KLÜBER LUBRICATION

your global specialist

Detailed information

The right lubricant for each component.

A selection of speciality lubricants for bearings, linear guides, gears, chains, screws, compressors and pneumatic applications

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The right lubricant for each component

You need a lubricant – we've got it: for each industry, component size or any conceivable load on the lubrication point. We've created this brochure on the most frequently used components to show you the quick way to find the right lubricant for your requirements.

The intention of this lubricant selection brochure

This brochure is an overview providing you with comprehensive know-how gained from our more than 80 years of experience in the lubricants sector. The products presented in this brochure represent merely a fraction of our extensive lubricant range and meet most requirements. They were selected by specialists for the individual technical fields.

We also have special lubricants for requirements and components not shown in this brochure. Do not hesitate to contact us if you feel that your requirements are not met by the products presented here. Our lubrication experts are glad to be of advice and can help you find the right lubricant for your application.

The intention of this product selection brochure is to provide a logical guide through the Klüber Lubrication specialised product range. The structure of the brochure first considers the various application requirements and then leads you toward selection of the appropriate lubricant solution.

Whenever products appear to have similar properties, we highlight the differences in grey in the respective fields to assist with the final product selection. Which criteria are the most important depends on the application.

- Most important selection criterion
- Selection criterion of secondary importance
- Selection criterion of tertiary importance

We generally recommend consulting our lubrication experts prior to selecting a lubricant.

Please refer to our product information leaflets for detailed product specifications. You can obtain them through your contact person at Klüber Lubrication or download them from our website www.klueber.com.

Rolling bearings
Special greases

Selection criteria	Upper service temperature approx.	Lower service temperature approx.	Speed factor n·dm [min^{-1}·mm], approx.	Base oil viscosity DIN 51562 [mm^2/s] at approx. 40 °C / 104 °F	Base oil viscosity DIN 51562 [mm^2/s] at approx. 100 °C / 212 °F
High-temperature applications	260 °C 500 °F	–40 °C –40 °F	300 000	420	40
	200 °C 392 °F	–40 °C –40 °F	1 000 000	130	20
	180 °C 356 °F	–40 °C –40 °F	1 000 000	80	11
Low-temperature applications	110 °C 230 °F	–70 °C –94 °F	1 000 000	9	2.6
Low-noise applications	180 °C 356 °F	–45 °C –49 °F	1 000 000	72	9.5
	160 °C 320 °F	–50 °C –58 °F	1 000 000	46	7.5
	140 °C 284 °F	–50 °C –58 °F	1 000 000	25	5

Most important selection criterion Selection criterion of secondary importance Selection criterion of tertiary importance

	Base oil	Thickener	Speciality lubricants from Klüber Lubrication	Description / application examples
	PFPE	PTFE	BARRIERTA L 55/2	– Tried-and-tested long-term grease for rolling bearings subject to high temperatures – Very good long-term stability – Very good corrosion protection – Approved and recommended by many manufacturers – Tested and listed for use in the food-processing industry according to NSF H1 [1)]
	PFPE, ester	PTFE, polyurea	Klübersynth BHP 72-102	– Patented hybrid grease concept for long-term lubrication – Also for wet and corrosive environments and vibrations
	ester	polyurea	Klübersynth BEP 72-82	– Excellent corrosion protection – Long bearing life due to special wear protection additives preventing premature material fatigue caused by vibration or high speeds – For motor vehicle applications, e.g. pulleys, generators, clutch release bearings, fan bearings, wiper motors
	ester	lithium soap	ISOFLEX PDL 300 A	– Heavy-duty grease for low friction moments
	ester	polyurea	Klüberquiet BQ 72-72	– For lifetime and long-term lubrication at high and low temperatures – For double-sealed and shielded rolling bearings – For applications in e.g. in electric motors, fans, air conditioning systems and hard disc drives
	synthetic hydrocarbon/ ester	polyurea	Klüberquiet BQ 72-42 PST	– Low-noise operation due to homogeneous and pure lubricant matrix made with “Pure Silent Technology” (PST) – For-life lubrication and wear-free operation of sealed ball bearings
	ester	lithium soap	ASONIC GLY 32	– For low temperatures and low friction moments – For the lifetime lubrication of double-sealed ball bearings such as miniature and instrument bearings

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Rolling bearings
Special greases

Selection criteria	Upper service temperature approx.	Lower service temperature approx.	Speed factor n·dm [min^{-1}·mm], approx.	Base oil viscosity DIN 51562 [mm^2/s] at approx. 40 °C / 104 °F	Base oil viscosity DIN 51562 [mm^2/s] at approx. 100 °C / 212 °F
High-speed and spindle bearing applications	120 °C 248 °F	–50 °C –58 °F	2 100 000	22	5
High-load and heavy-duty applications	150 °C 302 °F	–40 °C –40 °F	1 000 000	130	14
	140 °C 284 °F	–20 °C –4 °F	500 000	540	28
	140 °C 284 °F	–15 °C 5 °F	500 000	220	19
Applications in the food & pharma industry	120 °C 248 °F	–45 °C –49 °F	300 000	150	22
Applications requiring electric conductivity	150 °C 302 °F	–40 °C –40 °F	1 000 000	150	19

Most important selection criterion Selection criterion of secondary importance Selection criterion of tertiary importance

	Base oil	Thickener	Speciality lubricants from Klüber Lubrication	Description / application examples
	synthetic hydrocarbon / ester	polyurea	Klüberspeed BF 72-23	– Especially for spindle bearings with inclined or vertical mounting position, but also for horizontal shafts in machine tools
	synthetic hydrocarbon / mineral oil	special lithium soap	Klüberplex BEM 41-141	– For rolling and plain bearings subject to high loads – For vibrations and oscillations – For applications such as main bearings in wind turbines
	mineral oil	lithium soap	Klüberlub BE 41-542	– For low to medium speeds
	mineral oil	special calcium soap	Klüberplex BE 31-222	– For ball bearings subject to high loads in wet processing zones – For medium rotating speeds
	synthetic hydrocarbon	aluminium complex soap	Klübersynth UH1 14-151	– NSF H1-registered[1)] and ISO 21469-certified – supports compliance with the hygienic requirements of your production. Further information on our website www.klueber.com – Excellent low-temperature behaviour – Good wear protection – Good water resistance, reducing the risk of corrosion and premature bearing failure – For medium rotation speeds
	synthetic hydrocarbon	lithium soap, solid lubricant	Klüberlectric BE 44-152	– For the long-term lubrication of rolling bearings subject to static electricity, e.g. in electric motors, paper making machines, copying machines, film stretchers, guides in belt conveyors and fans – Electric resistance based on DIN 53 482 ([Ω x cm]), (electrode spacing 1 cm, electrode surface 1 cm^2) ≤ 10 000

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Plain bearings

Special greases

Industry	Type of operation	Sliding speed [m/s]	Max. surface pressure [N/mm²]	Upper service temperature approx.	Lower service temperature approx.	Speciality lubricants from Klüber Lubrication
Plant and machine building, appliance industry	Oscillating/ rotating	< 1	approx. 100	260 °C 500 °F	–40 °C –40 °F	Klüberalfa BHR 53-402
				180 °C 356 °F	–30 °C –22 °F	PETAMO GHY 441
				160 °C 320 °F	–20 °C –4 °F	Klüberlub BVH 71-461
				150 °C 302 °F	–40 °C –40 °F	POLYLUB GLY 501
				140 °C 284 °F	–20 °C –4 °F	Klüberlub BE 41-542
				140 °C 284 °F	–30 °C –22 °F	Klüberlub BEM 41-122
	Mainly rotating	≥ 1	approx. 10	150 °C 302 °F	–50 °C –58 °F	POLYLUB GLY 151
		≥ 2	approx. 1	130 °C 266 °F	–50 °C –58 °F	Klübersynth LR 44-21
Food-processing and pharmaceutical industry	Oscillating/ rotating	< 1	approx. 100	140 °C 284 °F	–5 °C 23 °F	Klübersynth UH1 64-1302
				120 °C 248 °F	–35 °C –31 °F	Klüberfood NH1 94-301
	Mainly rotating	≥ 1	approx. 10	120 °C 248 °F	–40 °C –40 °F	Klübersynth UH1 14-151
Plant and machine building, appliance and automotive industry if lubricant contact with the environment cannot be excluded	Mainly rotating	< 1	approx. 10	100 °C 212 °F	–30 °C –22 °F	Klüberbio LG 39-701 N

Most important selection criterion Selection criterion of secondary importance Selection criterion of tertiary importance

	Description	Benefits
	High-temperature, long-term lubricating grease with largely neutral behaviour towards many materials (metals, plastics).	Lifetime lubrication enables a significant reduction in lubrication quantities.
	Alternative to Klüberlub BVH 71-461, suitable for higher ambient temperatures.	Extended relubrication intervals, also at high temperatures owing to its long-term stability.
	The preferred lubricant option for plain bearings, offering long service life and relubrication intervals.	Suitable for universal standard applications.
	Especially for plastic plain bearings[2)]; also available in other base oil viscosities.	Good compatibility with many plastics.
	More solid alternative to Klüberlub BVH 71-461 (NLGI 2).	KP2N-20 grease according to the standard for bearing lubricants DIN 51825, which is often required.
	For steel/steel spherical plain bearings.	Improved functionality and long-term lubrication due to the formation of a wear-resistant tribolayer.
	Also for plastic plain bearings owing to its good compatibility.	Suitable for universal standard applications.
	Also for plastic plain bearings owing to its good compatibility.	Suitable for universal standard applications.
	NSF H1-registered[1)] and certified according to ISO 21469 for use in the food-processing and pharmaceutical industries.	Long lifetime owing to good water resistance and wear protection.
	NSF H1-registered[1)] for use in the food-processing and pharmaceutical industries.	Good corrosion- and wear protection, also when subject to micro movements; can be applied via centralised lubrication systems.
	NSF H1-registered[1)] and certified according to ISO 21469 for use in the food-processing and pharmaceutical industries.	Reduced risk of bearing failure due to good water resistance.
	Readily biodegradable. The preferred option to avoid contamination of soil or water.	Suitable for many applications due to good wear and water resistance.

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Plain bearings

Special lubricating oils and bonded coatings

Lubricating oils for hydrodynamic plain bearings:

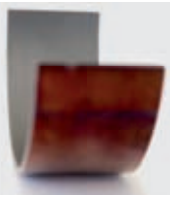
Application/requirement	Speciality lubricants from Klüber Lubrication
Standard	Klüberoil GEM 1-100, 150, 220, 320, 460 N
Particular long-term resistance	Klüber Summit SH 32, 46, 68, 100
	Alternative: Klübersynth GH 6-…, if the required viscosity is not available in the Klüber Summit SH series

Bonded coatings for tribologically optimised plain bearings:

Type of lubricant	Speciality lubricants from Klüber Lubrication
Thermosetting, black-coloured high-performance bonded coating made up of two components with nanoparticles	Klübertop TN 01-311 A/B
Thermosetting, single-component, black-coloured high-performance bonded coating containing graphite	Klübertop TG 05 N
Water-miscible, thermosetting PTFE bonded coating	Klübertop TP 46-111

Bonded coatings should be selected with regard to component geometry and material as well as the type of application, operating conditions and application methods. Further products available on request.

Most important selection criterion Selection criterion of secondary importance



	Description	Benefits
	Viscosity depends on temperature and speed.	Tried-and-tested gear oil series compatible with conventional plain bearing metals.
	Viscosity depends on temperature and speed.	Long-term, reasonably priced compressor oil series compatible with conventional plain bearing metals.
		Tried-and-tested long-term gear oil series compatible with conventional plain bearing metals.

	Description	Benefits
	Primarily for the coating of **metal** plain bearings used as dry lubrication, running-in lubrication or emergency lubrication in combination with oil.	Excellent wear protection for a very long component life.
	Primarily for the coating of **metal** plain bearings used as dry lubrication, running-in lubrication or emergency lubrication in combination with oil.	Good corrosion protection and low friction coefficient for a reliable function of components, even under the influence of media.
	Primarily for the coating of plastic plain bearings and medium loads, used as dry lubricant.	Increased component performance due to sliding without stick-slip; cost-effective coating process.

Linear guides
Special oils and fluid greases

Oil lubrication for continuous lubrication:

Industry/requirements	Linear type
General/increased corrosion protection	All
General	Rolling motion guides
General	Slideways
Food-processing and pharmaceutical industry	All
Readily biodegradable	All

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

Industry/requirements	NLGI grade/requirements
General/low speed (< 15 m/min)	NLGI 00/000
General/medium speed (corresponds to 15 to 60 m/min)	NLGI 000
General/medium speed (> 60 m/min)	NLGI 0/00
General/higher temperatures	NLGI 0/00
General/high load, micromovements, vibration	NLGI 0, 00/000
Food-processing and pharmaceutical industry	NLGI 000

Most important selection criterion Selection criterion of secondary importance

Speciality Lubricants from Klüber Lubrication	Description
Klübersynth MZ 4-17	Good compatibility with other lubricants; can also be used for initial lubrication.
Klüberoil GEM 1-46, 68, 220 N	CLP gear oil offering good corrosion- and wear protection. Viscosity to be selected according to speed. Klüberoil GEM 1-46 N is suitable for particularly low ambient temperatures.
LAMORA D 68, 220	CGLP slideway oil with good demulsifying behaviour towards cooling lubricants, tried-and-tested also for plastic guideways. Viscosity to be selected according to speed.
Klüberoil 4 UH1-68 N	NSF H1-registered and ISO 21469-certified[1]. Good ageing resistance and wear protection. Also available in other viscosities (ISO VG 32 … 1500).
Klüberbio C 2-46	Low water hazard ensures unharmed environment. High-performance lubricant. Also available in ISO VG 100 as Klüberbio CA 2-100.

Speciality Lubricants from Klüber Lubrication	Description
MICROLUBE GB 00	With high-pressure and antiwear additives, without solid lubricants.
CENTOPLEX GLP 500	Good pressure absorbtion capacity.
ISOFLEX TOPAS NCA 5051	Low base oil viscosity for low friction and smooth running.
ISOFLEX TOPAS NCA 5051	Synthetic base oil with good ageing resistance.
MICROLUBE GB 0, 00	With high-pressure and antiwear additives, without solid lubricants. Select NLGI grade according to lubrication specification.
Klüberfood NH 1 94-6000	NSF H1-registered[1]. Good corrosion protection and good pressure-absorption capacity.

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Linear guides
Special greases

Grease lubrication for extended relubrication intervals:

Linear type	Industry/requirements	Selection criterion
Rolling motion guides, primarily with balls	Universal	Low speed (< 15 m/min)
		Medium speed (corresponds to 15 to 60 m/min)
		High speed (> 60 m/min)
Miniature guideway	Universal	
Roller screw drives	Universal	
Trapezoidal thread drives	Plastic nut	Low speed (< 15 m/min)
	Metal nut	Medium speed (corresponds to 15 to 60 m/min)
Sliding motion guides	Universal	Medium speed (corresponds to 15 to 60 m/min)
All	Smooth running	High accelerations and speed
	Micromovement/vibration	Normal load
	High load	
	High temperature	Not in high vacuum, UV light, aggressive media
	Clean room production/semi-conductor, LCD, HDD production	Friction point temperature up to 60 °C (140 °F) not in high vacuum or aggressive radiation
	Clean room production/semi-conductor, LCD, HDD production	High temperature range, under high vacuum, UV radiation
	Food-processing and pharmaceutical industry	
	Ecologically sensitive areas	Readily biodegradable for a clean environment

Most important selection criterion Selection criterion of secondary importance Selection criterion of tertiary importance

	Speciality lubricants from Klüber Lubrication	Description
	Klüberplex BE 31-222	Lubricating grease, good adhesion and sealing effect.
	Klüberplex BE 31-102	Lubricating grease, good adhesion and sealing effect.
	ISOFLEX NCA 15	Lubricating grease, good adhesion and sealing effect.
	ISOFLEX TOPAS AK 50	Fluid grease. NLGI 0 for easy application.
	Klüberplex BEM 41-132	Good lubricating capacities in linear contact.
	POLYLUB GLY 801	Good compatibility with plastics. Lubricants for higher speeds on request.
	Klüberplex BEM 41-132	Good wear protection for long relubrication intervals. Lubricants for high/low speeds on request.
	Klüberplex BEM 41-132	Good wear protection for long relubrication intervals. Lubricants for high/low speeds on request.
	ISOFLEX TOPAS NCA 52	Ageing-resistant lubricating grease for long-term lubrication.
	Klüberplex BEM 34-132	Tried-and-tested grease against tribocorrosion.
	Klüberlub BE 71-501	Good wear protection, applicable through central lubricating systems.
	Klübersynth BM 44-42	Very wide temperature range. Compatible with plastics. Low-cost alternative to PFPE oils. Tried-and-tested for automotive applications (steering system).
	Klübersynth BEM 34-32	Primarily supplied in small 50 g packs for relubrication in clean room environments.
	BARRIERTA KM 192	Low evaporation rate.
	Klüberfood NH1 94-301	NSF H1-registered[1)].
	Klüberbio LG 39-701 N	Low water hazard ensures unharmed environment. Good water resistance. High pressure absorption capacity.

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Gears
Special oils

Industry	Gear type		Speciality lubricants from Klüber Lubrication	ISO viscosity grade, ISO VG	Service temperature range	
	Spur, bevel, planetary and hypoid gears	Worm gear			Upper service temperature, approx.	Lower service temperature, approx.
General	+++	+	Klüberoil GEM 1 N	46, 68, 100, 150, 220, 320, 460, 680, 1000	100 °C 212 °F	–15 °C 5 °F
General	+++	++	Klübersynth GEM 4 N	32, 46, 68, 100, 150, 220, 320, 460, 680	140 °C 284 °F	–50 °C –58 °F
General	+++	+++	Klübersynth GH 6	22, 32, 46, 68, 100, 150, 220, 320, 460, 680, 1000, 1500	160 °C 320 °F	–55 °C –67 °F
Food & pharma	+++	+++	Klübersynth UH1 6	100, 150, 220, 320, 460, 680	160 °C 320 °F	–35 °C –31 °F
Food & pharma	++	++	Klüberoil 4 UH1 N	22, 32, 46, 68, 100, 150, 220, 320, 460, 680, 1500	120 °C 248 °F	–35 °C –31 °F
Ecologically sensitive areas	++	++	Klübersynth GEM 2	220, 320	130 °C 266 °F	–30 °C –22 °F

+++ Optimum performance/enhanced benefit ++ Improved performance/benefit + Standard performance

	Performance parameters						DIN 51 502, DIN 51517-3, AGMA 9005 designation	Registrations and tests
	Energy saving potential	Oil life	Scuffing load capacity of gearing	Micro-pitting resistance of gearing	Wear protection of rolling bearings	Elastomer compati-bility radial shaft seals		
	+	+	+++	+++	+++	+++	CLP, EP oil	NSF H2
	++	++	+++	+++	+++	+++	CLP HC, EP oil	
	+++	+++	+++	+++	+++	+++	CLP PG, EP oil	
	+++	+++	+++	+++	+++	+++	CLP PG, EP oil	NSF H1 [1)], NSF ISO 21469
	++	++	++	++	+++	+++	CLP HC, EP oil	NSF H1 [1)], NSF ISO 21469
	++	++	+++	+++	+++	++	CLP E [2)], EP oil	CEC-L-33-A-93

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2) Complies with CLP requirements, except for demulsibility and resistance to SRE NBR 28 elastomer.

Chains
Speciality lubricants

Industry	Upper service temperature approx.
Food-processing and pharmaceutical industries	250 °C 482 °F
	160 °C 320 °F
	120 °C 248 °F
Other industries	1 000 °C 1 832 °F Note: above approx. 200 °C / 392 °F dry lubrication
	500 °C 932 °F Note: above approx. 200 °C / 392 °F dry lubrication
	250 °C 482 °F
	120 °C 248 °F
	110°C 230 °F
	80 °C 176 °F

Most important selection criterion Selection criterion of secondary importance Selection criterion of tertiary importance

	Selection criteria	Speciality lubricants from Klüber Lubrication
	High-temperature chain oil, NSF H1-registered[1], ISO 21469-certified.	Klüberfood NH1 CH 2-220 Plus
	Special high-temperature chain oil based on polyglycol for chains in can lacquering lines; NSF H1-registered[1] and ISO 21469-certified.	Klüberfood NH1 C 6-150
	NSF H1-registered[1] and ISO 21469-certified. For normal temperatures.	Klüberoil 4 UH1-32, 46, 68, 100, 150, 220, 320, 460 N
	Solid lubricant suspension, e.g. for chains in burning, melting or annealing furnaces. **Note: for applications at service temperatures above 250 °C / 482 °F.**	WOLFRAKOTE TOP FLUID
	High-temperature chain oil containing solid lubricants; also for plate carrier chains in baking ovens. **Note: for applications at service temperatures above 250 °C / 482 °F.**	Klüberoil YF 100
	Conveyors with dryers (e.g. powder painting). Conveyor chains in hardening furnaces (e.g. mineral wool and gypsum plate production).	Klübersynth CHM 2-100, Klübersynth CH 2-100 N or other viscosity grades of the Klübersynth CH 2-series
	For continuous fibreboard presses. Especially for belt lubrication.	HOTEMP SUPER N PLUS
	Lubrication of chains and pins (ContiRoll presses).	HOTEMP SUPER CH 2-100
	Especially for fabric conveyor chains in textile finishing machines.	Klübersynth CTH 2-260
	For conveyor chains in biaxial film stretchers; especially for high and highest chain speeds and stretching temperatures. Approved by Brückner or Andritz Biax resp., Lindauer-Dornier, ESOPP.	Klübersynth CH 2-280, Klübersynth CFH 2-400, Klübersynth CHZ 2-225
	Special oil for chain pin lubrication and cleaning of the chain system in film stretchers.	Klübersynth CZ 2-85
	Chain lubricant based on mineral oil, also for conveyor chains in wet processing zones.	STRUCTOVIS HD-series; especially STRUCTOVIS FHD and STRUCTOVIS EHD
	Lubricating wax for chains, up to 70 - 80°C / 158 - 176°F “quasi-dry” lubricating film; especially for the initial lubrication by the chain manufacturer.	Klüberplus SK 11-299
	Biodegradable chain oils.	Klüberbio CA 2 oils (multi-purpose oils)
		Klüberbio C 2-46 (especially for escalator step chain and passenger conveyors)

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Screws

Special pastes and dry lubricants

	Service temperature range[1]		Screw material					
	upper service temperature range approx.	lower service temperature range approx.	standard	friction values for initial tightening[2] standard screw material[6]	standard deviation (S)[6]	special steel A 2-70	friction values for initial tightening[3] special steel A 2-70[6]	standard deviation (S)[6]
Pastes	1 400 °C 2 552 °F	–40 °C –40 °F	•	μ_K = 0.1 μ_G = 0.1	S_K = 0.007 S_G = 0.009	•	μ_K = 0.1 μ_G = 0.13	S_K = 0.007 S_G = 0.017
	1 200 °C 2 192 °F	–30 °C –22 °F	•	μ_K = 0.13 μ_G = 0.11	S_K = 0.004 S_G = 0.013	•	μ_K = 0.1 μ_G = 0.12	S_K = 0.008 S_G = 0.017
	1 000 °C 1 832 °F	–40 °C –40 °F	•	μ_K = 0.11 μ_G = 0.09	S_K = 0.015 S_G = 0.01	•	μ_K = 0.09 μ_G = 0.11	S_K = 0.006 S_G = 0.03
	150 °C 302 °F	–40 °C –40 °F	•	μ_K = 0.14 μ_G = 0.11	S_K = 0.004 S_G = 0.007	•	μ_K = 0.12 μ_G = 0.15	S_K = 0.008 S_G = 0.019
	140 °C 284 °F	–40 °C –40 °F	•	–	–	•	μ_K = 0.1 μ_G = 0.09	S_K = 0.003 S_G = 0.011
	120 °C 248 °F	–45 °C –49 °F	•	μ_K = 0.13 μ_G = 0.1	S_K = 0.007 S_G = 0.007	–	–	–
	100 °C 212 °F	–20 °C –4 °F	•	μ_K = 0.15 μ_G = 0.12	S_K = 0.006 S_G = 0.009	–	–	–
Dry lubrication	90 °C 194 °F	–40 °C –40 °F	•	μ_K = 0.13[4] μ_G = 0.1[4]	S_K = 0.005[4] S_G = 0.008[4]	•	–	–

Most important selection criterion

1) Service temperatures are guide values which depend on the lubricant's composition, the intended use and the application method. Lubricants change their consistency, shear viscosity or viscosity depending on the mechanical-dynamical loads, time, pressure and temperature. These changes in product characteristics may affect the function of a component.
2) Measured with hexagon bolts M10x30-8.8, DIN EN ISO 4017, tightening speed n = 5 rpm, number of screws = 20, nut M10-8, plain and degreased, face material 42CrMo4 with roughness Ra 1.6, tightening torque MA = 50 Nm, μK = averaged bearing surface friction coefficient, μG = averaged thread friction coefficient
3) Measured with hexagon bolts M10x50-A2-70, DIN EN ISO 4017, tightening speed n = 5 rpm, number of screws = 20, material of the nut A2, face material 42CrMo4 with roughness Ra 1.6, tightening torque MA = 40 Nm, μK = averaged bearing surface friction coefficient, μG = averaged thread friction coefficient

	Colour	Application notes	Speciality lubricants from Klüber Lubrication
	black	High degree of purity as paste is virtually free of chlorine, fluorine and sulphur; for applications in oil refineries.	Klüberpaste HS 91-21
	light-grey	NSF H1-registered[7] and ISO 21469-certified. Above 200 °C dry lubrication.	Klüberpaste UH1 96-402[5]
	black	Approved acc. to VW-TL 52112 and Ford Tox No. 138624. Above 200 °C dry lubrication.	Klüberpaste HEL 46-450
	white	Light-coloured, extreme-pressure lubricating paste.	Klüberpaste 46 MR 401
	beige	For screws and bolts subject to normal temperatures.	DUOTEMPI PMY 45
	white	NSF H1-registered[7] and ISO 21469-certified.	Klüberpaste UH1 84-201
	yellow-light brown	For use in agricultural, forestry and water resources industries.	Klüberbio AG 39-602
	transparent (colour of the water-free lubricating film)	Lubricating wax emulsion. Ready-to-handle. Can be diluted with tap water.	Klüberplus SK 12-205

4) Friction values and standard deviation with a mixing ratio of 1:3, application: 2x dip/spin coating
5) Values are not valid for the spray version/aerosol can.
6) All values refer to the specified materials/surfaces and test conditions. All the other materials/surfaces are to be tested accordingly.
7) This lubricant is NSF H1 registered and therefore complies with FDA 21 CFR § 178.3570. The lubricant was developed for incidental contact with products and packaging materials in the food-processing, cosmetics, pharmaceutical or animal feed industries. The use of this lubricant can contribute to increase reliability of your production processes. We nevertheless recommend conducting an additional risk analysis, e.g. HACCP.

Air compressors
Special oils

Type of compressor	Oil change interval	Speciality lubricants from Klüber Lubrication	Food-processing and pharmaceutical industries	ISO viscosity grade, ISO VG	
Screw compressors with oil injection	Oil change intervals up to 12 000 hours under normal operating conditions or for compressors subject to extreme operating conditions, e.g. extreme temperatures, pressures.	Klüber Summit Ultima 46, 68		46, 68	
	Oil change intervals up to 10 000 hours under normal operating conditions[1)]	Klüber Summit SH 46, 68		46, 68	
	Oil change intervals up to 8 000 hours under normal operating conditions[1)]	Klüber Summit SB 46, 68		46, 68	
	Oil change intervals up to 5 000 hours under normal operating conditions[1)]	Klüber Summit PS 150, 200		46, 68	
	Oil change intervals up to 5 000 hours under normal operating conditions[1)]	Klüber Summit FG 200, 250	•	46, 68	
	Oil change intervals up to 8 000 hours under normal operating conditions[1)]	Klüber Summit Supra Coolant		55	
		Klüber Summit Supra 32		32	
Screw-type compressors, reciprocating piston compressors, rotary vane compressors	Approx. once per year up to max. 24 months, depending on the application and the operating hours.	Klüber Summit DSL 46, 68, 100, 125		46, 68, 100, 125	
Reciprocating piston compressors with total-loss or circulation lubrication, rotary vane compressors	1 to 2 times per year, depending on the operating hours	Klüber Summit FG 250, 300, 500	•	68, 100, 150	
	1 to 2 times per year, depending on the operating hours	Klüber Summit PS 200, 300, 400		68, 100, 150	

Most important selection criterion

	Product characteristics, advantages, benefits	Base oil
	– Reduced maintenance costs – Reduction of downtime – Especially for oil-injected screw compressors which are operated at pressures > 10 bar and temperatures up to 125 °C	ester oil, synthetic hydrocarbon
	– Reduced maintenance costs – Reduction of downtime – Good compatibility with elastomers – Non-hygroscopic – Especially suitable for installations with heat recovery	synthetic hydrocarbon, ester oil
	– Reduced maintenance costs – Reduction of downtime – Miscible with mineral and hydrocarbon oils	synthetic hydrocarbon, ester oil
	– Reduced maintenance costs – Reduction of downtime – Reduced formation of residues	mineral oil, ester oil
	– NSF H1-registered[2)] and ISO 21469-certified for use in the food-processing and pharmaceutical industries	synthetic hydrocarbon
	– Particularly for compressors filled with polyglycol-based compressor oils by the manufacturer (Ingersoll-Rand and Sullair) – Good chemical stability with low degradation and deposit formation – Not miscible with mineral oil and hydrocarbon-based oils	polyglycol oil, ester oil
	– Excellent residue removal on valves and in cylinders due to 100 % fully synthetic formulation – Even longer service life of valves and piston rings resulting in reduced maintenance and downtime costs compared to mineral and hydrocarbon-based oils – More energy efficiency resulting from lower friction coefficient, better thermal conductivity, etc. – Up to 220 °C (428 °F) discharge temperature – Klüber Summit DSL 46, 68 and 100 are biodegradable acc. to OECD 301 and can be used in all eco-sensitive areas, e.g. sewage plants, snow cannons or maritime applications, in accordance with regulatory requirements. – Klüber Summit DSL 46 is used in screw-type compressors and Klüber Summit 68, 100, 125 in reciprocating piston compressors.	diester oil
	– NSF H1-registered[2)] and ISO 21469-certified for use in the food-processing and pharmaceutical industries – up to 160 °C (320 °F) discharge temperature	synthetic hydrocarbon
	– Reduced residue formation on valves and in cylinders compared to mineral oil based compressor oils – Longer service life of valves and piston rings resulting in reduced maintenance and downtime costs in comparison to mineral oil – Up to approx. 160 °C (320 °F) discharge temperature	hydrogenated oil, diester oil

1) Normal operating conditions are considered a discharge temperature of max. 85 °C (176 °F), a discharge pressure of max. 8 bar, dry and clean intake air, oil cycle > 1.5

2) This lubricant is NSF H1 registered and therefore complies with FDA 21 CFR § 178.3570. The lubricant was developed for incidental contact with products and packaging materials in the food-processing, cosmetics, pharmaceutical or animal feed industries. The use of this lubricant can contribute to increase reliability of your production processes. We nevertheless recommend conducting an additional risk analysis, e.g. HACCP.

Air compressors
Special oils

	Speciality lubricants from Klüber Lubrication	Food-processing and pharmaceutical industries	ISO viscosity grades, ISO VG	
Gear lubrication in oil-free compressors	Klüber Summit HySyn FG 68, 100	•	68, 100	
	Klüber Summit SH 68		68	
	Klüber Summit Ultima 68		68	
Blower (gear lubrication)	Klüberoil 4 UH 1 N	•	100, 150, 220	
	Klüber Summit PS 300, 400		100, 150	
	Klübersynth G4 68, 130, 150, 220		68, 130, 150, 220	
Cleaning of screw compressors, turbo compressors and rotary vane air compressors with oil circulation	Klüber Summit Varnasolv		32	
Aging test oil for checking the aging condition of compressor oils	Klüber Summit T.A.N-Kit			
Rolling bearings of electric motors	Klüberquiet BQH 72-102			
Oilers with two products	AIRPRESS 15, 32	15, 32		
	Klüber Summit HySyn FG 15, 32	15, 32		

Most important selection criterion

	Product characteristics, advantages, benefits	Base oils
	– NSF H1-registered[1] and ISO 21469-certified for use in the food-processing and pharmaceutical industries – Fully synthetic compressor oil	synthetic hydrocarbon
	– Cost savings due to longer oil change intervals compared to mineral and partially synthetic oils – Fully synthetic compressor oil	synthetic hydrocarbon, ester oil
	– Cost savings due to longer oil change intervals compared to mineral and partially synthetic oils – Fully synthetic compressor oil	ester oil
	– NSF H1-registered[1] and ISO 21469-certified for use in the food-processing and pharmaceutical industries	synthetic hydrocarbon, ester oil
	– Cost savings due to longer oil change intervals compared to mineral oil	mineral oil, ester oil
	– Fully synthetic – Significantly longer service life compared to mineral oils – Wide service temperature range	PAO
	– Effectively dissolves residues and impurities caused by mineral oils (e.g. carbon buildup, oxidation residues) and removes them together with the oil during oil change – No downtimes due to cleaning during operation – Lower costs due to simple cleaning procedure – Economical operation of the cleaned compressor	Ester oil based conditioner for screw-type compressors, turbo compressors and rotary vane compressors with oil circulation lubrication. May not be used for polyglycol oils.
	– Rapid way of checking the condition (neutralisation number) of compressor oils on the spot – Suitable for determining the compressor oil change intervals	Can be used for all conventional mineral and synthetic compressor oils, except polyglycol oils.
	– Long-term and lifetime lubrication – Especially for frequency-controlled engines	ester oil, polyurea thickener
	– For the lubrication and maintenance of pneumatic systems – Good corrosion protection – Dispersion of condensed water, protection against icing	mineral oil, ester oil
	– Lubrication and maintenance of pneumatic systems – Fully synthetic – Low setting point	PAO

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Pneumatic systems

Cylinders in pneumatic systems:

Application	Products	Seal types
Standard applications / food-grade applications	Klübersynth AR 34-401	Damping seal, piston seal, rod seal
High-temperature applications	BARRIERTA KM 192	Damping seal, piston seal, rod seal

Valves in pneumatics systems:

Application	Products	Valve types
Standard applications	PETAMO GHY 133N	Seat valve, directional control valve
High-temperature applications in the food-processing and pharmaceutical industries	UNISILKON L 641	Seat valve, directional control valve

Most important selection criterion

	Product characteristics	Application notes
	Adhesive lubricating grease for wide piston speed ranges; reduced tendency to stick-slip at very low piston speeds; low breakaway torques after long periods of standstill; NSF H1 registered[1)] for use in the food-processing and pharmaceutical industries; excellent compatibility with commercial sealing materials (except for EPDM).	For lubricant application the use round brushes or automatic greasing pistons has proven effective. It is important that after assembly the piston is moved several times over the full stroke length in order to ensure adequate wetting of the sealing elements on both sides if only one-sided lubrication was possible.
	Very wide temperature range; low breakaway torques; high chemical stability; excellent compatibility with commercial sealing materials.	

	Product characteristics	Application notes
	Adhesive lubricating grease for a wide service temperature range; reduces static and dynamic friction; good water resistance; good corrosion protection.	A similar procedure as for cylinders applies. Excessive lubrication of the piston seal after several piston strokes – depending on the size and circumference – ensures a more uniform lubricant layer.
	Very adhesive, NSF H1 registered[1)] lubricating grease especially for applications involving a high number of cycles, high air throughput and thermal fluctuations.	

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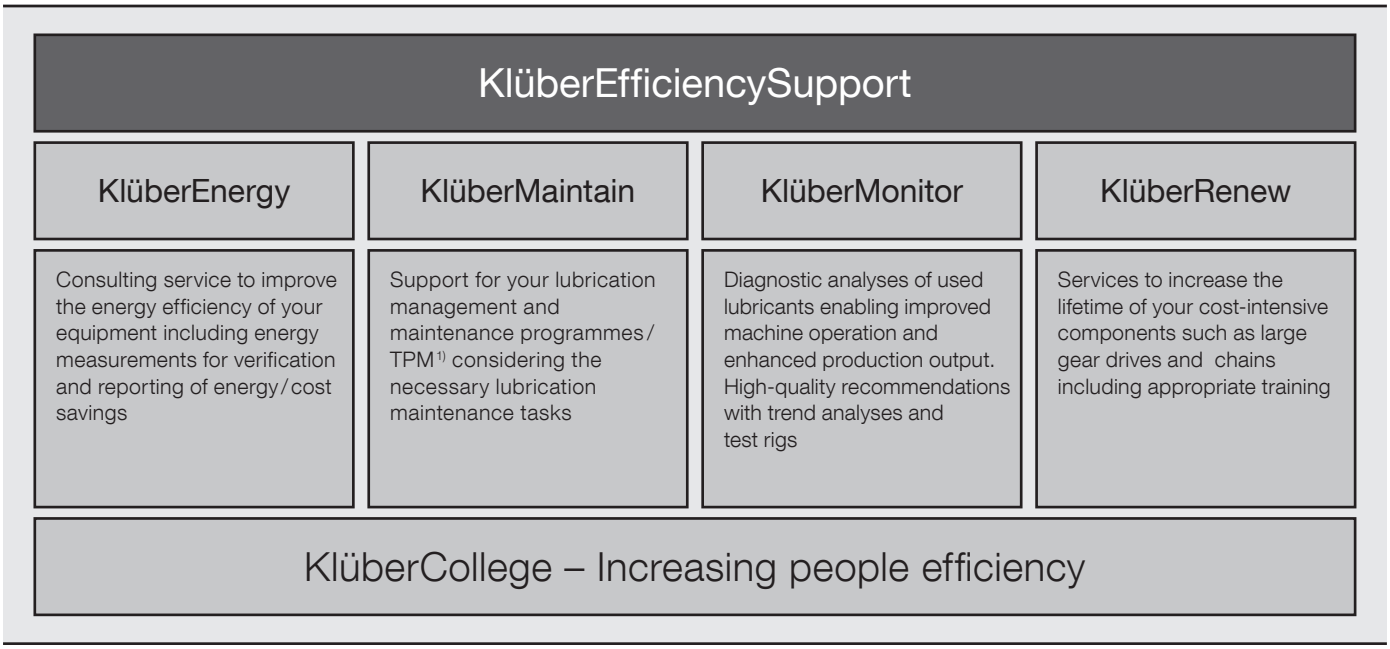
KlüberEfficiencySupport

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 the 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 that we develop solutions together 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

The right lubricant at the right place at the right time

Systems for automatic lubrication

We in 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 food-processing 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 %.

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.

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 %.

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.

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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 80 years.

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