FUCHS Industrial Lubricants

Innovative Lubricants Need Experienced Application Engineers

Consultation with an experienced Application Engineer should precede every lubricant change-over. This guarantees that the optimum lubricant system is selected. Our experienced engineers can not only offer advice on application but also inform you about our comprehensive range of lubricants.

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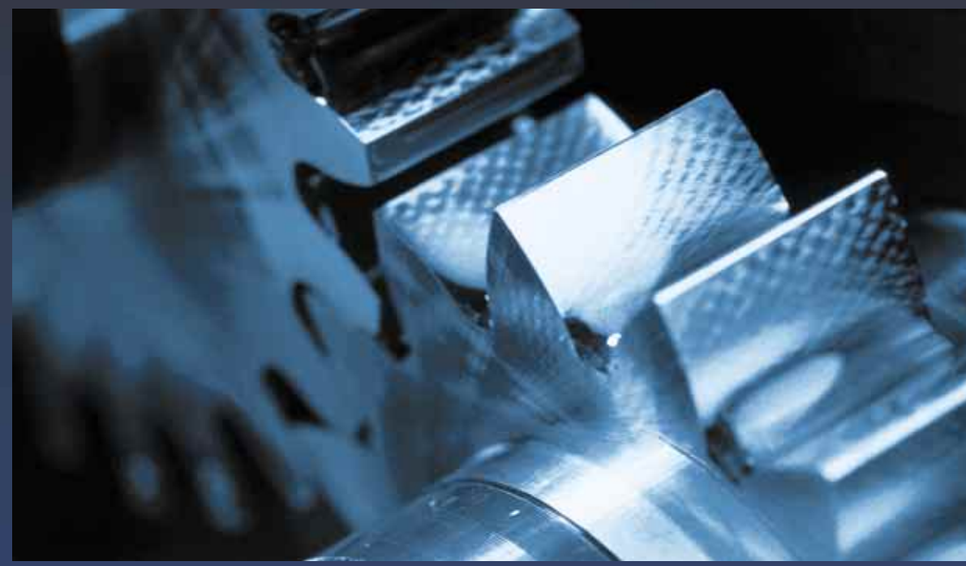
FUCHS Industrial Lubricants

RENOLIN

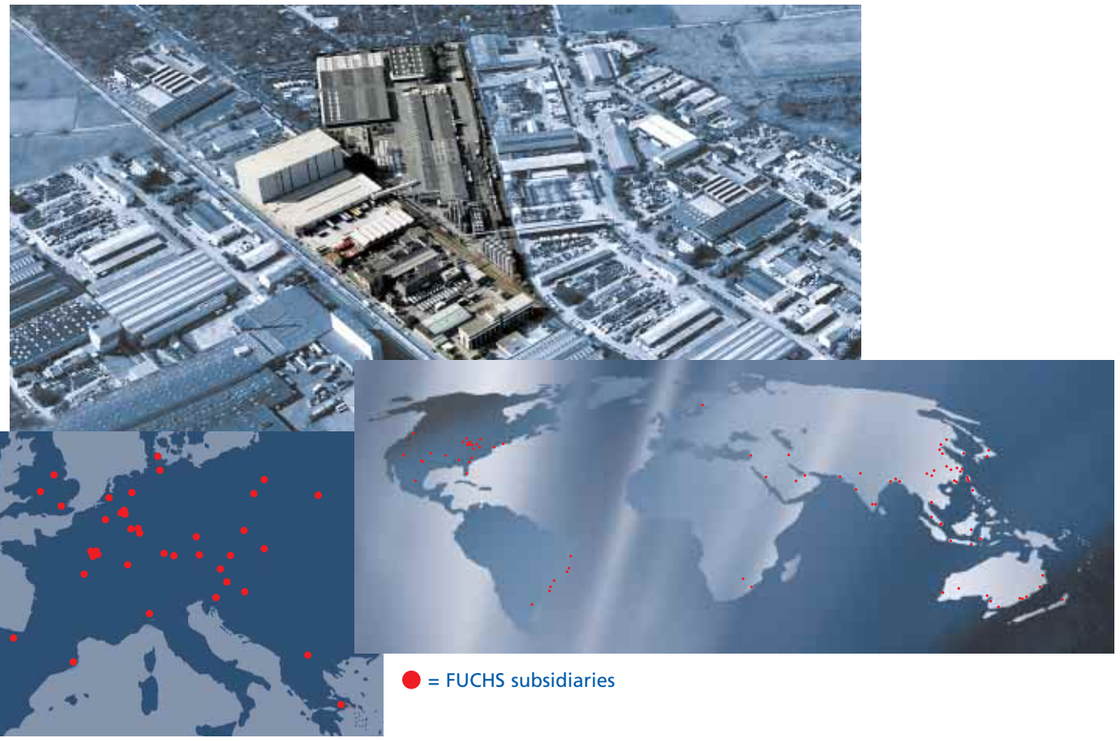
Reduced Friction, High Efficiency – Outstanding Performance



Industrial Gear Oils and General Lubricating Oils

FUCHS Industrial Lubricants

FUCHS EUROPE SCHMIERSTOFFE GMBH



● = FUCHS subsidiaries

We are a German company whose almost 600 employees manufacture and market a wide range of lubricants and derived specialties. The company, which was founded in 1931 as RUDOLF FUCHS, is located in Mannheim and is a 100 % subsidiary of FUCHS PETROLUB AG. With approximately 4,155 employees in over 65 operating companies, FUCHS PETROLUB AG is the world's largest independent manufacturer of lubricants. Our company's degree of specialization and innovation is way above the industrial average in this field. The full product line includes almost 2,000 lubricants and derived specialties for all walks of life, industrial processes and applications.

First Class Partner

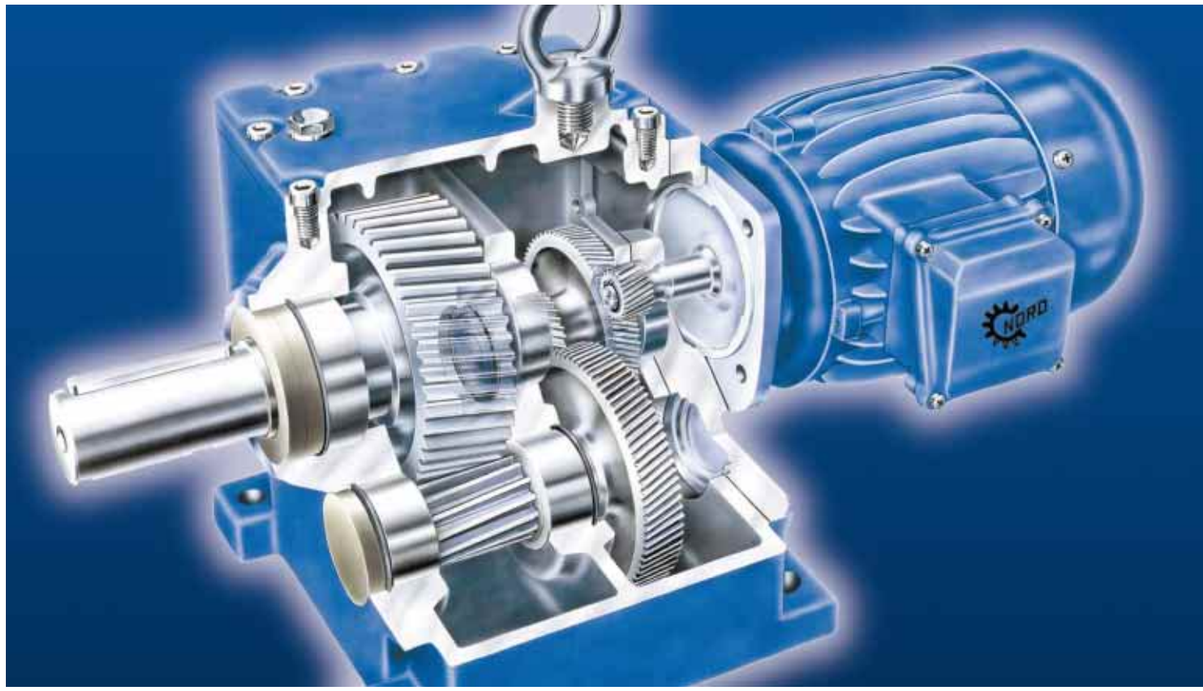
Our customer's success is also our success. Because partnership to us means passing-on advantages. The advantage of a strong market presence: FUCHS is the largest independent manufacturer of lubricants in the world. The advantage of first-class, innovative products: FUCHS sets the pace in terms of performance. The aim: Technological leadership. Not for nothing is FUCHS the leading factory-fill lubricant brand in the German automotive industry. The advantage of a comprehensive product line: FUCHS meets all the requirements of the market with a full line of products and tailor-made, special solutions. The advantage of reliability: Certified to DIN EN ISO 9001:2000 and ISO/TS 16949:2002, FUCHS has been continuously upgrading of its highly specialized lubricants for decades.

And of course, partnership to us also means expert service and complete customer support. By comprehensive marketing. By state-of-the-art logistics. By the development of successful service concepts. And expert advice. Because together, we can achieve more.

DIN EN ISO 9001: 2000
ISO/TS 16949: 2002
DIN EN ISO 14001
REG.NR. 2476

RENOLIN

A Major Engineering Element – Industrial Gear Oils



Gear Oils for All Applications

Germany is one of the world's leading manufacturers of drive trains and gearboxes. A gear oil represents an important engineering element in drive train technology and is used in almost all areas of application.

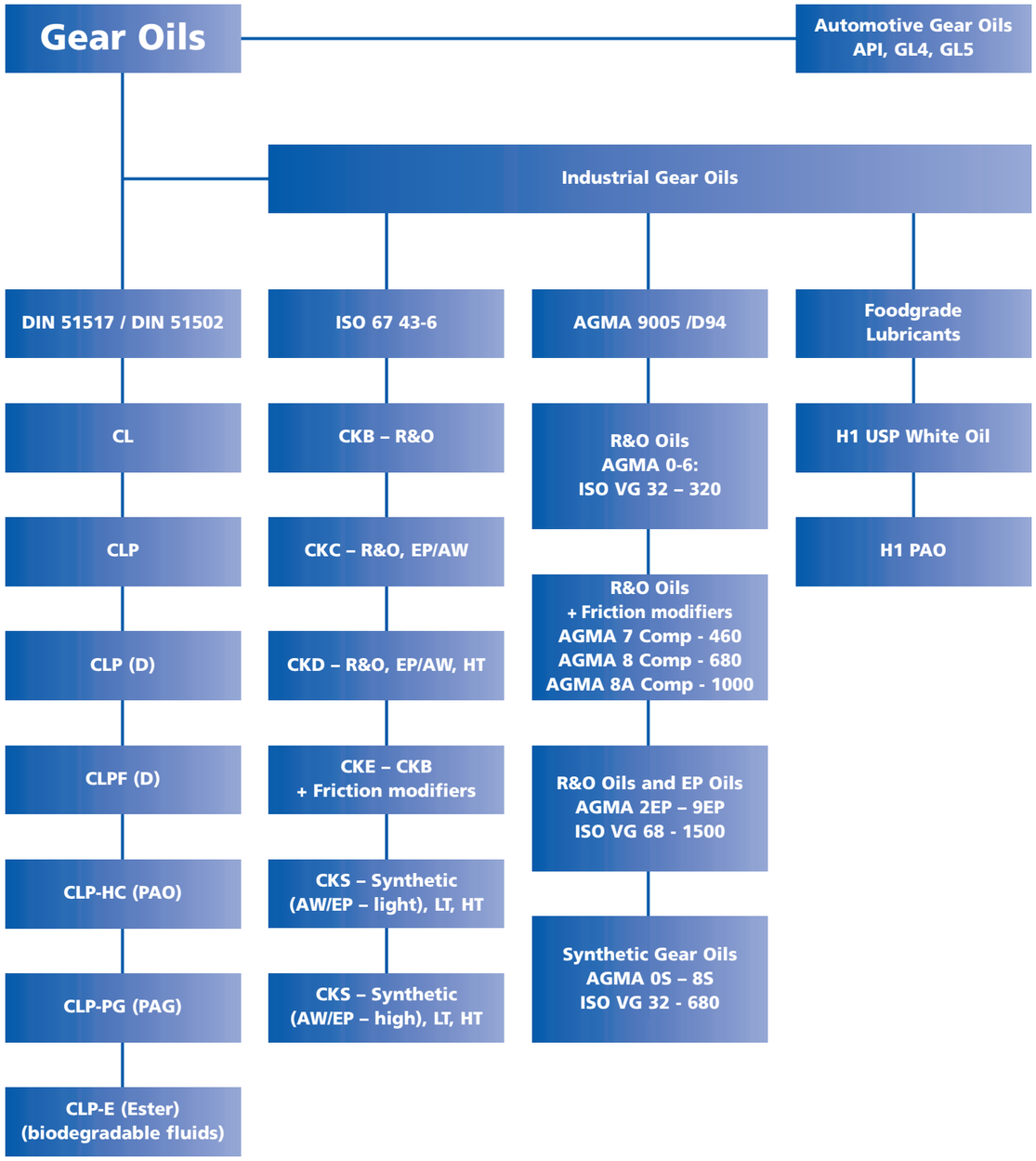
The demands made on gear oils have risen significantly. New developments in the field of drive train technology are mostly accompanied by increases in component performance: More performance or higher capacity needs to be transferred in ever shorter periods of time. At the same time, components and gearboxes become increasingly smaller and compact.

A gear oil, as one of the most important and complex engineering elements, must satisfy changing application conditions and performance requirements. Oil volumes get smaller, oil circulation cycles increase and the energy transferred to the lubricant increases. This leads to an increase in the thermal and oxidative load on the lubricant. And in addition, the technical demands on industrial lubricants have changed dramatically over recent years – these have become more "stringent". New, complex bench tests with exact thresholds have been developed to better reflect the demands and problem areas in test rig conditions.

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

- General lubricating and gear oils for industrial applications (stationary gear oils) conforming to DIN 51 517, ISO 6743/6 and
- Lubricating and gear oils for automotive applications (mobile gear oils), commercial vehicle gear oils and Automatic Transmission Fluids conforming to API GL 4, GL 5, etc.

General Classification of Gear Oils



New DIN 51517 – 2004

New AGMA standard – Wind Power

L = Anti Oxidant, Anti Corrosion = R&O

P = Anti-Wear, Extreme Pressure = AW/EP

D = Detergent / Dispersant

F = MoS_2 (black)

HT = High Temperature

LT = Low Temperature

C = General lubricating oil

RENOLIN

Reliable Solutions for Engineering and the Environment

Demands on Industrial Gear Oils

The demands made on industrial gear oils are increasing. Although the new DIN 51 517 only specifies a scuffing test in line with FZG A/8,3/90 and the roller bearing test FE8 in addition to the physical characteristics, many gear manufacturer's specifications contain additional demands:

- Intensified scuffing test according to FZG A/16,6/140
- Micro-pitting test according to GFT, FVA I-IV, C/8,3/90 and C/8,3/60
- FE8 roller bearing wear test in line with DIN 51 819, Part 3 (and variants) – D/7,5/80-80
- FZG Low-speed wear Test
- FZG Pitting Test
- Load-carrying capacity according to Brugger
- Filtration behaviour – dynamic test
- Foaming behaviour (e.g. Flender in-house test)
- etc.

These additional bench tests attempt to replicate the extreme conditions which gearboxes and gear oils are subject to and quantify the performance of the various formulations. FUCHS has advanced test rigs for the testing of industrial 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 Drivetrain Technology (FVA) and international customers results in a constant refinement and improvement of both standardized test procedures as well as FUCHS in-house bench tests.

FUCHS Industrial Lubricants

For the Drive Trains of Today and Tomorrow

Heavy Duty Synthetic Gear Oils

Although mineral oil-based gear oils continue to dominate, synthetic oils are increasingly being used in the rapidly growing power transmission market. The market share of synthetic oils in 2004 totalled 15 – 20 %. Compared to mineral oils, synthetic gear oils have a significantly longer life, generate lower service costs and offer excellent value for money in terms of reducing wear to gears and bearings. They are more expensive than mineral oils but these higher costs are compensated for by two-to-three times longer life, lower maintenance costs, wider application temperature range (multigrade characteristics), lower disposal costs, better technical performance and lower component wear.

FUCHS Synthetic Oils: A Complete Program

In addition to a comprehensive product program of mineral oil-based gear oils in the series

- RENOLIN CLP
- RENOLIN CLP PLUS
- RENOLIN AWD
- RENOLIN CLPF SUPER
- RENOLIN HighGear

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 polyalphaolefins (PAO)
- RENOLIN PG – based on polyalkylenglycols (PAG)
- PLANTOGEAR S – based on saturated esters (E)
- RENOLIN HighGear Synth – based on polyalphaolefins (PAO)

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

RENOLIN

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. Their compatibility with paints and elastomers is comparable with that of mineral oils. Compared to mineral oils, the service life of these oils is about two-to-three times longer. RENOLIN UNISYN CLP offers outstanding wear protection properties. As a result of their extremely low pourpoint, these oils display extraordinary cold flowing properties. And among synthetic gear oils, they represent the most important group.

RENOLIN PG Series

RENOLIN PG series products 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 drives and are recommended for applications subject to unfavourable friction conditions and very high temperatures (e.g. calender lubrication and paper-making machines). 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 ester oils. These offer very low friction coefficients, good load-carrying capacity and a high, naturally shear-stable Viscosity Index. Moreover, the polar structure of ester oils provides for good detergent and dispersant properties. And finally, ester oils display excellent thermal stability.
PLANTOGEAR S series products can be used to clean gearboxes which have been contaminated with deposits and sludge.

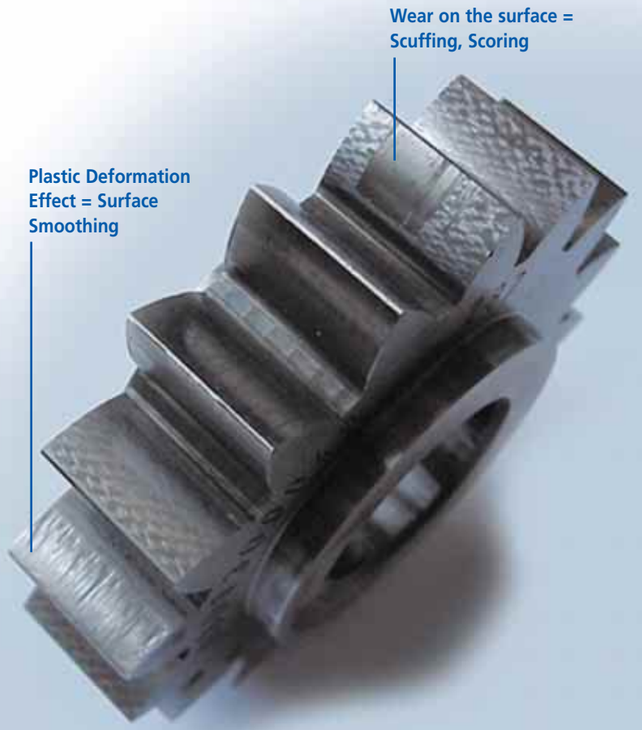
FUCHS is a leading player in the field of power transmission engineering and its product line satisfies all industrial gear oil applications and performance levels. In addition, special grades are also available which were specially developed to meet specific customer demands.

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

RENOLIN 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 extreme loads, boundary friction conditions, high pressures, high specific tooth flank loads, low speeds and when contact faces are damaged.

This is achieved by the use of synergic additive combinations of mild sulphur 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 terms of thermal and oxidation stability, long-term stability (to avoid sludge formation) and corrosion protection.
Both mineral oil- and polyalphaolefin-based products are thus available which fulfil the highest technical standards.
The results of tests performed in extreme conditions and with worn machine elements in large-scale gearboxes (in underground mine conveyor drives) as well as spindle drives in forging presses confirm these outstanding characteristics.



Special Lubricating Oils and Industrial Gear Oils – An Overview

RENOLIN DTA – Demulsifying General Lubricating, Spindle and Hydraulic Oils

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN DTA 2	Spindle, hydraulic and general machine lubricants containing selected base oils and additives to improve ageing behaviour and corrosion protection. RENOLIN DTA series products are hydraulic and general lubricating oils according to DIN 51 524-1 (HL) and DIN 51 517-2 (CL), mineral oil-based, demulsifying and zinc-free. ISO 6743/4, HL ISO 6743/6, CKB	805	100	2	–	–	-27	For thermally stressed bearings and hydraulics with peak temperatures of about 120 °C. General lubrication without specific anti-wear specifications (no AW/EP). (For further information, see PI 4-1292*) Mineral oil-based
RENOLIN DTA 5		837	120	5	1,6	106	-40	
RENOLIN DTA 7		839	155	7	2,2	103	-27	
RENOLIN DTA 10		852	174	10	2,6	92	-27	
RENOLIN DTA 15		856	195	15	3,5	99	-27	
RENOLIN DTA 22		865	210	22	4,1	93	-27	
RENOLIN DTA 32		874	222	32	5,5	103	-24	
RENOLIN DTA 46		874	228	46	7,1	111	-24	
RENOLIN DTA 68		882	250	68	8,6	99	-18	
RENOLIN DTA 100		881	248	100	11,3	97	-18	
RENOLIN DTA 150		886	266	150	14,5	95	-15	
RENOLIN DTA 220		893	280	220	18,9	95	-12	
RENOLIN DTA 320		898	280	320	24,1	95	-12	
RENOLIN DTA 460		904	315	460	30,5	95	-12	
RENOLIN DTA 680		913	302	680	37,6	92	-12	

RENOLIN CLP – Demulsifying EP/AW Gear Oils and General Lubricating Oils

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN CLP 68	High performance, gear oils and general lubricating oils with good ageing stability and additives to improve corrosion protection (combat ferrous and nonferrous metal corrosion caused by moisture). Outstanding anti-wear characteristics – good EP/AW performance, excellent protection against scuffing and micro-pitting, excellent FE8 roller bearing wear protection, good demulsifying properties, very good foaming suppression, zinc- and silicone oil-free. RENOLIN CLP oils fulfill and surpass the minimum requirements of lubricating oils. CLP according to DIN 51 517, Part 3 (2004), ISO 6743/6, CKC, US Steel 224, David Brown S1.53.101 Approved by leading gearbox manufacturers.	880	236	68	8,7	99	-27	Universal gear oils for all industrial applications such as in bearings, knuckles, spur, bevel and worm drives and whenever the manufacturer recommends a Type CLP oil. (For further information, see PI 4-1208*) Mineral oil-based
RENOLIN CLP 100		883	238	100	11,2	97	-27	
RENOLIN CLP 150		889	227	150	14,3	92	-24	
RENOLIN CLP 220		895	223	220	18,9	96	-18	
RENOLIN CLP 320		901	232	320	24,1	96	-15	
RENOLIN CLP 460		906	242	460	30,7	96	-12	
RENOLIN CLP 680		918	214	680	37,9	92	-12	

* 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 Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN CLP 46 PLUS	High performance gear and general lubricating oils offering excellent wear protection, good EP performance and excellent corrosion protection. Carefully selected anti-oxidants guarantee good ageing stability and special surface-active substances lower friction which can reduce operating temperatures and increase efficiency. Special detergent/dispersant additives offer good cleansing and dirt transportation properties. RENOLIN CLP PLUS oils have excellent foaming characteristics and offer good protection against micro-pitting. The RENOLIN CLP PLUS series of oils are zinc- and silicone oil-free. RENOLI CLP PLUS oils fulfil the minimum demands made on lubricating oils according to DIN 51 517, ISO 7643/6, CKC. RENOLIN CLP PLUS products were specially developed for the extreme conditions in which mining industry conveyors operate and can increase service life in such conditions.	883	238	46	6,8	103	-27	Special gear oils for highly-stressed industrial, spur, double-spur, bevel and worm drives. Long-life oils (tested for 30,000 hours in open-cast lignite mining conveyors and approved). (For further information, see PI 4-1226*)
RENOLIN CLP 68 PLUS		882	236	72	9,1	101	-27	
RENOLIN CLP 100 PLUS		885	231	100	11,1	95	-24	
RENOLIN CLP 150 PLUS		890	248	150	14,6	97	-24	
RENOLIN CLP 220 PLUS		897	224	233	20,0	98	-24	
RENOLIN CLP 320 PLUS		902	264	336	25,0	95	-21	
RENOLIN CLP 460 PLUS		907	230	486	32,2	99	-15	
RENOLIN CLP 680 PLUS		909	244	671	37,1	90	-15	

RENOLIN CLPF SUPER EP/AW Gear Oils with MoS_2 (Solid lubricants / Black colour)

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN CLPF 100 SUPER	EP gearbox oils with synergenic chemical EP/AW additives and physical MoS_2-based solid lubricants. The MoS_2-based solid lubricants are physically effective and cover a wide range of temperatures in boundary friction conditions. They reduce friction and have a damping effect. Excellent wear protection in boundary friction conditions, good dirt suspension properties (detergent effect), low foaming, very good FE8 roller bearing wear protection as well as zinc- and silicone oil-free. The RENOLIN CLPF SUPER series of oils surpass the minimum requirements of CLPD lubricating oils according to DIN 51 517, Part 3 (2004) together with DIN 51 502, ISO 6743/6, CKC.	885	238	100	11,4	100	-24	For highly-stressed gearboxes operating at low speeds and high loads, even when subject to shock loading, for noise reduction and for the lubrication of spindles and gearboxes in forging presses. (For further information, see PI 4-1264*) Mineral oil-based
RENOLIN CLPF 220 SUPER		897	230	220	19,2	98	-18	
RENOLIN CLPF 320 SUPER		904	214	320	24,5	96	-15	
RENOLIN CLPF 460 SUPER		912	214	460	29,5	92	-12	
RENOLIN CLPF 680 SUPER		931	214	680	37,2	90	-12	

* 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

Special Lubricating Oils and Industrial Gear Oils – An Overview

CLP-D Oils / High Brugger Values

RENOLIN AWD – Detergent EP/AW Gear Oils with high „Brugger" performance

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN AWD 68	Special gearbox and general lubricating oils when products with particularly good wear protection are required. Special additives reduce friction and form reactive layers which offer excellent wear protection in extreme boundary friction and load conditions. Brugger value > 70 N/mm², excellent FE8 roller bearing wear protection, good detergent/dispersant properties, zinc- and silicone oil-free and high additive reserves. The RENOLIN AWD series of oils surpass the minimum requirements of CLPD lubricating oils according to DIN 51 517, Part 3 together with DIN 51 502, ISO 6743/6, CKC.	882	221	68	8,8	106	-24	For highly-stressed industrial gearboxes and lubricating systems especially when good EP performance in extreme boundary friction and load conditions are required. High Brugger value of > 70 N/mm². (For further information, see PI 4-1060*)
RENOLIN AWD 100		886	222	100	11,2	97	-24	
RENOLIN AWD 150		894	208	150	14,3	96	-12	
RENOLIN AWD 220		896	210	220	18,8	95	-12	

CLP-HC Oils / PAO-Synthetic

RENOLIN UNISYN CLP – Fully Synthetic, High Performance EP/AW Gear Oils Based on Polyalphaolefins (PAO)

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN UNISYN CLP 68	Fully-synthetic gear and general lubricating oils with excellent thermal and ageing stability, very high Viscosity Index (shear-stable), outstanding low temperature characteristics, good cold-flowing properties, very good air release, low foaming, good protection against micro-pitting, good FE8 performance, good demulsifying as well as zinc- and silicone oil-free. The RENOLIN UNISYN CLP series of oils surpass the minimum requirements of CLP-HC gear oils according to DIN 51 517, Part 3 together with DIN 51 502, ISO 6743/6, CKD, AISE 224, David Brown S1.53.101. Approvals from leading gearbox manufacturers have been issued.	843	250	68	11,1	149	-60	For the lubrication of bearings and gearboxes which are subject to high thermal loads. RENOLIN UNISYN CLP oils are suitable for lubricated-for-life applications and in gearboxes with extended drain intervals. Miscible and compatible with mineral oils. Excellent low temperature characteristics, high, shear-stable Viscosity Index. (For further information, see PI 4-1104*)
RENOLIN UNISYN CLP 100		845	250	100	14,4	148	-60	
RENOLIN UNISYN CLP 150		849	250	150	19,4	148	-60	
RENOLIN UNISYN CLP 220		852	260	220	25,7	148	-54	
RENOLIN UNISYN CLP 320		855	260	320	36,6	162	-54	
RENOLIN UNISYN CLP 460		856	300	460	45,6	155	-45	
RENOLIN UNISYN CLP 680		858	300	680	62,2	160	-42	

* 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

Issue: 01/2006

CLP-PG Oils / Polyglycol

RENOLIN PG – Synthetic, High Performance EP/AW Gear Oils Based on Polyalkylene glycols (PAG)

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN PG 32	Fully synthetic gear and general lubrication oils base on special polyalkylene glycols (PAG) for applications -subject to extreme thermal loads. High oxidation and ageing stability, high Viscosity Index (shear-stability), good viscosity-temperature behaviour, excellent EP performance, low coefficients of friction, high FZG, good protection against micro-pitting and good FE8 performance. The RENOLIN PG series of oils surpass the minimum requirements of CLP-PG lubricating oils according to DIN 51 517, Part 3 together with DIN 51502, ISO 6743/6, CKD. Approvals from leading gearbox manufacturers have been issued.	1103	225	32	5,4	102	-54	For gearboxes operating in extreme thermal and mechanical conditions such as in worm gears and calenders. Can also be used as a compressor oil for process gases such as methane, ethane, propane, etc. Particularly suitable for steel/bronze bearings in worm gears. Not miscible or compatible with mineral oils. (For further information, see PI 4-1293*)
RENOLIN PG 46		989	> 280	46	8,5	171	-54	
RENOLIN PG 68		994	> 280	68	12,3	178	-51	
RENOLIN PG 100		997	269	100	17,6	188	-48	
RENOLIN PG 150		1051	240	145	27,0	224	-51	
RENOLIN PG 220		1075	240	220	36,8	218	-36	
RENOLIN PG 320		1075	240	320	54,4	237	-39	
RENOLIN PG 460		1075	280	460	75,1	245	-36	
RENOLIN PG 680		1075	280	680	110,3	245	-33	
RENOLIN PG 1000		1075	280	1000	162,0	281	-36	

CLP-E Oils / Synthetic Esters

PLANTOGEAR S – Rapidly Biodegradable, High Performance EP/AW Gear Oils Based on Saturated Esters

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
PLANTOGEAR 100 S	Biodegradable, high-performance gear oils based on special saturated esters. Extremely high thermal and ageing stability, high Viscosity Index (shear stability), good viscosity-temperature behaviour for low temperature applications, excellent cleansing power due to polar ester structures, low friction, excellent wear protection, good FZG performance, good protection against micro-pitting, outstanding FE8 performance, rapidly biodegradable and "Self-Cleaning". The PLANTOGEAR S series of oils surpass the minimum requirements of CLP-E lubricating oils according to DIN 51 517, Part 3 together with DIN 51 502, ISO 6743/6, CKD. Approvals from leading gearbox manufacturers have been issued.	936	> 280	100	15,7	170	-51	For highly-stressed spur, bevel, planetary and worm drives and especially applications which may be affected by contact with water. For both high and low application temperatures. High, shear-stable Viscosity Index. Can be used as a flushing fluid. (For further information, see PI 4-1227*)
PLANTOGEAR 150 S		943	> 280	150	21,1	165	-45	
PLANTOGEAR 220 S		951	> 280	220	27,7	160	-48	
PLANTOGEAR 320 S		958	270	320	38,2	158	-45	
PLANTOGEAR 460 S		957	> 280	460	48,6	164	-42	
PLANTOGEAR 680 S		956	> 280	680	66,7	171	-39	
PLANTOGEAR 1000 S		956	> 280	1000	92,2	180	-42	

* 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

Issue: 01/2006

The information and figures given here are typical of current production and confirm to specification. Subject to amendment.

Special Lubricating Oils and Industrial Gear Oils – An Overview

New PD Technology, Mineral Oil-Based, Smoothing

RENOLIN HighGear – Industrial Gear Oils Based on the Latest Additive Technologies. Smoothing PD Technology NEW

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN HighGear 220	RENOLIN HighGear is formulated on selected mineral base oils. Synergenic additive combinations guarantee the outstanding wear protection performance of these new High Tech Gear oils. Highly-effective, tribo-protection layers 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.	902	210	220	18,9	97	-21	RENOLIN HighGear can be used in both new gearboxes (spur, bevel, planetary and worm drives) to reduce friction, wear and noise in extreme conditions as well as in worn gearboxes and machine components to increase service life. **PD – Plastic Deformation Technology**
RENOLIN HighGear 320		907	220	320	24,1	96	-15	
RENOLIN HighGear 460		913	215	460	30,4	95	-15	

New PD Technology, PAO-Based, Smoothing

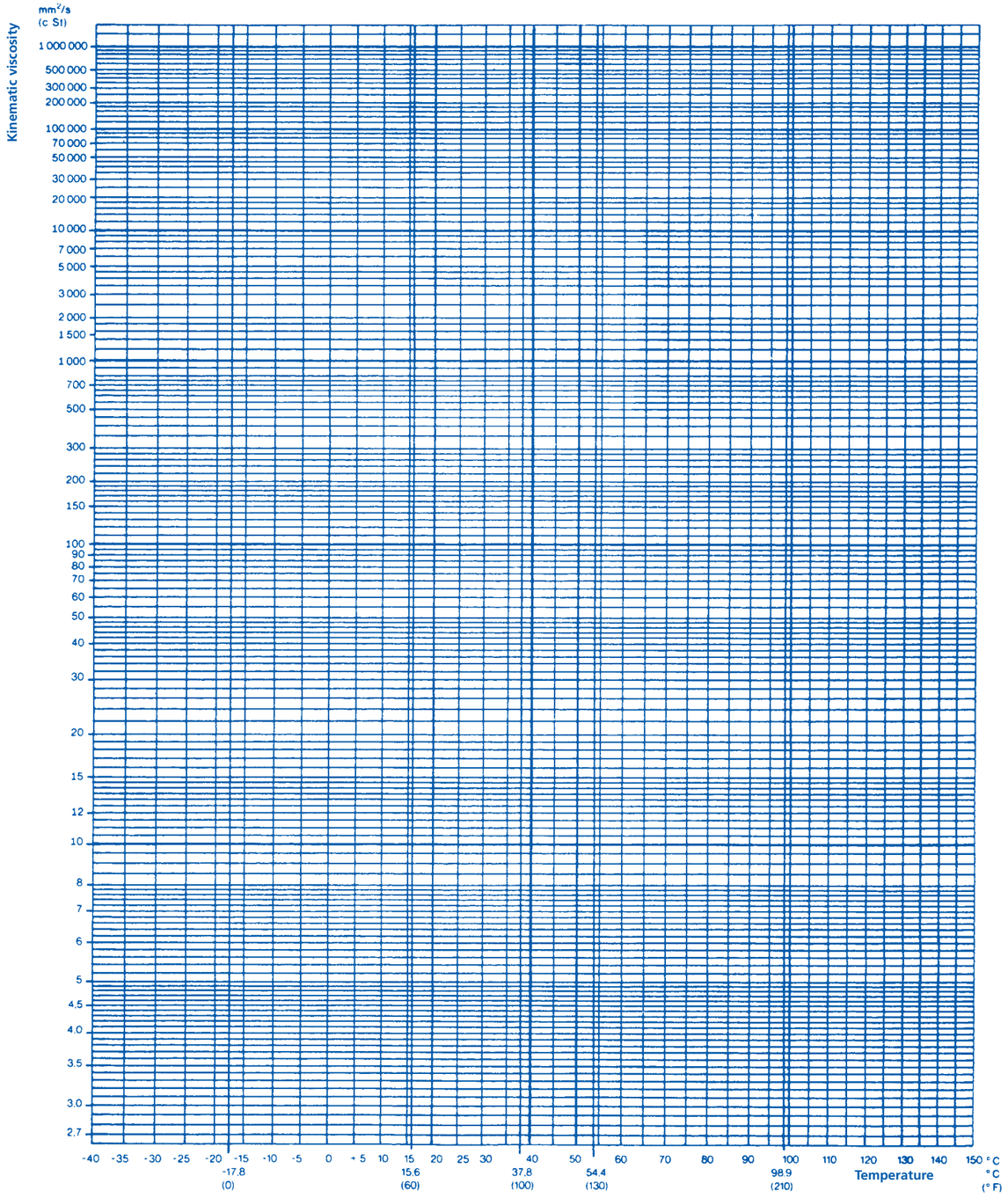
RENOLIN HighGear Synth – Industrial Gear Oils with the Latest Additive Technology Based on Polyalphaolefins (PAO). Smoothing PD Technology NEW

Product name	Description	Density at 15 °C kg/m³	Flash-point Cleveland °C	Kinematic viscosity at 40 °C mm²/s	Kinematic viscosity at 100 °C mm²/s	Viscosity Index VI	Pour-point °C	Main application area
RENOLIN HighGear Synth 320	RENOLIN HighGear Synth products are based on synthetic polyalphaolefins (PAO). Special synergetic additives in these High-Tech gear oils offer outstanding anti-wear performance. Highly-effective, tribo-protection layers 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.	876	220	320	31,2	135	-34	RENOLIN HighGear can be used in both new gearboxes (spur, bevel, planetary and worm drives) to reduce friction, wear and noise in extreme conditions as well as in worn 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 and high, shear-stable Viscosity Index. **Synthetic PD – Plastic Deformation Technology**
RENOLIN HighGear Synth 460		878	220	460	41,6	140	-31	
RENOLIN HighGear Synth 680		880	220	680	57,9	149	-31	

* 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

Issue: 01/2006

Viscosity-Temperature Diagram



Issue: 01/2006

FUCHS Industrial Lubricants

RENOLIN

Competence in R&D and in mechanical test field

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

FE8 roller bearing test – Set-up

FUCHS R&D Labs

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

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