

Engine bearings

Handling and function

Bearing functions and lubrication

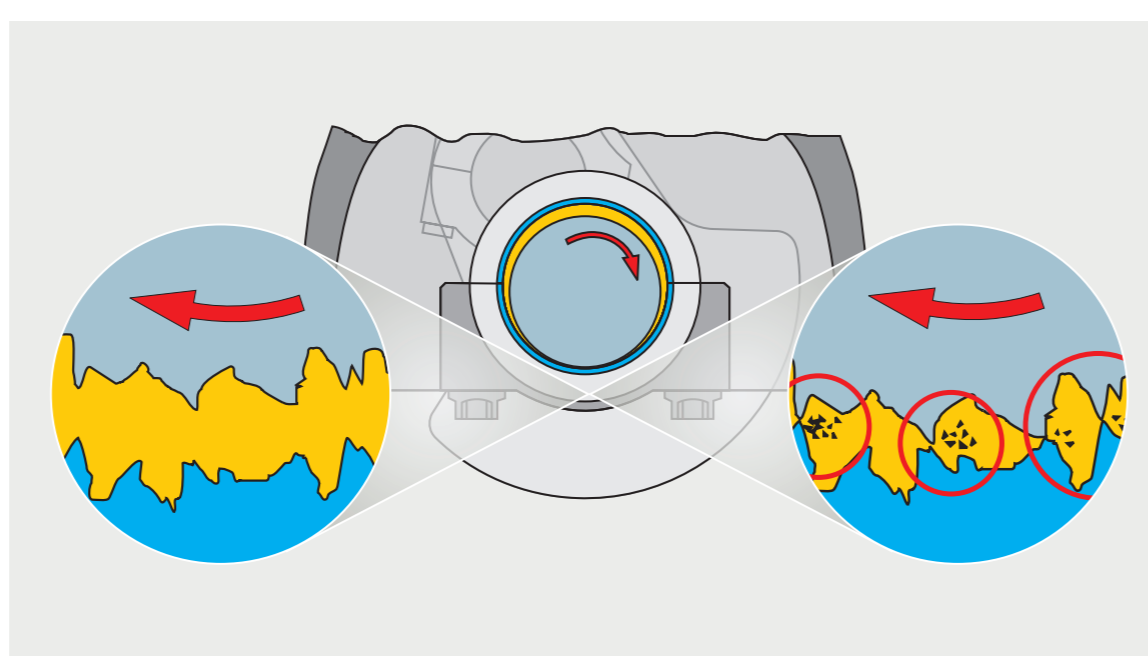
Liquid friction and mixed friction

Liquid friction

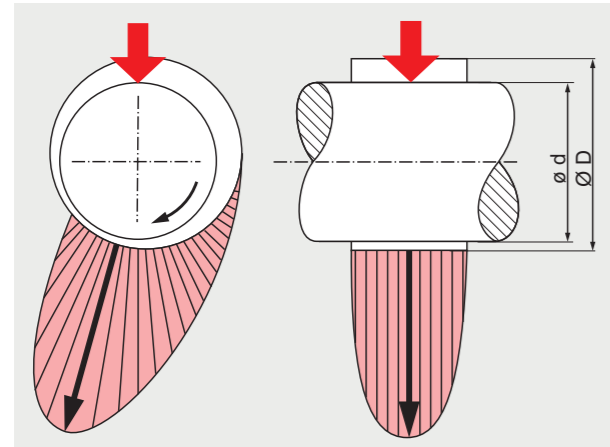
Liquid friction is the technical term for the condition in which the two interacting sliding parts are separated from one another by a film of liquid (oil, water, etc.) and have no metallic contact with one another. The shaft floats in the bearings.

Mixed friction

If the tips of the interacting sliding parts touch or the distance between the two interacting sliding parts is bridged by solid particles (dirt, abrasion), then mixed friction occurs. Both of these lead to premature wear to the sliding surfaces.



Oil pump pressure and hydrodynamic pressure

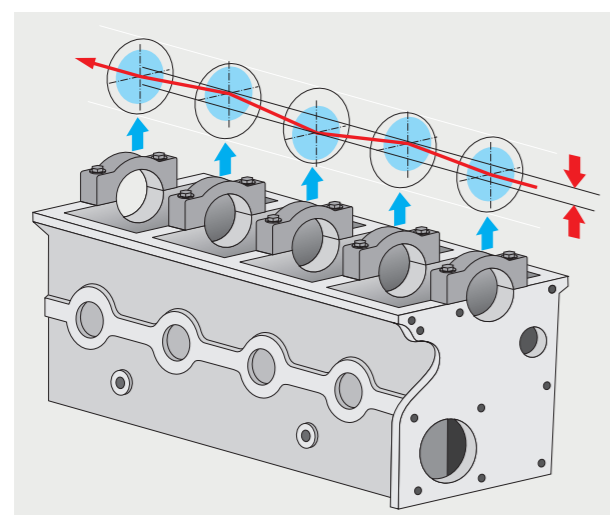


The oil pump pressure generated by the oil pump has the function of conveying the oil to the bearing point and cooling the bearing by a constant flow of oil.

The hydrodynamic pressure is primarily responsible for the bearing function and the service life of the bearing. This is only produced by the rotation of the shaft. The slight wobbling of the shaft within the bearings (normal condition) causes the shaft to push a wedge of lubricant in front of it, in which the prevailing pressure is a multiple of the original oil pump pressure.

Testing, measuring, reconditioning...

Concentricity of adjacent bearing points



If the centre points of all main bearing points are not exactly central on an axis, severe bearing damage occurs when starting due to the necessary bearing clearance being eliminated. Such problems are caused by bent or incorrectly ground crankshafts and a distorted engine case (previous damage caused by overheating).

Concentricity of the main bearing counterbore max. 0.02 mm
Concentricity of all crankshaft main bearing journals max. 0.01 mm

Surface hardness of the shaft

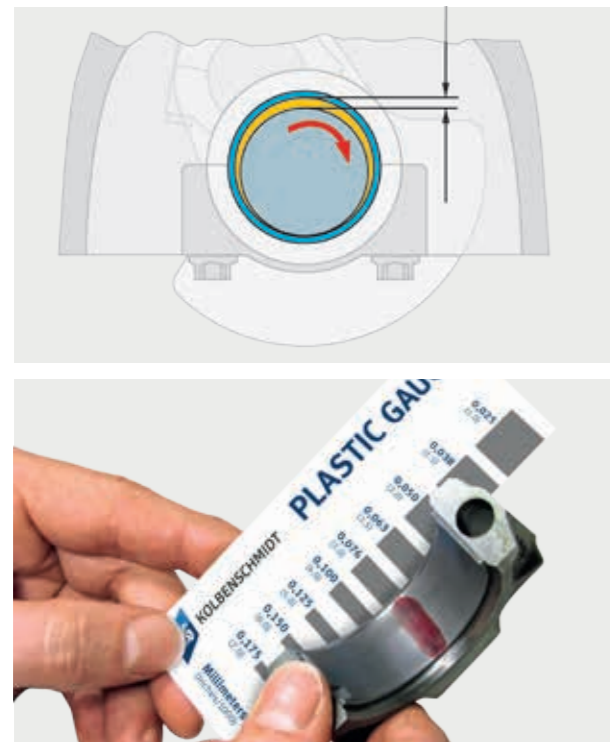


As a result of bearing damage (overheating of the bearing points) shaft journals regularly lose the necessary hardness.

Regrinding the shafts to the first or second undersize diameter can also result in a loss of the specified bearing journal surface hardness.

If the hardness of the journals is no longer sufficient, this must be resolved by rehardening the shaft (e.g. by nitration). The Rockwell hardness (HRC) for new shafts is 60. For used shafts, the hardness of the shaft journals must not be below 55.

Testing bearing clearances



The bearing clearance ensures that in every operating situation there is sufficient space between the bearing and the bearing journal. This enables a strong and stable film of oil to form and pure liquid friction is possible.

Insufficient bearing clearance is quickly bridged as a result of thermal expansion of the components as the engine temperature increases.

Excessive bearing clearance allows the oil pressure to fall quickly. The lubricant wedge necessary for a correct bearing function cannot be formed. Refer to "Oil pump pressure and hydrodynamic pressure".

Both conditions result in metallic contact between the shaft and the bearing. The bearing will be destroyed sooner or later.

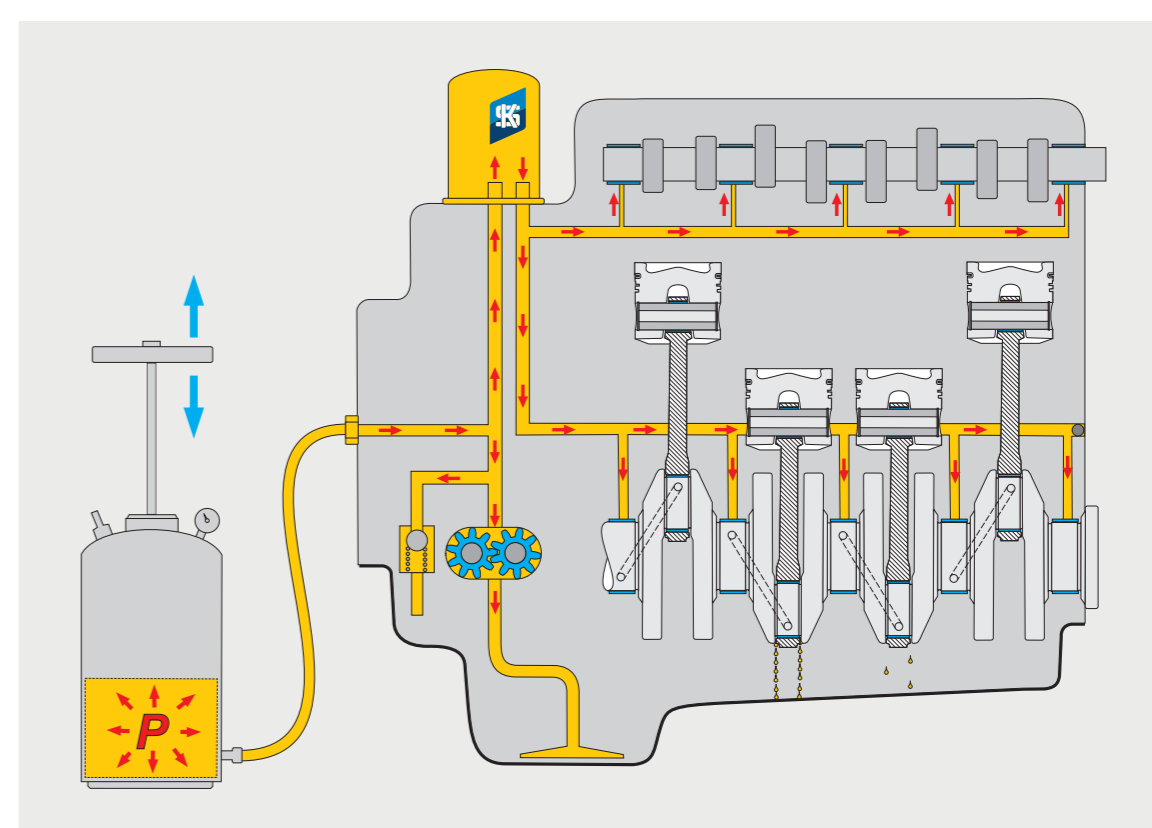
Measurement of bearing clearance with the "Kolbenschmidt Plastic Gauge" measuring tape

Installation and initial start-up

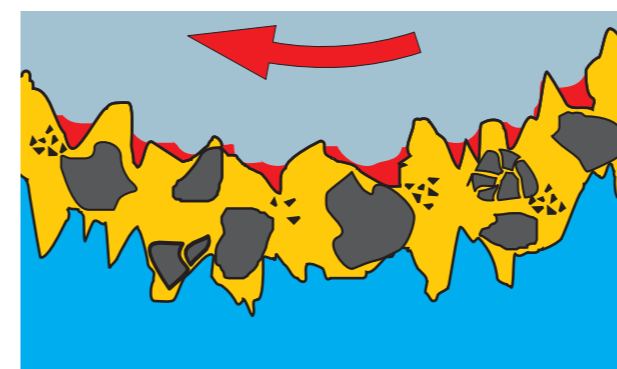
Filling the new engine with pressure oil

The critical factor when starting an engine for the first time is not that something might have been incorrectly fitted. The main problem is that the oil required for lubrication does not arrive where it is needed at the correct time. As soon as the engine has started, the oil supply must be set up and functioning. This is achieved by filling the engine with pressure oil before it is started for the first time.

All components that carry pressure oil, such as the oil pump, oil filter, oil cooler and pipes, are filled with oil in advance, so that the engine bearings do not suffer any damage when starting the engine for the first time. This process should generally be carried out after assembling every engine.



Impurities in the engine oil



Impurities in the engine oil such as dirt, abrasion, coolant and fuel lead to the oil losing its lubricating effect. Either solid parts cause mixed friction to start or the viscosity of the lubricating oil is reduced by other impurities in liquid form until the oil can no longer perform its support function within the bearing and the lubricating film is separated. The resulting mixed friction leads to rapid wear and destruction of the bearing.

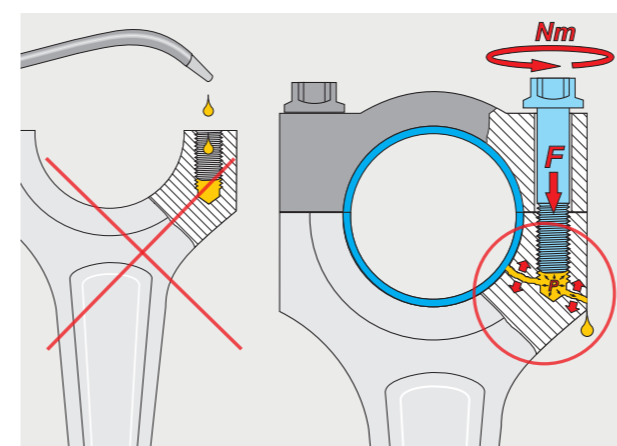
Insufficient oil pressure



Insufficient oil pressure leads to premature wear of the bearings or to bearing damage. The main reasons for this are:

- Operation of the engine at idle speed for hours (e.g. with incorrect running-in process)
- Lack of oil filter maintenance (clogging)
- Excessive bearing clearance

Connection of bearing caps



Severe bearing and engine damage frequency occurs as a result of extended bolts or inadequately cleaned or oil filled tapped blind holes. The problems mentioned above lead to the main bearing cap being insufficiently securely fitted and to violent destruction of the connection. However, tightening a bolt to the incorrect tightening torque or non-compliance with bolt tightening based on angular degrees also leads to warping and fitting problems with the bearing shells in the locating hole. The result is very severe bearing and engine damage.

Information on the product range can be found in our catalogue "Engine Bearings". Or ask your local Motorservice partner. We have also provided a lot more information for you at www.ms-motorservice.com and on our Technipedia at www.technipedia.info.

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