

Long-life grade capacitors

Applications

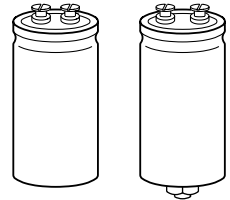
- Frequency converters
- Professional power supplies
- Uninterruptible power supplies

Features

- Extremely compact, i. e. high CU product
- High reliability and ripple current capability
- All-welded construction ensures reliable electrical contact
- Version with optimized construction for base cooling (2-pad solution) available
- Version with low-inductance design available

Construction

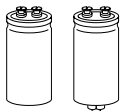
- Charge-discharge proof, polar
- Aluminum case with insulating sleeve
- Poles with screw terminal connections
- Mounting with ring clips, clamps or threaded stud
- The bases of types with threaded stud and $d \leq 76,9$ mm are not insulated, types with $d = 91$ mm have fully insulated bases



B43456

KAL0567-B

B43458

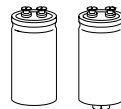
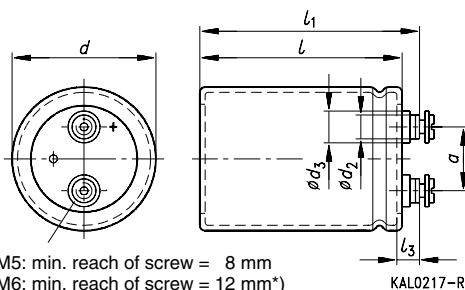

Specifications and characteristics in brief

| | | |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated voltage U_R | 350 ... 450 VDC | |
| Surge voltage U_S | $1,10 \cdot U_R$ | |
| Rated capacitance C_R | 1 000 ... 18 000 μ F | |
| Capacitance tolerance | $\pm 20 \% \triangleq M$ | |
| Leakage current I_L (5 min, 20 °C) | $I_L \leq 0,3 \mu\text{A} \cdot \left(\frac{C_R}{\mu\text{F}} \cdot \frac{U_R}{V} \right)^{0,7} + 4 \mu\text{A}$ | |
| Self-inductance ESL | Approx. 20 nH Capacitors with low inductance design: $d \geq 64,3$ mm: approx. 13 nH | |
| Useful life 85 °C; U_R ; $I_{\sim R}$ 40 °C; U_R ; $1,5 \cdot I_{\sim R}$ | > 12 000 h > 250 000 h | Requirements: $\Delta C/C \leq \pm 30 \%$ of initial value $ESR \leq 3$ times initial specified limit $I_L \leq$ initial specified limit Failure percentage: $\leq 1 \%$ Failure rate: ≤ 40 fit ($\leq 40 \cdot 10^{-9}/\text{h}$) (for definition "fit", refer to chapter "Quality", page 62) |
| Voltage endurance test 85 °C; U_R | 2 000 h | Post test requirements: $\Delta C/C \leq \pm 10 \%$ of initial value $ESR \leq 1,3$ times initial specified limit $I_L \leq$ initial specified limit |
| Vibration resistance | To IEC 60068-2-6, test Fc: displacement amplitude 0,75 mm, frequency range 10 to 55 Hz, acceleration max. 10 g, duration 3×2 h | |
| IEC climatic category | To IEC 60068-1: $U_R \leq 400$ VDC: 40/085/56 (– 40 °C/+ 85 °C/56 days damp heat test) $U_R = 450$ VDC: 25/085/56 (– 25 °C/+ 85 °C/56 days damp heat test) | |
| Detail specifications | Similar to CECC 30301-803, CECC 30301-807 | |
| Sectional specification | IEC 60384-4 | |

Ripple current capability

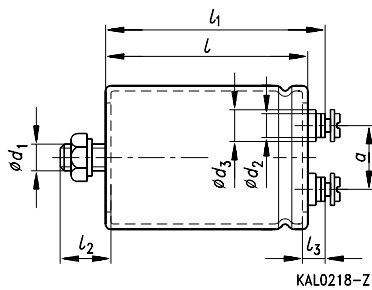
Due to the ripple current capability of the contact elements, the following current upper limits must not be exceeded:

| | | | | |
|-----------------------|---------|---------|---------|---------|
| Capacitor diameter | 51,6 mm | 64,3 mm | 76,9 mm | 91,0 mm |
| $I_{\sim \text{max}}$ | 30 A | 40 A | 50 A | 70 A |


Dimensional drawings
Type B43456
 Ring clip/clamp mounting


M5: min. reach of screw = 8 mm
 M6: min. reach of screw = 12 mm*)
 *) 8 mm for low-inductance design

KAL0217-R

Type B43458
 Threaded stud mounting


KAL0218-Z

Positive pole marking: +

The base of types with threaded stud and $d = 91$ mm is fully insulated (the lengths l and l_1 are increased by 0,5 mm in these cases). For types with threaded stud and $d \leq 76$ mm the base is not insulated. Also refer to the notes on mounting given on page 168.

Screw terminals with UNF threads are available upon request.

Dimensions and weights

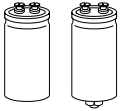
| Ter- minal | Dimensions (mm) with insulating sleeve | | | | | | | | | | Approx. wt. (g) |
|---------------|----------------------------------------|-----------|-------------|------------------------------------------------------|---------------|-------|-----------|-----------|--------------------------------------------------------|------|--------------------|
| | d | $l \pm 1$ | $l_1 \pm 1$ | $l_2 \begin{smallmatrix} +0 \\ -1 \end{smallmatrix}$ | l_3 | d_1 | d_2 max | d_3 max | $a \begin{smallmatrix} +0,2 \\ -0,4 \end{smallmatrix}$ | | |
| M 5 | 51,6 +0/-0,8 | 80,7 | 87,2 | 17 | 7,0 +0,2/-1 | M 12 | 8,2 | 13,5 | 22,2 | 220 | |
| M 5 | 51,6 +0/-0,8 | 105,7 | 112,2 | 17 | 7,0 +0,2/-1 | M 12 | 8,2 | 13,5 | 22,2 | 280 | |
| M 5 | 64,3 +0/-0,8 | 105,7 | 112,2 | 17 | 7,0 +0,2/-1 | M 12 | 8,2 | 13,5 | 28,5 | 440 | |
| M 6 | 76,9 +0/-0,7 | 105,7 | 111,5 | 17 | 6,4 +1,1/-0,8 | M 12 | 17,7 | 17,7 | 31,7 | 540 | |
| M 6 | 76,9 +0/-0,7 | 143,2 | 149,0 | 17 | 6,4 +1,1/-0,8 | M 12 | 17,7 | 17,7 | 31,7 | 840 | |
| M 6 | 76,9 +0/-0,7 | 220,7 | 226,5 | 17 | 6,4 +1,1/-0,8 | M 12 | 17,7 | 17,7 | 31,7 | 1300 | |
| M 6 | 91,0 +0/-2 | 144,5 | 149,8 | 17 | 6,4 +1,1/-0,8 | M 12 | 17,7 | 17,7 | 31,7 | 1200 | |
| M 6 | 91,0 +0/-2 | 221,0 | 226,3 | 17 | 6,4 +1,1/-0,8 | M 12 | 17,7 | 17,7 | 31,7 | 1900 | |

Dimensions are also valid for 2-pad solution and low-inductance design.

Packing

For ecological reasons the packing is pure cardboard.

| Capacitor diameter d | Packing units (pieces) | Capacitor diameter d | Packing units (pieces) |
|------------------------|------------------------|------------------------|------------------------|
| 51,6 mm | 22 | 76,9 mm | 12 |
| 64,3 mm | 15 | 91,0 mm | 8 |



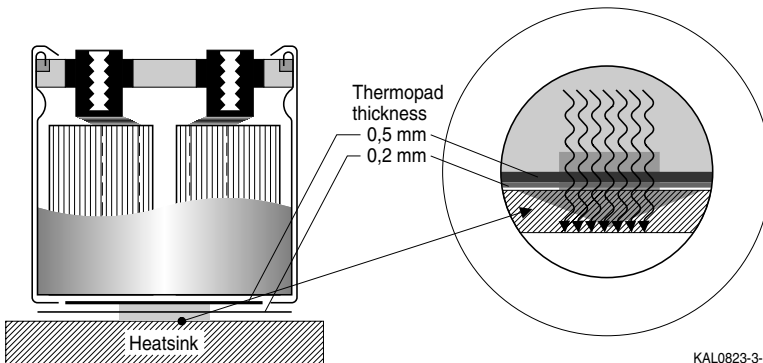
B43456 / B43458

Compact – 85 °C

Special designs

- Low-inductance design
- 2-pad solution

Design for optimized connection of the capacitor to the heatsink when using base cooling. This version is available for capacitors without threaded stud and for diameters $\geq 64,3$ mm (cf. $I_{-R}(B)$ in table “Technical data and ordering codes” and useful life graphs).



KAL0823-3-E

Ordering codes:

| Design | Identification in 3rd block of ordering code | Remark |
|------------------------|----------------------------------------------|-------------------------------------------------------------------------|
| Low inductance (13 nH) | M003 | For capacitors with diameter $d \geq 64,3$ mm |
| 2-pad solution | M006 | For capacitors with diameter $d \geq 64,3$ mm and without threaded stud |

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 | M 5 | A 5,1 DIN 6797 | Cylinder-head screw M 5 \times 8 DIN 84-4.8 | 2 Nm |
| | M 6 | A 6,4 DIN 6797 | Cylinder-head screw M 6 \times 12 DIN 85-4.8 | 2,5 Nm |
| For mounting | M 12 | J 12,5 DIN 6797 | Hex nut BM 12 DIN 439 | 10 Nm |

The following must be ordered separately:

Ring clips

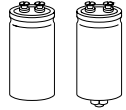
B 44 030 (cf. page 169)

Clamps for capacitors with $d \geq 64,3$ mm

B 44 030 (cf. page 173)

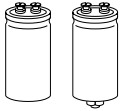
Insulating parts

B 44 020 (cf. page 166)


Overview of available types

| U_R (VDC) | 350 | 400 | 450 |
|------------------|-----------------------------------|--------------|--------------|
| C_R (μ F) | Case dimensions $d \times l$ (mm) | | |
| 1 000 | | 51,6 × 80,7 | 51,6 × 80,7 |
| 1 500 | 51,6 × 80,7 | 51,6 × 80,7 | 51,6 × 105,7 |
| 2 200 | 51,6 × 105,7 | 51,6 × 105,7 | 64,3 × 105,7 |
| 3 300 | | 64,3 × 105,7 | 76,9 × 105,7 |
| 3 900 | 64,3 × 105,7 | | |
| 4 700 | | 76,9 × 105,7 | |
| 5 600 | 76,9 × 105,7 | | 76,9 × 143,2 |
| 6 800 | | 76,9 × 143,2 | 91,0 × 144,5 |
| 8 200 | 76,9 × 143,2 | | 76,9 × 220,7 |
| 10 000 | | 91,0 × 144,5 | |
| 12 000 | 91,0 × 144,5 | 76,9 × 220,7 | 91,0 × 221,0 |
| 15 000 | 76,9 × 220,7 | 91,0 × 221,0 | |
| 18 000 | 91,0 × 221,0 | | |

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


B43456 / B43458
Compact – 85 °C
Technical data and ordering codes

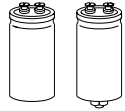
| U_R | C_R 100 Hz 20 °C μF | Case dimensions $d \times l$ mm | ESR_{max} 100 Hz 20 °C mΩ | Z_{max} 10 kHz 20 °C mΩ | $I_{~max}$ 100 Hz 40 °C A | $I_{~R}$ 100 Hz 85 °C A | $I_{~R(B)}$ 100 Hz 85 °C A | Ordering code ¹⁾ |
|-------|--------------------------------|------------------------------------------|--------------------------------------|------------------------------------|------------------------------------|----------------------------------|-------------------------------------|-------------------------------|
| 350 | 1 500 | 51,6 × 80,7 | 110 | 93 | 16 | 5,7 | 11 | B4345*A4158M000 |
| | 2 200 | 51,6 × 105,7 | 73 | 63 | 21 | 7,6 | 14 | B4345*A4228M000 |
| | 3 900 | 64,3 × 105,7 | 41 | 38 | 32 | 12 | 21 | B4345*A4398M000 ²⁾ |
| | 5 600 | 76,9 × 105,7 | 29 | 28 | 43 | 15 | 30 | B4345*A4568M000 ²⁾ |
| | 8 200 | 76,9 × 143,2 | 20 | 20 | 50 | 20 | 36 | B4345*A4828M000 ²⁾ |
| | 12 000 | 91,0 × 144,5 | 14 | 14 | 70 | 28 | 52 | B4345*A4129M000 ²⁾ |
| | 15 000 | 76,9 × 220,7 | 11 | 11 | 50 | 34 | 50 | B4345*A4159M000 ²⁾ |
| | 18 000 | 91,0 × 221,0 | 9 | 9 | 70 | 38 | 58 | B4345*A4189M000 ²⁾ |
| 400 | 1 000 | 51,6 × 80,7 | 160 | 133 | 13 | 4,6 | 8,2 | B4345*A9108M000 |
| | 1 500 | 51,6 × 80,7 | 110 | 93 | 17 | 6,0 | 13 | B4345*A9158M000 |
| | 2 200 | 51,6 × 105,7 | 73 | 63 | 22 | 8,0 | 15 | B4345*A9228M000 |
| | 3 300 | 64,3 × 105,7 | 49 | 44 | 30 | 11 | 20 | B4345*A9338M000 ²⁾ |
| | 4 700 | 76,9 × 105,7 | 34 | 32 | 40 | 14 | 29 | B4345*A9478M000 ²⁾ |
| | 6 800 | 76,9 × 143,2 | 24 | 24 | 50 | 19 | 33 | B4345*A9688M000 ²⁾ |
| | 10 000 | 91,0 × 144,5 | 16 | 16 | 70 | 25 | 48 | B4345*A9109M000 ²⁾ |
| | 12 000 | 76,9 × 220,7 | 14 | 14 | 50 | 31 | 46 | B4345*A9129M000 ²⁾ |
| | 15 000 | 91,0 × 221,0 | 11 | 11 | 70 | 35 | 54 | B4345*A9159M000 ²⁾ |
| 450 | 1 000 | 51,6 × 80,7 | 220 | 190 | 13 | 4,8 | 9,6 | B4345*A5108M000 |
| | 1 500 | 51,6 × 105,7 | 150 | 130 | 18 | 6,5 | 12 | B4345*A5158M000 |
| | 2 200 | 64,3 × 105,7 | 100 | 85 | 24 | 8,4 | 15 | B4345*A5228M000 ²⁾ |
| | 3 300 | 76,9 × 105,7 | 65 | 57 | 32 | 12 | 23 | B4345*A5338M000 ²⁾ |
| | 5 600 | 76,9 × 143,2 | 38 | 35 | 49 | 17 | 31 | B4345*A5568M000 ²⁾ |
| | 6 800 | 91,0 × 144,5 | 32 | 31 | 57 | 20 | 37 | B4345*A5688M000 ²⁾ |
| | 8 200 | 76,9 × 220,7 | 26 | 26 | 50 | 24 | 36 | B4345*A5828M000 ²⁾ |
| | 12 000 | 91,0 × 221,0 | 18 | 18 | 70 | 32 | 51 | B4345*A5129M000 ²⁾ |

Preferred types

1) * "6" = for capacitors with ring clip/clamp mounting

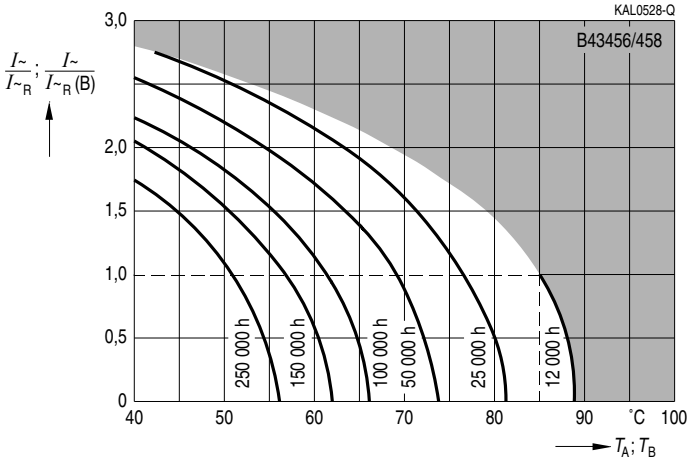
"8" = for capacitors with threaded stud

2) For 2-pad solution (types without threaded stud) and for low-inductance design, see page 128.

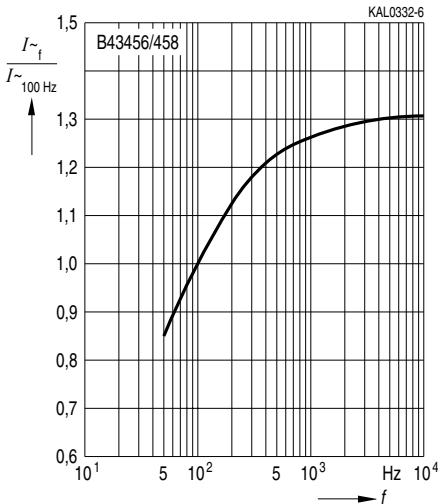


Useful life

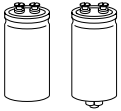
depending on ambient temperature T_A (for natural cooling) and versus temperature of case base T_B (for base cooling) under ripple current operating conditions¹⁾



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



1) The ripple current refers to $I_{\sim R}$ for natural cooling or to $I_{\sim R}(B)$ for base cooling, respectively. Refer to page 40 for an explanation on how to interpret the useful life graphs.

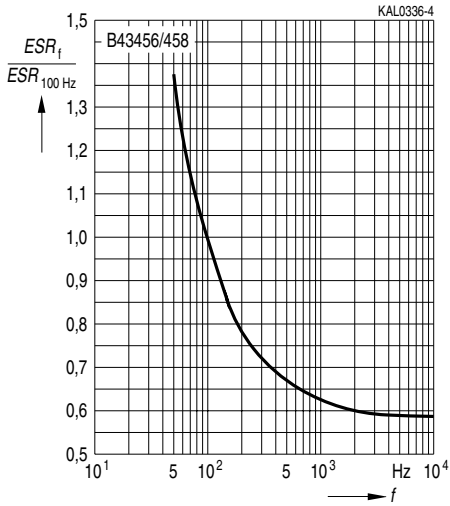


B43456 / B43458

Compact – 85 °C

Frequency characteristics of ESR

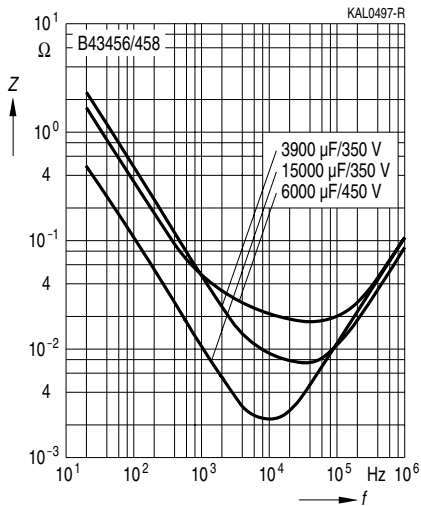
Typical behavior



Impedance Z

versus frequency f

Typical behavior at 20 °C



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