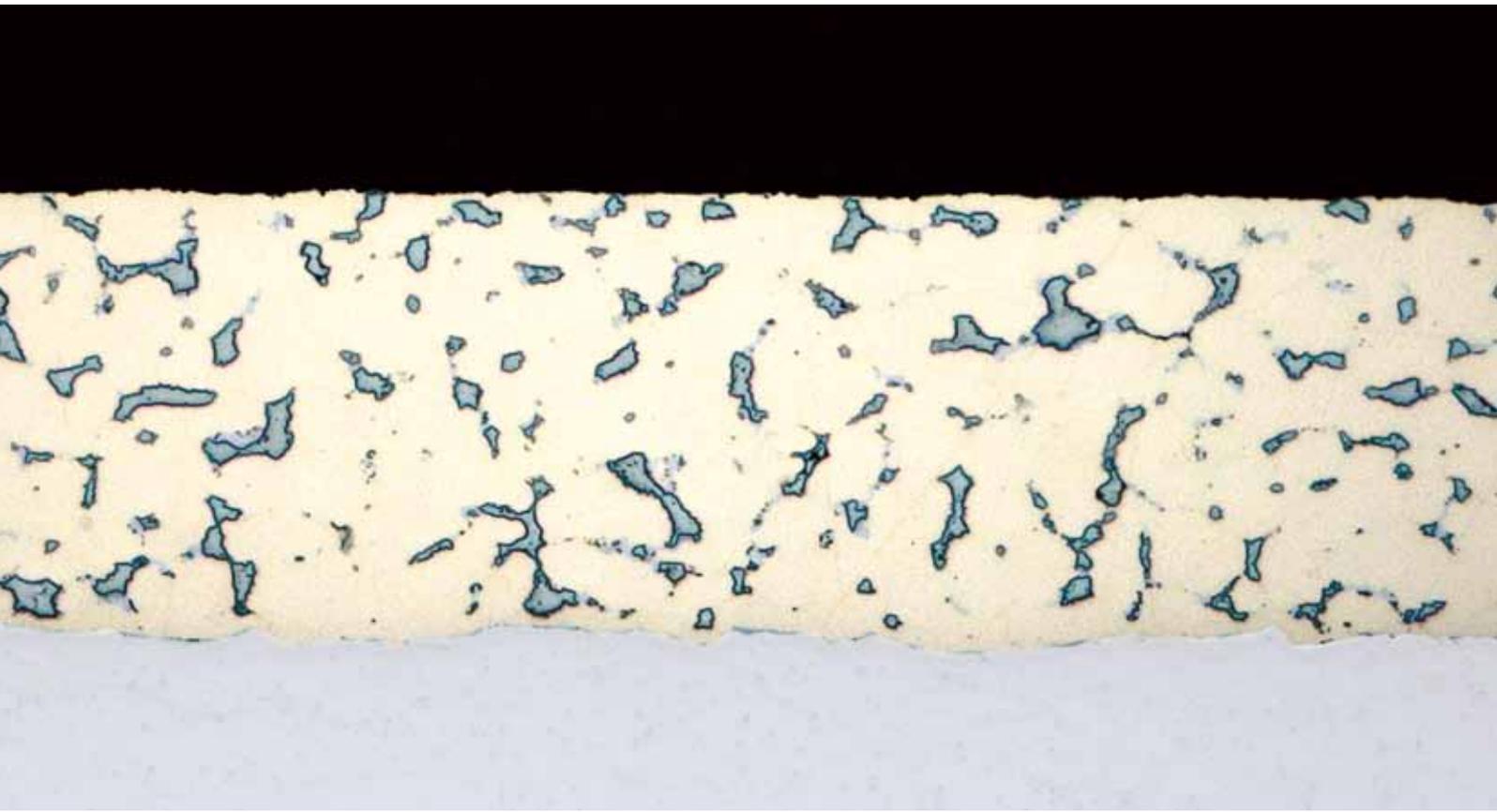


KOLBENSCHMIDT PIERBURG GROUP



KS S800 – KS S803

Lead-free Steel/Bronze Composite for
Bushes and Thrust Washers



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Brief description of the sliding material

KS S800 and KS S803 are tribological materials for bushes and thrust washers. This steel/bronze materials excels by high load capacity, good resistance to wear and high adaptability. Its corrosion resistance (e.g. to hot, additive-enhanced oil) is likewise highly.

The materials is lead-free and complies with the requirements of the EU Directive on End-of-Life-Vehicles, 2000/53/EC.

Bearing structure

The plain bearing composite material consists of a steel back and a tin-bismuth-bronze layer sintered on as bearing surface material.

For the steel back, steel of grade DC04 is used. Depending on the degree of rolling reduction, the steel back hardness is between 100 HB and 180 HB. Typical steel thicknesses are between 0.7 mm and 2.5 mm.

The bronze alloy used as bearing metal features a coat thickness of 0.2 mm–0.5 mm in the finished bearing (bush or thrust washer). The bearing metal coat hardness adjusts itself between 70 HB and 150 HB, likewise dependent on the rolling reduction degree.

The bearing metal surface may be manufactured with lubrication pockets or grooves.

Load capacity

KS S800 has been conceived as a material for bushes and thrust washers. Due to its specific load-carrying capacity of up to 110 MPa and its adaptability, it is the ideal material for bushes and thrust washers in transmission in the medium load.

With the higher grade of cold reduction KS S803 comes to higher hardness and load capacity values. The specific load raises up to 130 MPa.

Tribological characteristics

KS S800 and KS S803 ideally combines high-load capacity with above-average adaptability and satisfactory resistance to wear. The corrosion resistance (e.g. to hot additive-enhanced oil) is comparatively high.



Micrograph of the composite



Layer system: steel / tin-bismuth-bronze

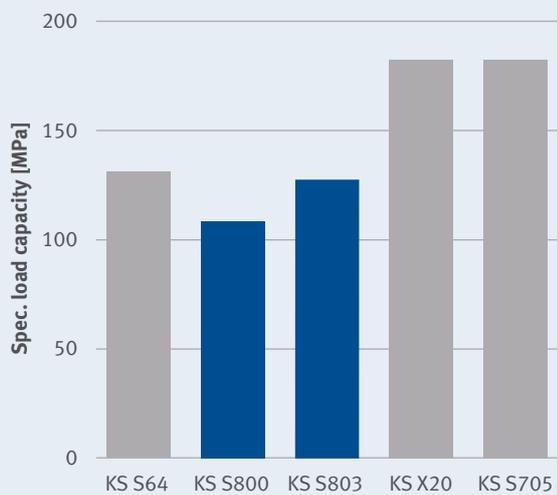
Material characteristics

Characteristics, limit loads	Unit	KS S800	KS S803
Tensile strength	MPa	230	250
Yield point	MPa	210	230
Young's modulus	GPa	85	85
Coefficient of thermal expansion	k^{-1}	$18.6 \cdot 10^{-6}$	$18.6 \cdot 10^{-6}$
Thermal conductivity	$W (m \cdot k)^{-1}$	50	50

Chemical composition of the the bronze layer

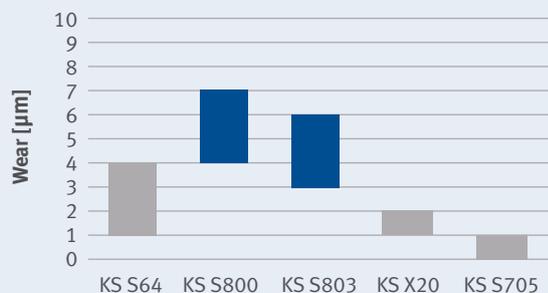
mass-%		
	Sn	9.0 to 11.0%
	Bi	6.0 to 9.0%
	Zn	2.5 to 3.5%
	Fe	max. 0.7%
	Sb	max. 0.5%
	Ni	max. 0.5%
	others combined	max. 0.5%
	Cu	rest

Comparison of specific load capacity



- KS S64: St/CuPb10Sn10
- KS S800: St/CuSn10Bi8Zn3
- KS S803: St/CuSn10Bi8Zn3
- KS X20: St/CuZn31Si
- KS S705: St/CuSn5Zn1

Comparison of wear test results



- KS S64: St/CuPb10Sn10
- KS S800: St/CuSn10Bi8Zn3
- KS S803: St/CuSn10Bi8Zn3
- KS X20: St/CuZn31Si
- KS S705: St/CuSn5Zn1

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

The alloying components Sn, Bi and Zn are accountable for the fair material balance of the bearing surface layer. Tin (Sn) increases strength. Bismuth (Bi) improves the emergency run properties and zinc (Zn) enhances the resistance to corrosion.

Bushes and thrust washers made of KS S800 have to be supplied with sufficient lubricant in order to keep the wearing rate at its minimum.

Production of the sliding material

A tin-bismuth-bronze alloy is sintered onto a steel strip. The desired characteristics such as steel back hardness or bearing metal hardness can be selectively adjusted in a wide range by applying thermo-mechanical treatment steps. The bearing metal surface can be provided with lubricating pockets in this process.

Manufacture of bushes and thrust washers

Bushes and thrust washers are produced from KS S800/ KS S803 strip by cutting, punching, bending and sizing. The bushes may be fabricated with plain butt joint or with notched butt joint and ground steel back. It is also possible to provide bushes with machining tolerance and embossed lubrication holes, grooves and pockets on the bronze side. These bushes can subsequently be machined to obtain a highly accurate inside bore diameter in order to reduce the bearing clearance.

Corrosion protection

The typical corrosion protection consists of a 1 µm – 3 µm thick Sn coat. The “oiled” version can be supplied as an alternative.

Application

Bushes and thrust washers made of KS S800 are distinguished by high load-carrying capacity, satisfactory resistance to wear and above-average adaptability. In combination with their good resistance to corrosion they are especially suitable for transmission applications.

The material KS S803 is used, because of its higher load capability, in internal combustion engine application.

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