FUCHS Special Applications

Product group
Pastes

LUBRICANTS.
TECHNOLOGY.
PEOPLE.

FUCHS

MOVING YOUR WORLD

FUCHS LUBRICANTS GERMANY

We do not just develop lubricants. We develop intelligent solutions for highly complex challenges.

To this end, we have pooled our expertise and experience from a wide range of application areas: FUCHS SCHMIERSTOFFE and FUCHS LUBRITECH became FUCHS LUBRICANTS GERMANY.
Our goal: to keep our customers' world in motion. Efficient, sustainable, reliable.
Today and tomorrow.

What can we move for you?

FUCHS LUBRICANTS GERMANY

Facts and figures

Company: FUCHS LUBRICANTS GERMANY GmbH, a company of the FUCHS Group

Locations: Based in Mannheim, with sites in Bremen, Dohna, Hamburg, Kaiserslautern, Kiel and Wedel; approx. 1,400 employees

Product range: A full range of more than 3,000 products for all application areas

Certifications i. a.: ISO 9001, IATF 16949, ISO 14001, ISO 45001, ISO 50001, ISO 21469, HALAL, KOSHER (detailed certifications at www.fuchs.com/de/en)

CO_2 neutral production*

Since 1931, we have been pursuing the same goal: to keep the world moving. With innovative and technological lubricant solutions that have a sustainable impact on the future. Unconditional reliability is our top priority, it is the foundation of our company and basis for everything that defines us.

Reliability is both a driver and a demand. And it's a promise to all our customers in the fields of automotive suppliers and OEMs, mechanical engineering, metal processing, mining and exploration, aerospace, energy, construction and transport, agriculture and forestry, as well as the paper, steel, metal, cement, forging and food industries, but also qualified lubricant dealers, car dealerships and workshops.

Long-term experience, high development strength and the fulfillment of far-reaching standards are the basis for the special quality of our world-leading product brands. We deliver solutions that are simply more efficient and therefore more sustainable. We always think in holistic solutions. For the development of individual solutions, we enter into an intensive customer dialog with you. This is the way we live up to our claim of moving your world.

MOVING YOUR WORLD

*Partially also based on compensation

Contents

BASICS OF PASTES

Pastes from FUCHS LUBRICANTS GERMANY are always used if a grease or oil lubrication cannot offer enough protection against wear. This is particularly the case when there is slow movement, high loads or oscillatory movement, and high temperatures.

The product range from FUCHS LUBRICANTS GERMANY includes many pastes for various uses. Examples are assembly pastes, which are indispensable aids during difficult installation and running-in processes, high-temperature screw pastes, which ensure that bolts can be untightened after having been subjected to high temperatures, or white pastes, which have proved themselves particularly in the case of machine elements with oscillating movements. For each application our product ranges CARBAFLO, CHEMPLEX, GLEITMO, MOLYPAUL, and PBC provide the appropriate solution.

Contents

Composition of pastes

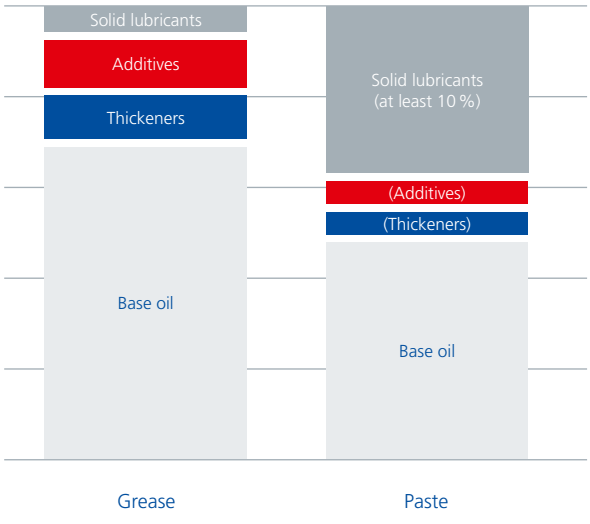
Pastes consist of a base oil, a thickener, special solid lubricants and further additives. The solid lubricants contained may also perform as a thickener. Their main purpose, however, is to give the product additional properties that an oil or grease alone cannot provide.

For extreme requirements when lubricating machine parts, pastes from FUCHS LUBRICANTS GERMANY are often the only possible solution. Particularly with very high surface pressures and low sliding speeds, with oscillatory motion or very high temperatures, pastes demonstrate their unique anti-wear properties.

The consistent lubricants from FUCHS LUBRICANTS GERMANY are divided into the categories of greases or pastes depending on the solid lubricant content. If the proportion of solid lubricants is below 10 %, it is a grease. Therefore the pastes contain at least 10 % solid lubricants.

Particularly in the restricted areas of grease lubrication, pastes demonstrate their exceptional performance. Particularly when there are moderately fast movements, under high pressure or with oscillatory or shock loads, normal greases can no longer provide adequate protection against wear. In these situations, pastes avoid metal-to-metal contact (scuffing) thus preventing or minimizing wear and premature component failure.

Pastes that have a relatively high proportion of solid lubricants are the right choice for slow movements, extreme loads and for all cases where there is boundary or mixed friction. The solid lubricants act not only as lubricants but also separate for protection of the surfaces.

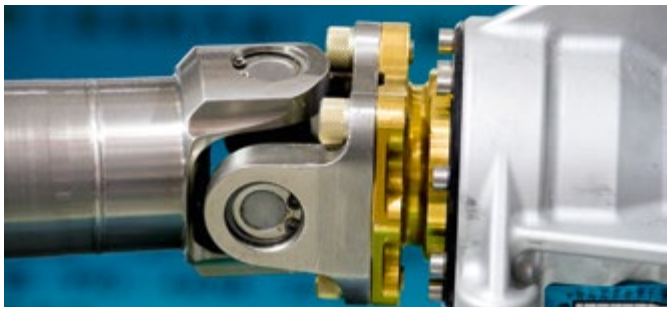


Typical fields of application for pastes

Ball screw drive, spindles

Casting tools and spouts

Sunroofs, car interior



Hinges, joints, ball joints

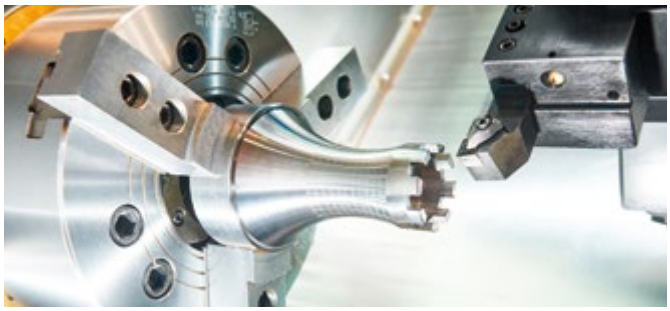
Fittings/valves, also oxygen-supplying

Gaskets, also those supplying gas and water

Installation of screws, bolts, flange couplings

Socket tools, wear bushings, hydraulic hammers

Roller bearings, plain bearings



Chucks, vices

Brake pads, seizure protection

Drive shafts

How pastes work

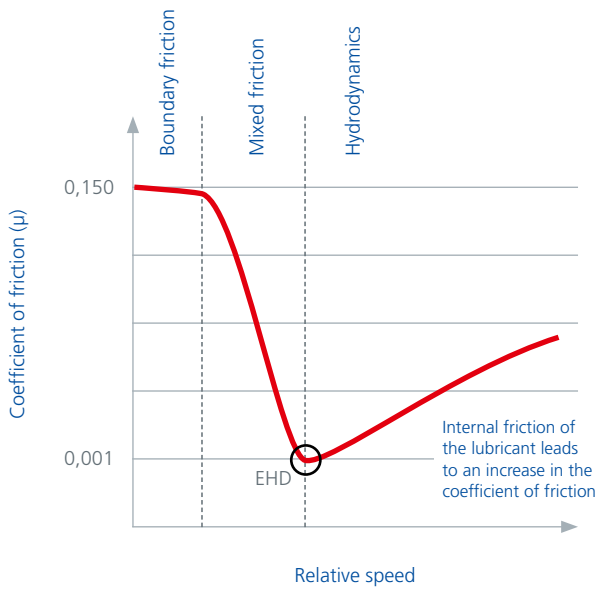
Solid lubricants reduce friction/wear and separate friction partners in extreme environments, such as boundary or mixed friction, oscillatory movements, high surface pressure, slow movements, extreme temperatures and where there are vibrations and shock loads.

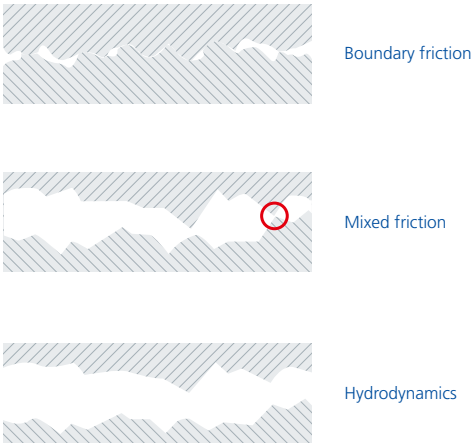
Friction conditions according to Stribeck

With very small relative speeds in machine components, a lubricating oil or grease does not provide full separation between the surfaces that move relative to each other such as in shafts or bearing shells. In this phase the tribological system is in the boundary friction mode. With increasing speeds, a lubricant film forms between the surfaces, separating the components from each other (mixed friction). The roughness peaks continue to make contact with each other, however, so that wear still occurs. Only at comparatively high relative speeds does a lubricant film form that fully separates the two surfaces (hydrodynamics). In hydrodynamic lubrication, there almost no wear of the friction partners occurs. However, this ideal situation is achieved in only few machines or machine components, e.g. in turbine plain bearings. The most frequent form of friction in technical applications is mixed friction. It is in mixed-friction situations that pastes with solid lubricants from FUCHS LUBRICANTS GERMANY show their special performance in comparison to conventional products.

The solid lubricants separate the friction partners thereby reducing the friction. A further benefit based on the separation of the surfaces is the reduction of wear. Therefore the machine parts may be used for much longer, and the operating costs are reduced.

Stribeck curve





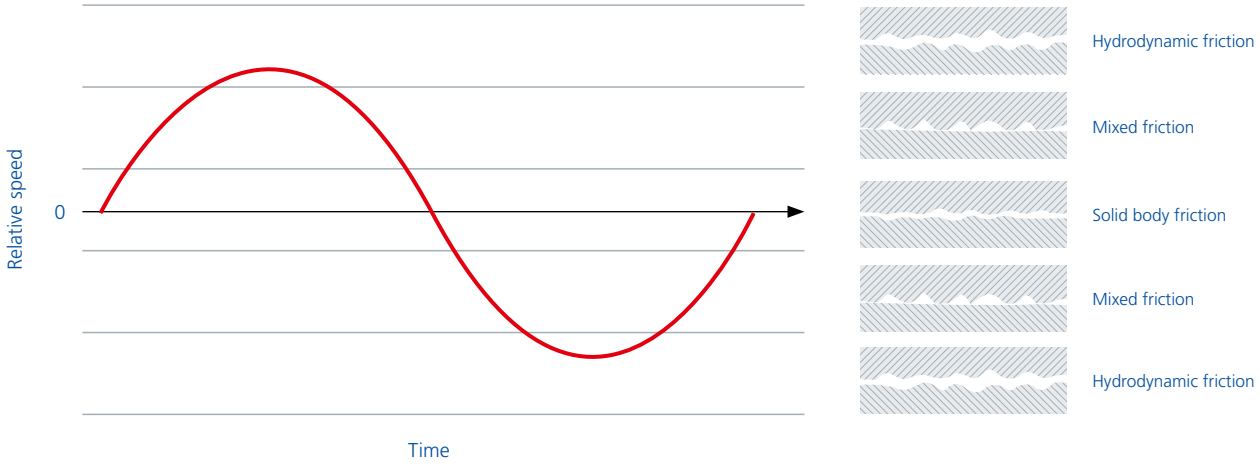
EHD = elastohydrodynamics

Oscillatory movements

Many machines and machine parts are subject to oscillations and vibration. In addition, there are cases where oscillatory movements take place as a normal part of the function. A characteristic of this is that with every cycle of the motion, the speed rises from zero to its maximum value, falls back and rises to its maximum value in the opposite direction.

Referring to the Stribeck diagram (see page 13) this means that the friction condition is constantly changing between static or boundary friction and mixed or even hydrodynamic friction. This places extreme demands on the performance capacity of the lubricant. Under these conditions, traditional greases cannot form a protective lubricant film with sufficient load resistance.

Oscillation

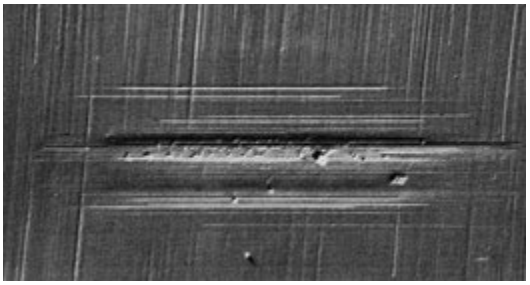


Frictional corrosion

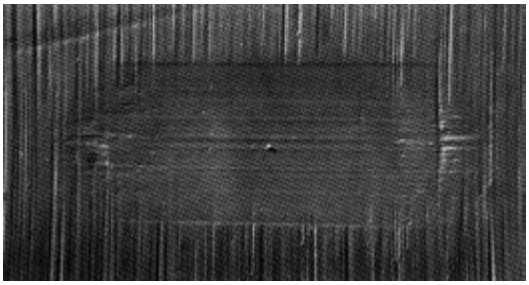
The performance data for lubricants which are intended for use in locations where friction is associated with oscillatory movements are determined on the frictional corrosion tester. In this process, the specimens (sphere, cylinder or cube) are in oscillatory motion on a straight line on a flat plate. The specimens, which are wetted with lubricant, are subject to mechanical loading with a compressive force, a specified frequency, a predetermined vibration frequency and a specific temperature. Typical values are, e.g. 500 µm/50 Hz/300 N/+50 °C. The friction coefficient "µ" is determined by measuring the friction force. The volume and depth of wear of the plate are also measured. The test data obtained this way show the actual performance of the lubricant often in direct comparison with other lubricants that were tested under the same conditions.

Frictional corrosion test (SRV)

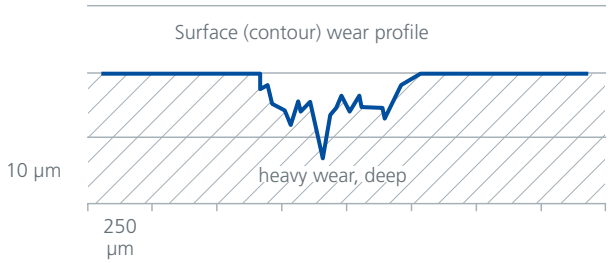
Surface of specimens after one hour of operation f= 50 Hz, A= 500 µm, F = 300 N, T = 50 °C, t = 60 min. In this test the GLEITMO pastes with reactive white solid lubricants show their outstanding performance in comparison to other products.

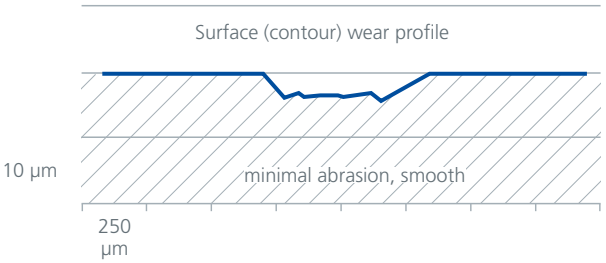


Lithium soap grease with MoS_2



Lithium paste with reactive white solid lubricants



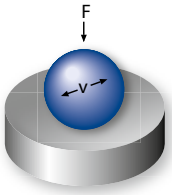


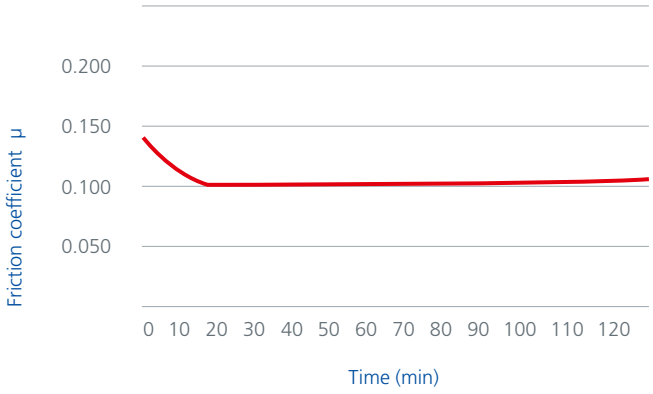
Test methods for pastes

The results from widely differing test methods show the outstanding properties of pastes particularly in comparison with test results for conventional lubricants under the same conditions.

Frictional corrosion test method (SRV)

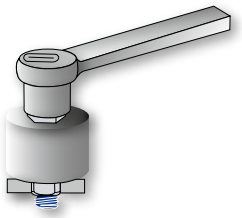
- DIN 51834-8, ASTM 5706 and 5707
- Oscillating test body on plate (lubricated)
- Contact geometry: point (alternatively flat surface or line)
- Test criteria: coefficient of friction, wear
- Life test at high sliding speeds and variable surface pressures, temperatures, amplitudes and frequencies

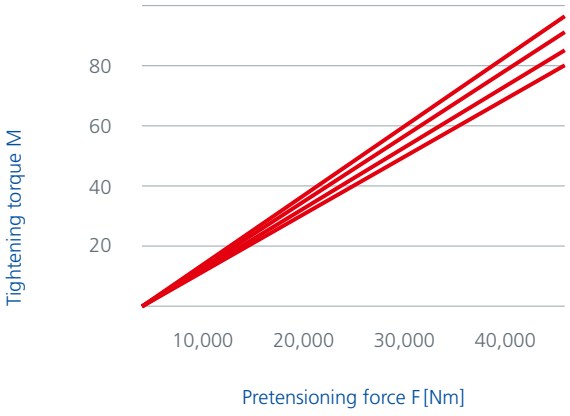




Testing on the bolt test rig

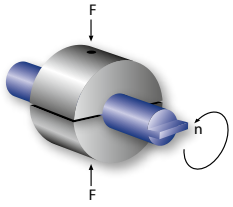
- DIN EN ISO 16047 (DIN 946)
- Determination of coefficients of friction on threaded connections
- Contact geometry: flat surface (thread and bolt head)
- Test criteria: friction coefficient, pretensioning force, release torque
- measurement of thread friction, head friction and overall coefficient of friction

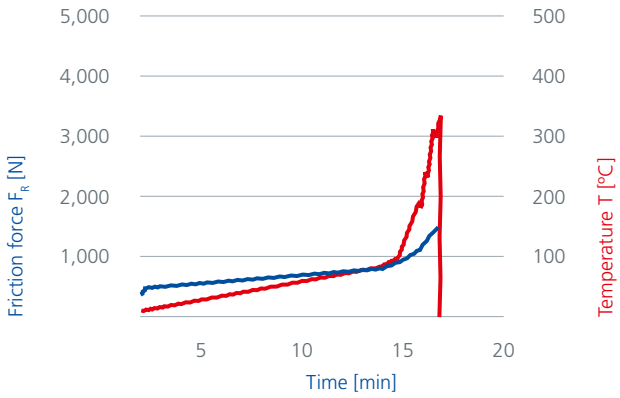




Almen-Wieland test method

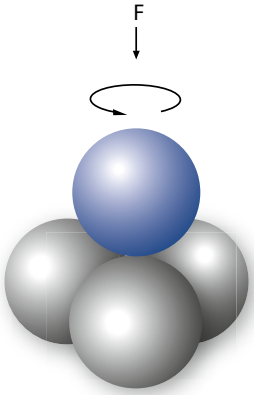
- FUCHS laboratory specification 060
- Rotating shaft (lubricated) fixed in two bearing shells
- Contact geometry: flat surface
- Test criteria: seizing load, coefficient of friction
- Measurement with low sliding speeds and high surface pressure





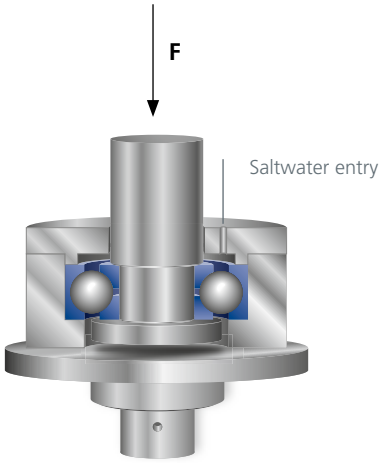
VKA test method (four-ball apparatus)

- DIN 51350 (1–5)
- Rotating ball on three fixed balls
- Contact geometry: point
- Test criteria: four-ball welding load, wear
- Gradual increase in test force until the balls weld together
- Constant test force during a specified period (1h or 1min), measurement of wear calotte



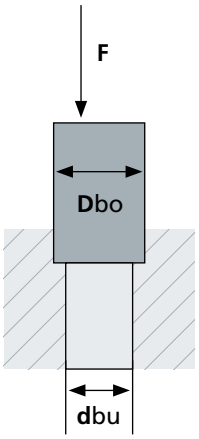
Rippling test method

- Test development by IME Aachen (Institute for machine elements and machine design of the RWTH Aachen) and ThyssenKrupp Rothe Erde GmbH, Dortmund
- Oscillating axial force on a four-point bearing. Outer ring fixed to the static housing and inner ring fixed to the moving shaft.
- Contact geometry: point
- Test criteria: wear depth (ripple depth) and corrosion protection
- Life test with high axial loads with influence of salt water



Pressfit test method

- FUCHS laboratory specification 070
- Realistic assessment of lubricants at low sliding velocities and high pressures
- Oversized test bolt is pressed into a bushing with a test speed of 15 mm/min at a load of up to 32 kN
- Test criteria: wear depth (ripple depth) and corrosion protection
- Test criteria: press-in force, press-out force, static and dynamic friction coefficients, occurrence of stick-slip



Solid lubricant systems of pastes

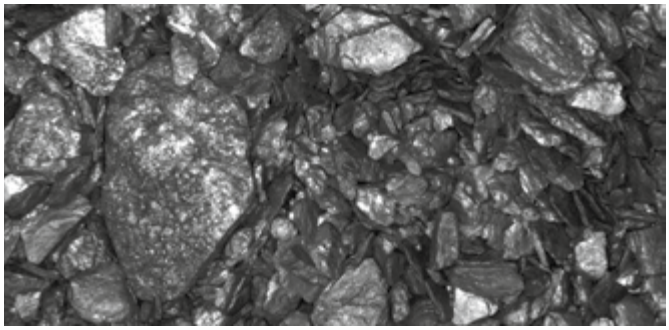
The classification and therefore also the multiplicity of application possibilities of pastes exhibit a high degree of complexity. So far, there is no uniform standardisation for this class of lubricants. A basic distinction can be reached according to (among others) the solid lubricants contained.

Depending on the particular application, different solid lubricant systems are suitable for achieving the best possible lubrication or separation. From a historical aspect, first graphite was added as a pressure-resistant medium to conventional lubricating greases for improving the performance. Soon afterwards, experiments were carriedous with molybdenum disulphide and metal particles. The latter ones, based on their high melting point, are the suitable solid lubricant particularly for high-temperature applications. Recently, new solid lubricants such as PTFE, plastics and above all the white solid lubricants from FUCHS LUBRICANTS GERMANY established themselves for very demanding applications.

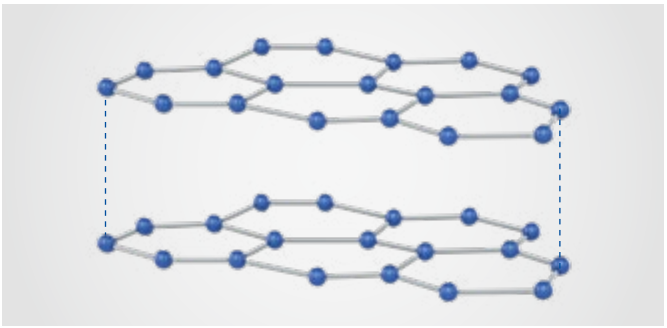
Classification of solid lubricants according to method of operation

1. Graphite, molybdenum disulphide (MoS_2)

These solid lubricants work, particularly in applications with high pressures, e.g. in pressing-in operations, because of their layered crystal lattice structure. The atoms are arranged through covalent bonds in a particularly stable structure within a layer. Weak van der Waals forces act between the layers. As a result of this arrangement, the solid lubricants of this category can absorb high pressures in vertical direction but can at the same time have a sliding motion in the horizontal direction.



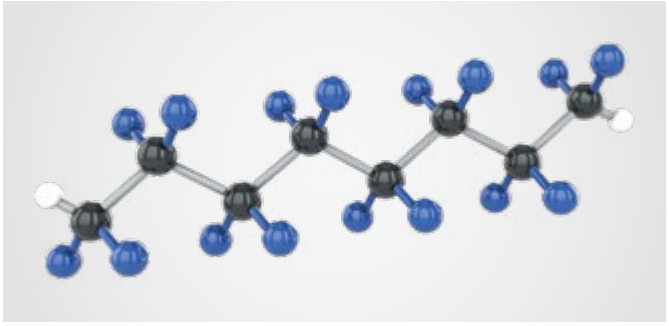
Graphite



Graphite: Layer lattice structure

2. Metals, Ceramics, PE, PTFE

These solid lubricants are suitable as additives to oils or greases because of their physico-mechanical properties. Depending on the type, the particles are very pressure-resistant because of the stable structure of the individual molecule groups. At the same time the addition of PTFE or certain plastics can achieve a reduced friction coefficient. The use of metal particles such as copper is advisable at very high temperatures in applications where flash temperatures considerably over 600 °C can occur.



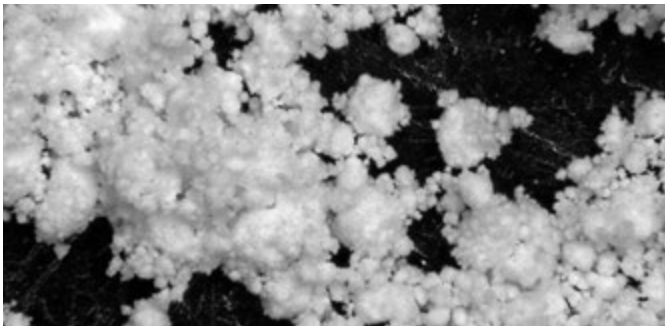
Plastic materials

Copper particles

3. White solid lubricants of the GLEITMO range

An inimitable speciality of FUCHS LUBRICANTS GERMANY are the pastes that have white solid lubricants. The solid lubricants of this special category ensure, through both chemical and physico-chemical properties, a separation and improvement of the friction coefficient in the applications. The appropriate combination of white solid lubricants is selected subject to the application case. This results in synergies between the solid lubricants. Depending on the mix ratio, pressure-induced glass-like protective layers form, that can effect full separation of the friction partners. Due to the complexity of these solid lubricants, they are covered in detail in the next two chapters.

Macroscopic view of white solid lubricants



Microscopic view of white solid lubricants

PRODUCTS AND FIELDS OF APPLICATION

The pastes have a defined role depending on the application, and they act like an autonomous machine element. The suitable lubricant components are selected according to the application parameters.

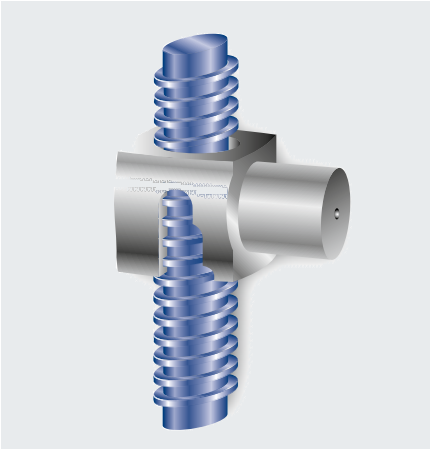
The following view of the pastes from FUCHS LUBRICANTS GERMANY gives a first look at the different possibilities for the for- mulation of pasty lubricants and their typical fields of application. This description does not claim to be comprehensive. For example, different solid lubricants can be combined and different pastes may be used in some applications.

Contents

White pastes

One particular group among the pastes from FUCHS LUBRICANTS GERMANY includes the products with white solid lubricants. Depending on the composition they form an adhesive protective layer in the contact zone of the sliding partners. This challenging function is activated by the surface pressure, lowers the friction and in particular inhibits the wear of the components. The protective layer is already beneficial during the running-in phase and helps to extend the lifetime of machine components considerably. The special synergistic effect of the combination of different white solid lubricants in GLEITMO pastes enables optimal separation, both in steel-steel pairing of materials and in other metal pairings with copper or aluminium alloys.

Pastes with white solid lubricants are preferably used on components and machine elements subject to particularly high loads/slow movements, rapidly changing operating conditions, e.g. alignment motion under load or oscillatory movements/vibration. With **GLEITMO 585 K** FUCHS LUBRICANTS GERMANY has developed a paste with white solid lubricants for highly loaded large-diameter bearings, that is unique in terms of protection against wear and customer recommendations. For decades, large-diameter bearings and rotary joints have been state of the art all over the world and in all areas of technology. As an important connection and construction element, large-diameter bearings are used, for example, in truck-mounted and building cranes, in offshore technology, in buses and rail vehicles, in antenna installations in aerospace, in construction of harbours and ships, in telescopes, tunneling machines, in marine current and tidal power stations and in solar and wind energy installations.



For heavily loaded heavy-duty lifting spindles, and for car jacks and linear guides, **GLEITMO WSP 5040** offers the highest protection against wear and the best compatibility with the contact materials. The white solid lubricants prevent stick-slip, even with unfavourable material pairings.

GLEITMO 585 M shows an exceptional performance when used in cardan joints. In this case there are no rolling movements as in a bearing, but a more or less uniform rotation with super-imposed pivoting. White solid lubricants are irreplaceable here for protection from wear.

GLEITMO 805 K-00 is the correct choice in curved teeth couplings. Constant sliding movements require effective lubrication of the toothing when the coupling is subject to fluctuating loads. White solid lubricants ensure a reliable operation.

For clamping elements in machine tools such as lathes, CNC milling machines or drill benches, the appropriate suitable lubricant is **GLEITMO 805**. The lubricant adheres very well, provides excellent separation thanks to the white solid lubricants, thus preventing fretting corrosion and other signs of wear.

Hinges in windows, doors or commercial vehicle bodywork have to bear very high loads and are usually subject to rare and slow dynamic loads. White solid lubricants proved to be ideal for a lifetime lubrication free of noise and wear. **GLEITMO 815** is particularly suitable because its functionality is maintained even at high temperatures up to 180°C.

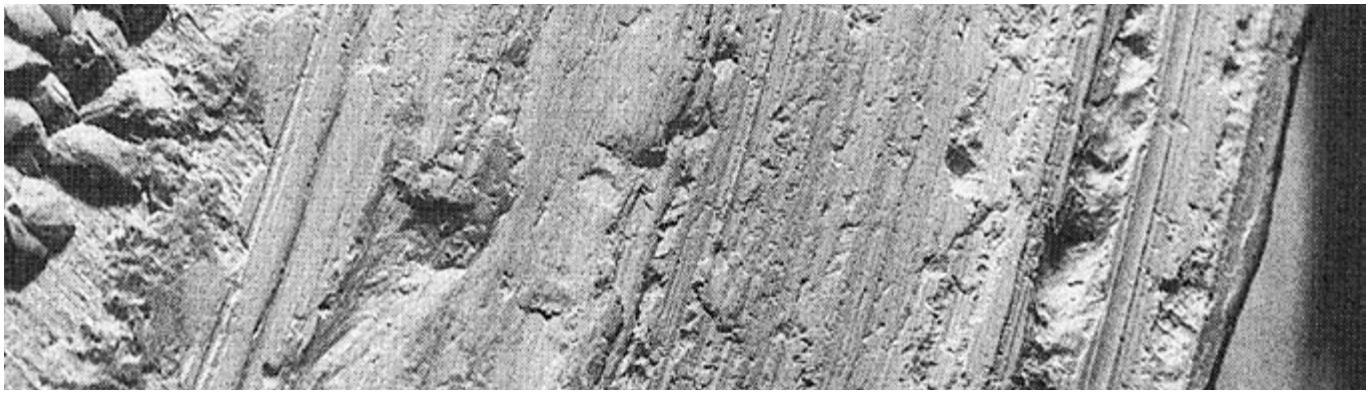
GLEITMO 2465 V was created especially for use as a drill chuck paste in hand tools. With its white solid lubricants, GLEITMO 2465 V provides an incomparably high protection against wear. Furthermore, the lubricant is compatible with a wide range of plastic and rubber parts and is also biodegradable.

For low-speed chains that can be heavily loaded, such as on crawler tracks, **GLEITMO 582** provides the appropriate lubrication. The chain lubricant is water-resistant, has a good penetrating capability and adheres very well to the items to be lubricated. Based on the white solid lubricants, the service life of the chain is increased many times.

Independent research results on the performance of white pastes

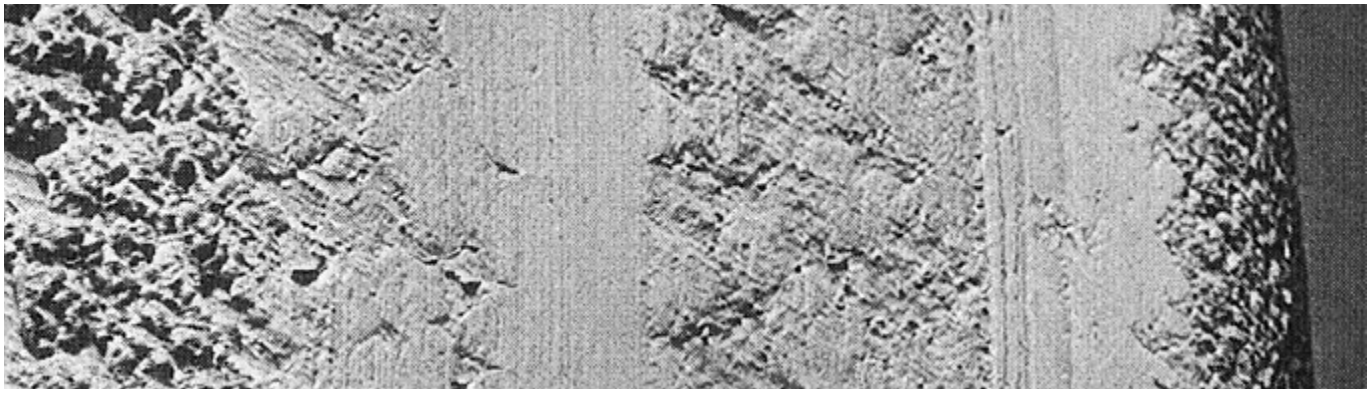
The following experiment was carried out by an independent institute. It shows the performance of pastes with reactive white solid lubricants in direct comparison to conventional lubricants.

Lubrication with molybdenum disulphide paste



Lubrication with MoS_2 paste. Spindle surface **after 35,000 motion cycles**. Test aborted, as power consumption of motor too high (torque exceeded).

Lubrication with GLEITMO paste with white solid lubricants



Lubrication with a paste that contains reactive white solid lubricants. Spindle surface **after 500,000 motion cycles**. Test aborted with spindle being fully intact.

Spindle lubrication

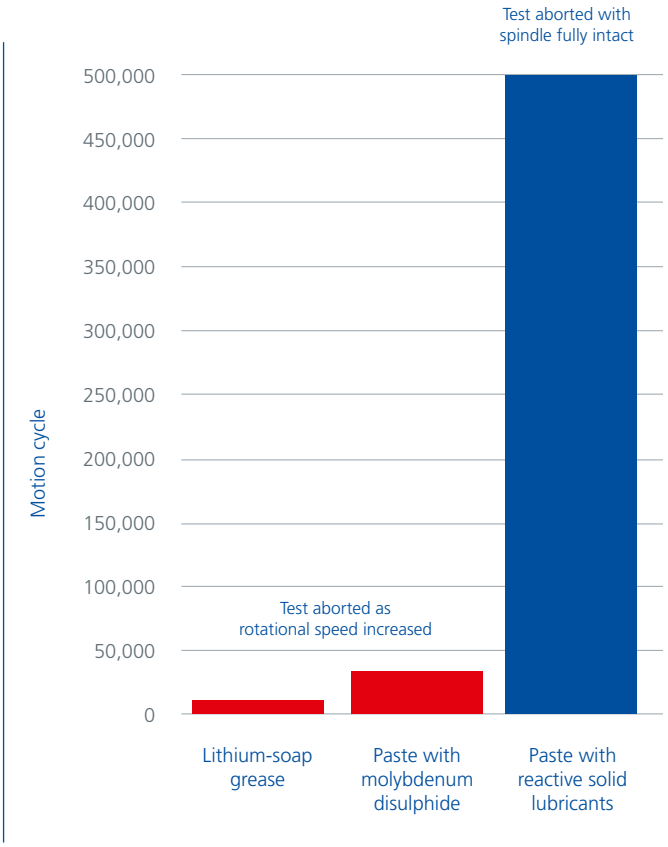
The superior lubrication performance of reactive white solid lubricants is shown impressively in the following experiment: A steel spindle is rotated cyclically for two rotations each time. In this process, it moves in a steel nut, which is firmly fixed to a tension spring. The nut and spindle are therefore subject to permanent tensile force. One cycle consists of two rotations to the right and two rotations to the left.

In the case of this unfavourable material combination, the surface pressure is decisive. The requirements for the lubricant are stringent, as the design of the spindle does not allow depot lubrication. The lubricant film must provide the entire lubricating effect during the loading.

A multi-purpose lithium-soap grease frequently used in such applications already fails after a few cycles. The MoS_2 paste which was tested achieved 35,000 cycles. The experiment with the paste including white solid lubricants was successfully accomplished after 500,000 cycles, with the spindle fully intact.

Conditions for the comparison test

Material combination: steel/steel
Sliding speed: 8.5 mm/s
Motion cycle: two revolutions to the right, two revolutions to the left
Switch-off criterion: increase in torque with stick-slip effect after 500,000 cycles



Pastes with metal content

Pastes that have metallic components as solid lubricants are particularly suitable for high-temperature applications. At temperatures beyond 300°C, it can be assumed that the base oil of every lubricant has already evaporated. In some applications very high temperatures or so-called flash temperatures occur between the friction partners e.g. due to very high surface pressures and rapid relative motion. It is nevertheless essential that the affected surfaces are reliably separated. In such cases the metallic solid lubricants are the correct choice. For example, the melting point of copper considerably exceeds 1,000°C making it the ideal solid lubricant in

MOLYPAUL 1054 is a soft paste containing aluminium that can be used very well as an anti-fretting paste. The separation of machine parts is effected up to very high temperatures exceeding 650°C. As a base metal, the aluminum particles also serve as additional corrosion protection. There are applications, among others, in spark plugs or glow plugs.

For bolts or other threaded machine items subject to high temperatures, the best separation and lubrication is achieved with pastes containing metal. Even after a long time and at high temperatures, the components can be easily untightened and re-tightened by separating the thread using metallic lubricants. For the assembly of stainless steel bolts, **GLEITMO 155** is well suited. **GLEITMO 160 NEU** is used for, among others, burnished and zinc-plated bolts. **GLEITMO 165** is the right lubricant for turbine bolts in a chemically aggressive environment.

MEISSELPASTE is the one and only lubricant for plug tools and bushings in hydraulic and compressed-air hammers. The paste can also be used under water and adheres very well to the tool even an high outside temperatures and a long operating time.

Furthermore, **MEISSEL-PASTE BIO** is available as a metal-free and rapidly biodegradable lubricant for this and other applications.

MEISSELPASTE for hydraulic demolition hammers. Further application areas for pastes with metal content are high-temperature bolts, brake pads, turbine bolts, chain rollers, exhaust systems, flange couplings, slideways and applications in the chemical industry. Depending on the application, attention should be paid to the use of metallurgically compatible lubricants. For example, for stainless-steel bolts a compatible solid lubricant package must be selected. Metal-containing pastes can also be categorised as black pastes if there is graphite or molybdenum disulphide in the lubricant in addition to the metal particles.

PBC 1574 is, among other things, very well suited for lubricating brake calipers and wheel nuts. The special paste is ealectrically non-conducting and has no adverse influence on the sensors in ABS systems. In addition, PBC 1574 prevents the seizing of screw threads, linkages, journals and flanges, even in aggressive environments.

For slowly rotating and highly loaded worm gears, **PBC TP 492** is the right choice. Also for fifth wheel bearings of heavy goods vehicles and in ball joints or wiper motors, PBC TP 492 has proved to be very successful.

Black pastes

The solid lubricant packages used account for the dark colour of this group of pastes. Depending on the later application of the lubricant, graphite or also molybdenum disulphide was included this way. These two media lead to improved friction coefficients of the lubricant as a result of their layer lattice structure. From this, the black pastes are particularly suitable for assembly applications when it is a matter of keeping forces or torques as low as possible. This is always the case for large components or interference fits.

It is seen here that graphite and particularly molybdenum disulphide have an enormous pressure resistance. This way, not only can the friction coefficient be lowered by the black pastes, but also the component wear can be minimised. In addition, the products are very suited to high-temperature applications, e.g. as wheel bearing lubricant in blast furnaces or as casting ladle facing. The black pastes have also always proved themselves as anti-seize paste and lubricant for steering columns.

GLEITMO 100, GLEITMO 100 S and **MOLYPAUL M8** offer the optimal solution for all pressing-in and assembly work. Through the addition of graphite or MoS_2, the lubricant achieves a very low friction coefficient, which assists the process of assembly of bolts, bearings and bushings without damage and with the lowest possible forces, moments and therefore also smaller tools.

For separating metals, from glowing up to liquid from spouts and the casting tools used with them or for lubrication of highly tempered bearings, bolts or hinges **GLEITMO 700** and **GLEITMO 705** are the right choice.

With their high content of solid lubricants, the lubricating pastes **MOLYPAUL GP 109 (S-722)** and **MOLYPAUL ZX 13 (S-720)** are ideally suited as anti-seize pastes. Both products have a NATO approval, confirming their performance in bearings with high-pressure loads regardless of the weather conditions.

In the pastes **CARBAFLO 3631** and **CARBAFLO 3701** the best properties of black pastes and PFPE base oils are combined. This makes both pastes very pressure-resistant and also, through the chemical properties of the base oil, inert to many acids and bases. Possible fields of application are low-speed bearings or the flanks of drive shafts, also in aggressive environments.

Perfluorinated pastes

If there is the possibility of lubricants coming into contact with very aggressive media such as acids or bases, there is no alternative to the use of perfluorinated oils and solid lubricants. The perfluorinated oils are also called PFPE (perfluorinated polyether) and the corresponding solid lubricants are called PTFE (polytetrafluoroethylene). These substances, that are very expensive to manufacture, can be considered as chemically inert. They are very resistant to oxidation. At FUCHS LUBRICANTS GERMANY you can find PFPE and PTFE in both the CARBAFLO and GLEITMO product ranges, with very different fields of application.

CARBAFLO range

The lubricating pastes of the CARBAFLO range are based on perfluorinated oils and a combination of different solid lubricant packages and additives.

CARBAFLO 2160 is an excellent choice for the lubrication of sliding elements in sunroofs, mirrors and other car elements with oscillatory motion. The lubricant suppresses the formation of noise in any weather condition and, with its chemically inert components, remains entirely unaffected by all environmental influences.

The pastes **CARBAFLO 2371, CARBAFLO 2372** and **CARBAFLO 2455** are used in, among others, high-temperature bearings, sliding guides, electrical components such as plug contacts and further machine elements. CARBAFLO 2455 includes also a UV indicator showing under the appropriate illumination, which makes clear that the lubricant has been applied.

CARBAFLO 4701 and **CARBAFLO 4701 SF** are the first choice for chains, bearings or other grease-lubricated items with high levels of chemical and thermal stress, above all when relubrication is difficult or not possible.

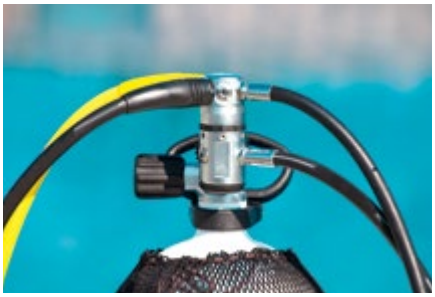
The pastes **CARBAFLO 3631** and **CARBAFLO 3701** are already listed among the black pastes since they have solid lubricant additives.

GLEITMO range: oxygen resistant pastes

The oxygen-resistant pastes of the GLEITMO 59 range are distinguished by a high lubrication performance in combination with a resistance to oxygen pressure. Depending on the lubricant there is a resistance to oxygen pressure surges up to 400 bar and a simultaneous suitability for liquid oxygen applications. For all items of this range, each batch is subjected to a test for oxygen pressure resistance at an accredited testing institute. These lubricants are produced in accordance with the very sensitive applications in a specially designed clean room.

GLEITMO 591 (OX) is resistant to 60 bar/min and **GLEITMO 593 (OX)** to at least 70 bar/min against oxygen pressure surges. These lubricants are primarily used in oxygen-supplying fittings, measuring instruments or threaded pipe joints.

GLEITMO 595 has resistance to oxygen pressure of at least 270 bar and is ideal as a lubricant for, among others, oxygen-supplying valves and conduits.



GLEITMO 599 is, with its oxygen pressure resistance of at least 400 bar and its suitability for liquid oxygen, the high-performance lubricant in the GLEITMO 59 product range. This makes the lubricant suitable for all high-pressure conduits and valves such as in medical applications, diving sport and also in welding installations.

The lubricating pastes **GLEITMO 591** and **GLEITMO 593** are available in versions with and without oxygen resistance testing.

Silicone pastes

The silicone pastes of the CHEMPLEX range are based on a specially conditioned silicone oil with the appropriate additives to meet requirements. The silicone pastes are particularly suitable for lifetime lubrication of plastic surfaces and valves supplying water or gas. The CHEMPLEX pastes are physiologically safe and compatible with plastics and elastomers. In addition, the products are resistant to ageing and cover a wide range of operating temperatures.

CHEMPLEX 746

CHEMPLEX 746 has a drinking water approval and is used, among others, for lubricating sliding pairings of plastic/plastic and plastic/metal. Thus the paste is suitable for lubricating gaskets, plastic bearings and a wide varieties of guides. Furthermore, CHEMPLEX 746 can be used in precision engineering, for plastic-coated wire ropes and in the food industry.

CHEMPLEX 750

CHEMPLEX 750 has the DVGW approval (German Technical and Scientific Association for Gas and Water) as a lubricant for gas equipment, and a drinking water approval. The applications of the lubricant include rubber parts, as sealing agent in taps and valves for gases and liquids including drinking water. Beyond that CHEMPLEX 750 is suitable for lubricating vacuum and pressurisation systems, and for insulating electrical systems and installations against the ingress of moisture.

OVERVIEW OF THE PRODUCTS AND POSSIBLE APPLICATIONS

The following chart gives an overview of the most common pastes by FUCHS LUBRICANTS GERMANY, including their temperature range and NLGI grades determining the consistency of the lubricant.

Contents

Product overview

	CARBAFLO 2160	CARBAFLO 2371	CARBAFLO 2372	CARBAFLO 2455	CARBAFLO 3631	CARBAFLO 3701	CARBAFLO 4701	CARBAFLO 4701 SF	CHEMPLEX 746	CHEMPLEX 750	GLEITMO 100	GLEITMO 100 S	GLEITMO 155	GLEITMO 160 NEU	GLEITMO 165	GLEITMO 582	GLEITMO 585 K	GLEITMO 585 M	GLEITMO 591 (OX)
Minimum temperature [°C]	-60	-35	-20	-45	-60	-30	-35	-35	-40	-40	-35	-35	-30	-30	-40	-15	-45	-25	-25
Maximum temperature [°C]	260	280	280	220	260	280	280	290	175	200	400	400	1200	1100	1200	120	130	120	260
NLGI grade	2	2	2	2	2	2	2	0-1	1-2	3-4	2	1	1-2	2	2	0	2	2	2
Additional NLGI grades		0															00	1	00,1,3
Press fitting	■				■	■					■	■							
Bending											■	■							
(Curved) teeth couplings																			
Clinching press											■	■							
Gaskets (incl. O-rings)			■	■			■	■	■	■			■	■	■				■
Running-in lubrication						■					■	■							
Electronics	■	■	■	■		■	■	■	■	■				■					
Tilting bearings					■		■	■			■			■			■	■	
Cardan shafts					■											■	■	■	
Threaded spindles											■	■				■	■	■	■
Plain bearings	■		■		■	■	■	■			■	■				■	■	■	■
High-temperature applications	■	■	■	■	■	■	■	■			■	■	■	■	■				
Hydraulic hammers																			
Chains				■			■	■								■			
Ball thread spindles																■	■	■	
Assembly	■	■				■					■	■	■	■	■	■			
Fretting corrosion protection					■	■							■			■	■	■	
Circular springs (circlips)											■	■							
Oxygen resistance																			■
Guide collumns																			
Hinges				■							■								
Threaded joints													■	■	■				
Chucks											■								
Roller bearings	■		■		■	■	■	■								■	■	■	■
Hot pressing											■	■							

GLEITMO 593 (OX)	GLEITMO 595	GLEITMO 599	GLEITMO 700	GLEITMO 705	GLEITMO 800	GLEITMO 805	GLEITMO 805 K	GLEITMO 810	GLEITMO 815	GLEITMO 820	GLEITMO 825	GLEITMO 830	GLEITMO 2465 V	GLEITMO WSP 5000	GLEITMO WSP 5040	MEISSELPASTE	MEISSELPASTE BIO	MOLYPAUL 1054	MOLYPAUL GP 109 (S-722)	MOLYPAUL M8	MOLYPAUL ZX 13 (S-720)	PBC	PBC TP 492	PBC 1574
-25	60	-40	-40	-20	-25	-20	-45	-25	-45	-20	-30	-25	-25	-20	-20	-20	-20	-20	-20	-35	-20	-20	-20	-20
250	250	250	400	1000	100	110	110	80	110	1150	1150	100	100	140	1200	(1100)	1100	800	450	450	800	1200	1200	1200
2	3	3	1	2	2	2	2	2	2	1-2	1	2	2	2	2	2	(2)	1	2	3-4	3	2	1-2	2-3
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For your notes

FUCHS LUBRICANTS GERMANY

Innovative lubricants need Experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.

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