

General information

When selecting lamps, the button/lens colour of the device should be taken into account.

transparent colours	Suitable for		
	Filament lamps	Neon lamps	LED
colourless	limited	good	good
red	good	good	good
yellow	good	good	good
green	good	limited	limited
blue	limited	limited	good

transparent = clear, grooved on inside for better light diffusion

translucent = translucent but not clear

Operating life specifications of lamps refer to AC operation. For DC operation, these values are reduced by approximately 40%. (Operating life specifications: when not mounted).

Neon lamps: rated current tolerance +/- 30%

We recommend to combine coloured lenses with the corresponding LED colours in order to achieve a really intensive colour.

On the other hand, when combining e.g. a white LED with a coloured lens, this will produce a dim colour.

LED Protective Diode

LEDs may be damaged when anode and cathode are connected in a wrong way. An integrated protective diode protects the LED against wrong polarization.

CE-Conformity

Illumination like lamps and LEDs displays are exchangeable, overall available as merchandise and not steadily connected with the network – thus, the Low-voltage Directive 73/23/EWG does not apply.

EMC

The components of this catalogue are within the meaning of the law concerning the electromagnetic conformity (= EMC) "basic components as f. ex. switches, signal lamps or like" and, therefore, do not all within the scope of the EMC.

Declarations of Conformity

Declarations of conformity for lamps are not available.



General data

Luminous elements

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LED

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Filament/neon lamp



Accessories Filament/neon lamp

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Filament lamps, wedge base W 2 x 4.6d DIN 49846



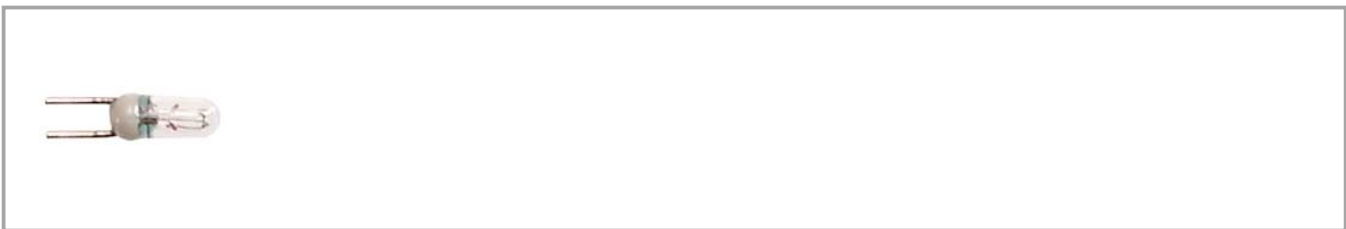
Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
6 V	0.2 A	1.2 W	5 mm	20 mm	20000 h	1.90.120.013/0000	1.90.900.003/0000
12 V	0.08 A	1.2 W	5 mm	20 mm	15000 h	1.90.120.012/0000	1.90.900.003/0000
24 - 30 V	0.04 A	1 W	5 mm	20 mm	1000 h	1.90.120.005/0000	1.90.900.003/0000
24 V	0.04 A	1.2 W	5 mm	20 mm	7000 h	1.90.120.011/0000	1.90.900.003/0000
48 V	0.025 A	1.2 W	5 mm	19 mm	2500 h	1.90.120.010/0000	1.90.900.003/0000
60 V	0.02 A	1.2 W	5 mm	19 mm	3300 h	1.90.120.009/0000	1.90.900.003/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

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Lamps

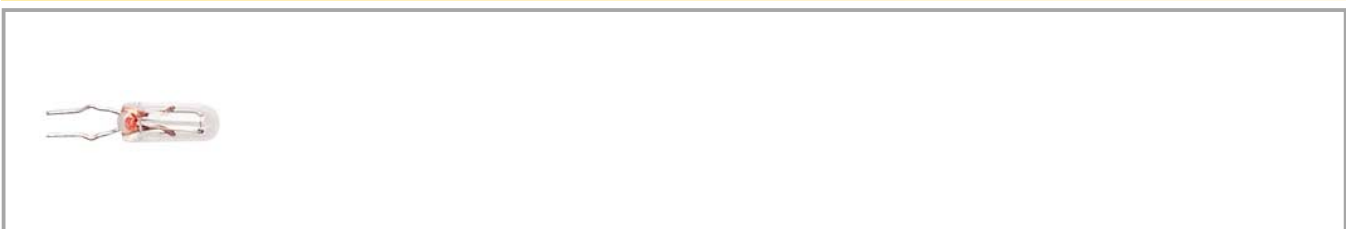
Filament lamps, Bi-Pin T 1 base



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 - 28 V	0.016 A	0.4 - 0.56 W			5000 h	1.90.180.473/0000	1.90.900.001/0000

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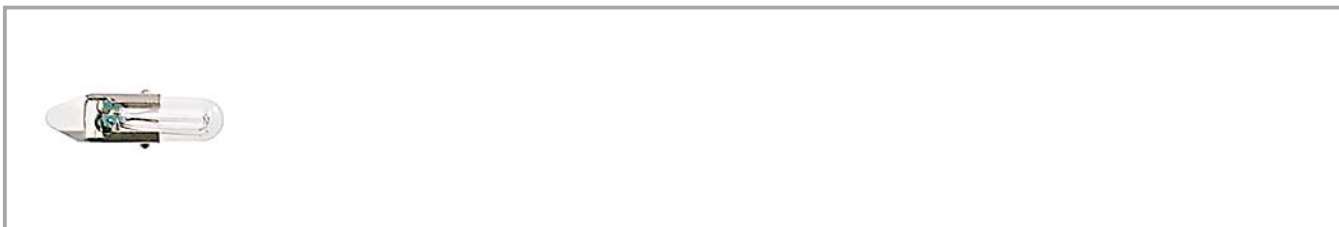
Filament lamps, Bi-Pin T 1/4 base



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
12 V	0.06 A	0.72 W	4.3 mm	10.5 mm	10000 h	1.90.180.474/0000	1.90.900.002/0000
28 V	0.03 A	0.84 W	4.3 mm	10.5 mm	5000 h	1.90.180.475/0000	1.90.900.002/0000

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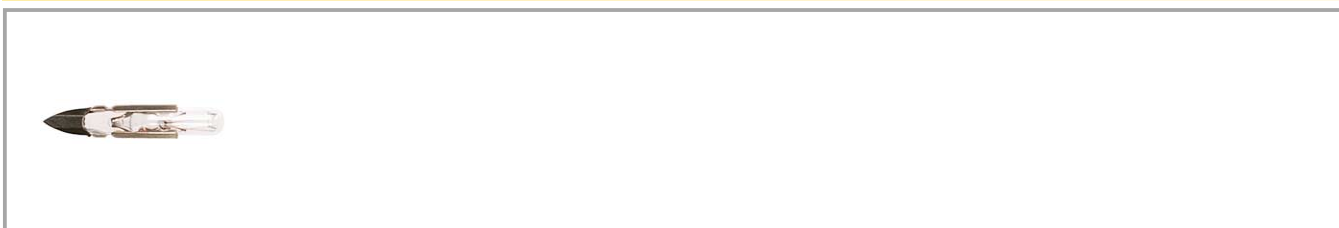
Filament lamps T 4.5



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
12 V	0.04 A	0.48 W	4.2 mm	16.5 mm	10000 h	1.90.100.022/0000	1.90.900.002/0000
24 V	0.02 A	0.48 W	4.2 mm	16.5 mm	8000 h	1.90.100.023/0000	1.90.900.002/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps T 4.6



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
12 V	0.04 A	0.3 W	4 mm	22 mm	5000 h	1.90.100.012/0000	1.90.900.002/0000
24 V	0.02 A	0.5 W	4 mm	22 mm	5000 h	1.90.100.013/0000	1.90.900.002/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps T 5.5



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 V	0.05 A	1.2 W	5 mm	22 mm	5000 h	1.90.101.054/0000	1.90.900.003/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps, BA 9s base (MBC/MCC), shape G, DIN 72601



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
12 - 15 V	0.12 A	1.2 W	9 mm	24 mm	10000 h	1.90.060.003/0000	1.90.900.006/0000
24 - 30 V	0.04 A	1.2 W	9 mm	24 mm	7000 h	1.90.060.014/0000	1.90.900.006/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

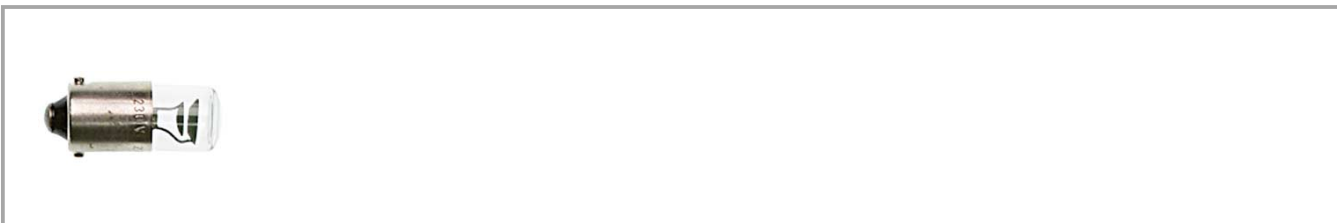
Filament lamps, BA 9s base (MBC/MCC), shape A, DIN 49851



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
12 - 15 V	0.166 A	2 W	11 mm	29 mm	10000 h	1.90.060.132/0000	1.90.900.007/0000
24 - 30 V	0.083 A	2 W	11 mm	29 mm	10000 h	1.90.060.133/0000	1.90.900.007/0000
110 - 130 V	0.018 A	2 W	11 mm	30 mm	25000 h	1.90.060.137/0000	1.90.900.007/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Neon lamps, BA 9s base (MBC/MCC)



Rated voltage	Rated current	Diameter max.	Length max.	Order no.	Accessory lamp extractor
220 AC V	0.0015 - 0.0018 A	10 mm	24 mm	1.90.560.002/0000	1.90.900.007/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Neon lamps, BA 9s base (MBC/MCC), DIN 49850



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
AC 220 V	0.0015 - 0.0018 A		10 mm	28 mm		1.90.560.102/0000	1.90.900.007/0000
AC 220 (green) V	0.0015 - 0.0018 A		10 mm	28 mm		1.90.560.104/0000	1.90.900.007/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.
Lamp 1.90.560.104/0000 should be used under green lenses.

Filament lamps, BA 15d base, DIN 49850



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
12 - 15 V	0.12 A	2 W	15.2/12.5 mm	31 mm	1000 h	1.90.070.003/0000	1.90.900.008/0000
24 - 30 V	0.08 A	2 W	15.2/12.5 mm	31 mm	1000 h	1.90.070.004/0000	1.90.900.008/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps, BA 15d base, DIN 49852



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 - 30 V	0.165 A	4 W	17 mm	57 mm	2000 h	1.90.070.105/0000	1.90.900.009/0000
220 - 260 V	0.023 A	5 W	17 mm	57 mm	2000 h	1.90.070.109/0000	1.90.900.009/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps, BA 15d base



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 V	0.2 A	5 W	16 mm	36 mm	2000 h	1.90.070.053/0000	1.90.900.009/0000
220 - 260 V	0,02 - 0,03 A	5 - 7 W	16 mm	36 mm	1000 h	1.90.070.061/0000	1.90.900.009/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps, E 10 (MES) base



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 - 30 V	0.083 A	2 W	11 mm	29 mm	1000 h	1.90.010.033/0000	1.90.900.007/0000
110 - 130 V	0.018 A	2 W	11 mm	30 mm	1000 h	1.90.010.037/0000	1.90.900.007/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Neon lamps, E 10 (MES) base



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
220 AC V	0.0015 - 0.0018 A		10.4 mm	28 mm		1.90.510.012/0000	1.90.900.006/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps, E 14 base, shape B, DIN 49850



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 - 30 V	0.083 A	2 W	14/12.5 mm	31 mm	1000 h	1.90.020.033/0000	1.90.900.008/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

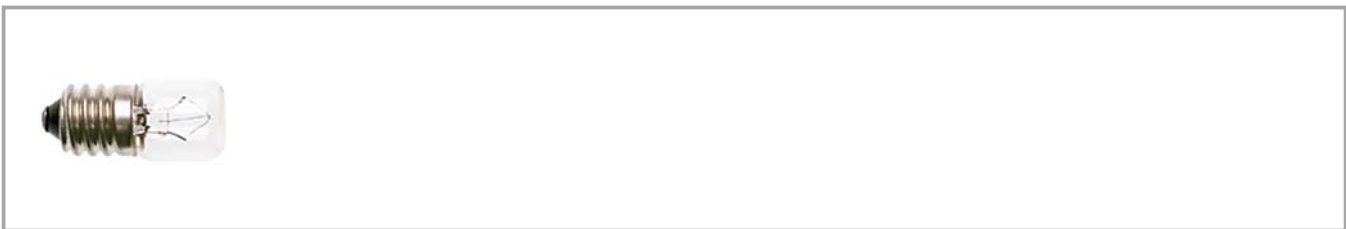
Filament lamps, E 14 base, shape A, DIN 49852



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 - 30 V	0.165 A	4 W	17 mm	57 mm	1000 h	1.90.020.105/0000	1.90.900.009/0000
220 - 260 V	0.023 A	5 W	17 mm	57 mm	1000 h	1.90.020.115/0000	1.90.900.009/0000

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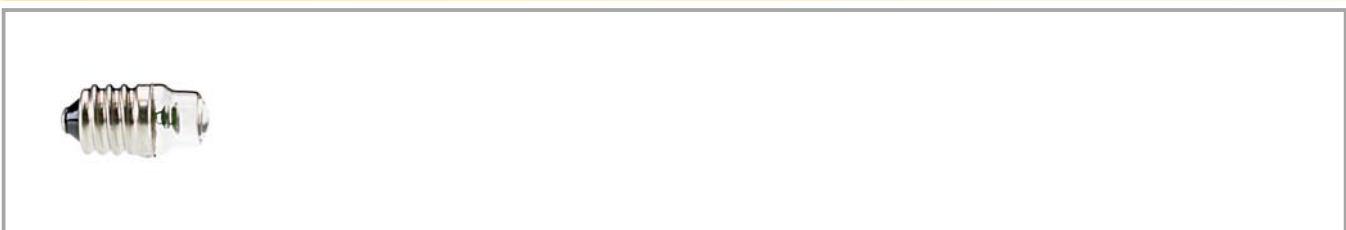
Filament lamps, E 14 base



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 V	0.2 A	5 W	16 mm	36 mm	2000 h	1.90.020.053/0000	1.90.900.009/0000
220 - 260 V	0,02 - 0,03 A	5 - 7 W	16 mm	36 mm	1000 h	1.90.020.061/0000	1.90.900.009/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

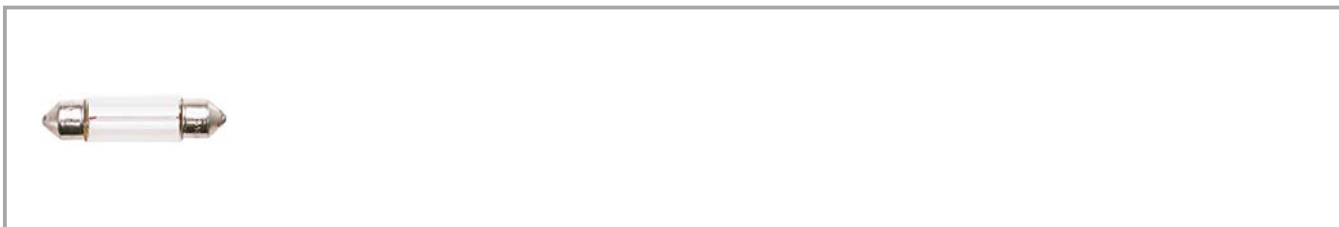
Neon lamps, E 14 base, shape B



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
220 AC V	0.0014 - 0.0026 A		14.1/11.5 mm	31 mm		1.90.520.002/0000	1.90.900.008/0000

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

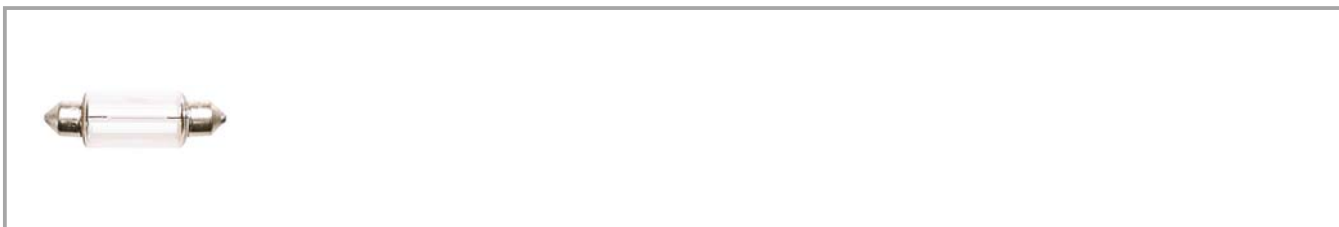
Filament lamps, tubular lamp, S 8.5 base, shape L, DIN 72601



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 V		3 W	11.5 mm	39 mm	200 h	1.90.111.003/0000	

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

Filament lamps, tubular lamp, S 8.5 base, shape K, DIN 72601



Rated voltage	Rated current	Rated power	Diameter max.	Length max.	Medium operating life AC	Order no.	Accessory lamp extractor
24 V		5 W	15.5 mm	44 mm	200 h	1.90.111.103/0000	

Ratings and operating life specifications generally refer to the lower rated voltage value. Operating life specifications of lamps refer to AC operation. With DC operation, these are reduced by about 40%.

LED



LED W 2 x 4.6d superbright



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
W 2 x 4.6d	red	24 V	12 mA	70 mcd	1.90.690.361/0000	1.90.900.003/0000
W 2 x 4.6d	green	24 V	12 mA	600 mcd	1.90.690.362/0000	1.90.900.003/0000
W 2 x 4.6d	yellow	24 V	12 mA	80 mcd	1.90.690.363/0000	1.90.900.003/0000
W 2 x 4.6d	blue	24 V	12 mA	300 mcd	1.90.690.364/0000	1.90.900.003/0000
W 2 x 4.6d	white	24 V	12 mA	400 mcd	1.90.690.365/0000	1.90.900.003/0000

All LEDs are provided with a protective diode. Operating temperature - 30 °C ... + 65 °C. For more intensive colours, please combine coloured lenses with suitable LED colours.

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Lamps

LED Bi-Pin T 1



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
Bi-Pin T 1	red	2 V	10 mA	26-52 mcd	1.90.691.026/0000	1.90.900.001/0000
Bi-Pin T 1	green	2 V	10 mA	9-33 mcd	1.90.691.027/0000	1.90.900.001/0000
Bi-Pin T 1	yellow	2 V	10 mA	26-52 mcd	1.90.691.028/0000	1.90.900.001/0000

Voltage U_B : External resistor: $R_V = (U_B - U_F) : I_F$

A suitable series resistor must be fitted externally.

Recommended resistor ratings:

- for 5 - 7 V = 270 Ω 0.25 W

- for 12 - 14 V = 680 Ω 0.50 W

- for 24 - 28 V = 1500 Ω 1.00 W

Forward voltage U_F : 2 V (3 V max.)

Reverse voltage U_R : 5 V

Reverse current I_R : 100 μ A.

Forward current: 10 mA

Operating temperature: -20°C ... +60°C

Storage temperature: -30°C ... +80°C

Operating life: 100,000 h at $T_U = 25^\circ\text{C}$

LED Bi-Pin T 1 superbright



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
Bi-Pin T 1	red	24 V	11 mA	70 mcd	1.90.690.351/0000	1.90.900.001/0000
Bi-Pin T 1	green	24 V	11 mA	600 mcd	1.90.690.352/0000	1.90.900.001/0000
Bi-Pin T 1	yellow	24 V	11 mA	80 mcd	1.90.690.353/0000	1.90.900.001/0000
Bi-Pin T 1	blue	24 V	11 mA	300 mcd	1.90.690.354/0000	1.90.900.001/0000
Bi-Pin T 1	white	24 V	11 mA	400 mcd	1.90.690.355/0000	1.90.900.001/0000

All LEDs are provided with a protective diode. Operating temperature - 30 °C ... + 65 °C.
For more intensive colours, please combine coloured lenses with suitable LED colours.

LED T 4.5



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
T 4.5	red	2 - 3 V	10 mA	26-52 mcd	1.90.692.001/0000	
T 4.5	green	2 - 3 V	10 mA	9-33 mcd	1.90.692.002/0000	
T 4.5	yellow	2 - 3 V	10 mA	26-52 mcd	1.90.692.003/0000	

Voltage U_B : External resistor: $R_V = (U_B - U_F) : I_F$

A suitable series resistor must be fitted externally.

Recommended resistor ratings:

-for 5 - 7 V = 270 Ω 0.25 W

-for 12 - 14 V = 680 Ω 0.50 W

-for 24 - 28 V = 1500 Ω 1.00 W

Forward voltage U_F : 2 V (3 V max.)

Reverse voltage U_R : 5 V

Reverse current I_R : 100 μ A.

Forward current: 10 mA

Operating temperature: -20°C ... +60°C

Storage temperature: -30°C ... +80°C

Operating life: 100,000 h at $T_U = 25^\circ\text{C}$

LED T 4.5 superbright



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
T 4.5	red	24 V	13 mA	90 mcd	1.90.690.331/0000	1.90.900.004/0000
T 4.5	green	24 V	13 mA	700 mcd	1.90.690.332/0000	1.90.900.004/0000
T 4.5	yellow	24 V	13 mA	100 mcd	1.90.690.333/0000	1.90.900.004/0000
T 4.5	blue	24 V	13 mA	380 mcd	1.90.690.334/0000	1.90.900.004/0000
T 4.5	white	24 V	13 mA	500 mcd	1.90.690.335/0000	1.90.900.004/0000

All LEDs are provided with a protective diode. Operating temperature - 30 °C ... + 65 °C.
For more intensive colours, please combine coloured lenses with suitable LED colours.

LED BA 9s (MBC/MCC) superbright



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
BA 9 s	red	24 V	15 mA	250 mcd	1.90.690.341/0000	1.90.900.007/0000
BA 9 s	green	24 V	15 mA	1000 mcd	1.90.690.342/0000	1.90.900.007/0000
BA 9 s	yellow	24 V	15 mA	250 mcd	1.90.690.343/0000	1.90.900.007/0000
BA 9 s	blue	24 V	15 mA	450 mcd	1.90.690.344/0000	1.90.900.007/0000
BA 9 s	white	24 V	15 mA	600 mcd	1.90.690.345/0000	1.90.900.007/0000

All LEDs are provided with a protective diode. Operating temperature - 30 °C ... + 65 °C.
For more intensive colours, please combine coloured lenses with suitable LED colours.

LED E 10 (MES) superbright



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
E 10	red	24 V	15 mA	250 mcd	1.90.690.371/0000	1.90.900.007/0000
E 10	green	24 V	15 mA	1000 mcd	1.90.690.372/0000	1.90.900.007/0000
E 10	yellow	24 V	15 mA	250 mcd	1.90.690.373/0000	1.90.900.007/0000
E 10	blue	24 V	15 mA	450 mcd	1.90.690.374/0000	1.90.900.007/0000
E 10	white	24 V	15 mA	600 mcd	1.90.690.375/0000	1.90.900.007/0000

All LEDs are provided with a protective diode. Operating temperature - 30 °C ... + 65 °C.
For more intensive colours, please combine coloured lenses with suitable LED colours.

LED 3 mm, without base



Socket	Colour	Forward voltage typ. U_F at I_F	Max. current, I_F	Light intensity	Order no.	Accessory lamp extractor
without socket	red	1.6 V/1 mA V	30 mA		1.90.690.228/0000	
without socket	yellow	2 V/10 mA V	20 mA		1.90.690.103/0000	
without socket	yellow	1.9 V/20 mA V	50 mA		1.90.690.267/0000	
without socket	red	1.9 V/20 mA V	50 mA		1.90.690.269/0000	
without socket	blue	3.6 V/20 mA V	30 mA		1.90.690.282/0000	
without socket	green	3.5 V/20 mA V	30 mA		1.90.690.285/0000	
without socket	white	3.6 V/20 mA V	30 mA		1.90.690.295/0000	