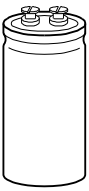
Aluminum electrolytic capacitors

Capacitors with screw terminals

Series/Type: **B41560, B41580**
Date: November 2008

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Long-life grade capacitors





B41560 B41580

Applications

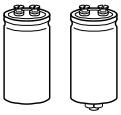
- General industrial electronics
- Professional power supplies

Features

- High reliability, extremely good electrical characteristics
- High CV product, i.e. extremely compact
- High ripple current capability
- All-welded construction ensures reliable electrical contact
- Version with low-inductance design available
- RoHS-compatible

Construction

- Charge-discharge proof, polar
- Aluminum case with insulating sleeve
- Poles with screw terminal connections
- Mounting with ring clips, clamps or threaded stud
- The bases of types with threaded stud are not insulated



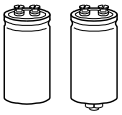
Specifications and characteristics in brief

Rated voltage V_R Surge voltage V_S	25 ... 100 V DC 1.15 · V_R		
Rated capacitance C_R Capacitance tolerance	1500 ... 330000 µF ±20% ≙ M		
Leakage current I_{leak} (20 °C, 5 min)	$I_{leak} \leq 0.3\ \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{V_R}{V}\right)^{0.7} + 4\ \mu A$		
Self-inductance ESL	Approx. 20 nH Capacitors with low-inductance design: d ≥ 64.3 mm: approx. 13 nH		
Useful life 105 °C; V_R; $I_{AC,R}$ 85 °C; V_R; $I_{AC,max}$ 40 °C; V_R; 2.2 · $I_{AC,R}$	 > 3000 h > 6000 h > 250000 h	Requirements: ΔC/C ESR I_{leak}	 ≤ ±45% of initial value ≤ 3 times initial specified limit ≤ initial specified limit
Voltage endurance test 105 °C; V_R	 2000 h	Post test requirements: ΔC/C ESR I_{leak}	 ≤ ±15% of initial value ≤ 1.3 times initial specified limit ≤ initial specified limit
Vibration resistance test	To IEC 60068-2-6, test Fc: Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 *g*, duration 3 × 2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.		
IEC climatic category	To IEC 60068-1: 40/105/56 (–40 °C/+105 °C/56 days damp heat test)		
Detail specification Sectional specification	Similar to CECC 30301-810 IEC 60384-4		

Ripple current capability

Due to the ripple current capability of the contact elements, the following current upper limits must not be exceeded:

Capacitor diameter	≤ 51.6 mm	64.3 mm	76.9 mm
$I_{AC,max}$	34 A	45 A	57 A

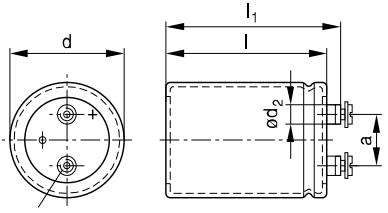


B41560, B41580

Extremely compact − 105 °C

Dimensional drawings

B41560
Ring clip/clamp mounting

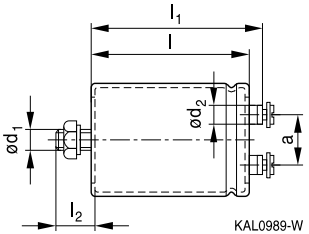


KAL0988-N-E

M5: Min. reach of screw = 8 mm
M6: Min. reach of screw = 12 mm *)

*) 9.5 mm for low-inductance design

B41580
Threaded stud mounting



KAL0989-W

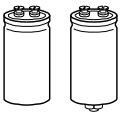
Positive pole marking: +

Screw terminals with UNF threads are available upon request.

Dimensions and weights

Ter-	Dimensions (mm) with insulating sleeve							Approx.
minal	d	l ±1	l_1 ±1	l_2 +0/−1	d_1	d_2 max.	a +0.2/−0.4	weight (g)
M5	35.7 +0/−0.8	55.7	62.2	13	M8	8.2	12.7	65
M5	35.7 +0/−0.8	80.7	87.2	13	M8	8.2	12.7	105
M5	35.7 +0/−0.8	105.7	112.2	13	M8	8.2	12.7	135
M5	51.6 +0/−0.8	80.7	87.2	17	M12	10.2	22.2	220
M5	51.6 +0/−0.8	105.7	112.2	17	M12	10.2	22.2	280
M5	64.3 +0/−0.8	105.7	112.2	17	M12	13.2	28.5	440
M6	76.9 +0/−0.7	105.7	111.5	17	M12	17.7	31.7	620
M6	76.9 +0/−0.7	143.2	149.0	17	M12	17.7	31.7	840

Dimensions are also valid for low-inductance design.



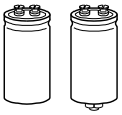
Packing

Capacitor diameter d (mm)	lenght l (mm)	Packing units (pcs.)
35.7	all	36
51.6	all	36
64.3	all	25

Capacitor diameter d (mm)	length l (mm)	Packing units (pcs.)
76.9	97.0 - 168.7	16
	191.0 - 220.7	12



For ecological reasons the packing is pure cardboard.



B41560, B41580

Extremely compact − 105 °C

Special design

- Low-inductance design

Design	Identification in 3rd block of ordering code	Remark
Low inductance (13 nH)	M003	For capacitors with diameter d ≥ 64.3 mm

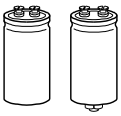
Accessories

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	Cylinder-head screw M5 × 8 DIN 84-4.8	2 Nm
	M6	A 6.4 DIN 6797	Cylinder-head screw M6 × 12 DIN 85-4.8	2.5 Nm
For mounting	M8	J 8.2 DIN 6797	Hex nut BM 8 DIN 439	4 Nm
	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

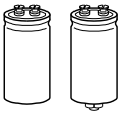


Overview of available types

V_R (V DC)	25	40	63	100
	Case dimensions d × l (mm)			
C_R (µF)				
1500				35.7 × 55.7
2200				35.7 × 80.7
3300				35.7 × 80.7
4700			35.7 × 55.7	35.7 × 105.7
6800			35.7 × 80.7	51.6 × 80.7
10000		35.7 × 55.7	35.7 × 105.7	51.6 × 105.7
15000	35.7 × 55.7	35.7 × 80.7	51.6 × 80.7	64.3 × 105.7
22000	35.7 × 80.7	35.7 × 105.7	51.6 × 105.7	76.9 × 105.7
33000	35.7 × 80.7	51.6 × 80.7	64.3 × 105.7	76.9 × 143.2
47000	35.7 × 105.7	51.6 × 105.7	64.3 × 105.7	
68000	51.6 × 80.7	51.6 × 105.7	76.9 × 105.7	
100000	51.6 × 105.7	64.3 × 105.7	76.9 × 143.2	
150000	64.3 × 105.7	76.9 × 105.7		
220000	76.9 × 105.7	76.9 × 143.2		
330000	76.9 × 143.2			

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

Other voltage and capacitance ratings are also available upon request.



B41560, B41580

Extremely compact – 105 °C

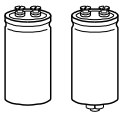
Technical data and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	ESR_{max} 100 Hz 20 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 100 Hz 40 °C A	$I_{AC,max}$ 100 Hz 85 °C A	$I_{AC,R}$ 100 Hz 105 °C A	Ordering code (composition see below)
V_R = 25 V DC								
15000	35.7 × 55.7	21	42	31	18	11	5.3	B415*0A5159M000
22000	35.7 × 80.7	14	29	22	25	15	7.4	B415*0A5229M000
33000	35.7 × 80.7	15	20	17	30	18	8.8	B415*0A5339M000
47000	35.7 × 105.7	8.0	16	13	30	23	11	B415*0A5479M000
68000	51.6 × 80.7	4.8	12	9.3	34	26	13	B415*0A5689M000
100000	51.6 × 105.7	4.7	9.4	7.6	34	32	15	B415*0A5100M000
150000	64.3 × 105.7	4.0	8.0	6.4	45	38	18	B415*0A5150M00#
220000	76.9 × 105.7	3.5	5.3	5.6	57	40	20	B415*0A5220M00#
330000	76.9 × 143.2	3.0	4.5	5.1	57	50	24	B415*0A5330M00#
V_R = 40 V DC								
10000	35.7 × 55.7	17	42	37	18	11	5.3	B415*0A7109M000
15000	35.7 × 80.7	12	23	16	25	15	7.4	B415*0A7159M000
22000	35.7 × 105.7	8.5	17	14	30	20	9.5	B415*0A7229M000
33000	51.6 × 80.7	6.0	12	13	34	23	11	B415*0A7339M000
47000	51.6 × 105.7	5.0	10	10	34	29	14	B415*0A7479M000
68000	51.6 × 105.7	4.5	9.0	8.4	34	30	15	B415*0A7689M000
100000	64.3 × 105.7	4.1	8.2	7.0	45	38	18	B415*0A7100M00#
150000	76.9 × 105.7	3.6	7.2	6.0	57	41	20	B415*0A7150M00#
220000	76.9 × 143.2	3.3	5.0	5.4	57	49	24	B415*0A7220M00#
V_R = 63 V DC								
4700	35.7 × 55.7	30	60	64	15	9.2	4.4	B415*0A8478M000
6800	35.7 × 80.7	22	44	46	20	12	6.0	B415*0A8688M000
10000	35.7 × 105.7	14	27	16	28	17	8.1	B415*0A8109M000
15000	51.6 × 80.7	9.5	19	14	31	19	9.1	B415*0A8159M000
22000	51.6 × 105.7	7.0	14	14	34	25	12	B415*0A8229M000
33000	64.3 × 105.7	5.5	11	12	45	31	15	B415*0A8339M00#
47000	64.3 × 105.7	4.8	10	9.4	45	35	17	B415*0A8479M00#
68000	76.9 × 105.7	3.3	5.0	7.8	57	39	19	B415*0A8689M00#
100000	76.9 × 143.2	3.3	5.0	6.6	57	48	23	B415*0A8100M00#

Composition of ordering code

* = Mounting style
- 6 = for capacitors with ring clip/clamp mounting
- 8 = for capacitors with threaded stud

= Design
- 0 = for capacitors with standard inductance
- 3 = for capacitors with low inductance (13 nH) - only capacitors with diameter d ≥ 64.3 mm



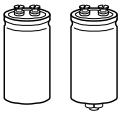
Technical data and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	ESR_{max} 100 Hz 20 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 100 Hz 40 °C A	$I_{AC,max}$ 100 Hz 85 °C A	$I_{AC,R}$ 100 Hz 105 °C A	Ordering code (composition see below)
V_R = 100 V DC								
1500	35.7 × 55.7	52	104	90	11	7.0	3.4	B415*0A9158M000
2200	35.7 × 80.7	35	70	77	16	9.9	4.7	B415*0A9228M000
3300	35.7 × 80.7	24	48	53	19	12	5.7	B415*0A9338M000
4700	35.7 × 105.7	18	35	39	26	16	7.5	B415*0A9478M000
6800	51.6 × 80.7	12	24	25	30	18	8.7	B415*0A9688M000
10000	51.6 × 105.7	7.0	14	12	34	24	11	B415*0A9109M000
15000	64.3 × 105.7	5.0	10	10	45	30	15	B415*0A9159M00#
22000	76.9 × 105.7	4.0	6.0	6.0	57	35	17	B415*0A9229M00#
33000	76.9 × 143.2	3.3	5.0	8.4	57	44	21	B415*0A9339M00#

Composition of ordering code

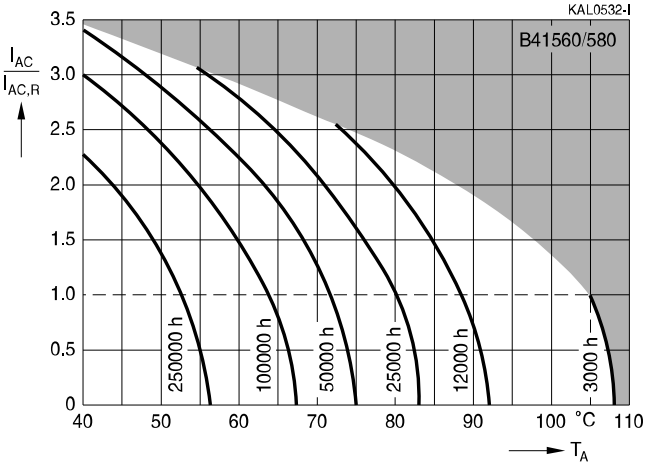
* = Mounting style
- 6 = for capacitors with ring clip/clamp mounting
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\# = Design
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- 3 = for capacitors with low inductance (13 nH) - only capacitors with diameter d ≥ 64.3 mm

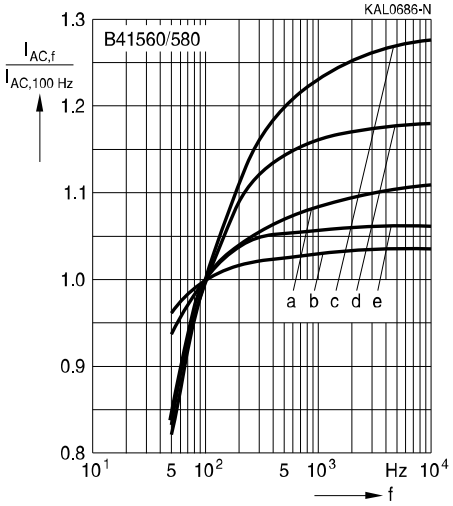


Useful life

depending on ambient temperature T_A under ripple current operating conditions[1)]

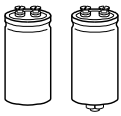


Frequency factor of permissible ripple current I_{AC} versus frequency f



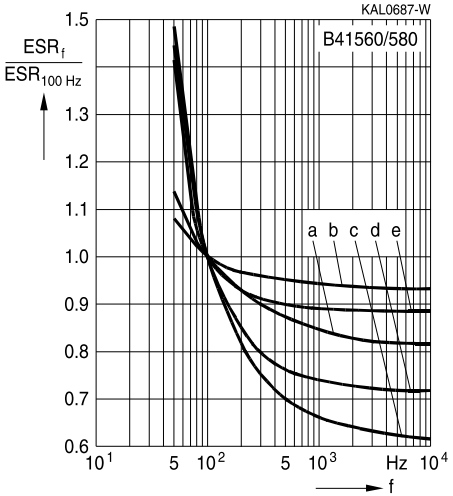
V_R (V DC)	≤ 63	100
d = 35.7 mm	a	c
d = 51.6 mm	a	d
d = 64.3 mm	a	d
d = 76.9 mm	b	e

1) Refer to chapter "General technical information, 5.3 Calculation of useful life" on how to interpret the useful life graphs.



Frequency characteristics of ESR

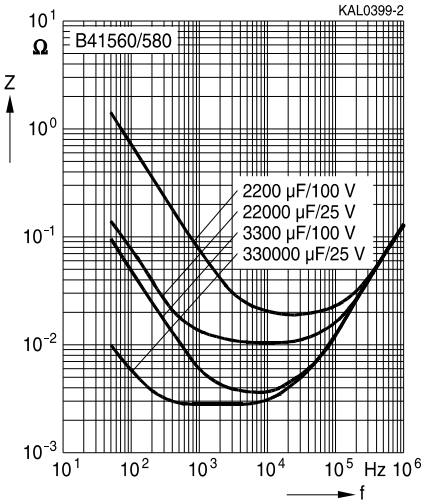
Typical behavior

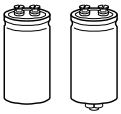


V_R (V DC)	≤ 63	100
d = 35.7 mm	a	c
d = 51.6 mm	a	d
d = 64.3 mm	a	d
d = 76.9 mm	b	e

Impedance Z versus frequency f

Typical behavior at 20 °C





Cautions and warnings

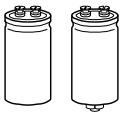
Personal safety

The electrolytes used by EPCOS have not only been optimized with a view to the intended application, but also 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, part of the high-voltage electrolytes used by EPCOS are self-extinguishing. They contain flame-retarding substances which will quickly extinguish any flame that may have been ignited.

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 safe substitute materials are currently known. However, the amount of dangerous materials used in our products has been limited to an absolute minimum. Nevertheless, the following rules should be observed when handling Al electrolytic capacitors:

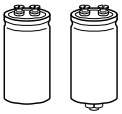
- Any escaping electrolyte should not come into contact with eyes or skin.
- If electrolyte does come into contact with the skin, wash the affected parts immediately with running water. If the eyes are affected, rinse them for 10 minutes with plenty of water. If symptoms persist, seek medical treatment.
- Avoid breathing in 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 summarize the safety instructions that must be observed without fail. A detailed description can be found in the relevant sections of chapter "General technical information".

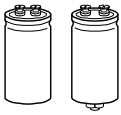
Topic	Safety information	Reference Chapter "General technical information"
Polarity	Make sure that polar capacitors are connected with the right polarity.	1 "Basic construction of aluminum electrolytic capacitors"
Reverse voltage	Voltages polarity classes should be prevented by connecting a diode.	3.1.6 "Reverse voltage"
Upper category temperature	Do not exceed the upper category temperatur.	7.2 "Maximum permissible operating temperature"
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"
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"
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"
Robustness of terminals	The following maximum tightening torques must not be exceeded when connecting screw terminals: M5: 2 Nm M6: 2.5 Nm	11.3 "Mounting torques"
Soldering	Do not exceed the specified time or temperature limits during soldering.	11.5 "Soldering"



B41560, B41580

Extremely compact – 105 °C

Topic	Safety information	Reference Chapter "General technical information"
Soldering, cleaning agents	Do not allow halogenated hydrocarbons to come into contact with aluminum electrolytic capacitors.	11.6 "Cleaning agents"
Passive flammability	Avoid external energy, such as fire or electricity.	8.1 "Passive flammability"
Active flammability	Avoid overload of the capacitors.	8.2 "Active flammability"
		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	Ableitstrom
$I_{leak,op}$	Operating leakage current	Ableitstrom bei Betrieb
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; $2 \cdot \pi \cdot f$

Notes

All dimensions are given in mm.

Important notes

The following applies to all products named in this publication:

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