


your global specialist

## Efficiency for your assembly line.

Specialty lubricants for MRO in the automotive industry





Economic and efficient operation	3
Chains	4
Bearings	8
Air compressors	9
Gears	10
Linear guides	12
Assembly aids	12
Klübermatic	13
Lubrication in automation	14

## 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 specialty 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.

<b>Application/ Process</b>	<b>Specialty lubricant</b>	<b>Kinematic viscosity, DIN 51562</b>	<b>Lower service temperature [°C]</b>	<b>Upper service temperature [°C]</b>	<b>Base oil</b>
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 N	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.

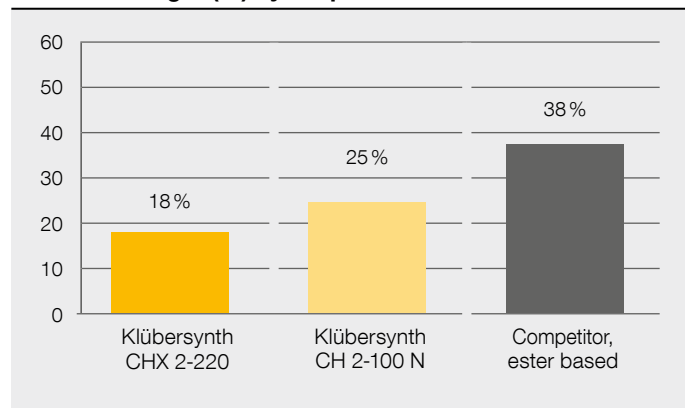
## Dish test (evaporation loss)

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.

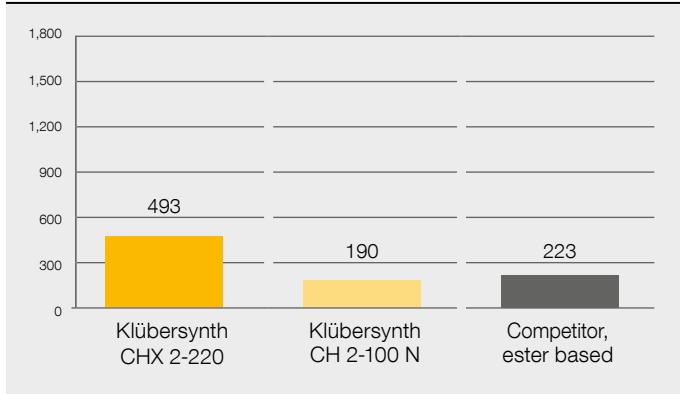
Less evaporation losses lead to lower oil consumption and longer relubrication intervals.

# Chains

## Dish test (dynamic viscosity)

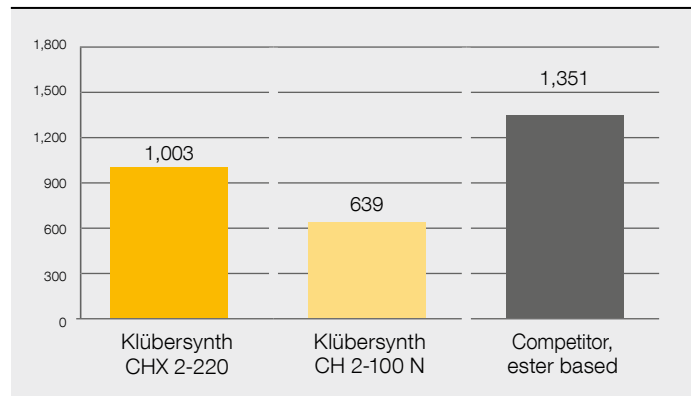
This test complements the evaporation loss test. It measures the increase in dynamic viscosity before and after the test.

**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.

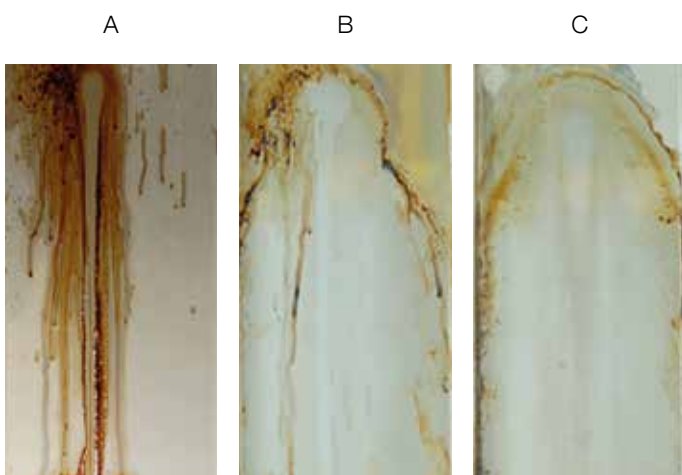




## Carbonisation test

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

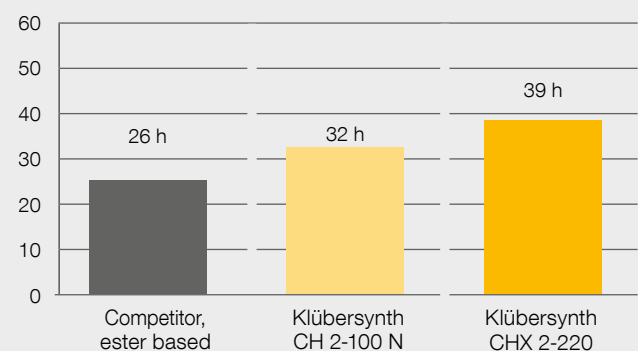
This test rig allows an evaluation of high-temperature chain oils under reproducible conditions similar to actual use. Since the thermal and the mechanical load are the critical parameters, this test mainly determines the effect of temperature on the chain oil's antiwear behaviour.

### Test conditions

Temperature: 220 °C  
 Speed: 0.5 m · min<sup>-1</sup>  
 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	Specialty 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

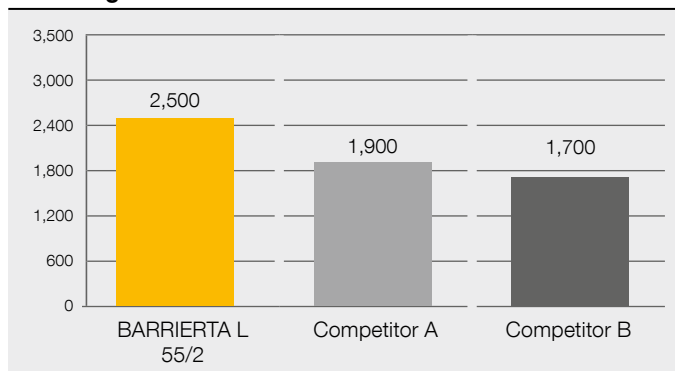
Klüber Lubrication 4" Trolley Bearing Test enables us to determine service life of high-temperature grease in trolley bearings for the automotive industry

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	Specialty 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 CO<sub>2</sub> emissions.

## Benefits of synthetic gear oils

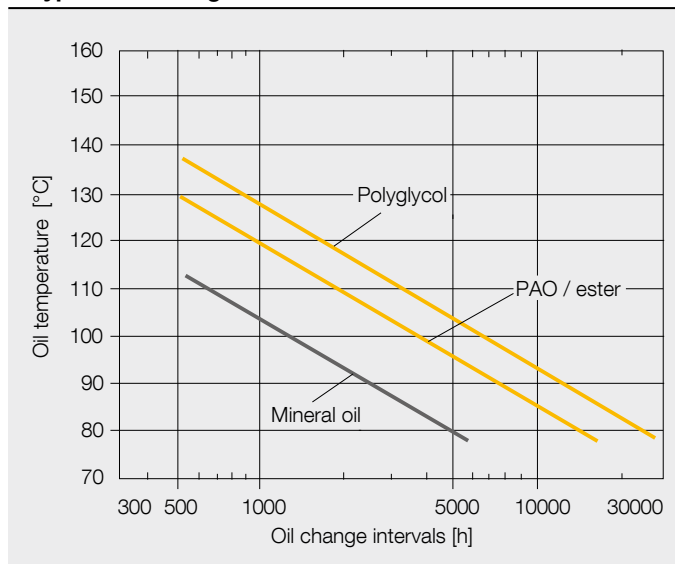
In addition to the wide service temperature range, synthetic gear oils offer many advantages compared to mineral oils:

- 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

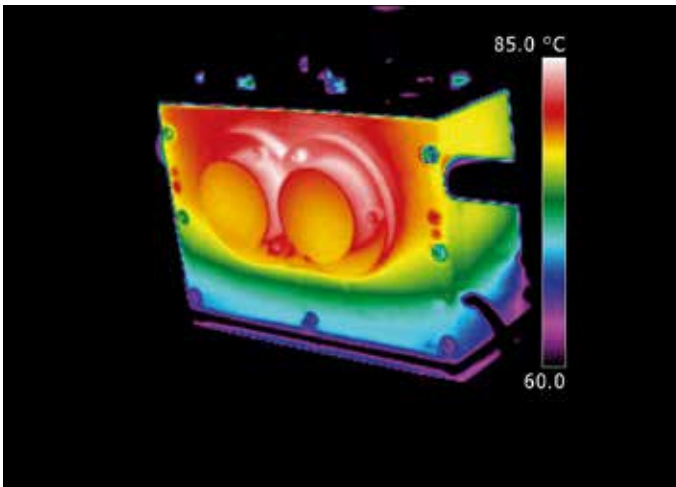
The prolonged service life of synthetic lubricants and the consequent longer oil change intervals can reduce equipment downtime and save resources. In some cases, lubrication for-life is possible.

**Typical oil change intervals**

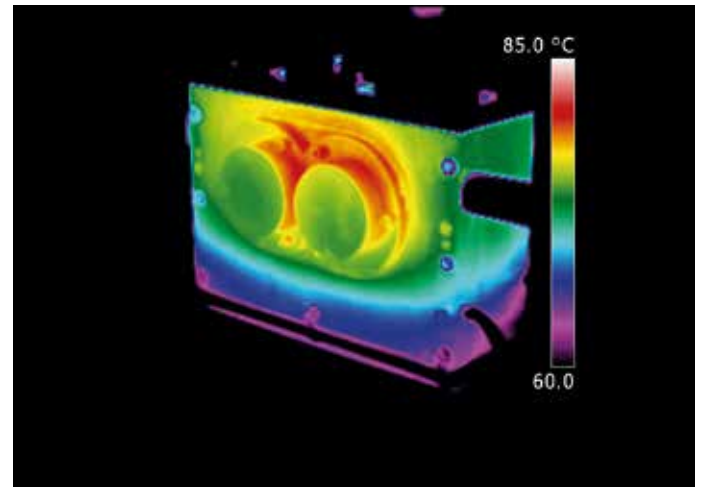




The synthetic gear oils made by Klüber Lubrication offer significantly higher efficiency than a standard gear oil based on mineral oil, resulting in a lower oil temperature even in spur gears, as shown in the thermal pictures.



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	Specialty 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 specialty 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	Specialty lubricant	Base oil	ISO VG
Guideways	Klüberoil	Mineral	
	GEM 1 68 N		68
	GEM 1 100 N		100
	GEM 1 220 N		220
Slideways	LAMORA	Mineral	
	D 68		68
	D 220		220

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

Application/ Process	Specialty 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 specialty 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	Specialty 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"> <li>- Easy assembly and disassembly of highly loaded frictional connections</li> <li>- Prevents premature material ageing caused by tribo-corrosion and stick slip</li> <li>- Can be used with many material combinations, including plastics and elastomers</li> </ul>
High temperature screw paste	Klüberpaste HEL 46-450	-40	1,000	<ul style="list-style-type: none"> <li>- Reliable screw connection ensured by constant and sufficient preload force</li> <li>- Easy release also after long time at high temperature</li> </ul>
High temperature paste	WOLFRAKOTE TOP PASTE	-25	1,000	<ul style="list-style-type: none"> <li>- Reliable dry lubrication at high to extreme temperatures</li> <li>- Prevents seizure of e.g. bolts and hinges</li> </ul>
Assembly gel for elastomer components	Klüberplus S 06-100 Klüberplus S 06-100 M2 Klüberplus S 06-100 M4	not required	not required	<ul style="list-style-type: none"> <li>- Environmentally sound</li> <li>- Ready for easy, immediate application</li> <li>- Good adhesion</li> <li>- Neutral to materials</li> </ul>

# 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.

## Benefits of lubricant dispensers:

- Less effort and expense thanks to automatic supply to the lubrication point over the duration of the set operating period
- No over lubrication, resulting in lower lubricant costs
- No under lubrication, allowing exploitation of the full equipment lifetime
- Easily deployable, even in poorly accessible locations
- Higher productivity due to reduced plant downtime






## Single-point lubricant dispenser, electro-chemical

Klübermatic FLEX	Klübermatic NOVA
	
Flexible use – and for lubrication points with high requirements	For applications subject to wide temperature fluctuations

## Single-point lubricant dispenser, electro-mechanical

Klübermatic STAR VARIO	Klübermatic STAR CONTROL
	
Precise and adjustable lubricant metering	Externally controlled single-point relubrication

## Multi-point lubricating systems, electro-mechanical

Klübermatic PRO MP-6	Klübermatic PRO C MP-6	Klübermatic PRO LINE	Klübermatic PRO C LINE	Klübermatic ECOSY
				
Battery-powered precision multi-point lubricating system for up to 6 lubrication points	Multi-point lubricating system with external control	Flexible multi-point lubricating system for linear guides	Flexible multi-point lubricating system with flexible outlet and external control	Ideal for oil lubrication in demanding applications

# Lubrication in automation

Automation has long been the standard in automotive industry: many process steps in car manufacturing have already been taken over by robots: they weld, assemble, adhere, paint and much more. To allow them to execute their sometimes very complex movement sequences, these robots contain multiple actuators and motors, precision gearboxes, cable routing and supply lines and therefore have a large number of lubrication points, all with different requirements. These lubrication points need powerful specialty lubricants that are perfectly tailored to the respective application

We have the right solution for you to reduce downtime: high-performance lubricants helping you to prevent breakdown, extend maintenance intervals and improve machine availability. With our product solutions coupled with individual consultation, we can help you boost your productivity.



## Your benefits at a glance:

- ▶ Very high productivity and long service life: Lubricants from Klüber Lubrication feature excellent lubricity, temperature resistance and ageing resistance. They also ensure the best possible service life for the seal system and protect against leakage and breakdowns
- ▶ High system availability and long maintenance intervals: Our lubricants are matched to your specific application area. They help prevent corrosion and wear. This enables a long service life for your systems.
- ▶ Clean and reliable application: Starting with the development stage, Klüber Lubrication focuses on easy lubricant metering, whether automatically with central lubrication systems and lubricant dispensers or manually. When maintenance is necessary, this enables short system downtimes.
- ▶ Proven in tests and in practice: As your development partner, we offer specialty lubricants according to your specifications. Tested in specialty test facilities and proven over and over again in practice. Our quality is measurable, tested, and certified internationally.
- ▶ Service support: Upon request, our experts analyse the lubrication points in your plant. We train your employees and create a lubrication schedule for your plant. Together we determine measures for better maintenance processes, which often save time and money.

Application/ Process	Special gear oil	Base oil	Kinematic viscosity DIN 51562	Lower service temperature [°C]	Upper service temperature [°C]
Robotic/ Precision Gear	Klübersynth GE 8-150	Mineral/Synthetic hydrocarbon	150	-15	120

Application/ Process	Special gear greases	Base oil	Thickener	Lower service temperature [°C]	Upper service temperature [°C]
Robotic/ Precision Gear	Klübersynth GE 44 series	Synthetic hydrocarbon	Lithium	-40	120



Publisher and Copyright:

Klüber Lubrication München SE & Co. KG

Reprints, total or in part, are permitted only prior consultation with Klüber Lubrication München SE & Co. KG and if source is indicated and voucher copy is forwarded.

The data in this document is based on our general experience and knowledge at the time of publication and is intended to give information of possible applications to a reader with technical experience. It constitutes neither an assurance of product properties nor does it release the user from the obligation of performing preliminary field tests with the product selected for a specific application. All data are guide values which depend on the lubricant's composition, the intended use and the application method. The technical values of lubricants change depending on the mechanical, dynamical, chemical and thermal loads, time and pressure. These changes may affect the function of a component. We recommend contacting us to discuss your specific application. If possible we will be pleased to provide a sample for testing on request. Products from Klüber Lubrication are continually improved. Therefore, Klüber Lubrication reserves the right to change all the technical data in this document at any time without notice.

Klüber Lubrication München SE & Co. KG  
Geisenhausenerstraße 7  
81379 München  
Germany

Local first-instance court Munich, Germany  
Certificate of registration 46624

## 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 90 years.

[www.klueber.com](http://www.klueber.com)

a brand of  
 **FREUDENBERG**