Powerful, naturally.
Environmentally acceptable and biodegradable lubricants for the marine industry
Superior environmentally friendly lubricant portfolio – Powerful, naturally

Reducing impacts from shipping operations on the environment is important to the future of our planet. We are increasingly successful in developing products suited to comply with the requirements of the marine industry. Klüber Lubrication already has the most comprehensive range of lubricants for this industry, meeting the highest environmental requirements.

Your economic benefits – we offer more than lubricants

Efficiency, sustainability, competitiveness and profitability are crucial for business success. Our products 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.

Klüber Lubrication – the benchmark for speciality lubricants

Our wide portfolio of synthetic, environmentally friendly lubricants is a real alternative to conventional mineral oils. Unique tribological know how, raw materials of highest quality, customised additive packages and our decades of experience in designing lubricants in close cooperation with leading OEMs from different industries are the backbone for our benchmark-setting marine product range.

Whether hydrodynamic oil film thickness, load carrying capacity, corrosion protection, water washout stability, resistance to hydrolysis and oxidation or low-temperature performance – our speciality lubricants are right at the forefront of lubrication.

An example: superior wear protection with Klüberbio LG 39-700 N / 701 N

Klüber Lubrication’s new open gear greases – formulated with more than 90% renewable materials – combine biodegradability and strong performance.

Klüberbio LG 39-700 N and 701 N set benchmarks in wear protection, low-temperature performance and reduced environmental impact:
- Lifetime of equipment
- Energy consumption
- Operational costs
- Reliability and efficiency

<table>
<thead>
<tr>
<th>Modified FZG slow speed wear test acc. to DGMK 377-01</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Graph showing wear test results for Klüberbio LG 39-700 N and 701 N" /></td>
</tr>
</tbody>
</table>

Klüberbio LG 39-700 N and 701 N show lower wear rates than other open gear lubricants.
An example: superior hydrodynamic oil film thickness with Klüberbio RM 2 stern tube oils

Oil film thickness ensuring hydrodynamic lubrication is a key prerequisite for reliable operation of propeller shafts.

Klüberbio RM 2-100/150 oils provide a significantly higher oil film thickness and load carrying capacity under dynamic operation than other available EALs and thus prevent high-temperature alarms and journal bearing failures.

Further key performance characteristics and advantages are:
- Resistance against scoring/wear
- Shear and oxidation stability
- Inherent viscosity of base oil – no viscosity improvers added
- Good seal compatibility (approved by all leading OEMs)
- Demulsifying oil

Oil film thickness vs. speed
Test results of 100 mm²/s stern tube oils at 40°C

Klüberbio RM 2-100 achieves higher oil film thickness in hydrodynamic operation than other EAL stern tube oils.
Selection of speciality lubricants on board

Mooring winch
Hydraulic system: Klüberbio LR 9
Gear: Klüberbio EG 2
Bearings: Klüberbio BM 32-142

Life boats
Bearings: Klüberbio AG 39-602
Steel wire ropes: Klüberbio AM 92-142

Ship crane
Bearings: Klüberbio BM 32-142
Slewing gear: Klüberbio AG 39-602
Hydraulic system: Klüberbio LR 9

Steel wire rope
Klüberbio AM 32-142

Mooring winch
Hydraulic system: Klüberbio LR 9
Gear: Klüberbio EG 2
Bearings: Klüberbio BM 32-142

Life boats
Bearings: Klüberbio AG 39-602
Steel wire ropes: Klüberbio AM 92-142

Ship crane
Bearings: Klüberbio BM 32-142
Slewing gear: Klüberbio AG 39-602
Hydraulic system: Klüberbio LR 9

Steel wire rope
Klüberbio AM 32-142

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.

Ro-Ro ramps hatches, doors
Hydraulic system: Klüberbio LR 9

ATB coupling
Klüberbio AM 12-501

Thruster
Klüberbio EG 2

Doors
Hydraulic system: Klüberbio LR 9

Air compressor
Klüber Summit DSL

Hatch cover
Hydraulic system: Klüberbio LR 9

Fin stabiliser
Klüberbio EG 2-150
Klüberbio LR 9
Bearings: Klüberbio AG 39-602
Klüberbio BM 32-142

Selection of speciality lubricants on board

Mooring winch
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Slewing gear: Klüberbio AG 39-602
Hydraulic system: Klüberbio LR 9

Steel wire rope
Klüberbio AM 32-142

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Slewing gear: Klüberbio AG 39-602
Hydraulic system: Klüberbio LR 9

Steel wire rope
Klüberbio AM 32-142

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.
**Jacking system**
Tooth rack & pinion: Klüberbio LG 39-700 N/-701 N, Klüberbio AG 39-602

**Planetary gearbox**
Klüberbio EG 2-320

**Anchor handling winch**
Open gear: Klüberbio AG 39-602, Klüberbio LG 39-700 N/-701 N
Enclosed gear: Klüberbio EG 2-320
Hydraulic motor: Klüberbio LR 9
Steel wire rope: Klüberbio AM 92-142

**Offshore crane**
Bearings: Klüberbio BM 32-142
Slewing gear: Klüberbio AG 39-602
Hydraulic system: Klüberbio LR 9
Steel wire rope: Klüberbio AM 92-142

**Rail crane**
Bearings: Klüberbio BM 32-142
Hydraulic system: Klüberbio LR 9
Steel wire rope: Klüberbio AM 92-142
Rack & pinion: Klüberbio AG 39-602

**Fairleads**
Bearings: Klüberbio BM 32-142
Klüberbio AG 39-602

**Azipod**
Propeller shaft seal: Klüberbio RM 2
Steering shaft seal: Klüberbio AG 39-602
Klüberbio LG 39-701 N
Slewing bearing: Klüberbio EG 2-320

**Rudder**
Bearings and seals: Klüberbio LG 39-700 N/-701 N
Klüberbio AG 39-602

**Stern roller**
Bearings: Klüberbio LG 39-700 N

**Propeller stern tube**
Klüberbio RM 2

**Towing pins**
Klüberbio AG 39-602

**Folding and stabilisation**
Stabiliser: Klüberbio EG 2-150
Klüberbio LR 9
Bearings: Klüberbio AG 39-602
Klüberbio BM 32-142

**Steel wire rope**
Klüberbio AM 92-142
## Environmentally acceptable (EAL) and biodegradable lubricants for the marine industry

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<tr>
<th>Product type</th>
<th>Speciality lubricant from Klüber Lubrication</th>
<th>Characteristic and environmentally relevant information</th>
<th>Module (selection)</th>
<th>Component (selection)</th>
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<td>- ISO VG 100</td>
<td>- Controllable pitch propeller</td>
<td>- Stern tube bearing and propeller shaft seal</td>
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<td></td>
<td></td>
<td>- Biodegradability &gt; 60 %</td>
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<td>- European Ecolabel</td>
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<tr>
<td>Gear oil</td>
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<td>- Gear set, bearings and seal</td>
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<td>- Meet CLP requirements according to ISO 51517-3</td>
<td>- Azipod from ABB</td>
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<td>- Biodegradability &gt; 60 %</td>
<td>- Anchor handling / mooring winch</td>
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<td>- European Ecolabel</td>
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<td>- EAL</td>
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<td>- Meet HEES requirements according to DIN ISO 15380</td>
<td>- Ship crane</td>
<td>- Servo piston inside the hub</td>
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<td>- European Ecolabel</td>
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<td>Klüberbio C 2-46</td>
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<td>Compressor oil</td>
<td>Klüber Summit DSL 32, Klüber Summit DSL 46, Klüber Summit DSL 68, Klüber Summit DSL 100 *</td>
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<td>- Rack and pinion gear</td>
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<td>- Anchor handling winch</td>
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<td>- European Ecolabel</td>
<td>- Stern roller</td>
<td>- Slow turning gear</td>
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<td>- EAL</td>
<td>- Rudder bearing</td>
<td>- Bearing</td>
</tr>
<tr>
<td>Open gear grease</td>
<td>Klüberbio LG 39-700 N, Klüberbio LG 39-701 N</td>
<td>- NLGI 0, NLGI 1</td>
<td>- Jack-up system</td>
<td>- Rack and pinion gear</td>
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<td>- OSPAR, Denmark, Norway Yellow 1</td>
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<td>- EAL</td>
<td>- Thruster / azipod (sealing grease)</td>
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<tr>
<td>Open gear and steel wire rope grease</td>
<td>Klüberbio AG 39-602</td>
<td>- NLGI 1 – 1.5</td>
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<td>- Rack and pinion gear</td>
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<td>- EAL</td>
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<td>- Offshore crane</td>
<td>- Bearing</td>
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<td>- Thruster / azipod (sealing grease)</td>
<td>- Seal</td>
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<tr>
<td>Multi-purpose EP 2 grease</td>
<td>Klüberbio BM 32-142</td>
<td>- NLGI 2</td>
<td>- Deck machinery</td>
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<td>- Biodegradability &gt; 60 %</td>
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<td>Wire rope grease</td>
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<td>- EAL</td>
<td>- Anchor handling / mooring winch</td>
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<tr>
<td>ATB coupling grease</td>
<td>Klüberbio AM 12-501</td>
<td>- NLGI 1</td>
<td>- ATB coupling</td>
<td>- Bearings</td>
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<td>- Pin</td>
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<td>Rust removing agent</td>
<td>Klüberbio Z 2-5</td>
<td>- ISO VG 5</td>
<td>- Miscellaneous</td>
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<td></td>
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<td>- Biodegradability &gt; 60 %</td>
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</tbody>
</table>

ISO viscosity class according to DIN ISO 3448; Consistency grade according to DIN 51818; Biodegradability according to OECD 301 F/B test after 28 days EAL = lubricant complies with requirements of Environmentally Acceptable Lubricants as defined in Appendix A of the 2013 Vessel General Permit

* Biodegradability according to OECD 301 B after 35 days
For an overview of our other lubricants for the marine industry, please see our brochure “Seaworthy“

Find our brochures on www.kluebermarine.com/brochures

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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.