

## Long-life grade capacitors

### Applications

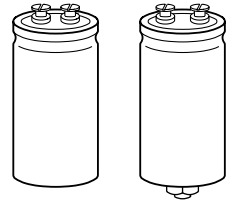
- Frequency converters

### Features

- Extended useful life, high reliability
- Good electrical characteristics and small dimensions
- Extremely high 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
- Self-extinguishing electrolyte

### Construction

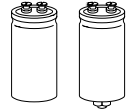
- Charge-discharge proof, polar
- Aluminum case with insulating sleeve
- Poles with screw terminal connections
- Mounting with ring clips, clamps or threaded stud
- The bases of types with threaded stud and  $d \leq 76,9$  mm are not insulated, types with  $d = 91$  mm have fully insulated bases



B43566

KAL0567-B

B43586


**Specifications and characteristics in brief**

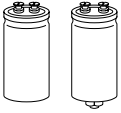
|   |   |   |  |
|---|---|---|--|
| Rated voltage $U_R$   | 350 ... 450 VDC   |   |  |
| Surge voltage $U_S$   | $1,10 \cdot U_R$  |   |  |
| Rated capacitance $C_R$   | 470 ... 6 800 $\mu\text{F}$   |   |  |
| Capacitance tolerance   | – 10/+ 30 % $\triangleq$ Q  |   |  |
| Leakage current $I_L$<br>(5 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 $ESL$   | $d = 51,6 \text{ mm}$ : approx. 15 nH<br>$d = 76,9 \text{ mm}$ : approx. 20 nH<br>$d = 91,0 \text{ mm}$ : approx. 20 nH<br>Capacitors with low-inductance design:<br>$d \geq 64,3 \text{ mm}$ : approx. 13 nH |   |  |
| Useful life<br>85 °C; $U_R$ ; $I_{\sim R}$<br>40 °C; $U_R$ ; $2 \cdot I_{\sim R}$ | $> 24\,000 \text{ h}$<br>$> 250\,000 \text{ h}$   | Requirements:<br>$\Delta C/C \leq \pm 30\%$ of initial value<br>$ESR \leq 3$ times initial specified limit<br>$I_L \leq$ initial specified limit<br>Failure percentage: $\leq 1\%$<br>Failure rate: $\leq 30 \text{ fit} (\leq 30 \cdot 10^{-9}/\text{h})$<br>(for definition "fit", refer to chapter "Quality", page 62) |  |
| Voltage endurance test<br>85 °C; $U_R$ ; $I_{\sim R}$                             | 5 000 h   | Post test requirements:<br>$\Delta C/C \leq \pm 10\%$ of initial value<br>$ESR \leq 1,3$ times initial specified limit<br>$I_L \leq$ initial specified limit  |  |
| Vibration resistance  | To IEC 60068-2-6, test Fc:<br>displacement amplitude 0,75 mm, frequency range 10 to 55 Hz,<br>acceleration max. 10 g, duration $3 \times 2 \text{ h}$   |   |  |
| IEC climatic category   | To IEC 60068-1:<br>350 VDC: 40/085/56 (– 40 °C/+ 85 °C/56 days damp heat test) <sup>1)</sup><br>$\geq 400 \text{ VDC}$ : 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    |

1) For case dimensions 76,9 mm  $\times$  220,7 mm: IEC climatic category 25/085/56



B43566 / B43586

Extended Useful Life – 85 °C

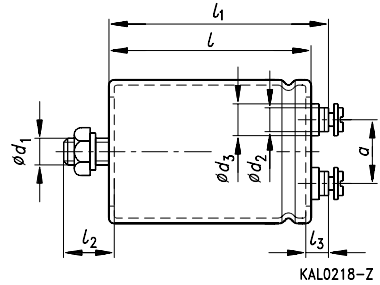
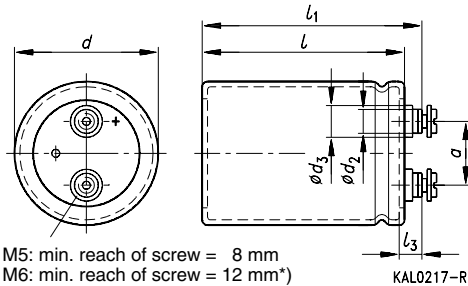
### Dimensional drawings

#### Type B43566

Ring clip/clamp mounting

#### Type B43586

Threaded stud mounting



Positive pole marking: +

The base of all 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.

### Dimensions and weights

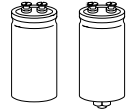
| Ter-<br>minal | Dimensions (mm) with insulating sleeve |           |             |                 |                |       |           |           |                   |      | Approx.<br>wt. (g) |
|---------------|--|-----------|-------------|-----------------|----------------|-------|-----------|-----------|-------------------|------|--------------------|
|               | $d$                                    | $l \pm 1$ | $l_1 \pm 1$ | $l_2^{+0}_{-1}$ | $l_3$          | $d_1$ | $d_2$ max | $d_3$ max | $a^{+0,2}_{-0,4}$ |      |                    |
| 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 |                    |

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

### Packing

For ecological reasons the packing is pure cardboard.

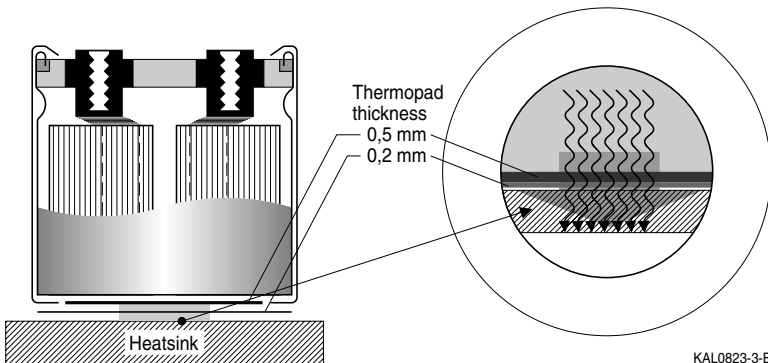
| Capacitor diameter $d$ | Packing units (pieces) |
|------------------------|------------------------|
| 51,6 mm                | 22                     |
| 64,3 mm                | 15                     |
| 76,9 mm                | 12                     |
| 91,0 mm                | 8            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



### 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) | Q003   | For capacitors with diameter $d \geq 64,3$ mm                           |
| 2-pad solution         | Q006   | 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

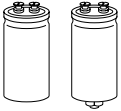
Clamps for capacitors with  $d \geq 64,3$  mm

Insulating parts

B44030 (cf. page 169)

B44030 (cf. page 173)

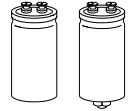
B44020 (cf. page 166)



**Overview of available types**

| $U_R$ (VDC) | 350                               | 400                          | 450          |
|-------------|-----------------------------------|------------------------------|--------------|
| $C_R$ (μF)  | Case dimensions $d \times l$ (mm) |                              |              |
| 470         |                                   | 51,6 × 80,7                  | 51,6 × 80,7  |
| 680         | 51,6 × 80,7                       | 51,6 × 80,7                  | 51,6 × 105,7 |
| 1 000       | 51,6 × 80,7                       | 51,6 × 105,7                 | 64,3 × 105,7 |
| 1 500       | 51,6 × 105,7                      | 64,3 × 105,7                 | 76,9 × 105,7 |
| 2 200       | 64,3 × 105,7                      | 76,9 × 105,7                 | 76,9 × 143,2 |
| 2 700       |                                   |                              | 91,0 × 144,5 |
| 3 300       | 76,9 × 105,7                      | 76,9 × 143,2                 | 76,9 × 220,7 |
| 4 700       | 76,9 × 143,2                      | 76,9 × 220,7<br>91,0 × 144,5 |              |
| 6 000       | 76,9 × 220,7<br>91,0 × 144,5      | 76,9 × 220,7                 |              |
| 6 800       | 76,9 × 220,7                      |                              |              |

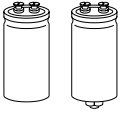
The capacitance and voltage ratings listed above are available in different cases upon request. Other voltage and capacitance ratings are also available upon request.


**Technical data and ordering codes**

| $U_R$ | $C_R$                      | Case dimensions    | $ESR_{max}$                   | $Z_{max}$                     | $I_{\sim max}$       | $I_{\sim max}$       | $I_{\sim R}$         | $I_{\sim R(B)}$      | Ordering code <sup>1)</sup>   |
|-------|----------------------------|--------------------|-------------------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
| VDC   | 100 Hz<br>20 °C<br>$\mu F$ | $d \times l$<br>mm | 100 Hz<br>20 °C<br>m $\Omega$ | 10 kHz<br>20 °C<br>m $\Omega$ | 100 Hz<br>40 °C<br>A | 100 Hz<br>85 °C<br>A | 100 Hz<br>85 °C<br>A | 100 Hz<br>85 °C<br>A |                               |
| 350   | 680                        | 51,6 × 80,7        | 120                           | 100                           | 13                   | 5,0                  | 4,4                  | 8,0                  | B435*6A4687Q000               |
|       | 1 000                      | 51,6 × 80,7        | 84                            | 73                            | 16                   | 6,3                  | 5,6                  | 12                   | B435*6B4108Q000               |
|       | 1 500                      | 51,6 × 105,7       | 59                            | 52                            | 21                   | 8,3                  | 7,3                  | 14                   | B435*6B4158Q000               |
|       | 2 200                      | 64,3 × 105,7       | 43                            | 39                            | 28                   | 11                   | 9,4                  | 17                   | B435*6A4228Q000 <sup>2)</sup> |
|       | 3 300                      | 76,9 × 105,7       | 32                            | 29                            | 33                   | 13                   | 12                   | 21                   | B435*6A4338Q000 <sup>2)</sup> |
|       | 4 700                      | 76,9 × 143,2       | 25                            | 23                            | 44                   | 17                   | 15                   | 27                   | B435*6A4478Q000 <sup>2)</sup> |
|       | 6 000                      | 76,9 × 220,7       | 22                            | 21                            | 50                   | 20                   | 18                   | 25                   | B435*6B4608Q000 <sup>2)</sup> |
|       | 6 000                      | 91,0 × 144,5       | 23                            | 22                            | 51                   | 20                   | 18                   | 32                   | B435*6J4608Q000 <sup>2)</sup> |
|       | 6 800                      | 76,9 × 220,7       | 20                            | 19                            | 50                   | 22                   | 19                   | 28                   | B435*6B4688Q000 <sup>2)</sup> |
| 400   | 470                        | 51,6 × 80,7        | 325                           | 290                           | 10                   | 4,0                  | 3,5                  | 6,2                  | B435*6A0477Q000               |
|       | 680                        | 51,6 × 80,7        | 225                           | 200                           | 13                   | 5,1                  | 4,5                  | 9,0                  | B435*6A0687Q000               |
|       | 1 000                      | 51,6 × 105,7       | 160                           | 140                           | 17                   | 6,6                  | 5,8                  | 11                   | B435*6A0108Q000               |
|       | 1 500                      | 64,3 × 105,7       | 100                           | 92                            | 22                   | 8,5                  | 7,5                  | 13                   | B435*6A0158Q000 <sup>2)</sup> |
|       | 2 200                      | 76,9 × 105,7       | 83                            | 65                            | 29                   | 11                   | 9,9                  | 19                   | B435*6A0228Q000 <sup>2)</sup> |
|       | 3 300                      | 76,9 × 143,2       | 58                            | 47                            | 38                   | 15                   | 13                   | 23                   | B435*6A0338Q000 <sup>2)</sup> |
|       | 4 700                      | 76,9 × 220,7       | 43                            | 40                            | 50                   | 19                   | 17                   | 24                   | B435*6A0478Q000 <sup>2)</sup> |
|       | 4 700                      | 91,0 × 144,5       | 38                            | 40                            | 53                   | 21                   | 18                   | 34                   | B435*6J0478Q000 <sup>2)</sup> |
|       | 6 000                      | 76,9 × 220,7       | 35                            | 33                            | 50                   | 24                   | 21                   | 31                   | B435*6A0608Q000 <sup>2)</sup> |
| 450   | 470                        | 51,6 × 80,7        | 350                           | 310                           | 11                   | 4,2                  | 3,7                  | 7,4                  | B435*6A5477Q000               |
|       | 680                        | 51,6 × 105,7       | 250                           | 220                           | 14                   | 5,4                  | 4,8                  | 8,6                  | B435*6A5687Q000               |
|       | 1 000                      | 64,3 × 105,7       | 190                           | 173                           | 17                   | 6,7                  | 6,0                  | 11                   | B435*6A5108Q000 <sup>2)</sup> |
|       | 1 500                      | 76,9 × 105,7       | 125                           | 120                           | 24                   | 9,3                  | 8,2                  | 16                   | B435*6A5158Q000 <sup>2)</sup> |
|       | 2 200                      | 76,9 × 143,2       | 95                            | 90                            | 30                   | 12                   | 10                   | 17                   | B435*6A5228Q000 <sup>2)</sup> |
|       | 2 700                      | 91,0 × 144,5       | 75                            | 83                            | 36                   | 14                   | 12                   | 21                   | B435*6A5278Q000 <sup>2)</sup> |
|       | 3 300                      | 76,9 × 220,7       | 70                            | 67                            | 40                   | 15                   | 14                   | 19                   | B435*6A5338Q000 <sup>2)</sup> |

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 145.

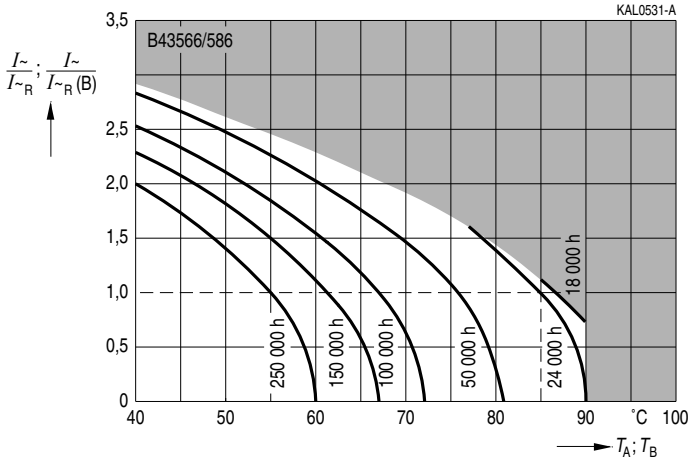


**B43566 / B43586**

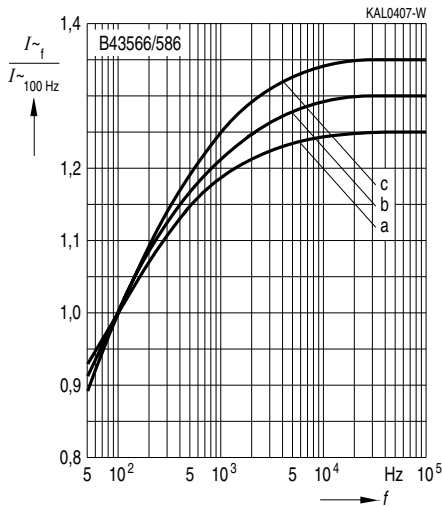
**Extended Useful Life – 85 °C**

**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 conditions<sup>1)</sup>

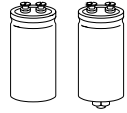


**Frequency factor of permissible ripple current  $I_{\sim}$  versus frequency  $f$**

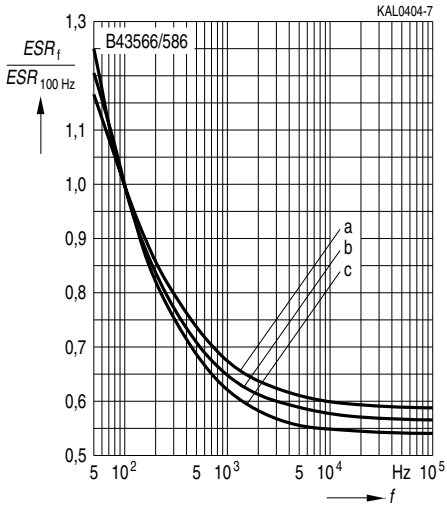


|          |      |      |      |      |
|----------|------|------|------|------|
| $d$ (mm) | 51,6 | 64,3 | 76,9 | 91,0 |
| Curve    | c    | b    | a    | c    |

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.



**Frequency characteristics of ESR**  
 Typical behavior



|               |      |      |      |      |
|---------------|------|------|------|------|
| <i>d</i> (mm) | 51,6 | 64,3 | 76,9 | 91,0 |
| Curve         | c    | b    | a    | a    |



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