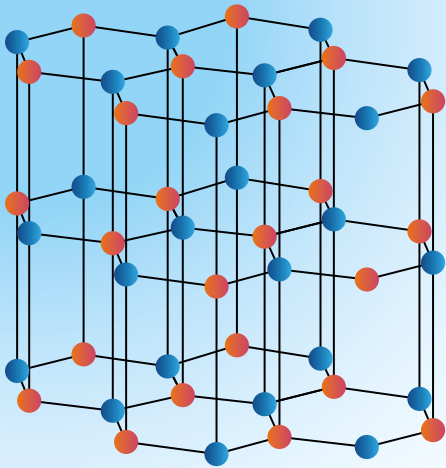




OUR NEW ENGINE OIL ADDITIVE:

Ceramix-Pro





Our unique formulation works in a special way. The following explains how the individual components of the oil additive contribute to the effect and special synergy in the product's function:

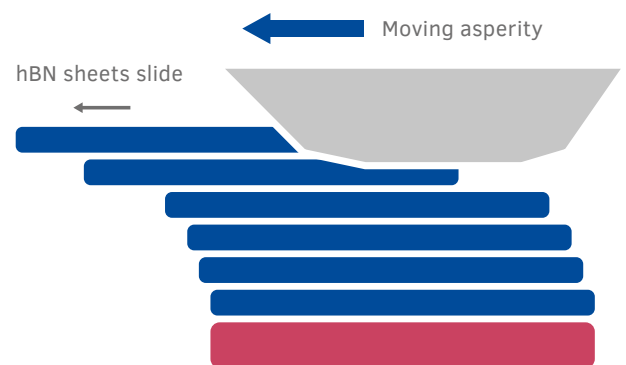
Component: hexagonal boron nitride

The active ingredient in RAVENOL CeramiX-Pro is hexagonal boron nitride (hBN), a modification of boron nitride with a layered, platelet-shaped crystal structure. In contrast to the cubic form of boron nitride (cBN), which is primarily known for its extreme hardness, hBN is characterized by very high chemical stability and excellent temperature and oxidation resistance. These properties make hexagonal boron nitride an ideal material for applications requiring chemical inertness (reaction resistance), thermal conductivity, or a solid lubricant.

The **platelet-shaped particles of hexagonal boron nitride (hBN)** combine high hardness with excellent layer displacement properties.

Despite their mechanical strength, the individual platelets can easily slide against each other, resulting in a significant reduction in friction – especially under boundary conditions where sufficient lubrication is no longer guaranteed.

If the lubricating film fails, hBN acts as a solid lubricant: it settles between the friction partners and thus prevents direct contact between the surfaces. This reduces wear and effectively prevents tribologically induced damage to the component surfaces.



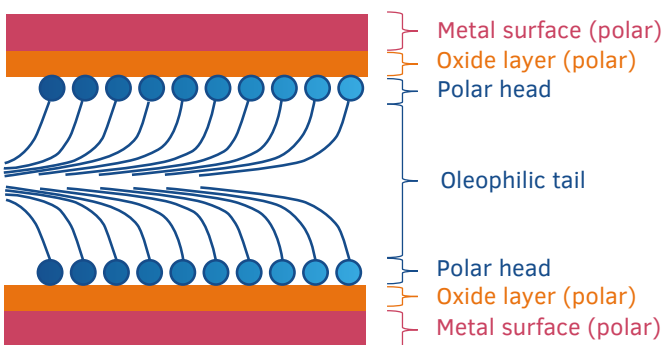
Component: organic friction modifiers

The inorganic solid lubricant (hBN) in RAVENOL CeramiX-Pro is perfectly complemented by organic friction modifiers:

While the solid lubricant provides reliable wear protection, especially at high pressures and temperatures, the **organic friction modifiers** reduce friction particularly effectively even at low and medium loads.

Special properties in the honing structures of cylinder bores:

Thanks to their special surface modification, our hBN particles **do not tend to agglomerate**. This means that they do not accumulate uncontrollably in sensitive areas and do not impair oil flow or lubricant distribution. In particular, **the honing structures** of the cylinder bores – which are crucial for oil retention and reliable lubricant film formation – **remain fully accessible**. This ensures an optimal lubricant film supply to the tribological contact surfaces, even under high loads.



Synergy of both components:

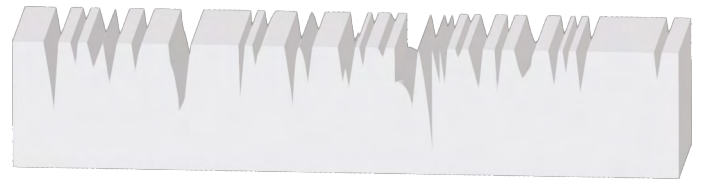
This creates a synergistic effect that reduces frictional resistance **across the entire operating range and under all load conditions** – more than the solid lubricant or organic friction modifier could achieve on their own.

Filter permeability



Our motor oil additive based on hexagonal boron nitride (hBN) has been specially designed so that the platelets / particles it contains are specifically dimensioned and stabilized: they are fine enough to pass through the oil filter without logging it.

Honed surfaces are specially machined functional surfaces with clearly defined tribological properties. Unlike randomly structured or simply machined, turned, or eroded surfaces, they have a **plateau profile**:



Honed surface

The load-bearing surface areas are relatively flat, while **micro-indentations** (known as honing grooves) are **deliberately introduced** between the plateaus.

These indentations serve as oil reservoirs – they retain (store) engine oil, holding it in the contact zone and thus ensuring a

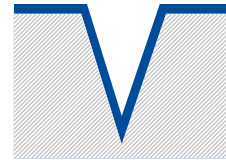
constant oil supply to the friction partners. This **significantly improves lubrication in the mixed friction range**, which reduces wear and stabilizes the friction contact.

Relevance of non-agglomerating properties (no clumping and no settling of clumps):

The use of non-agglomerating hBN flakes therefore pursues a complementary strategy: Instead of “smoothing” surfaces, we take functional topography into account and ensure that oil channels and microstructures remain free through optimal particle size and dispersion behavior. At the same time, tribological safety in the mixed friction range is improved by a solid lubrication effect – without artificially and counterproductively “sealing” the surface.



Honing structures filled with agglomerated solid lubricant

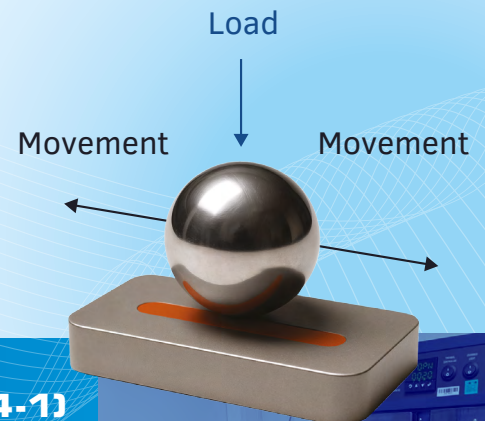
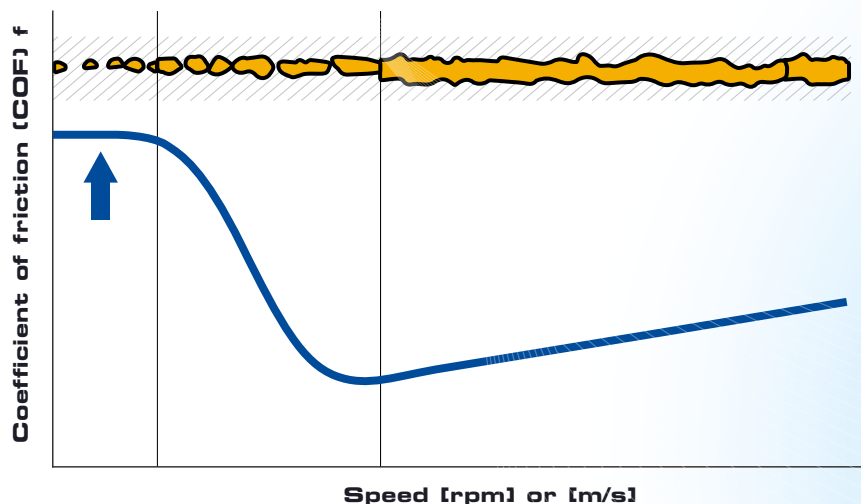


Non-agglomerating solid lubricant ensures an evenly coated surface of the honing structures. This optimally guarantees the desired oil retention and does not interfere with its function

High effectiveness proven by tests:

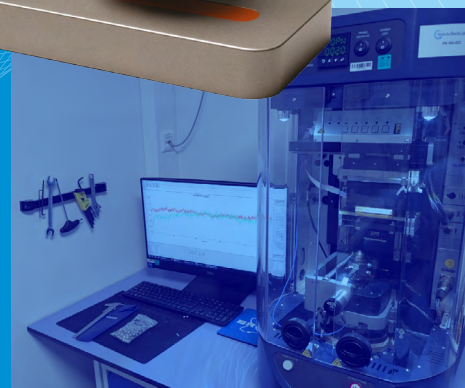
We use a state-of-the-art 3D laser scanning microscope for wear analysis:

How is it tested?


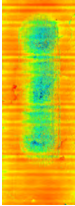
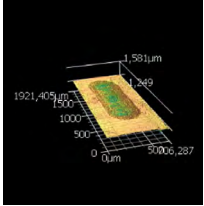
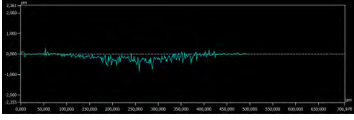

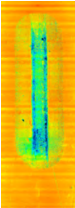
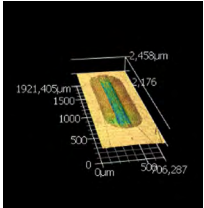
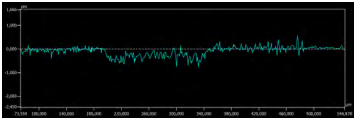


Bruker Tribolab (according to DIN 51834-1)

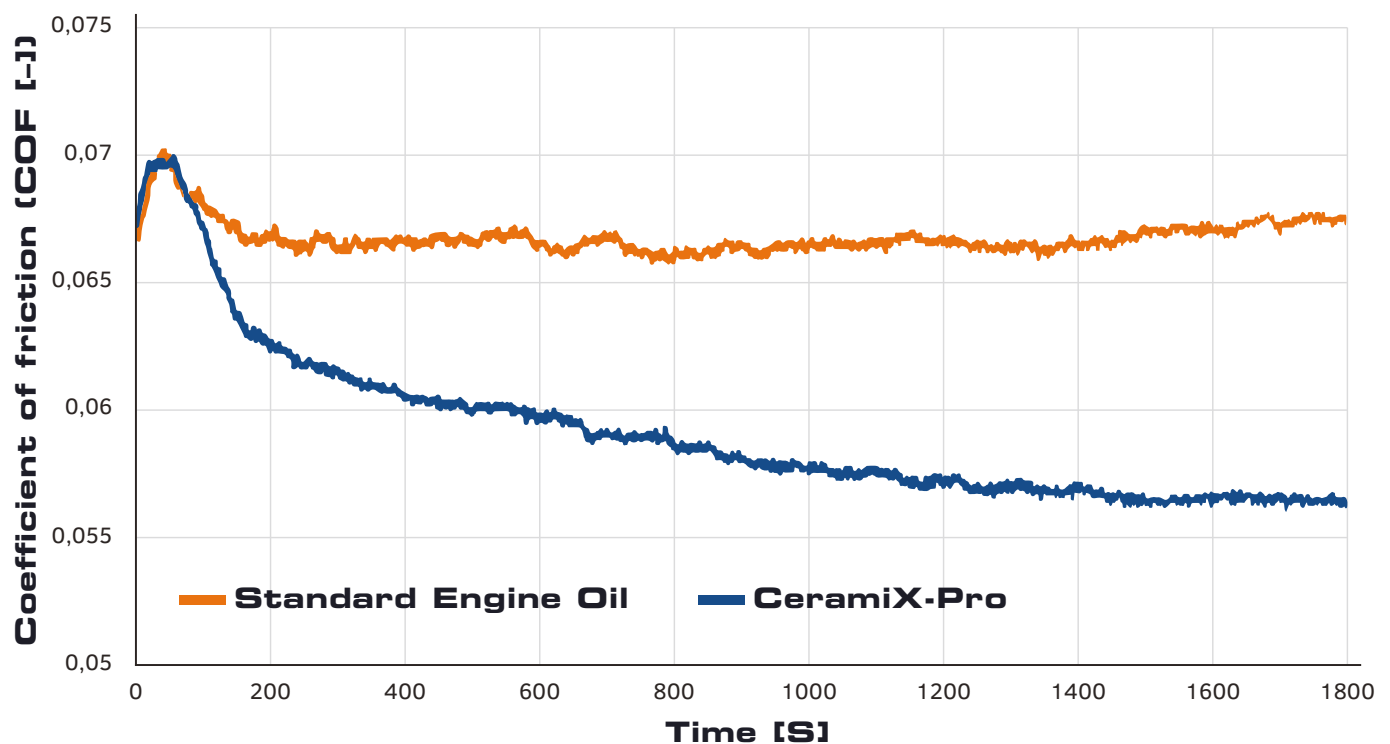
- Steel on steel
- Reciprocating test, which can be used to simulate the motion between piston and liner
- Gives information about friction and wear, especially at the top dead center and bottom dead center



Test Results:

Item tested:	Result: laser + optical	Result: depth	3D-Picture	Profile of wear	Color /depth - range
CeramiX-Pro					0,913µm 0,1 0 -0,1 -0,2 -0,3 -0,4 -0,467
without CeramiX-Pro					0,349µm 0,2 0 -0,2 -0,4 -0,6 -0,824

Up to 15% less friction and 42% less wear with CeramiX-Pro



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