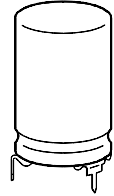


**LL grade**

**High reliability and long useful life**

**Construction**

- Charge-discharge proof, polar
- Aluminum case, partially insulated
- Solder pin terminals on mounting base that is securely welded to case, ensuring perfect electrical contact
- Positive pole connection brought out axially at center
- Negative pole connected to two or three solder pins of the mounting base



KAL0276-R

**Features**

- High reliability and long useful life
- Can be operated at temperatures of up to 105 °C 1)
- High parametric stability
- High vibration resistance
- Pinning ensures correct insertion

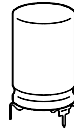
**Applications**

- Professional industrial electronics equipment
- Filtering, coupling and pulse circuits
- Automotive electronics

**Specifications and characteristics in brief**

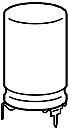
	B 41 593	B 43 593
Rated voltage $U_R$	10 ... 100 V–	160 ... 350 V–
Surge voltage $U_S$	$1,15 \cdot U_R$	$1,15 \cdot U_R$ (for $U_R \leq 250$ V–) $1,10 \cdot U_R$ (for $U_R = 350$ V–)
Rated capacitance $C_R$	47 ... 4 700 $\mu$ F	10 ... 220 $\mu$ F
Capacitance tolerance	– 10/+ 50 % $\triangleq$ T	– 10/+ 50 % $\triangleq$ T
Useful life		
40 °C, $U_R$	> 200 000 h ( $2,0 \cdot I_{-R,85^\circ C}$ )	> 200 000 h ( $1,7 \cdot I_{-R,85^\circ C}$ )
85 °C, $U_R$ ; $I_{-R}$	> 10 000 h	> 8 000 h
Failure percentage	$\leq 0,5$ % (during useful life)	$\leq 0,5$ % (during useful life)
Failure rate	$\leq 20$ fit ( $\leq 20 \cdot 10^{-9}$ /h)	$\leq 20$ fit ( $\leq 20 \cdot 10^{-9}$ /h)
Voltage endurance test	5 000 h, 85 °C (at $U_R$ )	5 000 h, 85 °C (at $U_R$ )

1) Operation at 105 °C and 0,6  $I_{-max, 85^\circ C}$  permissible for a total of 500 h.



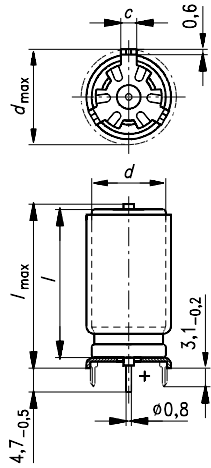
**Specifications and characteristics in brief**

	B 41 593			B 43 593			
Leakage current $I_{lka}$ (5 min, 20 °C)	$I_{lka} \leq 0,3 \mu A \cdot \left( \frac{C_R}{\mu F} \cdot \frac{U_R}{V} \right)^{0,7} + 4 \mu A$						
Self-inductance $L_{ESL}$	$d$ (mm)	12	14	16	18	21	25
	$l$ (mm)	30	30	30	39,5	40	40
	$L_{ESL}$ approx. (nH)	23	37	38	37	17	17
IEC climatic category	in accordance with IEC 68-1 40/085/56 (-40 °C/+85 °C, 56 days damp heat test)						
Detail specification	similar to CECC 30 301-049						
Sectional specification	IEC 384-4						
Vibration resistance	in accordance with IEC 68-2-6, test Fc: displacement amplitude 0,75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3 × 2 h						



**B 41 593**  
**B 43 593**

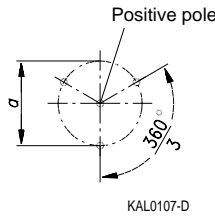
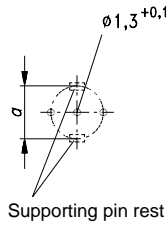
**Dimensional drawing**



Mounting holes  
 $d = 12 \dots 14 \text{ mm}$

$d = 16 \dots 25 \text{ mm}$

Soldering star and supports are connected to the negative pole



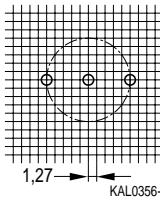
KAL0107-D

Dimensions (mm)				Approx weight (g)	Packing units (pieces)
$d \times l$	$d_{\max} \times l_{\max}$	$a \pm 0,1$	$c \pm 0,1$		
$12 \times 30$	$13,5 \times 33$	12,5	3,0	5,7	480
$14 \times 30$	$15,5 \times 33$	14,5		7,9	480
$16 \times 30$	$17,5 \times 33$	16,5		9,8	300
$18 \times 39,5$	$19,5 \times 40,8$	18,5		15	200
$21 \times 40$	$22,5 \times 42$	21,5	3,5	19	128
$25 \times 40$	$26,5 \times 42$	25,5		27	128

The PC-board hole arrangement specified above is based on circular arcs.

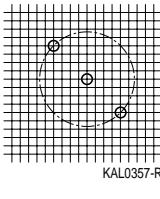
If, however, the mounting holes have to be matched to a standard drilling raster, a spacing of 1,27 mm ( $1/20''$ ) has proved to be sufficiently accurate if the following arrangements are used:

$d = 12 \text{ mm}$



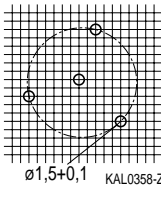
1,27 KAL0356-I

$d = 14 \text{ mm}$



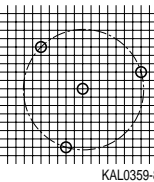
KAL0357-R

$d = 16 \text{ mm}$



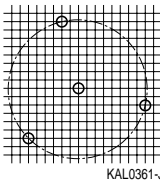
$\phi 1,5 \pm 0,1$  KAL0358-Z

$d = 18 \text{ mm}$



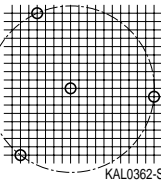
KAL0359-B

$d = 21 \text{ mm}$



KAL0361-J

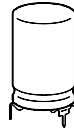
$d = 25 \text{ mm}$



KAL0362-S

Not for new design

For new design see types  
B 41 783/ 43 783, [page 311](#)



**Overview of available types**

**Type B 41 593**

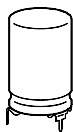
$U_R$ (V-)	10	16	25	40	63	100
$C_R$ ( $\mu$ F)	Case dimensions $d \times l$ (mm)					
47						12 × 30
100					12 × 30	16 × 30
220			12 × 30	12 × 30	16 × 30	18 × 39,5
470	12 × 30	12 × 30	14 × 30	16 × 30	21 × 40	25 × 40
1 000	14 × 30	16 × 30	18 × 39,5	21 × 40	25 × 40	
2 200	18 × 39,5	18 × 39,5	21 × 40	25 × 40		
4 700	25 × 40	25 × 40				

**Type B 43 593**

$U_R$ (V-)	160	250	350
$C_R$ ( $\mu$ F)	Case dimensions $d \times l$ (mm)		
10			12 × 30
22	12 × 30	14 × 30	14 × 30
47	14 × 30	16 × 30	18 × 39,5
100	18 × 39,5	21 × 40	25 × 40
220	25 × 40		

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

Not for new design.  
For new design see types B 41 783 (10 ... 100 V) and B 43 783 (160 ... 450 V), [page 311](#)



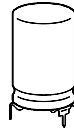
**B 41 593**  
**B 43 593**

**Technical data and ordering codes**

$U_R$	$C_R$	Case dimensions $d \times l$ mm	$R_{ESR, typ}$ 100 Hz 20 °C $\Omega$	$R_{ESR, max}$ 100 Hz 20 °C $\Omega$	$Z_{max}$ 10 kHz 20 °C $\Omega$	$I_{~max}$ 100 Hz 40 °C A	$I_{~R}$ 100 Hz 85 °C A	Ordering code <sup>1)</sup>  Short code
<b>B41593-</b>								
10	470	12 × 30	0,20	0,50	0,11	1,6	0,55	-A3477-T
	1 000	14 × 30	0,10	0,25	0,07	2,4	0,85	-J3108-T
	2 200	18 × 39,5	0,06	0,14	0,05	4,1	1,4	-A3228-T
	4 700	25 × 40	0,05	0,07	0,05	5,5	1,9	-A3478-T
16	470	12 × 30	0,18	0,45	0,11	1,7	0,57	-J4477-T
	1 000	16 × 30	0,10	0,25	0,06	2,7	0,92	-A4108-T
	2 200	18 × 39,5	0,06	0,12	0,05	4,1	1,4	-J4228-T
	4 700	25 × 40	0,05	0,06	0,05	5,5	1,9	-A4478-T
25	220	12 × 30	0,28	0,70	0,19	1,3	0,46	-A5227-T
	470	14 × 30	0,16	0,40	0,10	1,9	0,64	-J5477-T
	1 000	18 × 39,5	0,10	0,19	0,06	3,2	1,1	-J5108-T
	2 200	21 × 40	0,06	0,10	0,05	4,5	1,6	-A5228-T
40	220	12 × 30	0,25	0,63	0,18	1,4	0,49	-J7227-T
	470	16 × 30	0,13	0,33	0,10	2,2	0,77	-J7477-T
	1 000	21 × 40	0,07	0,16	0,06	4,0	1,4	-J7108-T
	2 200	25 × 40	0,04	0,08	0,05	5,9	2,0	-A7228-T
63	100	12 × 30	0,40	1,0	0,33	1,1	0,38	-J8107-T
	220	16 × 30	0,18	0,45	0,17	1,9	0,65	-J8227-T
	470	21 × 40	0,10	0,25	0,09	3,3	1,1	-J8477-T
	1 000	25 × 40	0,05	0,12	0,06	5,3	1,8	-A8108-T
100	47	12 × 30	0,60	1,5	0,62	0,90	0,31	-A9476-T
	100	16 × 30	0,32	0,80	0,31	1,4	0,49	-A9107-T
	220	18 × 39,5	0,16	0,40	0,15	2,4	0,83	-J9227-T
	470	25 × 40	0,09	0,23	0,09	4,1	1,4	-A9477-T

Not for new design. For new design see type B 41 783 (10 ... 100 V), [page 311](#)

1) To obtain the required ordering code, prefix the type number to the short code. E. g.: B41593-A3477-T

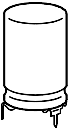


**Technical data and ordering codes**

$U_R$	$C_R$	Case dimensions $d \times l$ mm	$R_{ESR, typ}$ 100 Hz 20 °C $\Omega$	$R_{ESR, max}$ 100 Hz 20 °C $\Omega$	$Z_{max}$ 10 kHz 20 °C $\Omega$	$I_{\sim max}$ 100 Hz 40 °C A	$I_{\sim R}$ 100 Hz 85 °C A	Ordering code <sup>1)</sup>  Short code
<b>B43593-</b>								
160	22	12 × 30	3,6	8,0	3,3	0,38	0,13	-A1226-T
	47	14 × 30	1,7	3,8	1,6	0,58	0,20	-A1476-T
	100	18 × 39,5	0,8	1,8	0,75	1,11	0,38	-A1107-T
	220	25 × 40	0,36	0,80	0,35	2,0	0,68	-A1227-T
250	22	14 × 30	2,9	7,2	3,1	0,45	0,15	-A2226-T
	47	16 × 30	1,4	3,4	1,5	0,70	0,24	-A2476-T
	100	21 × 40	0,64	1,5	0,70	1,4	0,47	-A2107-T
350	10	12 × 30	4,8	12	6,4	0,33	0,11	-A4106-T
	22	14 × 30	2,2	5,5	2,9	0,51	0,18	-A4226-T
	47	18 × 39,5	1,0	2,5	1,4	1,0	0,34	-A4476-T
	100	25 × 40	0,48	1,3	0,67	1,7	0,59	-A4107-T

Not for new design. For new design see type B 43 783 (160 ... 450 V), [page 311](#)

1) To obtain the required ordering code, prefix the type number to the short code. E. g.: B43593-A1226-T

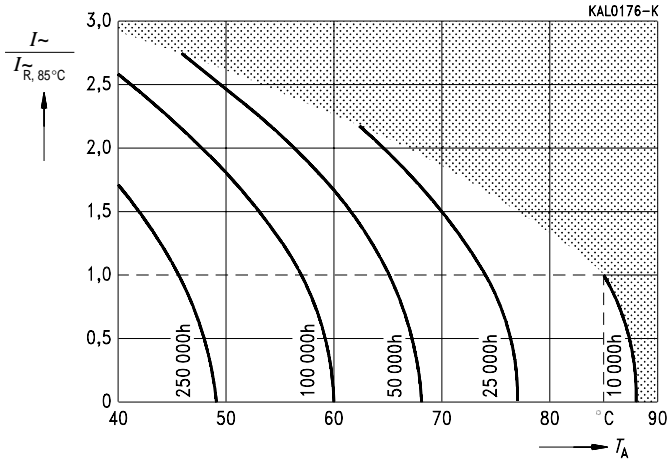


**B 41 593**  
**B 43 593**

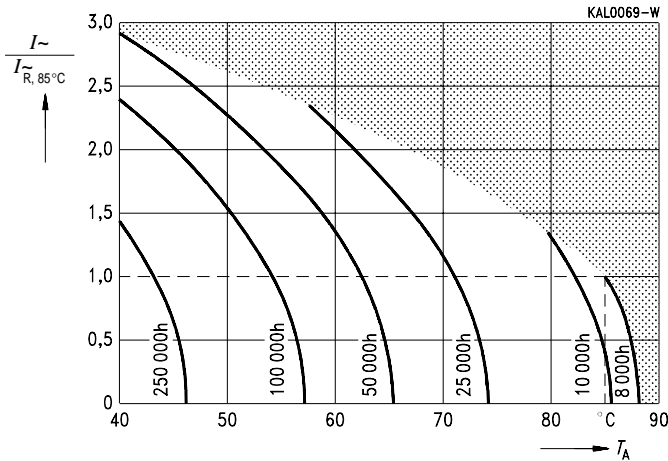
### Useful life

versus ambient temperature  $T_A$  under ripple current operating conditions<sup>1)</sup>

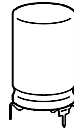
$U_R = 10 \dots 100 \text{ V-}$



$U_R = 160 \dots 350 \text{ V-}$

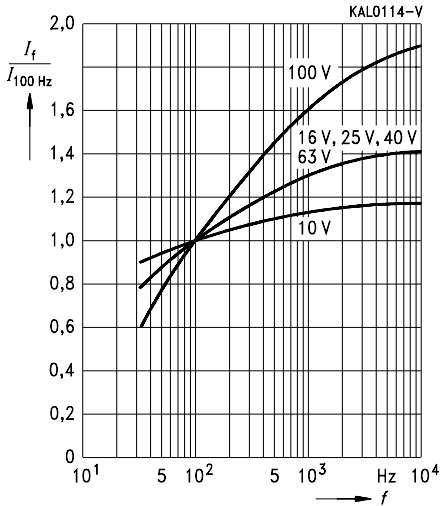


<sup>1)</sup> Refer to [page 34](#) for an explanation on how to interpret the useful life graphs.



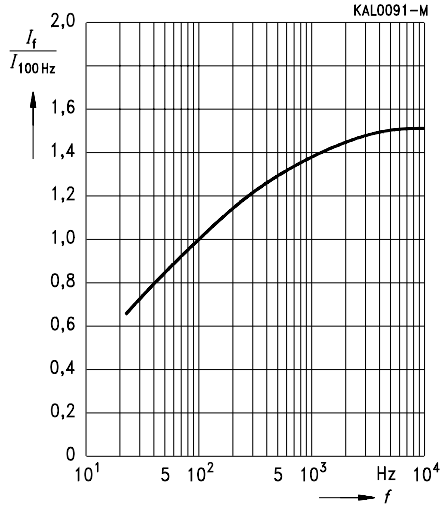
**Permissible ripple current  $I_r$**   
versus frequency  $f$

$U_R \leq 100 \text{ V-}$



**Permissible ripple current  $I_r$**   
versus frequency  $f$

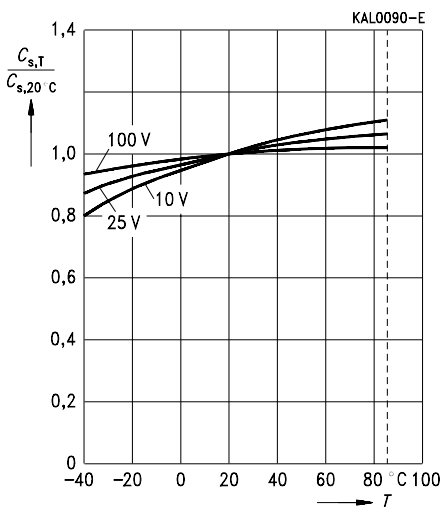
$U_R \geq 160 \text{ V-}$



**Series capacitance  $C_s$  at  $f = 100 \text{ Hz}$**   
versus temperature  $T$

Typical behavior

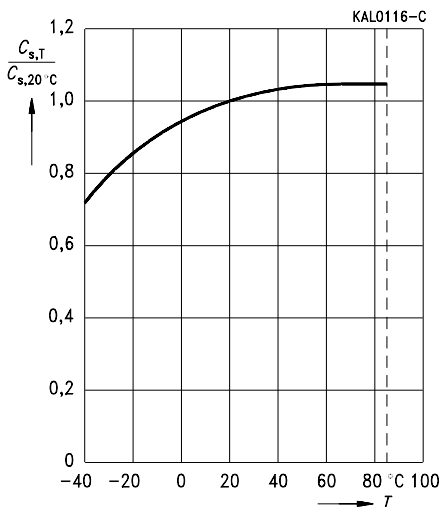
$U_R \leq 100 \text{ V-}$



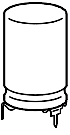
**Series capacitance  $C_s$  at  $f = 100 \text{ Hz}$**   
versus temperature  $T$

Typical behavior

$U_R \geq 160 \text{ V-}$







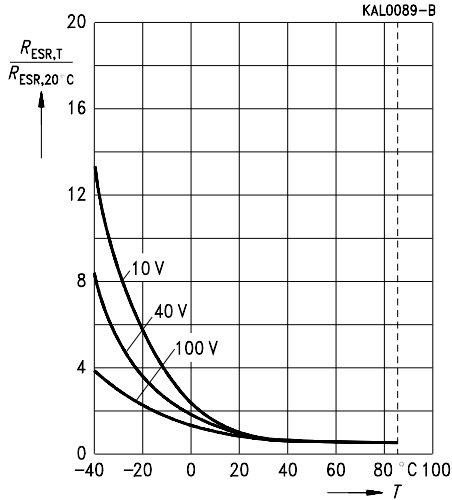
**B 41 593**  
**B 43 593**

**Equivalent series resistance  $R_{ESR}$**

at  $f = 100$  Hz versus temperature  $T$

Typical behavior

$U_R \leq 100$  V-

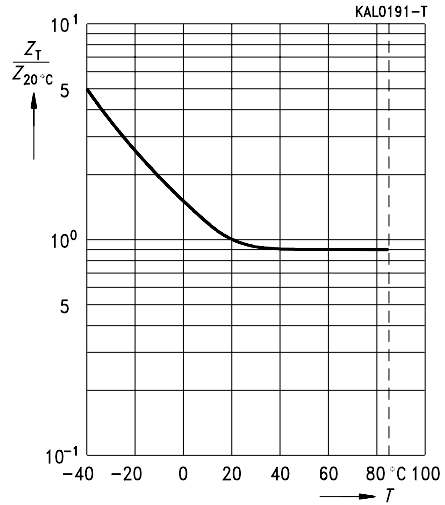


**Impedance  $Z$  at  $f = 100$  Hz**

versus temperature  $T$

Typical behavior

$U_R \geq 160$  V-

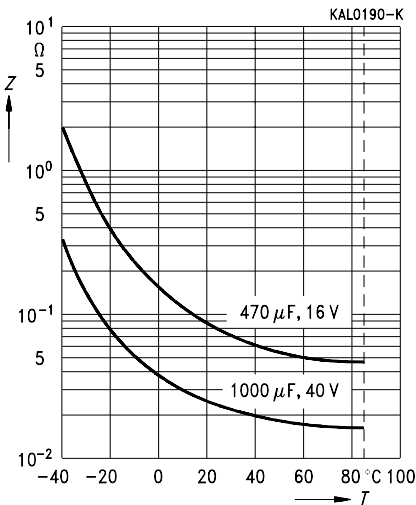


**Impedance  $Z$  at  $f = 10$  kHz**

versus temperature  $T$

Typical behavior

$U_R \leq 100$  V-

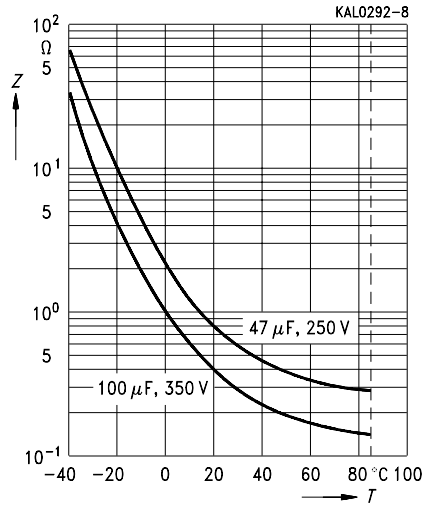


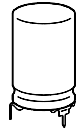
**Impedance  $Z$  at  $f = 10$  kHz**

versus temperature  $T$

Typical behavior

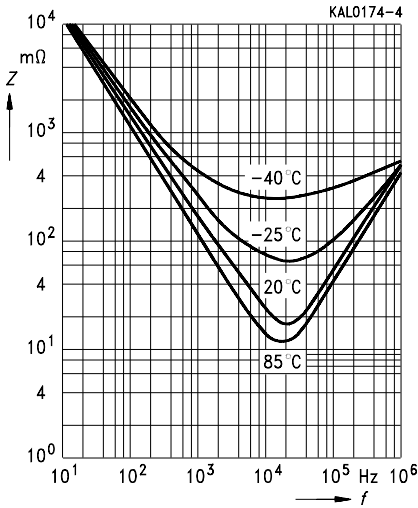
$U_R \geq 160$  V-





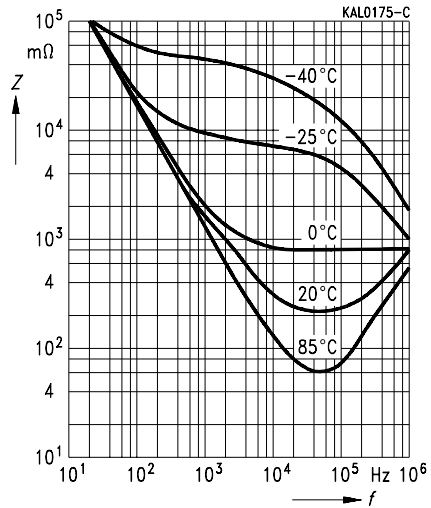
**Impedance  $Z$**

versus frequency  $f$   
and temperature  $T$  for 1000  $\mu\text{F}/40\text{ V}$ -  
Typical behavior



**Impedance  $Z$**

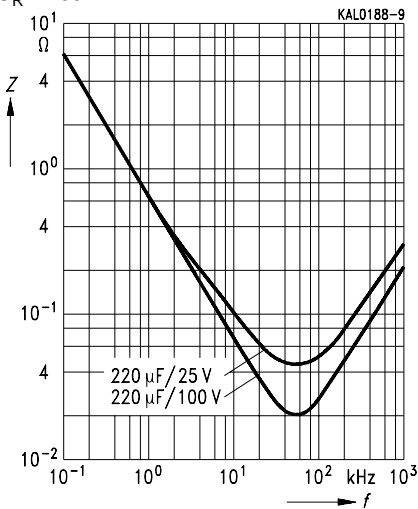
versus frequency  $f$   
and temperature  $T$  for 22  $\mu\text{F}/250\text{ V}$ -  
Typical behavior



**Impedance  $Z$**

versus frequency  $f$   
Typical values at 20 °C

$U_R \leq 100\text{ V}$ -



**Impedance  $Z$**

versus frequency  $f$   
Typical values at 20 °C

$U_R \geq 160\text{ V}$ -

