Hz, displacement amplitude 0.75 mm, acceleration max. 10 *g*, duration 3 × 2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.		
Characteristics at low temperature	Max. impedance ratio	$Z_{-25°C} / Z_{20°C}$	4
	at 100 Hz	$Z_{-40°C} / Z_{20°C}$	10
IEC climatic category	To IEC 60068-1: 40/105/56 (−40 °C/+105 °C/56 days damp heat test)		
Sectional specification	IEC 60384-4		

1) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.



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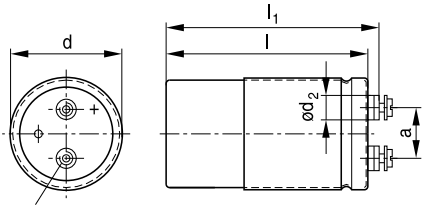
Extremely high ripple current – 105 °C

Dimensional drawings

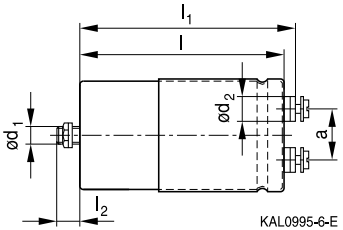
B43750
Ring clip/clamp mounting



M5: Min. reach of screw = 9.5 mm
9 mm for low inductance design
M6: Min. reach of screw = 12 mm
9.5 mm for low inductance design

Positive pole marking: +

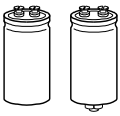
B43770
Threaded stud mounting



Dimensions and weights

Terminal	Dimensions (mm) with insulating sleeve							Approx. weight (g)
	d	l ±1	l_1 ±1	l_2 +0/−1	d_1	d_2 max.	a +0.2/−0.4	
M6	64.3 +0/−0.8	80.3	86.0	17	M12	17.7	28.5	380
M6	64.3 +0/−0.8	105.3	111.0	17	M12	17.7	28.5	450
M6	76.9 +0/−0.7	105.3	111.0	17	M12	17.7	31.7	630
M6	76.9 +0/−0.7	142.8	148.5	17	M12	17.7	31.7	850
M6	91.0 +0/−2	67.1	72.4	17	M12	17.7	31.7	600
M6	91.0 +0/−2	96.6	101.9	17	M12	17.7	31.7	1000
M6	91.0 +0/−2	144.1	149.4	17	M12	17.7	31.7	1300

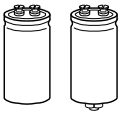
For low-inductance design the following deviation applies:
d = 91.0 mm: l_1 −1.7 mm



Packing

Capacitor diameter d (mm)	length l (mm)	Packing units (pcs.)
64.3	all	25
76.9	all	16
91.0	all	9

For ecological reasons the packing is pure cardboard.



Special design

- Low-inductance design

Design	Identification in third block of ordering code	Remark
Low inductance (13 nH)	M003	For capacitors with diameter d ≥ 76.9 mm

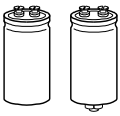
Accessories

The following items are included in the delivery package, but are not fastened to the capacitors:

	Thread	Toothed washers	Screws/nuts	Maximum torque
For terminals	M5	A 5.1 DIN 6797	DIN 7985 / ISO 7045-M5 × 10-5.6-Z	2.5 Nm thread depth t ≥ 8 mm
	M6	A 6.4 DIN 6797	DIN 7985 / ISO 7045-M6 × 12-5.6-Z	4.0 Nm thread depth t ≥ 9.5 mm
For mounting	M12	J 12.5 DIN 6797	Hex nut BM 12 DIN 439	10 Nm

The following items must be ordered separately. For details, refer to chapter "Capacitors with screw terminals – Accessories".

Item	Type
Ring clips	B44030
Clamps for capacitors with d ≥ 64.3 mm	B44030
Insulating parts	B44020

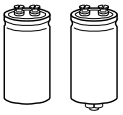


Overview of available types

V_R (V DC)	350	400	450
	Case dimensions d × l (mm)		
C_R (µF)			
560			64.3 × 80.3
680			91.0 × 67.1
850		64.3 × 80.3	64.3 × 105.3
1200	64.3 × 80.3	91.0 × 67.1	76.9 × 105.3
1300		64.3 × 105.3	91.0 × 96.6
1500	91.0 × 67.1		
1800	64.3 × 105.3		
1900		76.9 × 105.3	76.9 × 142.8
2400			91.0 × 144.1
2700	76.9 × 105.3		
2900		76.9 × 142.8	
3900	76.9 × 142.8	91.0 × 144.1	
5300	91.0 × 144.1		

The capacitance and voltage ratings listed above are available in different cases upon request.

Other voltage and capacitance ratings are also available upon request.



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Extremely high ripple current – 105 °C

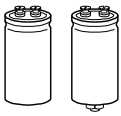
Technical data and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 10 kHz 40 °C A	$I_{AC,R}$ 10 kHz 105 °C A	$I_{AC,R}$(B) 10 kHz 105 °C A	$I_{AC,R}$(T+B) 10 kHz 105 °C A	Ordering code (composition see below)
V_R = 350 V DC								
1200	64.3 × 80.3	49	32	45	9.5	21.8	25.6	B437*0A4128M000
1500	91.0 × 67.1	39	26	49	10	28.0	31.1	B437*0A4158M00#
1800	64.3 × 105.3	31	21	56	12	22.4	28.3	B437*0A4188M000
2700	76.9 × 105.3	24	13	75	16	33.0	40.9	B437*0A4278M00#
3900	76.9 × 142.8	13	9	80	20	33.8	45.7	B437*0A4398M00#
5300	91.0 × 144.1	11	8	80	26	46.5	59.4	B437*0A4538M00#
V_R = 400 V DC								
850	64.3 × 80.3	70	110	45	9.5	21.8	25.6	B437*0A9857M000
1200	91.0 × 67.1	47	80	49	10.4	28.0	31.1	B437*0A9128M00#
1300	64.3 × 105.3	44	74	56	12	22.4	28.3	B437*0A9138M000
1900	76.9 × 105.3	30	51	75	16	33.0	40.9	B437*0A9198M00#
2900	76.9 × 142.8	20	34	80	20	33.8	45.7	B437*0A9298M00#
3900	91.0 × 144.1	15	24	80	26	46.5	59.4	B437*0A9398M00#
V_R = 450 V DC								
560	64.3 × 80.3	110	180	36	7.7	17.6	20.7	B437*0A5567M000
680	91.0 × 67.1	90	150	45	9.4	25.3	28.1	B437*0A5687M00#
850	64.3 × 105.3	75	120	44	9.1	17.4	21.9	B437*0A5857M000
1200	76.9 × 105.3	50	80	54	11.4	24.0	29.7	B437*0A5128M00#
1300	91.0 × 96.6	46	73	68	14.3	31.4	37.1	B437*0A5138M00#
1900	76.9 × 142.8	32	50	74	15.5	26.3	35.6	B437*0A5198M00#
2400	91.0 × 144.1	25	40	80	20.2	36.3	46.4	B437*0A5248M00#

Composition of ordering code

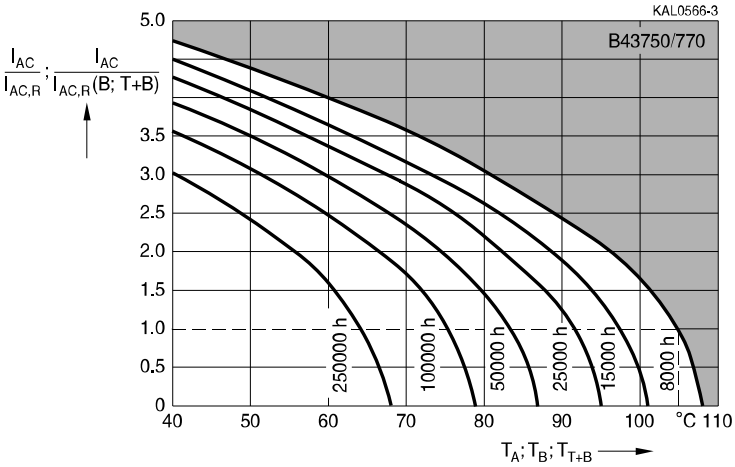
* = Mounting style
- 5 = for capacitors with ring clip/clamp mounting
- 7 = for capacitors with threaded stud

\# = Design
- 0 = for capacitors with standard inductance
- 3 = for capacitors with low inductance (13 nH) (only for capacitors with diameter d ≥ 76.9 mm)



Useful life[1)]

depending on ambient temperature T_A, T_B, T_{T+B} under ripple current operating conditions



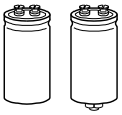
Depending on the application, interpret the graph as follows:

1. Natural cooling
   Use rated current $I_{AC,R}$ and ambient temperature T_A.
2. Cooling of base
   Use rated current $I_{AC,R}$ (B) and temperature of capacitor base T_B.
3. Cooling of terminals and base
   Use rated current $I_{AC,R}$ (T+B) and temperature of capacitors bas T_{T+B}.
   Ensure that the temperature of the cooled terminals is lower than that of the case base.

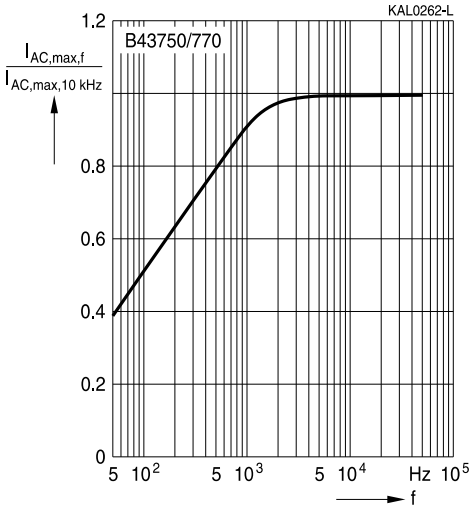
Due to the current load capability of the contact elements, the following current limits must not be exceeded, even if the frequency and the temperatur factors have been taken into account:

Capacitor diameter	Capacitor base cooling	Terminal and capacitor base cooling
64.3 mm	62 A	75 A
76.9 mm	80 A	100 A
91.0 mm	90 A	110 A

1) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.

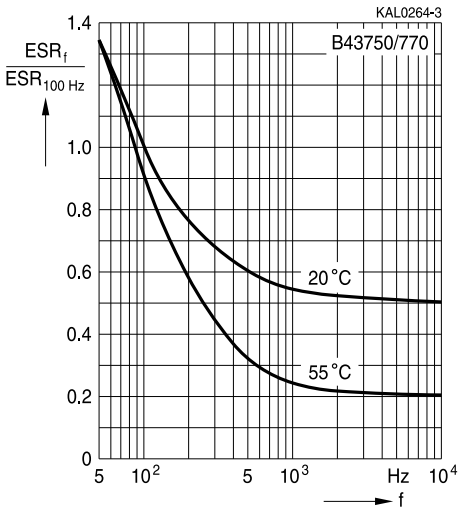


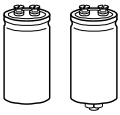
Frequency factor of permissible ripple current I_{AC} versus frequency f



Frequency characteristics of ESR

Typical behavior





Cautions and warnings

Personal safety

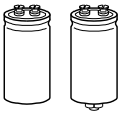
The electrolytes used by EPCOS have been optimized both with a view to the intended application and with regard to health and environmental compatibility. They do not contain any solvents that are detrimental to health, e.g. dimethyl formamide (DMF) or dimethyl acetamide (DMAC).
Furthermore, some of the high-voltage electrolytes used by EPCOS are self-extinguishing.

As far as possible, EPCOS does not use any dangerous chemicals or compounds to produce operating electrolytes. However, in exceptional cases, such materials must be used in order to achieve specific physical and electrical properties because no alternative materials are currently known. However, the amount of dangerous materials used in our products is limited to an absolute minimum.

Materials and chemicals used in EPCOS aluminum electrolytic capacitors are continuously adapted in compliance with the EPCOS Corporate Environmental Policy and the latest EU regulations and guidelines such as RoHS, REACH/SVHC, GADSL, and ELV.

MDS (Material Data Sheets) are available on the EPCOS website for all types listed in the data book. MDS for customer specific capacitors are available upon request.
MSDS (Material Safety Data Sheets) are available for all of our electrolytes upon request.

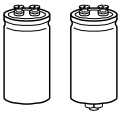
Nevertheless, the following rules should be observed when handling aluminum electrolytic capacitors: No electrolyte should come into contact with eyes or skin. If electrolyte does come into contact with the skin, wash the affected areas immediately with running water. If the eyes are affected, rinse them for 10 minutes with plenty of water. If symptoms persist, seek medical treatment. Avoid inhaling electrolyte vapor or mists. Workplaces and other affected areas should be well ventilated. Clothing that has been contaminated by electrolyte must be changed and rinsed in water.



Product safety

The table below summarizes the safety instructions that must be observed without fail. A detailed description can be found in the relevant sections of chapter "General technical information".

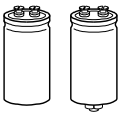
Topic	Safety information	Reference chapter "General technical information"
Polarity	Make sure that polar capacitors are connected with the right polarity.	1 "Basic construction of aluminum electrolytic capacitors"
Reverse voltage	Voltages polarity classes should be prevented by connecting a diode.	3.1.6 "Reverse voltage"
Mounting position of screw-terminal capacitors	Do not mount the capacitor with the terminals (safety vent) upside down.	11.1. "Mounting positions of capacitors with screw terminals"
Robustness of terminals	The following maximum tightening torques must not be exceeded when connecting screw terminals: M5: 2.5 Nm M6: 4.0 Nm	11.3 "Mounting torques"
Mounting of single-ended capacitors	The internal structure of single-ended capacitors might be damaged if excessive force is applied to the lead wires. Avoid any compressive, tensile or flexural stress. Do not move the capacitor after soldering to PC board. Do not pick up the PC board by the soldered capacitor. Do not insert the capacitor on the PC board with a hole space different to the lead space specified.	11.4 "Mounting considerations for single-ended capacitors"
Soldering	Do not exceed the specified time or temperature limits during soldering.	11.5 "Soldering"
Soldering, cleaning agents	Do not allow halogenated hydrocarbons to come into contact with aluminum electrolytic capacitors.	11.6 "Cleaning agents"
Upper category temperature	Do not exceed the upper category temperature.	7.2 "Maximum permissible operating temperature"
Passive flammability	Avoid external energy, such as fire or electricity.	8.1 "Passive flammability"



Topic	Safety information	Reference chapter "General technical information"
Active flammability	Avoid overload of the capacitors.	8.2 "Active flammability"
Maintenance	Make periodic inspections of the capacitors. Before the inspection, make sure that the power supply is turned off and carefully discharge the electricity of the capacitors. Do not apply any mechanical stress to the capacitor terminals.	10 "Maintenance"
Storage	Do not store capacitors at high temperatures or high humidity. Capacitors should be stored at +5 to +35 °C and a relative humidity of ≤ 75%.	7.3 Storage conditions
		Reference chapter "Capacitors with screw terminals"
Breakdown strength of insulating sleeves	Do not damage the insulating sleeve, especially when ring clips are used for mounting.	"Screw terminals – accessories"

Symbols and terms

Symbol	English	German
C	Capacitance	Kapazität
C_R	Rated capacitance	Nennkapazität
C_S	Series capacitance	Serienkapazität
$C_{S,T}$	Series capacitance at temperature T	Serienkapazität bei Temperatur T
C_f	Capacitance at frequency f	Kapazität bei Frequenz f
d	Case diameter, nominal dimension	Gehäusedurchmesser, Nennmaß
d_{max}	Maximum case diameter	Maximaler Gehäusedurchmesser
ESL	Self-inductance	Eigeninduktivität
ESR	Equivalent series resistance	Ersatzserienwiderstand
ESR_f	Equivalent series resistance at frequency f	Ersatzserienwiderstand bei Frequenz f
ESR_T	Equivalent series resistance at temperature T	Ersatzserienwiderstand bei Temperatur T
f	Frequency	Frequenz
I	Current	Strom
I_{AC}	Alternating current (ripple current)	Wechselstrom
$I_{AC,rms}$	Root-mean-square value of alternating current	Wechselstrom, Effektivwert
$I_{AC,f}$	Ripple current at frequency f	Wechselstrom bei Frequenz f
$I_{AC,max}$	Maximum permissible ripple current	Maximal zulässiger Wechselstrom
$I_{AC,R}$	Rated ripple current	Nennwechselstrom
$I_{AC,R}$ (B)	Rated ripple current for base cooling	Nennwechselstromstrom für Bodenkühlung
I_{leak}	Leakage current	Reststrom
$I_{leak,op}$	Operating leakage current	Betriebsreststrom
l	Case length, nominal dimension	Gehäuselänge, Nennmaß
l_{max}	Maximum case length (without terminals and mounting stud)	Maximale Gehäuselänge (ohne Anschlüsse und Gewindebolzen)
R	Resistance	Widerstand
R_{ins}	Insulation resistance	Isolationswiderstand
R_{symm}	Balancing resistance	Symmetrierwiderstand
T	Temperature	Temperatur
ΔT	Temperature difference	Temperaturdifferenz
T_A	Ambient temperature	Umgebungstemperatur
T_C	Case temperature	Gehäusetemperatur
T_B	Capacitor base temperature	Temperatur des Becherbodens
t	Time	Zeit
Δt	Period	Zeitraum
t_b	Service life (operating hours)	Brauchbarkeitsdauer (Betriebszeit)



Symbol	English	German
V	Voltage	Spannung
V_F	Forming voltage	Formierspannung
V_{op}	Operating voltage	Betriebsspannung
V_R	Rated voltage, DC voltage	Nennspannung, Gleichspannung
V_S	Surge voltage	Spitzenspannung
X_C	Capacitive reactance	Kapazitiver Blindwiderstand
X_L	Inductive reactance	Induktiver Blindwiderstand
Z	Impedance	Scheinwiderstand
Z_T	Impedance at temperature T	Scheinwiderstand bei Temperatur T
tan δ	Dissipation factor	Verlustfaktor
λ	Failure rate	Ausfallrate
ε_0	Absolute permittivity	Elektrische Feldkonstante
ε_r	Relative permittivity	Dielektrizitätszahl
ω	Angular velocity; $2 \cdot \pi \cdot f$	Kreisfrequenz; $2 \cdot \pi \cdot f$

Note

All dimensions are given in mm.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or lifesaving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
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