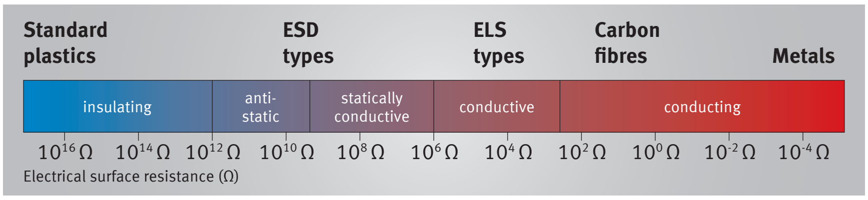
SI 1724
For technical personnel only!

SERVICEINFORMATION

STATIC CHARGING AND ELECTRICAL CONDUCTIVITY FOR PERMAGLIDE® PLAIN BEARINGS

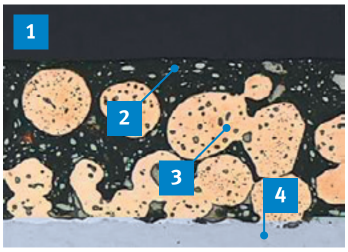
For every friction combination, electrostatic charges can arise which can cause unwanted sparks to flash over to the components concerned.
This mainly affects electrically insulating materials, such as plastics. If systems are subject to regulations such as the ATEX Directive on explosion protection, it must be ensured that no risks are created through electrostatic charging.
The structure of PERMAGLIDE® plain bearings is comprised of metals and plastics, so-called metal-plastic composites. Metals are typically electrical conductors, whilst unfilled plastics are insulators.



Classification of the electrical conductivity of plastics and metals

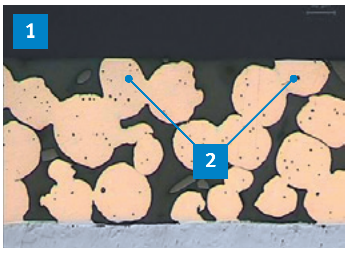
PERMAGLIDE® P1 MAINTENANCE-FREE MATERIALS

The running-in layer of PERMAGLIDE® P1 materials basically consists of the insulating plastic PTFE (polytetrafluoro-ethylene) with anti-friction additives which serve as a solid lubricant. The composite material then only becomes conductive (ELS*), when the running-in layer has been removed (material removal of between 0.005 mm and 0.030 mm) and there is contact between the surfaces of the metallic interacting sliding partner and the functioning sintered bronze layer. This is generally the case after a short running-in phase.



Condition of the sliding surface in the initial state

01 E.g. Shaft
02 Running-in layer PTFE solid lubricant
03 Bronze sliding layer
04 Supporting steel back



Condition of the sliding surface at the end of the run-in

01 E.g. Shaft
02 The bronze begins to function.
The material is electrically conducting.

*ELS = electrically conductive, stabilised

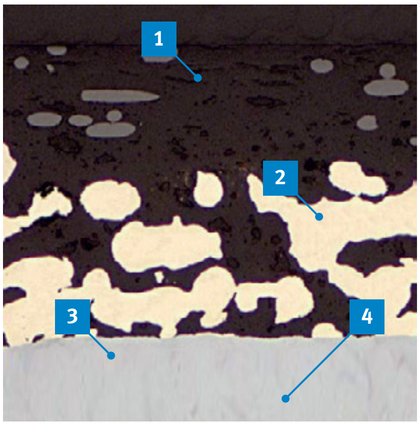
For static applications or for micro movements, it cannot always be presumed that the run-in process has been completed. The conductivity also depends on the specific compression. In the initial state of the plain bearing, higher surface resistances must therefore be expected.

PERMAGLIDE® P1 materials can fundamentally be classified in the group of anti-static materials (ESD) (electrical surface resistance ‹ 10^{12} Ω). Following the run-in of a PERMAGLIDE® plain bearing, metallic frictional contact is generally created with the bronze layer so that the surface resistance is moved into the range of megaohms (10^6 Ω) up to kiloohms (10^3 Ω), and becomes electrically conductive or electrically conducting.
Due to the elemental lead in the solid lubricant, the PERMAGLIDE® P10 and P11 materials tend to have better electrical conductivity than the unleaded PERMAGLIDE® materials such as P14.

PERMAGLIDE® P2 MATERIALS

The PERMAGLIDE® P2 materials do not provide any electrically conducting characteristics. Due to the structure, the metals in the material are shielded from the interacting sliding partner by a thick polymer sliding layer. PERMAGLIDE® P2 materials are therefore insulators (electrical surface resistance › 10^{12} Ω).

Even the components containing lead in the plastic or the amount of carbon fibres in unleaded PERMAGLIDE® P20x materials do not provide a sufficiently conducting compound to create anti-static characteristics. Low-maintenance PERMAGLIDE® P2 materials are also mainly used when lubricated, which increases the insulating effect.



Microsection of P203

01 Sliding layer PVDF compound
- layer thickness approx. 0.2 mm
- leaded variants P20, P22, P23
- unleaded variants P200, P202, P203

02 Compound layer approx. 0.3 mm
- spattered tin bronze
- porosity approx. 50 %

03 Steel back DC04

04 Corrosion protection – Tin approx. 2 µm