PRODUCT INFORMATION

Permaglide P1 plain bearings
Material information P10

P10, P11 ... maintenance-free and robust

Brief description
P10 and P11 are leaded, robust sliding materials with maximum tribological performance. They are designed for maintenance-free, dry-running applications, but can also be employed in systems with liquid lubrication. The use of grease as a lubricant with P10 or P11 is only possible to a limited extent, and is not recommended.

Material manufacture
The solid lubricant mass is produced in a specially adapted mixing process.
In a parallel, continuous sintering operation, bronze powder is sintered onto the steel or bronze back as a sliding layer. This produces a sliding layer with a thickness from 0.2 mm to 0.35 mm and a pore volume of approx. 30%. Next, the cavities are filled with solid lubricant by means of impregnating rollers. This process step is controlled in such a way that a running-in layer of solid lubricant up to max. 0.03 mm thick is produced above the sliding layer. In further thermal treatments, the characteristic properties of the material system are adjusted, and the required thickness tolerances of the composite material are produced using controlled roller pairs.

Plain bearing production
Sliding elements in a great variety of designs are produced from P10 and P11 in cutting, stamping and shaping processes.

Standard designs are:
- Cylindrical bushes
- Flange liners
- Thrust washers
- Strips

In a final step, plain bearings manufactured from P10 undergo corrosion protection treatment on the bearing back, face reliefs and striking faces.
Standard version: Tin
Layer thickness: approx. 0.002 mm

Additionally, P10 plain bearings can be supplied with improved corrosion protection coating “Zinc, transparent passivated”, on request.

P11 does not require any additional corrosion protection.

Note:
Tin is used as temporary corrosion protection and an assembly aid.

Characteristics of P10
- Very low stick-slip tendency
- Low wear
- Good chemical resistance
- Low friction coefficient
- No tendency to fuse with metal
- Largely resistant to swelling
- Does not absorb water

The materials P10 and P11 contain lead and must not be used in the food sector.

Preferred areas of application
- Maintenance-free operation under dry-running conditions
- Rotating or oscillating movements up to a speed of 2 m/s
- Linear movements
- Temperature range –200 °C to 280 °C

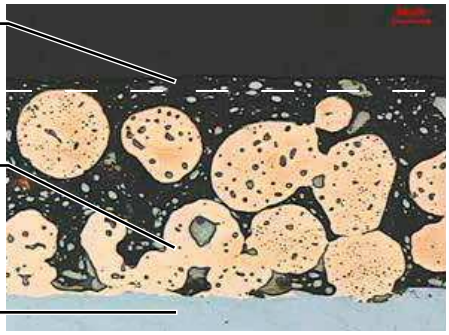
Characteristics of P11
Material P11 is recommended for more stringent requirements in terms of corrosion resistance or for use in aggressive media. It has some advantages over P10 in this respect:
- Very good thermal conductivity and therefore greater operational safety
- Anti-magnetic

Hydrodynamic operation
Use in hydrodynamic conditions is possible without problems up to a sliding speed of 3 m/s.
In continuous operation above 3 m/s, there is a risk of flow erosion or cavitation.
Motor Service offers the calculation of hydrodynamic operating states as a service.

Material structure: P10, P11

System composition

1	**Running-in layer**	
	PTFE matrix with bulking agent [1]	
	Layer thickness [mm]:	max. 0.03
2	**Sliding layer**	
	Tin-lead-bronze	
	Layer thickness [mm]:	0.20 – 0.35
	Pore volume [%]:	Approx. 30
3	**Bearing back**	
	Steel	
	Steel thickness [mm]:	Variable
	Steel hardness [HB]:	100 – 180
	Alternative	
	Bronze	
	Bronze thickness [mm]:	Variable
	Bronze hardness [HB]:	80 – 160



Layer system

Chemical composition

Running-in layer	
Components	**% weight**
PTFE	44
Pb	56
Sliding layer	
Components	**% weight**
Sn	9 to 11
Pb	9 to 11
Cu	Remainder
Bearing back	
Material	**Material information**
Steel	DC04
	DIN EN 10130
	DIN EN 10139
Alternative: Bronze	**CuSn 6**
	DIN 17662

Material characteristics

Characteristic values, load limit	Designation	Unit	Value
Permitted pv value	$pv_{per.}$	MPa·m/s	1.8
Permitted specific bearing load			
• Static	$p_{per.}$	MPa	250
• Concentrated load, circumferential load at sliding speed ≤0.013 m/s	$p_{per.}$	MPa	140
• Concentrated load, circumferential load at sliding speed ≤0.032 m/s	$p_{per.}$	MPa	56
• Concentrated load, circumferential load, increasing at a sliding speed of ≤0.064 m/s	$p_{per.}$	MPa	28
Permitted sliding speed			
• Dry running	$v_{per.}$	m/s	2
• Hydrodynamic operation	$v_{per.}$	m/s	3
Permitted temperature	$T_{per.}$	°C	–200 to +280
Coefficient of thermal expansion			
• Steel back	α_{St}	K^{-1}	$11*10^{-6}$
• Bronze back	α_{Bz}	K^{-1}	$17*10^{-6}$
Coefficient of thermal conductivity			
•Steel back	λ_{St}	$W(mK)^{-1}$	› 40
•Bronze back	λ_{Bz}	$W(mK)^{-1}$	› 70

[1] The pores of the sliding layer are also filled with this lubricant mass.