

your global specialist

Seaworthy.

A selection of lubricants for marine
and offshore applications





We offer more than just lubricants	3
Selection of applications: Optimally equipped with our speciality lubricants	6
Selected lubricants for ships and offshore platforms from Klüber Lubrication	8
Lubricant dispensers	18

We offer more than just lubricants

Efficiency, sustainability, competitiveness and profitability are crucial for your business success. Our lubricants and services can contribute to your success and competitiveness. In a personal exchange with you, we would like to introduce our services and discuss the comprehensive advantages of our products. Please take advantage of our knowledge and learn how we can help create comprehensive efficiency gains. If we do not have the right speciality lubricant for your application, let us talk about a new development.

The lubricant - a small investment that makes a big difference

Lubricants have a major impact on maintenance costs and the service life of equipment. We work in close cooperation with manufacturers of components and equipment to extend service intervals and component lifetime while increasing operational reliability and efficiency. The investment in a lubricant is

relatively small - however it can make a big difference. Even on OEM lubricant lists, there can be significant differences in the performance of the approved lubricants. Speciality lubricants from Klüber Lubrication are always a good choice.

Speciality lubricants from Klüber Lubrication – the benchmark for the marine industry

Our lubricants have proven effective for boats, ships and offshore platforms. Unique tribological know how, raw materials of highest quality and our experience in designing lubricants in close cooperation with leading OEMs from different industries are the backbone for our benchmark setting marine products. Whether hydrodynamic oil film thickness, load carrying capacity, corrosion protection, water wash out stability, resistance to hydrolysis and oxidation or very low temperature performance – our speciality lubricants are right at the forefront of lubrication technology.

An example: Test results show superior water resistance with Klüberplex AG 11-462

Grease loss due to rain, waves, and spray on steel wire rope and other deck equipment contributes to increased lubricant usage and higher operating costs. Klüberplex AG 11-462 with its excellent water resistance and adhesion offers:

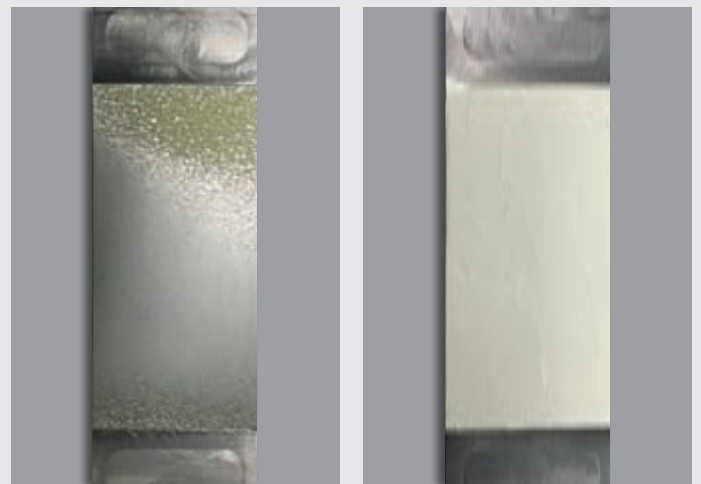
- Extended re-lubrication intervals
- Lower grease consumption
- Better corrosion and wear protection

This helps lower your operating costs and increase your profits.

Test procedure ASDM D-4049

1. Application of approx. 3 g of grease onto steel plate and weigh
2. Spray water (38 °C, 2.8 bar) for 5 minutes
3. Clear all grease that was pushed off of the top surface of the plate
4. Dry at 66 °C for 1 hour, then reweigh
5. Calculate % of grease sprayed off of the plate

Test result ASDM D-4049 (Water spray off)



Standard EP2 grease after test:
88 % spray-off

Klüberplex AG 11-462:
1 % spray-off

We offer more than just lubricants

Unique product portfolio – complemented by outstanding bio-products

Reducing the impact on the environment is important to the shipping and offshore industry. We have a comprehensive selection of high performance lubricants including an industry leading range of speciality marine products that meet the highest environmental requirements.

Legislation, regulation and compliance – we are your reliable partner

We take our time to develop our powerful and innovative products to ensure superior performance in addition to meeting regulatory requirements such as the US Vessel General Permit

(VGP), Ecolabel program, OSPAR convention, and others. Compliance plus performance is a must for us.

Unique testing and analytic facilities – foundation for tailor-made products

Klüber Lubrication only launches a new lubricant after it has been put through extensive testing. Your specific requirements are our yardstick. In the lab we are able to simulate the extreme stresses placed on lubricants in the marine and offshore environments. Our unique testing facilities include more than 100 test rigs, some of which we developed for our own particular testing purposes. We also perform our own lubrication analysis of field samples to expand our formulation experience and safeguard quality and performance.

An example: Clean deck and increased safety – no drip down of Klüberplex AG 11-462

Adhesion is important for open gear and steel wire rope lubricants to prevent dripping down, especially in tropical temperatures or on sun heated surfaces.

Due to its unique composition, Klüberplex AG 11-462 shows excellent adhesion to metal. Customers benefit from reduced wear of machine elements and better corrosion protection.

In addition operators benefit from:

- Lower work load and grease consumption
- Cleaner decks – increasing worker safety
- Extended life of equipment operating in harsh environmental conditions.

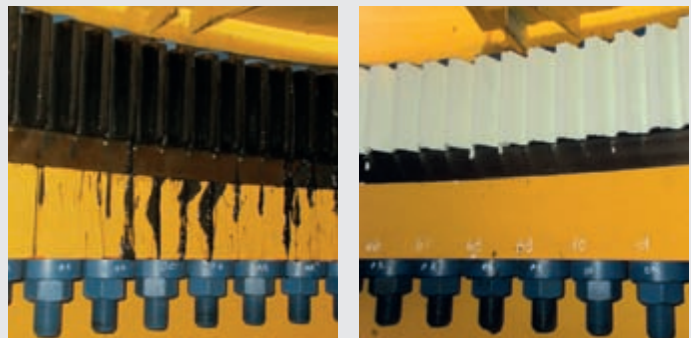
In-house adhesion test



NLGI 2 open gear grease Klüberplex AG 11-462

Pictures show 2.5 mm thick grease layer after 48 h at 70 °C on a vertically positioned sheet metal

Open slewing gear lubricated with



– standard black lubricant

– Klüberplex AG 11-462

Result: Klüberplex AG 11-462 achieves better adhesion on metal surfaces at higher temperatures than other open gear lubricants.



Market leader – more than 85 years of experience

We have decades of experience and know what the industry expects. Klüber Lubrication is the global market leader in speciality lubricants and tribological high-end solutions. Multinational groups as well as small- and medium-sized companies from a wide variety of industries have been relying on our competence and know-how.

We are closer to you – wherever you are

Wherever your ship may be: you can rely on our experienced experts who provide support and advice on lubrication and help you select the right lubricant. It is our aim to offer you high-quality speciality lubricants and services around the globe along with the high technical competence Klüber Lubrication is known for. We meet this aim through our worldwide network of

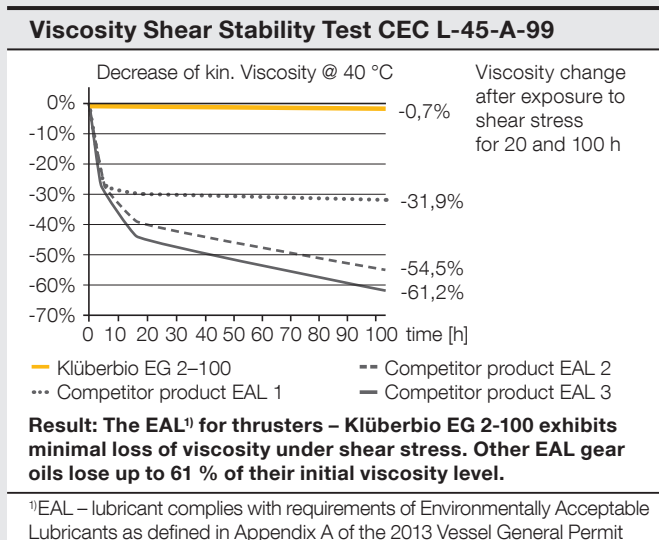
production and sales companies, competent dealers and our highly specialised experts ready to respond to your individual requirements.

Klüber Lubrication – our worldwide mission

It is our mission to be your first choice and long-term partner for speciality lubricants. Our approach is different and sets us apart in a world filled with generic lubricant suppliers. Whether you are looking for a specific lubricant to maximise the efficiency of a single component or you are looking for a high performance general purpose lubricant to support standardization, we provide the service and consultation to select the most suitable lubricant for your equipment according to your requirements. In summary, we sell speciality lubricant solutions, not commodities. We will serve your whole fleet – locally or worldwide. Contact us soon to begin your partnership with Klüber Lubrication.

An example: High shear stability of Klüberbio EG 2 gear oils ensure long service of equipment and lubricant

One measure of a lubricant's protective value is how well it withstands shearing under pressure. "Shear Stability" describes a lubricant's ability to resist a decrease in viscosity due to exposure to mechanical loads. Maintaining the appropriate viscosity is critically important to both protect the equipment with a proper lubrication film and to extend the time between oil change intervals.



With our speciality lubricants you can increase your:

- Operation and maintenance efficiency
- Profitability
- Productivity
- Competitiveness
- Sustainability
- Workplace safety



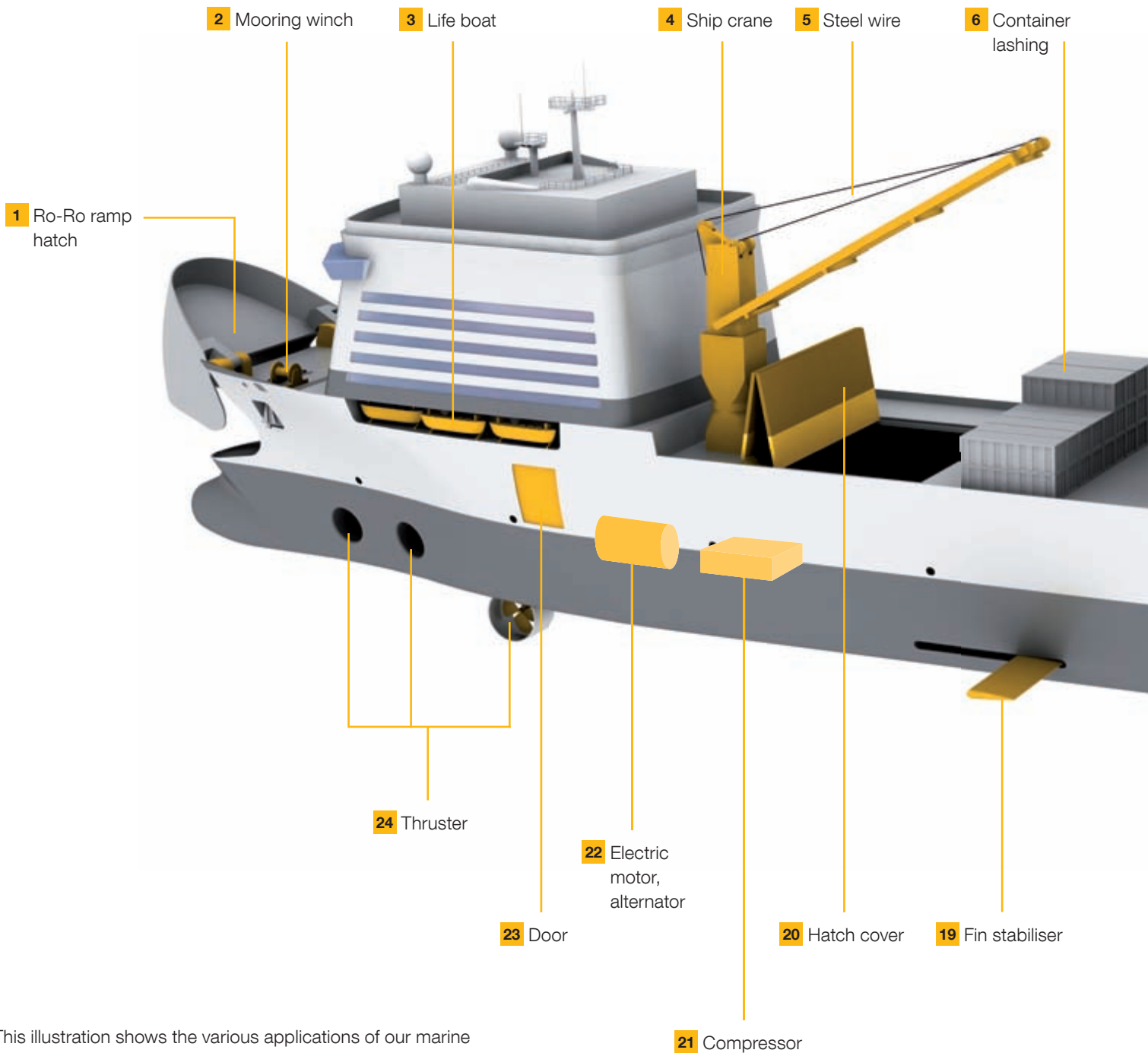
And you can reduce your:

- Maintenance costs
- Wear
- Failure risk
- Procurement costs
- Disposal costs

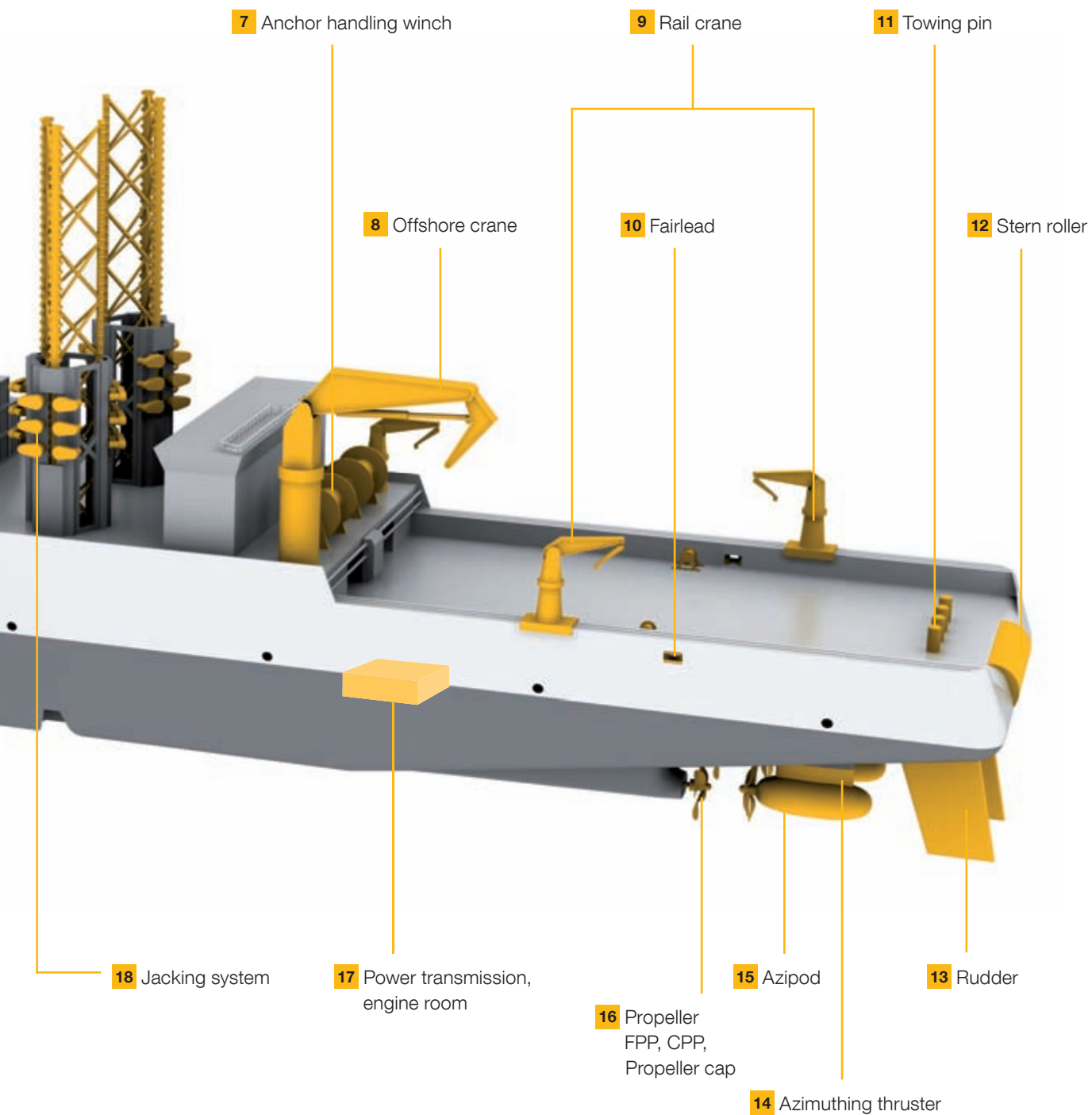


Please see www.kluebermarine.com for more information about us and our speciality lubricants for the marine industry.

Selection of applications: Optimally equipped with our speciality lubricants



This illustration shows the various applications of our marine lubricants. To show as many applications as possible in one illustration, we included components of the following ship types in this synthetic ship: Ferry, cruise ship, cargo ship, wind turbine installation vessel, anchor handling tug supply vessel.



Selected lubricants for ships and offshore platforms

Module	Component/ lubrication point	Speciality lubricant from Klüber Lubrication	Base oil viscosity at 40 °C (104 °F) according to DIN 51562 part 1 [mm ² /s], appr.	Compressor oil	Hydraulic oil according to HEES, ISO 15380	Gear oil according to CLP, DIN 51517-3
1	Ro-Ro ramp, hatch	Hydraulic system	Klüberbio LR 9-32 Klüberbio LR 9-46 Klüberbio LR 9-68	32 46 68	✓ ✓ ✓	
		Steel wire rope	Klüberbio AG 39-602 Klüberplex AG 11-462	600 460		
		Hinge, bearing	Klüberplex AG 11-462	460		
2	Mooring winch	Hydraulic system	Klüberbio LR 9-32 Klüberbio LR 9-46 Klüberbio LR 9-68	32 46 68	✓ ✓ ✓	
		Enclosed gearbox	Klüberoil GEM 1-100 N Klüberoil GEM 1-150 N	100 150		✓ ✓
			Klüberbio EG 2-100 Klüberbio EG 2-150	100 150		✓ ✓
	Open gear	Klüberplex AG 11-462 Klüberbio AG 39-602	460 600			
		Life boat	Hinge, bearing	Klüberbio BM 32-142 Klüberplex AG 11-462	140 460	
Steel wire rope	Klüberplex AG 11-462 Klüberbio AG 39-602		460 600			
	Ship crane		Hydraulic motor/cylinder	Klüberbio LR 9-32 Klüberbio LR 9-46 Klüberbio LR 9-68	32 46 68	✓ ✓ ✓
Offshore crane		Sheave bearing	Klüberbio BM 32-142	140		
Rail crane		Hinge	Klüberbio BM 32-142 Klüberplex AG 11-462	140 460		
	Open gear on hoisting winch	Klüberplex AG 11-462	460			
	Open gear at slewing bearing and drive pinion tooth rack & pinion	Klüberplex AG 11-462	460			
	Steel wire rope	Steel wire rope	Klüberplex AG 11-462 Klüberbio AG 39-602	460 600		
Container lashing		Twist lock	Klüberplex BE 11-462	500		
	Turnbuckle threads	Klüberplex AG 11-462	460			

empty field = not relevant; + = good; ++ = excellent; ✓ = applicable



	Grease, NLGI class	Wear protection and load carrying capacity	Corrosion protection	Adhesion	Resistance to water spray-off and washout	Low temperature performance	Compatibility with elastomers	Demulsifying oil	Biodegradation > 60 %, OECD 301 B or F	European Ecolabel	OSPAR	Environmentally Acceptable Lubricant
		+	+			++	++	++	✓	✓		✓
		+	+			++	++	++	✓	✓		✓
		+	+			++	++	++	✓	✓		✓
	1-2	++	++	++	++	+			✓			✓
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	2	++	++	++	++							

Selected lubricants for ships and offshore platforms

Module	Component/ lubrication point	Speciality lubricant from Klüber Lubrication	Base oil viscosity at 40 °C (104 °F) according to DIN 51562 part 1 [mm ² /s], appr.	Compressor oil	Hydraulic oil according to HEES, ISO 15380	Gear oil according to CLP, DIN 51517-3
7 Anchor handling winch	Open gear Running-in lubricant	GRAFLOSCON B-SG 00 ULTRA	500			
	Open gear Operational lubricant for central lubrication systems	Klüberfluid C-F 3 ULTRA	16,500			
		Klüberbio LG 39-700 N	680			
	Open gear Operational lubricant for manual lubrication	Klüberplex AG 11-462	460			
		Klüberbio AG 39-602	600			
	Enclosed gear box	Klübersynth GEM 4-220 N	220			✓
		Klübersynth GEM 4-320 N	320			✓
		Klüberbio EG 2-320 ¹⁾	320			✓
	Bearing – rolling bearing	Klüberplex AG 11-462	460			
		Klüberbio BM 32-142	140			
Anchor winch spooling device	Klüberplex AG 11-462	460				
	Klüberbio AG 39-602	600				
Hydraulic motor	Klüberbio LR 9-68	68		✓		
10 Fairlead	Bearing – plain bearing	Klüberplex AG 11-462	460			
		Klüberbio AG 39-602	600			
		Klüberbio BM 32-142	140			
11 Towing pin	Bushing, bronze plain bearing	Klüberplex AG 11-462	460			
		Klüberbio AG 39-602	600			
12 Stern roller	Bearing – plain bearing	Klüberbio LG 39-700 N	680			
13 Rudder	Bearing and seal	Klüberbio LG 39-701 N	680			
		Klüberbio AG 39-602	600			
		Klüberbio BM 32-142	140			
14 Azimuthing thruster	Gear and bearing	Klüberbio EG 2-68	68			✓
		Klüberbio EG 2-100	100			✓
		Klüberbio EG 2-150	150			✓
	Steering shaft seal	Klüberbio AG 39-602	600			

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¹⁾under development



	Grease, NLGI class	Wear protection and load carrying capacity	Corrosion protection	Adhesion	Resistance to water spray-off and washout	Low temperature performance	Compatibility with elastomers	Demulsifying oil	Biodegradation > 60 %, OECD 301 B or F	European Ecolabel	OSPAR	Environmentally Acceptable Lubricant
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	0	++	+	+	+	++	++		✓		✓	✓
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		++	+			++	++	++	✓	✓		✓
	1-2	++	++	++	++	+	++		✓			✓

Selected lubricants for ships and offshore platforms

Module	Component/ lubrication point	Speciality lubricant from Klüber Lubrication	Base oil viscosity at 40 °C (104 °F) according to DIN 51562 part 1 [mm ² /s], appr.	Compressor oil	Hydraulic oil according to HEES, ISO 15380	Gear oil according to CLP, DIN 51517-3	
15 Azipod V	Azipod V and X – slewing bearing with gear teeth	Klübersynth GEM 4-320 N	320			✓	
		Klüberbio EG 2-320 ¹⁾	320			✓	
	Azipod X	Klüberfluid C-F 3 ULTRA	16,500				
	Azipod V and X – sealing grease for turning shaft seal	Klüberbio AG 39-602	600				
		Azipod VI – seal and support bearing (ice operation)	Klüberbio LG 39-701 N	680			
	Azipod V – thrust bearing	Klübersynth GEM 4-320 N	320			✓	
	Azipod X – thrust bearing (hybrid bearing)	Klübersynth GEM 4-150 N	150			✓	
	Azipod V and X – propeller shaft bearing	Klübersynth GEM 4-320 N	320			✓	
	Azipod C	Azipod X – propeller shaft seal	Klüberbio RM 2-150	150			
		Azipod C – slewing bearing	MICROLUBE GL 262	280			
Azipod C – propeller shaft bearing and seal		MICROLUBE GL 262	280				
Azipod C – gear teeth on slewing bearing		GRAFLOSCON C-SG 0 ULTRA	680				
Azipod C – thrust bearing		Klübersynth GEM 4-320 N	320			✓	
16 Propeller	Stern tube bearing and propeller shaft seal	Klüberbio RM 2-100	100				
		Klüberbio RM 2-150	150				
	Servo system for pitch setting	Klüberbio EG 2-68	68			✓	
		Klüberbio LR 9-46	46		✓		
	Propeller cap	Klüberbio LR 9-68	68		✓		
		Klüberbio AG 39-602	600				
		Klüberbio BM 32-142	140				

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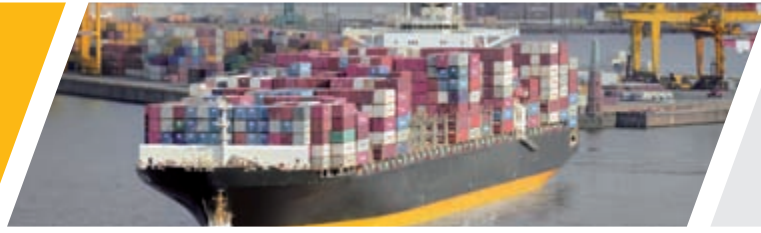


	Grease, NLGI class	Wear protection and load carrying capacity	Corrosion protection	Adhesion	Resistance to water spray-off and washout	Low temperature performance	Compatibility with elastomers	Demulsifying oil	Biodegradation > 60 %, OECD 301 B or F	European Ecolabel	OSPAR	Environmentally Acceptable Lubricant
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Selected lubricants for ships and offshore platforms

Module	Component/ lubrication point	Speciality lubricant from Klüber Lubrication	Base oil viscosity at 40 °C (104 °F) according to DIN 51562 part 1 [mm ² /s], appr.	Compressor oil	Hydraulic oil according to HEES, ISO 15380	Gear oil according to CLP, DIN 51517-3
17 Power transmission	Marine reduction gearbox	Klüberoil GEM 1-100 N	100			✓
		Klüberoil GEM 1-150 N	150			✓
	Curved tooth gear coupling – oil lubrication	Klübersynth GEM 4-100 N	100			✓
		Klübersynth GEM 4-150 N	150			✓
	Curved tooth gear coupling – grease lubrication	STRUCTOVIS BHD MF	4,750			
		Klüberoil GEM 1-460 N	460			✓
	Split roller bearing for propeller shaft	GRAFLOSCON C-SG 500 PLUS	680			
Klüberlub BE 41-1501		1,500				
Klüberplex GE 11-680		680				
18 Jacking system	Tooth rack and pinion – manual lubrication	Klüberbio AG 39-602	600			
	Tooth rack and pinion – automatic lubrication	Klüberbio LG 39-700 N Klüberbio LG 39-701 N	680			
	Planetary gearbox	Klübersynth GH 6-320	320			✓
19 Fin stabiliser	Shaft bearing, rigging axis bearing	Klüberbio EG 2-100	100			✓
		Klüberbio EG 2-150	150			✓
	Mechanical arm and pivot lubrication points	Klüberbio AG 39-602	600			
		Klüberbio BM 32-142	140			
	Hydraulic power unit	Klüberbio LR 9-32 Klüberbio LR 9-46 Klüberbio LR 9-68	32 46 68		✓ ✓ ✓	

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		+	+			++	++	✓	✓		✓	

Selected lubricants for ships and offshore platforms

Module	Component/ lubrication point	Speciality lubricant from Klüber Lubrication	Base oil viscosity at 40 °C (104 °F) according to DIN 51562 part 1 [mm ² /s], appr.	Compressor oil	Hydraulic oil according to HEES, ISO 15380	Gear oil according to CLP, DIN 51517-3
20 Hatch cover	Hydraulic system	Klüberbio LR 9-32 Klüberbio LR 9-46 Klüberbio LR 9-68	32 46 68		✓ ✓ ✓	
	Tooth rack (MacRack), hinge	Klüberplex AG 11-462	460			
21 Compressor	Gas screw compressor	Klüber Summit PGS 68 Klüber Summit PGS 100 Klüber Summit PGS 150	68 100 150	✓ ✓ ✓		
	Gas piston compressor	Klüber Summit NGL-444 Klüber Summit NGL-555 Klüber Summit NGL-777 Klüber Summit NGL-888	80 100 150 220	✓ ✓ ✓ ✓		
	Screw and piston compressors for refrigeration	Klüber Summit R 100	32	✓		
		Klüber Summit R 150	46	✓		
		Klüber Summit R 200	68	✓		
	Compressed air screw and piston compressor	Klüber Summit PGI 68	68	✓		
Klüber Summit PGI 100		100	✓			
Klüber Summit PGI 150		150	✓			
22 Electric motor	Electric motor bearing Generator bearing	Klüberplex BEM 41-132	120			
	23 Door	Hydraulic system	Klüberbio LR 9-32 Klüberbio LR 9-46 Klüberbio LR 9-68	32 46 68		✓ ✓ ✓
Hinge		Klüberbio AG 39-602	600			
24 Thruster Swing-up thruster Tunnel thruster		Gear and bearing	Klüberbio EG 2-68	68		
	Klüberbio EG 2-100		100			✓
	Klüberbio EG 2-150		150			✓

empty field = not relevant; + = good; ++ = excellent; ✓ = applicable

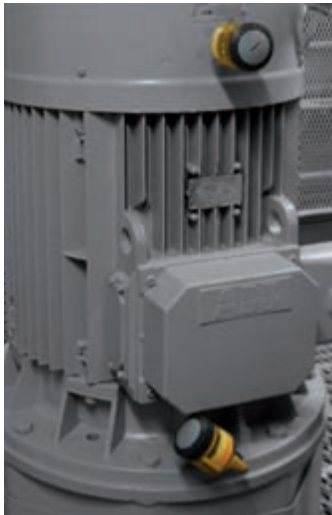


	Grease, NLGI class	Wear protection and load carrying capacity	Corrosion protection	Adhesion	Resistance to water spray-off and washout	Low temperature performance	Compatibility with elastomers	Demulsifying oil	Biodegradation > 60 %, OECD 301 B or F	European Ecolabel	OSPAR	Environmentally Acceptable Lubricant
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Lubricant dispensers

Many lubrication points are difficult to access or a special challenge from a health and safety perspective.

To increase safety, reliability and machine availability, Klüber Lubrication supplies high-performance oils and greases in “intelligent packages” for automatic lubrication of your machines and components.



Engine room applications:

- fan bearings
- electric motor bearings
- pump bearings

Lubrication system:

- Klübermatic FLEX 60 cm³
- Klübermatic FLEX 125 cm³

Selected lubricants are available in automatic lubricant dispensers for single-point lubrication.

These tried-and-tested electromechanical or electrochemical devices are available with various speciality lubricants.



Life raft davit applications:

- rolling bearings
- cable pulley

Lubrication system:

- Klübermatic FLEX 60 cm³

Flexible – for use in demanding applications

Klübermatic FLEX is a compact, ready-to-use lubricator. It can be used for diverse applications at temperatures between –20 °C and +60 °C. The lubrication interval can be selected in monthly increments between 1 and 12 months. An electronically controlled chemical reaction generates the pressure to ensure continuous fresh lubricant supply to the lubrication point at set intervals. Klübermatic FLEX is available in volumes of 60 cm³ and 125 cm³.

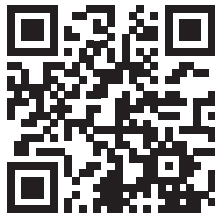
Applications

Klübermatic FLEX is particularly suitable for single-point lubrication in rolling and plain bearings, slideways, open gears, toothed racks, shaft seals and chains. The lubrication system is dust-tight and protected against splash water (according to IP 68).



For an overview of our biodegradable and environmentally acceptable lubricants, please see our brochure 'Powerful, Naturally'.

Find our brochures on www.kluebermarine.com/brochures



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The data in this document is based on our general experience and knowledge at the time of publication and is intended to give information of possible applications to a reader with technical experience.

It constitutes neither an assurance of product properties nor does it release the user from the obligation of performing preliminary field tests with the product selected for a specific application. All data are guide values which depend on the lubricant's composition, the intended use and the application method. The technical values of lubricants change depending on the mechanical, dynamical, chemical and thermal loads, time and pressure. These changes may affect the function of a component. We recommend contacting us to discuss your specific application.

If possible we will be pleased to provide a sample for testing on request. Klüber products are continually improved. Therefore, Klüber Lubrication reserves the right to change all the technical data in this document at any time without notice.

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Klüber Lubrication – your global specialist

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