



## Material Specification

➤ for strips of BRONZE und BRONZE WITH ZINC CONTENT



**Bronzes - mechanical properties**

| Alloy  | Temper    | Tensile strength<br>R <sub>m</sub> [MPa]* | Yield strength<br>R <sub>p0,2</sub> [MPa]* | Elongation<br>A <sub>50</sub> [%] | Vickers<br>hardness | Spring bending<br>limit [MPa]* |
|--------|-----------|---|--|-----------------------------------|---------------------|--------------------------------|
| Cu Sn4 | R290/H70  | 290-390                                   | ≤ 190                                      | ≥ 40                              | 70-100              | ≥ 340 **                       |
|        | R390/H115 | 390-490                                   | ≥ 210                                      | ≥ 11                              | 115-155             |                                |
|        | R480/H150 | 480-570                                   | ≥ 420                                      | ≥ 4                               | 150-180             |                                |
|        | R540/H170 | 540-630                                   | ≥ 490                                      | ≥ 3                               | 170-200             |                                |
|        | R610/H190 | ≥ 610                                     | ≥ 540                                      | ---                               | ≥ 190               |                                |
| Cu Sn5 | R310/H75  | 310-390                                   | ≤ 250                                      | ≥ 45                              | 75-105              |                                |
|        | R400/H120 | 400-500                                   | ≥ 240                                      | ≥ 14                              | 120-160             |                                |
|        | R490/H160 | 490-580                                   | ≥ 430                                      | ≥ 8                               | 160-190             |                                |
|        | R550/H180 | 550-640                                   | ≥ 510                                      | ≥ 4                               | 180-210             |                                |
|        | R630/H200 | 630-720                                   | ≥ 600                                      | ≥ 2                               | 200-230             |                                |
|        | R690/H220 | ≥ 690                                     | ≥ 670                                      | ---                               | ≥ 220               |                                |
| Cu Sn6 | R350/H80  | 350-420                                   | ≤ 300                                      | ≥ 45                              | 80-110              | ≥ 350 **<br>≥ 370 **           |
|        | R420/H125 | 420-520                                   | ≥ 260                                      | ≥ 17                              | 125-165             |                                |
|        | R500/H160 | 500-590                                   | ≥ 450                                      | ≥ 8                               | 160-190             |                                |
|        | R560/H180 | 560-650                                   | ≥ 500                                      | ≥ 5                               | 180-210             |                                |
|        | R640/H200 | 640-730                                   | ≥ 600                                      | ≥ 3                               | 200-230             |                                |
|        | R720/H220 | ≥ 720                                     | ≥ 690                                      | ---                               | ≥ 220               |                                |
| Cu Sn8 | R370/H90  | 370-450                                   | ≤ 300                                      | ≥ 50                              | 90-120              | ≥ 410 **                       |
|        | R450/H135 | 450-550                                   | ≥ 280                                      | ≥ 20                              | 135-175             |                                |
|        | R540/H170 | 540-630                                   | ≥ 460                                      | ≥ 13                              | 170-200             |                                |
|        | R600/H190 | 600-690                                   | ≥ 530                                      | ≥ 5                               | 190-220             |                                |
|        | R660/H210 | 660-750                                   | ≥ 620                                      | ≥ 3                               | 210-240             |                                |
|        | R740/H230 | ≥ 740                                     | ≥ 700                                      | ≥ 2                               | ≥ 230               |                                |

**Bronzes with zinc content - mechanical properties**

| Alloy      | Temper    | Tensile strength<br>R <sub>m</sub> [MPa]* | Yield strength<br>R <sub>p0,2</sub> [MPa]* | Elongation<br>A <sub>50</sub> [%] | Vickers<br>hardness | Spring bending<br>limit [MPa]* |
|------------|-----------|---|--|-----------------------------------|---------------------|--------------------------------|
| Cu Sn3 Zn9 | R320/H80  | 320-380                                   | ≤ 230                                      | ≥ 25                              | 80-110              |                                |
|            | R380/H110 | 380-430                                   | ≥ 200                                      | ≥ 16                              | 110-140             |                                |
|            | R430/H140 | 430-520                                   | ≥ 330                                      | ≥ 6                               | 140-170             |                                |
|            | R510/H160 | 510-600                                   | ≥ 430                                      | ≥ 3                               | 160-190             |                                |
|            | R580/H180 | 580-690                                   | ≥ 520                                      | ---                               | 180-210             |                                |
|            | R660/H200 | ≥ 660                                     | ≥ 610                                      | ---                               | ≥ 200               |                                |
| Cu Sn6 Zn6 | R610/H190 | 610-690                                   | ≥ 570                                      | ≥ 12                              | 190-220             |                                |
|            | R760/H230 | ≥ 760                                     | ≥ 690                                      | ---                               | ≥ 230               |                                |

 \* 1 MPa = 1 N/mm<sup>2</sup>

\*\* Vickers hardness – values are not binding for official acceptance

## Bronzes - physical properties

| Density [g/cm <sup>3</sup> ] | Coefficient of thermal expansion [10 <sup>-6</sup> /K] | Electrical conductivity [MS/m] <sup>***</sup> | Electrical conductivity [% IACS] | Thermal conductivity [W/m K] | Modulus of elasticity [GPa] <sup>****</sup> | Weldability | Solderability | Season cracking |
|------------------------------|--|---|----------------------------------|------------------------------|---|-------------|---------------|-----------------|
| 8,85                         | 18,2   | 11,5  | 20                               | 84                           | 118   | good        | very good     | no              |
| 8,85                         | 18,2   | 10  | 16,5                             | 82                           | 118   | good        | very good     | no              |
| 8,80                         | 18,5   | 9   | 15                               | 75                           | 115   | good        | very good     | no              |
| 8,80                         | 18,5   | 7,5   | 13                               | 62                           | 115   | good        | very good     | no              |

## Bronzes with zinc content - physical properties

| Density [g/cm <sup>3</sup> ] | Coefficient of thermal expansion [10 <sup>-6</sup> /K] | Electrical conductivity [MS/m] <sup>***</sup> | Electrical conductivity [% IACS] | Thermal conductivity [W/m K] | Modulus of elasticity [GPa] <sup>****</sup> | Weldability | Solderability | Season cracking |
|------------------------------|--|---|----------------------------------|------------------------------|---|-------------|---------------|-----------------|
| 8,70                         | 18,4   | 12  | 20                               | 120                          | 120   | good        | good          | light           |
| 8,80                         | 18,4   | 9   | 15                               | 75                           | 114   | good        | good          | light           |

\*\*\* MS/m = m/Ωmm<sup>2</sup>

\*\*\*\* 1 GPa = 1 kN/mm<sup>2</sup>

### Bronzes - chemical composition

| Chemical composition [%]                     | EN     | USA UNS Alloy-No. | Earlier standards            | Applications  |
|--|--------|-------------------|------------------------------|---|
| Sn 3,5-4,5/<br>P max. 0,01 - 0,4/<br>Cu rest | CW450K | C51100            | DIN 17670<br>BS Alloy PB 101 | connectors,<br>contact springs,<br>multiple plugs,<br>relay springs,<br>switch elements,<br>all kinds of stamped parts,<br>blade springs,<br>membranes,<br>metallic hoses,<br>corrugated tubes,<br>gear wheels,<br>bushes,<br>pump parts,<br>clock parts,<br>parts in the machine and apparatus manufacturing |
| Sn 4,5-5,5/<br>P max. 0,01 - 0,4/<br>Cu rest | CW451K | C51000            | BS Alloy PB 102              |   |
| Sn 5,5-7/<br>P max. 0,01 - 0,4/<br>Cu rest   | CW452K | C51900            | DIN 17670<br>BS Alloy PB 103 |   |
| Sn 7,5-8,5/<br>P max. 0,35/<br>Cu rest       | CW453K | C52100            | DIN 17670<br>BS Alloy PB 104 |   |

### Bronzes with zinc content - chemical composition

| Chemical composition [%]                       | EN     | USA UNS Alloy-No. | Earlier standards | Applications              |
|--|--------|-------------------|-------------------|---------------------------|
| Sn 1,5-3,5/<br>Zn 7,5-10/<br>P 0,2/<br>Cu rest | CW454K | C42500            | ---               | stamped parts, connectors |
| Sn 5-7/<br>Zn 5-7/<br>P 0,01-0,1/<br>Cu rest   | ---    | ---               | DIN 17670         | stamped parts, connectors |



## Forms of supply

You may choose between the following types und forms:

### Dimensions

#### Strips

Thickness: 0,1 - 3 mm

Width: Thickness  $\leq$  0,3 mm: 3 - 310 mm  
Thickness  $>$  0,3 mm: 3 - 330 mm

#### Coils

Thickness: 0,1 - 0,8 mm

up to 12 kg / mm width

Thickness: over 0,8 mm

up to 6 kg / mm width

#### Traverse wound strips

on cores

on drums

(depending on strip cross section  
and type, up to 1,800 kg drum weight)

### POLYCOIL

up to 3 t

#### Order quantities

bare strip min. 500 kg, tinned strip min. 800 kg,  
other quantities upon request

#### Surface

with oil film

oil-free

passivated

#### Surface plating

hot dip tinning

galvanic tinning

selective plating

gold, silver, nickel plating

#### Profiled

according to your drawings

Our products are tested, evaluated and subjected to stringend tests in every stage of our production process. KEMPER strips meet the highest technical requirements of the automotive, communications and electrical engineering industries worldwide. We ensure these requirements by our quality management system which is certified per ISO/TS 16949:2002 and DIN EN ISO 9001:2000. At KEMPER quality is an obligation for all our employees, resulting in products which you can lastingly rely on.



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