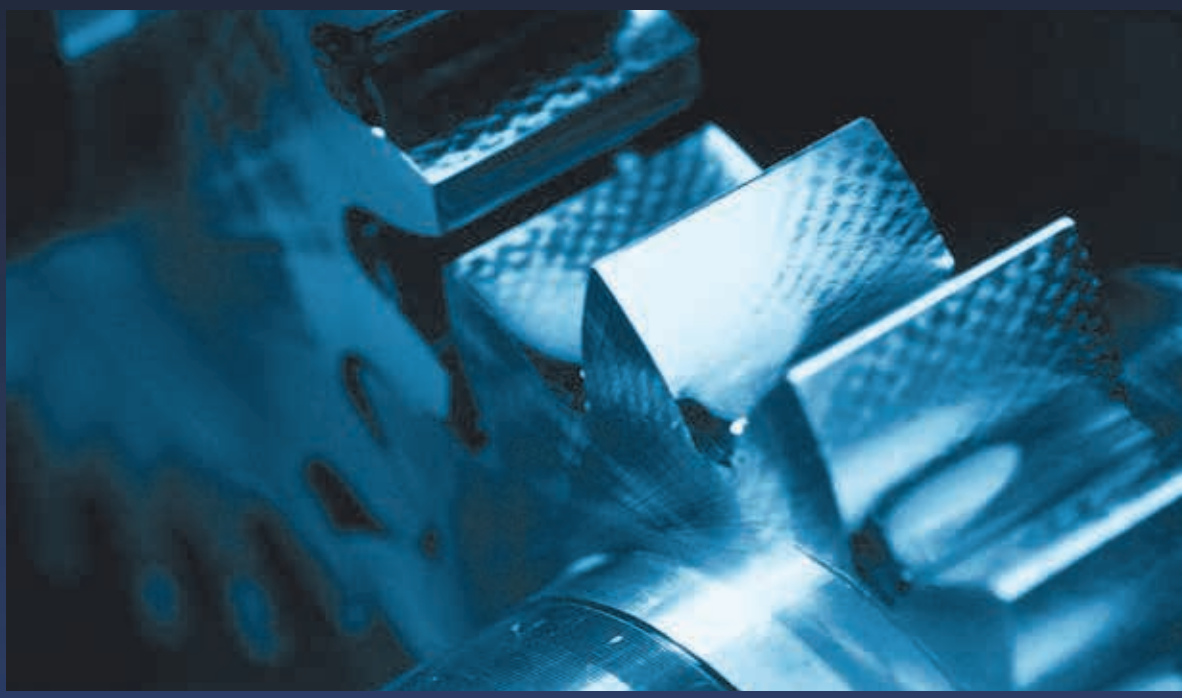
FUCHS Industrial Lubricants

RENOLIN

Reduced friction, high efficiency – outstanding performance



Industrial gear oils and general lubricating oils

LUBRICANTS.
TECHNOLOGY.
PEOPLE.

FUCHS

OUR LUBRICANTS KEEP THE WORLD MOVING

For over 80 years now, Fuchs has focused all our activities and research expertise on the development of innovative lubricants.
This specialization has resulted in our company growing continuously, not only geographically but also technically and in terms of application areas.

Today, FUCHS is a globally-active, German company synonymous for high-performance lubricants and related specialties for nearly all fields of application and industries.






What sets our products apart.

We develop application-specific lubricants specifically for our partner's processes. Together with our customers, we strive to create perfect lubricant solutions. This co-operation we term a "development partnership" and Fuchs brings the expertise associated with being the world's largest independent lubricant company. Our independence is important, it means we are open to new. We are open to new approaches, open to new visions – the prerequisites for innovation. And innovations are a hallmark of FUCHS.

Together, we can achieve more.

A major engineering element – industrial gear oils.

Gear oils for all applications.

Germany is one of the world's leading manufacturers of drive technology and gearboxes. Gear oil represents an important construction element in power transmission engineering and is used in nearly all areas of application.

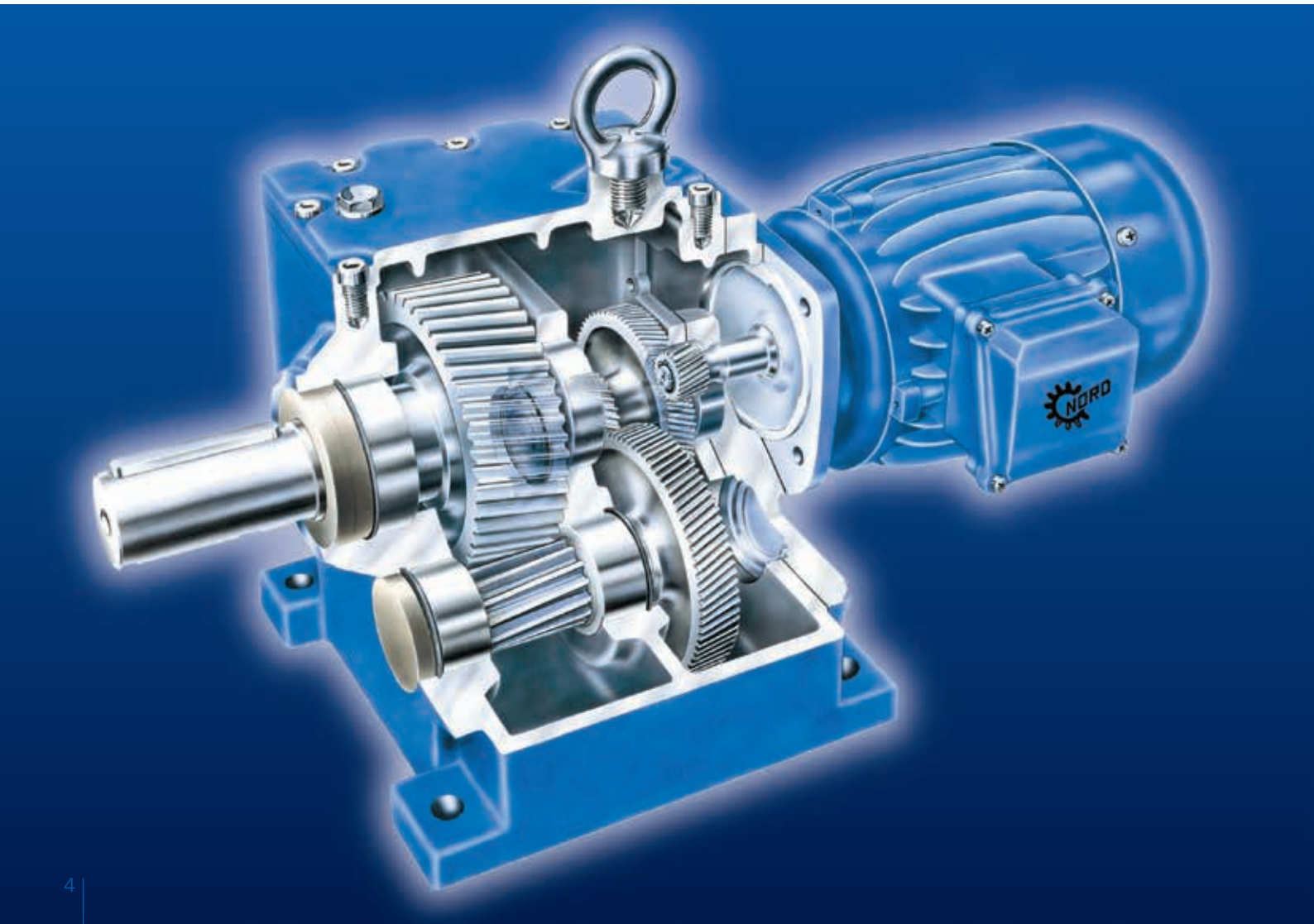
The demands placed on gear oils have grown sharply. Further developments in the field of power transmission engineering usually result in an increase in the power density of components:
Greater performance must be transmitted in ever shorter times. At the same time, the components and gearboxes are becoming ever smaller and more compact.

As one of the most important and complex machine elements, the gear oil must cope with these changed conditions and requirements. Oil volumes become smaller, oil circulation cycles become larger and the energy transferred to the lubricant increases.

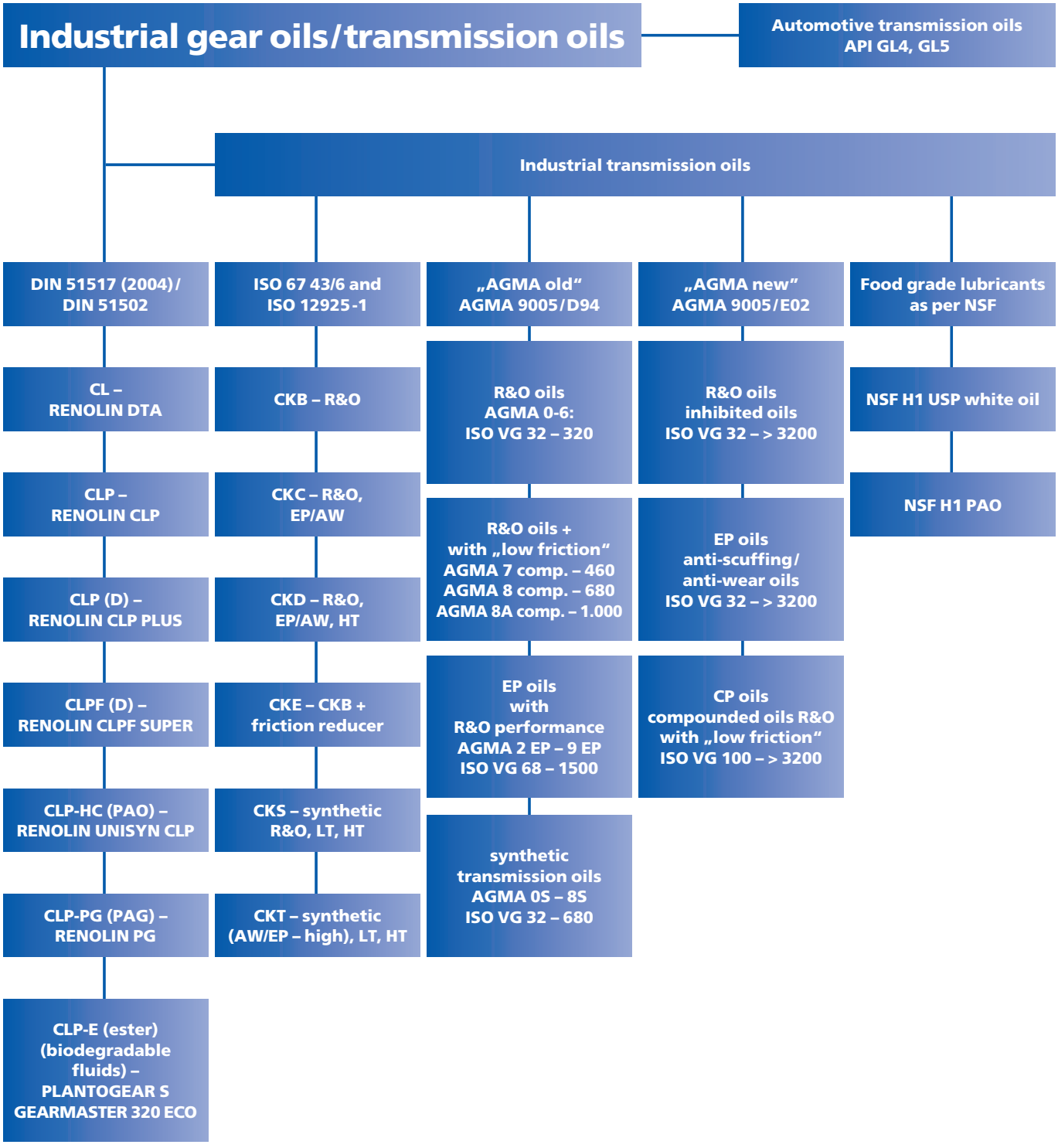
This leads to an increase in the thermal and oxidative load on the lubricants. And in addition, the technical demands on industrial gear oils have changed dramatically over recent years – these have become significantly more stringent. New, complex bench tests with exact thresholds and extreme test conditions have been developed to better reflect the demands and problem areas in drive chains in test facilities.

Gear oils can be divided into two main groups according to their use:

- Lubricating, circulating and gear oils for industrial applications (stationary gear oils) conforming to DIN 51 517, ISO 6743/6, AGMA 9005 and
- Lubricating and gear oils for automotive applications (mobile gear oils), gear oils for automobiles and commercial vehicles and automatic transmission fluids according to API GL 4, GL 5, etc.



General classification of gear oils.



The listed product series are available in different viscosity classes.

FUCHS industrial gear oils.

FUCHS industrial gear oils, performance to ISO 6743-6, ISO 12925-1

Product name	CKB	CKC	CKD	CKE	CKS	CKT
	**R&O	**R&O AW/EP	**R&O AW/EP "higher temp."	**R&O "low friction"	**R&O "extreme temp."	**R&O AW/EP "extreme temp."
RENOLIN DTA/CL	■	–	–	–	–	–
RENOLIN CLP	–	■	■	–	–	–
RENOLIN CLP-PLUS*	–	■	■	–	–	–
RENOLIN CLPF SUPER*	–	■	■	–	–	–
RENOLIN UNISYN CLP	–	■	■	■	–	–
RENOLIN PG	–	■	■	■	■	■
PLANTOGEAR S	–	■	■	■	–	–
RENOLIN HighGear*	–	■	■	■	–	–
RENOLIN HighGear Synth*	–	■	■	■	–	–
RENOLIN SynGear HT	–	■	■	■	■	■

■ Performance tests have been passed
■ Products which generate low friction containing EP/AW additives
■ Products which contain AW/EP additives for extreme temperatures

* DD (Detergent/Dispersant) products
** R&O: Lubricating oils with anti-oxidants and corrosion inhibitors
AW/EP: Anti-wear and extreme pressure additives
"Higher temp." – for high working temperatures
"Low friction" – low friction coefficients
"Extreme temp." – for extreme working temperatures

Oxidation test for CKC at 95 °C
Oxidation test for CKD at 121 °C
Oxidation test for CKT at 150 °C
Oxidation test for CKS at 150 °C
Oxidation test for CKE at 95 °C

Lubricating Oils

ISO-L Symbol	Composition and properties
CKB	Refined mineral oils with oxidation stability, anticorrosion (ferrous and non-ferrous metal) and antifoam properties.
CKC	Refined mineral oils with oxidation stability, anticorrosion (ferrous and non-ferrous metal) and antifoam with enhanced extreme pressure and antiwear properties.
CKD	Lubricants with oxidation stability, anticorrosion (ferrous and non-ferrous metal), antifoam, extreme pressure and antiwear properties, with enhanced thermal/oxidative stability that permits use at a higher temperature.
CKE	Lubricants with oxidation stability, anticorrosion (ferrous and non-ferrous metal) and antifoam properties, ensuring low coefficient of friction.
CKS	Lubricants with oxidation stability, antifriction and anticorrosion (ferrous and non-ferrous metal) properties usable under extreme temperature conditions (low and high).
CKT	Lubricants with oxidation stability, antifriction and anticorrosion (ferrous and non-ferrous metal) properties usable under extreme temperature conditions (low and high) and under high load.

Others

ISO-L Symbol	Composition and properties
CKG	Greases with extreme pressure and anti-wear properties.
CKH	Products usually of bituminous type with anti-corrosion properties.
CKJ	Products of CKH type with enhanced extreme-pressure and anti-wear properties.
CKL	Greases with improved extreme-pressure, anti-wear and anti-corrosion properties and improved thermal stability.
CKM	Products with improved anti-seizing properties that permit use under extreme load conditions, and products with anti-corrosion properties.

While the information and figures given here are typical of current production and confirm to specification, minor variations may occur. Subject to amendment.
Edition 12/2014

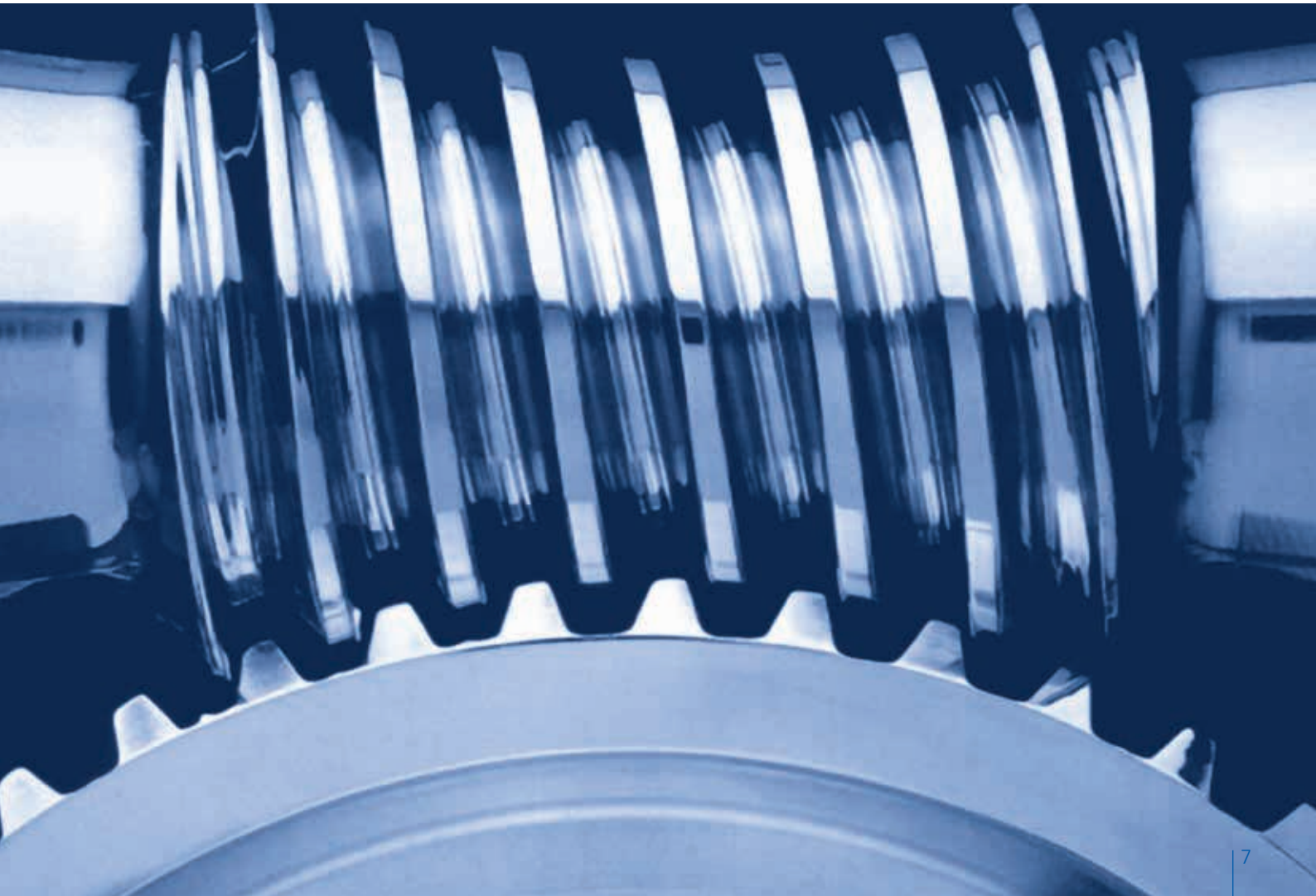
Reliable solutions for technology and the environment.

Requirements of industrial gear oils.

The demands made on industrial gear oils are increasing. Although the new DIN 51517 (dated 2014) only specifies a scuffing load carrying test in line with FZG A/8.3/90 and the roller bearing test FE8 in addition to the physical characteristics, many leading gear manufacturers' specifications contain additional requirements:

- More stringent scuffing load carrying test according to FZG A/16.6/140
- Micropitting test at 60°C and 90°C according to GFT, FVA I-IV, C/8,3/90 and C/8,3/60
- FE8 roller bearing wear test according to DIN 51 819, Part 2 (and variants) – D/7.5/80-80
- FZG low-speed wear test
- FZG pitting test
- Load-carrying capacity according to Brugger
- Filtration behavior – dynamic tests
- Foaming behavior (e.g. Flender in-house test)
- Low temperature behavior
- Flow temperature behavior
- etc.

These additional bench tests attempt to reflect the extreme conditions which gearboxes and gear oils are subject to and quantify the performance of the various formulations. FUCHS has state-of-the-art test rigs for the testing of industrial gear oils on which customer demands can be simulated. Close cooperation with the relevant DIN and ISO committees and working groups and intensive cooperation with the German research association for power transmission engineering (FVA) as well as renowned gear manufacturers and international customers results in a constant refinement and improvement of both standardized test procedures and FUCHS in-house bench tests.



FUCHS Industrial Lubricants

For the drive chains of today and tomorrow.

Heavy duty synthetic gear oils.

Although mineral oil-based gear oils continue to dominate, synthetic oils are becoming increasingly popular in the rapidly growing power transmission engineering market. In 2010, the market share of synthetic oils already totaled 15 – 20%. Compared to mineral oils, synthetic gear oils have a significantly longer life, generate lower service costs and excel in terms of reducing wear to gears and rolling bearings. They are more expensive than mineral oils but these higher costs are compensated by increased operating hours (lifetime two to three times longer), lower maintenance costs, wider operating temperature range (multigrade characteristics), lower disposal costs, better technical performance, lower component wear and improved energy efficiency.

FUCHS synthetic oils: a complete program.

FUCHS offers a comprehensive product range of mineral oil-based gear oils:

- RENOLIN CLP – demulsifying
- RENOLIN CLP PLUS – detergent with AO Booster
- RENOLIN AWD – "high Brugger" lubricating oils
- RENOLIN CLPF SUPER – black color with MoS2
- RENOLIN HighGear – plastic deformation technology
- RENOLIN GEAR VCI – special corrosion protection

In addition, a complete range of fully synthetic gear oils have been developed and refined over recent years.

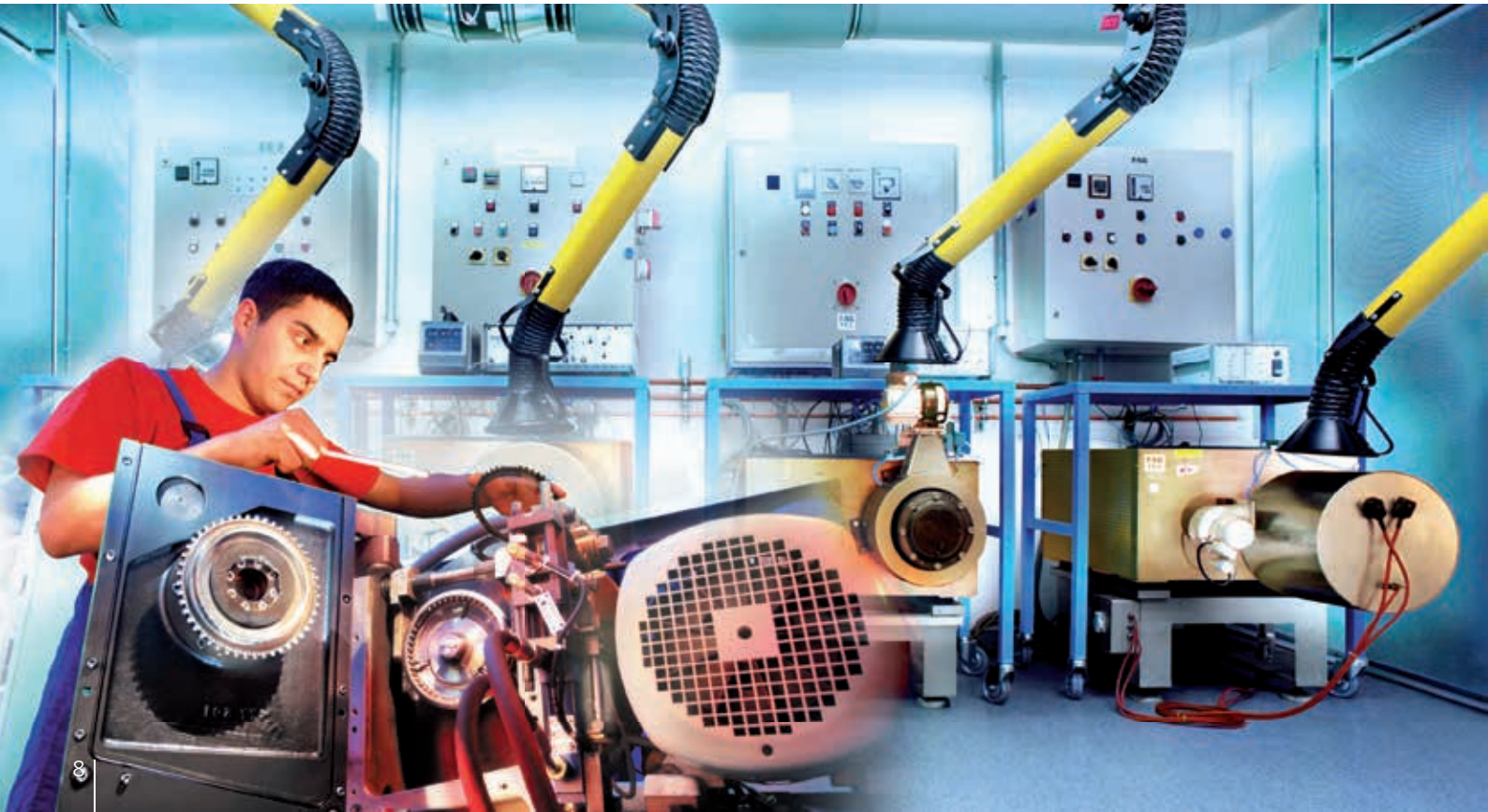
Products in the series

- RENOLIN UNISYN CLP – based on polyalphaolefin (PAO)
- RENOLIN PG – based on polyalkylene glycol (PAG)
- PLANTOGEAR S – based on saturated synthetic esters (E)
- RENOLIN HighGear Synth – based on polyalphaolefin (PAO)
- RENOLIN UNISYN GEAR VCI – based on polyalphaolefin (PAO)

make up a complete portfolio of new-generation synthetic gear oils with the maximum technical performance.

FUCHS is a leading player in the field of power transmission engineering and its product range covers all industrial gear oil applications and performance levels. In addition, special grades are also available which were specially developed to meet specific customer demands.

The optimum gear oil for every application. The optimum solution for every problem.



The synthetic gear oil series.

RENOLIN UNISYN CLP series

These synthetic polyalphaolefin-based gear oils are characterized by a high natural, shear-stable viscosity index. This provides effective lubrication at both high and low application temperatures (multi-grade lubricants).

Their compatibility with paints and elastomers is comparable with that of mineral oils. Compared to mineral oils, the lifetime of these oils is two to three times longer. RENOLIN UNISYN CLP offers outstanding wear protection properties. As a result of their extremely low pour point, these oils display outstanding cold flow properties. They represent the most important group among synthetic gear oils.

This range also includes an approved wind turbine gear oil in the form of RENOLIN UNISYN CLP 320.

RENOLIN PG series

Products from the RENOLIN PG series are based on special polyalkylene glycols. They display very low friction coefficients in tribological conditions. Their high natural viscosity index makes them shear-stable. RENOLIN PG oils can be used at both high and low temperatures. RENOLIN PG oils are primarily used to lubricate steel / bronze worm gears and are recommended for applications subject to unfavorable friction conditions and very high temperatures (e.g. calender lubrication and paper machine oil). Compatibility with machine components must be tested prior to use. Polyglycols are neither miscible nor compatible with mineral oils.

PLANTOGEAR S series

The rapidly biodegradable PLANTOGEAR S series of oils are based on saturated synthetic ester oils. These offer very low friction coefficients, good load-carrying capacity and a high, naturally shear-stable viscosity index.

The polar structure of ester oils provides for good cleaning properties and dirt holding capacity. Furthermore, saturated esters display excellent thermal stability.

Products from the PLANTOGEAR S series can be used to clean gearboxes which have been contaminated with deposits and sludge.

The PLANTOGEAR S series has been awarded the European environmental seal (EU Ecolabel).

GEARMASTER 320 ECO is an approved, biodegradable wind turbine gear oil.

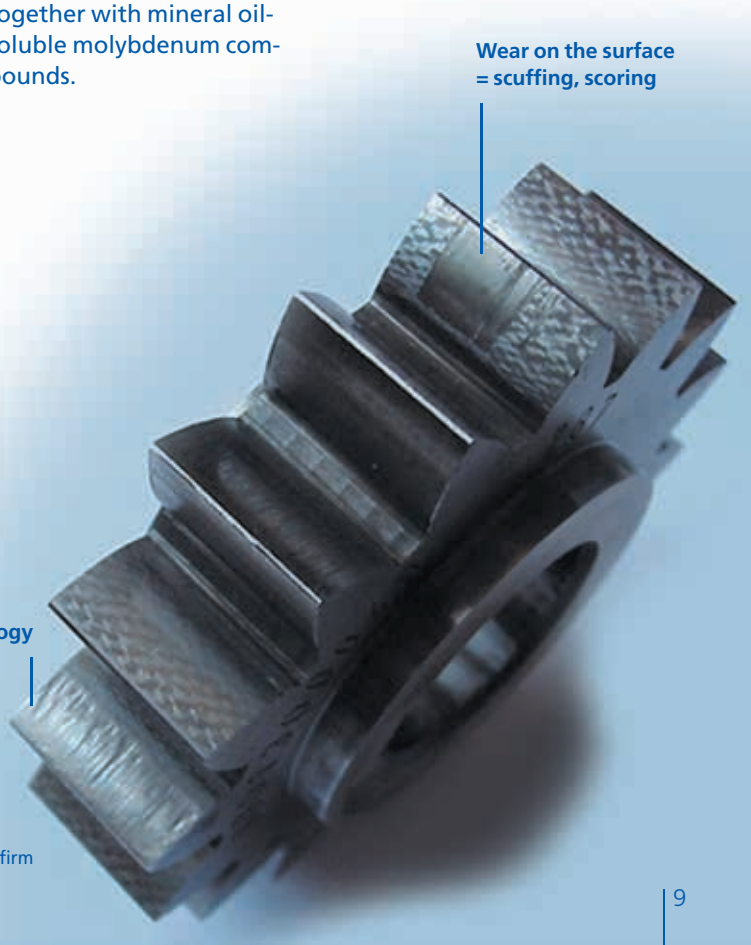
RENOLIN HighGear / HighGear Synth

A highlight of our latest research and development activities is our new RENOLIN HighGear series of gear oils. These contain special additive systems which form high-performance protective films on gear teeth and protect machine elements against wear, even under extreme loads, mixed friction conditions, high pressures, high specific contact pressures, at low speeds and when the surfaces of the teeth are damaged.

This is achieved by the use of synergistic additive combinations of mild sulfur carriers, surface-active phosphorous and zinc additives together with mineral oil-soluble molybdenum compounds.

This technology is also referred to as a plastic deformation (PD) reaction or surface roughness smoothing.
As opposed to the previously available technologies, RENOLIN HighGear was further developed in particular in terms of thermal and oxidation stability, long-term stability (to avoid sludge formation) and its excellent corrosion protection.

Both mineral oil-based and polyalphaolefin-based products are thus available which fulfill the highest technical standards. The results of tests performed in extreme conditions and with pre-damaged machine elements in large-scale gearboxes (in underground mine conveyor drives) as well as spindle drives in forging presses confirm these outstanding characteristics.



Special lubricants for gearboxes and circulating systems – an overview.

RENOLIN DTA – demulsifying circulating, spindle and hydraulic oils

CL/HL oils (demulsifying)

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN DTA 2	Spindle, hydraulic and lubricating oils (machine oils) made from selected base oils with additives to improve aging behavior and corrosion protection. All RENOLIN DTA products are DIN 51 524-1 (HL) hydraulic oils and DIN 51 517-2 (CL) circulating oils based on mineral oil, demulsifying (water-repellent) and free of zinc. ISO 6743/4, HL, ISO 6743-6 and ISO 12925-1: CKB.	805	100	2.2	–	–	-27	For thermally-stressed bearings and hydraulics systems with peak temperatures of approx. 120°C. General lubrication without specific wear protection requirements (without AW/EP). (Refer to PI* 4-1292 for further details) Mineral oil-based
RENOLIN DTA 5		837	120	4.6	1.6	106	-40	
RENOLIN DTA 7		839	155	7.4	2.2	103	-27	
RENOLIN DTA 10		851	174	10	2.6	92	-27	
RENOLIN DTA 15		856	195	15	3.4	98	-27	
RENOLIN DTA 22		865	210	22	4.2	94	-27	
RENOLIN DTA 32		874	222	32	5.4	102	-24	
RENOLIN DTA 46		874	228	46	6.8	101	-24	
RENOLIN DTA 68		882	250	68	8.7	99	-18	
RENOLIN DTA 100		881	248	100	11.2	97	-18	
RENOLIN DTA 150		889	266	150	15.5	94	-15	
RENOLIN DTA 220		893	280	220	18.8	95	-12	
RENOLIN DTA 320		898	280	320	24.0	95	-12	
RENOLIN DTA 460		904	315	460	30.4	95	-12	
RENOLIN DTA 680		913	302	680	37.9	92	-12	

RENOLIN CLP – demulsifying EP/AW gear oils and circulating oils

CLP oils (demulsifying)

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN CLP 68	High performance, gear oils and circulating oils with good aging stability and additives to improve corrosion protection (also combat steel and non-ferrous metal corrosion caused by moisture). Outstanding anti-wear characteristics – good EP/AW performance, excellent scuffing load carrying capacity and protection against micropitting, excellent FE8 roller bearing wear protection, good demulsifying properties, very good foaming behavior, zinc-free and silicone oil-free. RENOLIN CLP oils fulfill and surpass the minimum requirements of lubricating oils. CLP according to DIN 51 517, Part 3 (2014), ISO 6743-6 and ISO 12925-1: CKC, CKD. US Steel 224, David Brown S1.53.10. Approved by leading gearbox manufacturers.	886	236	68	8.7	99	-24	Universal gear oils for industrial applications such as in bearings, joints, spur, bevel and worm gears and whenever the manufacturer recommends a gear oil type CLP. (Refer to PI* 4-1208 for further details) Mineral oil-based
RENOLIN CLP 100		890	240	100	11.2	98	-21	
RENOLIN CLP 150		894	250	150	14.5	96	-24	
RENOLIN CLP 220		896	260	220	18.9	96	-24	
RENOLIN CLP 320		900	255	320	24.0	95	-12	
RENOLIN CLP 460		901	270	460	30.4	95	-12	
RENOLIN CLP 680		918	270	680	36.8	88	-10	

* PI = Product information
EP = Extreme pressure additives, to avoid wear seizures and scuffing at high pressures and loads
AW = Anti wear additives, to avoid wear in boundary friction conditions

RENOLIN CLP PLUS – detergent EP/AW gear oils with improved oxidation stability

Product name	Description	Density at 15 °C kg/m³	Flash point Cleve-land °C	Kine-matic viscosity at 40 °C mm²/s	Kine-matic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN CLP 46 PLUS	High performance gear and circulating oils offering excellent wear protection, good EP performance and excellent corrosion protection. Carefully selected antioxidants guarantee good aging stability and special surface-active substances lower friction which can reduce operating temperatures and increase efficiency. Special detergent/dispersant additives offer good cleaning properties and dirt holding capacity. RENOLIN CLP PLUS oils have excellent foaming characteristics and offer good protection against micropitting. The RENOLIN CLP PLUS series oils of are free from zinc and silicone oil. RENOLIN CLP PLUS oils fulfill the minimum requirements of lubricating oils according to DIN 51 517, Part 3 (2014), ISO 6743-6 and ISO 12925-1: CKC, CKD, RENOLIN CLP PLUS were developed specially for the extreme conditions in which mining industry conveyors operate and can increase service life in such conditions.	885	200	46	6.8	102	-27	Special gear oils for highly-stressed mechanical industrial, spur, double-spur, bevel and worm gears. Long-life oils (tested for 30,000 hours in brown coal open pit mining conveyors) and approved. Improved oxidation stability. (Refer to PI* 4-1226 for further details)
RENOLIN CLP 68 PLUS		888	236	68	8.7	100	-27	
RENOLIN CLP 100 PLUS		891	240	100	11.2	97	-24	
RENOLIN CLP 150 PLUS		895	250	150	14.8	97	-24	
RENOLIN CLP 220 PLUS		899	260	220	18.9	96	-24	
RENOLIN CLP 320 PLUS		899	255	320	24.0	95	-18	
RENOLIN CLP 460 PLUS		904	270	460	30.2	94	-14	
RENOLIN CLP 680 PLUS		908	270	680	39.6	95	-17	

CLP-D oils (detergent/dispersant)

RENOLIN CLPF SUPER EP/AW gear oils with MoS_2 (solid lubricants/black color)

Product name	Description	Density at 15 °C kg/m³	Flash point Cleve-land °C	Kine-matic viscosity at 40 °C mm²/s	Kine-matic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN CLPF 100 SUPER	EP gear oils with synergistic chemical EP/AW additives and physical MoS2-based solid lubricant additives. The MoS2-based solid lubricant additives cover a wide range of temperatures in mixed friction areas. They reduce friction and have a damping effect. Excellent wear protection in mixed friction areas, good dirt holding capacity (detergent effect), excellent foaming behavior, very good FE8 roller bearing wear protection, free from zinc and silicone oil. The RENOLIN CLPF SUPER series of oils surpass the minimum requirements of CLPD lubricating oils according to DIN 51 517, Part 3 (2014) together with DIN 51 502, ISO 6743-6 and ISO 12925-1: CKC, CKD.	891	240	100	11.2	98	-21	For highly-stressed gearboxes operating at low circumferential speeds and high loads, even when subject to shock loading, for noise reduction and for the lubrication of spindles and gearboxes in forging presses. (Refer to PI* 4-1264 for further details) Mineral oil-based
RENOLIN CLPF 220 SUPER		901	260	220	18.8	95	-21	
RENOLIN CLPF 320 SUPER		900	255	320	24.0	95	-14	
RENOLIN CLPF 460 SUPER		911	270	460	30.4	95	-12	
RENOLIN CLPF 680 SUPER		922	270	680	36.8	88	-10	
RENOLIN CLPF 1500 SUPER		906	240	1,500	70,5	104	-12	

CLPF oils / black colour (detergent/dispersant)

* PI = Product information
EP = Extreme pressure additives, to avoid wear seizures and scuffing at high pressures and loads
AW = Anti wear additives, to avoid wear in boundary friction conditions

While the information and figures given here are typical of current production and confirm to specification, minor variations may occur. Subject to amendment.

Special lubricants for gearboxes and circulating systems – an overview.

RENOLIN AWD – detergent EP/AW gear oils with high Brugger performance

CLP-D oils / high Brugger values

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN AWD 68	Special gear and circulating oils when products with particularly good wear protection properties are required. Special additives reduce friction and form reaction layers which offer excellent wear protection in extreme mixed friction and load conditions. Brugger value >70 N/mm², excellent FE8 roller bearing wear protection, good dirt holding capacity (detergent / dispersant), free from zinc and silicone oil, high additive reserves. The RENOLIN AWD series oils of the surpass the minimum requirements of CLPD lubricating oils according to DIN 51 517, Part 3 (2014) together with DIN 51 502, ISO 6743-6 and ISO 12925-1: CKC, CKD. Approved by leading press manufacturers.	882	221	68	8.9	105	-24	For highly-stressed industrial gearboxes and circulating systems, especially when good load-carrying capacity in extreme mixed friction and load conditions are required. High Brugger value of >75 N/mm². Used in applications including press lines in the automotive industry. (Refer to PI* 4-1060 for further information)
RENOLIN AWD 100		886	222	100	11.2	97	-24	
RENOLIN AWD 150		894	208	150	14.6	96	-12	
RENOLIN AWD 220		896	210	220	18.7	95	-12	

RENOLIN UNISYN CLP – fully synthetic, high-performance EP/AW gear oils based on polyalphaolefin (PAO)

CLP-HC oils / PAO-synthetic

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN UNISYN CLP 68	Fully-synthetic gear and circulating oils with excellent thermal and aging stability, very high viscosity index (shear-stable), outstanding low-temperature behavior, very good flowability at low temperatures, excellent air release properties and foaming behavior, good protection against micropitting, excellent FE8 performance, good demulsifying properties, free from zinc and silicone oil. The RENOLIN UNISYN CLP series oils of the surpass the minimum requirements of CLP-HC gear oils according to DIN 51 517, Part 3 (2014) together with DIN 51 502, ISO 6743-6 and ISO 12925-1: CKC, CKD, CKE, AISE 224, David Brown S1.53.101. Approved by leading gearbox manufacturers.	848	240	68	10.7	147	-56	For the lubrication of bearings and gearboxes which are subject to high thermal loads. RENOLIN UNISYN CLP oils are also suitable for lubricated-for-life applications and in gearboxes with extended oil change intervals. Miscible and compatible with mineral oils. Excellent low-temperature characteristics, high, shear-stable viscosity index. RENOLIN UNISYN CLP 320 is used in wind turbine gears worldwide and is an approved gear oil for wind turbines. (Refer to PI* 4-1104 for further information)
RENOLIN UNISYN CLP 100		851	250	100	14.5	150	-53	
RENOLIN UNISYN CLP 150		853	250	150	19.6	150	-45	
RENOLIN UNISYN CLP 220		854	260	220	26.7	155	-42	
RENOLIN UNISYN CLP 320		860	260	320	35.0	155	-42	
RENOLIN UNISYN CLP 460		861	300	460	45.6	155	-39	
RENOLIN UNISYN CLP 680		862	300	680	62.2	160	-33	
RENOLIN UNISYN CLP 1000		864	300	1,000	84.0	165	-27	

* PI = Product information
EP = Extreme pressure additives, to avoid wear seizures and scuffing at high pressures and loads
AW = Anti wear additives, to avoid wear in boundary friction conditions

RENOLIN PG – synthetic, high-performance EP/AW gear oils based on polyalkylene glycol (PAG)

CLP-PG oils / polyglycol

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN PG 32	Fully synthetic gear and circulating oils based on special polyalkylene glycols (PAG) for applications subject to extreme thermal loads. High oxidation and aging stability, high viscosity index (shear-stable), good viscosity-temperature behavior, excellent load-carrying capacity, low coefficients of friction, high FZG, good protection against micropitting, excellent FE8 performance, very good resistance to pitting. The RENOLIN PG series oils of the surpass the minimum requirements of CLP-PG lubricating oils according to DIN 51 517, Part 3 (2014) together with DIN 51 502, ISO 6743-6 and ISO 12925-1: CKC, CKD, CKE, (CKS), CKT. Approved by leading gearbox manufacturers.	1,022	220	32	7.1	194	-54	For gearboxes operating in extreme thermal and mechanical conditions, such as worm gears and calenders. Can also be used as compressor oils for process gases such as methane, ethane, propane, etc. Particularly suitable for steel/bronze sliding pairs in worm gears. Not miscible or compatible with mineral oils. (Refer to PI* 4-1293 for further details)
RENOLIN PG 46		1,029	240	46	9.7	203	-48	
RENOLIN PG 68		1,035	240	68	13.8	212	-51	
RENOLIN PG 100		1,043	260	100	19.6	220	-48	
RENOLIN PG 150		1,051	260	145	27.0	224	-51	
RENOLIN PG 220		1,075	240	220	36.8	218	-33	
RENOLIN PG 320		1,075	240	320	54.4	237	-36	
RENOLIN PG 460		1,075	280	460	75.1	245	-36	
RENOLIN PG 680		1,075	280	680	110.3	261	-33	
RENOLIN PG 1000		1,075	280	1,000	162.0	281	-36	

PLANTOGEAR S – rapidly biodegradable, high-performance EP/AW gear oils based on saturated esters

CLP-E oils / synthetic esters

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
PLANTOGEAR 100 S	Biodegradable, high-performance gear oils based on special saturated synthetic esters. Extremely high thermal and aging stability, high viscosity index (shear-stable), good viscosity-temperature behavior, for low-temperature applications, excellent cleaning power due to polar ester structure, low friction, excellent wear protection, good FZG scuffing load carrying capacity, good protection against micropitting, outstanding FE8 performance, rapidly biodegradable and self-cleaning. The PLANTOGEAR S series oils of the surpass the minimum requirements of CLP-E lubricating oils according to DIN 51 517, Part 3 (2014) together with DIN 51 502, ISO 6743-6 and ISO 12925-1: CKC, CKD, CKE. The PLANTOGEAR S range has been awarded the European environmental seal (EU Ecolabel). Approved by leading gearbox manufacturers.	924	280	100	13.7	138	-33	For highly-stressed spur, bevel, planetary and worm gears, above all in areas where leakages could present a hazard to soil and the ground or surface water. For both high and low application temperatures. High, shear-stable viscosity index. Can be used as a cleaning fluid. Gearmaster 320 Eco – rapidly biodegradable wind turbine gear oil. EU Ecolabel PLANTOG. 100 S - DE/027/100 PLANTOG. 150 S - DE/027/101 PLANTOG. 220 S - DE/027/102 PLANTOG. 320 S - DE/027/103 PLANTOG. 460 S - DE/027/107 PLANTOG. 680 S - DE/027/108 (Refer to PI* 4-1387 for further details)
PLANTOGEAR 150 S		926	280	150	19.1	145	-30	
PLANTOGEAR 220 S		938	280	220	26.2	152	-30	
PLANTOGEAR 320 S		943	280	320	35.1	155	-30	
PLANTOGEAR 460 S		951	280	460	48.0	163	-30	
PLANTOGEAR 680 S		958	280	680	66.0	170	-30	
GEARMASTER 320 ECO		943	280	320	35.1	155	-33	

* PI = Product information
EP = Extreme pressure additives, to avoid wear seizures and scuffing at high pressures and loads
AW = Anti wear additives, to avoid wear in boundary friction conditions

While the information and figures given here are typical of current production and confirm to specification, minor variations may occur. Subject to amendment.

Special lubricants for gearboxes and circulating systems – an overview.

RENOLIN HighGear – industrial gear oils based on the latest additive technology. Smoothing PD technology

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN HighGear 220	RENOLIN HighGear oils are based on selected mineral oil-based base oils. Synergistic additives guarantee the outstanding wear protection performance of these new high-tech gear oils. Highly effective, tribo-protection layers reliably protect wetted machine components against wear. This new additive technology is also referred to as a smoothing PD (plastic deformation) reaction mechanism. These additives have a noticeable smoothing effect on surface roughness. ISO 6743-6 and ISO 12925-1: CKC, CKD, CKE.	902	210	220	18.9	97	-21	RENOLIN HighGear can be used both in new gearboxes (spur, bevel, planetary and worm gears) to reduce friction, wear and noise in extreme conditions as well as in pre-damaged gearboxes and machine components to increase service life. (Refer to PI* 4-1093 for further details) Mineral oil-based
RENOLIN HighGear 320		907	220	320	24.1	96	-15	
RENOLIN HighGear 460 **PD – Plastic Deformation Technology**		913	215	460	30.4	95	-15	

RENOLIN HighGear Synth – industrial gear oils with the latest additive technology based on polyalphaolefin (PAO). Smoothing PD technology

Product name	Description	Density at 15 °C kg/m³	Flash point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN HighGear Synth 150	RENOLIN HighGear Synth is based on synthetic polyalphaolefins (PAO). Special synergistic additives guarantee the outstanding wear protection performance of these new high-tech gear oils. Highly effective, tribo-protection layers reliably protect wetted machine components against wear. RENOLIN HighGear Synth oils have a high, natural and shear-stable viscosity index and are suitable for both high and low temperature applications. Their high thermal and oxidation stability allow oil change intervals to be extended. ISO 6743-6 and ISO 12925-1: CKC, CKD, CKE.	871	220	150	18.0	133	-36	RENOLIN HighGear can be used both in new gearboxes (spur, bevel, planetary and worm gears) to reduce friction, wear and noise in extreme conditions as well as in pre-damaged gearboxes and machine components to increase service life. Synthetic PAO components help reduce friction, lower operating temperatures and can increase mechanical efficiency. Excellent low-temperature characteristics, high, shear-stable viscosity index. (Refer to PI* 4-1096 for further details)
RENOLIN HighGear Synth 220		873	220	220	23.6	133	-33	
RENOLIN HighGear Synth 320		876	220	320	31.2	135	-34	
RENOLIN HighGear Synth 460		878	220	460	41.6	140	-27	
RENOLIN HighGear Synth 680		880	220	680	57.9	149	-27	

* PI = Product information
EP = Extreme pressure additives, to avoid wear seizures and scuffing at high pressures and loads
AW = Anti wear additives, to avoid wear in boundary friction conditions

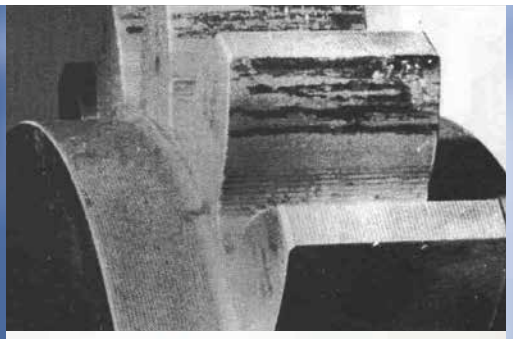
RENOLIN MORGEAR – demulsifying circulating oils with mild AW additives for applications in the steel industry

Product name	Description	Density at 15 °C kg/m³	Flash point Cleve-land °C	Kine-matic viscosity at 40 °C mm²/s	Kine-matic viscosity at100 °C mm²/s	Viscosity index VI	Pour-point °C	Main application area
RENOLIN MORGEAR 100	High-performance circulating oils based on mineral oil, for the lubrication of MORGOIL bearings. Mild EP/AW additives guarantee excellent wear protection; synergistically acting additives ensure good aging stability and excellent demulsifying power (very good water separation properties). ISO 6743-6 and ISO 12925-1: CKB.	888	248	100	11.1	96	-19	For the lubrication of MORGOIL bearings. RENOLIN MORGEAR oils fulfill and surpass the requirements of DANIELI (Italy, 2000) and SMS (2005).
RENOLIN MORGEAR 220		895	255	226	19.2	96	-10	
RENOLIN MORGEAR 320		903	>260	320	24.0	95	-12	
RENOLIN MORGEAR 460		904	>270	470	31.1	96	-9	
RENOLIN MORGEAR 680		915	252	682	39.2	95	-7	

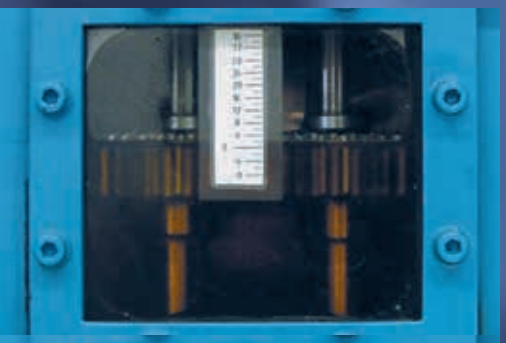
Special gear oils and circulating oils NEW

Product name	Description
RENOLIN UNISYN CLP PA	Fully synthetic, "newly developed" high-performance paper machine oil series based on polyalphaolefin. Excellent demulsibility (very good water separation properties), good aging stability, excellent wear protection, excellent corrosion protection, long lifetime. Fulfills requirements from SKF, FAG and VOITH for paper machine oils.
RENOLIN PA	Mineral oil-based gear oil with the latest additive technology for the special requirements of lubricating bearings in paper machines; very good demulsifying properties, excellent corrosion protection and wear protection.
RENOLIN SynGear 220 HT	Fully synthetic high-temperature EP industrial gear oil based on selected polyalkylene glycols, extreme high-temperature stability, low evaporation loss, high wear protection, high thermal and oxidative stability, for lubrication of calenders in the paper and foils industries, CKC / CKD / CKT gear oil according to ISO 6743/6.
RENOLIN GEAR VCI **RENOLIN UNISYN GEAR VCI**	Special anticorrosion oil based on mineral oil or polyalphaolefin (PAO), reliable long-time corrosion protection guaranteed both in the oil phase and vapor phase, fulfills and surpasses the requirements of CLP industrial gear oils, good wear protection, high scuffing load carrying capacity, good compatibility with gear oils.

Competence in R&D and in mechanical test field.



Micro-pitting test. Influence of lubricants and additives on micro-pitting



Foaming behaviour of industrial gear oils (start and running conditions) according to Flender

FZG test rig to determine the friction coefficients and efficiency of industrial gear oils

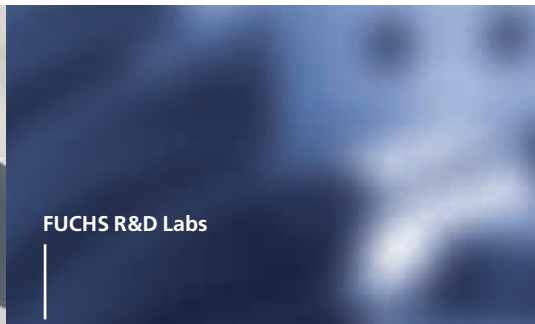
FE8 roller bearing

Test rig for Automotive Lubricants

FE8 roller bearing test failure

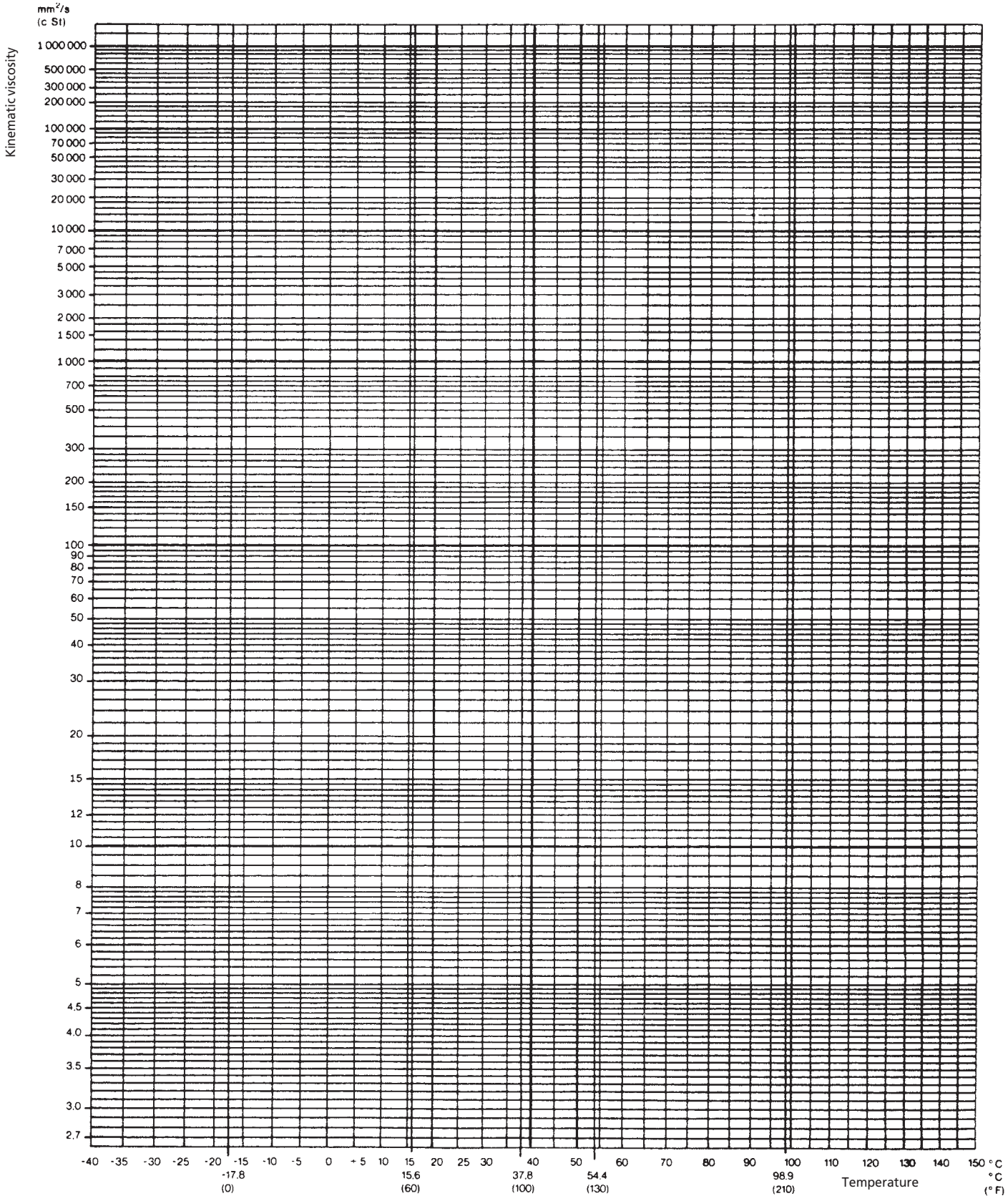
FE8 roller bearing test – Set-up

FZG Gear test rig to test
the load carrying capacity of
EP/AW gear oils and lubricating oils



FUCHS R&D Labs

Viscosity-temperature diagramm.



Notes

FUCHS Industrial Lubricants

Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.

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