

## 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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## Filament/neon lamp



## Accessories Filament/neon lamp

| Description                            | Photo                                                                                | Order no.                | Page   |
|----------------------------------------|--------------------------------------------------------------------------------------|--------------------------|--------|
| Lamp extractor for lamp diameter 11 mm |  | <b>1.90.900.007/0000</b> | 5 - 22 |

## 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                  | <b>1.90.120.013/0000</b> | <b>1.90.900.003/0000</b> |
| 12 V          | 0.08 A        | 1.2 W       | 5 mm          | 20 mm       | 15000 h                  | <b>1.90.120.012/0000</b> | <b>1.90.900.003/0000</b> |
| 24 - 30 V     | 0.04 A        | 1 W         | 5 mm          | 20 mm       | 1000 h                   | <b>1.90.120.005/0000</b> | <b>1.90.900.003/0000</b> |
| 24 V          | 0.04 A        | 1.2 W       | 5 mm          | 20 mm       | 7000 h                   | <b>1.90.120.011/0000</b> | <b>1.90.900.003/0000</b> |
| 48 V          | 0.025 A       | 1.2 W       | 5 mm          | 19 mm       | 2500 h                   | <b>1.90.120.010/0000</b> | <b>1.90.900.003/0000</b> |
| 60 V          | 0.02 A        | 1.2 W       | 5 mm          | 19 mm       | 3300 h                   | <b>1.90.120.009/0000</b> | <b>1.90.900.003/0000</b> |

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, 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                   | <b>1.90.180.473/0000</b> | <b>1.90.900.001/0000</b> |

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, 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                  | <b>1.90.180.474/0000</b> | <b>1.90.900.002/0000</b> |
| 28 V          | 0.03 A        | 0.84 W      | 4.3 mm        | 10.5 mm     | 5000 h                   | <b>1.90.180.475/0000</b> | <b>1.90.900.002/0000</b> |

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 4.5



| 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                  | <b>1.90.100.022/0000</b> | <b>1.90.900.002/0000</b> |
| 24 V          | 0.02 A        | 0.48 W      | 4.2 mm        | 16.5 mm     | 8000 h                   | <b>1.90.100.023/0000</b> | <b>1.90.900.002/0000</b> |

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                   | <b>1.90.100.012/0000</b> | <b>1.90.900.002/0000</b> |
| 24 V          | 0.02 A        | 0.5 W       | 4 mm          | 22 mm       | 5000 h                   | <b>1.90.100.013/0000</b> | <b>1.90.900.002/0000</b> |

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                   | <b>1.90.101.054/0000</b> | <b>1.90.900.003/0000</b> |

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                  | <b>1.90.060.003/0000</b> | <b>1.90.900.006/0000</b> |
| 24 - 30 V     | 0.04 A        | 1.2 W       | 9 mm          | 24 mm       | 7000 h                   | <b>1.90.060.014/0000</b> | <b>1.90.900.006/0000</b> |

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                  | <b>1.90.060.132/0000</b> | <b>1.90.900.007/0000</b> |
| 24 - 30 V     | 0.083 A       | 2 W         | 11 mm         | 29 mm       | 10000 h                  | <b>1.90.060.133/0000</b> | <b>1.90.900.007/0000</b> |
| 110 - 130 V   | 0.018 A       | 2 W         | 11 mm         | 30 mm       | 25000 h                  | <b>1.90.060.137/0000</b> | <b>1.90.900.007/0000</b> |

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       | <b>1.90.560.002/0000</b> | <b>1.90.900.007/0000</b> |

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       |                          | <b>1.90.560.102/0000</b> | <b>1.90.900.007/0000</b> |
| AC 220 (green) V | 0.0015 - 0.0018 A |             | 10 mm         | 28 mm       |                          | <b>1.90.560.104/0000</b> | <b>1.90.900.007/0000</b> |

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                   | <b>1.90.070.003/0000</b> | <b>1.90.900.008/0000</b> |
| 24 - 30 V     | 0.08 A        | 2 W         | 15.2/12.5 mm  | 31 mm       | 1000 h                   | <b>1.90.070.004/0000</b> | <b>1.90.900.008/0000</b> |

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%.

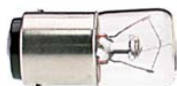
## Filament lamps, BA 15d base, DIN 49852



| 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                   | <b>1.90.070.105/0000</b> | <b>1.90.900.009/0000</b> |
| 220 - 260 V   | 0.023 A       | 5 W         | 17 mm         | 57 mm       | 2000 h                   | <b>1.90.070.109/0000</b> | <b>1.90.900.009/0000</b> |

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                   | <b>1.90.070.053/0000</b> | <b>1.90.900.009/0000</b> |
| 220 - 260 V   | 0,02 - 0,03 A | 5 - 7 W     | 16 mm         | 36 mm       | 1000 h                   | <b>1.90.070.061/0000</b> | <b>1.90.900.009/0000</b> |

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                   | <b>1.90.010.033/0000</b> | <b>1.90.900.007/0000</b> |
| 110 - 130 V   | 0.018 A       | 2 W         | 11 mm         | 30 mm       | 1000 h                   | <b>1.90.010.037/0000</b> | <b>1.90.900.007/0000</b> |

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       |                          | <b>1.90.510.012/0000</b> | <b>1.90.900.006/0000</b> |

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                   | <b>1.90.020.033/0000</b> | <b>1.90.900.008/0000</b> |

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                   | <b>1.90.020.105/0000</b> | <b>1.90.900.009/0000</b> |
| 220 - 260 V   | 0.023 A       | 5 W         | 17 mm         | 57 mm       | 1000 h                   | <b>1.90.020.115/0000</b> | <b>1.90.900.009/0000</b> |

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



| 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                   | <b>1.90.020.053/0000</b> | <b>1.90.900.009/0000</b> |
| 220 - 260 V   | 0,02 - 0,03 A | 5 - 7 W     | 16 mm         | 36 mm       | 1000 h                   | <b>1.90.020.061/0000</b> | <b>1.90.900.009/0000</b> |

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       |                          | <b>1.90.520.002/0000</b> | <b>1.90.900.008/0000</b> |

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                    | <b>1.90.111.003/0000</b> |                          |

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                    | <b>1.90.111.103/0000</b> |                          |

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<br>typ. $U_F$ at $I_F$ | Max. current, $I_F$ | Light intensity | Order no.                | Accessory<br>lamp extractor |
|------------|--------|----------------------------------------|---------------------|-----------------|--------------------------|-----------------------------|
| W 2 x 4.6d | red    | 24 V                                   | 12 mA               | 70 mcd          | <b>1.90.690.361/0000</b> | <b>1.90.900.003/0000</b>    |
| W 2 x 4.6d | green  | 24 V                                   | 12 mA               | 600 mcd         | <b>1.90.690.362/0000</b> | <b>1.90.900.003/0000</b>    |
| W 2 x 4.6d | yellow | 24 V                                   | 12 mA               | 80 mcd          | <b>1.90.690.363/0000</b> | <b>1.90.900.003/0000</b>    |
| W 2 x 4.6d | blue   | 24 V                                   | 12 mA               | 300 mcd         | <b>1.90.690.364/0000</b> | <b>1.90.900.003/0000</b>    |
| W 2 x 4.6d | white  | 24 V                                   | 12 mA               | 400 mcd         | <b>1.90.690.365/0000</b> | <b>1.90.900.003/0000</b>    |

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 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       | <b>1.90.691.026/0000</b> | <b>1.90.900.001/0000</b> |
| Bi-Pin T 1 | green  | 2 V                                 | 10 mA               | 9-33 mcd        | <b>1.90.691.027/0000</b> | <b>1.90.900.001/0000</b> |
| Bi-Pin T 1 | yellow | 2 V                                 | 10 mA               | 26-52 mcd       | <b>1.90.691.028/0000</b> | <b>1.90.900.001/0000</b> |

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  $\Omega$  0.25 W
- for 12 - 14 V = 680  $\Omega$  0.50 W
- for 24 - 28 V = 1500  $\Omega$  1.00 W

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

Reverse voltage  $U_R$ : 5 V

Reverse current  $I_R$ : 100  $\mu$ 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          | <b>1.90.690.351/0000</b> | <b>1.90.900.001/0000</b> |
| Bi-Pin T 1 | green  | 24 V                                | 11 mA               | 600 mcd         | <b>1.90.690.352/0000</b> | <b>1.90.900.001/0000</b> |
| Bi-Pin T 1 | yellow | 24 V                                | 11 mA               | 80 mcd          | <b>1.90.690.353/0000</b> | <b>1.90.900.001/0000</b> |
| Bi-Pin T 1 | blue   | 24 V                                | 11 mA               | 300 mcd         | <b>1.90.690.354/0000</b> | <b>1.90.900.001/0000</b> |
| Bi-Pin T 1 | white  | 24 V                                | 11 mA               | 400 mcd         | <b>1.90.690.355/0000</b> | <b>1.90.900.001/0000</b> |

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       | <b>1.90.692.001/0000</b> |                          |
| T 4.5  | green  | 2 - 3 V                             | 10 mA               | 9-33 mcd        | <b>1.90.692.002/0000</b> |                          |
| T 4.5  | yellow | 2 - 3 V                             | 10 mA               | 26-52 mcd       | <b>1.90.692.003/0000</b> |                          |

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  $\Omega$  0.25 W

-for 12 - 14 V = 680  $\Omega$  0.50 W

-for 24 - 28 V = 1500  $\Omega$  1.00 W

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

Reverse voltage  $U_R$ : 5 V

Reverse current  $I_R$ : 100  $\mu$ 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          | <b>1.90.690.331/0000</b> | <b>1.90.900.004/0000</b> |
| T 4.5  | green  | 24 V                                | 13 mA               | 700 mcd         | <b>1.90.690.332/0000</b> | <b>1.90.900.004/0000</b> |
| T 4.5  | yellow | 24 V                                | 13 mA               | 100 mcd         | <b>1.90.690.333/0000</b> | <b>1.90.900.004/0000</b> |
| T 4.5  | blue   | 24 V                                | 13 mA               | 380 mcd         | <b>1.90.690.334/0000</b> | <b>1.90.900.004/0000</b> |
| T 4.5  | white  | 24 V                                | 13 mA               | 500 mcd         | <b>1.90.690.335/0000</b> | <b>1.90.900.004/0000</b> |

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<br>typ. $U_F$ at $I_F$ | Max. current, $I_F$ | Light intensity | Order no.                | Accessory<br>lamp extractor |
|--------|--------|----------------------------------------|---------------------|-----------------|--------------------------|-----------------------------|
| BA 9 s | red    | 24 V                                   | 15 mA               | 250 mcd         | <b>1.90.690.341/0000</b> | <b>1.90.900.007/0000</b>    |
| BA 9 s | green  | 24 V                                   | 15 mA               | 1000 mcd        | <b>1.90.690.342/0000</b> | <b>1.90.900.007/0000</b>    |
| BA 9 s | yellow | 24 V                                   | 15 mA               | 250 mcd         | <b>1.90.690.343/0000</b> | <b>1.90.900.007/0000</b>    |
| BA 9 s | blue   | 24 V                                   | 15 mA               | 450 mcd         | <b>1.90.690.344/0000</b> | <b>1.90.900.007/0000</b>    |
| BA 9 s | white  | 24 V                                   | 15 mA               | 600 mcd         | <b>1.90.690.345/0000</b> | <b>1.90.900.007/0000</b>    |

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<br>typ. $U_F$ at $I_F$ | Max. current, $I_F$ | Light intensity | Order no.                | Accessory<br>lamp extractor |
|--------|--------|----------------------------------------|---------------------|-----------------|--------------------------|-----------------------------|
| E 10   | red    | 24 V                                   | 15 mA               | 250 mcd         | <b>1.90.690.371/0000</b> | <b>1.90.900.007/0000</b>    |
| E 10   | green  | 24 V                                   | 15 mA               | 1000 mcd        | <b>1.90.690.372/0000</b> | <b>1.90.900.007/0000</b>    |
| E 10   | yellow | 24 V                                   | 15 mA               | 250 mcd         | <b>1.90.690.373/0000</b> | <b>1.90.900.007/0000</b>    |
| E 10   | blue   | 24 V                                   | 15 mA               | 450 mcd         | <b>1.90.690.374/0000</b> | <b>1.90.900.007/0000</b>    |
| E 10   | white  | 24 V                                   | 15 mA               | 600 mcd         | <b>1.90.690.375/0000</b> | <b>1.90.900.007/0000</b>    |

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<br>typ. $U_F$ at $I_F$ | Max. current, $I_F$ | Light intensity | Order no.         | Accessory<br>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 |                             |