


your global specialist

Efficiency for your assembly line.

Speciality lubricants for MRO in the automotive industry





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Economic and efficient operation

You invest a lot of money in your equipment and the maintenance of this equipment. Lubricants may have a major impact on maintenance costs and the service life of the machinery. The investment in a lubricant may be relatively small – but it can make a big difference.

Assembly plants have to find the best lubrication solution for their requirements if they want their Maintenance, Repair and Operations (MRO) to be state-of-the-art in terms of lubrication engineering. We are happy to advise you on extended maintenance intervals, increased lifetimes of machine components or reduced external cost factors. If you have not met Klüber Lubrication's MRO solutions so far, our specialists will be ready to assist you to find out MRO solutions which will technically and economically fit your plant.



A test bay that is unrivalled worldwide

We develop and test our automotive speciality lubricants based on the specific requirements of your industry. Our unique test bay offers more than 100 test rigs, some of which we developed ourselves for particular testing purposes. In our development activities, we attach great importance to close cooperation with automobile manufacturers and suppliers. We adjust the test rigs to your requirements where needed. After all, we know how important it is that the lubricant meets, or even exceeds, your requirements already during testing.

Global competence

We are where you are. Our specialists will advise you wherever it is convenient for you. Consultations may focus on the selection of a suitable product, or the development of a solution tailored to your requirements.

“Made by Klüber Lubrication” stands for consistent high quality level worldwide. We offer you products that are all made to the same high quality, no matter whether produced in Asia, Europe or the Americas.

Paintshop

The paintshop is one of the key processes in automotive manufacturing and it is the most demanding operation for the lubricants. As the paintshop is one of the biggest bottlenecks of automobile production, generating approximately 25 % of the total cost of the assembly plant, selection of proper lubricants is extremely important.

Klüber Lubrication offers special lubricants for paintshop operations which provide excellent lubrication properties even at high temperatures as 260 °C while reducing maintenance costs.

Klüber Lubrication works closely with paint manufacturers to develop paint friendly lubricants which help to reduce re-work ratio.

Chains

Chains are often used in the automobile painting process to drive conveyor systems in very hot areas such as paint curing ovens, or through chemically aggressive areas such as pre-treatment.

Chains are versatile design elements used in the transmission of power. They consist of a series of identical – usually metal – links. There are various types of chains to cover different requirements, for example roller chains, pin chains and bushing chains. A chain performs a very complex movement, resulting in a permanent state of mixed friction. Tribo-systems need special lubricants these meet all technical requirements.

Each application calls for a reliable lubrication solution to deal with the listed requirements. We offer an extensive list of products for chain lubrication, customised to suit your specific requirements.

Application/ Process	Speciality lubricant	Kinematic viscosity, DIN 51562	Lower service temperature [°C]	Upper service temperature [°C]	Base oil
Pre-treatment	STRUCTOVIS FHD	150	0	120	Mineral
E-coat, primer, base coat, clear coat	Klübersynth CHX 2-220	220	-5	250	Ester
E-coat, primer, base coat, clear coat	Klübersynth CH 2-100 N	100	0	250	Ester
E-coat, primer, base coat, clear coat	Klübersynth CH 6-110	110	-20	200	PAG



Thermal stability and wear protection at high temperatures

When operating at high temperatures, chain oils must offer good thermal stability for preserving the components and increasing the lifetime of the chain, even under extreme conditions (e.g. load and speed).

The products Klübersynth CHX 2-220 and Klübersynth CH 2-100 N demonstrate excellent thermal stability and wear protection. Thermal stability is measured using a dish test and carbonization tests; the main objectives are to evaluate the ageing behavior and oxidation resistance of the lubricant according to the temperature.

Wear protection is measured by a specific high-temperature chain test rig, simulating real working conditions. It compares the time necessary to achieve a certain elongation of the chains by using different lubricating oils.

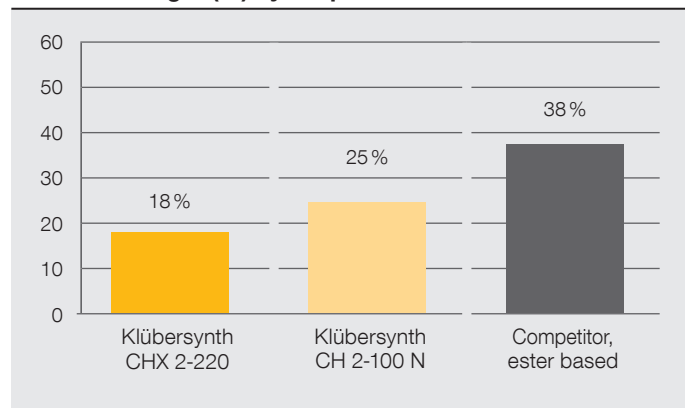
Dish test (evaporation loss)

The test shows the oil weight loss by evaporation after 24 hours at 250 °C.



Test is performed using a capped dish simulating the chain's working conditions

Loss of weight (%) by evaporation



Klüber Lubrication ester based high-temperature chain oils show 34% to 53% lower evaporation losses when compared to an established ester based competitor product.

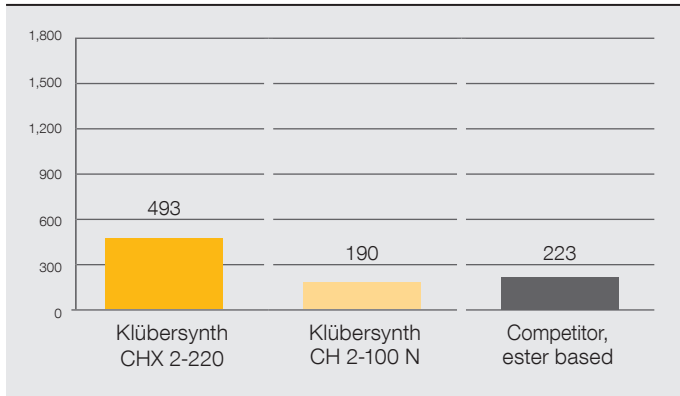
Less evaporation losses lead to lower oil consumption and longer relubrication intervals.

Chains

Dish test (dynamic viscosity)

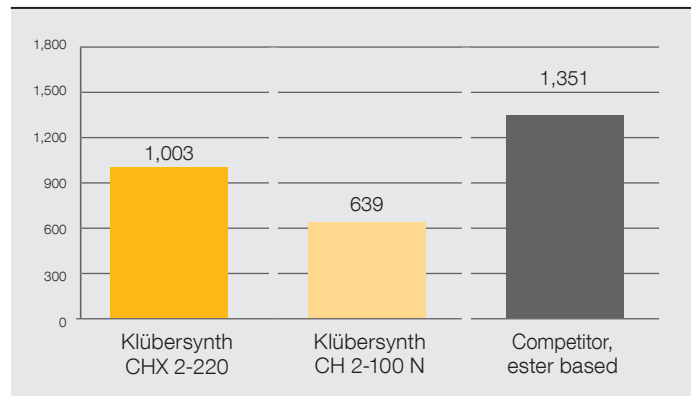
This test complements the evaporation loss test. It measures the increase in dynamic viscosity before and after the test.

Dynamic viscosity of the fresh oil at 250 °C [mPa·s]



Both Klüber Lubrication high-temperature chain oils show the lowest increase in dynamic viscosity after 24 hours testing.

Dynamic viscosity of the residual oil at 250 °C [mPa·s] after 24 hours



The increase in dynamic viscosity over time is undesirable as it makes it difficult for the new oil to flow correctly between the pins and keep the chain well lubricated. The lower increase of dynamic viscosity allows better oil penetration, therefore longer lifetime of the chain.

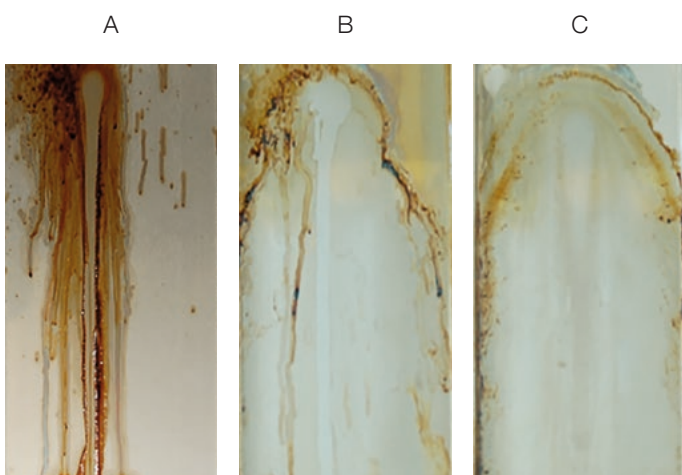




Carbonisation test

Oil is kept heated constantly at 240 °C and applied on a metal polished surface (30 ml per hour in small drops). The objective is to evaluate the condition of the metal surface after 48 hours. A cleaner surface means the oil created less residues; therefore cleaning is less frequently required.

Pictures taken from the surfaces which are tested with different chain oils



- A Competitor, ester based
- B Klübersynth CH 2-100 N
- C Klübersynth CHX 2-220

Klüber Lubrication chain test rig

This test rig allows an evaluation of high-temperature chain oils under reproducible conditions similar to actual use. Since the thermal and the mechanical load are the critical parameters, this test mainly determines the effect of temperature on the chain oil's antiwear behaviour.

Test conditions

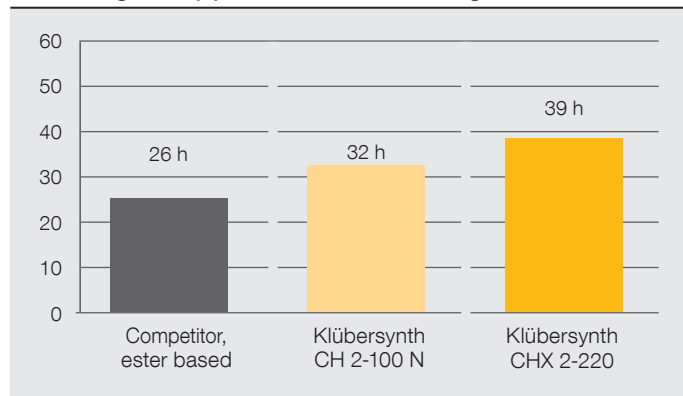
Temperature: 220 °C

Speed: 0.5 m · min⁻¹

Load: weight of approx. 2,600 N

The objective is to measure the operating time at the above mentioned conditions to achieve an elongation of 0.1 % in the roller chain.

Running time (h) until 0.1 % chain elongation is reached



Rolling bearings



In addition to their basic function of enabling machine movements, rolling bearings used in the automobile assembly and painting process need to perform satisfactorily when under attack from ambient media, such as pre-treatment chemicals or when exposed to high temperatures. The correct selection of the lubricating grease to cope with these conditions is crucial for lower maintenance costs and to avoid unplanned machine stops or downtime.

The following table gives you an overview of greases, developed on the basis of several decades of experience, for achieving the highest performance in each lubrication challenge in the automobile assembly and painting process.

Application/process	Speciality lubricant	Base oil	Thickener	Lower service temperature [°C]	Upper service temperature [°C]
Conveyor rollers, pretreatment	Klüberplex BE 31-222	Mineral	Special calcium soap	-10	140
Conveyor rollers, E-coat, primer, base coat, clear coat	BARRIERTA L 55/2	PFPE	PTFE	-40	260
Conveyor rollers, E-coat, primer, base coat, clear coat	Klübertemp HM 83-402	PFPE	PTFE	-30	260
Conveyor rollers, E-coat, primer, base coat, clear coat	Klübertemp GR AR 555	PFPE	PTFE	-30	250
Conveyor rollers, E-coat, primer, base coat, clear coat	Klüberalfa BHR 53-402	PFPE	Sodium soap	-40	260
Conveyor rollers, E-coat, primer, base coat, clear coat	Klübersynth HB 72-222	Ester	Polyurea	-15	200
High speed and spindle bearing applications	Klüberspeed BF 72-22	Ester and SHC	Polyurea	-50	120
Demanding heavy duty applications (acid, corrosion, water)	Klüberplex BEM 34-132	Mineral and SHC	Calcium complex soap	-35	140
Electric motor, fans	Klüberplex BEM 41-132	Mineral and SHC	Special Li soap	-40	150

Klüber Lubrication 4" Trolley Bearing Test Rig

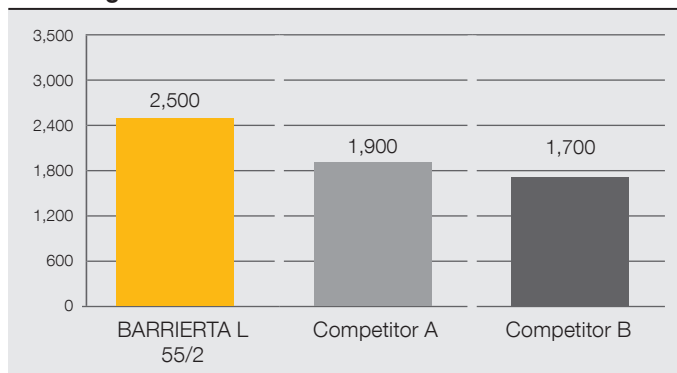
Klüber Lubrication 4" Trolley Bearing Test enables us to determine service life of high-temperature grease in trolley bearings for the automotive industry

Specimen 4" 'trolley' rollers

Test conditions:

Speed: 20 rpm (alternating direction of rotation)
 Duration of test: until bearing failure
 Temperature: 250 °C

Trolley test 4" load rollers (20 rpm, at 250 °C) running time in h



Klüber Lubrication high temperature bearing grease (BARRIERTA L 55/2) shows 32 % longer running time than the best competitor, which means significant advantages in lifetime offered by Klüber Lubrication.

Air compressors



Compressors have to meet some hard challenges – and they become harder and harder. Klüber Lubrication offers specially developed solutions for compressor lubrication to overcome these hard challenges.

Have you ever considered how lubricants can influence your operating costs? The lubricant is a relatively small investment which can make all the difference. Here are some good reasons why you should optimise the performance of your compressors with lubricants from Klüber Lubrication.

Energy saving

Energy is a major factor in air compressor operating costs. Synthetic lubricants from Klüber Lubrication offer a significant economic advantage by improving thermal and mechanical efficiency. They exhibit lower coefficients of friction, high thermal stability, and superior heat-transfer ability.

These inherent properties reduce friction and result in reduced power consumption and lower operating temperatures for your compressor.

Field studies have also documented that a 3% to 5% efficiency improvement can be expected from synthetic lubricants. When multiplied over the life of your compressor, this can mean energy savings that significantly reduce your energy costs.

Your benefits:

- Reduced power consumption
- Improved thermal efficiency
- Improved mechanical efficiency
- Reduced friction

Increase operating safety

The flash point of synthetic lubricants is around 40 °C higher than that of comparable mineral oil products. This makes synthetic lubricants a safer product for compressor use. Even more importantly: The auto-ignition temperature of synthetic lubricants is approx. 70 °C higher than that of comparable mineral oil products at all pressures.

Fires and explosions in reciprocating compressors can usually be traced to deposits of carbon, over lubrication and improper lubricant. Klüber Lubrication synthetic lubricants' excellent cleaning action and superior oxidation resistance keeps your compressor almost carbon-free, providing you with an extra margin of operating safety.

Your benefits:

- Higher auto-ignition temperature
- Virtually a carbon-free system
- Superior oxidation resistance
- Lower operating temperature
- Reduced residue formation
- Longer valve lifetime

Help protect the environment

Klüber Lubrication synthetic lubricants last many times longer than mineral oil-based (2,000 – 3,000 hours) lubricants resulting in less volume and cost associated with their disposal.

Application/ Process	Speciality lubricant	Base oil	Available ISO VG
Screw type air compressors	Klüber Summit SH	Synthetic hydrocarbon	32.....100

Gears

Special lubrication solutions by Klüber Lubrication help you achieve the goals of higher revenue and an improved ecological footprint: Our special gear oils ensure long maintenance intervals or even lifetime lubrication, high efficiency and lasting component protection, even at the gear's performance limits. Our specialists will recommend to you the perfect oil for your requirements. Together we can lower your maintenance costs energy consumption and CO₂ emissions.

Benefits of synthetic gear oils

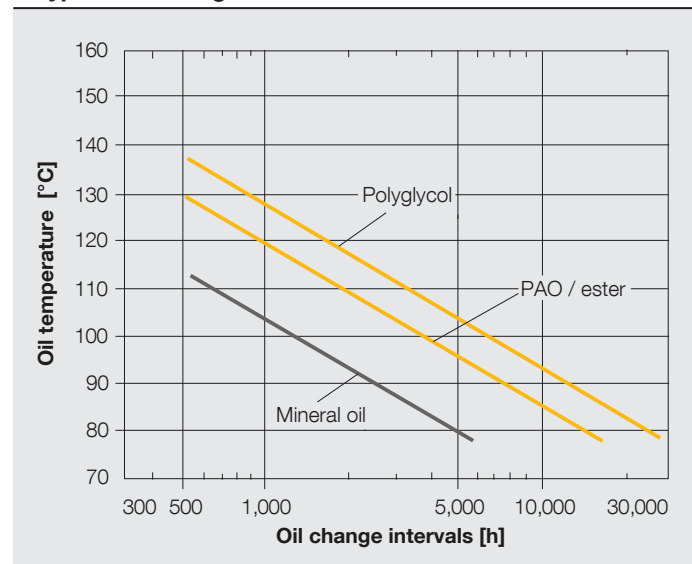
In addition to the wide service temperature range, synthetic gear oils offer many advantages compared to mineral oils:

- 3 to 5 times longer oil change intervals under the same thermal conditions
- Higher wear protection
- Better cold start with the same nominal viscosity (ISO VG)
- Oil coolers may not be required due to reduced operating temperatures under full load
- Lower gearing losses due to reduced friction leads to lower energy costs

Oil life time

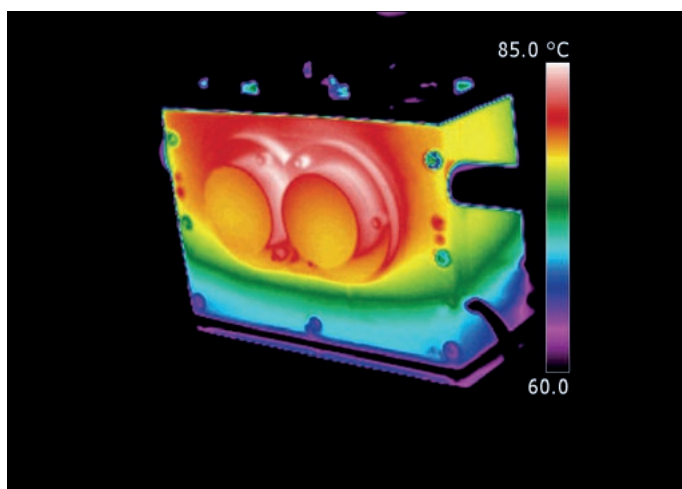
The prolonged service life of synthetic lubricants and the consequent longer oil change intervals can reduce equipment downtime and save resources. In some cases, lubrication for-life is possible.

Typical oil change intervals

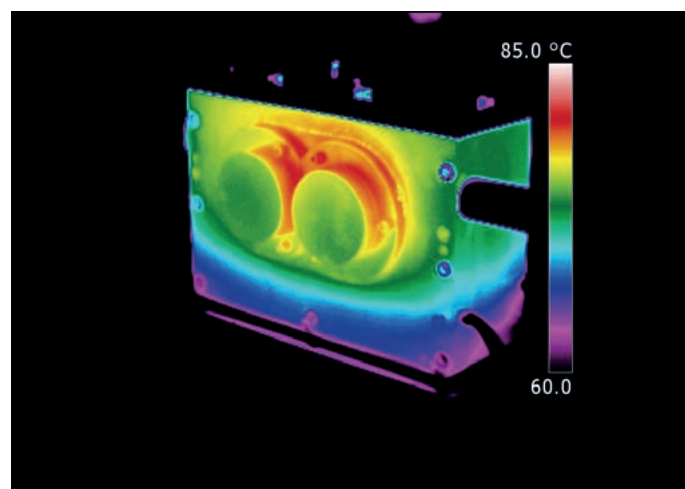




The synthetic gear oils made by Klüber Lubrication offer significantly higher efficiency than a standard gear oil based on mineral oil, resulting in a lower oil temperature even in spur gears, as shown in the thermal pictures.



Standard gear oil: mineral oil, ISO VG 220



Synthetic gear oil from Klüber Lubrication: Klübersynth GEM 4-220 N

Even in spur gears, an oil temperature reduction from 85 °C with mineral oil to 80 °C with our synthetic gear oils based on PAO can be achieved. This results in a reduction of energy consumption, longer lifetime of the gearbox and less maintenance.

For superior protection of all your components, Klüber Lubrication's gear oils based on mineral or synthetic PAO or polyglycol oils are a good choice.

Application/Process	Speciality lubricant	Base oil	Available ISO VG	Lower service temperature [°C]	Upper service temperature [°C]
Spur, bevel, planetary, hypoid, worm gears	Klüberoil GEM 1 N	Mineral	46.....1000	-15	100
Spur, bevel, planetary, hypoid, worm gears	Klübersynth GEM 4 N	PAO	32.....680	-45	140
Spur, bevel, planetary, hypoid, worm gears	Klübersynth GH 6	PG	22.....1500	-55	160

Linear guides and assembly aids

Linear guides

Linear guides are expected to function precisely and to run smoothly despite being subject to many start-ups, stops and vibrations. Maintenance intervals are to be as long as possible. Investing in one of our speciality lubricants pays off, as it ensures smooth functioning of your components for a long time. We at Klüber Lubrication develop lubricants suited to your requirements that ensure maximum lifetime of your linear guides.

Oils for continuous lubrication

Application/ process	Speciality lubricant	Base oil	ISO VG
Guideways	Klüberoil GEM 1 68 N GEM 1 100 N GEM 1 220 N	Mineral	68
			100
			220
Slideways	LAMORA D 68 D 220	Mineral	68
			220

Fluid grease lubrication for the continuous lubrication of all linear guide types

Application/ Process	Speciality lubricant	Base oil	Thickener
General/ low speed (< 15 m/min)	MICROLUBE GB	Mineral	Lithium soap/silicate
General/ low speed (< 15 m/min)	MICROLUBE GL 261	Mineral	Special lithium soap
General/ low speed (15 to 60 m/min)	CENTOPLEX GLP 500	Mineral	Lithium soap

Assembly aids

Assembly aids are speciality lubricants for the assembly of elastomers-, thermoplastic polymers, metals and non-metals in various components. Requirements on the assembly aids differ a lot depending on the application.

We offer a wide range of assembly aids suitable to your specific requirements.

Application/ process	Speciality lubricant	Lower service temperature [°C]	Upper service temperature [°C]	Description and benefits
High pressure lubricating paste	Klüberpaste 46 MR 401	-40	150	<ul style="list-style-type: none"> - Easy assembly and disassembly of highly loaded frictional connections - Prevents premature material ageing caused by tribo-corrosion and stick slip - Can be used with many material combinations, including plastics and elastomers
High temperature screw paste	Klüberpaste HEL 46-450	-40	1,000	<ul style="list-style-type: none"> - Reliable screw connection ensured by constant and sufficient preload force - Easy release also after long time at high temperature
High temperature paste	WOLFRAKOTE TOP PASTE	-25	1,000	<ul style="list-style-type: none"> - Reliable dry lubrication at high to extreme temperatures - Prevents seizure of e.g. bolts and hinges
Assembly gel for elastomer components	Klüberplus S 06-100	not required	not required	<ul style="list-style-type: none"> - Environmentally sound - Easy application - Good adhesion - Neutral to materials

The right lubricant at the right place at the right time



Systems for automatic lubrication

We at Klüber Lubrication understand ourselves as a solution provider. We not only supply high-performance oils and greases, but also “intelligent packages” for automatic lubrication of your machines and components. Selected lubricants covering a wide range of typical applications are available in automatic lubricant dispensers for single-point lubrication. These tried-and-tested systems based on electromechanical or electrochemical

technology are available with standard, long-term or high-pressure greases, standard or high-temperature chain oils and special oils and greases for the automotive industry. We are also able to supply other lubricants in automatic dispensers on request and for higher order volumes, provided they have been tested and approved for use – please contact your Klüber Lubrication consultant for details.

Your benefits at a glance

Profitability

Continuous production processes and predictable maintenance intervals reduce production losses to a minimum. Consistently high lubricant quality ensures continuous, maintenance-free long-term lubrication for high plant availability. Continuous supply of fresh lubricant to the lubrication points keeps friction low and reduces energy costs.

→ **Lubrication with Klübermatic can reduce costs by up to 25 %**

Safety

Longer lubrication intervals reduce the frequency of maintenance work and the need for your staff to work in danger zones. Lubrication systems from Klüber Lubrication can therefore considerably reduce occupational safety risks in work areas that are difficult to access.

→ **Lubrication with Klübermatic can decrease the risk of accidents by up to 90 %**

Reliability





Automatic lubrication systems from Klüber Lubrication ensure reliable, clean and precise lubrication around the clock. Plant availability is ensured by continuous relubrication of the application.

→ **Lubrication with Klübermatic may help to prevent up to 55 % of rolling bearing failures**

From low-cost to high-tech – automatic systems for all requirements

Klüber Lubrication offers you the following technological solutions:

- freely adjustable lubrication increments between 1 and 12 months
- range of speciality lubricants
- self-contained or machine-controlled lubrication systems (time control with programmable controller)
- combination of tried-and-tested Klüber Lubrication lubricants with proven automatic lubricant dispensers

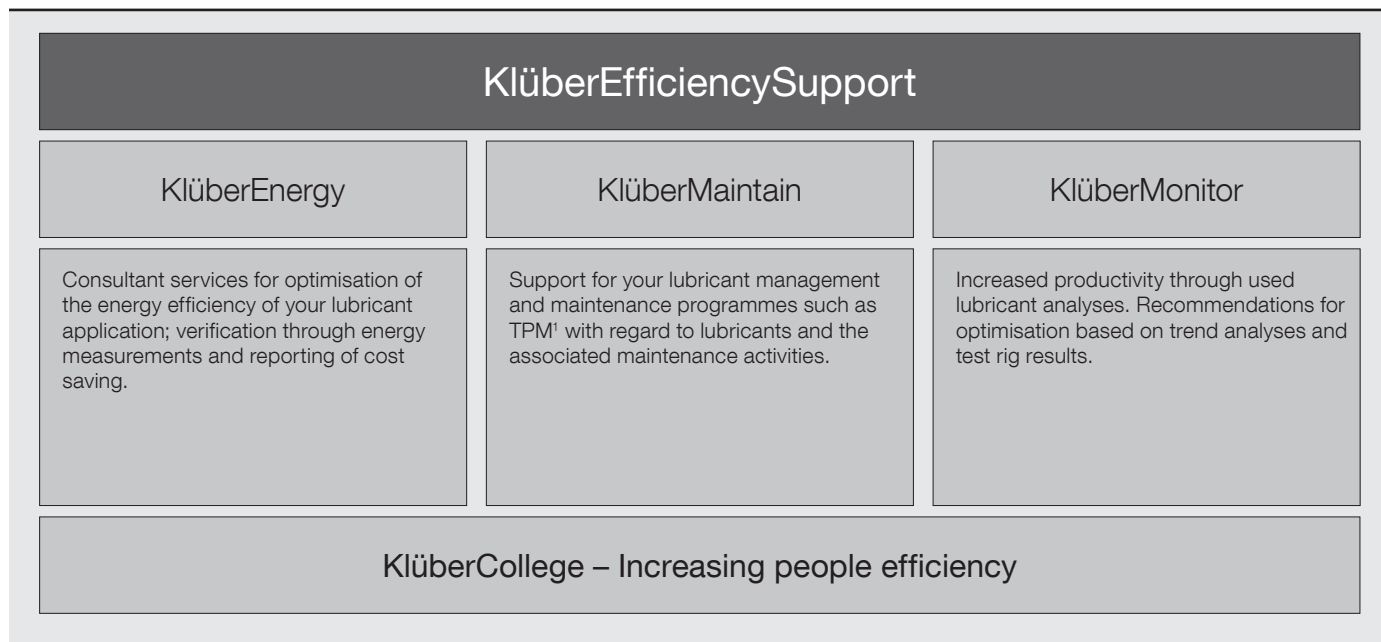
Klübermatic FLEX	Klübermatic NOVA	Klübermatic STAR VARIO	Klübermatic STAR CONTROL
			
Flexible use – and for lubrication points with high requirements	For applications subject to wide temperature fluctuations	Precise and adjustable lubricant metering	Externally controlled single-point relubrication

KlüberEfficiencySupport

Services by Klüber Lubrication – your success from one tool box

Every manufacturer and operator in every industry wants his machinery to run reliably and efficiently to its design life and beyond. The right lubricants carry considerable potential to reduce energy costs, spare parts and labour while increasing productivity. Companies from many industries have been

using Klüber Lubrication's professional services in addition to its high-quality lubricants to benefit from considerable added value and the optimum solution for their needs. Our consulting and other services are put together under the umbrella of KlüberEfficiencySupport.



The methodology was developed by Klüber Lubrication, is tried-and-tested and consists of a multi-stage, systematic approach. We identify your requirements together with you at an early stage to discover potential for optimisation. From there, we develop solutions with you to improve the energy efficiency of your machinery or the efficiency of your maintenance and production

processes, machines or components, going well beyond a simple lubricant recommendation. We also verify the effects our measures have in practice. This provides you with everything you need to multiply improvements and develop your success.

1) TPM: Total Productive Maintenance



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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.