

# KS PERMAGLIDE® Plain Bearings

Applications





#### **Motorservice**

The Motorservice Group is the sales organisation for the global aftermarket activities of KSPG (Kolbenschmidt Pierburg). It is one of the leading suppliers of engine components for the independent aftermarket, including the premium brands KOLBENSCHMIDT, PIERBURG and TRW Engine Components, as well as the BF brand.



#### **KS Gleitlager**

Within the Kolbenschmidt Pierburg Group, KS Gleitlager is the specialist for high-precision bearings. The introduction of new technologies in production and surface finishing, innovative material developments and a clear customer focus have made KS Gleitlager one of the world's leading suppliers of engine plain bearings and dry plain bearings (KS PERMAGLIDE®).



#### **KSPG (Kolbenschmidt Pierburg)**

As long-standing partners to the automotive industry, the companies in the KSPG Group develop innovative components and system solutions with acknowledged competence for air supply and emission control, for oil and water pumps, for pistons, engine blocks and engine bearings. The products comply with the high demands and quality standards of the automotive industry. Low emission, reduced fuel consumption, reliability, quality and safety – these are the forces that drive innovation at KSPG.

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## 1.1 Bearing of the lamellae in fire dampers

**Sector: Fire safety technology, building technology**

### Function

Fire dampers must function reliably. If there is a fire, the lamellae of the fire damper must open smoothly and correctly. Environmental influences such as heat, cold, dirt or dust must not impede the function of the lamellae. If used frequently – or indeed rarely – this correct opening must not be impeded. Jamming caused by corrosion, dirt or the influence of certain temperatures must be prevented.

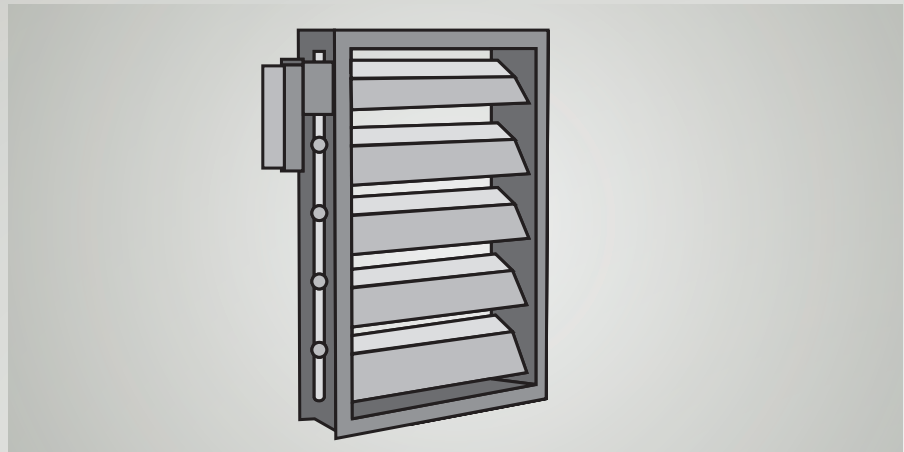
### Bearing with KS PERMAGLIDE® P10 plain bearing bushes

KS PERMAGLIDE® P10 plain bearings, which are implemented in pairs, are an ideal solution for the bearing of the lamellae in fire dampers.

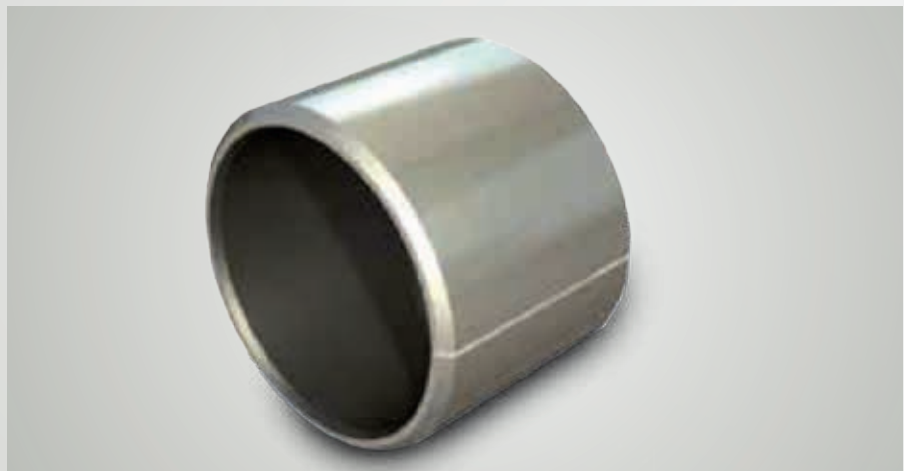
The maintenance-free KS PERMAGLIDE® P10 plain bearings prevent the bearing from corroding and freezing solid, and prevent the lubricant from dripping out due to heat. The bearing clearance may not become too low, e.g. due to high temperatures, as this can lead to the lamellae becoming stuck. The reliable function of the fire damper – even after long periods of use – is guaranteed by using KS PERMAGLIDE® P10 plain bearings.

### Advantage: Reliable function of the bearing thanks to KS PERMAGLIDE® P10 plain bearings

- Impervious to temperature, dirt and dust
- Maintenance-free, even when used very frequently or rarely
- Protected against corrosion



*Lamellae arranged one behind the other in a fire damper*



*KS PERMAGLIDE® P10 plain bearing bush*

### Use of KS PERMAGLIDE® P10 plain bearings in fire dampers

Bearing of the lamellae pivots:  
KS PERMAGLIDE® bushes in the locating hole of the lamellae

**Description of material**

**KS PERMAGLIDE® P10 – robust and reliable**

- Universally usable plain bearing material for dry and lubricated applications
- High rigidity
- Durability
- High chemical resistance
- Good emergency running properties
- Material: Lead bronze sintered onto a steel base, friction-minimising additives PTFE and lead.

**KS PERMAGLIDE® P10 offers the following advantages over comparable lead-free plain bearing products:**

- Higher thermal conductivity
- Good chemical resistance
- Good transfer of lubricant onto the interacting sliding partner
- Good passivation of the interacting sliding partner
- Impervious to high edge loading

In damp environments, in particular, this sliding layer system provides outstanding protection against corrosion. Moreover, lead and PTFE are extremely non-absorbent. Absorption of the surrounding fluids with consequent swelling of the materials is prevented, as is chemical damage to interacting sliding partners. The result is dimensional stability and optimum corrosion protection during use.

**Application description**

In normal operation, the lamellae of the fire damper are closed and are never opened, or if so, then very rarely.

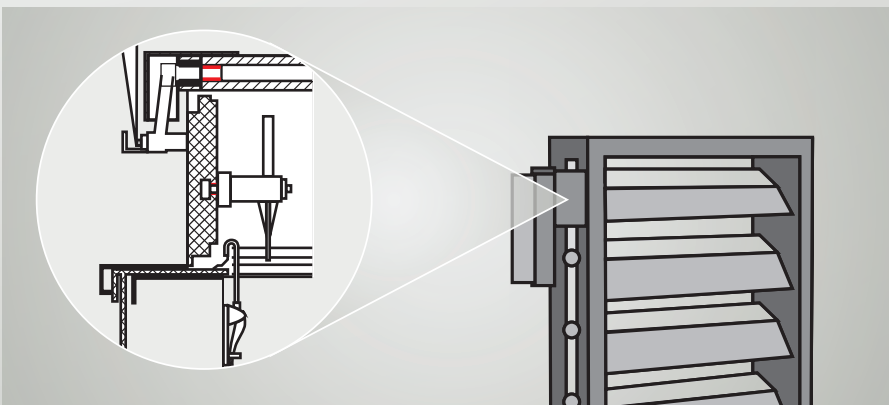
Fire dampers are installed in building ventilation systems in order to prevent fire and smoke spreading via ventilation lines. In the event of fire, fire dampers are opened so that toxic fumes can be extracted. Fire dampers are sometimes mandatory as safety components according to § 14 of the German Model Building Ordinance (MBO). Fire dampers are also used for normal ventilation in building technology.



Fire damper



Ventilation system



Bearing of the lamellae using KS PERMAGLIDE® P10 plain bearings

## 1.2 Bearing of the shaft journal in maintenance-free isolating valves

Sector: Chemical industry, building technology, industrial and process technology

### Product used

KS PERMAGLIDE® cylindrical plain bearing bushing, type PAP ... P10/P11.

The KS PERMAGLIDE® materials P10 (with steel back) or P11 (with bronze back) are used, depending on the aggressiveness of the gas or liquid.

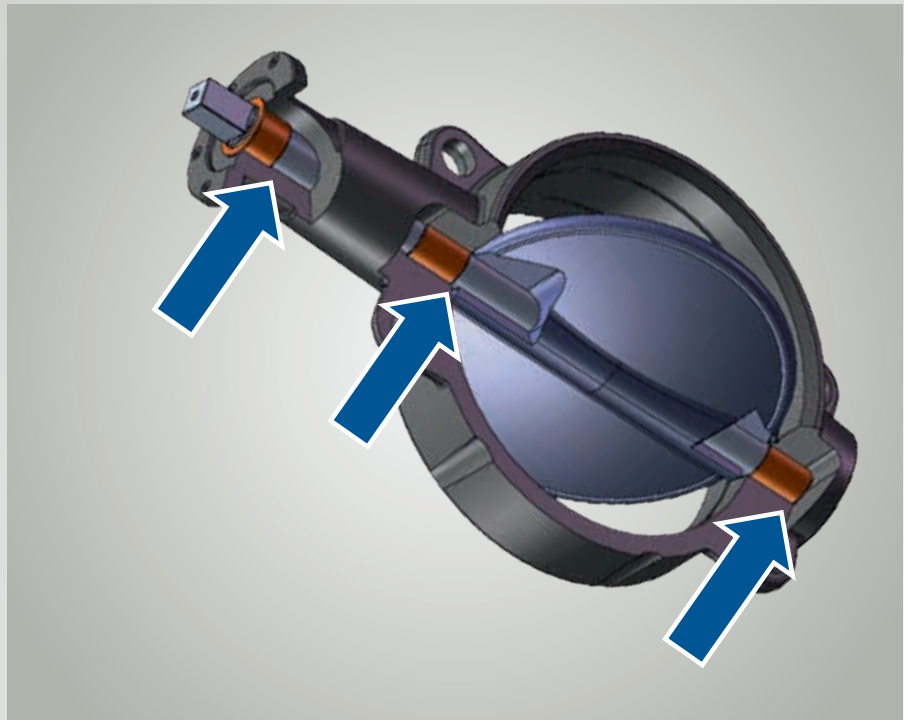
### Function

Isolating valves regulate by increasing and decreasing the flow of liquids and gases in pipelines. The installed plain bearings are constantly exposed to the influence of chemicals and high or extremely low temperatures. Liquids cause constant vibrations on the valve, amongst other things. The bearing must not become stuck due to corrosion or the influence of certain temperatures. If used frequently – or indeed rarely – the function of the isolating valve must not be impeded. The bearings are no longer accessible once installed, and so maintenance-free bearings are required. Isolating valves act as safety switches: if the pressure is too high, the isolating valve opens. If a section of the pipeline is leaking, the isolating valve closes.

### Bearing with KS PERMAGLIDE® P10/P11 plain bearing bushes

The shaft journal and the valve disc are mounted with KS PERMAGLIDE® P10 or P11 plain bearing bushes.

The P10 and P11 plain bearings do not become electrostatically charged, as they act as electrical conductors after running-in. The isolating valves can also be used in environments where there are explosive gases.



Isolating valve, bearing by means of KS PERMAGLIDE® P10 or P11 plain bearing bushes (arrows)

### Advantage: Reliable function of the bearing thanks to KS PERMAGLIDE® P10/P11 plain bearings

- Suitable for use with liquids and gases
- High chemical resistance
- Corrosion-resistant
- Minimal swelling tendency
- Temperature-resistant
- Dry running: No lubrication is necessary. The plain bearings are also used with aggressive media.
- Maintenance-free
- No static charging, also suitable for explosive media

The maintenance-free KS PERMAGLIDE® P10 plain bearings guarantee permanent bearing, even in extreme operating conditions.

**Description of material**

**KS PERMAGLIDE® P10 – robust and reliable**

- Universally usable plain bearing material for dry and lubricated applications
- High rigidity
- Durability
- High chemical resistance
- Good emergency running properties
- Material: Lead bronze sintered onto a steel base, friction-minimising additives PTFE and lead.

**KS PERMAGLIDE® P10 offers the following advantages over comparable lead-free plain bearing products:**

- Higher thermal conductivity
- Good chemical resistance
- Good transfer of lubricant onto the interacting sliding partner
- Good passivation of the interacting sliding partner
- Impervious to high edge loading

In damp environments, in particular, this sliding layer system provides outstanding protection against corrosion. Moreover, lead and PTFE are extremely non-absorbent. Absorption of the surrounding fluids with consequent swelling of the materials is prevented, as is chemical damage to interacting sliding partners. The result is dimensional stability and optimum corrosion protection during use.

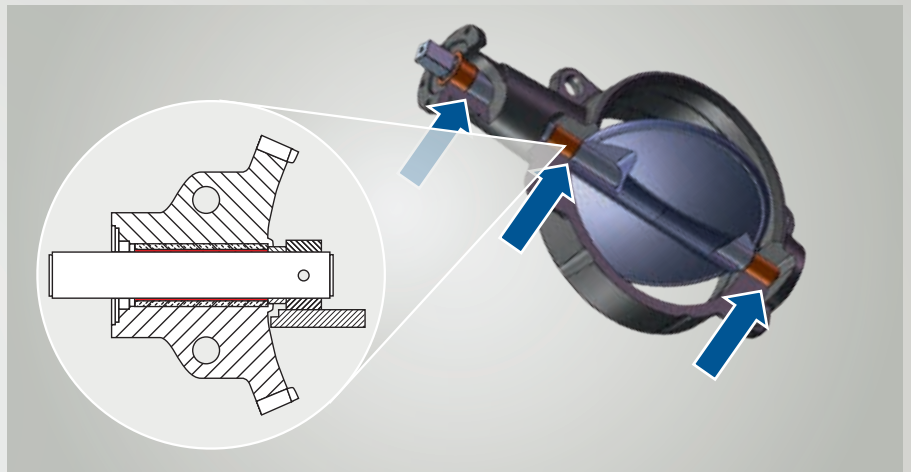
**Application description**

**Use of various media in pipelines:**

- Gases
- Liquids
- Vapours
- Acids
- Bases



*KS PERMAGLIDE® P10 and P11 plain bearing bush*



*Bearing of the shaft journal using KS PERMAGLIDE® P10/P11 plain bearings*

**Examples of isolating valve applications:**

- Plants in the chemical industry
- Plants in the pharmaceutical industry
- Gas plants
- Landfill gas plants
- Sewage plants
- Drinking water plants
- Service water plants
- Sea water desalination plants
- Cooling water plants
- Heating systems
- Swimming pool technical systems
- Industrial fittings
- Pump systems
- Shipbuilding

**Other designations for isolating valves:**

- Butterfly valves
- Shut-off valves
- Throttle valves
- Regulating throttles
- Check valves
- Versions: Poppet valves, annular valves

## 1.3 Bearing of the piston rod in pneumatic cylinders

**Sector: Conveyor technology, automation technology, drive engineering, engineering, handling technology, compressed-air technology**

### Product used

KS PERMAGLIDE® cylindrical plain bearing bush, design PAP ... P20

### Function

Pneumatic cylinders are used for the drive of linear movements, e.g. in conveyor technology and in engineering. Pneumatic cylinders are either single-acting or double-acting. The force of the piston rod thus acts in one or in both directions on the axle. This means that the cylinder can be used to generate a pushing force or a pulling force. The use of compressed air can lead to jerky movements and vibrations.

### Bearing with KS PERMAGLIDE® P20 plain bearings

In pneumatic cylinders, KS PERMAGLIDE® P20 plain bearing bushes are used as spigot bearings for the piston rod. The plain bearings are sealed and initially lubricated with grease.

The plain bearings are designed with oil distributing pockets in the sliding surface. This guarantees the appropriate distribution of lubricant over the entire service life. Lubrication ensures a low and constant friction coefficient and enables smooth linear movement. The bearing also provides

a high level of guidance accuracy under changing operating conditions. The structure of the P20 makes it ideally suited to this application. High lateral forces, significant vibrations and sometimes high speeds act on the bearing position. With its extreme stress potential and distinct damping characteristic, the P20 constantly maintains its function as a precise spigot bearing.

### Advantage: Reliable bearing with KS PERMAGLIDE® P20 plain bearings

- Low-maintenance operation with lubrication
- High wear resistance
- Constant and low friction coefficient
- Good damping characteristics
- Insensitivity to shocks and impacts

### Description of material

KS PERMAGLIDE® P20 is a low-maintenance, leaded bearing material with a high performance. It is designed for grease-lubricated or liquid-lubricated applications. This composite, multi-layered material excels through its high rigidity, durability and resistance to oscillation and vibration. These characteristics are largely achieved by a sliding layer system made of polyvinylidene fluoride (PVDF), polytetrafluoroethylene (PTFE) and lead. The wear-resistant material has already proven itself many times in industry.

The standard P20 version features oil distributing pockets as per DIN ISO 3547. The bearings are provided ready to install for recommended connection-design installation dimensions. Also available are versions with a different wall thickness, suitable for rework when installed, or with a smooth sliding surface for hydrodynamic applications.



*Pneumatic cylinder application, bearing with KS PERMAGLIDE® P20 plain bearings*



**Application description**

A pneumatic cylinder comprises a cylindrical tube housing and a moving piston rod. Single-acting cylinders are usually also equipped with a return spring.

**Requirement of pneumatic cylinders or bearing in pneumatic cylinders**

- Functional reliability
- High durability
- Wear resistance
- No subsequent lubrication required
- Smooth piston-rod movement
- Vibration damping

**Technical data**

- Operating temperature up to 130°C
- Sliding speed up to 6 m/s
- Piston diameter from Ø 30 mm to Ø 110 mm
- Stroke 25 mm to 500 mm

**Pneumatic cylinder applications include the following:**

- Sheet-metal working: Cutting, stamping, shaping, bending, pressing, embossing, mounting, riveting, pressure-joining, clinching, press-fitting
- Conveyor technology: Sorting, transporting, lifting, lowering

- Clamping devices
- Driving compressed-air motors in tools
- Injection-moulding technology
- Clamping units:
  - Opening and closing valves
- Automation technology
- Engineering
- Assembly units
- Packaging units

**Note for the food industry:** The material P20 contains lead and must not be used in the food sector. The material P200 (unleaded) can be used in the food sector.

**Other terms for pneumatic cylinder:**

- Piston-rod cylinder
- Single-acting cylinder
- Double-acting cylinder



KS PERMAGLIDE® P20 plain bearing bush with oil distributing pockets

## 1.4 Bearing of the gear shafts in gear pumps

**Sector: Chemical industry, automotive industry, agricultural machinery, construction machinery, machine tool manufacture**

### Product used

KS PERMAGLIDE® cylindrical plain bearing bush, design PAP ... P10

### Function

Gear pumps are used in many applications to deliver liquids (media) or as a force-transmitting drive for hydraulic motors. The gear pump delivers the medium evenly from the intake side (intake), through the gears and to the thrust side (exhaust). Among other applications, gear pumps are used in vehicles as a fuel pump, oil pump or coolant pump. The chemical industry uses gear pumps to deliver organic and inorganic chemicals. Within construction machinery and agricultural machinery, gear pumps are used as a drive for hydraulic motors, for example.

### Bearing with KS PERMAGLIDE® P10 plain bearing bushes

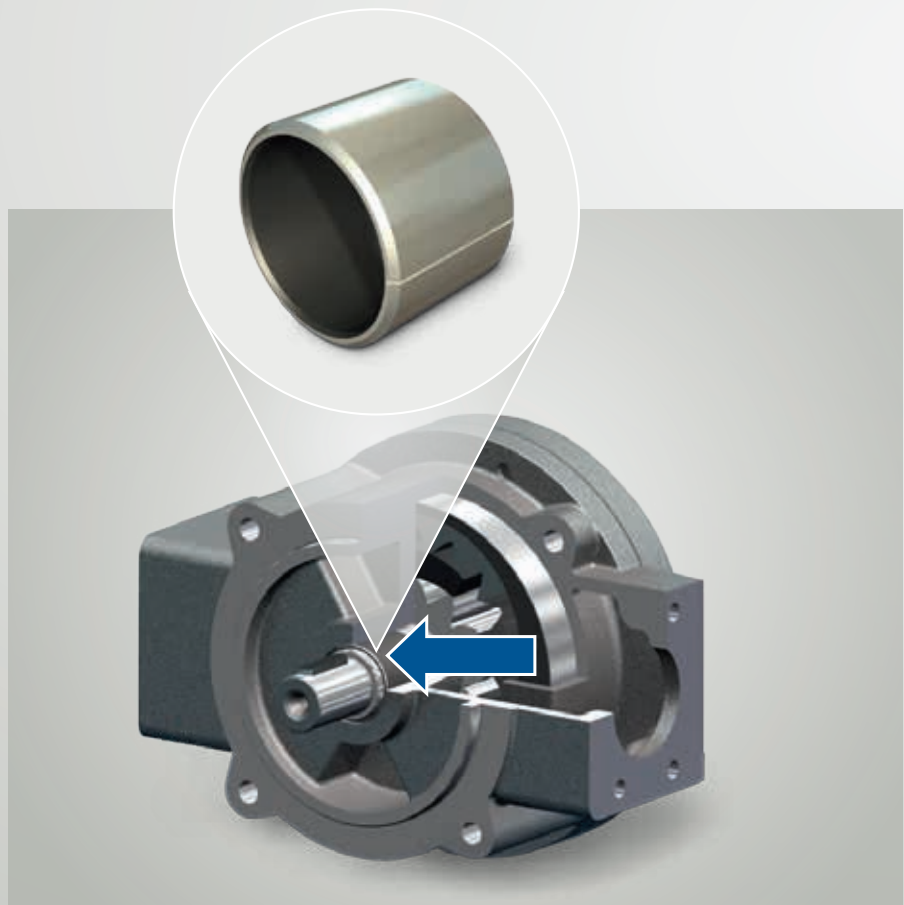
KS PERMAGLIDE® P10 plain bearings are used as the main bearing for the gear shafts in gear pumps.

A low operating bearing clearance is essential for the high build-up of pressure and for low gear-pump leakage. To ensure a fault-free hydrodynamic operating state, the plain bearings must exhibit a bearing clearance tailored to the operating medium. The plain bearings come into direct contact with the operating medium. Aggressive media may be used, depending on the application. The plain bearings must therefore offer high resistance to abrasion, good resistance to erosion, chemical

compatibility and low swelling tendency. KS PERMAGLIDE® P10 plain bearings meet these requirements. The excellent dry-running behaviour of KS PERMAGLIDE® P10 plain bearings also ensures a low level of wear in the mixed friction operation that occurs when the pump is switched on and off.

### Technical data for the application applied

- Application: Central lubrication with stationary combustion engines
- Displacement: Up to 1400 cc/rev
- Engine speed: 2,000 to 2,500 rpm
- p<sub>max</sub>: 25 bar
- Flow: up to 1,600 l/min



*Gear pump application, bearing with KS PERMAGLIDE® P10 plain bearings (arrow)*

**Advantage: Reliable function of the bearing with KS PERMAGLIDE® P10 plain bearings**

- Hydrodynamic operation
- Sliding speed up to 10 m/s
- High media compatibility
- Low operating bearing clearance
- High resistance to abrasion
- High resistance to erosion
- Good chemical resistance
- Low swelling tendency
- Low level of wear, even at high engine speeds and mixed friction

**Description of material**

KS PERMAGLIDE® P10 – robust and reliable

- Universal-use bearing material for dry and lubricated applications
- Material: lead bronze sintered onto a steel base, friction-minimising additives PTFE and lead.
- High rigidity
- Durability
- Optimum corrosion protection
- Good emergency running property

In damp environments in particular, this sliding layer system provides outstanding protection against corrosion. Moreover, lead and PTFE have an extremely low absorption tendency. Absorption of the surrounding fluids, swelling of the materials and chemical damage to interacting sliding partners are prevented. The result is dimensional stability and optimum corrosion protection during use.

**Application description**

Among other things, gear pumps comprise a multiple-component housing, gears and gear shafts.

**Gear pumps are used in many applications, including**

- The chemical industry
- The automotive industry
- Agricultural machinery
- Construction machinery
- Foodstuff engineering
- Machine tool manufacture



**Note for the food industry:**

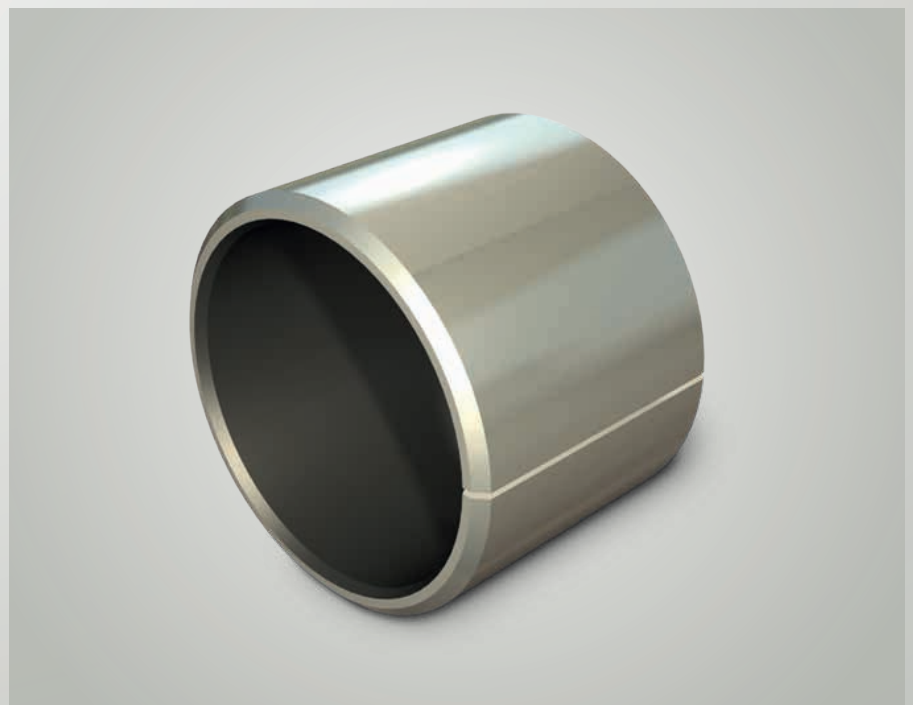
The material P10 contains lead and must not be used in the food sector. The material P14/P147 (unleaded) can be used in the food sector.

**Requirements from gear pumps**

- High reliability
- Good durability
- Low noise level
- High build-up of pressure

**Types of gear pump**

- External gear pump
- Internal gear pump
- Screw pump
- Screw-spindle pump
- Screw-type compressor
- Toothed ring pump
- Rotor pump
- Crescent pump



KS PERMAGLIDE® P10 plain bearing bush

## 2 | Overview of materials

### 2. Overview of materials of KS PERMAGLIDE® P1 plain bearings

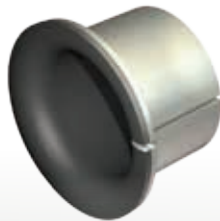
- Maintenance-free
- Suitable for dry running

Characteristics & properties	Units	P10 P11	P14	P147*
lead-free	–	no	yes	yes
$p_{v\max}$	MPa · m/s	1.8	1.6	1.4
$p_{\max.\text{stat.}}$	MPa	250	250	250
$p_{\max.\text{dyn.}}$	MPa	56	56	56
$v_{\max.}$	m/s	2	1	0.8
T	°C	–200 to +280	–200 to +280	–200 to +280

#### Versions of the KS PERMAGLIDE® P1



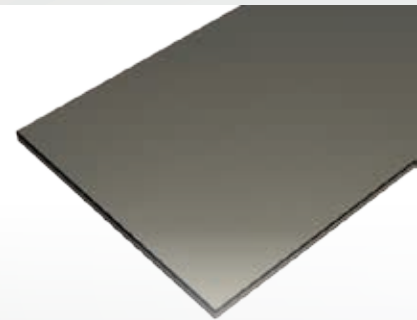
*PAP bushes*  
P10, P11, P14, P147\*



*PAF collar bushes*  
P10, P11, P14, P147\*



*PAW thrust washers*  
P10, P11, P14, P147\*



*PAS strips*  
P10, P11, P14, P147\*

#### KS PERMAGLIDE® P1 materials

##### Standard material P10

- Contains lead
- 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

##### Special material P11

- Contains lead
- Improved corrosion resistance
- Very good thermal conductivity and therefore greater reliability
- Anti-magnetic
- All other properties as P10

##### Standard material P14

- Lead-free
- Very low stick-slip tendency
- Low wear
- Low friction coefficient
- No tendency to fuse with metal
- Largely resistant to swelling

##### Special material P147\*

- Lead-free
- Very good corrosion resistance
- All other properties as P14

\* On request

## 2. Overview of materials of KS PERMAGLIDE® P2 plain bearings

- Low-maintenance
- For grease or liquid-lubricated applications

Characteristics & properties	Unit	P20 P22*, P23*	P200 P202*, P203*
lead-free	–	no	yes
$p v_{max}$	MPa · m/s	3	3.3
$p_{max.stat.}$	MPa	250	250
$p_{max.dyn.}$	MPa	70	70
$v_{max.}$	m/s	3	3.3
T	°C	-40 to +110	-40 to +110

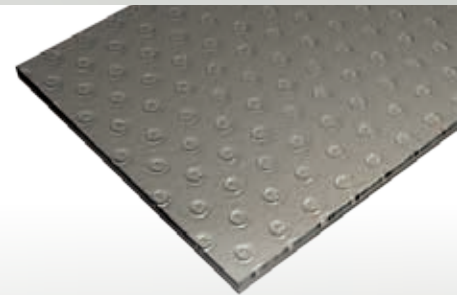
### Versions of the KS PERMAGLIDE® P2



*PAP bushes*  
P20, P22\*, P23\*,  
P200, P202\*, P203\*



*PAW thrust washers*  
P20, P22\*, P23\*,  
P200, P202\*, P203\*



*PAS strips*  
P20, P22\*, P23\*,  
P200, P202\*, P203\*

### KS PERMAGLIDE® P2 materials

#### Standard material P20

- Contains lead
- With oil distributing pockets, ready to install
- Lifetime lubrication possible
- Low wear
- Low sensitivity to edge loading
- Good damping characteristics
- Insensitive to impact
- Good chemical resistance

#### Special material P22\*

- Contains lead
- Smooth sliding surface, with machining allowance
- All other properties as P20

#### Special material P23\*

- Contains lead
- Smooth sliding surface, ready to install
- All other properties as P20

#### Standard material P200

- Lead-free
- With oil distributing pockets, ready to install
- Lifetime lubrication
- Low wear
- Very good dry-running properties
- Insensitive to edge loading and impact
- Good damping characteristics
- Good chemical resistance

#### Special material P202\*

- Lead-free
- Smooth sliding surface, with machining allowance
- All other properties as P20

#### Special material P203\*

- Lead-free
- Smooth sliding surface, ready to install
- All other properties as P20

\* On request

## 3 | Applications realized



## 3. Applications realized

### 1. KS PERMAGLIDE® P1 Plain Bearings

- Pump turbines, blade adjustment
- Wind turbine gears, core shaft bearings
- Fluid coupling, shaft passage
- Gear-wheel pump, shaft bearing
- Butterfly valve, pin bearing
- Surrounding structure, carriage chain
- Stamping machine, workpiece table
- Toggle lever spanner, piston pin bed
- Telescopic crane, luffing jib foot
- Concrete distributor mast, break joint
- Automatic packing machine, pressure equipment
- Automatic placement machine, sliding guidance
- Matrix printer, ink ribbon drive
- Proportional solenoid, piston guide
- Weir gate, link chain
- Home trainer, freewheel

### 2. KS PERMAGLIDE® P2 Plain Bearings

- Pneumatic cylinder, rod guidance
- Plastic blowing machine, bar bearings
- Injection moulding machine, tool changer
- High bay warehouse, coupling chain
- Drilling system, swivel bearing
- Lifting platform, scissor joints
- ABS brake, cam roller
- Potato harvesting machine, steering pivot bearings
- Wind power station

and many other

### Branches

- Mechanical and plant engineering
- Printing press manufacturing and paper machinery
- Food technology
- Medical technology
- Industrial
- Energy and electrical engineering
- Furniture industry
- Automotive and vehicle construction
- Agricultural machinery, Construction machines and special purpose machines
- Railway vehicles

and many other

## 4. Motorservice – Your premium supplier

### Sales support and technical customer service

- Expert advice during order and delivery processing
- Online catalogue with calculation tool, CAD drawings and 3D views
- Product catalogues and product information – personalised version with your address and your logo available on request
- Sales promotion: trade fair presentations, product samples, promotional items and give-aways

- Always stay up to date with our newsletter and website: [www.permaglide.com](http://www.permaglide.com)
- Individual advice, calculations and plain bearing design
- Special designs according to your requirements

### Our experience is your gain

- Over 30 years of expertise in the manufacture of KS PERMAGLIDE® plain bearings
- Top-quality standards of the German automotive industry

- Practical test rigs according to your requirements
- Material and process development

### Logistics performance

- High availability and warehouse storage
- Quick order processing and commissioning
- Cost-optimised delivery at a given deadline or overnight via express delivery

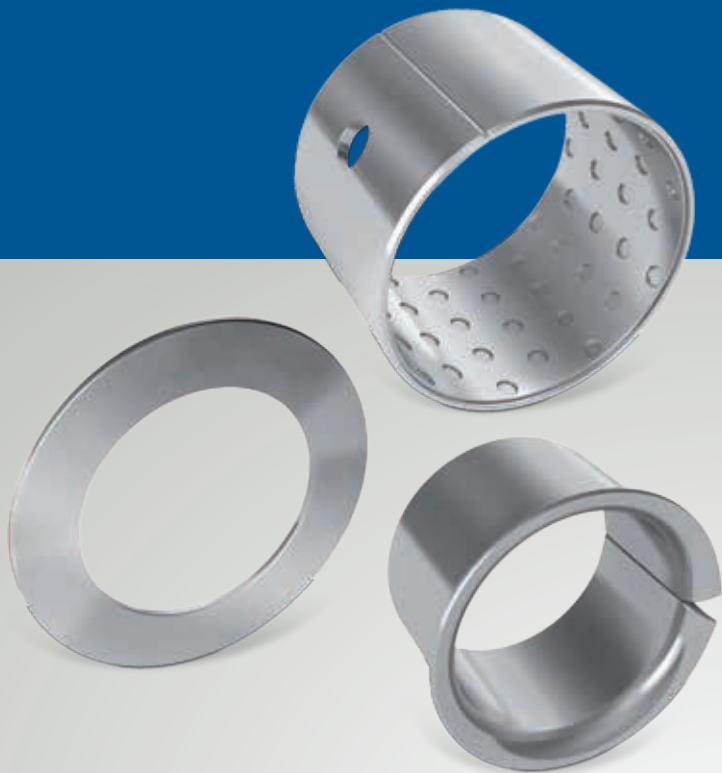
**100% made in Germany**

**Comprehensive technical service**

**Extensive technical service**

KS PERMAGLIDE® Plain Bearings –  
For perfect running.





**Original**

**KS PERMAGLIDE®**

**Plain Bearings**

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