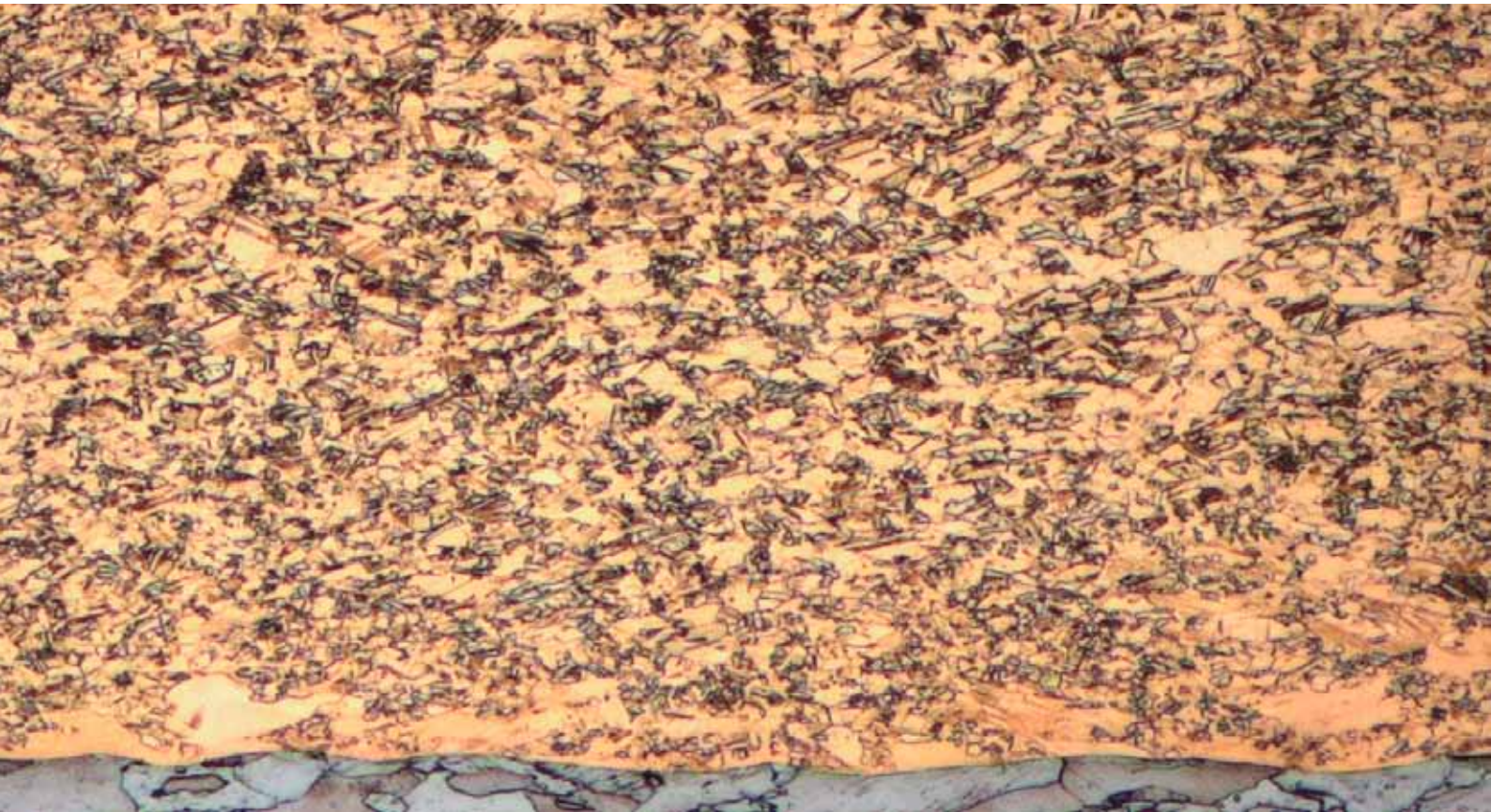


KOLBENSCHMIDT PIERBURG GROUP



**KS S705**

Lead-free Steel/Bronze Composite  
for Bushings



**GLEITLAGER**

## Brief description of the sliding material

KS S705 is a sliding material for bushes. It is specifically used for high-performance conrods and excels by high load capacity and good corrosion resistance. Outstanding adaptability and low wear round off its positive properties. The material is lead-free and meets the requirements of the EU Directive 2000/53/EC.

## Bearing structure

The plain bearing composite consists of a steel back and a cast-on bronze layer as bearing material.

The material used for the steel back is comparable to grade DC04. Depending on the rolling reduction, the steel back hardness is between 140 HB and 220 HB. Typical steel thicknesses range from 0.5 mm to 2.2 mm.

The bronze alloy used as bearing metal exhibits a layer thickness of 0.2 mm–0.5 mm in the finished bearing. A fine-grained recrystallized, wrought alloy with a hardness of 120 HB to 180 HB is obtained by thermo-mechanical treatment. This bronze alloy can easily be provided with lubricating grooves or lube pockets by embossing.

## Load capacity

KS S705 is particularly developed as a material for conrod bushes. The specific load in the small end of the conrod of combustion engines are extremely high and may reach 160 MPa and above. The specific load capacity of this material also comes up to these requirements in critical applications.

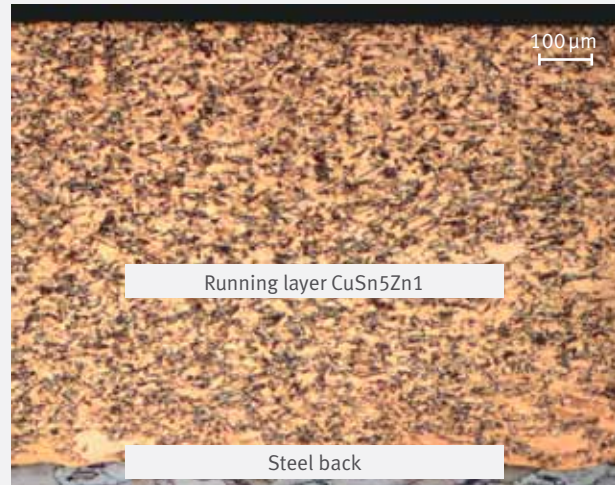
The diagram below shows the specific load capacity in comparison with other materials.

## Tribological characteristics

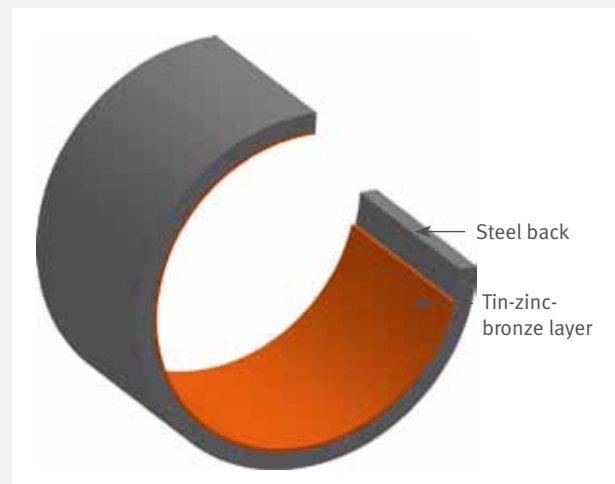
The tribological system composed of conrod, piston pin and conrod bush is characterized by a multitude of factors of influence, such as:

- Mechanical load
- Temperature
- Lubricating conditions
- Type of movement (e. g. oscillating)
- Conrod design
- Material mating

Bushes out of KS S705 have to be supplied with sufficient lubricant in order to keep the wearing rate at its minimum.



Micrograph of the composite



Layer system: steel / tin-zinc-bronze

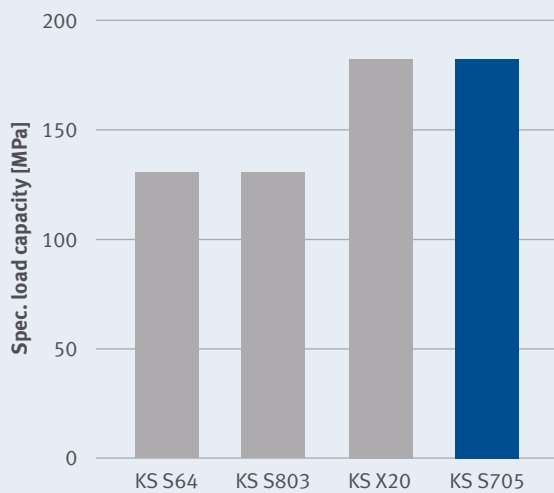
## Material characteristics

Characteristics, limit loads	Unit	KS S705
Tensile strength	MPa	450–600
Yield point	MPa	> 380
Young's modulus	GPa	110
Coefficient of thermal expansion	$k^{-1}$	$18.5 \cdot 10^{-6}$
Thermal conductivity	$W (m \cdot k)^{-1}$	80

### Chemical composition of the sliding layer

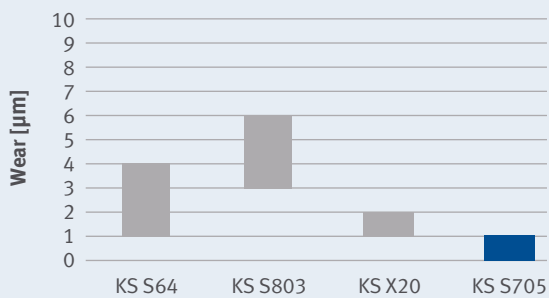
mass-%		
	Sn	4.3 to 5.7%
	Zn	0.8 to 1.7%
	Fe	max. 0.50%
	Mg	max. 0.15%
	Ti	max. 0.05%
	Zr	max. 0.15%
	P	max. 0.15%
	others combined	max. 0.30%
	Cu	rest

### Comparison of specific load capacity



- **KS S64:** St/CuPb10Sn10
- **KS S803:** St/CuSn10Bi8Zn3
- **KS X20:** St/CuZn31Si
- **KS S705:** St/CuSn5Zn1

### Comparison of wear test results



- **KS S64:** St/CuSn10Pb10
- **KS S803:** St/CuSn10Bi8Zn3
- **KS X20:** St/CuZn20
- **KS S705:** St/CuSn5Zn1

#### Test conditions

V = 0.6 m/s  
 p = 12 MPa  
 t = 60 min  
 T = 130 °C  
 Oil = Titan Supersyn 05W30

## Manufacture of the sliding material

In the first step, the bronze alloy is cast onto a steel strip. Next, the casting scale is milled off and the steel back is finish-ground. Targeted thermo-mechanical treatment steps are geared to adjust the required material thicknesses and material properties.

## Manufacture of bushes

By cutting, bending and sizing operations, bushes are made from the KS S705 strip. The bushes may be designed with a butt joint or clinched. Further optional design characteristics are a ground steel back, machining allowance of the inner diameter and embossed lubrication holes, grooves and pockets.

## Corrosion protection

The typical corrosion protection consists of 1 µm–3 µm thick Sn coat. As an alternative, an „oiled“ version can be supplied.

## Application

Conrod bushes made of KS S705 excel in extremely high load capacity, excellent adaptability and higher wear resistance. The corrosion resistance to hot engine oil is likewise good. This material is therefore well suited for use as high-duty bushes in gasoline and diesel engines.

**KS Gleitlager GmbH** · Am Bahnhof 14 · 68789 St. Leon-Rot · GERMANY  
Tel. +49 6227 56-0 · Fax +49 6227 56-302 · [www.kspg.com](http://www.kspg.com)

KS Gleitlager GmbH does not assume any liability for the completeness of the data presented in this materials brochure. It is exclusively up to the customer to form his opinion about the characteristics of the material and its adequacy for the purposes intended by the customer.

KS Gleitlager GmbH would also like to stress that any information given in this materials brochure does not constitute a legal guarantee for the appearance, characteristics and workmanship nor does it represent a warranted quality.

G-S705

Printed in Germany. A||X|j