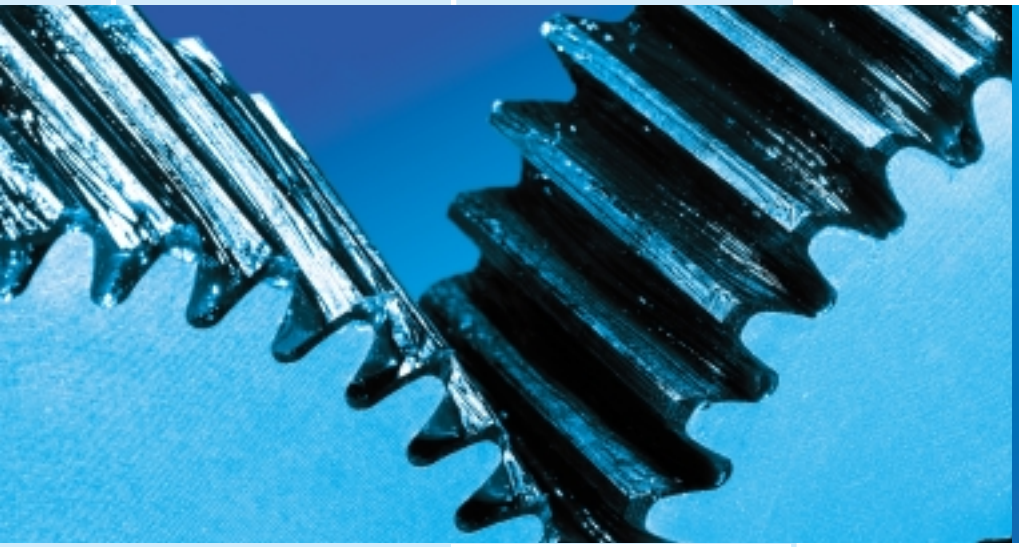
PETER GREVEN –
Competence in lubricants



PETER GREVEN

Partner of industry

PETER GREVEN –
Competence in lubricants

Based on natural raw materials of animal and vegetable origin, we manufacture fatty acids as saponification basis for lubricating greases and as friction modifiers in lubricating oils. Our metallic and alkaline soaps are used as thickening agents in lubricating greases and as emulsifiers and corrosion preventives in lubricating oils. Our latest product series, synthetic esters of monoalcohols and polyols are the basis for biodegradable lubricating oils and greases, as well as indispensable additives for lubricity improvement in water miscible and non water miscible mineral oil formulations.

Oleochemical raw materials for the lubricant industry

Owing to decades of experience in the area of fat chemistry, modern equipment for exploitation of olechemical raw materials as the basis for subsequent saponification and esterifying processes and the flexibility of a family-owned company, enables us to offer high-quality products with excellent cost effectiveness.

Lubricating greases

Lubricating greases are solid or semiliquid products of a dispersion from a thickening agent in a liquid lubricant. Through the delivery of a sufficient quantity of liquid lubricant by slow separation they avoid friction and wear over wide temperature ranges and over long periods of time. At the same time they are used as sealing against water and foreign particles. Lubricating greases are, for example, used for lubrication of machine elements as roller and journal bearings, conveying chains and ropes as well as gear units.

Metallic and alkali soaps as thickeners

The use of ready-made metallic and alkali soaps avoids the critical reaction phase during grease production. The soaps are solved in the basic liquid, by which small quantities of residual moisture are stripped. By special temperature control the grease structure is obtained, followed by mechanical processing (addition of additives, trituration, aeration etc). Depending on which grease properties are required, the metal soaps can be used individually or in combination. Ready-made metal soaps are of special advantage in connection with synthetic or natural esters as base stocks.

LIGA LITHIUM-12-HYDROXY-STEARAT
LIGA LITHIUMSTEARAT

Most important soaps for the production of lubricating greases. Applied in mineral oil, vegetable oil (e.g. castor oil, rapeseed oil) or in synthetic base stocks (e.g. ester oils, PAO). The application quantity for NLGI-class 2 is approx. 8-10%.
Lithium base greases are preferred lubricants for virtually all roller bearing types in the operative range between -40 and +140°C, but also very much suitable for friction bearings, joints, slide rails, etc. They are characterized by good adhesiveness and good corrosion protection. Very high fulling resistance and drop points of 200°C are achieved by using LIGA LITHIUM-12-HYDROXYSTEARAT. With LIGA LITHIUMSTEARAT grease types for lower mechanical load are gained, whereas the drop points can be realized to approx. 180°C.

LIGA CALCIUM-12-HYDROXY-STEARAT
LIGA CALCIUMSTEARAT 600
LIGA CALCIUMSTEARAT 800
LIGA CALCIUMBEHENAT
LIGA CALCIUMLAURAT

For the production of **lime base greases** of NLGI-class 2 approx. 15-18% soap share is needed. Here mainly mineral oil and vegetable oil (rape, castor) are used as base stocks. The application temperature of these grease types are between -35 and +60°C. Good adhesiveness and very good water resistance are the excellent properties. With LIGA CALCIUM-12-HYDROXYSTEARAT drop points of about 130°C are reached, with LIGA CALCIUMSTEARAT 600 and 800 around 100°C, whereas type 600 offers a higher alkalinity for better corrosion protection. By combination with LIGA CALCIUMBEHENAT and -LAURAT grease properties as for example consistency and drop point can be influenced.

LIGA NATRIUMSTEARAT R/D

By using approx. 15% of LIGA NATRIUMSTEARAT R/D in suitable base oils (mineral, vegetable or synthetic; see lithium base grease) **sodium base greases** of the NLGI-class 2 are produced with drop points between 160 and 180°C.
Characteristic features of these lubricants are good adhesive force and the ability to emulsify low quantities of water, which considerably contributes to their especially good corrosion protection. The fulling stability of sodium base grease is moderate. Its temperature application range reaches from -30 to +120°C.

LIGA ALUMINIUMSTEARAT TR
LIGA ALUMINIUMSTEARAT DT
LIGA ALUMINIUMSTEARAT D1
LIGA ALUMINIUMSTEARAT D2
LIGA ALUMINIUMSTEARAT D3
LIGA ALUMINIUMSTEARAT F 100/7

Soaps for the manufacture of **aluminium base greases** on mineral, vegetable or synthetic basis.
LIGA Aluminiumstearat TR and DT have low swelling properties and are used for very soft or semiliquid greases with highest softness and transparency (drop point < 65°C). The applied quantities are between 4 and 10%.
LIGA ALUMINIUMSTEARAT D1, D2 and D3 produce consistent greases with drop points of about 80°C. The swelling maximum is at product D2. The application quantities are 6-8% for the achievement of NLGI-class 2, depending on the basic oil.
LIGA ALUMINIUMSTEARAT F100/7 is a complex soap. By using 6-10% in suitable basic oils, fulling-resistant, highly consistent greases with drop points of about 200°C are produced.
Aluminium base greases are in principal transparent, soft and of good adhesiveness. They have a very good corrosion protection, but are, however, only of moderate water resistance. The lower application temperature is at -30°C. Products on complex soap basis can be used up to approx. +150°C.

Fatty acids as saponification basis

Fatty acids are dissolved in the basic liquid and saponified by adding the hydrous solution of the corresponding hydroxide. Solvent and reaction water are stripped. After that the structure formation of the lubricating grease follows through special reaction control, then mechanical processing. Depending on which grease properties are required, the fatty acids can be used single or in different mixtures. If vegetable oils or synthetic esters are used as base stocks, the saponification phase has to be controlled carefully in order to avoid a possible competitive reaction. When ready-made metal and alkali soaps are used this risk does not exist.

LIGALUB FSO	12-hydroxy stearic acid
LIGACID SG 3	technical stearic acid, Jz max. 3, sack material
LIGACID SG 10-12	technical stearic acid, Jz 10-12, sack material
LIGACID SF 3	technical stearic acid, Jz max. 3, tank truck
LIGACID SF 10-12	technical stearic acid, Jz 10-12, tank truck

Ester oils as base stocks

For the manufacture of fast biodegradable lubricating greases vegetable or synthetic ester oils are used instead of mineral oils. These products show clear advantages regarding lubricity, corrosion protection, viscosity/temperature-behaviour and as mentioned before, biodegradability. However, natural weak points are thermal and hydrolytic stability. In principle it can be said that synthetic esters in this respect and under the aspect of constant quality are definitely superior to vegetable oils. To achieve different product properties all LIGALUB ester oils can be mixed with each other.

LIGALUB 9 GE — **Natural castor oil.** Applicable as highly viscous basic oil with excellent lubricating properties, alone or mixed with other ester oils. Compared to rapeseed oil it shows clear advantages regarding sludge formation and gumming.

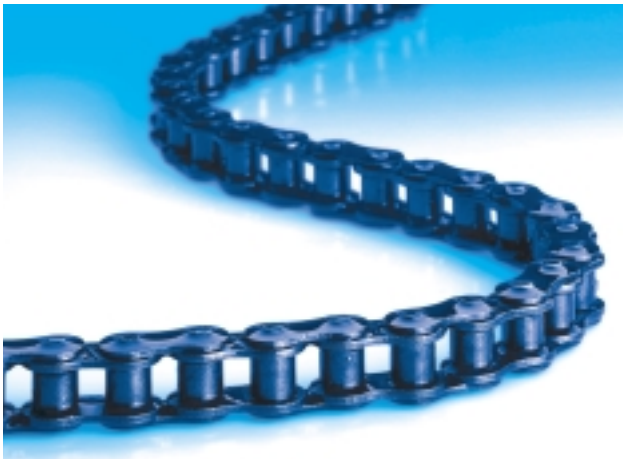
LIGALUB 9 GE-H — **Hardened castor oil.** As mixing component with increased oxidation stability.

LIGALUB 13 GE — **Synthetic glycerol trioleate.** Base stock of constant condition with low inclination to gumming.

LIGALUB 18 TMP — **Trimethylolpropane trioleate.** Synthetic ester with good hydrolysis stability. Available also on pure vegetable basis as well as in different viscosity categories.

Lubricating oils

Lubricating oils are liquid lubricants, which primarily serve to reduce friction and wear at bearings and contact points. Secondary tasks include protection of corrosion, transport of heat and removal of disturbing particles from the friction point. Lubricating oils fulfil their function in machine elements, as metal working fluids and as hydraulics. They are water miscible or not, their basis is mineral or synthetic.



Fatty acids, alkali and metallic soaps as additives

Due to their polar character fatty acids have an excellent adhesive force on metallic surfaces. Under suitable conditions of pressure, temperature and concentration they build metal soap layers with the basic material. These carry the load in the area of boundary lubrication, i. e. where the basic oil alone can no longer become effective and the high-pressure additives have not yet become effective. Alkali soaps as well have a high affinity to metals. Their effort to cover such surfaces and their natural alkalinity gives them corrosion-protective and lubrication-supporting properties. Metal soaps on aluminium basis influence the structure of the base oil.

LIGACID OW
LIGACID OB
Surface active **oleic acids.** Additions of 0.3-1 % increase the lubrication effect of mineral-oil based formulations.

LIGALUB FSO — **12-hydroxy stearic acid** for excellent lubrication support in mineral-oil based formulations.

LIGA KALIUMOLEAT 90 — **Alkali soap** on oleic acid basis. Quantities of 0.5-2 % improve corrosion protection and lubricity of mineral oil formulations. Anionic emulsifier in coolants.

LIGA ALUMINIUMSTEARAT TR
LIGA ALUMINIUMSTEARAT DT
Aluminium soaps in low addition quantities, hotly dispersed in base oil, change the viscosity and the shearing behaviour, improve the adhesiveness of lubricants on mineral or synthetic basis. They stabilize the dispersion of pigments, e.g. in graphit/ MoS_2-lubricants.

Synthetic esters as additives in mineral oil formulations

Owing to their polar properties synthetic esters are important lubricating agents in mineral oil based formulations. They have a higher wetting effect as mineral oils and spread over the metallic surface, where they reduce sliding friction and increase corrosion protection. Esters with free OH-groups support the emulsifying system in water miscible formulations.

LIGALUB 8 GE — **Glycerol tricaprylate/caprate.** Saturated ester with good oxidation and hydrolysis stability. As greasing agent in water miscible and non water miscible metal working fluids.

LIGALUB 10 GE
LIGALUB 12 GE — **Glycerol monooleate** and **Glycerol dioleate.** Additions of 1-2 % increase the affinity to the metal surface and improve lubricity and corrosion protection. In water miscible oils they are also used as emulsifiers.

LIGALUB 13 GE — **Glycerol trioleate.** Proven fatty agent in water miscible metal working fluids. Application quantity 2-5 %.

LIGALUB 18 TMP — **Trimethylolpropane trioleate.** For lubrication improvement in water miscible and non water miscible metal working oils, especially for NE-metals (aluminium).

LIGALUB 19 TMP — **Trimethylolpropane tricaprylate/caprate.** Fattening agents with good oxidation and hydrolysis stability for water miscible and non water miscible metal working fluids and thermally loaded lubricating oils.

LIGALUB 38 ITD — **Diisotridecyl adipate.** Lubricating agent for formulations under high thermal load, e.g. compressor, gear or hydraulic oils.

LIGALUB 45 ITD — **Isotridecyl stearate.** Lubricating agent with good oxidation stability for broad application in the water miscible area.

LIGALUB 51 PE — **Pentaerythritol monooleate.** Friction modifier in non water miscible formulations.

LIGALUB 53 PE — **Pentaerythritol tetracaprylate/caprate.** Oxidation resistant ester as fatty component in thermally loaded lubricant formulations.

LIGALUB 58 NPG — **Neopentylglycol dioleate.** For lubrication improvement in water miscible and non water miscible metal working fluids.

LIGALUB PEG 400 MO — **Ethylene glycol monooleate.** Lubricity improver and emulsifier with moderate foaming properties in water miscible lubricants.

Synthetic esters as base oils for environmentally acceptable lubricants

The products of this series are based on natural raw materials of animal and vegetable origin. They are free of solvents and mineral oils and they are the choice in many application cases when mineral oil has to be replaced, e.g. for hydraulic oils, gear oils, motor oils, corrosion protection oils and coolants, or in the area of loss lubrication (e.g. two stroke oils). In their properties lubricity, viscosity index, low-temperature behaviour, volatility and biodegradability synthetic esters are definitely superior to mineral oils. Due to their excellent lubricity it can in many cases be dispensed with chlorine, sulphur and phosphorus addition, when formulating water miscible metal working fluids. With regard to oxidation and hydrolysis stability as well as quality constancy they are to be preferred to vegetable oil raffinates e.g. from rape-seed, soybean, sunflower which are also used as base stocks.

LIGALUB 18 TMP — **Trimethylolpropane trioleate.** Unsaturated ester of good hydrolytic stability. Available in the viscosities 46, 68, 320 and 1000, as 46 also on pure vegetable basis.

LIGALUB 19 TMP — **Trimethylolpropane tricaprylate/caprate.** Saturated ester of good hydrolytic and thermal stability. V_{40}: approx. 20 mm^2/s.

LIGALUB 38 ITD — **Diisotridecyl adipate.** Saturated ester of high thermal and hydrolytic stability. V_{40}: 25-29 mm^2/s.

LIGALUB 51 PE — **Pentaerythritol monooleate.** Unsaturated partial ester with high surface affinity and good hydrolysis resistance. V_{40}: ca. 110 mm^2/s.

LIGALUB 52 PE — **Pentaerythritol tetraoleate.** Unsaturated ester of good hydrolytic stability. V_{40}: 40-50 mm^2/s.

LIGALUB 53 PE — **Pentaerythritol tetracaprylate/caprate.** Saturated ester of good hydrolytic and thermal stability. V_{40}: approx. 30 mm^2/s.

LIGALUB 58 NPG — **Neopentylglycol dioleate.** Unsaturated ester of good hydrolytic stability. V_{40}: 22-26 mm^2/s.

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