TECHNICAL INFORMATION

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RENOLIT INDUSTRIAL GREASES

Grades, applications, terminology, tests

RENOLIT industrial greases make up a comprehensive and balanced program of products which not only offers optimum technical but also economic solutions for the largest possible number of industrial applications.

This brochure contains excerpts of the FUCHS industrial grease program.

In addition, the brochure also contains important information on applications, terminology and the testing of greases.

Special greases and specific customer formulations are available on request.

The following criteria need to be considered when selecting a grease:

- Operating temperature
- Load
- RPM and speed
- Ambient conditions (water, dust, acids, alkalines, etc.)
- Sealing materials and plastics.

Together with leading manufacturers of central lubrication systems, we can also offer customers perfect grease application solutions.

Content | Page

DIN EN ISO 9001:2000
ISO/TS 16949:2002
DIN EN ISO 14001:2004
Reg. Nr. 2476

A. Core program

Product name	Classification DIN 51 502 ISO 6743-9 Solid lubricant	Colour	Product information	Thickener Base oil	NLGI-grade	Dropping point [°C]	Operating temperature = continuous = short term Minus 70 60 50 40 30 20 Plus 60 80 100 120 140 160 180 200 220 240 260 280	Remarks Application area
1. Greases, water-resistant, up to +60 °C								
RENOLIT CA-CC 1	K 1 C-30 ISO-L-X-CAHA 1	blue	5-1019	Calcium soap Mineral oil	1	>95		Tacky lubricating and sealing grease, excellent hot and cold water resistance, e.g. for Archimedian screws in waste treatment plants and power stations; softer consistency – "Winter grease".
RENOLIT CA-FH 5	K 2 C-30 ISO-L-X-CAHA 2	red	5-1021	Calcium soap Mineral oil	2	>95		Tacky lubricating and sealing grease, excellent hot and cold water resistance, e.g. for Archimedian screws in waste treatment plants and power stations; stiffer consistency – "Summer grease".
RENOLIT CA-FN 3	K 2 C-30 ISO-L-X-CAHA 2	light brown	5-1020	Calcium soap Mineral oil	2	>95		High quality lubricating and sealing grease with excellent water resistance even against hot water and alkaline solutions. Used as water pump grease.
RENOLIT CA-FG 50	MPF 2 E-30 Graphite	black	5-1100	Calcium soap Mineral oil	2	>95		Graphited underwater dredger grease with good adhesion, excellent water resistance and corrosion protection. Recommended for plain and roller bearings, e.g. conveying and transporting systems, construction machines and watergates.
2. Greases, not water-resistant, up to +120 °C								
RENOLIT SO-GFB	GP 00 H-30 ISO-L-X-CBBB 00	brown	5-2511	Sodium soap Mineral oil	00	>140		Semi-fluid grease with good adhesion for lubrication of high speed gearboxes and gear motors, Flender approval.
RENOLIT SO-GF 00	G 00 H-30 ISO-L-X-CBBA 00	brown	5-2640	Sodium soap Mineral oil	00	>145		For the lubrication of small, light loaded gearboxes.
RENOLIT SO-GFO 35	GP 0 H-30 ISO-L-X-CBBB 0	brown	5-2510	Sodium soap Mineral oil	0	>140		Recommended to lubricate high speed gears of agricultural machines.
RENOLIT SO-WIA 3	K 3 M-30 ISO-L-X-CCBA 3	brown	5-2110	Sodium soap Mineral oil	3	>170		For electric motors, machine tools and conveyor systems.
3. Multipurpose greases for temperatures up to +120 °C								
RENOLIT MP 735	KP 2 K-40 ISO-L-X-DCEB 2	light brown	5-4420	Lithium soap Mineral oil	2	>180		High-performance, multipurpose grease for plain and roller bearings; especially for wheel bearings if no high temperature or special greases is required, good low temperature properties. Approvals: VW TL 735 and MAN 28 Li-P 2.
RENOLIT MP	KP 2 K-40 ISO-L-X-DCEB 2	light brown	5-4550	Lithium soap Mineral oil	2	>180		Multipurpose grease for cars, trucks, agricultural machines and industrial applications. Approvals: DBL 68.04.00, MB-APPROVAL 267.0.
RENOLIT MP PLUS Only available for use in FUCHS system grease guns.	KP 2 K-30 ISO-L-X-CCEB 2	light brown	5-4422	Lithium soap Mineral oil	2	>180		High-performance, multipurpose EP grease for plain and roller bearings with excellent adhesion, very good corrosion protection and ageing stability, for e.g. cars, trucks and agricultural machines.
RENOLIT GP 2 Also in NLGI grade 1 and 3 available.	K 2 K-30 ISO-L-X-CCEA 2	light brown	5-4425	Lithium soap Mineral oil	2	>180		Multipurpose grease for all types of plain and roller bearings.
RENOLIT CA-LZ Also in spray can as RENOLIT UNIMAX LZ available.	KP 2 K-30 ISO-L-X-CCHB 2	yellowish-green fluorescent	5-1082	Calcium soap Mineral oil	2	>140		Long-life tacky grease, prevents wear even in extreme conditions; highly resistant to water wash-out; long-term lubrication of cars, trucks, construction and agricultural machines.

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4. Greases for temperatures > +120 °C and high loads								
RENOLIT FEP 2 Also in NLGI grade 1 and 3 available.	KP 2 N-20 ISO-L-X-BDEB 2	yellow	5-4554	Lithium soap Mineral oil	2	>180		Heavy-duty grease containing special additives to reduce wear and to improve the EP-performance, for mechanically and thermally stressed applications in the steel industry, also for e.g. printing machines, press lubrication and dredger.
RENOLIT LZR 2 H	KP 2 N-30 ISO-L-X-CDIB 2	light brown	5-4441	Lithium soap Mineral oil	2	>180		Premium quality multipurpose grease, long-term rust protection and good corrosion protection even in the presence of salt water, compatible with Hytrel. Recommended for central lubrication systems, sugar plants, brickworks, paper industry and because of its good adhesion as sealing grease.
RENOLIT H 443-HD 88	KP 3/2 N-30 ISO-L-X-CDEB3/2	green	5-4665	Lithium soap Mineral oil	3/2	>180		For highly stressed plain and roller bearings, even under shock loads and severe vibration, e.g. unbalanced motors, vibrating screens, vibrators, soil tampers and electrical machines. Also recommended for central lubrication systems.
RENOLIT DURAPLEX EP 2 Also in NLGI grade 00/000, 1 and 3 available.	KP 2 P-30 ISO-L-X-CEHB 2	light brown	5-3451	Li-X-soap Mineral oil	2	>260		RENOLIT DURAPLEX EP greases are specially designed for long-term and lubricated-for-life applications in roller bearings and all kinds of lubrication points with high demands regarding service life, temperature and corrosion protection, e.g. electric motors in the chemical industry, clutch release bearings of mobile cranes, construction machines, EUMUCO forging presses and truck wheel bearings.
RENOLIT LX-PEP 2 Also in NLGI grade 1/2, 2/3 and 3 available.	KP 2 N-30 ISO-L-X-CDEB 2	green	5-4731	Li-X-soap Mineral oil	2	>250		EP grease series for a wide temperature range, especially recommended for truck wheel bearings. Approvals: MAN 284 Li-H 2, MB-APPROVAL 265.1, DBL 6806.00, ZF TE-ML 12.
RENOLIT CX-EP 2 Also in NLGI grade 0 and 1 available.	KP 2 N-30 ISO-L-X-CDHB 2	brown	5-3650	Ca-X-soap Mineral oil	2	>250		Universally applicable for thermally and/or mechanically stressed bearings, recommended for the chemical, rubber, tire, steel and quarrying industries. Easy pumpable in central lubrication systems, even over long distances.
RENOLIT CX-FO 20	KP 2 N-30 ISO-L-X-CDEB 2	light brown	5-3657	Ca-X-soap Mineral oil	2	>250		Similar to RENOLIT CX-EP series, especially designed for continuous casting, approved by Voest Alpine.

Li-X = Lithium complex
Ca-X = Calcium complex

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B. Specialties

1. Greases containing solid lubricants

Product name	Classification DIN 51 502 ISO 6743-9 Solid lubricant	Colour	Product information	Thickener Base oil	NLGI-grade	Dropping point [°C]	Operating temperature = continuous = short term Minus 70 60 50 40 30 20 Plus 60 80 100 120 140 160 180 200 220 240 260 280	Remarks Application area
RENOLIT FLM 2 Also in NLGI grade 0 available.	KPF 2 N-30 ISO-L-X-CDEB 2 MoS_2	black	5-4570	Lithium soap Mineral oil	2	>180		Premium quality EP grease with emergency running properties for mechanically stressed bearings operating in boundary friction conditions. Contains additives to improve the EP-performance, corrosion and wear protection.
RENOLIT FG 150	KPF 2 K-30 ISO-L-X-CCEB 2 Graphite	black	5-4565	Lithium soap Mineral oil	2	>180		Similar to RENOLIT FLM 2, optimised for mechanically stressed bearings exposed to water.
RENOLIT FLM 302	KPF 2 N-20 ISO-L-X-BCEB 2 MoS_2	black	5-4535	Lithium soap Mineral oil	2	>180		For highly stressed plain and roller bearings, cardan shafts, guides, slow running gearboxes and joints. Emergency running properties.
RENOLIT FLM 502	KPF 2 N-20 ISO-L-X-BDEB 2 MoS_2	black	5-4510	Li/Ca-soap Mineral oil	2	>180		For highly stressed plain and roller bearings and low speeds. Emergency running properties.
RENOLIT FLM 1002 Also in NLGI grade 1 available.	KPF 2 N-20 ISO-L-X-BDEB 2 MoS_2	black	5-4485	Li/Ca-soap Mineral oil	2	>180		With higher base oil viscosity compared to RENOLIT FLM 502, for highly stressed plain and roller bearings, low speeds, e.g. roller mills. Emergency running properties.
RENOLIT PASTE AZ 0-1	White solid lubricants	light grey	5-4015	Li-X-soap Semi-synth.	0/1	>150		Assembly paste for roller bearings to prevent corrosion and fretting corrosion on the axle end. Extremely shear stable and aging resistant.
RENOLIT LX-WHITE 2	White solid lubricants	white	5-3421	Li-X-soap Mineral oil	2	>250		High resistance to thermal and mechanical loads even at low sliding speeds with a high corrosion protection. Recommended as assembly paste for the lubrication of three-jaw chucks and as screw protection.
RENOLIT CX-TC 1	Graphite	black	5-3540	Ca-X-soap Mineral oil	1	>250		Highly graphited screw paste for applications in the offshore and mining industry.
RENOLIT CX-HT 2 Also in spray can as RENOLIT UNIMAX and in NLGI grade 0 available.	MoS_2	black	5-3536	Ca-X-soap Mineral oil	2	>270		Suitable for the lubrication of mechanically highly loaded plain and roller bearings with low speeds at high temperatures, especially when corrosion and wear protection is necessary, e.g. for open gears and kiln cars.
RENOLIT LX-OTP 2	PTFE	light brown	5-4030	Li-X-soap Polyglycol	2/1	>250		For oscillating, highly loaded applications. Special solid lubricants minimise the release torque, even at low temperatures.
RENOLIT L 20	MF 2 K-30 ISO-L-X-CCEA 2 Copper-powder	copper-coloured	5-4170	Lithium soap Mineral oil	2	>180		Electric contact grease for the lubrication of commutators, collectors, slip rings, interrupter, switches, grinding and sliding contacts. Approved by Bosch VS 9771-Ft.

Li/Ca = Lithium/Calcium
Li-X = Lithium complex
Ca-X = Calcium complex

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2. Semi-fluid greases for central lubrication systems and gearboxes

Product name	Classification DIN 51 502 ISO 6743-9 Solid lubricant	Colour	Product information	Thickener Base oil	NLGI-grade	Dropping point [°C]	Operating temperature = continuous = short term Minus 70 60 50 40 30 20 Plus 60 80 100 120 140 160 180 200 220 240 260 280	Remarks Application area
RENOLIT LZR 000	GP 00/000 G-40 ISO-L-X-DCIB 00/000	green	5-4460	Li/Ca-soap Mineral oil	00/000	>160		Semi-fluid grease which offers excellent corrosion protection. Primarily used in central lubrication systems of trucks and commercial vehicles, Approved by: WILLY VOGEL, MAN 283 Li-P 000, DEUTSCHE TECALEMIT, MB-APPROVAL 264.0, DBL 6833.00.
RENOLIT SF 7-041	GP 000 K-30 ISO-L-X-CCEB000	brown	5-4680	Lithium soap Mineral oil	000	>160		Grease for industrial central lubrication systems with narrow bore lines, recommended for e.g. labelling machines, packaging machines and machine tools.
RENOLIT GFW 00	GP 00 K-20 ISO-L-X-BCEB 00	brown	5-4675	Lithium soap Mineral oil	00	>160		For the lubrication of medium to small gearboxes, e.g. hand drilling machines and angle grinders. Good protection against wear and corrosion.
RENOLIT EPLITH 00	GP 00 K-10 ISO-L-X-ACEB 00	brown	5-4453	Lithium soap Mineral oil	00	>160		For the lubrication of heavily loaded gearboxes, low oil separation, highly adhesive, four ball weld load > 4000N, special grease for industrial central lubrication systems, approved for the moulding presses of Müller-Weingarten, Schuler and Erfurt.
RENOLIT DURAPLEX EP 00	GP 00/000 N-40 ISO-L-X-DDHB 00/000	green	5-3470	Li-X-soap Mineral oil	00/000	>180		Long life EP semi-fluid grease for a large temperature range with a good corrosion protection. For central lubrication systems of trucks, commercial vehicles and industry machines.
RENOLIT R EP 000	GP 000 G-60 ISO-L-X-EBEB 000	light brown	5-3400	Li/Ca-soap PAO	000	>150		Fully synthetic semi-fluid grease for extreme low temperatures, high oxidation resistance, low friction moments. Recommended for all grease lubricated sliding points, e.g. gear-boxes, servo motors and actuators.
PLANTOGEL 000 S	GPE 00/000 K-40 ISO-L-X-DCEB 00/000	green	5-8430	Li/Ca-soap Synth. esters	00/000	>150		For central lubrication systems of machine tools, commercial vehicles, construction machinery, for low to average loaded gearboxes and gear motors; approved by WILLY VOGEL for central lubrication systems of trucks and commercial vehicles.
RENOLIT LST 00 Also in NLGI grade 0 and 2 available.	GPPG 00 N-30 ISO-L-X-CDEB 00	yellow	5-4186	Lithium soap Polyglycol	00	>180		For highly-loaded gearboxes which are subjected to contaminations by liquids or solid lubricants. Good compatibility with elastomers and nonferrous metals. Supports the sealing of the gearbox and minimises the risk of leakages.

Li/Ca = Lithium/Calcium
Li-X = Lithium complex

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3. Heavy duty greases

Product name	Classification DIN 51 502 ISO 6743-9 Solid lubricant	Colour	Product information	Thickener Base oil	NLGI-grade	Dropping point [°C]	Operating temperature = continuous = short term Minus Plus 70 60 50 40 30 20 60 80 100 120 140 160 180 200 220 240 260 280	Remarks Application area
RENOLIT CXI 2		light brown	5-3510	Ca-X-soap Mineral oil	2	>270		For highly-loaded plain and roller bearings, excellent wear protection and good EP performance, high working stability even in the presence of water, excellent corrosion protection. Used in steel mills, mining, cement plants, quarries, paper and construction industry, machine tools. Even for unfavourable conditions such as dusty environments, contact with water, weak acids and weak alkalines.
RENOLIT CX-TOM 15		light brown	5-3515	Ca-X-soap Semi-synth.	2/1	>250		Semi-synthetic and low temperature version of RENOLIT CXI 2, high thermal and mechanical resistance, excellent wear protection, good pumpability in central lubrication systems. For highly-loaded plain and roller bearings.
RENOLIT CX-HT 2 Also in spray can as RENOLIT UNIMAX and in NLGI grade 0 available.	MoS_2	black	5-3536	Ca-X-soap Mineral oil	2	>270		Suitable for the lubrication of mechanically highly-loaded plain and roller bearings with low speeds at high temperatures, especially when corrosion and wear protection is necessary, e.g. for open gears and kiln cars.
RENOLIT FAP 502	KP 2 N-20 ISO-L-X-BDEB 2	light brown	5-4505	Li/Ca-soap Mineral oil	2	>180		For highly-loaded plain and roller bearings and/or low sliding speeds.
RENOLIT FLM 502	KPF 2 N-20 ISO-L-X-BDEB 2 MoS_2	black	5-4510	Li/Ca-soap Mineral oil	2	>180		For highly-stressed plain and roller bearings and low speeds. Emergency running properties.
RENOLIT FLM 1002 Also in NLGI grade 1 available.	KPF 2 N-20 ISO-L-X-BDEB 2 MoS_2	black	5-4485	Li/Ca-soap Mineral oil	2	>180		With higher base oil viscosity compared to RENOLIT FLM 502, for highly-stressed plain and roller bearings, low speeds, e.g. roller mills. Emergency running properties.

Ca-X = Calcium complex
Li/Ca = Lithium/Calcium

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4. Special greases

Product name	Classification DIN 51 502 ISO 6743-9 Solid lubricant	Colour	Product information	Thickener Base oil	NLGI-grade	Dropping point [°C]	Operating temperature = continuous = short term Minus 70 60 50 40 30 20 Plus 60 80 100 120 140 160 180 200 220 240 260 280	Remarks Application area
RENOCAL FN 745/94	K 2/1 G-50 ISO-L-X-EBIA 2/1	light brown	5-1090	Calcium soap Mineral oil	2/1	>135		Recommended for the lubrication of automotive components such as door locks and other mechanisms, hinges, joints, sliding roofs, seat adjusters, mirror mechanisms, window lifters, bowden cables, fans, etc. Approved by VW TL 745, DBL 6810.50, BMW.
RADSATZROLLEN-LAGERFETT	KP 2 N-30 ISO-L-X-CDEB 2	dark brown	5-4166	Lithium soap Mineral oil	2	>180		Railroad wheel bearing grease, approved by Deutsche Bahn AG, material No. 106225, for lubrication intervals of 700.000 km.
RENOLIT LX-OS 3	KP 3 N-30 ISO-L-X-CDEB 3	light brown	5-3467	Li-X-soap Mineral oil	3	>250		Highly-adhesive special grease for applications subject to oscillating movements such as packaging and washing machines.
RENOLIT JP 1619	KP 1 K-50 ISO-L-X-ECEB 1	yellow-brown	5-4710	Lithium soap Synthetic oil	1	>180		EP grease with good corrosion protection and oxidation stability. For the lubrication of machinery when good lubricity and low start-up resistance are required even at low temperatures, e.g. for steering gears, prop shafts and high-speed bearings.
RENOLIT S 2	KE 2/1 K-60 ISO-L-X-ECEA 2/1	light grey	5-4120	Lithium soap Synth. esters	2/1	>180		For low temperatures and high peripheral speeds; machine tool spindle bearings, small motors, instruments, aviation and telecommunication systems, air conditioners and refrigerators.
RENOLIT HI-SPEED 2	KHCE 2 K-40 ISO-L-X-DCEA 2	light brown	5-2520	Lithium soap Synthetic oil	2	>180		Fully-synthetic grease based on oxidation resistant oils, specially developed for the lubrication of high speed machine tool and textile machine spindle bearings.
RENOLIT LX-B EP 2	KPHC 2 K-40 ISO-L-X-DCEB 2	green	5-3457	Li-X-soap PAO	2	>230		For high peripheral speeds, machine tool spindle bearings and small motors. Approved by Bosch VS 16789 Ft.
RENOLIT HLT 2 Also in NLGI grade 1 available.	KPHC 2 N-40 ISO-L-X-DDHB 2	light brown	5-4430	Lithium soap PAO	2	>180		For bearings subject to fluctuating ambient temperatures; resistant to salt water, good corrosion protection, high ageing resistance. Recommended for pneumatic applications, high speed bearings, also for life time lubrication.
RENOLIT IPR 2		light grey	5-4490	Lithium soap PAO	2	>180		For the lubrication of pneumatic valves, also made of aluminium, when the working pneumatic medium is contaminated with mineral oil. Do not mix with other mineral oil-based greases!
RENOLIT RHF 1	KPHC 1 N-50 ISO-L-X-EDHB 1	light brown	5-4455	Lithium soap PAO	1	>180		EP long life grease based on a lithium soap. Good corrosion protection, even in the presence of salt water. Adhesive, good elastomer compatibility for fast high-speed bearings even at low temperatures and fluctuating ambient temperatures.
RENOLIT FOL 2	KPFHC 2 N-40 ISO-L-X-DDEB 2 PTFE	white	5-4575	Lithium soap PAO	2	>180		Extraordinary ageing resistant, containing friction reducing additives. Especially for the lubrication of sliding pairs with and without plastic components, including slide foil bearings used in building construction, inspected by the MPA.
RENOLIT AS		light brown	5-4020	Lithium soap Synthetic oil	1	>220		Hydrocarbon-resistant lubricating and sealing grease. Resistant to gasoline, kerosene, lubricating and hydraulic oils. Supplementary sealant, vibration damping, anti stick-slip properties.
RENOLIT VLS	Graphite	black	5-0052	HDK Synthetic oil	1/2	none		Hydrocarbon resistant special grease based on an inorganic thickener, containing solid lubricants. Resistant to gasoline, natural gas, crude oil, lubricating and hydraulic oils. For the lubrication of any type of valves exposed to these media.
RENOLIT VLS LT	Graphite	black	5-0057	HDK Synthetic oil	1	none		Low temperature version of RENOLIT VLS with improved pumpability and low temperature properties.

Li-X = Lithium complex
HDK = Highly dispersed silic acid

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4. Special greases

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RENOLIT GL 1 Also in spray can as RENAX GLEITSPRAY available.	KP 1 N-30 ISO-L-X-CDEB 1	light brown	5-4435	Lithium soap Synthetic oil	1	>170		Adhesive, reduces friction and wear, good corrosion protection, good thermal stability, noise reducing. For the lubrication of plain and roller bearings, gearboxes, bowden cables, guide rails and sliding roofs.
RENOLIT LX-PG 2	KPPG 2 P-40 ISO-L-X-DEEB 2	light brown	5-3460	Li-X-soap Polyglycol	2	>250		Good elastomer (e.g. EPDM) and nonferrous metal compatibility, for high temperatures, corrosion protection, good EP properties, resistant to lubricant coolants and cutting fluids. Also for the lubrication of bearings in polyglycol oil filled gearboxes.
RENOLIT LST 2 Also in NLGI grade 00 and 0 available.	KPPG 2 N-30 ISO-L-X-CDEB 2	yellow	5-4187	Lithium soap Polyglycol	2	>180		Synthetic grease, high mechanical resistance, good compatibility with nonferrous metals, elastomers and plastics. For the lubrication of plain and roller bearings, small gearboxes with plastic gear wheels, low temperature contact grease.
RENOLIT G 2000		colourless to yellowish	5-5010	HDK PAO	2	none		Fully synthetic grease with good adhesiveness and noise damping properties, excellent compatibility with elastomers and plastics. Suitable for the inside of vehicle interior lubrication because of its very low release of odour.
RENOLIT G 8-022/2		light brown	5-5020	Bentonite PAO	2/1	none		Special grease with a neutral behaviour to various plastics. For the lubrication of plastic-to-plastic or plastic-to-metal bearings, also suitable for low temperatures.
RENOLIT G-PF 1		brown	5-5062	Bentonite Mineral oil	1	none		Good adhesiveness, excellent resistance against corrosive media (especially battery acid), special friction behaviour. Used as battery pole and friction dampering grease (in washing machines).
RENOLIT UNITEMP 2	KPHC 2 R-50 ISO-L-X-EFEB 2	light brown	5-5025	synth. Na-X PAO	2	>250		Fully synthetic grease for plain and roller bearings over a wide temperature range, good corrosion protection, water resistant, good EP properties.
RENOLIT PU-FH 300	KP 2 R-20 ISO-L-X-BFEB 2	light brown	5-5036	Polyurea Mineral oil	2	>230		For thermally stressed and low speed bearings, e.g. in road pavers, paint shops, hot-air blowers, dryers, conveyor and oven systems, tire and chemical industry.
RENOLIT PU 8-061/2	KPE 2 R-20 ISO-L-X-BFEB 2	light brown	5-5085	Polyurea Semi-synth.	2	>260		For the lubrication of chain conveyors in drying oven, spindle bearings, dryers, tumble dryers and drying cylinders in the paper industry, hot air flaps, calendar bearings and thermally-stressed electric motors.
RENOLIT ST-FTM 0/1	KPFFK 1 U-20 ISO-L-X-BGEB 1	white	5-2652	PTFE Perfluorether	1	none		High temperature grease for the lubrication of ejectors of plastic injection moulding machines and machine parts which are exposed to very high temperatures, e.g. bearings of kiln cars.
RENOLIT ST 8-081/2	KPFFK 2 U-20 ISO-L-X-BGIB 2	white	5-5075	PTFE Perfluorether	2	none		Extremely high temperature grease for plain and roller bearings in all industrial applications, e.g. paint shops, drying ovens, calendar, embossing roller bearings, food and packaging industry. Recommended by Steinmüller for hot air and exhaust gas flap bearings in power stations. Not mixable with other lubricants!

Li-X = Lithium complex
HDK = Highly dispersed silic acid
Na-X = Sodium complex

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5. Food grade greases								
RENOLIT G 7 FG 1 Also in spray can as RENOLIT UNIFOOD available.	K 2 N-20 ISO-L-X-BDEA 2	light brown	5-5065	Bentonite Pharm. white oil	2	none		For plain and roller bearings of packaging and filling machines in the food industry. Also for the lubrication of conveyor worms in the sugar industry, for drinking water applications (hot and cold water). Approvals: NSF-H1 and KTW.
RENOLIT SI 410 M	KSI 2 K-55 ISO-L-X-ECEA 2	white transparent	5-6080	Calcium soap Silicone oil	2	>140		Beer tap grease, for the greasing of taps, bearings and seals in brewing and filling lines of the beverage industry, food processing and packaging machines. Approvals: NSF-H2, KTW.
RENOLIT SILICONE WRAS	MSI 3 S-40 ISO-L-X-DGIA 3	white	5-6000	PTFE Silicone oil	3	none		Highly water repellent, tasteless and odourless grease. Especially formulated for the lubrication of taps, valves, mixer, tap ceramic discs and spindles as well as threaded stainless steel components. Approvals: KTW and WRAS.
6. Rapidly biodegradable greases								
PLANTOGEL 2 N Also in NLGI grade 1 available.	KX 2 C-20 ISO-L-X-BAEA 2	light brown/ yellow	5-8110	Calcium soap Rapeseed oil	2	>130		For the lubrication of total loss applications such as canal lock gates, waste water treatment plants, chains, garage doors, joints and agricultural vehicles.
PLANTOGEL 2 S Also in spray can as PLANTO MULTISPRAY and in NLGI grade 1 available.	KPE 2 K-40 ISO-L-X-DCEB 2	light brown	5-8410	Li/Ca-soap Synth. esters	2	>170		Rapidly biodegradable long life grease for plain and roller bearings, also useable for wheel hubs. Good pumpability in central lubrication systems, water resistant. Approved by MAN 283 Li-P 2-B and DELIMON.
PLANTOGEL 2 FS	KPFE 2 K-30 ISO-L-X-CCEB 2 Graphite	black	5-8420	Li/Ca-soap Synth. esters	2	>170		For the lubrication of highly-loaded plain and roller bearings, particularly at the risk to pollute soil and/or ground water. Good pumpabilty, adhesive, emergency running properties for the use at boundary friction conditions and at low speeds.
PLANTOGEL 000 S	GPE 00/000 K-40 ISO-L-X-DCEB 00/000	green	5-8430	Li/Ca-soap Synth. esters	00/000	>150		For central lubrication systems of machine tools, commercial vehicles, construction machinery, for low to average loaded gearboxes and gear motors; Approved by WILLY VOGEL for central lubrication systems of trucks and commercial vehicles.

Li/Ca = Lithium/Calcium

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7. Silicone greases

Product name	Classification DIN 51 502 ISO 6743-9 Solid lubricant	Colour	Product information	Thickener Base oil	NLGI-grade	Dropping point [°C]	Operating temperature = continuous = short term Minus 70 60 50 40 30 20 Plus 60 80 100 120 140 160 180 200 220 240 260 280	Remarks Application area
RENOLIT SI 300 M Also in NLGI grade 3 (S) and as bridge bearing lubricant available.	KSI 2 P-70 ISO-L-X-EEHA 2	white	5-6040	Lithium soap Silicone oil	2	>210		Low temperature grease for electrical and precision machinery, sealing grease for radial seals, O-rings, bellows. Approvals: DBL 6812.10 and VW TL 767 X.
RENOLIT SI 400 M Also in NLGI grade 1 (L) available.	KSI 2 R-30 ISO-L-X-EFEA 2	white	5-6060	Lithium soap Silicone oil	2	>210		Standard silicone grease for light to averagely loaded plain and roller bearings, electric motors, guides, household equipments, fans and dryers.
RENOLIT SI 410 M	KSI 2 K-55 ISO-L-X-ECEA 2	white transparent	5-6080	Calcium soap Silicone oil	2	>140		Beer tap grease, for the greasing of taps, bearings and seals in brewing and filling lines of the beverage industry, food processing and packaging machines. Approvals: NSF-H2, KTW.
RENOLIT SI 511 M Also in NLGI grade 1 (L) and 00 (F) available.	KSI 2 T-30 ISO-L-X-CGEA 2	light brown	5-6078	Polyurea Silicone oil	2	>300		High-temperature grease for plain and roller bearings, assembly lubricant for rubber and plastics, applications also in the textile industry, brickworks, casting shops, paper mills, e.g. in hot air ventilators, drying ovens, electric motors, conveyor systems, kiln cars. For the following bearing materials: metal/metal, metal/plastic and plastic/plastic.
RENOLIT SI 704 Also in NLGI grade 2/1 (703) and 4 (708) available.		colourless transparent	5-6015	HDK Silicone oil	3	none		Assembly aid for organic elastomers and plastics, sealant for elastomers, for electronic and chemical equipment, e.g. plastic chains, joints, control units, threaded connections. For the following material combinations: metal/plastic and plastic/plastic.
RENOLIT SI HVS	MSI 3 S-40 ISO-L-X-DGHA 3	colourless transparent	5-6090	HDK Silicone oil	3	none		High vacuum grease with a low evaporation loss for lubrication and sealing of check valves and glass joints, which work in the range from 10^{-3} to 10^{-8} mbar; highly-adhesive and good sealing properties.
RENOLIT SILICONE WRAS	MSI 3 S-40 ISO-L-X-DGIA 3	white	5-6000	PTFE Silicone oil	3	none		Highly water repellent, tasteless and odourless grease. Especially formulated for the lubrication of taps, valves, mixer, tap ceramic discs and spindles as well as threaded stainless steel components. Approvals: KTW and WRAS.

HDK = Highly dispersed silic acid

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Product name	Remarks Application area	Benefits

8. Spray cans

RENOLIT UNIMAX LZ Basis: RENOLIT CA-LZ	Long-life tacky grease for lubrication of plain and roller bearings, chains and gears in the construction machinery and agricultural industry, for cars, motorbikes, household and the hobby area.	MAXimum tackiness, resistant to salt water, good lubrication properties and long fibrous.
RENOLIT UNIFOOD Basis: RENOLIT G 7 FG 1	Special grease for plain and roller bearings of packaging and filling machines in the food industry.	Excellent lubrication properties, conform to the requirements of NSF-H1 and KTW, odourless and tasteless.
RENOLIT UNILOAD Basis: RENOLIT CX-HT 2	High temperature grease for low speeds and mechanically highly-stressed plain and roller bearings, especially when excellent corrosion and wear protection is necessary, lubrication of open gears.	Extremely tacky, thermally stable, extreme EP loadable, excellent corrosion protection even in the presence of salt water, offers emergency running properties.
RENAX GLEITSPRAY Basis: RENOLIT GL 1	Special grease for lubrication in the industry, of cars, at home or for hobbies, ideal assembly lubricant.	Excellent reduction of friction and wear, long life lubrication, adhesive, noise damping, temperature stable, synthetic grease.
PLANTO MULTISPRAY Basis: PLANTOGEL 2 S	Environmentally friendly grease for the construction and agriculture industry, household, garden and hobby.	Environmentally friendly, because it is rapidly biodegradable. Good lubrication properties, high anti-wear and corrosion protection.
DUOTAC CP 300	Special-tacky grease for chains, threads and bolts, open gears, steel cables and slide bars.	Free of bitumen, contains graphite, high mechanical resistance, high adhesiveness, grease like lubricating film.
DUOTAC ZAHNRADSPRAY	Special grease for chains, gear racks, gear rims and gears, e.g. fork lift trucks, construction and agriculture machines.	Free of bitumen, contains graphite, high mechanical resistance, extremely tacky, resistant to hot and salt water, dry and bendable lubricating film.

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C. Terminology and tests

Introduction

Greases are firm lubricants consisting of base oils and specially selected thickeners. Additives are also added to greases to improve certain characteristics.

Greases are engineering elements, especially long-life lubricants

For a number of applications, lubricating with grease offers the advantage of offering a barrier between the sliding surfaces, thus reducing friction, wear and increasing efficiency. Compared to oils, greases have a series of benefits:

- Lower maintenance input
- Lubrication for life is possible
- Simpler seal designs
- Lower engineering complexity
- Lower leakage hazard
- The formation of a grease lip supports the sealing effect of seals

Just a few grams of grease can protect against high repair bills and the surprisingly expensive follow-up costs caused, for example, by machine down-times. It is therefore prudent to pay special attention to greases.

1. Classification and allocation of K-type greases according to DIN 51 502

Due to the vast number of possible applications and their differing compositions, greases are classified and grouped according to certain parameters. DIN 51 502 describes the following classification:

Classification and characteristics of a K-type grease

Grease DIN 51 502 – K 1 G-20

Name
DIN standard-number
Letter denoting type of grease (see Table 1)
Consistency (NLGI grade, see Table 2)
Additional letter (see Table 3)
Additional number (see Table 4)

Description of a K-type grease, of NLGI grade 1 (see Table 2), additional letter G (see Table 3) and additional number –20 (see Table 4).

Table 1: Prefix letters and symbols for greases (colour: white)

1	2	3
Type of grease	Prefix letter	Symbol
Greases for roller bearings, plain bearings and sliding surfaces, defined by DIN 51 825	K[1]	For mineral oil-based greases: △
Greases for enclosed gears defined by DIN 51 826	G	
Greases for open gearboxes and exposed gears (bitumen-free tacky lubricants)	OG	
Greases for plain bearings and seals[2]	M	
The basic characteristics of synthetic greases are classified similary to mineral oil-based products	Add the letter from Table 1, substance groupe 3	For synthetic greases: ◇

[1] ISO/TR 3498 : 1986 the letters XM are used instead of K
[2] Lower requirements than for K-type greases

Table 2. NLGI grades

NLGI grade	Worked penetration in 0.1 mm DIN ISO 2137	Description
000	445 / 475	Flowing
00	400 /430	Flowing
0	355 / 385	Still flowing
1	310 / 340	Very soft
2	265 / 295	Soft-creamy
3	220 / 250	Still soft
4	175 / 205	Moderately stiff
5	130 / 160	Stiff
6	85 / 115	Very stiff

Table 3: Additional code letters for greases

1	2	3
Letter	Max operating temperature[1]	Water resistance, defined by DIN 51 807-1; evaluation stage DIN 51 807[2]
C	+60 °C	0–40 or 1–40
D		2–40 or 3–40
E	+80 °C	0–40 or 1–40
F		2–40 or 3–40
G	+100 °C	0–90 or 1–90
H		2–90 or 3–90
K	+120 °C	0–90 or 1–90
M		2–90 or 3–90
N	+140 °C	Subject to agreement
P	+160 °C	
R	+180 °C	
S	+200 °C	
T	+220 °C	
U	over +240 °C	

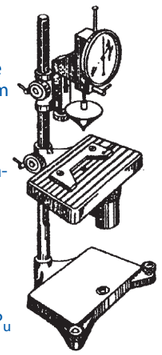
[1] Max operating temperature for lubricated-for-life applications is the highest temperature tested by DIN 51 821-2 insofar as the test is passed.
[2] 0 = denotes no change
1 = denotes small change
2 = denotes moderate change
3 = denotes great change

Table 4: Additional numbers for greases

1	2
Additional number	Minimum operating temperature
–10	–10 °C
–20	–20 °C
–30	–30 °C
–40	–40 °C
–50	–50 °C
–60	–60 °C

2. Cone penetration, as defined by DIN ISO 2137

Penetration in this case is the depht, measured to an accuracy of 0.1 mm, to which a standard cone sinks into the grease in defined conditions. For example, 26.5 mm penetration is
265 x 0.1 mm



In general, greases which have been mechanically worked become some-what softer; therefore there is a difference between
– Unworked penetration P_u and
– Worked penetration P_w

3. Worked penetration, as defined by DIN ISO 2137

Prior to this penetration test, the grease is mechanically churned:

- P_{w60} = 60 double strokes
- P_{w10^5} = 1 x 10^5 double strokes

Worked penetration results form the basis of NLGI grades

4. Consistency, as defined by DIN 51 818

Consistency, as shown by NLGI grade, is based on worked penetration figures (see Table 2).

5. Consistency stability

Consistency stability is the resistance of a grease to the mechanical shearing of the soap thickener

An indication of consistency stability is the worked stability
– Worked stability = $P_w – P_u$
– The smaller the difference, the better the consistency stability of the grease

6. Base oil

95% of greases are based on mineral base oils. The rest are based on synthetic oils like polyalphaolefins, natural and synthetic esters, glycols, polyethers, silicone oils and other products.

Depending on the type of thickener used and the desired consistency of the finished grease, between 65% and 95% of the grease is base oil, the rest thickener and additives.

The type of base oil and its viscosity are of fundamental significance to certain basic properities of greases.

Working temperature, pumpability, EP performance, ageing stability, elastomer compatibility, tackiness, oil separation and noise suppression are just a few of the characteristics of a grease which are directly determined or influenced by the base oil.

7. Thickeners

Thickeners are divided into soap and non-soap versions and these products also influence basic properties of a grease such as temperature range, water resistance and EP performance. Soap thickeners are divided into simple and complex versions which, due to their higher dropping point, allow an increase in the upper temperature limit. The following thickeners are used in FUCHS greases:

Simple and complex soap thickeners
Lithium
Calcium
Aluminium
Sodium

Non-soap thickeners
Bentonite
Highly dispersed silicic acid
Polyurea
PTFE

8. Additives

Additives are included in greases to achieve certain characteristics. A grease can contain up to 10% additives. Above all, the following additives are used:

Extreme pressure (EP) additives:	to improve load carrying behaviour
Anti-wear (AW) additives:	to protect against wear
Corrosion protection additives:	to avoid corrosion
Anti-Oxidation (AO) additives:	to improve ageing stability
Tackiness improvers:	to increase the tackiness
Solid lubricants:	to provide run-dry lubrication

9. Service temperature range

All greases have a working temperature range in which the grease can develop all the characteristics it claims to offer.

The temperature range of a grease is determined by test methods and practical trials.

10. Ageing

Greases generally age as a result of oxidation processes, i.e. reactions with the oxygen in the air. A critical factor is the temperature range in which the grease will be used. Ageing is accelerated by high temperatures.

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11. Miscibility of greases

The question of the miscibility of different greases often arises when re-lubricating operations are performed. Not all greases are compatible with each other. Greases containing the same thickener and the same type of base oil are usually compatible. However, as this compatibility also depends on the additives in the grease, this cannot be taken for granted.
Mixing non-compatible greases generally leads to a decrease in the dropping point and a hardening or softening of the grease.

As a rule therefore, mixing greases should be avoided. A much better option is to clean the bearing and to refill with a fresh product. If this is not possible, contact should be made with a FUCHS application engineer before a bearing is re-lubricated.

12. Compatibility with elastomers and plastics

The compatibility of lubricants with elastomers and plastics cannot be definitively answered because of the huge number of materials which exist. One can assume that mineral oils are commonly compatible with NBR elastomers but the compatibility of every additive cannot be taken from lists. At the same time, some synthetic greases attack thermoplastics while mineral oils are relatively unproblematic with these products

The effect of inadequate compatibility of an elastomer or plastic with a grease can be unacceptable shrinking or swelling, a large change to Shore A hardness or even rupturing.

A lot of experience has been gathered with a number of material/lubricant combinations. We have performed compatibility tests on most of our greases with
SRE-NBR 1. Seal manufacturers use these results to evaluate their materials. In the case of untested material/grease combinations, it is recommended that realistic tests are performed by the seal manufacturers.

Elastomer Compatibility index (ECI)

The Elastomer Compatibility Index is a reliable method of numerically describing the effect of lubrications on representative standard reference elastomers as defined in
ISO 6072 and DIN 53 538. The ECI is based on changes to the volume, hardness, elongation and tensile strength of a standard reference elastomer caused by the influence of the lubricant in controlled conditions. The volume change of a standard reference elastomer is linearly proportional to the swelling behaviour of commonly used elastomers so that the volume change of a standard reference elastomer caused by a lubricating oil or grease can be extrapolated to any elastomer in question, thus eliminating the need to perform individual swelling tests. Corresponding information is available from the elastomer manufacturers.

13. Kesternich flow pressure, as defined by DIN 51 805

Flow pressure is the pressure necessary to force grease through a defined nozzle. This figure provides information about the consistency of a grease in relation to low
temperatures.

The temperature generated by a flow pressure of 1400 hPa is also the lower operating temperature of a grease.

14. FAG FE9 roller bearing test rig, defined by DIN 51 821-1 and -2.

A practical procedure to determine the life of greases in roller bearings

Test bodies: 5 FAG tapered rollers

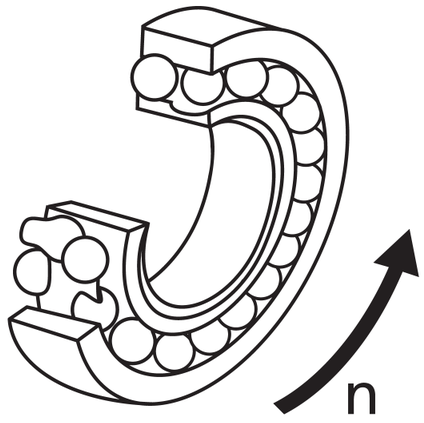
Axial load: 1500, 3000 and 6000 N

RPM: 3000 and 6000 rpm

Test temperature: Up to +250 °C

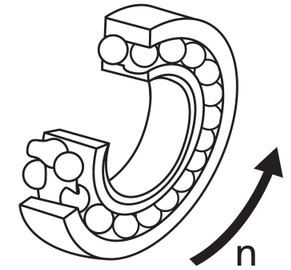
Test criteria: F_{10} and F_{50} in hours

The test temperature, over 100 hours for the F 50 value, is also the upper temperature limit of K-typ
greases as defined by DIN 51 825.



15. EMCOR corrosion protection, as defined by DIN 51 802

Testing the corrosion inhibiting properties of lubricants in realistic, practical conditions
- 2 roller bearings 1306 K
- 7 day cycle (8 hours running – 16 hours stationary)
- n = 80 rpm
- distilled water
- or distilled water with 3% NaCl
- evaluation criterion is the degree of corrosion on the outer race



Degree of corrosion	Description	Description of the surface
0	No corrosion	Unchanged
1	Traces of corrosion	Max. 3 spots < 1 mm
2	Slight corrosion	less than 1% of the surface area
3	Moderate corrosion	more than 1% to less than 5%
4	Heavy corrosion	more than 5% to less than 10%
5	Serious corrosion	more than 10% of the surface area

16. Determining oil separation by DIN 51 817

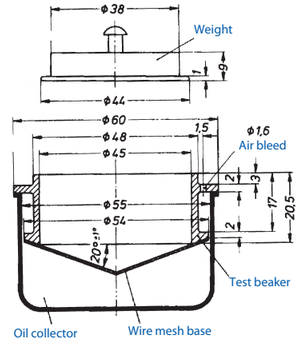
This static method can assist determining the oil separation of greases during their storage. This information cannot be used to quantify the lubricity of a grease.

The grease-filled test apparatus is loaded with a 100-gram weight.

Test duration: 18 hours or 7 days

Test temperature: +40 °C

Test criterion: Quantity of oil separated in %



Oil often collects at the surface, especial in hollows of grease and at the bottom of grease containers. This
is a typical phenomenon of the grease. It represents no deterioration of grease quality.

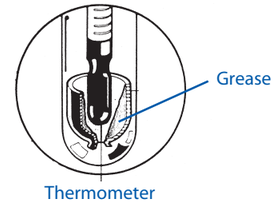
Any such oil can be mixed back into the grease with suitable paddles.

17. Dropping point, as defined by DIN ISO 2176

The dropping point is the temperature at which, in defined conditions, the three dimensional grease structure is melting, i.e. it drops out of the test cup.

The dropping point of a grease is only of limited significance to the practical behaviour of a grease.

The dropping point can be determined by automatical method IP 396 or by hand method DIN ISO 2176.



18. Water resistance – Static test as defined by DIN 51 807-1

This static procedure should illustrate how a grease behaves when exposed to distilled water.

Test medium: Distilled water

Test object: Grease on glass strips

Test duration: 3 hours

Test criterion: Optical changes

Evaluation stages: 0 to 3, along with temperature, e. g. 0–40 or 0–90

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Evaluation level	Indicates	Description
0	No change	None of the changes listed below
1	Slight change	Colour change (lightening) to the surface of the grease, caused by a marginal absorption of moisture into the upper surface of the grease
2	Moderate change	Grease starts to dissolve, indicated by the formation of a yellowish-whitish slimy layer on the grease and moderate to major turbidity in the water
3	Major change the formation of a milky-white oil-in-water emulsion	Partial to total dissolution of the grease along with oil separation and

19. Copper corrosion, as defined by DIN 51 811

This test procedure serves to determine whether a grease corrodes copper.

Test medium: Grease

Test object: Copper strips

Test duration: 24 hours

Test criterion: Degree of corrosion based on discolouration

Evaluation stages: 1 to 4, along with temperature, e.g. 1-100

Degree of corrosion	Indicates	Description
1	Slight discolouration	Weak orange, freshly ground copper colour, to dark orange
2	Moderate discolouration	Wine red, lavender blue, multi-coloured with lavender blue and/or silvery gloss
3	Major discolouration	Magenta-coloured layer with a reddish, greenish hue (peacock-like) but not grey
4	Corrosion	Translucent black, dark grey or brown a slight hue, graphite black or mat black

20. Determining oxidation stability, as defined by DIN 51 808

The oxidation stability of a grease indicates its resistance to the effects of oxygen in static conditions. A grease sample is exposed to oxygen under pressure.

Any pressure drop is a measure of oxidation stability.
The lower the pressure drop, the greater the oxidation stability of the grease.

In normal circumstances the test is performed for 100 hours at 100 °C.

In the case of a good grease, the pressure drop is less than 0.5 bar.

21. Four Ball Apparatus test, as defined by DIN 51 350

This procedure, for lubricants with EP-additives, tests the wear behaviour in boundary friction conditions.

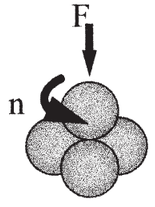
Test medium: Four bearing balls

Rotational speed: 1420 rpm

Load: 150 to 12000 N

Test duration: 1 minute or 1 hour

Test criterion: Welding load (N) and scar diameter (mm)



Greases which achieve a welding load of 2000 N or above are described as EP greases.

22. Storage/use

As opposed to foodstuffs, greases are not perishable. As a result, greases do not have “best-by“ date restrictions.

Greases can be stored for years!

When in reasonable conditions and in original containers, FUCHS RENOLIT industrial greases can be stored for, at least, the following periods:

Rapeseed oil-based greases 2 years

Mineral and synthetic oil-based greases 3 years

Notes:

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