

5.2 P2 PLAIN BEARINGS

5.2.1 P200, P202, P203 ... LOW-MAINTENANCE, UNIVERSAL

Brief description

P200, P202 and P203 are unleaded, environmentally friendly sliding materials with a very high performance. Thanks to a special combination of bulking agents, high wear resistance is achieved with simultaneously very good dry-running behaviour. They are therefore ideally suited to low-maintenance grease or liquid-lubricated applications subject to more stringent requirements. The standard P200 version features oil distributing pockets to DIN ISO 3547 in the sliding surface and a pre-finished wall thickness. The P202 versions (smooth sliding surface, suitable for remachining) and P203 (smooth sliding surface, ready to install) are also available on request.

Material manufacture

The bronze compound layer is sintered onto a prepared steel surface (strip) in a continuous sintering process in such a way as to produce a pore volume of around 50 % at a layer thickness of approx. 0.3 mm. Next, the sliding layer is applied in powder form and rolled into the cavities in the compound layer under a high temperature. The result is a sliding layer thickness of approx. 0.08 mm or approx. 0.2 mm above the compound layer, depending on the intended purpose. At the same time, the oil distributing pockets are produced, if required. A further rolling calibration process ensures the necessary thickness tolerance of the composite.

Material	Versions		
	Ready to install	Oil distributing pockets	Machining allowance
P200	•	•	
P202			•
P203	•		

Tab. 19: Material versions P202 and P203 available on request

Plain bearing production

Sliding elements in a great variety of designs are produced from the composite material in cutting, stamping and shaping processes. Standard designs are:

- Cylindrical bushes
- Thrust washers
- Strips

Plain bearings manufactured from P200, P202 or P203 undergo corrosion protection treatment on the bearing back, face reliefs and striking faces.

Standard version: Tin

Layer thickness [mm]: approx. 0.002

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

NOTE

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

Characteristics

- Lifetime lubrication
- Low wear
- Very good dry-running properties
- Insensitive to edge loading and impacts
- Good damping characteristics
- Good chemical resistance
- Unleaded
- Compliant with Directive 2011/65/EU (RoHS II)

Preferred areas of application

- Food sector
- Special requirements for environmental protection
- Low-maintenance operating with lubrication, more stringent requirements
- Rotating and oscillating movements up to a sliding speed of 3.3 m/s
- Linear movements up to 6 m/s
- Temperature range –40 °C to 110 °C



Fig. 20: P200 – Plain bearings with oil distributing pocket and oil hole

P202 and P203 feature smooth sliding surfaces and can be used under hydrodynamic conditions. P202 is suitable for remachining. Motorservice offers the calculation of hydrodynamic operating states as a service.

NOTE

Materials P202 and P203 are available on request.

Material composition P200, P202, P203

01 Sliding layer
PVDF matrix with bulking agents ¹⁾ Layer thickness [mm]: 0.08–0.20
02 Intermediate layer
Tin-bronze Layer thickness [mm]: 0.20–0.35 Pore volume [%]: approx. 50
03 Bearing back
Steel Steel thickness [mm]: Variable Steel hardness [HB]: 100–180

Tab. 20: System composition



Fig. 21: Layer system

Sliding layer	
Components	% weight
PTFE	9 to 12
Wear and friction-reducing bulking agents	22 to 26
PVDF	Remainder
Intermediate layer	
Components	% weight
Sn	9 to 11
P	max. 0.05
sonstige	max. 0.05
Cu	Remainder
Bearing back	
Material	Material information
Stahl	DC04
	DIN EN 10130
	DIN EN 10139

Tab. 21: Chemical composition

Characteristic values, load limit	Symbol	Unit	Value
Permitted pv value	$p_{v,perm.}$	MPa · m/s	3.3
Permitted specific bearing stress			
• Static	$p_{perm.}$	MPa	250
• Concentrated load, circumferential load at sliding speed ≤ 0.024 m/s	$p_{perm.}$	MPa	140
• Concentrated load, circumferential load at sliding speed ≤ 0.047 m/s	$p_{perm.}$	MPa	70
• Concentrated load, circumferential load, increasing at sliding speed ≤ 0.094 m/s	$p_{perm.}$	MPa	35
Permitted sliding speed			
• Grease-lubricated, rotating, oscillating	$v_{perm.}$	m/s	3.3
• Grease-lubricated, linear	$v_{perm.}$	m/s	6
• Hydrodynamic operation	$v_{perm.}$	m/s	6
Permitted temperature	$T_{perm.}$	°C	–40 to +110
Coefficient of thermal expansion			
• Steel back	α_{St}	K ⁻¹	11*10 ⁻⁶
Coefficient of thermal conductivity			
• Steel back	λ_{St}	W(mK) ⁻¹	40

Tab. 22: Material characteristics P200, P202, P203

SUSTAINABILITY



¹⁾ The cavities of the intermediate sliding layer are also filled with this mass.