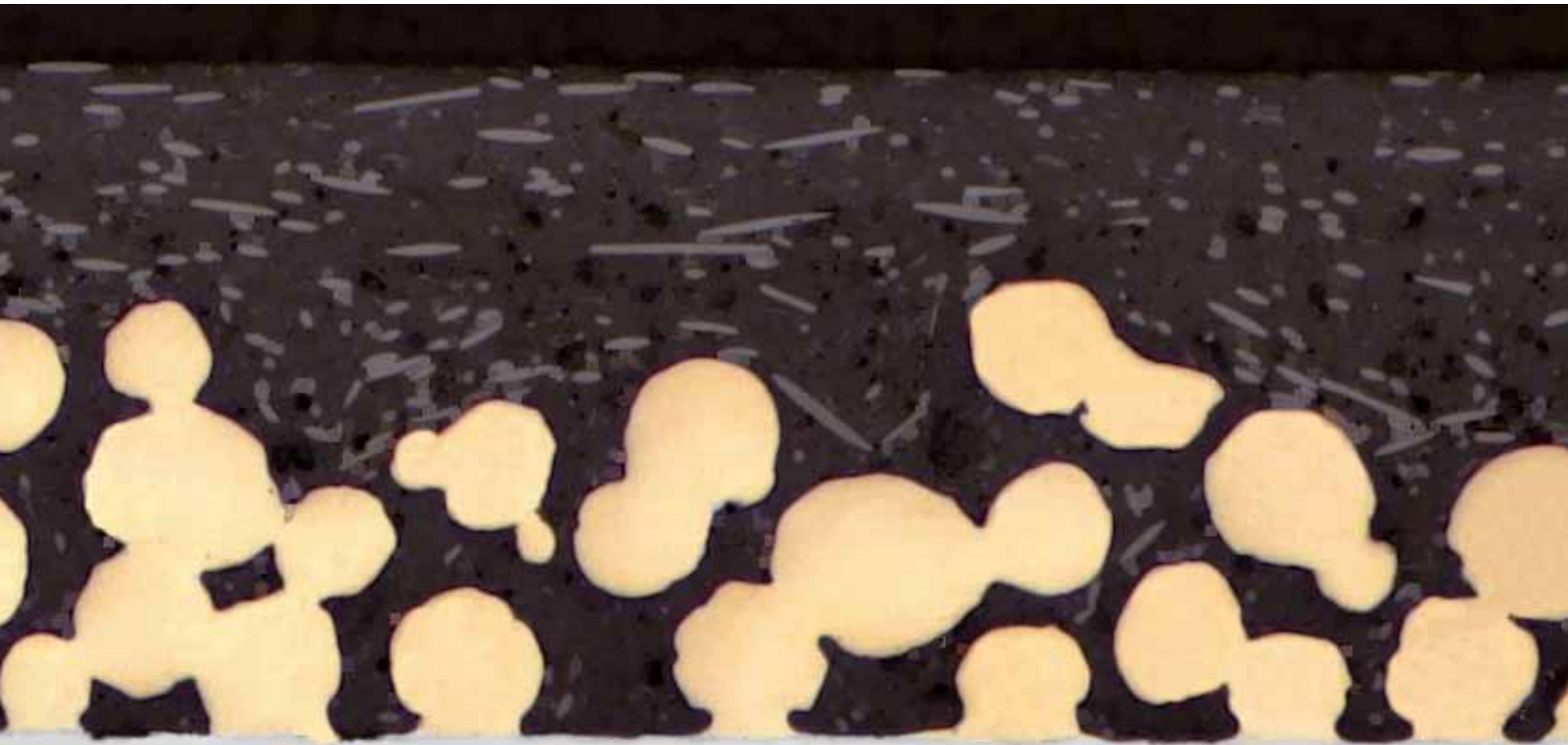


KOLBENSCHMIDT PIERBURG GROUP



KS P210 – KS P213

Low-maintenance, Lead-free
Steel/Plastics Composites



GLEITLAGER

Brief description of the sliding material

The material family KS P210 to KS P213 encompasses different varieties in terms of sliding layer thickness and profile design of the sliding surface.

Bearing type	Characteristics			
	Layer above bronze (mm)	Ready for installation	Machining allowance	Lube pockets ¹⁾
KS P210	0.05 – 0.20	●		●
KS P211	0.15 – 0.50		●	●
KS P212	0.15 – 0.50		●	
KS P213	0.05 – 0.20	●		

¹⁾ Lubrication pockets acc. to DIN ISO 3547, sampling at request

The base material consists of a steel back, a bronze bonding layer and a PEEK sliding layer with purpose-adapted fillers.

Plain bearings made of KS P210 – KS P213 have been designed for application in tribological systems with initial lubrication or for hydrodynamic systems with elevated rates of mixed friction at operating temperatures up to 200 °C.

Bearing structure

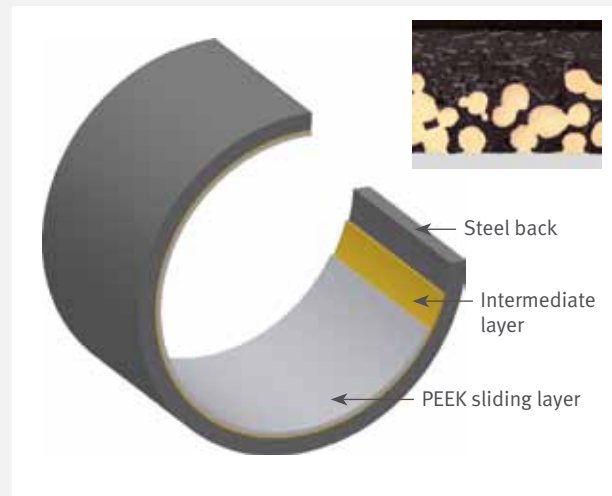
The steel carrier material used is typically of grade C22. The steel back hardness is in the range of 100 HB – 180 HB. The bonding layer is porous, sintered CuSn10 bronze with a pore volume of 45 – 60 % and a layer thickness of 0.2 – 0.35 mm. The sliding surface is based on a filler-reinforced PEEK layer

Manufacture of the sliding material

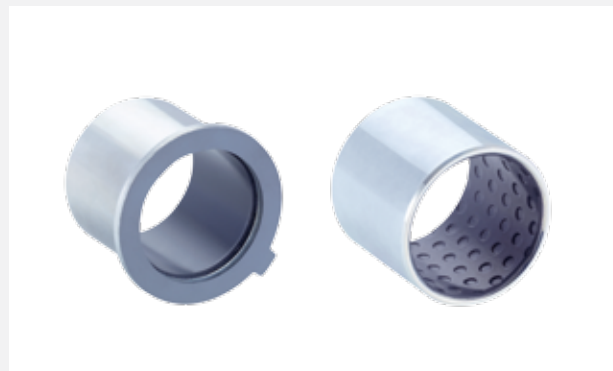
In a granulating and extrusion process, first a PEEK-based, filler-reinforced plastic sheet is produced. In a continuous sintering process, the bronze bonding layer is applied to the steel strip in such a way that a pore volume of 45 – 60 % is obtained. Next, the plastics sheet and the steel-bronze strip are joined by hot pressing and the exact material thickness is adjusted. The quality-determining parameters in this process are temperature, press power and pressing time.

Tribological performance

In order to demonstrate the performance capability of this new development, various tests were carried through. The



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



Laser-welded flange bushing composed of a bearing bush (radial part) and a thrust washer (axial part)

Benefits of laser-welded flange bushings

- Possibility to combine discretionary flange and bush diameters
Geschlossene Bund-Anlaufläche
- Closed flange-thrust contact area
- Accurate wall-thickness distribution at the flange-thrust contact surface
- Bush (radial part) and flange/thrust washer (axial part) may consist of different materials and also exhibit different material thicknesses

Material characteristics

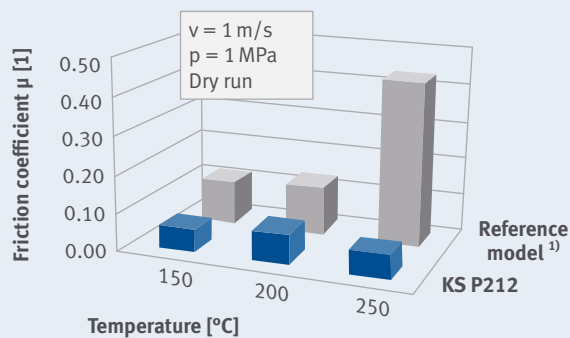
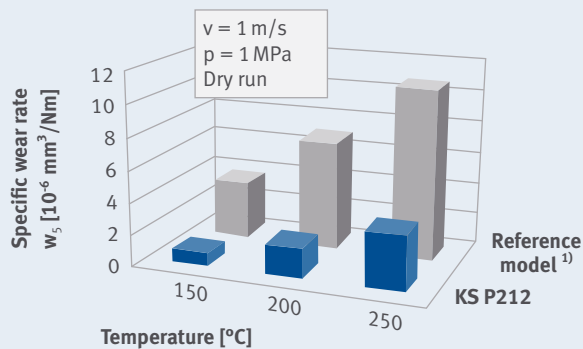
Characteristics, limit loads	Unit	KS P210 – P213
Permissible specific bearing load p		
■ Static	N/mm ²	250
■ Very low sliding speed	N/mm ²	180
■ Dynamic load	N/mm ²	90
Permissible sliding speed v		
■ With mixed friction	m/s	3
■ Hydrodynamic	m/s	10
Permissible temperature range	°C	-60 to +200
Coefficient of thermal expansion	k ⁻¹	49 · 10 ^{-6*}
Thermal conductivity	W (m·k) ⁻¹	8 – 10*

^{*)} These parameters were measured at a sliding layer thickness of 0.15 mm. Different values may be obtained when changing the sliding layer thickness.

Chemical composition of the sliding layer

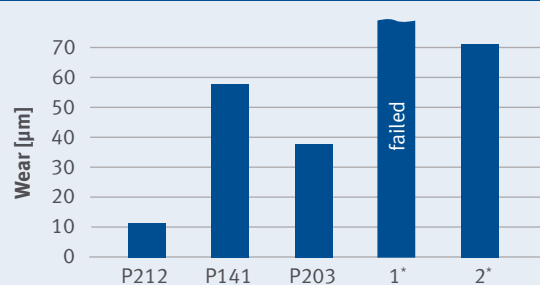
mass-%	Material	Percentage
	PEEK	60%
	C-Fiber	10%
	ZnS	10%
	TiO ₂	10%
	Graphite	10%

Comparison of tribological performance Wearing test (pin-on-disk test bench)



¹⁾Origin: Mat. wiss. u. Werkstofftechnik 2004, 35, No.8

Wearing behavior in the high-pressure pump system



^{*)} Competitive product

Start-stop test (pump test bench)

- Start-stop-cycles: 18,000
- Revs: 0–800 min⁻¹
- Intake temperature: 60 °C
- Shear force: 1,400 N
- Test duration: 40 h
- Rail pressure: 400 bar
- Test fluid: V-Oil 1404

results shown on the left side attest to excellent performance, also in comparison with competing design solutions. What is especially noteworthy is the high wear resistance for pump bearings in start-stop operation.

Chemical resistance

	Engine oil	Damper oil	Transmission oil	Hydraulic oil
Temperature (°C)	150	140	150	125
Duration(h)	528	528	528	528
Thickness increase (μm)	0–3	0–5	0–2	0–4
Damage through chem. attack	none	none	none	none

Plain bearing manufacture

Sliding elements of the most varied shapes are produced from this composite by cutting, punching and forming. Flange bushings composed of wrapped bushes and punched thrust washers are joined by applying a newly developed laser welding method and boast a series of benefits compared to the standard forming process. Depending on each specific case of application, at the end of the process a fine-tuned corrosion protection treatment is performed

Quality

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

Application

Plain bearings made of KS P210–KS P213 are particularly suited for use in tribological systems with minimum lubrication or for hydrodynamic systems with high rates of mixed friction such as, for example, high-pressure injection pumps, hydro-engines or high-performance gear units. They excel by extremely low wear even at high temperatures and very good chemical resistance. Plain bearings made with a machining allowance can be reworked by chipping. This way, any misalignments can be equaled out and closer bearing plays adjusted.

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G-P210 – P213

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