



Selection and Application of  
***Screw and  
Assembly Pastes***

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***INNOVATIVE PRODUCTS FOR  
PRODUCTION AND MAINTENANCE TECHNOLOGY***

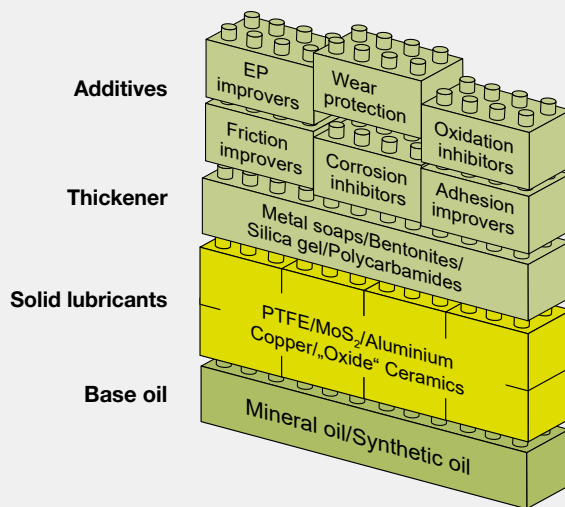
Speciality Lubricants  
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## Structure and selection of pastes

Pastes are important aids in plant engineering and for maintenance. Correctly selected, they allow for high functional reliability during assembly and disassembly of screw threaded connections or simple press-fitting of bearings and thus help avoiding costs. However – which paste is suitable for which application? What are the differences between the various pastes and what effect do these have for the application?

### Structure of pastes

Generally the structure of pastes corresponds to that of greases but differs in the higher portion of solid lubricants. This ensures reliable lubricating, separating and corrosion protection effects also when used under extreme temperature and pressure conditions and aggressive media.



### Basic knowledge tribology

The content of solid lubricants is the substantial difference between pastes and greases. It is typical both for assembly pastes (only lubrication effect) as well as for screw pastes (lubricating and separating effect).

In the case of pastes the base oil (main constituent of greases) is “only” the carrier material to hold the solid lubricants at the lubrication point. In contrast to grease, a **paste is generally not suitable for lubrication of rolling bearings.**

### Fields of applications of pastes

Pastes are used at screw-threaded connections as well as when pressing in pins and bolts and for lubrication/run-in lubrication at gear wheels or slideways. The type of solid lubricant determines the essential properties and thus the applications of the paste, amongst others the lubrication effect and separating effect.

Solid lubricant	Max. operating temp. [°C]	Field of application
PTFE	< 300	Assembly, media influence
MoS <sub>2</sub>	< 450	Assembly, press-on processes
Aluminium	< 1100	High-temp. screwed connections
Copper	< 1100	High-temperature screwed connections, “Anti-Seize” paste, el. conductivity
Graphite	< 1400	Extreme-temperature screwed connections, stainless steel screwed connections

### Selection criteria for assembly pastes:

#### ► Low mounting force

**Press-fit test:** Provides information on the lubricating effect of pastes

**Temperature range for lubrication effect:** Both oil and solid lubricants of the paste are effective

### Selection criteria for screw pastes:

#### ► Constant coefficient of friction

**Coefficient of friction:** This determines the force required when tightening bolts, screws and nuts

**Breakaway torque:** Ratio of the required breakaway torque when loosening the screw-threaded connection to the tightening torque

**Temperature range for separating effect:** Only the solid lubricants of the paste are effective after the oil has evaporated

## Use and application of pastes

### Screw pastes

**Screw pastes allow for functionally stable and reliable screw mounting as well as problem-free and non-destructive dismantling after a long fastening time and aggressive operating conditions.**

Screws are used to connect system components and components that can be loosened again. A screw-threaded connection is based on converting the tightening torque exercised via the screw head into a clamping force with which the parts to be connected are pressed together.

For a screw threaded connection it is of particular importance to achieve a defined clamping force. Screw pastes are characterized by a constant coefficient of friction  $\mu$ . The correct screw paste ensures that the required clamping force is reached. This establishes a secure connection.

### High-temperature screw paste

After long periods of use, in particular aggressive conditions of use, screw-threaded connections may corrode into a "permanent lock". The application of a high-temperature screw paste prevents this. The base oil evaporates above the upper operating temperature. What remains are solid lubricants which ensure separation of the surfaces up to the maximum operating temperature.

### Selection of the correct screw paste

Choosing the right screw paste not only ensures the reliability of a screw-threaded connection, but also facilitates dismantling later on – including corresponding cost advantages. Depending on the solid lubricant or application case, screw pastes are also **referred to as copper paste, ceramic paste, anti-seize paste or hot screw paste.**

### Assembly pastes

**As a rule an assembly paste is used when press-fitting bearings, shafts, bushings as well as the run-in lubricant for slideways and gears subjected to high loads and stresses.**

The most important characteristic for an assembly paste, especially for press-fitting is the result of the press-fit test, the coefficient of friction  $\mu$ . The test also determines whether stick-slip occurs.

Both results are important for the application of an assembly paste, e.g. for press-fitting work in manufacturing or slideways of tool machines. The lower the coefficient of friction  $\mu$  is, the lower the required force, and rattling indicates that the lubricant film has failed and does not fulfil its desired function anymore.

### Basic knowledge tribology

#### Thread friction

Depending on the screw material, the **coefficient of friction  $\mu$**  is determined technically with a screw test bench according to DIN 16047.

**For good screw pastes the  $\mu$  value lies at approx. 0.12 +/- 0.03.**

#### Press-fit test

This test according to E DIN 51 833 describes the behaviour and adhesion of solid lubricants under high pressures and low sliding speeds. The **coefficient of friction  $\mu$**  is measured and it is determined whether stick-slip occurs.

**Good assembly pastes have coefficients of friction of  $\mu = 0.05$  and cause no rattling.**

The enclosed "Insert" introduces our **range of screw and assembly pastes** in more detail. If you have any further questions on the selection of suitable pastes for your application or on our **speciality pastes** (heat sink paste, insulating paste, chuck jaw paste, etc.), please do not hesitate to contact our customer and technical service.





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For a world in motion

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Product	Designation	Technical data	Colour, Main components	Characterisation	Examples of use
<b>OKS 217</b>	<b>High-temperature paste, high purity</b>	<ul style="list-style-type: none"> <li>Operating temperature: -40 °C to +1,400 °C</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.10</li> <li>Breakaway torque &lt; 2.0 Nm x tightening torque</li> </ul>	<ul style="list-style-type: none"> <li>Black-grey</li> <li>Semi-synthetic oil</li> </ul>	<ul style="list-style-type: none"> <li>Assembly lubrication of screw threaded connections made of high-strength steel, at high temperatures in aggressive environment</li> <li>Optimum ratio of screw tightening torque to achievable pre-tension</li> <li>No seizing and no rusting on and no reaction with metals</li> <li>For use in the chemical industry</li> </ul>	<ul style="list-style-type: none"> <li>Gas and steam turbines</li> <li>Combustion engines, screwed connections at pipe fittings, flange joints and fittings in superheated steam lines</li> <li>Exhaust pipe and combustion chamber screwed connections</li> </ul>
<b>OKS 235</b> <b>OKS 2351</b>	<b>Aluminium paste, Anti-seize paste</b>	<ul style="list-style-type: none"> <li>Operating temperature: -40 °C to +1,100 °C</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.12</li> <li>Breakaway torque &lt; 2,0 Nm x tightening torque</li> </ul>	<ul style="list-style-type: none"> <li>metallic silver</li> <li>aluminium powder</li> <li>other solid lubricants</li> <li>Synthetic oil</li> <li>Inorganic thickener</li> </ul>	<ul style="list-style-type: none"> <li>Lubricating and separating paste for assembling screw and bolt threaded connections that are subjected to high temperatures and corrosive influences</li> <li>Optimum ratio of screw tightening torque to achievable pre-tension</li> <li>Prevents solidifying or rusting-in and avoids seizing</li> </ul>	<ul style="list-style-type: none"> <li>Screwed connections, fittings, flange and plug connections,</li> <li>Ovens, boilers, burners, engines in the chemical and petrochemical industry shipping and offshore sectors, in power and heating plants, glassworks and iron and steel works</li> </ul>
<b>OKS 240</b> <b>OKS 241</b>	<b>Anti-seize Paste (Copper Paste)</b>	<ul style="list-style-type: none"> <li>Operating temperature: -30 °C to +200 °C/+1,100 °C (lubrication/separation)</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.09</li> <li>Breakaway torque &lt; 2,5 Nm x tightening torque</li> </ul>	<ul style="list-style-type: none"> <li>copper-brownish</li> <li>Copper powder</li> <li>MoS<sub>2</sub></li> <li>other solid lubricants</li> <li>Synthetic oil</li> <li>Inorganic thickener</li> </ul>	<ul style="list-style-type: none"> <li>For assembling screw threaded connections subjected to high temperatures and corrosive influences</li> <li>Prevents burning together or rusting on</li> <li>Optimum ratio of screw tightening torque to achievable pre-tension</li> <li>Anti-seize paste for reliable, non-destructive dismantling</li> </ul>	<ul style="list-style-type: none"> <li>Combustion engines, threads on pipe fittings, flange joints and fittings of superheated steam lines, exhaust pipe and combustion chamber screwed connections, gas and oil burner mounting bolts</li> </ul>
<b>OKS 245</b>	<b>Copper paste with high-performance corrosion protection</b>	<ul style="list-style-type: none"> <li>Operating temperature: -30 °C to +100 °C/+1,100 °C (lubrication/separation)</li> <li>Four-ball test rig (welding load): 3.400 N</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.14</li> </ul>	<ul style="list-style-type: none"> <li>copper-coloured</li> <li>Copper powder</li> <li>EP, AW additive</li> <li>Mineral oil</li> <li>Thickener: organic, inorganic</li> </ul>	<ul style="list-style-type: none"> <li>For screws, bolts and sliding surfaces subjected to high temperatures, water or sea water</li> <li>Prevents burning together and rusting on</li> <li>Prevents seizing during assembly</li> <li>Highly adhesive, excellent corrosion protection</li> <li>Suitable for brake systems</li> </ul>	<ul style="list-style-type: none"> <li>Screw-threaded connections, e.g. at combustion engines</li> <li>Screwed connections at pipe fittings, flange joints and fittings in superheated steam lines</li> <li>Exhaust pipe and combustion chamber screwed connections</li> <li>Gas and oil burner mounting bolts</li> </ul>
<b>OKS 250</b> <b>OKS 2501</b>	<b>White Allround Paste, metal-free</b>	<ul style="list-style-type: none"> <li>Operating temperature: -40 °C to +200 °C/+1,400 °C (lubrication/separation)</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.12</li> <li>Thread friction (V2A M10 x 50–70): <math>\mu</math> total = 0.15</li> <li>Breakaway torque &lt; 2,7 Nm x tightening torque</li> <li><b>NSF H2</b> Reg.-No. 131379 (OKS 250)</li> </ul>	<ul style="list-style-type: none"> <li>White</li> <li>White solid lubricants</li> <li>Mo<sub>x</sub>-Active</li> <li>Synthetic oil</li> <li>Polycarbamide</li> </ul>	<ul style="list-style-type: none"> <li>For screws, bolts and sliding surfaces subjected to high pressures and temperatures</li> <li>Optimum ratio of tightening torque to achievable pre-tension</li> <li>Metal-free excellent corrosion protection</li> <li>Universal high-temperature paste</li> <li>For stainless-steel connections</li> </ul>	<ul style="list-style-type: none"> <li>Screw and plug connections made of steel or non-ferrous metals</li> <li>Combustion engines and turbines</li> <li>Corrosion protection at screws, bolts, flanges, spindles and fits</li> </ul>
<b>Mo<sub>x</sub>-Active</b>					
<b>OKS 252</b>	<b>White high-temperature paste for food processing technology</b>	<ul style="list-style-type: none"> <li>Operating temperature: -30 °C to +160 °C/+1,200 °C (lubrication/separation)</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.15</li> <li>Thread friction (V2A M10 x 50–70): <math>\mu</math> total = 0.15</li> <li>Breakaway torque &lt; 3,2 Nm x tightening torque</li> <li><b>NSF H1</b> Reg. No. 135748</li> </ul>	<ul style="list-style-type: none"> <li>Light grey</li> <li>White solid lubricants</li> <li>Polyglycol</li> <li>silicate</li> </ul>	<ul style="list-style-type: none"> <li>Lubrication of screws, bolts and sliding surfaces that are subjected to high pressures, high temperatures at low speeds or oscillating movements</li> <li>Prevents burning together and rusting on</li> <li>Metal-free and highly adhesive</li> <li>Universal high-temperature assembly paste</li> </ul>	<ul style="list-style-type: none"> <li>Screw and plug connections made of steel or non-ferrous metals.</li> <li>Screws, bolts, flanges, fits in the food processing technology</li> <li>Separation of temperature-stressed threaded connections</li> </ul>
<b>OKS 255</b>	<b>Ceramic paste</b>	<ul style="list-style-type: none"> <li>Operating temperature: -30 °C to +100 °C/+1,400 °C (lubrication/separation)</li> <li>Four-ball test rig (welding load): 3.400 N</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.13</li> </ul>	<ul style="list-style-type: none"> <li>White</li> <li>Mineral oil</li> <li>White solid lubricants</li> <li>EP additive</li> <li>AW additive</li> </ul>	<ul style="list-style-type: none"> <li>Exempt from labelling requirements in accordance with DIRECTIVE (EC) No. 1272/2008</li> <li>Metal-free</li> <li>Good wear and corrosion protection</li> <li>Prevents solidifying and cold welding</li> <li>Good absorption capacity</li> <li>Prolonged lubrication effect</li> </ul>	<ul style="list-style-type: none"> <li>Lubrication of heavily loaded sliding surfaces of all types, in particular at low sliding speeds or oscillating movements</li> <li>Surface separation of temperature-stressed threaded connections</li> <li>For stainless-steel connections</li> </ul>

Product	Designation	Technical data	Colour, Main components	Characterisation	Examples of use
<b>OKS 200</b>  	MoS <sub>2</sub> assembly paste	<ul style="list-style-type: none"> <li>Operating temperature: -35 °C to +450 °C</li> <li>Press-fit: <math>\mu = 0.09</math>, no rattling</li> <li>Four-ball test rig (welding load): 2.400 N</li> </ul>	<ul style="list-style-type: none"> <li>black</li> <li>White solid lubricants</li> <li>MoS<sub>2</sub></li> <li>graphite</li> <li>Mo<sub>x</sub>-Active</li> <li>Synthetic oil</li> <li>Thickener: Lithium soap</li> </ul>	<ul style="list-style-type: none"> <li>Assembly lubrication for press-on processes</li> <li>Run-in lubrication of highly loaded sliding surfaces</li> <li>Lubricant for difficult moulding processes</li> <li>Prevents wear, stick-slip, seizing,</li> <li>run-in damage or pitting</li> <li>For universal use</li> </ul>	<ul style="list-style-type: none"> <li>Press-fitting wheels, shafts, tires or bearings</li> <li>Non-stick primer coat for moving threads, guides and slideways to prevent stick-slip effect</li> <li>In non-cutting shaping of the difficult type, such as doming, pressing, embossing while avoiding critical metal contacts and welding</li> </ul>
<b>OKS 220</b> <b>OKS 221</b>  	MoS <sub>2</sub> Paste Rapid	<ul style="list-style-type: none"> <li>Operating temperature: -35 °C to +450 °C</li> <li>Press-fit: <math>\mu = 0.05</math>, no rattling</li> <li>Four-ball test rig (welding load): 4.200 N</li> </ul>	<ul style="list-style-type: none"> <li>black</li> <li>other solid lubricants</li> <li>MoS<sub>2</sub></li> <li>Mo<sub>x</sub>-Active</li> <li>Synthetic oil</li> </ul>	<ul style="list-style-type: none"> <li>Assembly lubrication for press-on processes</li> <li>Run-in lubrication of highly loaded sliding surfaces</li> <li>Lubricant for difficult moulding processes</li> <li>Effective immediately through high MoS<sub>2</sub> share</li> <li>Rubbing in the paste not required</li> <li>High-quality assembly paste</li> </ul>	<ul style="list-style-type: none"> <li>Assembly paste for press-fitting wheels, shafts, tires or bearings</li> <li>Non-stick primer coat for moving threads, guides and slideways to prevent stick-slip effect, seizing and wear</li> <li>Run-in lubrication of highly stressed sliding surfaces such as plain bearings, gearwheels, crankshafts with provision of anti-seizing properties</li> <li>Suitable for non-cutting shaping of the difficult type, such as doming, pressing, embossing while avoiding critical metal contacts and welding</li> </ul>
<b>OKS 230</b>	MoS <sub>2</sub> high-temperature paste	<ul style="list-style-type: none"> <li>Operating temperature: -35 °C to +180 °C/+450 °C (lubrication/separation)</li> <li>Press-fit: <math>\mu = 0.11</math></li> <li>Four-ball test rig (welding load): 3.200 N</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.10</li> </ul>	<ul style="list-style-type: none"> <li>black</li> <li>other solid lubricants</li> <li>MoS<sub>2</sub></li> <li>Polyglycol</li> <li>Thickener: Lithium hydroxystearate</li> </ul>	<ul style="list-style-type: none"> <li>For high-temperature applications up to 450°C. (Dry lubrication from approx. 200 °C)</li> <li>Prevents wear, stick-slip, seizing,</li> <li>run-in damage, pitting</li> <li>Carrier oil evaporates residue-free from 200 °C upwards</li> <li>Relubrication in operation with OKS 310</li> </ul>	<ul style="list-style-type: none"> <li>Lubrication of temperature-stressed machine parts, e.g. rolling bearings, friction bearings, slideways, chains, rollers or moving parts in hot forming, heat treatment or drying</li> <li>Dry lubrication, e.g. of kiln and rack-truck bearings, bearings of pouring ladles, converters or hot-air blowers at temperatures over 250 °C</li> <li>Lubrication of plastic and rubber at normal temperature if the materials are mineral oil-resistant</li> </ul>
<b>OKS 260</b>	White Assembly Paste	<ul style="list-style-type: none"> <li>Operating temperature: -25 °C to +150 °C</li> <li>Press-fit: <math>\mu = 0.09</math>, no rattling</li> <li>Four-ball test rig (welding load): 2.600 N</li> <li>Thread friction (M10/8.8): <math>\mu</math> overall = 0.08</li> </ul>	<ul style="list-style-type: none"> <li>Light-coloured</li> <li>White solid lubricants</li> <li>White oil</li> <li>Thickener: Lithium soap</li> </ul>	<ul style="list-style-type: none"> <li>For screws, bolts and sliding surfaces subjected to high pressures at low speeds</li> <li>Optimum ratio of tightening torque to achievable pre-tension</li> <li>Prevents frictional corrosion</li> <li>Metal-free</li> <li>Waterproof</li> </ul>	<ul style="list-style-type: none"> <li>Assembly lubrication of sliding points</li> <li>Screw lubrication at normal temperatures and low speeds</li> <li>Lubrication when joining parts</li> </ul>