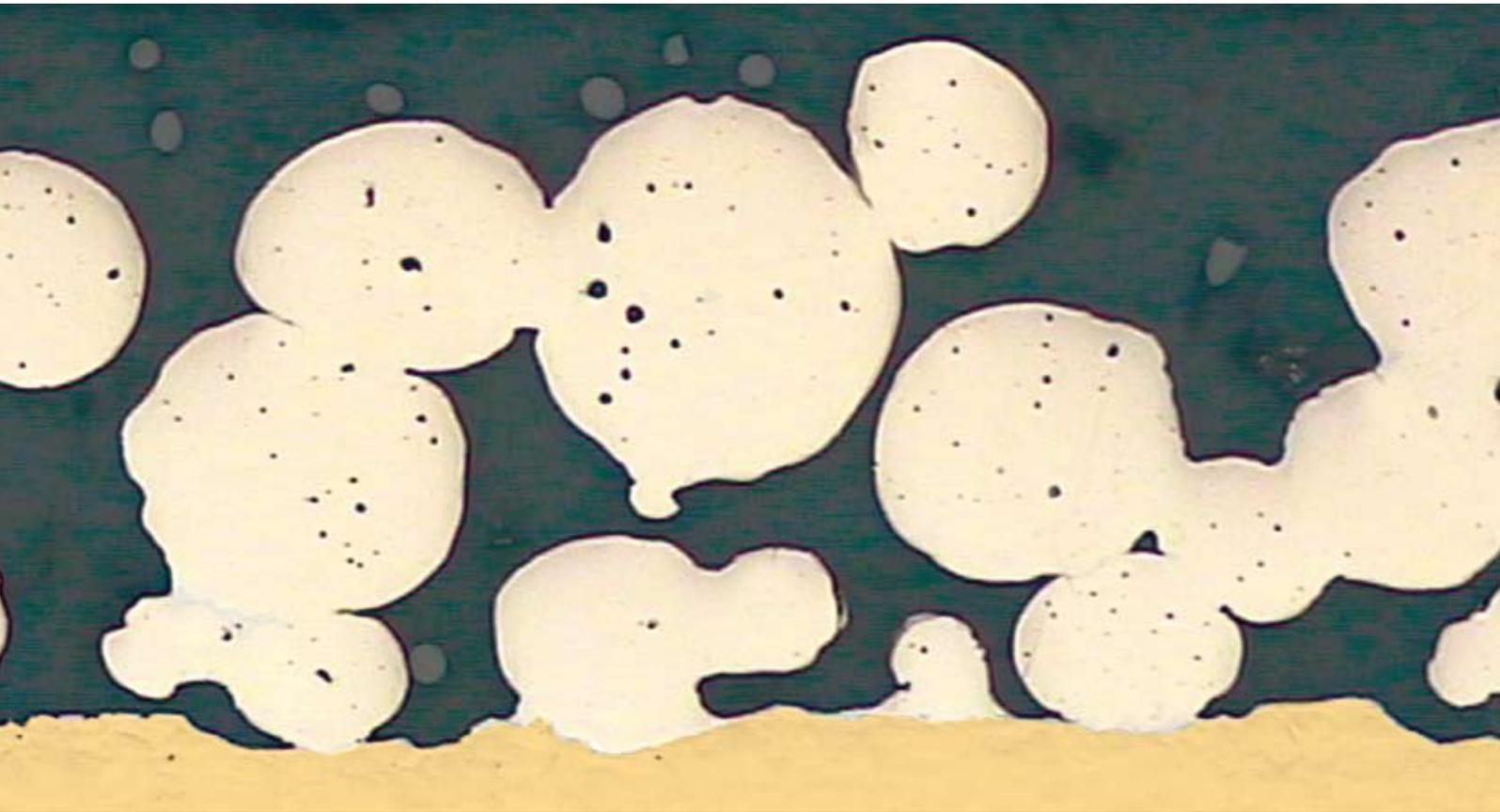


KOLBENSCHMIDT PIERBURG GROUP



KS P144

Lead-free Bronze/Plastics Composite



GLEITLAGER

Brief description of the sliding material

KS P144 is a lead-free bronze/plastics composite material for applications not requiring maintenance (dry run) with increased corrosion impact.

Its use in liquid-lubricated systems is also viable. Grease is only recommended conditionally as lubricant in contact with KS P144.

The material is produced by applying a continuous sinter impregnation method. In a purpose-adapted process, the sliding surface of bronze is sintered onto a steel carrier material, leaving a mean pore volume of about 30%. A solid lubricant mass is impregnated into these hollows and submitted to thermal treatment.

KS P144 features a low coefficient of friction, excellent emergency running properties and high resistance to flow erosion. By using bronze as a support, this material offers advantages over KS P141, e.g. improved corrosion protection and higher heat conductivity. The material is also anti-magnetic. This system of materials fulfills the requirements of EU Directive 2000/53/EC on End-of-Life Vehicles.

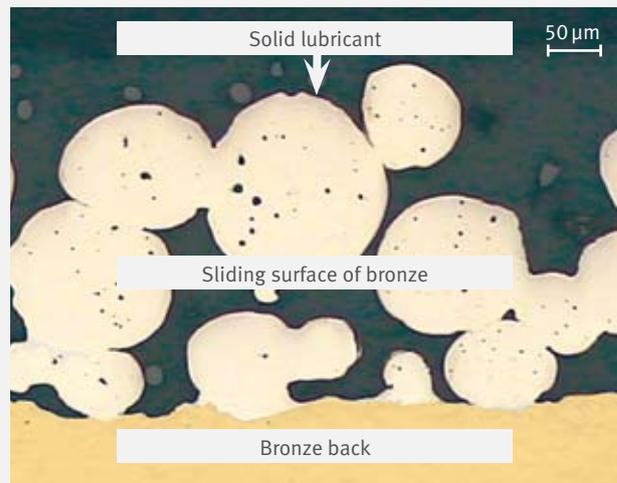
Bearing structure

Sliding elements in KS P144 consist of a bronze back, a sintered-on, porous tin-bronze-lubricant layer and the solid lubricant PTFE with fillers.

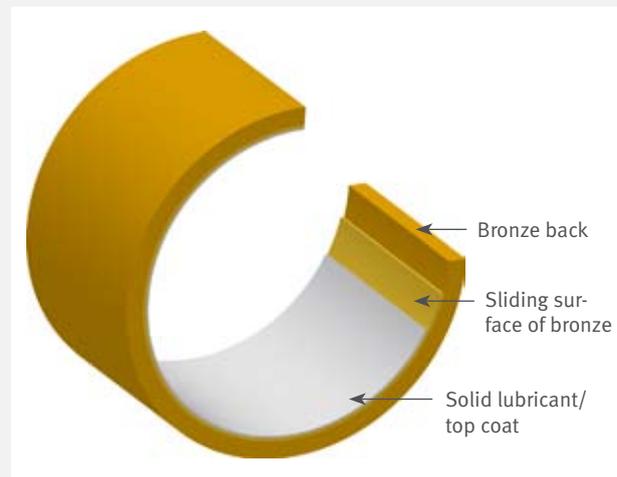
The bronze material used is typically CuSn6. Its hardness ranges from 80 to 160 HB.

The bronze thickness is chosen as a function of the proposed application. Typical thicknesses are between 0.7 and 3.2 mm.

The contact surface is made up of spherical CuSn10 bronze. The bronze is sintered to exhibit a pore volume of about 30%. The coat thickness is 0.2–0.35 mm. The pores are filled with a thermally treated solid lubricant which covers the bronze surface, acting as run-in coat. The run-in coat thickness is 0.005–0.030 mm.



Micrograph of the composite



Layer system: bronze back / sliding surface of bronze / solid PTFE lubricant

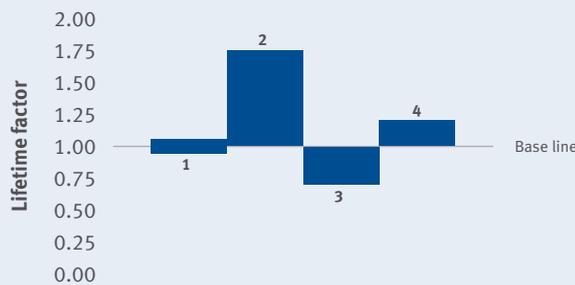
Material characteristics

Characteristics, limit loads	Unit	KS P144
Max. pv value	N/mm ² · m/s	2.0
Permissible specific bearing load p		
■ Static	N/mm ²	250
■ Very low sliding speed	N/mm ²	140
■ Oscillating, vibrating	N/mm ²	56
Permissible sliding speed v		
■ Dry run	m/s	2
■ Wet run	m/s	3
Permissible temperature range	°C	-60 to +260
Coefficient of thermal expansion	k ⁻¹	17 · 10 ⁻⁶
Coefficient of thermal conductivity	W · (m·k) ⁻¹	> 70

Chemical composition of the solid lubricant

in vol. -%		
	ZnS	17%
	PFA	5%
	C fiber	3%
	PTFE	75%

Lifetime factor of shaft materials (dry run)

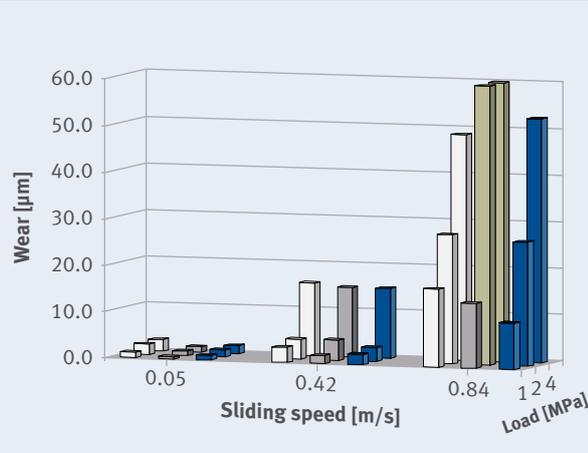


- 1: Steel shaft X 155 Cr V Mo 121 (base shaft), hardness 58 HRc
- 2: Shaft of hard-anodized aluminum, hardness 450 HV
- 3: Shaft of gray cast iron (GG 25)
- 4: Steel shaft, nitrated, hardness 1000HV, 0.2 mm deep

Test conditions

- Rotation
- Point load
- Sliding speed 0.42m/s
- Specific load 2N/mm²
- Shaft material cf. above diagram "lifetime factor of shaft materials"
- Surface roughness (shaft) ~ R_z 1.5–2
- Room temperature
- Test duration 60h

Non-lubricated wear



□ P10 ■ P143 ■ P144 ■ failed

Shaft material X 155 Cr V Mo 121, hardness 58 HRc

Tribological system bearing/shaft in dry run

Besides load, sliding speed and ambient temperature as factors influencing wear, the shaft material also plays an important part in dry run mode. Depending on the shaft material, the expected service life of the plain bearing may substantially vary from the normal level. Also the surface roughness of the shaft also plays an important role. It should be in the range of R_z 1–3.

Manufacture of the sliding material

The solid lubricant mass is produced in a purpose-adapted mixing process. In parallel, bronze powder is pore-sintered onto bronze in a continuous sintering process. Subsequently, impregnating rollers will feed and apply the solid lubricant. In a series of thermal process steps the characteristic features of the integral tribological system are adjusted and then the necessary thickness accuracy of the composite is accomplished by means of controlled roller pairs.

Minor alterations of the contact surface color will not affect the performance of the plain bearing.

Plain bearing manufacture

Sliding elements of the most varied shapes are produced from KS P144 by cutting, punching and forming.

Quality

The complete manufacturing process is monitored and controlled by a close-meshed net of quality assurance measures.

Application

KS P144 has been designed for maintenance-free use. It is especially effective in liquid-lubricated systems with a high degree of mixed friction in combination with the improved corrosion behaviour and higher heat conductivity as compared to KS P141. KS P144 is also anti-magnetic.

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