



# Permaglide P2 plain bearings

## Material information P20

### P20, P22, P23 ... Low-maintenance standard solutions

#### Brief description

P20, P22 and P23 are leaded standard sliding materials with a high performance. They are designed for low-maintenance grease or liquid-lubricated applications. The standard P20 version features oil distributing pockets to DIN ISO 3547 in the sliding surface and a pre-finished wall thickness.

The P22 versions (smooth sliding surface, suitable for reworking) and P23 (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.

#### 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

In a final step, plain bearings manufactured from P20, P22 or P23 undergo corrosion protection treatment on the bearing back, face reliefs and striking faces.

Standard version: Tin

Layer thickness [mm]: Approx. 0.002



#### Note:

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

#### Characteristics

- Lifetime lubrication possible
- Low wear
- Low sensitivity to edge loading
- Good damping characteristics
- Insensitive to impact
- Good chemical resistance

#### Preferred areas of application

- Low-maintenance operation with lubrication
- Rotating and oscillating movements up to a speed of 3 m/s
- Linear movements up to 6 m/s
- Temperature range -40 °C to 110 °C

**The materials P20, P22 and P23 contain lead and must not be used in the food sector.**



*P20 plain bearing with oil distributing pockets and oil hole*

P22 and P23 feature smooth sliding surfaces and can be used under hydrodynamic conditions. The bearing bore of P22 is suitable for reworking.

Motor Service offers the calculation of hydrodynamic operating states as a service.

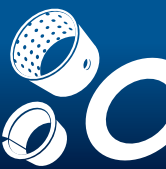


#### Note:

Materials P22 and P23 are available on request.

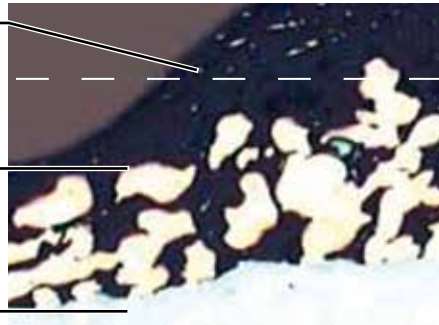
| Material | Versions         |                          |                     |
|----------|------------------|--------------------------|---------------------|
|          | Ready to install | Oil distributing pockets | Machining allowance |
| P20      | •                | •                        |                     |
| P22      |                  |                          | •                   |
| P23      | •                |                          |                     |

The right of changes and deviating pictures is reserved. For assignment and replacement parts, refer to the current catalogues, TecDoc CD or respective systems based on TecDoc.



## Material composition of P20, P22, P23

|   |                                                                                    |
|---|------------------------------------------------------------------------------------|
| 1 | <b>Sliding layer</b>                                                               |
|   | PVDF matrix with bulking agents <sup>1)</sup><br>Layer thickness [mm]: 0.08 - 0.20 |
| 2 | <b>Intermediate layer</b>                                                          |
|   | Tin-bronze<br>Layer thickness [mm]: 0.20 - 0.35<br>Pore volume [%]: Approx. 50     |
| 3 | <b>Bearing back</b>                                                                |
|   | Steel<br>Steel thickness [mm]: Variable<br>Steel hardness [HB]: 100 – 180          |



Layer system

### Chemical composition

| Sliding layer      |                      |
|--------------------|----------------------|
| Components         | % weight             |
| PVDF               | 51                   |
| PTFE               | 8                    |
| Pb                 | 41                   |
| Intermediate layer |                      |
| Components         | % weight             |
| Sn                 | 9 to 11              |
| Cu                 | Remainder            |
| Bearing back       |                      |
| Material           | Material information |
| Steel              | DC04                 |
|                    | DIN EN 10130         |
|                    | DIN EN 10139         |

### Material characteristics

| Characteristic values, load limit                                                            | Designation       | Unit                | Value               |
|----------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|
| Permitted pv value                                                                           | pvper.            | MPa·m/s             | 3                   |
| Permitted specific bearing load                                                              |                   |                     |                     |
| • Static                                                                                     | pper.             | MPa                 | 250                 |
| • Concentrated load, circumferential load at sliding speed $\leq 0.021$ m/s                  | pper.             | MPa                 | 140                 |
| • Concentrated load, circumferential load at sliding speed $\leq 0.043$ m/s                  | pper.             | MPa                 | 70                  |
| • Concentrated load, circumferential load, increasing at a sliding speed of $\leq 0.086$ m/s | pper.             | MPa                 | 35                  |
| Permitted sliding speed                                                                      |                   |                     |                     |
| • Grease-lubricated, rotating, oscillating                                                   | vper.             | m/s                 | 3                   |
| • Grease-lubricated, linear                                                                  | vper.             | m/s                 | 6                   |
| • Hydrodynamic operation                                                                     | vper.             | m/s                 | 6                   |
| Permitted temperature                                                                        | T <sub>per.</sub> | °C                  | -40 to +110         |
| Coefficient of thermal expansion                                                             |                   |                     |                     |
| • Steel back                                                                                 | $\alpha_{St}$     | K <sup>-1</sup>     | 11·10 <sup>-6</sup> |
| Coefficient of thermal conductivity                                                          |                   |                     |                     |
| • Steel back                                                                                 | $\lambda_{St}$    | W(mK) <sup>-1</sup> | < 4                 |

<sup>1)</sup> The pores of the sliding layer are also filled with this lubricant mass.