

KLÜBER
LUBRICATION

Special lubricants
for the pulp and
paper industry



Lubrication is our World

Special lubricants for the pulp and paper industry

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product. We recommend contacting
our Technical Consulting Staff to discuss
your specific application. If required and
possible we will be pleased to provide a
sample for testing.

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Front page: Glazing rollers
Courtesy of:
Fa. VOITH SULZER PAPIERTECHNIK
89522 Heidenheim, Germany

Klüber – Partner of the
Pulp & Paper Industry



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This brochure describes the main applications of specialty lubricants in machines and installations used in the pulp and paper industry.

It provides details on lubrication problems related to individual components, operations and processes which may occur when using unsuitable lubricants.

It also shows how to solve these problems and explains the advantages and benefits derived from using Klüber lubricants.

The following production sections are covered:

- Wood yard
- Pulp manufacture
- Paper making
- Upgrading
- Finishing

Klüber also offers high-performance lubricants for related equipment such as valves, hydraulic units, pumps, fans, compressors, gears, and for maintenance and repair purposes. All these

products are state-of-the-art from the economical and ecological point of view.

However, this brochure does not cover used paper processing and waste/process water treatment. As we have not yet gathered sufficient experience in these fields, pertinent comments on your part are appreciated.

Through our subsidiaries all over the world we will collect relevant information and include it in the next issue of this brochure.

All Klüber lubricants recommended in this brochure are high-performance lubricants. When used appropriately, they ensure

- maximum functional reliability
- low maintenance costs
- extended relubrication cycles
- reduced environmental impact
- resistance to water and other process fluids

Detailed descriptions and additional application notes are listed in the individual product information leaflets. Please contact us for free copies.

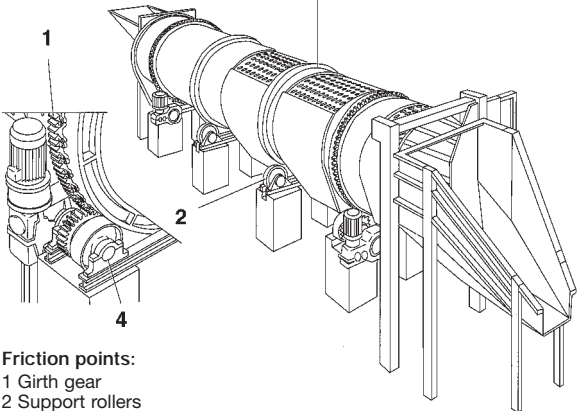
We would also like to refer you to other technical brochures we have published, such as “Lubrication of gear systems”, “Lubrication of chains”, “Lubricant testing”, etc., which also provide interesting details.

The services we offer include more than just submitting quotations and supplying our lubricants. We support you in all matters related to lubricants and lubrication technology, and we are sure we will find a cost-effective, intelligent solution to all lubrication problems you encounter in the pulp and paper industry.

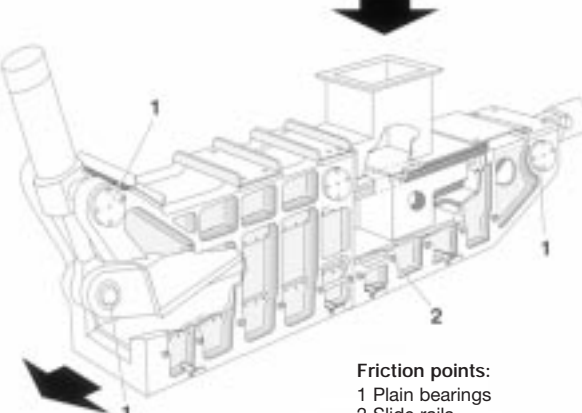
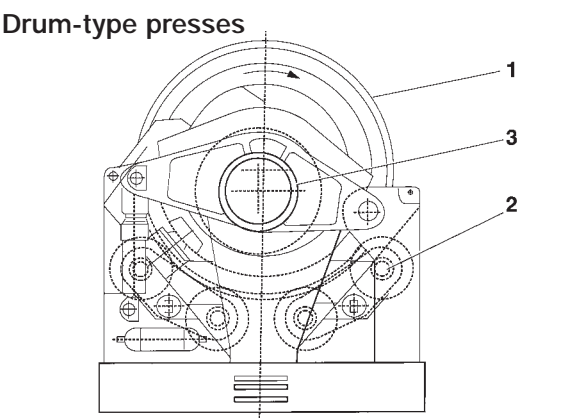
This not only applies to standard situations but also to complex problems involving entire machines and installations.

Wood yard

Debarking drum

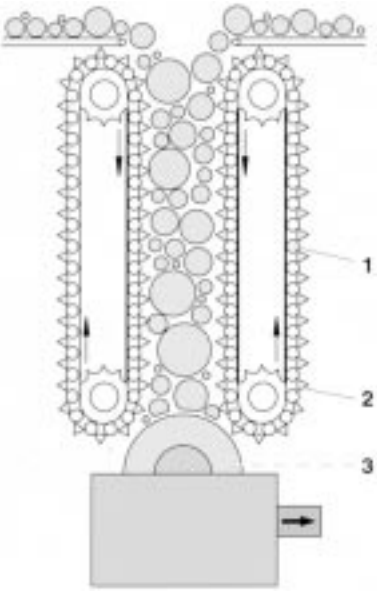
	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Girth gear 2 Support rollers 3 Tyre 4 Load roller bearings</p>	1	High lubricant consumption, large quantities of used lubricant have to be disposed	GRAFLOSCON C-SG 2000 ULTRA¹⁾	Low consumption, good lubricity, resistant to high loads, water and other ambient media
	-	Lubricant not sprayable at low temperatures	GRAFLOSCON C-SG 0 ULTRA¹⁾	Sprayable through automatic systems at ambient temperatures as low as 10 °C
	4	High lubricant consumption	Klüberlub BE 41-1501	Good pressure absorption capacity, low consumption
<p>¹⁾ GRAFLOSCON C-SG 0 ULTRA and GRAFLOSCON C-SG 2000 ULTRA are operational lubricants for large girth gear drives which have completed the running-in process and whose tooth flanks are in a good condition. The GRAFLOSCON series also includes running-in and repair lubricants for girth gear drives. Please contact us for more details or ask for our free brochure „Lubrication of large girth gear drives” (9.2e) which provides information about running-in, operational and repair lubrication.</p>				

Bark presses

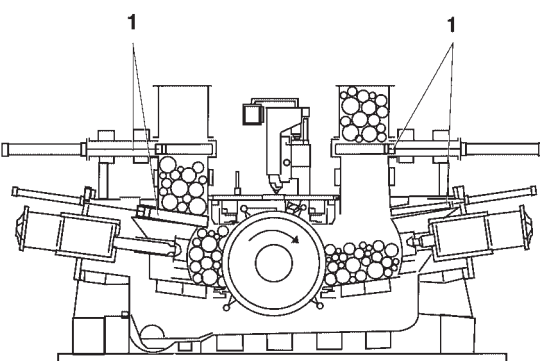
Piston-type presses	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Plain bearings 2 Slide rails</p>	1	High rail wear, high lubricant consumption	GRAFLOSCON C-SG 0 ULTRA	Excellent adhesion, low consumption (especially in wet presses)
	2	Insufficiently adhesive lubricant is sheared off and removed by press water	GRAFLOSCON C-SG 2000 ULTRA	Excellent wear protection, extended rail life GRAFLOSCON lubricants are very adhesive and resistant to high pressure, water and bark
<h3>Drum-type presses</h3>  <p>Friction points: 1 Tyres 2 Load/support roller bearings (spherical roller bearings) 3 Drum bearings (spherical roller bearings)</p>	1	Tyre surface suffers wear and material chipping Insufficient adhesion of standard lubricants	GRAFLOSCON C-SG 0 ULTRA or GRAFLOSCON C-SG 2000 ULTRA For load rollers with a centralized lubrication system: UNIMOLY OIL ... Viscosity grade depending on equipment manufacturer's specifications	Low consumption, good lubricity Both products provide excellent protection against wear Excellent adhesion, low consumption Very good protection against wear
	2	High wear and oil consumption	UNIMOLY OIL 1500	
	3	Premature bearing failure	Klüberlub BE 41-1501	Ensures that rated bearing life is achieved

Wood yard

Wood grinders

	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Grinder chain, links and plates 2 Chain sprocket 3 Gear</p>	1	High wear due to high loads, impact of water and aggressive atmosphere	GRAFLOSCON C-SG 0 ULTRA or GRAFLOSCON C-SG 2000 ULTRA	GRAFLOSCON lubricants are resistant to loads and ambient media, thus eliminating wear problems
	2	Lubricant is thrown off		Good adhesion
	3	Lubricants for gears see page 18		


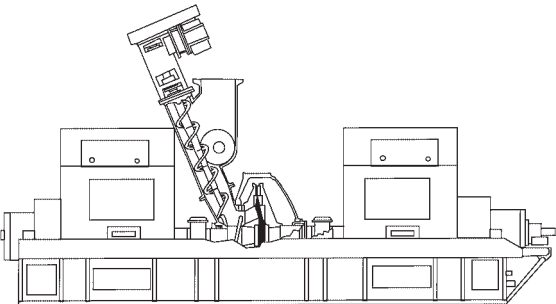
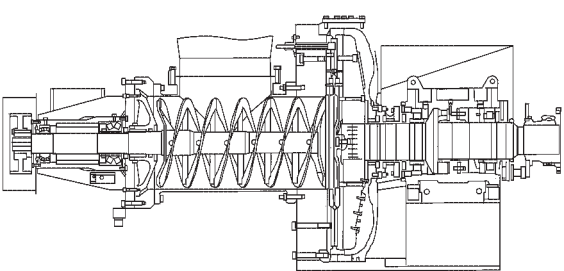
Pressure wood grinders

	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Slide rails</p>	1	Lubricant contaminates waste water	Klüberbio CA 2-460	Rapidly biodegradable lubricating oil with a synthetic base oil (CEC-L-33-A-94, after 21 days > 70%). Water pollution category 1. Lower consumption than with vegetable oils, no resin build-up

Pulp manufacture

Thermo-mechanical pulping (TMP) and
Chemi-thermo-mechanical-pulping (CTMP)

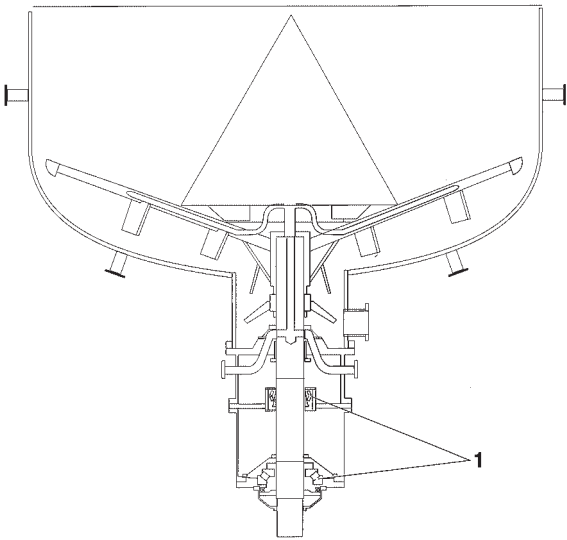
Refiners

Twin refiner	Andritz Sprout-Bauer	No.	Lubrication problem	Recommended product	Advantages
		1		Klüberplex BE 31-102	Extended grease life
		2	High speeds and high axial loads Frequent relubrication High lubricant consumption	Klüberplex BE 31-102	Extended grease life
<p data-bbox="65 994 339 1032">Double disc refiner</p> <p data-bbox="443 999 655 1025">Andritz Sprout-Bauer</p> 					
<p data-bbox="65 1532 325 1570">Single disc refiner</p> <p data-bbox="560 1536 655 1570">Kvaerner</p> 					
<p data-bbox="65 2018 209 2047">Friction points:</p> <p data-bbox="65 2047 280 2107">1 Centralized lubrication system: Grease lubrication</p>	<p data-bbox="320 2047 568 2107">2 Bearings: Plain bearings Taper roller thrust bearings Cylindrical roller bearings</p>				

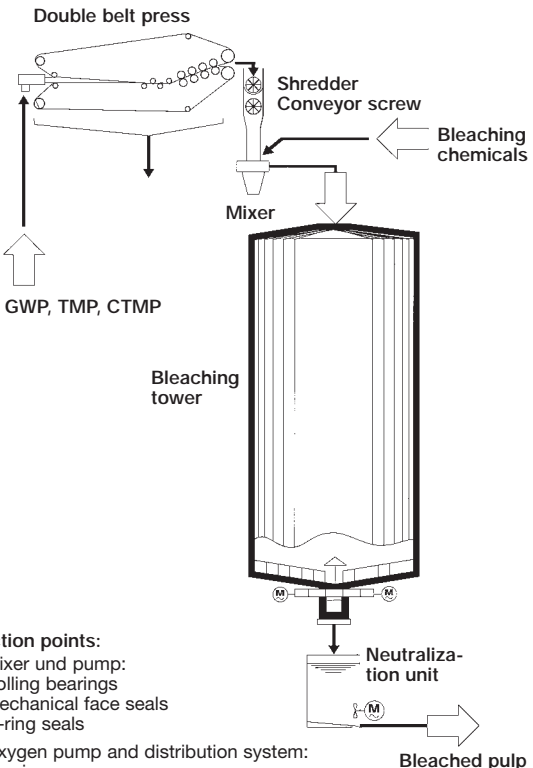
Pulp manufacture

Chemical pulping

Digester

Stirring unit in discharger		No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Roller and ball bearings 2 Girth gear 3 Enclosed gear</p>	1	Holding tank Low speeds, high loads, lubricant in contact with pulp Exposed to pulp Digester Low speeds, high loads, lubricant subject to high temperatures and chemicals	Klüberlub BE 41-1501	This heavy-duty grease is very resistant to ambient media and eliminates lubrication problems.	
	2	Lubricants for girth gear drives see page 15			
	3	Lubricants for encased gears see page 18			

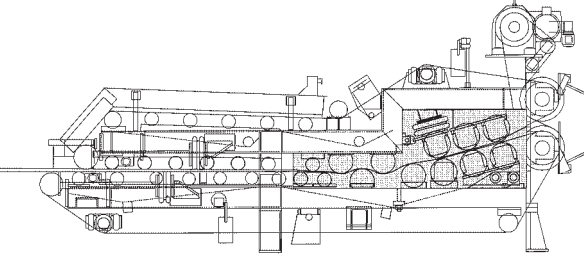
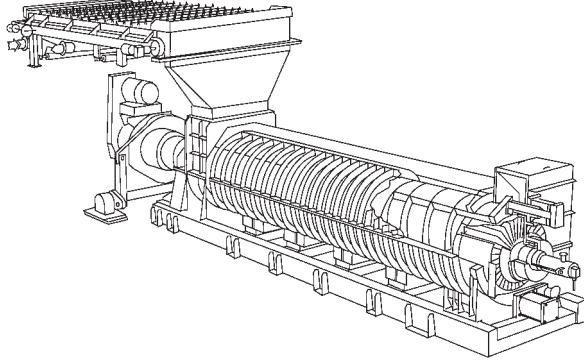
Bleacher

Bleacher		No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Mixer und pump: Rolling bearings Mechanical face seals O-ring seals 2 Oxygen pump and distribution system: Bearings Gears Valves</p>	1	Lubricant is dissolved by bleaching agents Lubricant ages rapidly due to impact of ClO_2 , SO_2 , H_2SO_4 , H_2O_2 , NaOCl , $\text{Ca}(\text{OCl})_2$, NaOH , $\text{Na}_2\text{S}_2\text{O}_4$, CaS_2O_4 , O_2 , O_3 Conventional grease becomes hard and brittle	BARRIERTA L 55/2	This product is chemically inert, thus ensuring the required functional reliability.	
	2	Conventional lubricants are prohibited in context with oxygen. DANGER OF EXPLOSION !	OXIGENOEX sliding agents Contact our Technical Service to help you select a suitable sliding agent.	OXIGENOEX sliding agents are approved by BAM (German Institute for Materials Testing) for the respective pressure range.	

Pulp manufacture

Dewatering

Dewatering presses

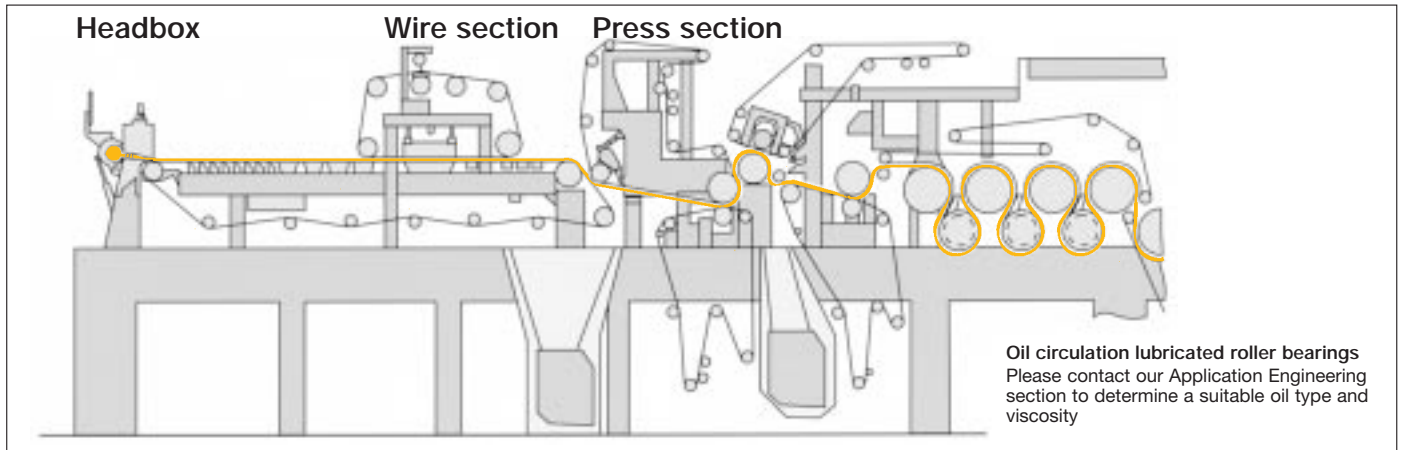
Wire press	No.	Lubrication problem	Recommended product	Advantages
 <p data-bbox="71 824 231 974"> Friction points: Rolling bearings: Drive rolls Press rolls Tension rolls Adjusting rolls Return rolls </p>	1	Relubrication cycles too short	Klüberlub BE 41-1501	Extension of relubrication cycles (e. g. in machines made by Andritz, Austria) up to 150 operating hours
 <p data-bbox="71 1601 231 1646"> Friction points: Rolling bearings </p>	1	High temperatures, lubricant subject to steam Low speeds, high axial and radial loads	Klüberlub BE 41-1501	Minimizes bearing wear. Much longer relubrication cycles than with conventional lubricants.

Notes

Paper manufacture

Headbox – Wire section – Press section

Wet end

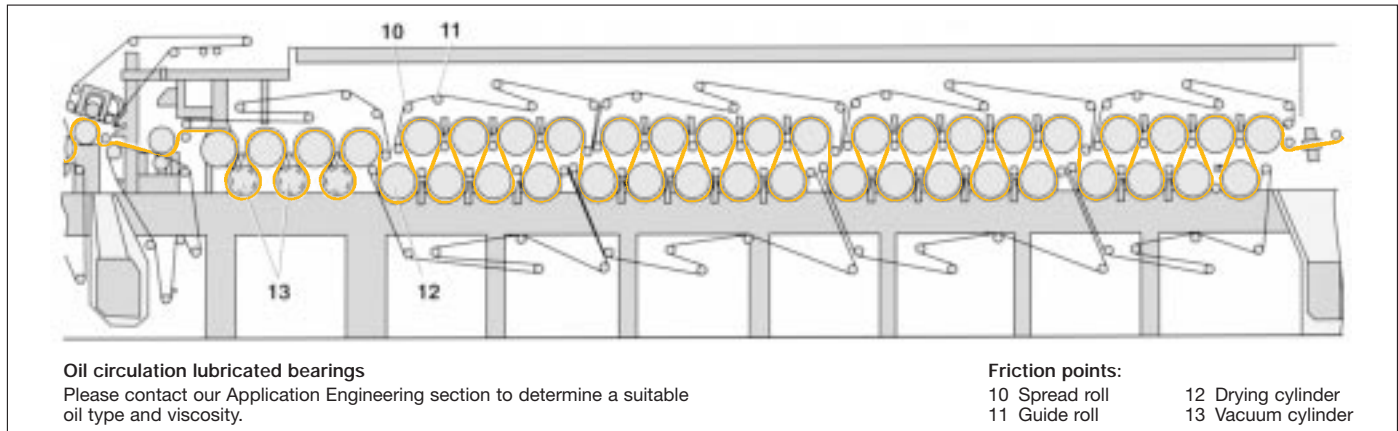


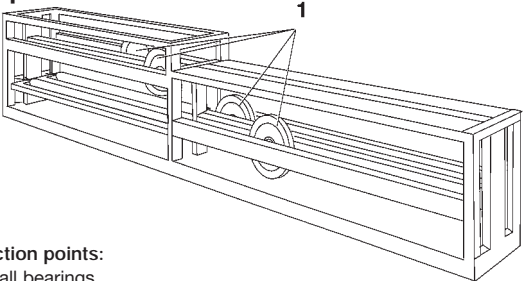
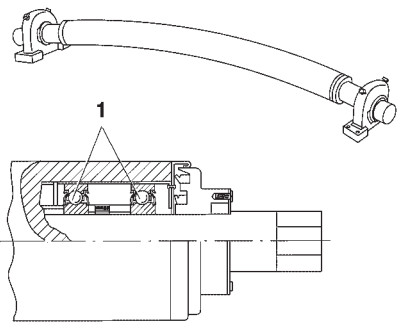
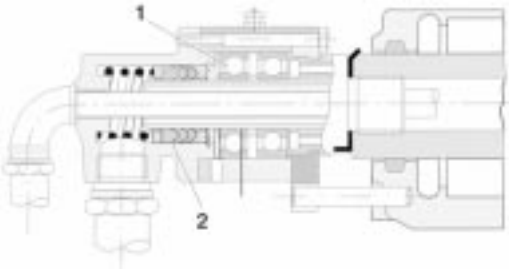
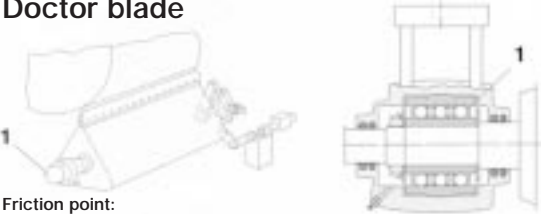
Oil circulation lubricated roller bearings
Please contact our Application Engineering section to determine a suitable oil type and viscosity

Headbox		No	Lubrication problem	Recommended product	Advantages		
<p>Friction points:</p> <p>1 Gross slice adjuster gear (worm gear)</p> <p>2 Micro slice adjuster gear (worm gear)</p> <p>3 Slice adjuster</p>		1	Gear subject to humidity and vibration	Klüberplex GE 11-680	Extended gear life		
		2	Oil separation Grease has insufficient sealing effect Gear subject to humidity	STABURAGS NBU 8 EP	Makes very precise adjustment possible. Grease will stay in friction point. Lifetime lubrication		
		3	Stick slip during adjustment	UNISILKON L 250 L	No stick slip		
<p>Wire section</p> <p>Friction points: Bearing in:</p> <p>1 Breast roll 3 Wire tensioning roll 5 Wire drive roll</p> <p>2 Wire guide roll 4 Wire adjusting roll 6 Suction roll</p>		4	Grease with insufficient sealing effect is washed out of bearings, resulting in corrosion and bearing failure,	Klüberplex BE 31-222 alternatively PETAMO GHY 133 N	Considerably longer relubrication cycle and reduced maintenance. Water or media of varying aggressiveness require suitable lubricants.		
		5				Aggressive water and/or other media accelerate grease ageing.	alternatively STABUTHERM GH 461
		6					
		7					
		8.1					
		8.2					
		9					
		10					
		<p>Press section</p> <p>Friction points: Bearings in:</p> <p>7 Suction pick-up roll 8.2 Press roll 10 Felt guide roll</p> <p>8.1 Suction roll 9 Constant pressure roll (pivoting bearings) 11 Spread roll</p>		11	Bearings subject to high temperatures and humidity High speeds Rotating outer ring Low loads may cause rolling elements to slip Lubricant subject to aggressive cleaning agents	ISOFLEX TOPAS NB 52	Ensures that expected roll life is achieved
<p>Doctor blade</p> <p>Friction point:</p> <p>1 Ball adjusting screw, centralized grease lubrication</p>		1	Wear due to high loads, grease is forced out of bearings, corrosion occurs	STABURAGS NBU 12 / 300 KP	Meets all requirements and is very resistant to ambient media.		

Paper manufacture

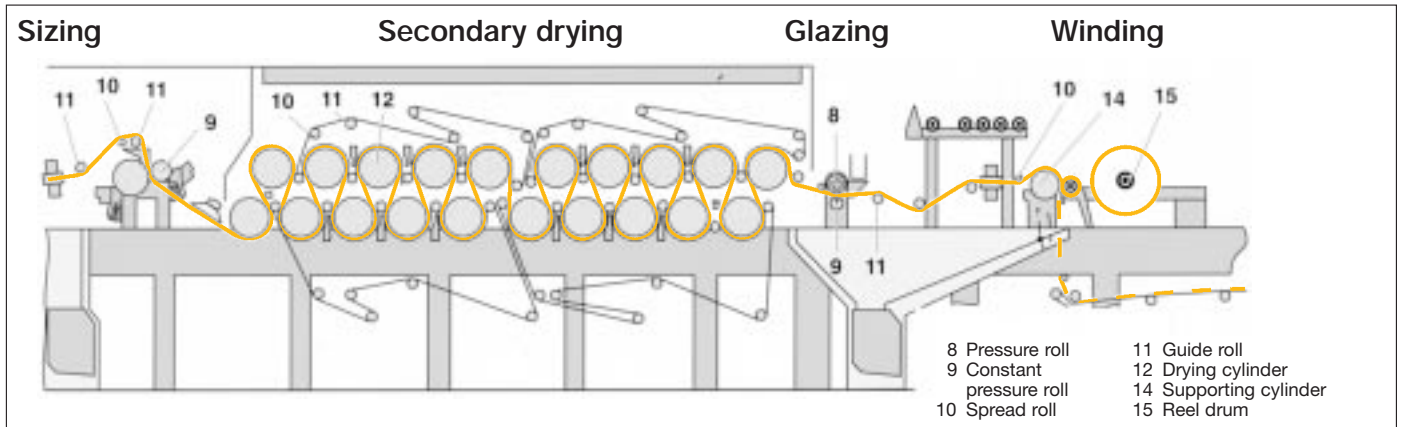
Dry end

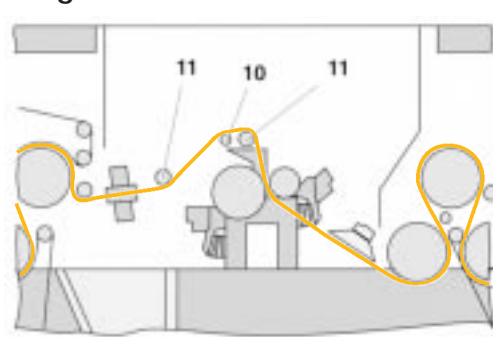
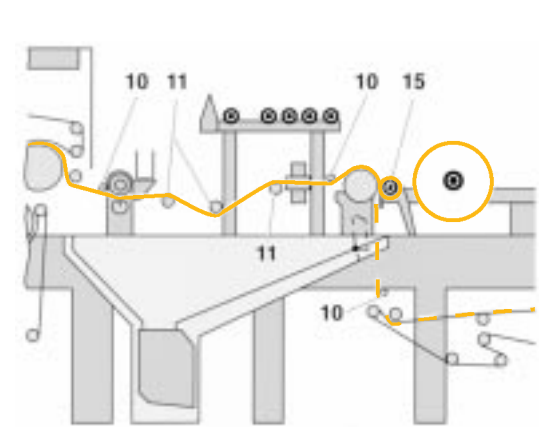


	No.	Lubrication problem	Recommended product	Advantages
Rope sheaves  Friction points: 1 Ball bearings	1	Conventional lubricants are not sufficiently resistant to water and steam, thus resulting in premature bearing failure	Klüberquiet BQ 72-102	Excellent resistance to high temperatures, hot water and steam; meets all requirements
Spread rolls  Friction points: 1 Ball bearings	1	Bearing failure before roll life expires. Oil separation or grease loss results in starved lubrication and corrosion. Reason: High temperature and speed, rotating outer ring.	Up to 80 °C ISOFLEX TOPAS NB 52 or STABURAGS NBU 4 above 80 °C Klüberquiet BQ 72-102	Expected roll life is achieved despite high bearing loads.
Steam heads / Rotating unions  Friction points: 1 Plain and rolling bearings, esp. ball bearings 2 Seals - Stuffing boxes and packings, - assembly of O-ring 3 Centralized lubrication of rotating unions with elastomer seals	1	Frequent relubrication due to high temperatures. Impeded bearing operation.	Up to 180 °C PETAMO GY 193 PETAMO GHY 441 Up to 260 °C BARRIERA L 55/2	Relubrication cycles considerably longer.
	2	Unsuitable grease which is not resistant to high temperatures attacks elastomer parts. Steam head malfunction	UNISILKON TK 44 N 2 UNISILKON L 250 L	Precise axial guiding of seal ring. Greases are resistant to high temperatures and protect elastomer parts.
	3		UNISILKON TK 44 N 2	Do not use on silicone rubber components.
Doctor blade  Friction point: 1 Ball adjusting screw, centralized grease lubrication	1	Wear due to high loads, grease is forced out of bearings, corrosion occurs	STABURAGS NBU 12 / 300 KP	Meets all requirements and is very resistant to ambient media.

Paper manufacture

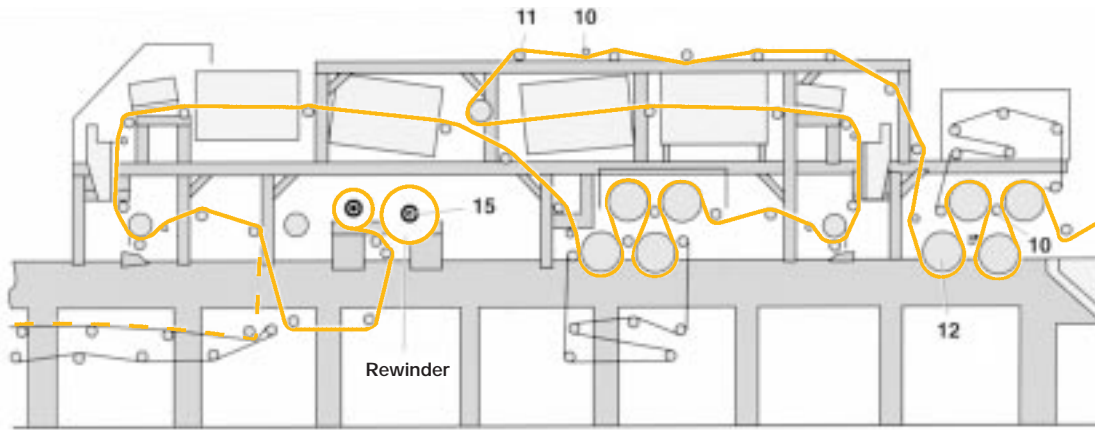
Sizing – Secondary drying – Glazing – Winding



	No.	Lubrication problem	Recommended product	Advantages
Sizing  Friction points: Rolling bearing in 10 Spread roll 11 Guide roll	10	Bearing failure before roll life expires. Oil separation or grease loss results in starved lubrication and corrosion. Reason: High temperature and speed, rotating outer ring.	Klüberquiet BQ 72-102	Usable roll life is achieved despite high bearing loads.
	11	Low loads may cause rolling elements to slip	ISOFLEX TOPAS NCA 52	Ensures function of balls / rolling elements, no sliding wear
Glazing / Winding  Friction points: Rolling bearings in 10 Spread rolls 16 Sliding guides (steel/steel) 11 Guide rolls 15 Reel drum Oil circulation lubricated roll and cylinder bearings Please contact our Application Engineering section to determine a suitable oil type and viscosity.	10	Bearing failure before roll life expires. Oil separation or grease loss resulting in starved lubrication and corrosion. Reason: High temperature and speed, rotating outer ring.	ISOFLEX TOPAS NB 52 alternatively ISOFLEX TOPAS NCA 52	Usable roll life is achieved despite high bearing loads.
	11	Low loads may cause rolling elements to slip		Ensures function of balls/rolling elements, no sliding wear
	15	Standard greases result in premature bearing failure due to high roller weight and high speeds	ISOFLEX TOPAS NCA 52	Bearing life is considerably longer.
	16	Severe surface wear, stick slip, fretting corrosion	Priming UNIMOLY C 220-SPRAY Lubrication ALTEMP Q NB 50-SPRAY	Efficient priming protects against wear and corrosion. Excellent protection against wear and stick slip, easy relubrication, easy disassembly of the components after extended use.
Secondary drying Steam heads / Rotating unions	See page 10			

Upgrading

Coating section

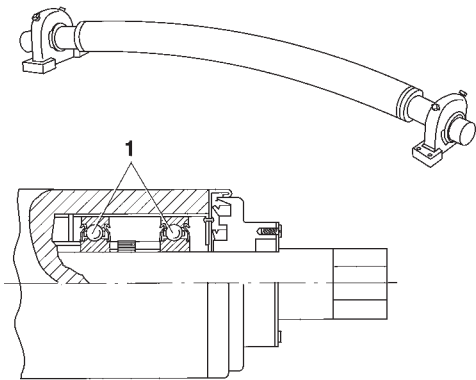


Oil circulation lubricated roll and cylinder bearings

Please contact our Application Engineering section to determine a suitable oil type and required viscosity.

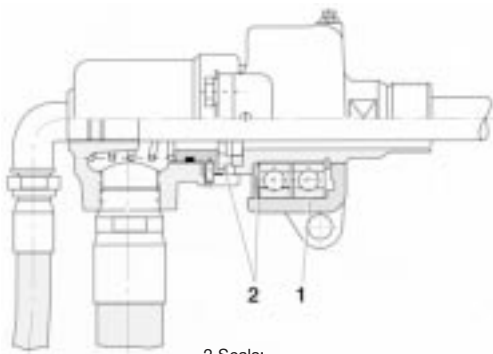
- 10 Spread roll
- 11 Guide roll
- 12 Drying cylinder
- 15 Reel drum

Spread rolls



Friction points:
1 Ball bearings

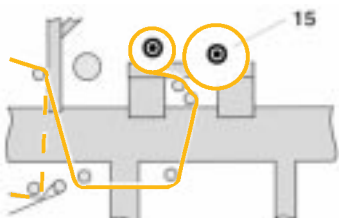
Steam heads / Rotating unions



Friction points:
1 Plain and rolling bearings, esp. ball bearings

2 Seals:
- Stuffing boxes and packings,
- assembly of O-rings
3 Centralized lubrication of rotating unions with elastomer seals

Rewinder

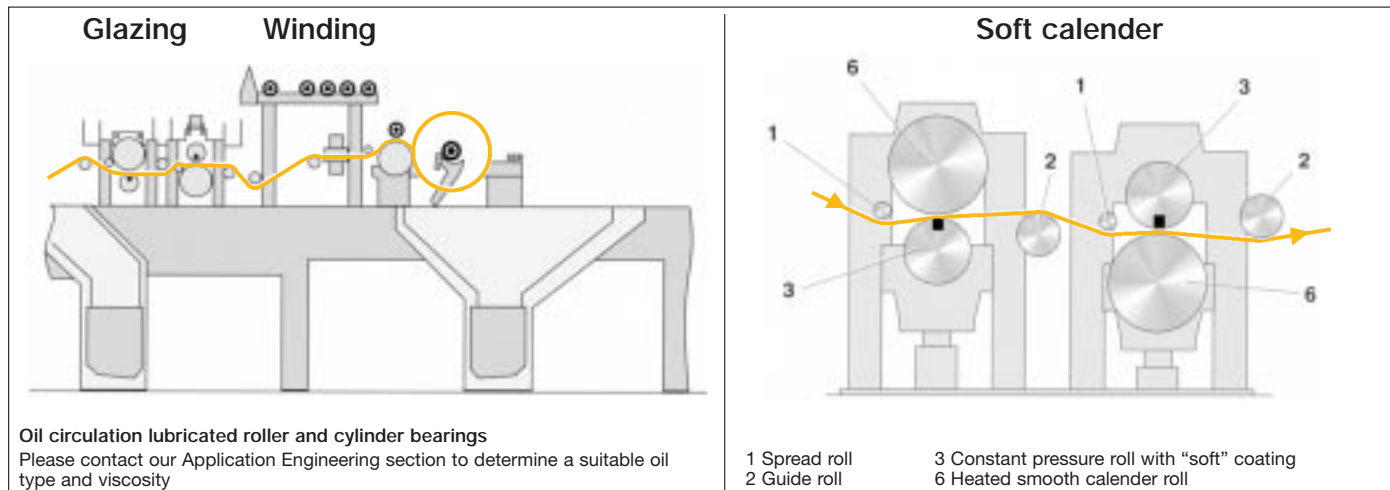


Friction points:
15 Reel drums (rolling bearings)

No.	Lubrication problem	Recommended product	Advantages
1	Bearing temperature approx. 100 °C, high speed, rotating outer ring Standard greases lead to premature bearing failure before the expected life of the roll coating or the roll itself expires	Depending on temperature and type of roll: Klüberquiet BQ 72-102 or BARRIERTA I L (Observe OEM's instructions on other Klüber lubricants)	Usable life of spread rolls is achieved
1	Frequent relubrication due to high temperatures. Impeded bearing operation.	Up to 180 °C PETAMO GY 193 PETAMO GHY 441 Up to 260 °C BARRIERTA L 55/2	Relubrication cycles are considerably longer.
2	Unsuitable grease which is not resistant to high temperatures attacks elastomer parts. Steam head malfunction	UNISILKON TK 44 N 2 UNISILKON L 250 L	Precise axial guiding of seal ring. Greases are resistant to high temperatures and protect elastomer parts.
3		UNISILKON TK 44 N 2	Do not use on silicone rubber components. Check compatibility.
15	Standard grease results in premature bearing failure due to high roll weight and high speeds	ISOFLEX TOPAS NCA 52	Bearing life is considerably longer

Upgrading

Glazing – Winding



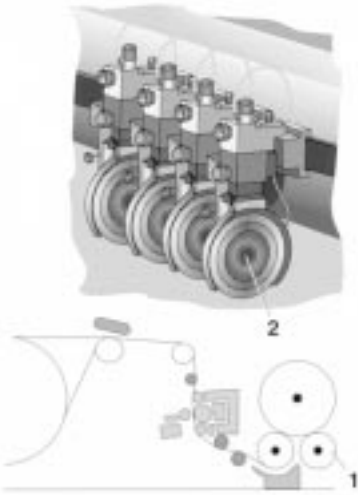
	No.	Lubrication problem	Recommended product	Advantages	
<p>Super calender</p> <p>Friction points: Bearings in 1 Spread roll (deep groove ball bearings) 2 Guide roll 3 Constant pressure roll (oil circulation lubrication) 4 Spread roll (relubricatable) with self-aligning ball bearings or spherical roller bearings 5 Rotating unions – see page 12</p>	1	Standard grease results in premature bearing failure before the expected life of the roll coating or the roll itself is reached	ISOFLEX TOPAS NCA 52 (Observe OEM's specifications on other Klüber lubricants)	Usable life of spread rolls is achieved despite high bearing loads (high speed, rotating outer ring)	
	2	Low loads may cause rolling elements to slip	ISOFLEX TOPAS NCA 52	Ensures function of balls/rolling elements, no sliding wear	
	3	Multi-purpose oil is required (lubricating, heat carrier and hydraulic oil)	SYNTHESO D oils Observe OEM's viscosity specifications!	Fully synthetic oils No oil carbonization	
	6	Oil carbonization		Long usable life Only one oil for three applications	
	<p>Winding machine</p> <p>Friction points: Rolling bearings in 1 Guide roll 2 Spread roll 3 Reel drum 4 Sliding guides (steel/steel)</p>	1	Low loads may cause rolling elements to slip	ISOFLEX TOPAS NCA 52	Ensures function of balls/rolling elements, no sliding wear
		2	Standard grease results in premature bearing failure before the expected life of the roll coating or the roll itself is reached	ISOFLEX TOPAS NCA 52	Expected roll life is reached despite high bearing loads (high speed, rotating outer ring)
3		Standard grease results in premature bearing failure due to high roll weight and high speed	ISOFLEX TOPAS NCA 52	Considerably longer usable life if relubricated regularly	
4		Severe surface wear, stick slip, fretting corrosion	Priming UNIMOLY C 220-SPRAY Lubrication ALTEMP Q NB 50-SPRAY	Efficient priming protects against wear and corrosion. Excellent wear and corrosion protection, no stick slip, easy relubrication, easy disassembly of components even after extended use.	

Finishing Section

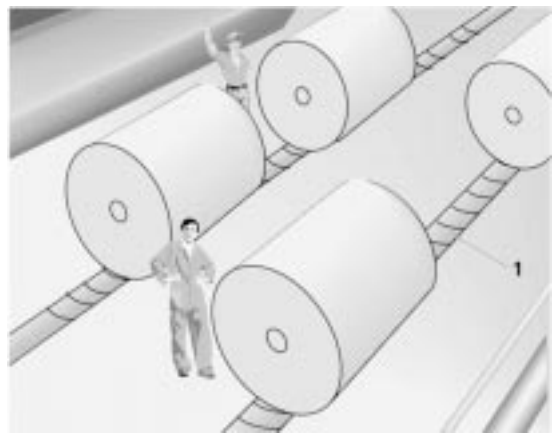
Roll and sheet cutters

Underfloor conveyors

Roll cutter – Sheet cutter

	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Support rollers spherical roller bearings, self-aligning ball bearings 2 Knife holder Bearing</p>	1	General sealing problems in bearings Grease loss causes starved lubrication, high friction and premature bearing failure	ISOFLEX TOPAS NCA 52	The ideal smooth running and high-temperature grease which remains safely in the bearing
	2	High friction due to ingress of paper dust	ISOFLEX TOPAS NCA 52	Dynamically light grease which ensures smooth operation

Underfloor conveyors

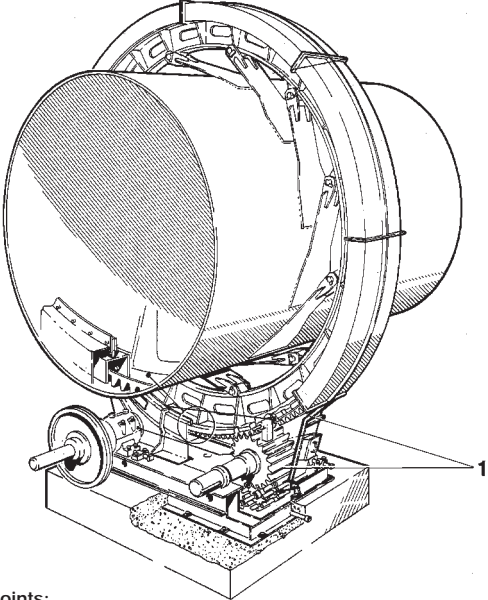
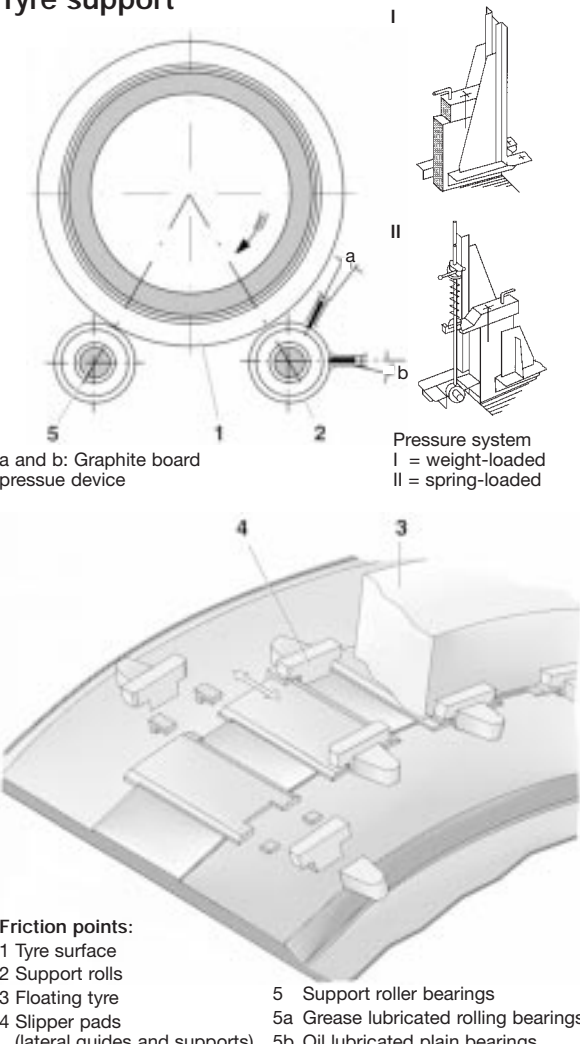
	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Conveyor chain</p>	1	Dripping oil contaminates the chain environment and may pollute waste water	Klüberbio CA 2-460	Synthetic lubricating oil, rapidly biodegradable (CEC-L-33-A-94, 21 days > 705), water pollution category 1

Notes

Chemical recovery

Heating and burning systems

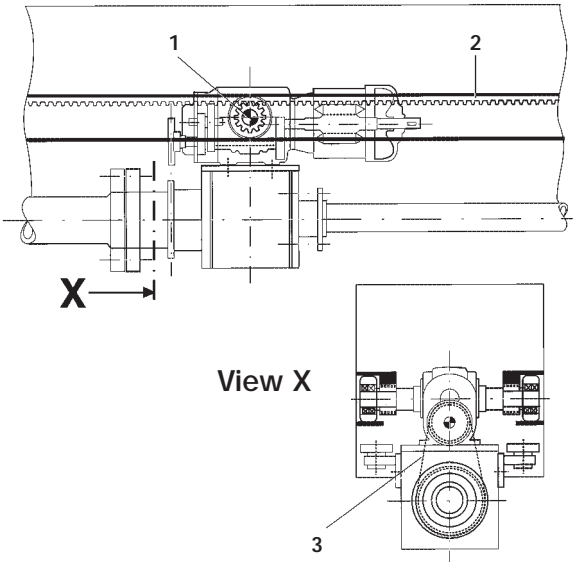

Rotary kiln (lime)

Girth gear drive		No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Pinion and girth gear</p>	1	Excessive lubricant consumption due to high specific flank pressure and high temperatures	For spray lubricated girth gear drives GRAFLOSCON C-SG 2000 ULTRA¹⁾ For immersion lubricated girth gear drives Klüberfluid C-F2 ULTRA¹⁾	Both lubricants are very adhesive and pressure resistant. They ensure optimum wear resistance, especially in the mixed friction regime, and low consumption	
	¹⁾ GRAFLOSCON C-SG 0 ULTRA and Klüberfluid C-F2 ULTRA are operational lubricants for large girth gear drives which have completed the running-in process and whose tooth flanks are in a good condition. The GRAFLOSCON and Klüberfluid series also include running-in and repair lubricants for girth gear drives. Please contact us for more details or ask for our free brochure "Lubrication of large girth gear drives" (9.2e) which provides information about running-in, operational and repair lubrication.				
Tyre support		No.	Lubrication problem	Recommended product	Advantages
 <p>a and b: Graphite board pressure device</p> <p>Pressure system I = weight-loaded II = spring-loaded</p> <p>Friction points: 1 Tyre surface 2 Support rolls 3 Floating tyre 4 Slipper pads (lateral guides and supports) 5 Support roller bearings 5a Grease lubricated rolling bearings 5b Oil lubricated plain bearings</p>	1	Lubricant drips off and ambient dust is attracted when using conventional oils and greases	Dry lubrication with CATENEGRA SG 2 graphite boards	Prevents adhesion of dust, reduces friction and wear due to graphite content	
	2	This results in increased wear of the contact surfaces.			
	3	Extreme operating conditions cause high abrasive wear.	WOLFRACOAT C for lubrication during assembly	Excellent wear protection under boundary friction conditions and high temperatures.	
	4	Bearing clearance is reduced or eliminated, thus leading to tyre seizure.	WOLFRACOAT C FLUID for operational lubrication	The fluid is easily applicable, spreads quickly, and penetrates narrow lubrication gaps.	
	5a	Premature bearing failure, high lubricant consumption, disposal of large quantities required	Klüberlub BE 41-1501	Tyre clearance and relative ring movement on the kiln are ensured.	
5b	Premature bearing failure due to low sliding speed, high load, and high temperature.	SYNTHESO D 1000 EP	Nominal bearing life is achieved.		
			Reduced grease consumption		
			Fully synthetic high-performance oil ensuring excellent wear protection.		
			Extended bearing life, low consumption		

Chemical recovery

Heating and burning systems

Recovery system

Soot blower	No.	Lubrication problem	Recommended product	Advantages
 <p>Friction points: 1 Roller bearings (grease lubricated) 2 Rack and pinion 3 Roller chain Roller bearings (in oil-tight pillow blocks)</p>	1	Grease tends to carbonize Grease is forced out of sealing gaps	PETAMO GHY 441 PETAMO GHY 443	Both greases ensure a long service life Both greases ensure a long service life
		Oil life is too short	SYNTHESO D 1500	Synthetic lubricating oil ensuring a long service life with one-time filling of pillow block
	2	Corrosion, impeded operation due to residues from burning	HOTEMP 2000-SPRAY	Excellent lubricating and separating effect, no accumulation of residues
 <p>Blade adjustment: NOVENCO VARIAX principle</p> <p>Friction points: 1 Induced-draft fan Thrust ball bearings Plain bearings 2 Flue gas fan Ball bearings</p>	1	Lubricant is not sufficiently resistant to high temperatures and impedes fan adjustment	For thrust ball bearing types (shown left): BARRIERIA L 55/3 For plain bearing types: WOLFRAKOTE TOP PASTE	Functional reliability of fans is ensured Long lubricant life
	2	Bearing failure, lubricant tends to carbonize	PETAMO GY 193	No lubricant carbonization, no premature bearing failure

Related equipment

Machine / Component	Lubrication problem	Recommended lubricant	Advantages
Valves and fittings Plug cocks, valves, gate valves / stuffing boxes, spindles, pneumatic drives (seals)	Lubricant is subject to water, steam, various aggressive media, high temperatures	UNISILKON L 250 L	Special silicone grease with excellent resistance to aggressive media und high temperatures. Suitable for many plastics and elastomers.
Electric motors Enclosed rolling bearings Relubricatable ball and cylindrical bearings	Lifetime lubrication required Short relubrication intervals, high consumption	PETAMO GHY 133 N	Ensures lifetime lubrication Relubrication intervals 3 to 5 times longer than with conventional lubricants
Universal shafts supported by ball and needle bearings	Friction points are difficult to access, alternating stress and high temperature cause tribo-corrosion	STABURAGS NBU 8 EP (Observe OEM's recommendations for individual Klüber lubricants)	Reliable prevention of tribo-corrosion, long grease life
Hot air fans Deep groove ball bearings Angular contact ball bearings	Bearing failure due to ingress of pulp and because of high temperatures	STABURAGS NBU 8 EP > 120 °C Klüberquiet BQ 72-102	Greases are resistant to aggressive media. Grease collar seals and protects bearings.
Hydraulic systems Oil fill		LAMORA HLP (Observe OEM's viscosity specifications)	
Chains Drive chains Control chains Transport chains	Excess or dripping oil may contaminate the environment and waste water. High thermal load, high wear of chain links	Klüberbio CA 2-100 Klüberbio CA 2-100 Spray HOTEMP 2000-SPRAY	Synthetic lubricating oil, rapidly biodegradable (CEC-L-33-A-94, 21 days > 70%), water pollution category 1. Resistant to high temperatures, good wear protection
Pumps Rolling bearings		STABURAGS NBU 8 EP	High thermal stability and resistance to aggressive media
Air circulation fans Ball bearings and cylindrical roller bearings	Bearings are subject to aqueous media and humidity, which causes the grease to emulsify and be washed out. Frequent relubrication is necessary to prevent corrosion	PETAMO GY 193 Klüberplex BE 31-102	Relubrication intervals are 3 to 5 times longer than with conventional lubricants
Adjusting spindles Vertical roll adjustment mechanism	High loads and operating temperatures of 120 to 150 °C result in impeded spindle operation and premature failure	GRAFLOSCON C-SG 0 ULTRA	Excellent adhesion and wetting properties ensure functional reliability of spindles

Gear systems

Machine / Component	Lubrication problem	Recommended lubricant	Advantages
Spur and bevel gears	Oil sump temperature too high. Rapid oil ageing, very short oil change intervals.	Klübersynth EG 4 oils High-performance gear oils with synthetic hydrocarbon (HC) base Observe gear OEM's viscosity instructions. Available in all common ISO viscosity grades.	Good friction behaviour, thus lower gear temperatures. Oil change intervals at least 3x longer than with mineral oils.
	Extremely high loads on tooth flanks in mixed friction regime	SYNTHESO D...EP oils up to max. 100 °C Synthetic gear oils for extreme loads with a polyglycol (PG base) Observe gear OEM's viscosity instructions. Available in all common ISO viscosity grades.	Very high scuffing load capacity, oil change intervals up to 5 times longer. Also suitable for hypoid gears (GL 5)
	Severe impact of humidity, e.g. in wet end	Klübersynth GH 6 oils up to 160 °C High-performance gear oils, polyglycol base (PG) Observe gear OEM's viscosity instructions. Available in all common ISO viscosity grades.	Suitable for very high loads and high temperatures
	Gears inaccessible or difficult to access, lubricant cannot be changed	Klübersynth GE 46-1200 Synthetic fluid gear grease on a polyglycol (PG) base	Substantially higher upper temperature limit (up to 120 °C) than mineral fluid greases. Suitable for high loads, long-term and lifetime lubrication.
Worm gears	Oil sump temperature too high Rapid oil ageing, very short oil change intervals High wear of gear wheel and worm Low efficiency Oil leakage	Klübersynth GH 6 oils High-performance gear oils with a polyglycol (PG) base Observe gear OEM's viscosity instructions. Available in all common ISO viscosity grades. alternatively: Klübersynth EG 4 oils (see above) Fluid grease: Klübersynth GE 46-1200 (see above)	Klübersynth GH 6 oils have an excellent wear behavior. Gear temperatures are reduced considerably, and gear efficiency is increased by up to 10%. Special additives reduce wear significantly. Oil change intervals can be up to 5 times longer than with mineral oils.
Open gears	Lubricant is thrown off due to insufficient adhesion, resulting in starved lubrication and increased wear. Adjacent machine components are contaminated.	GRAFLOSCON C-SG 0 ULTRA GRAFLOSCON C-SG 2000 ULTRA	Excellent adhesion and back-flow behaviour, good wear protection. Lubricant is not thrown off, machine components stay clean.

Compressors

Machine / Component	Lubrication problem	Recommended lubricant	Advantages
Screw-type compressors	<p>Formation of residues due to poor oxidation stability.</p> <p>Poor low-temperature behaviour.</p> <p>Inadequate lubricant film under high thermal loads.</p>	<p>Klüber Summit SH oils</p> <p>Compressor oils with synthetic hydrocarbon base</p> <p>Recommended viscosities: DIN 51 519 (ASTM D 2422) ISO VG 32 / 46 / 68 depending on OEM's viscosity specifications</p>	<p>Klüber Summit SH oils meet VDL requirements in acc. with DIN 51 506.</p> <p>Excellent low-temperature behaviour, stable lubricant film at high temperatures.</p> <p>Very little residues, high resistance to oxidation.</p> <p>Reduction of maintenance costs due to oil change intervals of up to 8000 operating hours.</p> <p>Behaviour towards paints, seals and plastics same as that of mineral oils.</p>
<p>Reciprocating compressors</p> <p>Sliding vane compressors</p>	<p>High amount of deposits</p> <p>High oil consumption</p>	<p>Klüber Summit DSL oils</p> <p>Compressor oils with a diester base</p> <p>Recommended viscosities: DIN 51 519 (ASTM D 2422) ISO VG 68 / 100 as well as 125 (not standardized) depending on OEM's viscosity specifications</p>	<p>Klüber Summit DSL oils meet VDL requirements in acc. with DIN 51 506.</p> <p>Excellent lubricity and wear protection.</p> <p>Increased functional reliability because deposits are largely prevented.</p> <p>Oil change intervals of up to 8000 operating hours</p>
Conditioning concentrate for compressors	<p>Lacquer-like deposits and carbonization residues in the entire lubrication system.</p> <p>Expensive cleaning, especially before changing from a mineral to a synthetic oil</p>	<p>Klüber Summit Varnasolv</p> <p>Conditioner to be mixed with compressor oil.</p>	<p>Klüber Summit Varnasolv reliably dissolves lacquer-like and carbonization residues.</p> <p>It is used during operation and does not require the compressor to be shut down for cleaning.</p> <p>Lower maintenance requirements result in cost savings</p>
Test kit for compressor oils		<p>Klüber Summit T.A.N. Kit</p> <p>Simple and quick test to determine the ageing condition of a compressor oil.</p>	<p>Rapid qualitative test on level of ageing.</p> <p>Easy to handle.</p> <p>Suitable for all conventional mineral and synthetic compressor oils.</p>

Maintenance and Repair

Friction point	Lubrication problem	Recommended lubricant	Advantages
Rust remover Threaded connections Sliding fits Positive connections Spindles Actuating drives	Risk of damage and destruction during the disassembly of corroded components	Klüberbio Z 2-5	Rapidly biodegradable rust remover (CEC-L-33-A-94, 21 days > 70%), water pollution category 1. Good penetrating properties, ensures quick non-destructive disassembly of corroded parts.
Lubricating and assembly pastes Bearing seats Bolts Slideways Sliding and guide surfaces Threaded spindles Positive connections	<ul style="list-style-type: none"> - High wear, esp. in case of high surface pressure and low sliding speed - Stick slip and high friction - Tribocorrosion - Seizure and high friction during assembly - Difficult or impossible to disassemble due to corrosion 	ALTEMP Q NB 50 Klüberbio EM 72-81 > 150 °C Klüberpaste HEL 46-450	Both products are excellent lubricating pastes which are applied prior to assembly onto the surfaces exposed to high tribological stress. They facilitate assembly, and reduce wear during operation, ensure uniform operation without stick slip. They also protect reliably against tribocorrosion and allow non-destructive disassembly of components even after a long period of operation.
Bonded coating Couplings Sliding elements Spline shafts Fitting parts Bearing seats	<ul style="list-style-type: none"> - Parts subject to paper dust - Conventional oils and greases become pasty - Lubricant is thrown off 	UNIMOLY C 220-SPRAY	Smooth operation, dry lubricant prevents tribocorrosion and fretting corrosion. Easy application, resistant to high pressure, excellent protection against wear and corrosion

Product Survey

Lubricating greases
Lubricating pastes
Adhesive lubricants

Product data	Product data										
	Base oil / Thickener Solid lubricant	Consistency grade*** DIN 51 818	Worked penetration DIN ISO 2137	Service temperature (0.1 mm), approx. (°C), approx.	Density DIN 51 757 at 20 °C (g/cm ³), approx.	40	100	Base oil viscosity DIN 51 562 (mm ² /s)	Drop point DIN ISO 2176 (°C), approx.	Speed factor** n · d _m (mm / min)	Apparent dynamic viscosity*** Klüber viscosity grade
Klüber product											
ALTEMP Q NB 50 Lubricating paste ALTEMP Q NB 50 SPRAY Sprayable lubricating paste, solvent: hydrocarbon, propellant: propane- butane	Mineral oil, barium complex soap, solid lubricant	3/2	250 to 270	- 15 to 150	1.40	46	6.5	> 170	-	M/S	beige
BARRIERTA I L Lubricating grease	Fluorina- ted poly- ether oil, PTFE	2	265 to 295	- 45 to 260	1.95	160	18	not measur- able	500,000	M	white
BARRIERTA L 55/2 Lubricating grease	Fluorina- ted poly- ether oil, PTFE	2	265 to 295	- 40 to 260	1.96	410	40	not measur- able	300,000	S	white
GRAFLOSCON C-SG 500 PLUS Sprayable adhesive lubricant	Mineral oil, Al complex soap, graphite	0/00	360 to 400	- 30 to 200 ¹⁾	0.96	1,000	-	> 160	-	L	black
GRAFLOSCON C-SG 0 ULTRA Sprayable adhesive lubricant	Mineral oil, Al complex soap, graphite	0	355 to 385	- 30 to 200 ¹⁾	0.96	680	40	> 100	-	M	black
GRAFLOSCON C-SG 2000 ULTRA Sprayable adhesive lubricant	Mineral oil synthetic hydrocar- bon oil, Al com- plex soap, graphite	0	360 to 380	- 20 to 250 ¹⁾	0.98	2,000	95	> 190	-	S	black
ISOFLEX TOPAS NB 52 Lubricating grease	Synthetic hydrocar- bon oil, barium complex soap	2	265 to 295	- 50 to 130	0.96	30	5.5	> 240	1,000,000	M	beige
ISOFLEX TOPAS NCA 52 Lubricating grease	Synthetic hydrocar- bon oil, special calcium soap	2	265 to 295	- 50 to 130	0.89	30	5.5	> 200	1,000,000	L/M	beige
Klüberbio EM 72-81 Rapidly bio- degradable lubricating paste	Ester oil, poly- urea/ solid lubricant	1/2	290 to 330	- 30 to 120	1.11	100	28	> 220	-	L	whitish

¹⁾ Lower value = Functional lubricant film
Upper value = Thermal load carrying limit of the lubricant film, depending on relubrication

Footnotes see page 23

Product Survey

Lubricating greases
Lubricating pastes
Adhesive lubricants

Product data	Klüber product	Base oil / Thickener Solid lubricant	Consistency grade*** DIN 51 818	Worked penetration DIN ISO 2137 (0.1 mm), approx.	Service temperature range* (°C), approx.	Density DIN 51 757 at 20 °C (g/cm ³), approx.		Base oil viscosity DIN 51 562 (mm ² /s) at °C, approx.	Drop point DIN ISO 2176 (°C), approx.	Speed factor** n · d _m (mm / min)	Apparent dynamic viscosity*** Klüber viscosity grade	Colour
						40	100					
	Klüberlub BE 41-1501 Lubricating grease	Mineral oil, special lithium soap, MoS ₂	1	310 to 340	- 10 to 150	0.92	1,500	60	> 180	100,000	S	black
	Klüberpaste HEL 46-450 Lubricating paste	Poly- glycol oil, ester oil, inorganic solid lubri- cants	1	-	- 40 to 1,000 (above 200 °C dry lubri- cation)	1.43	42	10	> 250	-	M	black
	Klüberplex BE 31-102 Lubricating grease	Mineral oil, special calcium soap	2	265 to 295	- 20 to 120	0.96	100	12	> 190	500,000	M	light brown
	Klüberplex BE 31-222 Lubricating grease	Mineral oil, special calcium soap	3/2	245 to 275	- 15 to 140	0.96	220	19	> 190	400,000	M/S	light brown
	Klüberplex GE 11-680 Sprayable adhesive lubricant	Mineral oil, Al complex soap	0/00	380 to 420	- 30 to 200 ¹⁾	0.94	680	-	> 160	-	L	brown
	Klüberquiet BQ 72-102 Lubricating grease	Ester oil, poly- urea	2/3	250 to 280	- 40 to 180	0.97	100	12	> 240	700,000	L/M	beige
	Klübersynth GE 46-1200 Fluid gear grease	Poly- alkylene glycol oil, lithium soap	00	400 to 430	- 30 to 120	0.99	120	20	> 160	-	EL	brown
	PETAMO GHY 133 N Lubricating grease	Mineral oil, synthetic hydrocar- bon oil, polyurea	2	265 to 295	- 30 to 160	0.88	150	18	> 250	500,000	L	beige
	PETAMO GHY 441 Lubricating grease	Ester oil, poly- urea	1	310 to 340	- 30 to 180	0.97	435	36	> 250	250,000	L/M	beige
	PETAMO GHY 443 Lubricating grease	Ester oil, poly- urea	2/3	250 to 280	- 20 to 180	0.97	435	36	> 250	250,000	M/S	beige
	PETAMO GHY 193 Lubricating grease	Ester oil, poly- urea	2/1	270 to 310	- 20 to 180	1.03	160	17.5	> 240	400,000	M/S	beige

¹⁾ Lower value = Functional lubricant film
Upper value = Thermal load carrying limit of the lubricant film, depending on relubrication

Product Survey

Lubricating greases
Lubricating pastes
Adhesive lubricants

Product data Klüber product	Base oil / Thickener Solid lubricant	Consistency grade**** DIN 51 818	Worked penetration DIN ISO 2137 (0.1 mm)	Gebrauchstemperaturbereich* (°C), approx.	Density DIN 51 757 at 20 °C (g/cm ³), approx.	Base oil viscosity DIN 51 562 (mm ² /s) at 20 °C		Drop point DIN ISO 2176 (°C), approx.	Speed factor** n · d _m (mm / min)	Apparent dynamic viscosity*** Klüber viscosity grade	Colour
						40	100				
STABURAGS NBU 4 Lubricating grease	Mineral oil, barium complex soap	3/2	245 to 275	- 20 to 130	0.96	46	7	> 220	500,000	M	beige
STABURAGS NBU 8 EP Lubricating grease	Mineral oil, barium complex soap	2	265 to 295	- 20 to 140	0.99	100	11	> 220	500,000	M	light brown
STABURAGS NBU 12/300 KP Lubricating grease	Mineral oil, barium complex soap	2/1	285 to 315	- 20 to 140	0.97	220	19	> 220	350,000	M	light brown
STABUTHERM GH 461 Lubricating grease	Mineral oil, polyurea	1	310 to 340	- 20 to 180	0.90	490	31.5	> 240	200,000	M	beige, light brown
UNISILKON L 250 L Lubricating grease	Methyl silicone oil, PTFE	3	220 to 250	- 45 to 160	1.27	1,000	360	> 230	-	S	white
UNISILKON TK 44 N 2 Lubricating grease	Silicone oil, sodium complex soap	2	265 to 295	- 40 to 180	1.06	107.5	25	> 230	-	M	beige
WOLFRACOAT C Lubricating grease	Synthetic hydro-carbon oil, silicate, solid lubricant	2/1	270 to 310	- 30 to 1,200 ²⁾	1.01	137	14	none	-	M/S	gray, copper-colored
WOLFRAKOTE TOP PASTE Lubricating paste	Synthetic hydro-carbon oil, solid lubricant	1	300 to 330	- 25 to 1,000 ²⁾	1.30	800	38	> 250	-	S	hell-grau

²⁾ > 200 °C dry lubrication

* Service temperatures are guide values which depend on the lubricant's composition, the intended use and the application method. Lubricants change their consistency, apparent dynamic viscosity or viscosity depending on the mechano-dynamical loads, time, pressure and temperature. These changes in product characteristics may affect the function of a component.

** Speed factors are guide values which depend on the type and size of the rolling bearing and the local operating conditions, which is why they have to be confirmed in tests carried out by the user in each individual case.

*** Apparent dynamic viscosity, Klüber viscosity grades:

EL = extra light lubricating grease; L = light lubricating grease;
M = medium lubricating grease; S = heavy lubricating grease;
ES = extra heavy lubricating grease

**** Consistency grade:

Consistency grade DIN 51 818 (NLGI)	Worked penetration DIN ISO 2137 (0.1 mm)	Texture
000 00 0	445 to 475 400 to 430 355 to 385	fluid almost fluid extremely soft
1 2 3	310 to 340 265 to 295 220 to 250	very soft soft medium
4 5 6	175 to 205 130 to 160 85 to 115	hard very hard extremely hard

Product Survey

Lubricating oils

Product data Klüber product	Type of oil	ISO VG DIN 51 519		Service temperature range* (°C), approx.	Density DIN 51 757 at 20 °C (g/ml), approx.		Kinematic viscosity DIN 51 562, pt. 1 (mm ² /s) at °C, approx.	Viscosity index (VI) DIN ISO 2909, approx.	Flash point DIN ISO 2592 (°C), approx.	Pour point DIN ISO 3016 (°C), approx.	Product information Application notes
		–	0 to 250		40	100					
HOTEMP 2000-SPRAY	Ester oil, synthetic hydrocarbon oil	–	0 to 250	0.94	2,000	126	153	265	– 10	High-temperature chain oil, excellent adhesion, very good wear protection. Easy application Solvent: hydrocarbon Propellant: propane-butane	
Klüberbio CA 2-100 Klüberbio CA 2-100 SPRAY	Ester oil	100	See product info column	0.94	100	15	> 140	> 200	< – 30	Fully synthetic rapidly biodegradable multi-purpose oils (CEC-L-33-A-94, 21 days > 70%), water pollution category 1. <i>Service temperature range*:</i> Immersion lubrication of gears and chains: ISO VG 100 approx. – 25 °C to 110 °C ISO VG 460 approx. – 20 °C to 110 °C	
Klüberbio CA 2-460	Ester oil	460	See product info column	0,95	460	50	> 160	> 220	< – 20	Functional lubricant film on chains: ISO VG 100 to approx. – 35 °C ISO VG 460 to approx. – 30 °C Thermal load limit for lubricant film in case of total loss lubrication, depending on relubrication: to approx. 160 °C	
Klüber Summit DSL 32	Ester oil	32	–	0.92	31	5	70	> 220	< – 40	Diester base compressor oils for reciprocating, screw-type and sliding vane compressors. Meet VDL requirements in acc. with DIN 51506.	
Klüber Summit DSL 68		68	–	0.97	64	8.2	95	> 240	≤ – 35	Excellent lubricity and anti-wear properties. Prevent deposits, thus ensuring functional reliability. Oil change intervals up to 8000 operating hours.	
Klüber Summit DSL 100		100	–	0.97	95	10.2	90	> 250	≤ – 30	Recommended viscosities: Reciprocating compressors: 100/125 Sliding vane compressors: 68/100/125 Screw-type compressors: 68	
Klüber Summit DSL 125		–	–	0.97	125	13.1	100	> 260	≤ – 30		
Klüber Summit SH 32	Synthetic hydrocarbon oil, ester oil	32	–	0.85	32	6.0	140	> 230	≤ – 50	Compressor oils with a synthetic hydrocarbon base for reciprocating, screw-type, sliding vane and centrifugal compressors. Meet VDL requirements in acc. with DIN 51506.	
Klüber Summit SH 46		46	–	0.86	46	7.8	140	> 240	≤ – 45	Excellent low-temperature behaviour, stable lubricant film at high temperatures. Minimized residue formation, oil change intervals up to 8000 operating hours.	
Klüber Summit SH 68		68	–	0.88	62	10	145	> 240	≤ – 45	Recommended viscosities: Reciprocating compr.: 100 Sliding vane compr.: 68/100 Screw-type compr.: 46/68 Centrifugal compr.: 32	
Klüber Summit SH 100		100	–	0.87	100	12.0	140	> 240	≤ – 35		

Footnotes see page 23

Product Survey

Lubricating oils

Product data	Product data											
	Klüber product	Type of oil	ISO VG DIN 51 519	Service temperature range* (°C), approx.	Density DIN 51 757 at 20 °C (g/ml), approx.	40	100	Kinematic viscosity DIN 51 562, pt. 1 (mm ² /s) at °C, approx.	Viscosity index (VI) DIN ISO 2909, approx.	Flash point DIN ISO 2592 (°C), approx.	Pour point DIN ISO 3016 (°C), approx.	Product information notes
Klüber Summit T.A.N.-Kit Test kit for compressor oils	–	–	–	0.8	–	–	–	–	–	–	–	Blue fluid for rapid determination of a compressor oil's ageing condition. Easy to handle, suitable for all conventional and synthetic compressor oils
Klüber Summit Varnasolv Conditioner concentrate for compressors	Ester oil, emul- sifier	–	–	0.98	78	–	–	> 165	–	–	–	Cleaning concentrate to be mixed with existing compressor oil. Reliably dissolves deposits and carbonization residues. Used during operation, does not require compressor to be shut down.
Klübersynth EG 4-150	Synthetic hydro- carbon oil, ester oil	150	– 35 to 140	0.87	150	18	ca. 130	> 200	approx. – 40	High-performance lubricating oils for all gear types except hypoid gears. Excellent low-temperature characteristics, miscible with mineral oil residues, largely neutral to conventional seals and paints. Good wear protection, excellent corrosion protection, very resistant to ageing and oxidation. Scuffing load stage > 12 and work-related change in weight ≤ 0,2 mg/kWh in stringent FZG test (A/16.6/140)		
Klübersynth EG 4-220		220	– 350 to 140	0.88	220	24	ca. 130	> 200	approx. – 35			
Klübersynth EG 4-320		320	– 30 to 140	0.88	320	30	ca. 130	> 200	approx. – 30			
Klübersynth EG 4-460		460	– 30 to 140	0.88	460	38	ca. 130	> 200	approx. – 35			
Klübersynth EG 4-680		680	– 25 to 140	0.89	680	50	ca. 130	> 200	approx. – 25			
Klübersynth EG 4-1000		1000	– 15 to 120	0.90	1000	65	ca. 135	> 200	approx. – 15			
Klübersynth GH 6-32	Poly- alkylene- glycol	32	– 45 to 160	0.98	32	7	> 150	> 220	< – 45	High-performance oils, high scuffing resistance, good wear protection. Scuffing load stage > 12 and work-related change in weight ≤ 0,2 mg/kWh in stringent FZG test (A/16.6/140). Very resistant to ageing and oxidation, particularly suitable for high-temperature lubrication. Mainly used on worm gears, but also suitable for spur and bevel gears. Cont'd		
Klübersynth GH 6-80		–	– 35 to 160	1.05	80	18	> 190	> 280	< – 35			
Klübersynth GH 6-100		100	– 35 to 160	1.05	100	20	> 190	> 280	< – 35			
Klübersynth GH 6-150		150	– 35 to 160	1.05	150	28	> 200	> 280	< – 35			
Klübersynth GH 6-220		220	– 30 to 160	1.06	220	42	> 220	250	– 35			
Klübersynth GH 6-320		320	– 30 to 160	1.05	320	58	> 220	> 280	< – 30			

Footnotes see page 23

Product Survey

Lubricating oils

Product data		Product data									Product information Application notes
Klüber product	Type of oil	ISO VG	DIN 51 519	Service temperature range* (°C), approx.	Density DIN 51 757, at 20 °C (g/ml), approx.		Kinematic viscosity DIN 51 562, pt. 1 (mm ² /s) at °C, approx.	Viscosity index (VI) DIN ISO 2909, approx.	Flash point DIN ISO 2592 (°C), approx.	Pour point DIN ISO 3016 (°C), approx.	
					40	100					
Klübersynth GH 6-460	Poly- alkylene glycol	460	- 35 to 160	1.05	460	78	> 230	280	< - 40	Not miscible with oils containing a different base oil. Check compatibility with seals, paints, sight glasses, etc.	
Klübersynth GH 6-680		680	- 25 to 160	1.05	680	116	> 260	> 280	< - 25		
Klübersynth GH 6-1000		1000	- 25 to 160	1.05	1000	167	> 260	> 280	< - 25		
LAMORA HLP 32	Mineral oil	32	- 25 to 120	0.87	32	5.4	100	> 200	- 30	HLP hydraulic oils in acc. with DIN 51524 / 2	
LAMORA HLP 46		46	- 20 to 120	0.88	46	7.0	100	> 210	- 30		
LAMORA HLP 68		68	- 15 to 120	0.88	68	8.8	100	> 220	- 25		
SYNTHESO D 220	Poly- alkylene glycol oil					100	150			High -temperature lubricating and heat carrier oils, excellent resistance to ageing and oxida- tion, very good viscosity-tem- perature behavior. High pressure absorption capacity and good wear protec- tion, therefore suitable as work- ing medium in hydraulic sys- tems, as heat carrier fluid and for the lubrication of rolling bearings subject to high tem- peratures.	
SYNTHESO D 460		220	- 25 to 180	1.04	38	18.4	> 200	> 250	< - 30		
SYNTHESO D 680		460	- 25 to 180	1.05	75	35	> 230	> 250	< - 30		
SYNTHESO D 1000		680	- 25 to 180	1.05	110	43	> 250	> 250	< - 25		
SYNTHESO D 1500		1000	- 20 to 180	1.05	170	71	> 270	> 250	< - 20		
SYNTHESO D 1500	1500	0 to 180	1.08	230	90	> 270	> 250	0			
SYNTHESO D 68 EP	Poly- alkylene glycol oil					40	100			High-performance gear oils for spur and bevel gears subject to extreme loads. Also suitable for hypoid gears. ISO VG 220 and 460 oils pass the FZG-L-42 test (hypoid gear test).	
SYNTHESO D 100 EP		-	- 35 to 100	1.04	80	15.5	> 180	> 200	< - 40		
SYNTHESO D 150 EP		100	- 35 to 100	1.04	107	-	> 210	> 200	- 40		
SYNTHESO D 150 EP	150	- 35 to 100	1.05	150	29	> 210	> 200	< - 40	Cont'd		

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Product Survey

Lubricating oils
Fluid
Coating

Product data Klüber product	Type of oil	ISO VG DIN 51 519		Service temperature range* (°C), approx.		Density DIN 51 757, at 20 °C (g/ml), approx.		Kinematic viscosity DIN 51 562, pt. 1 (mm ² /s) at °C, approx.		Viscosity index (VI) DIN ISO 2909, approx.		Flash point DIN ISO 2592 (°C), approx.		Pour point DIN ISO 3016 (°C), approx.		Product information Application notes
		40	100	40	100	40	100	40	100	40	100	40	100			
SYNTHESO D 220 EP	Poly-alkylene glycol oil	220	-30 to 100	1.05	220	38	> 210	> 200	< -35	SYNTHESO D...EP oils are not miscible with oils containing a different base oil. Check compatibility with seals, paints, sight glasses, etc.						
SYNTHESO D 320 EP		320	-30 to 100	1.05	320	60	> 230	> 200	< -30							
SYNTHESO D 460 EP		460	-30 to 100	1.05	460	75	> 230	> 200	< -30							
SYNTHESO D 680 EP		680	-20 to 100	1.05	680	110	> 250	> 200	< -25							
SYNTHESO D 1000 EP		1000	-20 to 100	1.05	1,000	170	> 270	> 200	< -20							
UNIMOLY OIL 1500	Mineral oil MoS ₂	1500	0 to 120	0.93	1,500	60	90	230	0	Multi-purpose oil for industrial applications						

Product data Klüber product	Oil type / Solid lubricant / Thickener	Service temperature range* (°C), approx.		Cone penetration of lubricating grease in acc. with Klein worked penetration at 25 °C Density DIN 51 757, at 20 °C (g/ml), approx.		Kinematic base oil viscosity DIN 51 562, pt. 1 (mm ² /s) at °C, approx.		Product information, application notes
		40	100	40	100	40	100	
Klüberfluid C-F 2 ULTRA	Mineral oil, graphite, aluminium soap	See product info column	450	1.00	3,200	95	Operational lubricant for open girth gear drives, especially developed for immersion and circulation lubrication. Resistant to high pressure, contains antiwear additives and corrosion inhibitors. Free from bitumen, solvents, heavy metals and chlorine. Application by immersion: from 5 °C Application through circulation lubrication systems: from 15 °C to 80 °C Functional lubricant film: to -30 °C Thermal load limit of lubricant film: to 200 °C	

Product data Klüber product	Service temperature range* of solvent free film, °C, approx.		Colour	Solid lubricant	Drying time at 20 °C, dry to the touch/ completely hard	Yield m ² /liter, approx. with a film thickness of 10 µm	Friction coefficient (Tannert 20 °C) V _{max} = 0.243 mm/s, F = 300 N	Product information application notes
	40	100						
UNIMOLY C 220 SPRAY	-180 to 450	gray	MoS ₂	5 min/30 min	7	approx. 0.10	Hygrosetting bonded coating, wide service temperature range, excellent metal adhesion. Suitable for high vacuum. Solvent: ester Propellant: propane-butane	

Footnotes see page 23

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