

Safer process.
Safer profit.



rhenus

HIGH-PERFORMANCE

**Special greases for the
commercial vehicle industry**



The invisible components

They ensure durable functions, minimise noise, increase convenience, withstand extreme loads and are tailored to materials with high precision – Rhenus Lub's special greases for the commercial vehicle industry.

As much research, development and experience has gone into them as into many other complex components. They are mostly invisible to the user and yet indispensable. For the powertrain, chassis, body and interior.

rhenus special greases are tailored to your applications and goals. With a level of reliability that has been tried and tested a million times over. We provide you with the optimum solution for your lubricant problem, be it from our extensive lubricating grease portfolio or as an innovation partner in the development of new lubricating greases for your pioneering technologies.



Put your trust in the quality of Rhenus Lub. We are certified according to IATF 16949, ISO 9001, ISO 14001 and ISO 45001, and meet the strict auditing requirements of suppliers and OEMs.

What makes rhenus special?

It is the combination of optimal products tailored to your requirements and a partnership offering real added value.

- Global availability
- Compliant with the chemical regulations in all countries and of all OEMs
- Approvals in the commercial vehicle industry
- Expertise in material compatibility
- Testing expertise and capacity
- Problem-solving expertise

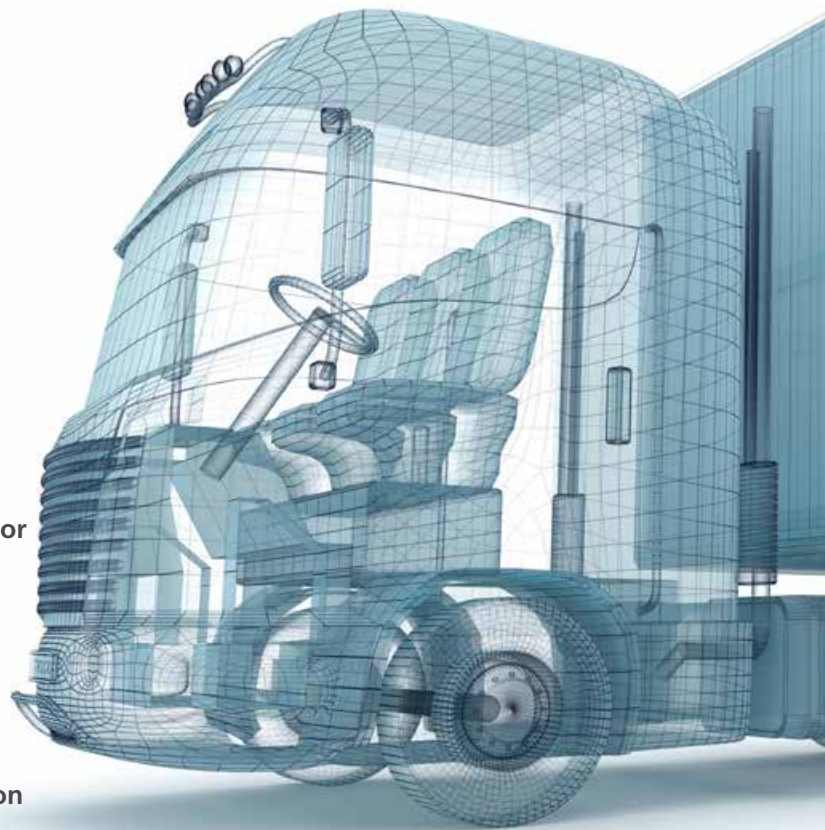


One partner for all special greases

Rhenus Lub is a partner who offers you the perfect solution for each of your applications and specifications. Work with us to reduce your administrative burden and maximise the success of your projects.

Drive

- **Lubrication of roller bearings and plain bearings (demanding operating conditions)**
- **Transmissions with liquid grease / central lubrication systems**
- **Engine**
 - Starter
 - Alternator
 - Fuel system
 - Exhaust system
 - Belt tensioner
- **E-mobility roller bearing applications**
- **Gearshift**
- **Release mechanism**
- **DMF**
- **Transmission actuator**
- **Drive shaft**
- **Shaft seals / transmissions**
- **Wheel bearings, hubs, axle lubrication**
- **Slack adjuster**



Chassis

- **Brake system**
 - Valves
- **Brakes**
 - Hydraulic
 - Electromechanical
 - Parking brake
 - Assembly aids
 - Brake paste
- **Steering**
 - Steering column
 - Steering gear
 - EPS worm gear
 - EPS ball screw
 - Tie rod joint
 - Rear wheel steering
- **Axle**
 - Ball joints
 - Rubber mounts
 - Strut bearing
 - Active roll stabiliser
- **Landing gear lubrication**
- **Lubrication for drive spindles and landing gears**
- **Ball bearing turntables**
- **Fifth wheel plate (5 point / 1 point)**

Body

- **Door kinematics**
- **Locks**
- **Window mechanisms**
 - Gear motor
 - Sliding guides
- **Sunroof**
 - Gear motor
 - Sliding guides
- **Exterior mirrors**
- **Wiper motor gear**
- **Windscreen washer system**



E-mobility

- **Drive**
 - Roller bearings
- **Noise damping**
 - Plastic/plastic applications
 - Actuators and miniature drives
- **Electrical connectors**
 - Grease for electric contacts
- **Charging point, wallbox**
 - Plug grease for sealing
 - Grease for electric contacts

Interior

- **Interior special grease**
 - odourless
- **HVAC**
 - Ventilation flaps
- **Plastic mechanisms**
- **Seat belts**
 - Retractors
- **Seats**
 - Seat rails
 - Gear motors
 - Seat recliner
 - Spindle gear
- **Headrest**
 - Height adjustment

Innovation starts with team work

Research and development

New materials and technological advances or changes always require new special commercial vehicle greases. We firmly believe that the best way to find the solution to these development processes and challenges is to work closely with you as partners – all the way from the initial idea to the finished special grease.

Both technological and methodological expertise

There are two key factors for us in the joint development of lubricants: technological expertise and methodological expertise. In practice, this means that we bring engineering know-how, creativity as well as project and development methodologies together for you. These synergies allow us to significantly speed up the development of your new lubricating grease.



Straight from the simulation to the practical test

Another advantage of working in a development partnership with Rhenus Lub: our short communication channels. Our development teams work together on an interdisciplinary basis. Following successful simulations of the chemical and physical properties, the lubricating grease prototypes can be tested and verified in our fully equipped testing laboratories with your original components and materials.

Our range of modern testing equipment and processes include:

- Friction value tests
- Wear tests / service life tests
- Model and component testing facilities
- Acoustic measurements / noise emissions
- Odour tests (olfactory assessments)
- Grease transport
- Vibration tests
- Continuous pressure tests



Special commercial vehicle greases

Drive

New lubricants for new concepts

At present, the majority of development work is centred on the drive. There are a number of very different drive concepts emerging, ranging from the internal combustion engine and purely electric commercial vehicle, through various hybrid variants combined with different concepts for the supply of electricity. All drive concepts with their varying components and requirements for elements including temperature stability, speed, electrical conductivity and noise damping

require adapted lubricants for each individual friction point. Rhenus Lub has been working closely with the pre-development departments of suppliers for many years. With its own testing facility, where the service life for new applications can be tested at various temperatures, Rhenus Lub is able to “look to the future” and provide qualified statements about the performance of new lubricating greases.

| Commercial vehicle industry | Application in the sector | Lubricating greases/oils | |
|-----------------------------|--|--------------------------|-----------------|
| Drive | Lubrication of roller bearings and plain bearings (demanding operating conditions) | rhenus HHN 15 | |
| | Transmissions with liquid grease / central lubrication systems | rhenus LIN 0 | |
| | Engine - starter | rhenus LKG 2 | |
| | Engine - alternator | rhenus LKT 2 | |
| | Engine - fuel system | rhenus WBN 2 | |
| | Engine - exhaust system | rhenus WBN 2 | |
| | Engine - belt tensioner | rhenus HCN 25 | |
| | E-mobility roller bearing applications | rhenus HIN 2 | |
| | Gearshift | rhenus LKB 1 | |
| | Release mechanism | rhenus HDN 2 | |
| | DMF | rhenus LXA 2 | |
| | Transmission actuator | rhenus LKG 2 | |
| | Drive shaft | rhenus LKZ 2 | |
| | Shaft seals / transmissions | rhenus LKZ 2 | |
| | Wheel bearings, hubs, axle lubrication | | rhenus LKF 2 TB |
| | | | rhenus LKI 2 |
| | | rhenus LKM 2 | |
| Slack adjuster | rhenus LKI 2 | | |



| Operating temperatures [°C] | Properties |
|-----------------------------|---|
| -30 to 180°C | Resistant to high temperatures, very water resistant, compatible with elastomers |
| -40 to 120°C | MAN approval, water resistant, good adhesion, well suited to central lubrication systems |
| -50 to 150°C | EP, very high load capability, low starting torques at low temperatures |
| -60 to 140°C | High speed factor, excellent low temperature properties, EP |
| -30 to 280°C | Resistant to fuel |
| -30 to 280°C | Very stable at high temperatures |
| -40 to 190°C | Very good damping properties, very temperature-stable |
| -40 to 160°C | Meets the latest specifications for motor bearings |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -40 to 180°C | High level of wear protection |
| -40 to 160°C | Low oil separation, high level of wear protection |
| -50 to 150°C | EP, very high load capability, low starting torques at low temperatures |
| -40 to 150°C | Synthetic base oil with wide temperature range |
| -40 to 150°C | Excellent elastomer compatibility |
| -30 to 150°C | Anti-false brinelling |
| -40 to 150°C | Very high mileages in commercial vehicles, low friction values, resistant to high temperatures |
| -30 to 150°C | Resistant to high temperatures, water resistant, good adhesion, high pressure absorption capacity |
| -40 to 150°C | Very high mileages in commercial vehicles, low friction values, resistant to high temperatures |

Special commercial vehicle greases

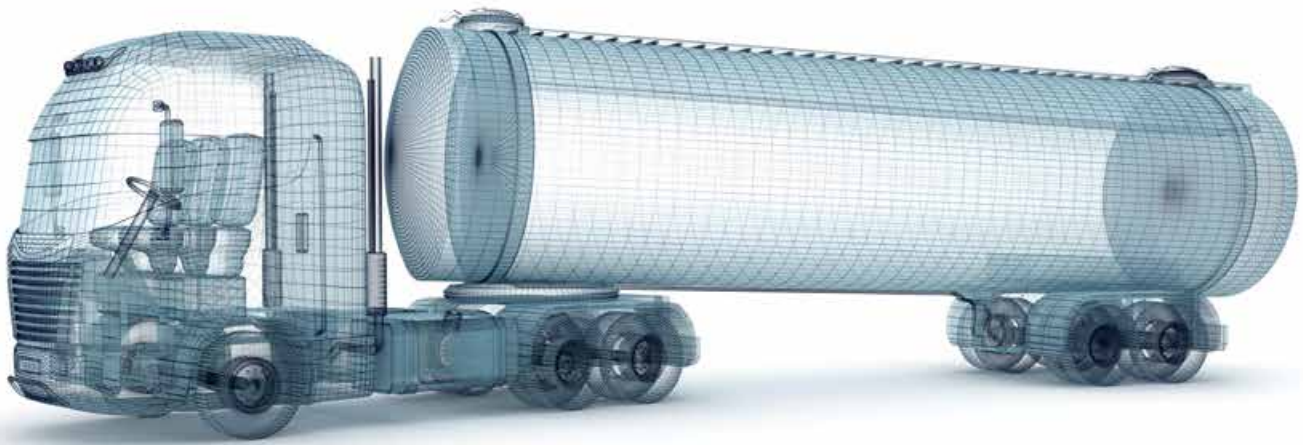
Chassis

For your chassis of the future

Our lubricants are a key design element. They ensure that friction in the ball joints is significantly reduced, thus laying the foundations for active chassis kinematics and actively engaging control systems for vehicle stabilisation, distance control

and lane keeping assistance. The functions are made possible by the control of a multitude of electromechanical actuators. These systems are bridging technologies to autonomous driving.

| Commercial vehicle industry | Application in the sector | Lubricating greases/oils |
|-----------------------------|--|--------------------------|
| Chassis | Brake system - valves | rhenus LKB 1 |
| | Brakes - hydraulic | rhenus LPO 15 |
| | Brakes - electromechanical | rhenus LKG 2 |
| | Brakes - parking brake | rhenus LKB 1 |
| | Brakes - assembly aids | rhenus OPG 24 |
| | Brake paste | rhenus MCK 2 |
| | Steering system - steering column | rhenus AKC 1 |
| | Steering system - steering gear | rhenus LKG 2 |
| | Steering system - EPS worm gear | rhenus LKB 1 |
| | Steering system - EPS ball screw | rhenus LKG 2 |
| | Steering system - tie rod joints | rhenus LKC 1 |
| | Steering system - rear wheel steering | rhenus LKB 1 |
| | Axle - ball joints | rhenus LKC 1 |
| | Axle - rubber mounts | rhenus LPO 15 |
| | Axle - strut bearings | rhenus CYN 15 GB |
| | Axle - active roll stabiliser | rhenus LKG 2 |
| | Landing gear lubrication | rhenus LMU 2 |
| | | rhenus CMU 2 |
| | Lubrication of the landing gear drive spindles | rhenus CIN 2 |
| | Ball bearing turntables | rhenus LCC 2 |
| | Fifth wheel plate (5 point / 1 point) | rhenus LBH 2 |
| | | rhenus CCN 15 |



| Operating temperatures [°C] | Properties |
|-----------------------------|--|
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -40 to 120°C | Compatible with EPDM, low sliding friction |
| -50 to 150°C | EP, very high load capability, low starting torques at low temperatures |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -40 to 160°C | Polyalkylene glycol (PAG) |
| -30 to 250°C | Metal-free, thus also suitable for aluminium brake callipers and ABS systems |
| -45 to 160°C | Reduces static friction |
| -50 to 150°C | EP, very high load capability, low starting torques at low temperatures |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -50 to 150°C | EP, very high load capability, low starting torques at low temperatures |
| -40 to 150°C | Reduces static friction and thus supports the unimpeded steering return |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -40 to 150°C | Reduces static friction and thus supports the unimpeded steering return |
| -40 to 120°C | Compatible with EPDM, low sliding friction |
| -50 to 100°C | High level of wear resistance with oscillating movements |
| -40 to 150°C | EP, very high load capability, low starting torques at low temperatures |
| -30 to 130°C | Outstanding protection against corrosion, high pressure absorption capacity, good adhesion |
| -30 to 130°C | Very good protection against corrosion, high pressure absorption capacity, good adhesion |
| -30 to 110°C | Outstanding protection against corrosion, very high pressure absorption capacity, very good adhesion |
| -30 to 140°C | Well suited to central lubrication systems with long line lengths, mechanically very stable |
| -30 to 130°C | Water resistant, ageing resistant, contains black solids |
| -40 to 100°C | Well suited to central lubrication systems, mechanically very stable, biodegradable |

Special commercial vehicle greases

Body

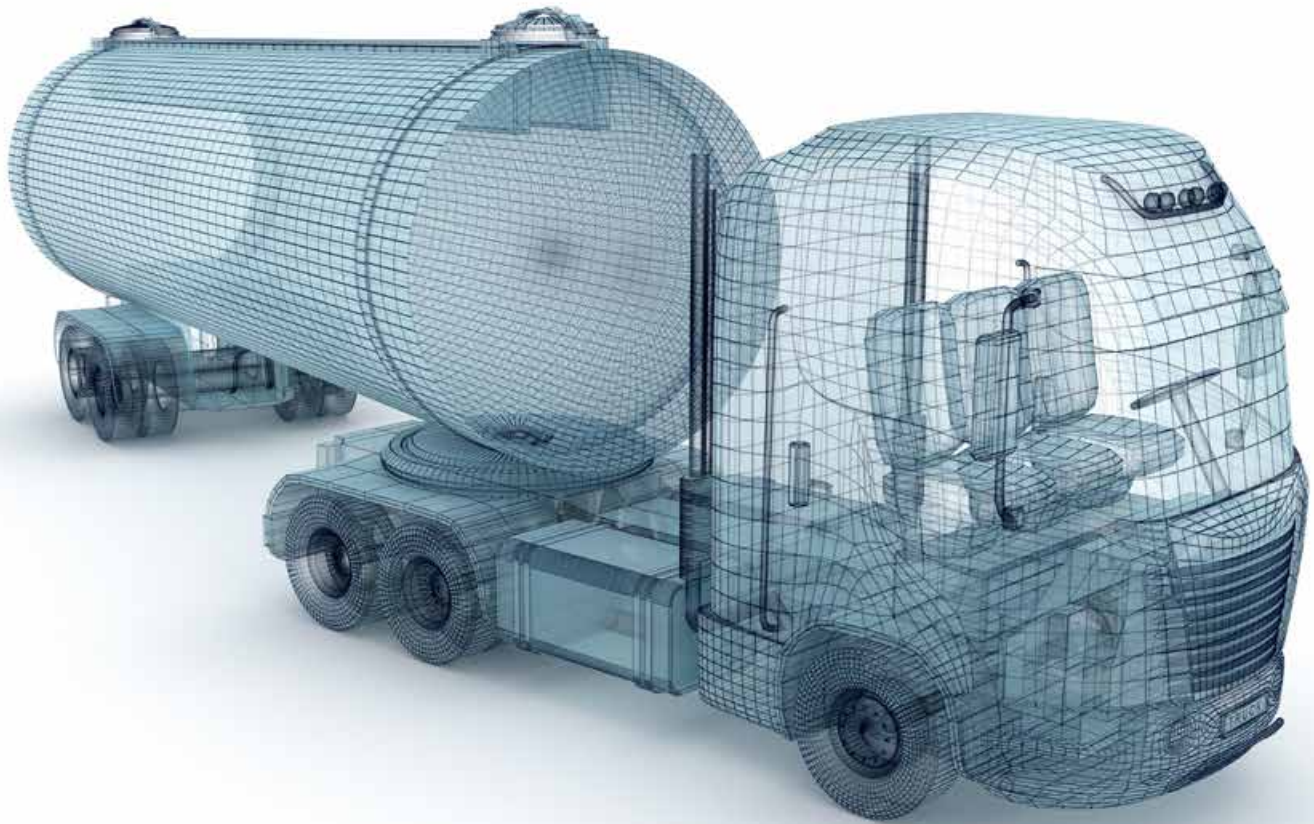
Resistant to environmental factors and good noise damping properties

The lubricant is often exposed to environmental factors. How resistant is it to these?

Rhenus Lub has the relevant testing methods. We test the respective lubricating grease specifically for the plastic, the elastomer of your supplier and any environmental factors. Chemically inert lubricants, which do not undergo chemical reactions, are also available.

Another aspect is the damping of body-borne noise caused e.g. by small gear motors. We have developed greases for transmission lubrication with high damping properties which also permit exceptionally low torques at low temperatures.

| Commercial vehicle industry | Application in the sector | Lubricating greases/oils |
|-----------------------------|-----------------------------------|--------------------------|
| Body | Door kinematics | rhenus LKC 1 |
| | Locks | rhenus LXN 2 |
| | Window mechanism – gear motor | rhenus LKB 1 |
| | Window mechanism – sliding guides | rhenus LXN 2 |
| | Sunroof – gear motor | rhenus LKB 1 |
| | Sunroof – sliding guides | rhenus LPO 15 |
| | Exterior mirrors | rhenus LXN 2 |
| | Wiper motor gear | rhenus LKK 15 |
| | Windscreen washer system | rhenus WBN 2 |



| Operating temperatures [°C] | Properties |
|-----------------------------|---|
| -40 to 150°C | High level of wear protection (e.g. hinges, locking devices, roller guides) |
| -60 to 130°C | Excellent low temperature properties |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -60 to 130°C | Excellent low temperature properties |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -40 to 120°C | Compatible with EPDM, low sliding friction |
| -60 to 130°C | Very low actuating forces at -40°C |
| -50 to 150°C | Good wear protection and corrosion protection |
| -30 to 280°C | Resistant to washing water and solvents |

Special commercial vehicle greases

Interior

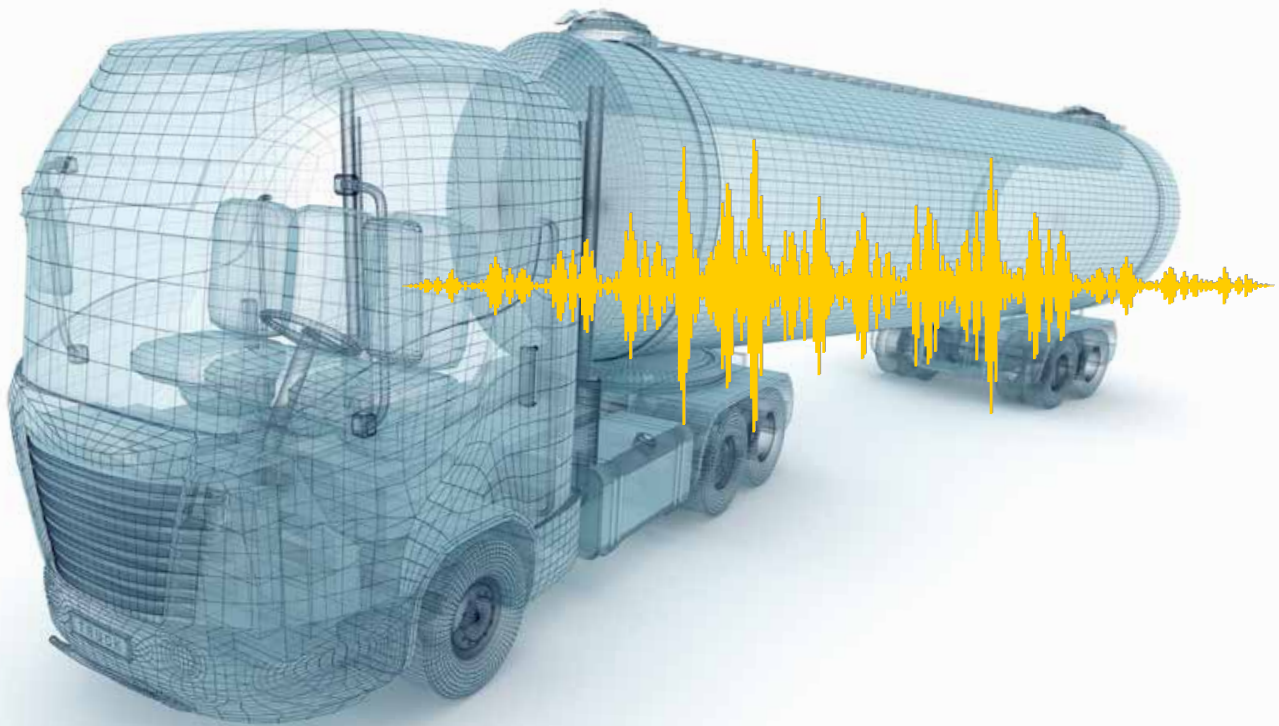
The future will be quieter

Friction values and vibrations can be significantly reduced by using rhenus greases, such as in seat and belt adjusters, headrests, covers/interior linings through to window regulators and gear levers. This ensures that all the interior fittings function optimally and disturbing noises are effectively damped or eliminated. We also develop lubricants in accordance with VDA 270 to prevent the development of unwanted odours – for the most stringent requirements for an odour-free interior climate.

Soothing calm in the interior

- rhenus low-noise greases are particularly pure, prevent noise from developing in the bearing and help to make the driving experience more relaxing.
- rhenus greases that prevent noise ensure reduced static friction and avoid the stick-slip effect. This effectively prevents squeaking and creaking.
- rhenus damping greases reduce noises such as knocking and clattering.

| Commercial vehicle industry | Application in the sector | Lubricating greases/oils | |
|-----------------------------|-------------------------------------|--------------------------|---------------|
| Interior | Interior special grease – odourless | rhenus XBO 2 | |
| | HVAC – ventilation flaps | rhenus LKB 1 | |
| | Seats – seat rails | rhenus LKK 15 | |
| | Seats – gear motors | rhenus LXN 2 | |
| | Seats – seat recliner | rhenus BBC 15 | |
| | Seats – spindle gear | rhenus LKB 1 | |
| | Plastic mechanisms | | rhenus LXN 2 |
| | | | rhenus LKM 1 |
| | | | rhenus BJN 15 |
| | Headrest – height adjustment | rhenus OAS 22 | |
| | Seat belts – retractors | rhenus LPO 15 | |



Tribological expertise

NVH – noise, vibration, harshness – we are interested in the cause: Is the difference between static and dynamic friction too great or does kinetic energy have to be absorbed?

We identify the problem and validate the solution, for example directly on your component in our noise testing facility.

| Operating temperatures [°C] | Properties |
|-----------------------------|---|
| -40 to 130°C | Low-odour and low-emission special grease for the interiors |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -50 to 150°C | Good wear protection and corrosion protection |
| -60 to 130°C | Very low actuating forces at -40°C |
| -50 to 150°C | Compatible with CDC, prevents juddering |
| -50 to 150°C | Low sliding friction values, low starting torques at low temperatures |
| -60 to 130°C | |
| -40 to 150°C | Damping greases with varying viscosities |
| -40 to 150°C | |
| -50 to 200°C | Colourless, synthetic oil |
| -40 to 120°C | Compatible with PP, low sliding friction |

Special commercial vehicle greases

E-mobility

Showing initiative, rethinking and looking ahead

Not only do we consider ourselves to be your manufacturer and technology expert for special commercial vehicle greases, we also see ourselves as your strategic partner. We think entrepreneurially to meet your needs and want to play an active part in safeguarding your future viability, competitiveness and value creation.

Special greases for sustainable e-mobility

Whether electric vehicles or hybrid drives, new generations of vehicles are placing new requirements on special lubricating greases. There are many challenges related to the drivetrain with its high torques and we have developed intelligent solutions for these. We have just the right lubricating grease concepts for electric motor and hybrid drives, which are perfectly suited to high levels of heat generation and have the desired conductivity or insulating capacity. And if there is no lubricant that is up to your challenge, we will develop one in collaboration with you.

| Commercial vehicle industry | Application in the sector | Lubricating greases/oils |
|-----------------------------|---|--------------------------|
| E-mobility | Roller bearings in the drive | rhenus HIN 2 |
| | Noise damping, plastic/plastic compounds | rhenus WBN 2 |
| | Noise damping, actuators and miniature drives | rhenus WAO 2 |
| | Electrical connectors, grease for electrical contacts | rhenus AKC 2 |
| | Charging point, wallbox, plug grease for sealing | rhenus CVN 3 |
| | Charging point, wallbox, grease for contact | rhenus LMN 2 |



| Operating temperatures [°C] | Properties |
|-----------------------------|--|
| -40 to 160°C | Meets the latest specifications for motor bearings |
| -30 to 280°C | Very stable at high temperatures, chemically resistant |
| -30 to 280°C | Damping, good low temperature, good material compatibility |
| -45 to 160°C | Low-emission, high electrical resistance |
| -30 to 100°C | Resistant to ageing, very good water resistance, high level of corrosion protection, very good adhesive properties |
| -30 to 120°C | Protects against corrosion, high electrical resistance |

From tribological to ecological

Sustainability is one of our main company assets. We take responsibility for our society, the environment and future generations.

You can help to improve sustainability with our rhenus special greases. Our long-life products conserve valuable, natural resources. They reduce friction values and thus contribute directly to lowering emissions. We develop lubricating greases of the highest quality for this purpose.

Opting for rhenus special commercial vehicle greases is not just the right choice in terms of cost efficiency based on purchase costs and life cycle costs, it is also an investment in a liveable, mobile future.

Social, ethical, global economic, political and ecological challenges are inherent in the entire commercial vehicle industry. Our material compliance management and active membership of the UN Global Compact initiative demonstrate that we take responsibility for sustainable development in this sector with our company's climate neutrality goals.



When excellent partnership is a promise

Our customers put their trust in us. By offering innovative products and services, we help to create sustainable value for OEMs and commercial

vehicle industry suppliers. This has culminated in long-standing partnerships in the international commercial vehicle industry for over 130 years.

AAM • ACPS AUTOMOTIVE • ADIENT • Autoliv • BENTELER • BILSTEIN

BMW • Borg Warner • bosal • BOSCH • BPW Bergische Achsen • brose

Continental • CW BEARING • DAIMLER • DANA • Delphi • DURA

EATON • Eberspächer • ebm-papst • Edscha • elringklinger • faurecia

FEDERAL-MOGUL • Ford • FTE • GRAMMER • HELLA • HOERBIGER • Huf

INTEVA • JOST • JOYSON SAFETY SYSTEMS • KERN-LIEBERS • KNORR-BREMSE

KNORR-BREMSE STEERINGSYSTEMS • LEAR • LISI AUTOMOTIVE • MAGNA

MAHLE • MAN • MANN+HUMMEL • MITSUBA • neapco • NSK

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