RENEP/PLANTO

Slideway Oils

LUBRICANTS.
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FUCHS

LUBRICANTS. TECHNOLOGY. PEOPLE.

We focus consistently on high-quality lubricants and related specialties.

We develop innovative and holistic solutions for a wide variety of applications.

We value the high level of commitment of our employees and their trusting interaction with one another.

Facts and figures

Company: FUCHS SCHMIERSTOFFE GMBH, a company of the FUCHS Group
Headquarters: Mannheim
Product range: A full range of more than 2,000 products and 6,000 articles
Certifications: ISO/TS 16949, DIN EN ISO 14001, BS OHSAS 18001, ISO 50001, KTA 1401
References: One of the leading lubricants OEM for the German automotive industry

FUCHS has developed, produced and sold high-quality lubricants and related specialties for more than 85 years – for virtually all areas of application and sectors. With over 100,000 customers and 57 companies worldwide, the FUCHS Group is the leading independent supplier of lubricants.

A team of more than 800 specialists across Germany works to guarantee the satisfaction of our customers. Whatever their requirements, we have the ideal lubricant for their specific applications and processes. In our technology center we link interdisciplinary expertise in a quick and efficient way – and work on innovative lubricant solutions to meet the demands of today and tomorrow every single day.

FUCHS lubricants stand for performance and sustainability, for safety and reliability, for efficiency and cost savings. They represent a promise: technology that pays off.

SLIDEWAY OILS

The guides and slideways fitted to supports, tables and tool-holders are among the most important loadbearing elements of machine tools. Particular demands made on these slideways are high operational precision and high performance.

For the lubrication of machine tool slideways

The dimensional accuracy and surface finish of machined components are greatly influenced by the stick-slip behaviour of slideways and guide rails. The slideway oil used is of particular importance to achieve optimum accuracy.

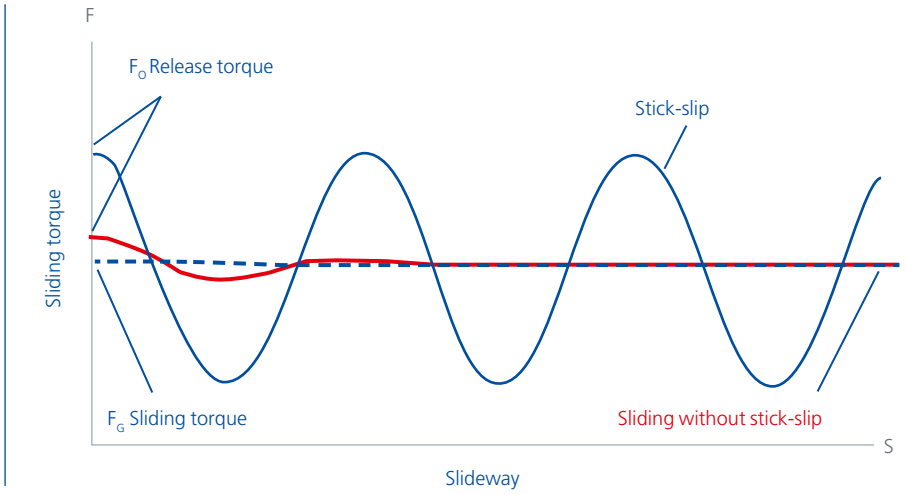
To avoid chatter marks on component surfaces resulting from high surface pressures and slow feeds, a sufficiently adhesive lubricating film must be present on slideways and guides. This film must eliminate stick-slip, combat wear and avoid corrosion.

The cause of stick-slip is frictional vibration resulting from the constantly changing friction between the machine-tool toolholder – the tool and the work-piece – or slide and its slideway. The same applies to linear guide systems. When a machine tool slide is moved, high frictional and breakaway forces are created. The roughness peaks on both contacting surfaces, which can key into each other with increasing specific pressure, must ride up over each other and the breakaway forces must be overcome. Special slideway oils and their additives assist the formation of lubricant films on the surfaces.

Chemically-active additives activate the metal surface, form antiwear layers and reduce the coefficient of friction between the sliding surfaces. The adhesive properties of the slideway oil must be good enough to withstand machine shut-downs as well as the influence of neat cutting oils and water-miscible cutting fluids. This stops the slideway oil from being squeezed out of the lubricant gap even at high pressures. Good adhesion and good wetting properties also avoid possible lubricant wash-out by the cutting fluid. This prevents the slideway from running dry, and prevents metal-to-metal contact between the roughness peaks.

Special surface-active agents improve lubricant film stability, reduce the coefficient of friction and reduce frictional forces at the point of breakaway and during feed movement.

Stick-slip / respectively release torque



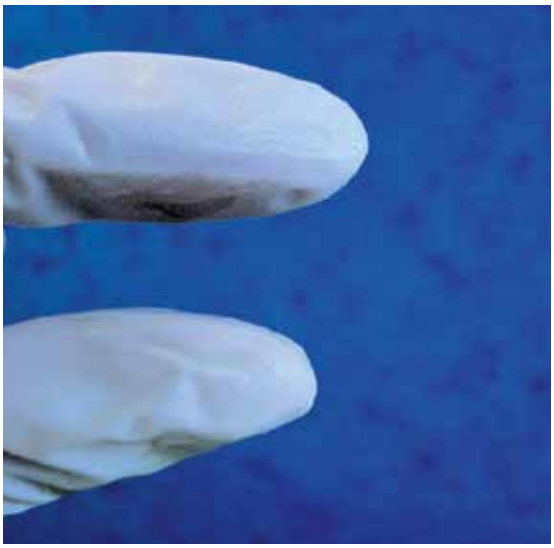
Guide, slideway, linear guide systems

The most important characteristics of guides and slideways are:

- Low Friction
- No stick-slip at low feed speeds and high pressures
- Low wear and good protection against seizures and scuffing
- High stiffness, low play
- Good damping properties

As a rule, hydrodynamic, hydrostatic and roller guides are used in machine tools. Aerostatic and electromagnetic guides are only used for special applications.

The use of hydrostatic guides is falling but are still fitted to a great number of machine tools. These days, more and more hydrodynamic and roller guide systems (linear guides) are being used. The most common material combinations in hydrodynamic slideways are grey cast iron-grey cast iron, grey cast iron-plastic, grey cast iron-steel and steel-plastic. CGLP slideway oils according to DIN 51502 and ISO 6743/13 are usually used for these material combinations. Horizontal slideways are also lubricated with CGLP 68, HG 68 or G 68 slideway oils. Vertical slideways are lubricated with CGLP 220, HG 220 or G 220 slideway oils. In a number of cases, total-loss, central lubrication systems are used. Slideway oils are general lubricating oils with additives to improve oxidation resistance and corrosion protection.



Slideway oil without "tackyfier"

Slideway oil with "tackyfier"

They also contain special AW and EP agents along with surface-active substances and some even contain tackiness improvers. When slideway oils are used in linear guide systems, the lubricants should form a barrier between the rollers in the contact zone (opposing movement of the rollers). In the contact area, the lubricant should also offer damping, especially at endpoints as well as protection against wear and seizures. The slideway oil should form an effective lubricating film almost instantaneously. Slideway oils for hydrodynamic slideways and linear guides should display the following characteristics:

- Low static and dynamic friction coefficients
- Good compatibility with cutting fluids (chemical compatibility with water-based cutting fluids)
- Good compatibility with neat cutting oils
- Good demulsibility with emulsions, no slideway gumming
- Excellent corrosion protection
- Avoidance of stick-slip
- Compatibility with central lubrication equipment
- Good slideway adhesion
- Excellent wear-protection properties (Extreme-Pressure and Anti-Wear performance)
- Good compatibility with slideway materials
- No discoloration of slideways (no corrosion effects)
- Good compatibility with hydraulic oils used
- Must satisfy the demands of hydraulic systems in combined hydraulic and slideway oil circuits (specific systems)

Demulsifying properties of slideway oils and cutting fluids

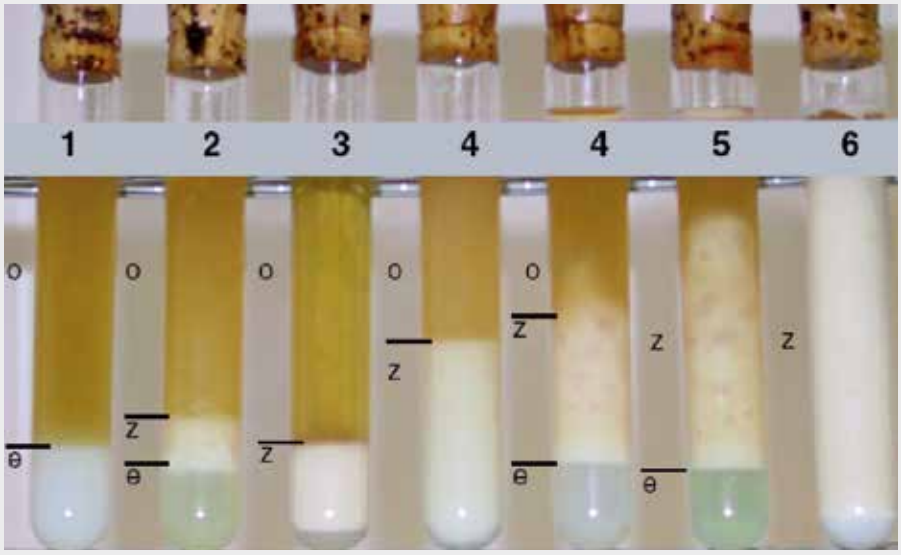
The demulsifying properties and the separating properties of slideway oil and cutting fluids are examined in a special laboratory test.
This test provides information on the compatibility or incompatibility of slideway oils and cutting fluids. Furthermore, it should examine the influences of the function of slideways and guides.

The cutting fluids to be tested are mixed with the corresponding slideway oils (80% oil, 20% cutting fluid, intensive stirring at room temperature) and then examined for demulsification and separation properties and evaluated in line with DIN 51599. The evaluation is performed visually after one hour (1h), after one day (1d) and after seven days (7d).

Stage 1 classifies the demulsibility as "very good", i.e. both phases are completely separated.
Stage 2 shows an almost complete separation with a small boundary phase.
Stage 3 contains one oil and one boundary phase.
Stage 4 contains the three phases; an oil, emulsion and boundary phase or one oil and one boundary phase > 30% vol.
Stage 5 contains one boundary and one emulsion phase.
Stage 6 shows no demulsifying, i.e. the boundary phase remains fully intact.

These tests can also be conducted at a ratio of 1:1 (e.g. 125 ml slideway oil to 125 ml cutting fluid). Again, the pH value of the oil and emulsion phases should be determined before and after the test. Ideally, any pH value deviation should be as small as possible.

In addition, a shift or a drop in concentration and the conductivity before and after the test should be recorded and again any deviations should be as small as possible.



The images show the evaluation stages 1 – 6 (e = emulsion, o = oil, z = boundary phase).

The boundary phase z appears in various states:
foam (1d) – stable foam – precipitation/flocculation – creamy residue).

Evaluation

It can be assumed that combinations with the evaluation 1 or 2 have no negative effect on guide or slideway systems. Combinations with the evaluation 3 can still be tolerated. Combinations with the evaluation 4 – 6 form large boundary phases in the forms described below. An increased formation of microorganisms can be recorded. Combinations with the evaluation 4 – 6 should not be used.

Note

The concentration of the cutting fluid has a major impact on demulsifying properties. Test temperature also influences demulsifying.

Further testing possibilities – compatibility tests: oil – cutting fluid emulsion

A mixture of slideway or hydraulic or gear oil and cutting fluid emulsion is subject to a demulsification test. The following parameters of the emulsion (which may be contaminated with oil) are tested:

- Concentration (stability)
- PH value (corrosion)
- Conductivity (drag-in of contaminants)
- Sulfide potential (odour problems)

The emulsion data is compared with data from a freshly-mixed emulsion. Ideally, deviations should be minimal.

While concentration changes indicate possible stability problems, pH changes can result in corrosion and possible skin compatibility problems. Conductivity changes are also an indicator of dragged-in impurities and thus lower stability and deviations in sulphide potential can result in odour problems.

Slideway oil demulsifying

Slideway oil emulsifying

Determining the static coefficient of friction with an inclined tribometer

Test method

The test apparatus, manufactured by the company SKC Gleittechnik in 96472 Rödental/Germany, uses the inclined plane principle. The inclined plane is formed by a bar, containing a slideway in which suitably machined strips of the mating materials are fitted. The slideway is raised at a constant angular velocity with the aid of a hydraulic piston. The slider is fitted at each end with two specimens of the materials to be tested. Taking into account the 90° vee-geometry, this produces a pressure of 10 N/cm² which can be increased up to 40 N/cm² with extra weights.

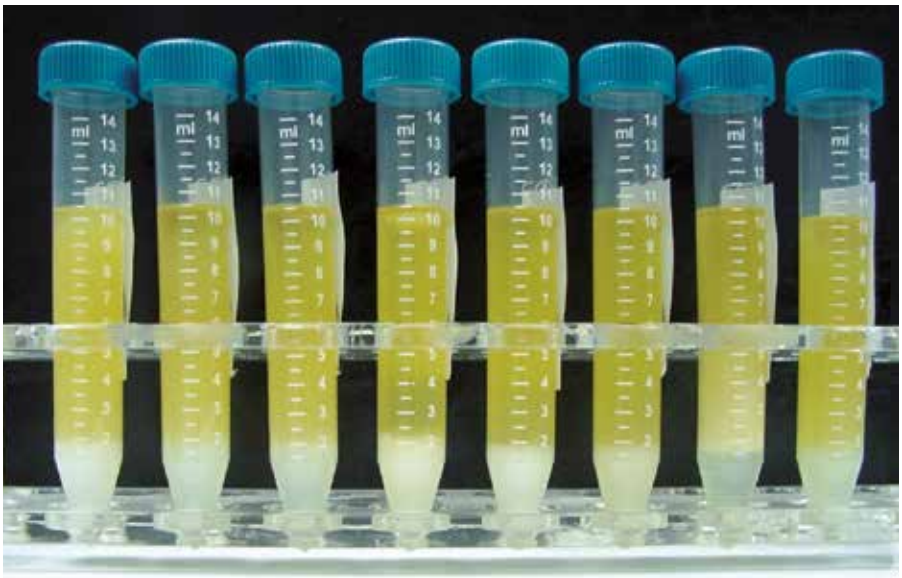
Test procedure

When the slider has moved a distance of 20 microns, a limit switch stops the upward movement of the inclined plane. Also the plotter, which up to this point, made a stiction vs. travel plot, is switched over to travel vs. time. A computer connected via an interface converts the angle reached to the coefficient of friction using the formula (90° V-slideway): $f_0 = \tan \alpha \times \sin 45°$.

After the test has been repeated ten times, a mean value and standard deviation are determined. The coefficient of friction f_0 is shown in the results together with the mating materials, the sliding speed and the slideway oil used.

Evaluation

The coefficients of friction should be as low as possible and remain at a low, stable level. To compare the coefficients of friction, other major criteria and properties of the slideway oil should be examined, especially wear protection and demulsibility. The evaluation of slideway oils should also consider the compatibility with the cutting fluid emulsion used. It is recommended that an overall evaluation of the slideway oil-cutting fluid-machine tool parameters is undertaken.



Very good demulsibility in the Schmidt-test:
RENEP slideway oils with ECOCOOL cutting fluids.

Demulsibility of RENEP slideway oils with ECOCOOL cutting fluids

Valuation: Demulsibility / separation behaviour after 1 hour, after 1 day, after 7 days

Name of the cutting fluid	Name of the slideway oil	Conz. [%]	Valuation after 1 hour [stage]	Valuation after 1 day [stage]	Valuation after 7 days [stage]
ECOCOOL R-AFC 1515	RENEP CGLP 68	5	2	1	1
ECOCOOL R-GRINDSTAR	RENEP CGLP 68	5	2	1	1
ECOCOOL FB 1001	RENEP CGLP 68	5	2	1	1
ECOCOOL R-TN 2525 HP	RENEP CGLP 68	5	2	1	1
ECOCOOL R-2030 MB	RENEP CGLP 68	5	1	1	1
ECOCOOL R-2510 N	RENEP CGLP 68	5	2	1	1
ECOCOOL R-AFC 1515	RENEP CGLP 220*	5	1	1	1
ECOCOOL FB 1001	RENEP CGLP 220*	5	1	1	1
ECOCOOL R-TN 2525 HP	RENEP CGLP 220*	5	2	2	1
ECOCOOL R-2030 MB	RENEP CGLP 220*	5	1	1	1
ECOCOOL R-AFC 1515	RENEP CGLP 68 KN	5	1	1	1
ECOCOOL R-GRINDSTAR	RENEP CGLP 68 KN	5	1	1	1
ECOCOOL FB 1001	RENEP CGLP 68 KN	5	1	1	1
ECOCOOL R-TN 2525 HP	RENEP CGLP 68 KN	5	1	1	1
ECOCOOL R-2030 MB	RENEP CGLP 68 KN	5	1	1	1
ECOCOOL R-2510 N	RENEP CGLP 68 KN	5	1	2	1
ECOCOOL R-AFC 1515	RENEP CGLP 220 KN	5	1	1	1
ECOCOOL R-GRINDSTAR	RENEP CGLP 220 KN	5	1	1	1
ECOCOOL FB 1001	RENEP CGLP 220 KN	5	1	1	1
ECOCOOL R-TN 2525 HP	RENEP CGLP 220 KN	5	1	1	1
ECOCOOL R-2030 MB	RENEP CGLP 220 KN	5	1	1	1
ECOCOOL R-2510 N	RENEP CGLP 220 KN	5	1	1	1

Valuation 1 / Stage 1: Very good demulsibility
Valuation 2 / Stage 2: Good demulsibility
*RENEP CGLP 150 shows the same behaviour like RENEP CGLP 220

MINIMIZED FRICTION

Carefully selected base oils and additives matched to ensure almost „smooth“ movement in the lubrication gap. By the formation of adhesive, surface-active layers, a minimization of the internal friction and a reduction of the current consumption during start-up are achieved.

The perfect slideway oil for application

RENEP CGLP
ISO VG 68, 150, 220
High-performance slideway oils for all machine tools offering excellent demulsibility, good chemical compatibility with cutting fluids, outstanding wear protection and low coefficients of friction.

RENEP CGLP products are highly-advanced slideway oil formulations for machine tools and all slideways and linear guide systems. Specially selected additives guarantee high lube film stability, lowest possible friction coefficients (to avoid stick-slip), high wear protection and excellent demulsibility with water-based cutting fluids. RENEP CGLP products ensure that load-bearing and protective lubricating film is formed.

They do not stain or discolour the slideways and protect against scuffing and corrosion. In addition, RENEP CGLP 68 can be used as a fully-functional hydraulic oil according to DIN 51524-2 resp. ISO 6734-4.

Products of the RENEP CGLP series are advanced and universally-applicable lubricants for the latest generation of slideways and linear guide systems.

Noteworthy features of the RENEP CGLP series of products are:

- Extremely low friction coefficients (static and dynamic)
- Excellent anti-stick-slip behaviour
- Excellent demulsibility with water-based cutting fluids
- Outstanding adhesion on metal and plastic surfaces
- Very good corrosion protection, combats staining of the surface
- Avoids gumming and the formation of cutting fluid deposits

RENEP KN
ISO VG 68, 220
RENEP KN series products are highly-tacky, demulsifying, universal and advanced slideway oils. Special surface-active additives guarantee good product adhesion. The tackyfiers in RENEP KN products are highly-stable and display excellent compatibility with water-based cutting fluids.

RENEP KN products are universally applicable in slideway and linear guide systems.

Outstanding features of the RENEP KN series are:

- Excellent adhesion provided by special additives which increase the adhesion to metal and plastic surfaces – “tacky effect”
- Very good anti-stick-slip behaviour, low friction coefficients
- Good demulsibility with water-based cutting fluids

RENEP K
ISO VG 68, 100, 220
Universal slideway oils for the machine tool industry with powerful detergent and dispersant properties.

RENEP K series products are universal products suitable for all slideway applications. They offer good adhesion, good EP performance, good anti-wear properties and pronounced corrosion protection. RENEP K series products display good compatibility with slide materials, very good ageing and oxidation stability and reliably combat stick-slip.

RENEP K products are formulated to be detergent and dispersant slideway oils with powerful cleaning properties and good compatibility with cutting oils and water-based fluids. RENEP K products keep the surface clean and avoid the formation of residues.

Outstanding features of the RENEP K Series are:

- Excellent wetting properties
- Good anti-stick-slip behaviour
- High detergency/dispersant performance
- Good compatibility with neat cutting oils
- Good corrosion protection

PLANTOLUBE CGLP S
ISO VG 68, 220
PLANTOLUBE CGLP S products are carefully matched to the whole range of rapidly biodegradable hydraulic and gear oils.

PLANTOLUBE CGLP S products are fully compatible with the environmentally harmless range of FUCHS of PLANTO products. They offer good protection against seizing, wear, corrosion and display excellent stability. Due to the polarity of esters, PLANTOLUBE CGLP S products have good wetting properties and good "natural" cleaning properties.

The outstanding features of the PLANTOLUBE CGLP S Series are:

- Excellent wetting properties
- Excellent anti-stick-slip properties
- Very low friction coefficient
- Good compatibility with other PLANTO products
- Good corrosion protection

Note
The information contained in this brochure is based on the experience and expertise of FUCHS SCHMIERSTOFFE GMBH in the development and manufacture of lubricants and represents the current state of the art. The performance of our products can be influenced by a series of factors, especially the specific use, the method of application, the operational environment, component pretreatment, possible external contamination, etc. For this reason, it is not possible to make universally valid statements about the function of our products. Our products must not be used in aircraft/spacecraft or parts thereof. This does not apply insofar as the products can be removed again before components are fitted in an aircraft/spacecraft. The information given in this product information represents general, non-binding guidelines. No warranty expressed or implied is given concerning the properties of the product or its suitability for any given application. We therefore recommend that you consult a FUCHS SCHMIERSTOFFE GMBH application engineer to discuss application conditions and the performance criteria of the products before the products are used.

It is the responsibility of the user to test the functional suitability of the products and to use them with the corresponding care. Our products are subject to continuous further development. We therefore retain the right to change our product range, the products, and their manufacturing processes as well as all details in this brochure at any time and without warning, provided that no customer-specific agreements exist that require otherwise.

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RENEP / PLANTO slideway oils

Overview of selected technical data

Product name	Density at 15°C [kg/m³]	Flashpoint Cleveland [°C]	Kinematic viscosity at 40°C [mm²/s]	Pourpoint [°C]	Friction coefficient SKC3-GG25	Friction coefficient GG25-GG25
RENEP CGLP 68	879	220	68	-24	0.089	0.156
RENEP CGLP 150	892	230	150	-12	–	–
RENEP CGLP 220	895	240	220	-15	0.064	0.143
RENEP KN 68 (TACKY)	880	220	68	-29	0.086	0.130
RENEP KN 220 (TACKY)	895	238	220	-17	0.092	0.103
RENEP 2 K	882	230	68	-27	0.111	0.204
RENEP 4 K	885	240	100	-24	0.118	0.189
RENEP 5 K	900	248	220	-12	0.125	0.155
PLANTOLUBE CGLP 68 S	916	280	68	-33	0.08	0.123
PLANTOLUBE CGLP 220 S	938	280	220	-33	0.092	0.129

Properties in comparison

Some important properties in comparison	Coefficients of friction	Demulsification with water-based cutting fluids	Adhesion "tackiness"	Wear protection "scuffing protection"
RENEP CGLP Series	extremely low +++	extremely good +++	very good, without "tackyfier" ++	very high protection FZG A/8, 3/90:12 +++
RENEP KN Series	extremely low +++	very good ++	extremely good, with "tackyfier" +++	very high protection FZG A/8, 3/90:12 +++
RENEP K Series	very low ++	emulsifying DD-performance	very good, without "tackyfier" ++	high protection FZG A/8, 3/90:11 ++
PLANTOLUBE CGLP Series	extremely low +++	very good ++	very good, without "tackyfier" ++	very high protection FZG A/8, 3/90:12 +++

FUCHS lubricants

Innovative lubricants need experienced application engineers

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

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