

KOLBENSCHMIDT PIERBURG GROUP



KS P209

Low-maintenance, Lead-free
Steel/Plastics Composite



GLEITLAGER

Brief description of the sliding material

KS P209 is a lead-free steel/plastic composite for tribological systems operating with minimal lubrication or under hydrodynamic conditions.

The material is composed of a steel back, a bronze interlayer and a sliding surface based on PVDF with purpose-selected fillers.

The performance of the tribological system is the result of the interaction of the bronze interlayer with the extremely thin sliding coat in combination with special fillers.

Bearing structure

Plain bearings made of KS P209 consist of a steel back, a sintered-on porous CuSn10 interlayer and an extremely thin PVDF sliding coat with fillers.

The steel back is made of grade DC04. Its hardness ranges from 100 HB to 180 HB.

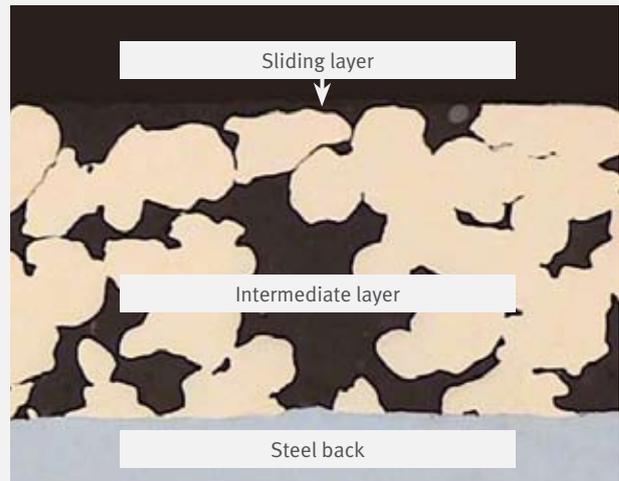
The interlayer is composed of spattered CuSn10 bronze which is sintered on such that a pore volume of about 45 % is obtained. The mean layer thickness is approx. 0.3 mm.

PVDF, combined with special fillers, constitutes the sliding surface above the bronze up to 0.01 mm in thickness.

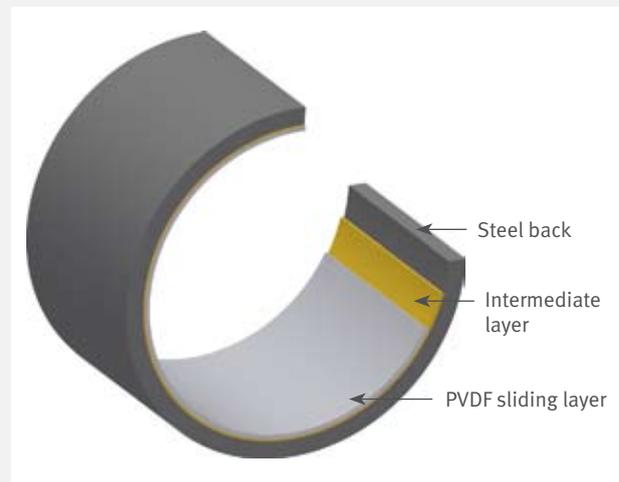
Tribological performance of KS P209

The material has been designed for application with minimal lubrication or under hydrodynamic conditions at high mixed friction rates.

The diagrams below illustrate the wearing and friction characteristics in comparison to the standard lead-bearing material KS P23.



Micrograph of the composite



Layer system: steel back / intermediate layer / PVDF sliding layer

Material characteristics

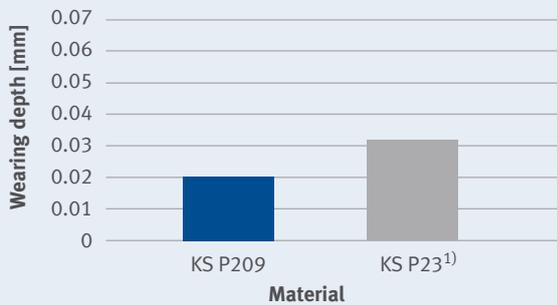
Characteristics, limit loads	Unit	KS P209
Permissible specific bearing load p		
■ Static	N/mm ²	250
■ Very low sliding speed	N/mm ²	150
■ Dynamic load	N/mm ²	80
Permissible sliding speed v	m/s	3 ¹⁾
Permissible temperature range	°C	-40 to +130
Coefficient of thermal conductivity	W (m·k) ⁻¹	> 6

¹⁾ under hydrodynamic conditions up to 5 m/s

Chemical composition of the sliding layer

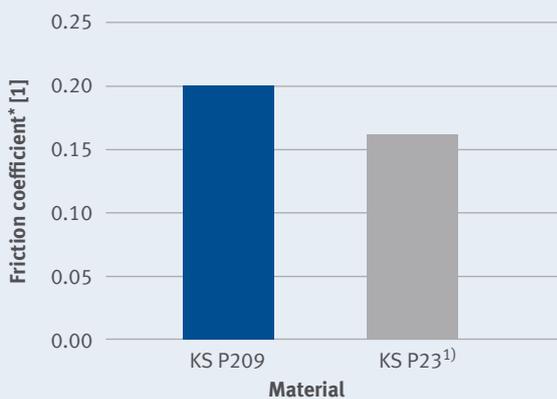
in vol-%		
	PTFE	10.5%
	BaSO ₄	21.5%
	C fibers	2.5%
	PVDF	rest

Comparison of the tribological performance Wearing properties (crash test)



¹⁾ leaded material

Comparison of the tribological performance Friction behavior (crash test)



¹⁾ leaded material, *past inlet

Test conditions

- Sphere/prism system
- Rotation, test load: $F = 90 \text{ N}$
- Sliding speed: $v = 28 \text{ m/s}$
- Temperature: RT
- Lubrication: dry
- Sphere material: 100 Cr6
- Test duration: 10 h

Manufacture of the sliding material

In a continuous sintering process, the bronze interlayer is sintered onto a prepared steel surface (strip) such that a pore volume of about 45% is obtained. Subsequently, the sliding surface coat is applied in the form of a powder and expanded into the bronze interlayer at elevated temperature. This results in a sliding layer thickness above the bronze up to 0.01 mm. The necessary thickness accuracy of the composite is adjusted in a further calibration rolling process.

Plain bearing structure

Sliding elements of the most varied shapes are produced from KS P209 by cutting, punching and forming. The last process step is a fine-tuned corrosion protection treatment adapted to each specific case of application.

Quality

The entire production process is monitored and controlled by means of a close-meshed net of quality assurance measures, thus ensuring process reliability of all important plain bearing characteristics.

Application

KS P209 has been designed specifically for application with minimal lubrication at high mixed friction rates. Thanks to the extremely thin sliding coat above the bronze, the propensity to swelling in liquids is appreciably reduced. This allows an exact bearing clearance to be achieved across the entire operating range. The thermal conductivity and admissible load are improved compared to the lead-containing material KS P23.

Given its high resistance to wear satisfactory resistance to chemicals and enhanced load capacity in the operating temperature range in combination with good emergency running properties KS P209 is particularly suitable for use in high-pressure pumps and gear bearings.

In many applications, with minimal lubrication in particular, the frictional torque (breakaway torque) has to be allowed for. In such cases, the sliding surface of KS P209 can be equipped with lubricating grooves or lubrication pockets. This will retain lubricant residues within the sliding surface, which makes it possible to distinctly reduce the breakaway torque.

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