

Aluminum electrolytic capacitors

Hybrid polymer aluminum electrolytic capacitors,
very high ripple current capability

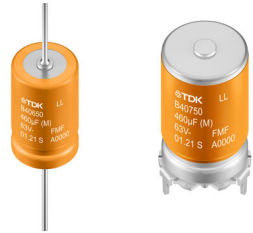
Series/Type: **B40650, B40750**

Date: June 2024

Axial-lead and soldering star capacitors

Applications

- Industrial electronics
- 48 V DC output filtering of SMPS
- 48 V DC motor control circuit
- Industrial and telecommunication equipment
- Server and data center
- Power tools
- Battery charger
- Servo drives
- Solar micro-inverter



Features

- Very high ripple current capability
- Very low impedance
- Long useful life, 10000 h at up to 105 °C
- Operating temperature range up to 125 °C is available upon request
- Very low ESR at low temperatures down to -40 °C
- PCB area/volume saving
- RoHS-compatible

Construction

- Polar
- Aluminum case with PET sleeve
- Negative pole connected to case

Terminals

- Axial leads, welded to capacitor case and cover disc
- Soldering star option for upright mounting on PCB

Taping and packing

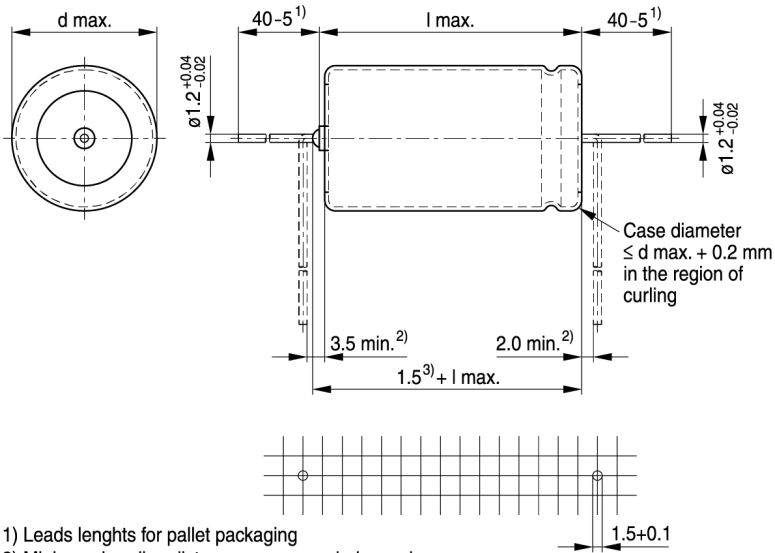
- Axial-lead capacitors will be delivered in pallet package or taped on reel
- Soldering star capacitors are packed in blister trays

Specifications and characteristics in brief

Rated voltage V_R Surge voltage V_S	25 ... 80 V DC 1.15 V_R				
Rated capacitance C_R Capacitance tolerance	250 ... 3600 μ F $\pm 20\%$ \triangleq M				
Dissipation factor $\tan \delta$ (20 °C, 100 Hz)	For capacitance higher than 1000 μ F add 0.02 for every increase of 1000 μ F.				
	V_R (V DC)	25	35	63	80
	$\tan \delta$ (max.)	0.14	0.12	0.08	0.08
Leakage current I_{leak} (2 min, 20 °C)	$I_{leak} \leq 0.01 \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{V_R}{V} \right) + 4 \mu A$				
Self-inductance ESL ¹⁾	Diameter (mm)		14	16	18
	Terminals	Length l (mm)	Approx. ESL (nH)		
	axial	25	22	26	30
		30	24	29	34
	soldering star	25	6	7	8
30		7	8	10	
Useful life ²⁾ $T_A = 105$ °C; V_R ; $I_{AC,R}$	> 10000 h	Requirements $I_{\Delta C/CI} \leq 30\%$ of initial value ESR ≤ 3 times initial specified limit ³⁾ $I_{leak} \leq$ initial specified limit			
Voltage endurance test 105 °C; V_R	2000 h	Post test requirements $I_{\Delta C/CI} \leq 10\%$ of initial value ESR ≤ 1.5 times initial specified limit ³⁾ $I_{leak} \leq$ initial specified limit			
Biased humidity test 85 °C, 85% RH, V_R	2000 h	Requirements $I_{\Delta C/CI} \leq 30\%$ of initial value ESR ≤ 3 times initial specified limit ³⁾ $I_{leak} \leq$ initial specified limit			
Vibration resistance test	To IEC 60068-2-6:2007, test Fc: Frequency range 10 Hz ... 1 kHz, displacement amplitude max. 0.75 mm, acceleration max. 10 g, duration 3 x 2 h. Capacitor rigidly clamped by the aluminum case, e.g. using our standard fixture				
Characteristics at low temperature	Max. impedance ratio at 100 kHz	Z_{-55 °C / Z_{20} °C		1.5	

IEC climatic category	To IEC 60068-1:2013, 55/105/56 (–55 °C/+105 °C/56 days damp heat test)
Operating temperature range ⁴⁾	–55 °C to +105 °C
Sectional specification	IEC 60384-4:2016

- 1) If optimum circuit design is used, the values are lower by 30%.
- 2) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.
- 3) ESR_{max} at 100 kHz, +20 °C is measured with the probe connected in close proximity to the capacitor body. In case of soldering star capacitors with all negative pins connected in parallel.
- 4) Operating temperature range up to 125 °C is available upon request.

B40650, Axial-lead capacitors
Dimensional drawing


- 1) Leads lengths for pallet packaging
- 2) Minimum bending distance recommended per wire
- 3) Maximum length of welding projection

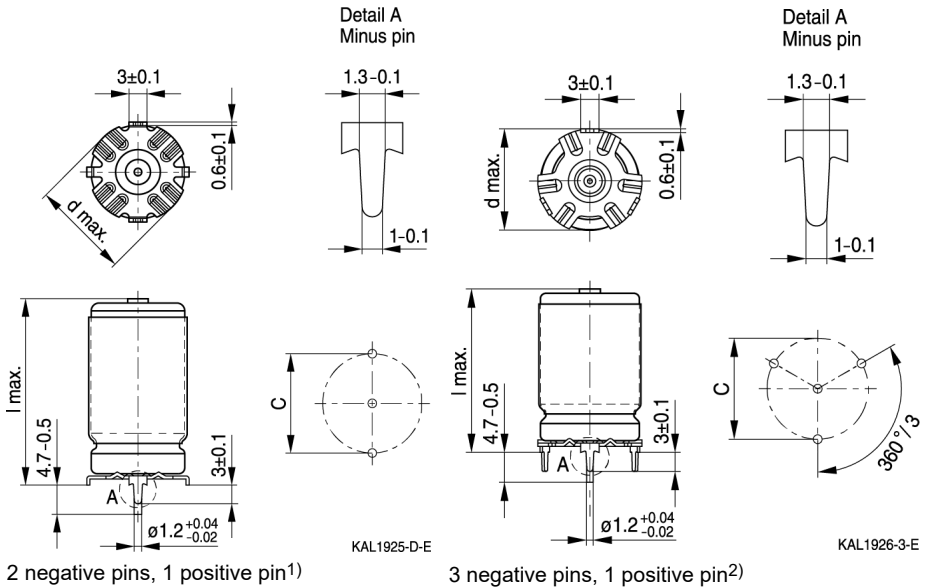
KAL1868-8-E

Dimensions, weights and packing units

d x l mm	d _{max} x l _{max} mm	Approx. weight g	Packing units (pcs.)	
			Pallet	Reel
14 x 25	14.5 x 26	6.1	200	350
14 x 30	14.5 x 31	7.3	200	350
16 x 25	16.5 x 26	7.7	180	250
16 x 30	16.5 x 31	9.1	180	250
18 x 25	18.5 x 26	9.6	160	—
18 x 30	18.5 x 31	11.2	160	—

B40750, Soldering star capacitors
Dimensional drawing

 Mounting holes $d = 14 \dots 16 \text{ mm}$

 Mounting holes $d = 14 \dots 18 \text{ mm}$

Dimensions, weights and packing units

$d \times l$ mm	$d_{max} \times l_{max}$ mm	$c \pm 0.1$ mm	Approx. weight g	Packing units pcs.
14 x 25	15.5 x 28	14.5	6.1	480
14 x 30	15.5 x 33	14.5	7.3	480
16 x 25	17.5 x 28	16.5	7.7	300
16 x 30	17.5 x 33	16.5	9.1	300
18 x 25	19.5 x 28	18.5	9.6	300
18 x 30	19.5 x 33	18.5	11.2	300

- Two negative pins on soldering star, one positive lead wire in the center.
- Three negative pins on soldering star, one positive lead wire in the center.

Case dimensions and ordering codes¹⁾

C_R 100 Hz 20 °C μF	Case dimen- sions d x l mm	Ordering code Axial pallet	Ordering code Axial reel	Ordering code Soldering star 2 negative pins 1 positive pin ²⁾	Ordering code Soldering star 3 negative pins 1 positive pin ³⁾
$V_R = 25 \text{ V DC}$					
1600	14 x 25	B40650A5168M001	B40650A5168M003	B40750A5168M002	B40750A5168M001
2100	14 x 30	B40650A5218M001	B40650A5218M003	B40750A5218M002	B40750A5218M001
2200	16 x 25	B40650A5228M001	B40650A5228M003	B40750A5228M002	B40750A5228M001
2700	16 x 30	B40650A5278M001	B40650A5278M003	B40750A5278M002	B40750A5278M001
2700	18 x 25	B40650B5278M001			B40750B5278M001
3700	18 x 30	B40650A5378M001			B40750A5378M001
$V_R = 35 \text{ V DC}$					
1100	14 x 25	B40650A7118M001	B40650A7118M003	B40750A7118M002	B40750A7118M001
1400	14 x 30	B40650A7148M001	B40650A7148M003	B40750A7148M002	B40750A7148M001
1400	16 x 25	B40650B7148M001	B40650B7148M003	B40750B7148M002	B40750B7148M001
1800	16 x 30	B40650A7188M001	B40650A7188M003	B40750A7188M002	B40750A7188M001
1800	18 x 25	B40650B7188M001			B40750B7188M001
2500	18 x 30	B40650A7258M001			B40750A7258M001
$V_R = 63 \text{ V DC}$					
460	14 x 25	B40650A8467M001	B40650A8467M003	B40750A8467M002	B40750A8467M001
600	14 x 30	B40650A8607M001	B40650A8607M003	B40750A8607M002	B40750A8607M001
600	16 x 25	B40650B8607M001	B40650B8607M003	B40750B8607M002	B40750B8607M001
790	16 x 30	B40650A8797M001	B40650A8797M003	B40750A8797M002	B40750A8797M001
750	18 x 25	B40650A8757M001			B40750A8757M001
1000	18 x 30	B40650A8108M001			B40750A8108M001
$V_R = 80 \text{ V DC}$					
250	14 x 25	B40650A0257M001	B40650A0257M003	B40750A0257M002	B40750A0257M001
340	14 x 30	B40650A0347M001	B40650A0347M003	B40750A0347M002	B40750A0347M001
330	16 x 25	B40650A0337M001	B40650A0337M003	B40750A0337M002	B40750A0337M001
430	16 x 30	B40650A0437M001	B40650A0437M003	B40750A0437M002	B40750A0437M001
440	18 x 25	B40650A0447M001			B40750A0447M001
600	18 x 30	B40650A0607M001			B40750A0607M001

1) Other voltage and capacitance ratings are available upon request.

2) Two negative pins on soldering star, one positive lead wire in the center.

3) Three negative pins on soldering star, one positive lead wire in the center.

Technical data

C_R 100 Hz 20 °C μF	Case dimensions d x l mm	$\text{ESR}_{\text{max}}^{1)}$ 100 kHz 20 °C m Ω	$\text{ESR}_{\text{max}}^{1)}$ 100 kHz -40 °C m Ω	$Z_{\text{max}}^{2)}$ 100 kHz 20 °C m Ω	$I_{\text{AC,R}}$ 100 kHz $T_A = 105 \text{ °C}$ A
$V_R = 25 \text{ V DC}$					
1600	14 x 25	5.6	6.8	7.3	11.7
2100	14 x 30	4.9	6.1	6.4	13.8
2200	16 x 25	4.4	5.6	5.7	14.6
2700	16 x 30	3.9	5.1	5.1	17.2
2700	18 x 25	4.9	6.1	6.4	14.7
3700	18 x 30	4.3	5.5	5.6	17.2
$V_R = 35 \text{ V DC}$					
1100	14 x 25	5.6	6.8	7.3	11.7
1400	14 x 30	4.9	6.1	6.4	13.8
1400	16 x 25	4.4	5.6	5.7	14.6
1800	16 x 30	3.9	5.1	5.1	17.2
1800	18 x 25	4.9	6.1	6.4	14.7
2500	18 x 30	4.3	5.5	5.6	17.2
$V_R = 63 \text{ V DC}$					
460	14 x 25	5.9	7.1	6.5	13.8
600	14 x 30	5.2	6.2	5.7	16.0
600	16 x 25	4.5	5.3	5.0	17.0
790	16 x 30	4.0	4.7	4.4	19.5
750	18 x 25	4.4	5.0	5.9	18.0
1000	18 x 30	4.2	4.5	5.1	20.2
$V_R = 80 \text{ V DC}$					
250	14 x 25	5.9	7.1	6.5	11.7
340	14 x 30	5.2	6.2	5.7	14.5
330	16 x 25	4.5	5.3	5.0	14.4
430	16 x 30	4.0	4.7	4.4	18.0
440	18 x 25	4.4	5.0	5.9	14.6
600	18 x 30	4.2	4.5	5.1	18.0

1) ESR_{max} at 100 kHz, +20 °C measured with the probe connected in close proximity to the capacitor body. In case of soldering star capacitors with all negative pins connected in parallel.

2) Z_{max} at 100 kHz, +20 °C measured at soldering star capacitors with at least two negative pins connected.

Useful life¹⁾

Calculations of useful life are performed on request, based on operational conditions stated by the customer, or based on temperatures measured by the user in the application.

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

Cautions and warnings

Personal safety

The electrolytes used 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 are self-extinguishing.

As far as possible, we do not use any dangerous chemicals or compounds to produce operating electrolytes, although in exceptional cases, such materials must be used in order to achieve specific physical and electrical properties because no alternative materials are currently known.

We do, however, restrict the amount of dangerous materials used in our products to an absolute minimum.

Materials and chemicals used in our aluminum electrolytic capacitors are continuously adapted in compliance with the TDK Electronics 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 our website for all types listed in the data book. MDS for customer specific capacitors are available 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 separate file 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 of opposite polarity should be prevented by connecting a diode.	3.1.6 "Reverse voltage"
Mounting position of capacitors with screw or multi-pin terminals	Multi-pin capacitors with pressure relief vent on the can base must not be mounted with terminals facing up unless otherwise specified.	11.1 "Mounting positions of capacitors with screw or multi-pin 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	11.2 "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.	11.3 "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, e.g. fire.	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 capacitors. Do not apply excessive mechanical stress to the capacitor terminals when mounting.	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 $\leq 75\%$.	7.3 "Shelf life and 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"

Display of ordering codes for TDK Electronics products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications, on the company website, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products.

Detailed information can be found on the Internet under www.tdk-electronics.tdk.com/orderingcodes.

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_{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_B	Capacitor base temperature	Temperatur des Gehäusebodens
T_C	Case temperature	Gehäusetemperatur
t	Time	Zeit
Δt	Period	Zeitraum
t_b	Service life (operating hours)	Brauchbarkeitsdauer (Betriebszeit)
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

Symbol	English	German
X_L	Inductive reactance	Induktiver Blindwiderstand
Z	Impedance	Scheinwiderstand
Z_T	Impedance at temperature T	Scheinwiderstand bei Temperatur T
$\tan \delta$	Dissipation factor	Verlustfaktor
λ	Failure rate	Ausfallrate
ϵ_0	Absolute permittivity	Elektrische Feldkonstante
ϵ_r	Relative permittivity	Dielektrizitätszahl
ω	Angular frequency; $2 \cdot \pi \cdot f$	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 we are 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 a 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 life-saving 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.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.
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Important notes

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The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System**. For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.
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