

your global specialist

Lubricants help reduce
maintenance costs.

Solutions for the rail industry





Speciality lubricants made by Klüber Lubrication can help reduce maintenance costs

Speciality lubricants made by Klüber Lubrication can help reduce maintenance costs	3
Gear lubrication	4
Traction motor bearing lubrication	6
Lubrication of railway switches	7
Optimally equipped with our speciality lubricants	8
Drives and chassis	10
Bogies	12
Coaches and connectors	14
Infrastructure	16
Production and workshops	18

Clearing the line with high-quality speciality lubricants

With Klüber Lubrication speciality lubricants, you make sure the complex interaction of trains and infrastructure is kept running. The right lubricant will reduce operating costs reliably and efficiently by ensuring the correct lubrication of bogie components, doors and switches.

Customised solutions for maximum benefit

Speciality lubricants made by Klüber Lubrication make a considerable difference: for many decades, the special requirements of rail industry users have been a central concern of our development work. Your specific needs are constantly in our focus. We collaborate with you to analyse the lubrication requirements of your components and use the resulting specifications as a basis for developing customised lubricants. In addition to high-quality, mineral oil based lubricants we also offer a comprehensive range of synthetic high-performance speciality lubricants. In support of your efforts to reduce impact on the environment, we offer eco-compatible and rapidly biodegradable lubricants. These products contribute significantly to improving environmental protection. They contribute to a reduction of life cycle costs and, due to their large reserve performance capacity, better reliability of your rail vehicles and infrastructure. Our speciality lubricants help extend maintenance intervals and reduce the quantities of lubricant required.

We are where you are

Our aim is to offer you high-quality speciality lubricants and services around the globe along with the outstanding consulting competence for which Klüber Lubrication is known. We meet this aim through our worldwide network of development, production and sales companies, competent dealers, and last but not least, through our highly specialised experts who are ready to respond to your individual requirements. We have compiled a selection of speciality lubricants and listed them by modules and components. Most of these lubricants have been tried and tested both in trains and in rail infrastructure for many years.

Gear lubrication

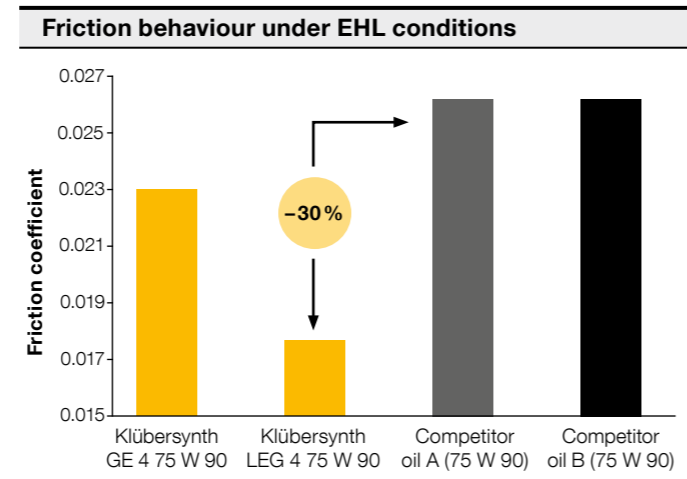


Rail vehicle gearboxes have to reliably withstand high stress: high loads, high speeds, vibrations and extremely variable temperatures. Klüber Lubrication has developed a range of high-performance gear oils to ensure that gearboxes can meet these challenges. Due to their extraordinary performance capabilities, these gear

oils can cope with different sets of requirements. All our gear oils for railway applications are fully synthetic and based on polyalphaolefins (PAO):

	Pour point in °C	Kinematic viscosity at 40°C in mm ² /s	Kinematic viscosity at 100°C in mm ² /s	Viscosity index	Micropitting resistance	API GL 5 scuffing test
Klübersynth GE 4 75 W 90	-42	130	18	≥ 150	Hoch GFT ≥ 10	Passed
Klübersynth LEG 4 75 W 90	-60	90	14.5	≥ 170	Hoch GFT ≥ 10	Passed
Klübersynth GE 4 80 W 140	-30	250	30	≥ 150	Hoch GFT ≥ 10	Passed

Klübersynth LEG 4 75 W 90 is a railway gear oil based on the latest technology of Klüber Lubrication. It is characterised by a combination of synthetic base oils with a unique additive system. Because the friction coefficient is up to 30 per cent lower, the oil sump temperature can be reduced significantly, leading to less strain on the gears. Due to its excellent low-temperature behaviour (pour point < -60°C), Klübersynth LEG 4 75 W 90 shows a lower starting torque at low temperatures than normal synthetic gear oils, and offers good protection of the lubricated components. This is why Klübersynth LEG 4 75 W 90 is preferably used in climates below -40°C, but it also shows excellent performance at operating temperature.



There's "75 W 90", and then there's "75 W 90"

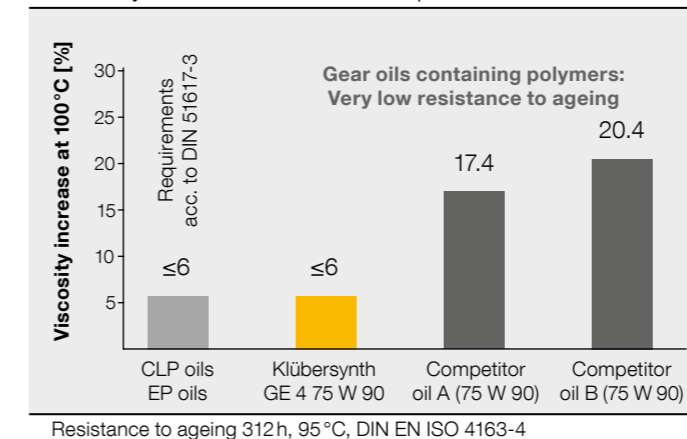
There is a wide variety of "75 W 90" gear oils. But what are the differences between them? The fully synthetic gear oils from Klüber Lubrication have polyalphaolefin (PAO) base oils. They were developed especially for the requirements of the railway industry and do not contain viscosity improvers. What does that mean? Many of the "75 W 90" oils commonly found on the market have base oils containing a sizeable proportion of polymer-based viscosity improvers. These products have been designed with a view to the requirements of the automotive industry. While they are inexpensive, they have some major disadvantages compared to our product design that does not use polymers.

1. Oxidation stability

As the following diagram shows, gear oils containing polymers show clear signs of ageing in the form of changes to the molecular structure of the polymer, leading to higher viscosity – the oil becomes "thicker". In addition, as the polymer changes substantially, so do the properties of the oil. The following graph shows the change in viscosity under elevated oxidative stress. Requirements for CLP oils specify that viscosity must increase by no more than 6%. Our gear oils meet this requirement. By contrast, the viscosity of oils containing polymers often increases by 15–20%.

Resistance to ageing

Klübersynth GE 4 75W90 and competitors

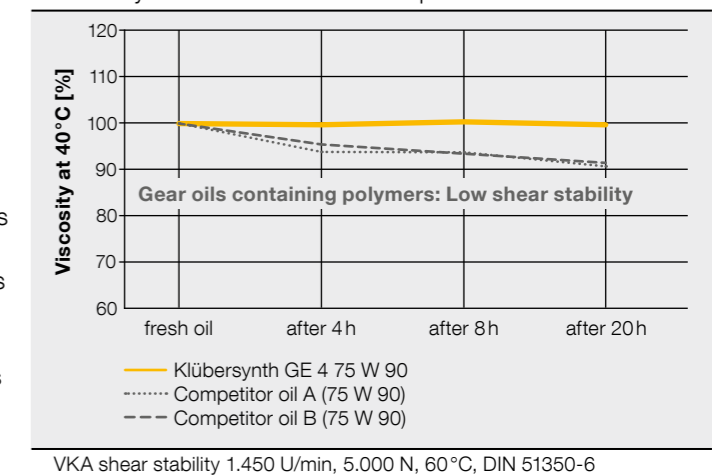


2. Shear stability

Besides their limited thermal stability, polymer-based viscosity improvers show no pronounced shear stability. As shown in the diagram below, the shear forces acting inside a railway gearbox tend to shear off the polymer contained, leading to reduced viscosity – the oil becomes "thinner".

Shear stability

Klübersynth GE 4 75W90 and competitors



VKA shear stability 1.450 U/min, 5.000 N, 60°C, DIN 51350-6

The effects of polymer-based viscosity improvers described under 1 and 2 impair the performance of gear oils. The longer the oils are in use, the more their performance characteristics change. The higher the oil sump temperatures and shear stresses to which they are subjected, the more oils containing viscosity improvers are affected. The oil designs used by Klüber Lubrication do not have these drawbacks.

What does that mean in practice?

Our railway gear oils allow much longer oil change intervals, as the oxidation and shear stability of our lubricants changes very little over time. Our goal is the reduction of oil change intervals by 50 per cent. This means you only have to perform half as many oil changes as today. For a maximally safe process, we support you with used oil analyses.

Longer oil change intervals

Reduced maintenance costs

Lower life cycle costs

Traction motor bearing lubrication

Lubricants for use in traction motors have to fulfil stringent requirements. They also have to do their job reliably at low or high temperatures, variable speeds and vibrations. It is therefore advisable that you use only lubricants that have shown their capability to cope with such requirements in practice. Many of our customers from all over the world have very good experience with our speciality lubricants and have also performed used grease analyses for different mileages. These analyses show that our lubricants work reliably in traction motors over a huge mileage range.

Major factor influencing the overall operating costs of a traction motor

The total cost of ownership of a traction motor is determined mostly by bearing lifetime, as replacing bearings incurs high costs and lengthy downtime. As the process steps involve considerable expense, whether bearings last one or three million kilometres makes a significant difference to the total cost of ownership. Klüber Lubrication offers two different product concepts for lubricating traction motor bearings:

Proven fully synthetic grease

ISOFLEX TOPAS L 152 comes into its own in traction motors in which the bearing temperature is normally not much higher than 100 °C. The oil release characteristics of this fully synthetic rolling bearing grease are ideal for continuous oil supply to the rolling contact, even for linear contact as in cylindrical roller bearings. In addition, **ISOFLEX TOPAS L 152** is particularly resistant to oxidation and ageing. Good wear protection at varying speeds and loads completes this speciality lubricant's profile. Our **ISOFLEX TOPAS L 152** has proven successful in the long term in many applications, from high-speed trains to locomotives and streetcars. The grease maintains its lubricity in traction motor bearings even after many years of use and stays smooth. The combination of fully synthetic base oil and a special lithium soap thickener means **ISOFLEX TOPAS L 152** can be used at temperatures down to minus 50 °C with low friction coefficients, ensuring safe start-up in challenging climates.

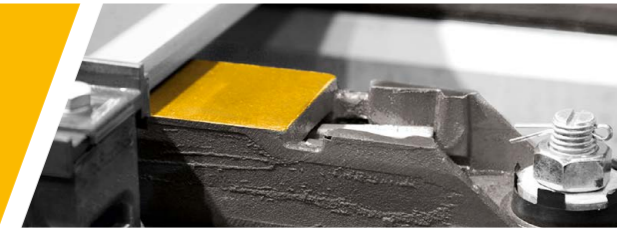
High-performance hybrid grease

We recommend our patented hybrid grease **Klübersynth BHP 72-102** for traction motor bearings constantly operated at temperatures considerably above 100 °C. This synthetic long-term grease was designed for the demanding operating conditions of rolling bearings in traction motors. In addition to outstanding antiwear and anticorrosive effects.

Klübersynth BHP 72-102 offers excellent ageing and oxidation resistance. This ensures very high component availability even under strong vibrations or when exposed to moisture. **Klübersynth BHP 72-102** enables much longer relubrication intervals than conventional lubricants. **This powerful hybrid grease has been shown in practical application to run for more than 1 million kilometres without relubrication.**



Lubrication of railway switches

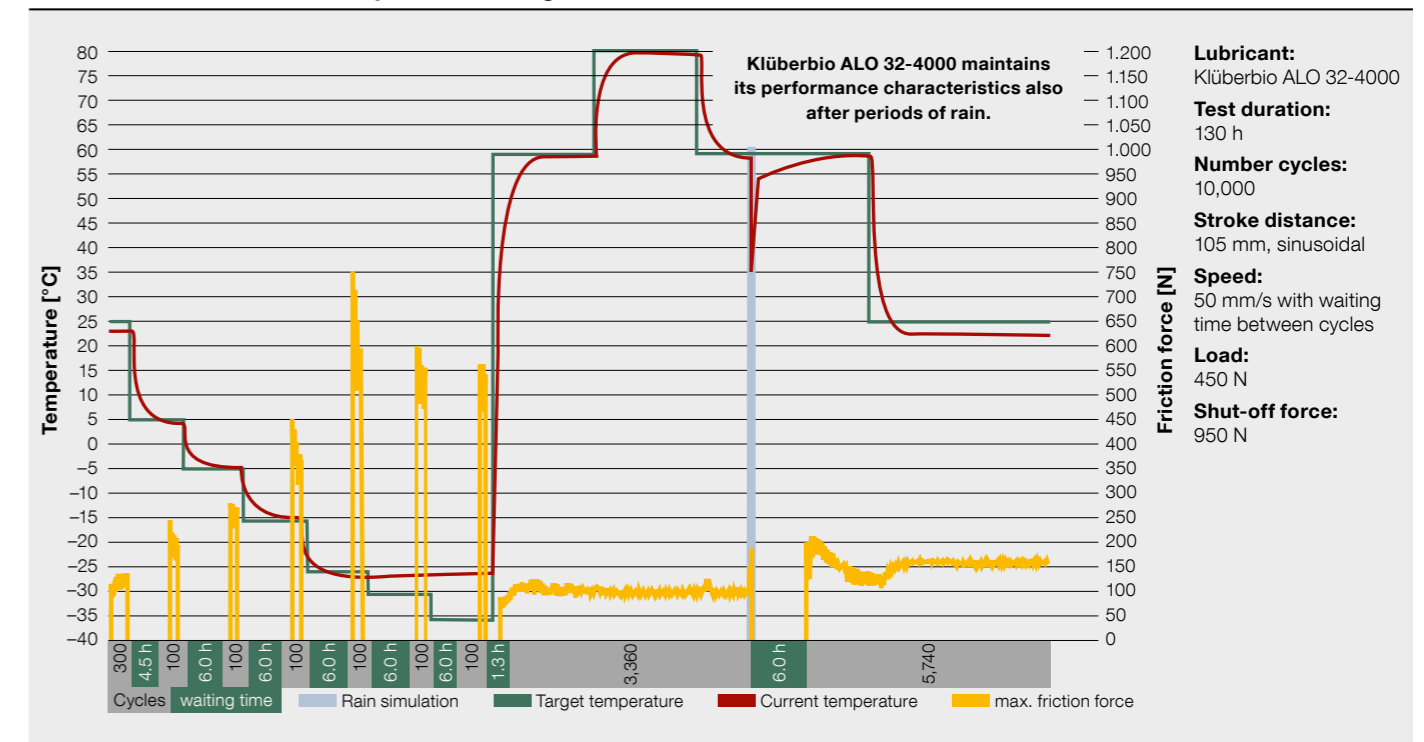


One of the most important maintenance tasks of railway and infrastructure operators is ensuring that switches work correctly under all weather conditions. Appropriate high-performance lubricants increase the reliability of switches. They also have a positive effect on the total costs.

A railway switch lubricant must feature certain characteristics to ensure long relubrication intervals. These include a low friction coefficient, high corrosion and wear protection, good adhesion to the slide plate, very high water and UV resistance and easy application – even at low temperatures. Another important aspect are the ever increasing environmental protection requirements. Conventional biodegradable lubricants, however, often offer lower performance than standard mineral oil lubricants. The key challenge for us when developing our railway switch lubricants was to combine these different requirements. All our railway switch lubricants are rapidly or ultimately biodegradable according to OECD standard 301 while providing high performance.

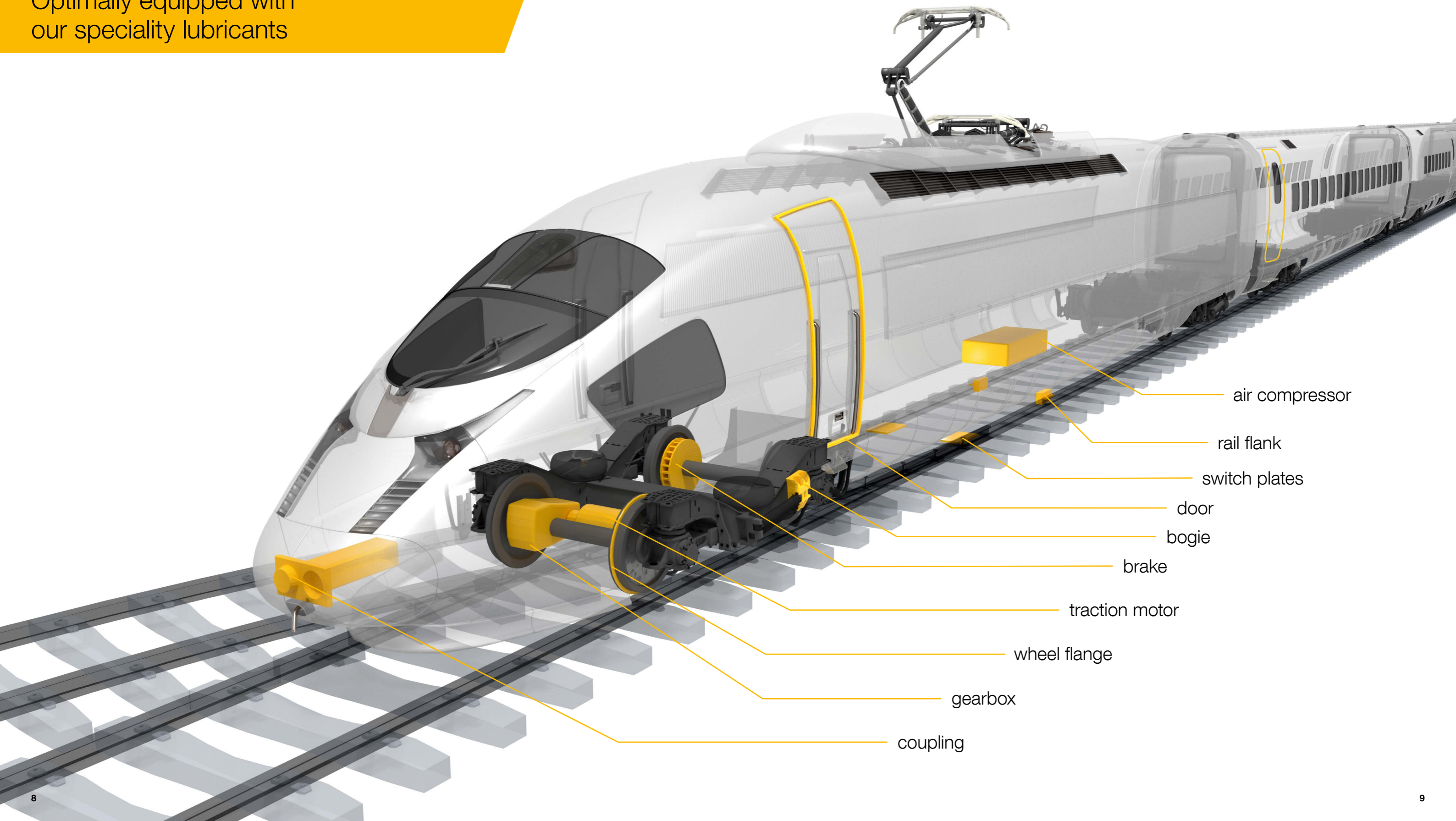
The most important task of a high-performance railway switch lubricant is to ensure low switch positioning forces for a long time. It is difficult to measure the setting forces on a real-life switch over a long period of time. We have developed a special test rig for our customers to simulate actual conditions and to measure the forces in each setting cycle. Various test cycles can be run and specific operating conditions simulated. Our railway switch test rig can measure adjustment forces at different temperatures. A 30-minute simulation can be used to determine the influence of rain on adjustment forces. Tests have shown that friction forces increase only slightly under the influence of rain when using our railway switch lubricants, such as **Klüberbio ALO 32-4000**, which also offer very good corrosion protection. Their good corrosion protection has also been proven on slide plates.

Rain simulation in the railway switch test rig



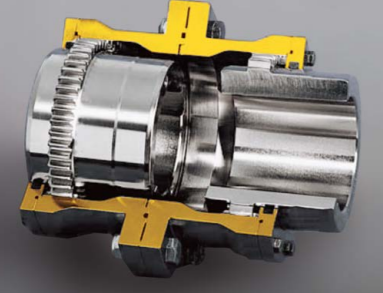



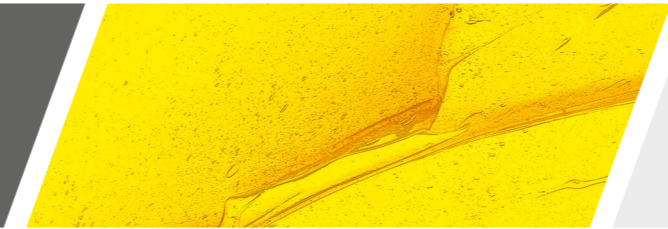
Using our railway switch test rig we were able to develop a portfolio of railway switch lubricants that meets the different requirements of infrastructure operators (see chapter on infrastructure on page 16).

Optimally equipped with
our speciality lubricants



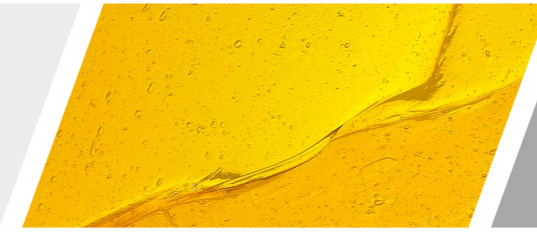
Drives and chassis


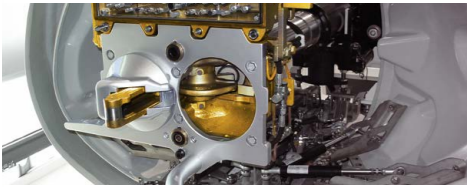

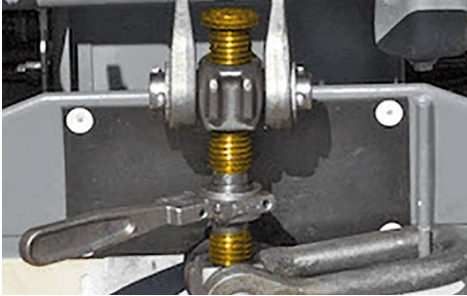

	Module	Application	Lubricant composition	Product	Benefits for your application
	Traction motor bearings	Service temperature < 100 °C permanently	Fully-synthetic hydrocarbon oil with lithium soap	ISOFLEX TOPAS L 152	<ul style="list-style-type: none"> - Extended relubrication intervals - Good thermal resistance - Low start-up torque at low temperatures - Tried-and-tested for many years by international OEMs and operators
		Service temperature > 100 °C permanently	Ester oil mixed with PFPE, PTFE and a polyurea thickener	Klübersynth BHP 72-102	<ul style="list-style-type: none"> - Very good performance at high bearing temperatures - Long relubrication intervals - Successfully used by international OEMs like Bombardier, TSA, VEM, Skoda Electric and operators
	Wheelset gears		Fully synthetic polyalphaolefin (PAO)	Klübersynth GE 4 75 W 90	<ul style="list-style-type: none"> - Fully synthetic gear oil with particularly high temperature resistance and special additive package - Meets API-GL5 requirements, hence high scuffing resistance - Much longer oil change intervals due to high ageing and shear stability - Approvals from important gear manufacturers like Voith Turbo, Wateeuw, Siemens-Flender, Deutschen Bahn, Stadler and Bombardier available
				Klübersynth LEG 4 75 W 90	<ul style="list-style-type: none"> - Clearly reduced friction - Fully synthetic gear oil with particularly high temperature resistance and special additive package - Meets API-GL5 requirements, hence high scuffing resistance - Much longer oil change intervals due to high ageing and shear stability
				Klübersynth GE 4 80 W 140	<ul style="list-style-type: none"> - Fully synthetic gear oil for low-temperature applications, pour point < -60 °C - Meets API-GL5 requirements, hence high scuffing resistance - Much longer oil change intervals due to high ageing and shear stability
	Curved gear couplings	Gear teeth	Mineral oil with lithium complex soap and a high percentage of solid lubricant	Klüberlub BE 41-1501	<ul style="list-style-type: none"> - Heavy-duty grease - Very good wear protection due to high percentage of solid lubricant and EP/AW additives - Low oil separation - Long-standing practical experience
		Gear teeth – Oil lubrication	Polyalphaolefin	Klübersynth GEM 4-460 N	<ul style="list-style-type: none"> - Excellent wear protection - Good shear stability for reliable lubricant film formation - Excellent ageing and oxidation resistance
	Disc brakes	Bolts, bushes, slideways	Mineral oil with barium complex soap and a high percentage of solid lubricant	STABURAGS NBU 30 PTM	<ul style="list-style-type: none"> - Very adhesive assembly grease - Easy dismantling of screws and fasteners after a long period of use - Protects against tribo-corrosion - Very good water and media resistance - Good corrosion protection - With friction values from 0.09 to 0.14 it meets DIN 25201 requirements - Also available as spray
					Block brakes



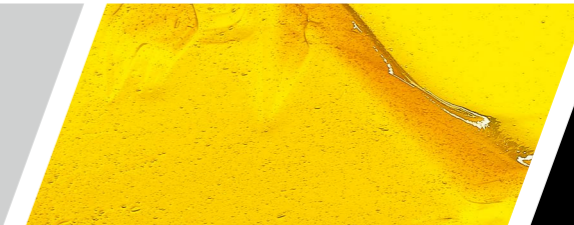
	Module	Application	Lubricant composition	Product	Benefits for your application
	Bogies	Screw and bolt connections	Mineral oil with barium complex soap and a high percentage of solid lubricant	STABURAGS NBU 30 PTM	<ul style="list-style-type: none"> - Easy dismantling of screws and fasteners after a long period of use - Protects against tribo-corrosion - Very good water and media resistance - Good corrosion protection - With friction values from 0.09 to 0.14 it meets DIN 25201 requirements - Also available as spray
		Screw and bolt connections made of special steel	PAO + mineral with lithium complex soap thickener and light-coloured solid lubricants	DUOTEMPI PMY 45	<ul style="list-style-type: none"> - With friction values from 0.09 to 0.14 it meets DIN 25201 requirements - Easy dismantling of screw connections, even after long period of use - Good corrosion protection - Very good resistance to water and media
	Bogie wheels	Wheel flanges	Ester oil with bentonite thickener and solid lubricant	Klüberail LEA 62-2000	<ul style="list-style-type: none"> - Sprayable fluid grease - Lubricant is not flung off the wheel flange, even at high speeds - Good wear protection - Good water resistance - Readily biodegradable acc. to OECD 301F for environmentally sound operation - Good environmental compatibility as the product is readily biodegradable acc. to OECD 301F
			Ester oil with solid lubricants and a mixed thickener	Klüberail ALE 92-2000	<ul style="list-style-type: none"> - Particularly suitable for high ambient temperatures and vibrations - Good wear protection - Good water resistance - Is not flung off the wheel flange - Sprayable fluid grease - Good environmental compatibility as the product is readily biodegradable acc. to OECD 301F
	Axles	Pressing on of bogie wheels	Barium complex soap with mineral oil and a high percentage of light-coloured solid lubricant	ALTEMP Q NB 50	<ul style="list-style-type: none"> - Uniform pressing on of the wheel due to high pressure absorption capacity - Low friction value allows reduction of assembly forces - Clean operation due to light colour of lubricant - Good resistance to water and media - Protects against tribocorrosion
	Bearing shell and bolt connections	Assembly wheelset bearings	Sandwich lubrication, MOS2 bonded coating and barium complex soap with mineral oil and a high solid lubricant content	UNIMOLY C 220 Spray plus STABURAGS NBU 30 PTM	<ul style="list-style-type: none"> - Protects against tribocorrosion - Good corrosion protection - Discharge of voltage potential - Very good water and media resistance - Easy dismantling of screws and fasteners even after a long period of use

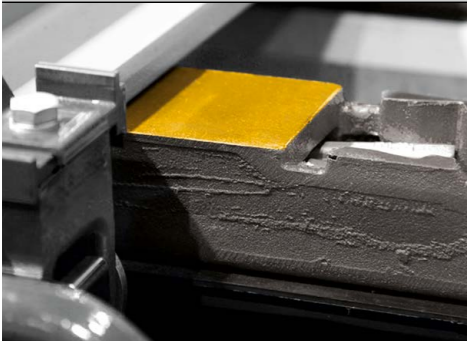



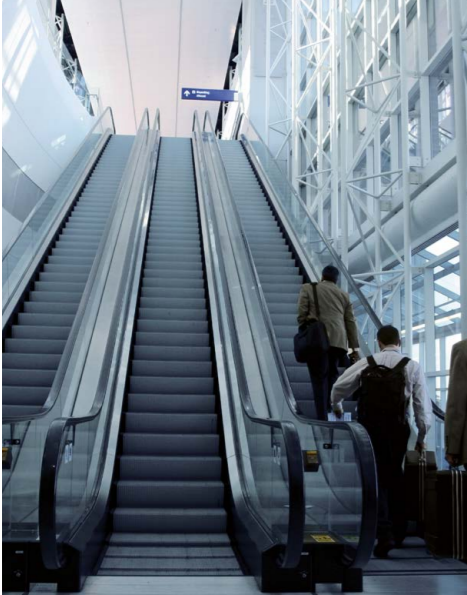
Coaches and connectors



	Module	Application	Lubricant composition	Product	Benefits for your application
	Doors	Seals, T > -25 °C	PFPE oil with PTFE thickener	BARRIERTA L 25 DL	<ul style="list-style-type: none"> - Ensures low door opening and closing forces; particularly at low temperatures - Good UV protection for longer seal life - Neutral towards EPDM and silicone seals - Silicone-free – no impairment of coating processes during chassis repair
				BARRIERTA L 25 DL DISPERS	<ul style="list-style-type: none"> - After evaporation of the solvent same performance at the seal as BARRIERTA L 25 DL BUT: - Much easier application - Thins layers can be applied
		Seals, T < -25 °C	PFPE oil with PTFE thickener	BARRIERTA KL 092	<ul style="list-style-type: none"> - Ensures low door opening and closing forces; particularly at low temperatures - Good UV protection for longer seal life - Neutral towards EPDM and silicone seals - Silicone-free – no impairment of coating processes during chassis repair
		Linear guides, drive spindles	Mineral/ester oil mixture with lithium soap	ISOFLEX LDS 18 Spezial A	<ul style="list-style-type: none"> - Dynamically light long-term grease - Good corrosion protection - Good water resistance - Low friction coefficient at high speeds - Low start-up torque, also at low temperatures
		Functional surfaces, locks, springs, star wheels, mounting rails, torsion springs	Hydrocarbon oil with barium complex soap	ISOFLEX TOPAS NB 52	<ul style="list-style-type: none"> - Fully synthetic long-term grease with good wear protection - Very good water and media resistance - Good low-temperature characteristics - Good oil retention for better adhesion, also at high temperatures - Successfully used by international OEMs and operators - Also available as spray
	Automatic couplings	Couplings, coupling heads, main bolts, coupling rods, electronic couplings, etc.	Hydrocarbon oil with calcium complex soap	ISOLFEX TOPAS NCA 52	<ul style="list-style-type: none"> - Keeps movements smooth even at low temperatures down to -50 °C - Good corrosion protection - Very good wear protection
	Buffer heads		Calcium soap with ester oil and solid lubricants	Klüüberbio AG 39-602	<ul style="list-style-type: none"> - Readily biodegradable acc. to OECD 301F for environmentally sound operation - The base oil consists of native raw materials - Base oil composed of native base oils - Good adhesion and water resistance - Does not dip off even at high temperatures - Excellent corrosion protection
	Screw coupling		Aluminium complex soap with mineral oil and a high percentage of light-coloured solid lubricants	Klüüberplex AG 11-462	<ul style="list-style-type: none"> - Excellent adhesion - Very good water resistance - Good corrosion protection - Extended relubrication intervals - Also available as spray
			Calcium soap with ester oil and solid lubricants	Klüüberbio AG 39-602	<ul style="list-style-type: none"> - Readily biodegradable acc. to OECD 301F for environmentally sound operation - The base oil consists of native raw materials - Base oil composed of native base oils - Good adhesion and water resistance - Does not dip off even at high temperatures - Good corrosion protection
	Air compressors		Hydrocarbon oil with additives	Klüüber Summit SH 46,68	<ul style="list-style-type: none"> - Fully-synthetic oil for long relubrication intervals. - High evaporation stability - Low formation of oxidation residues in the oil circuit
			Ester oil with additives	Klüüber Summit Ultima 46,68	<ul style="list-style-type: none"> - Fully-synthetic oil for considerably longer relubrication intervals. - High evaporation stability and hence clean (oil-free) compressed air - Low formation of oxidation residues in the oil circuit

Infrastructure



	Module	Application	Lubricant composition	Product	Benefits for your application
	Points	Spray application with spray equipment on slide plates, sprayable down to -20 °C	Ester oil with calcium soap, very thin consistency	Klüberail AL 32-2000	<ul style="list-style-type: none"> - Readily biodegradable, eco-friendly lubricant - Low switching forces in points, also at low temperatures - Good water resistance - Good corrosion protection - Long relubrication intervals - Easy application with portable spray equipment
		Spray / brush application on slide plates, sprayable down to -10 °C	Ester oil with calcium soap, thin consistency	Klüberail AL 32-3000	
		Brush application on slide plates	Ester oil with calcium soap, slightly viscous consistency	Klüberbio ALO 32-4000	
	Rail	Rail flank, stationary lubrication system	Ester oil with solid lubricants and bentonite thickener	Klüberail AE 62-21	<ul style="list-style-type: none"> - Good adhesiveness - Is not flung off the wheel flange - Good pumpability in lubrication system - Readily biodegradable acc. to OECD 301F for environmentally sound operation
	Power supply	Contact wire - winter	Ester oil with calcium soap and solid lubricant	Klüberbio LO 32-2500	<ul style="list-style-type: none"> - Considerably less wear on contact wires - No leakage - Reduced sparking - Reduces contact wire vibrations - Is not washed off by rain
	Electrical contacts	Without thermal loads	Special lithium soap with fully synthetic hydrocarbon	Klüberlectric KR 44-402	<ul style="list-style-type: none"> - Reduced plug-in and switching forces - Less fretting corrosion - Very good corrosion protection of copper, tin and silver surfaces - Considerably longer service life due to excellent ageing resistance and oxidation stability - Good compatibility with plastics
		With thermal loads	PFPE oil with PTFE thickener	BARRIERTA KM 192	<ul style="list-style-type: none"> - Very good thermal stability - Reduces switching forces - Considerably longer service life due to excellent ageing resistance and oxidation stability - Good compatibility with plastics
	Escalator	Gear box	Fully synthetic polyglycol oil with KlüberComp Lube Technology	Klübersynth GH 6	<ul style="list-style-type: none"> - Fully synthetic high-performance gear oil - Very high wear protection - Reduces friction and temperatures - Excellent scuffing load resistance - Good elastomer compatibility - Excellent ageing and oxidation resistance
	Outdoor escalators	Chain	Mineral oil	Klüberoil C 1-150	<ul style="list-style-type: none"> - Good corrosion and wear protection - Noise dampening - Good creeping and penetration properties - Good resistance to water, media and salt water
			Synthetic ester oil	Klüberbio EG 2-100	<ul style="list-style-type: none"> - Good corrosion and wear protection - Good creeping and penetration properties - Long-term lubrication effect and low oil consumption - Ultimately biodegradable acc. to OECD 301F - Miscible with mineral oil and PAO - Contains approx. 90 % of renewable raw materials - European Eco-label
Indoor escalators	Chain	Fully synthetic oil based on a mixture of polyalphaolefin and ester	HOTEMP 2000	<ul style="list-style-type: none"> - Fully synthetic chain oil - Very good adhesiveness - Good creeping and penetration properties - Smooth, noise-dampening chain operation - Long-term lubrication effect and low oil consumption 	



Production and workshops



Application	Function	Product	Benefits for your application
Screws and bolts, chains, locks, hinges, control cables	Lubricating oil, preservation, rust remover, cutting oil	QUIETSCH-EX	<ul style="list-style-type: none"> - Infiltrates and repels water - Creeps into very small gaps - Good corrosion protection - Clean cuts when drilling and sawing - Non-destructive dismantling of rusted components
Machine tool	Assembly paste	ALTEMP Q NB 50	<ul style="list-style-type: none"> - Long service life due to good water and media resistance - Prevents fretting corrosion - Reduces assembly forces and screw torques
Machines, installations, components	Corrosion protection	Klübersynth MZ 4-17	<ul style="list-style-type: none"> - For preservation and initial lubrication at the same time - Good corrosion protection - No residue formation, no gumming - Free from solvents - Available as spray for easy application
Rolling and plain bearings, gear rims, racks	Universal lubricating grease	MICROLUBE GL 261 Klüberplex BEM 41-132	<ul style="list-style-type: none"> - Optimum lubrication effect in the mixed friction regime - Low frictional resistance and reduced component temperature - Reduced wear due to excellent lubricity - Longer service life of rolling bearings due to good wear protection characteristics also under vibration conditions - Good protection against fretting rust and corrosion
Spindle bearings	Lubricating grease	ISOFLEX NBU 15	<ul style="list-style-type: none"> - Bearings in indirectly driven spindles - Long component life due to high load-carrying capacity and corrosion protection - High resistance to water and cooling lubricants - High ageing resistance for long-term and lifetime lubrication - For speed factors up to 1,600,000 mm · min⁻¹
For drilling and milling head gearboxes	Lubricating grease	ISOFLEX TOPAS NB 52	<ul style="list-style-type: none"> - Longer component life due to good load-carrying capacity and corrosion protection - High resistance to water and cooling lubricants - High ageing resistance for long-term and lifetime lubrication

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Klüber Lubrication – your global specialist

Innovative tribological solutions are our passion. Through personal contact and consultation, we help our customers to be successful worldwide, in all industries and markets. With our ambitious technical concepts and experienced, competent staff we have been fulfilling increasingly demanding requirements by manufacturing efficient high-performance lubricants for more than 85 years.