Lubrication

Lubricants

Lubrication management tools

Automatic lubricators

Manual lubrication tools

Lubrication software

Lubrication

Poor lubrication accounts for more than 36% of premature bearing failures

Include contamination, and this number rises to well above 50%. The importance of proper lubrication and cleanliness is self-evident in the determination of bearing life.

What the right lubrication programme can do for you

Increase

- Productivity
- Reliability
- Availability and durability
- Machine uptime
- Service intervals
- Safety
- Health
- Sustainability

Reduce

- Energy consumption due to friction
- Heat generation due to friction
- Wear due to friction
- Noise due to friction
- Downtime
- Operating expenses
- Product contamination
- Maintenance and repair costs
- Lubricant consumption
- Corrosion

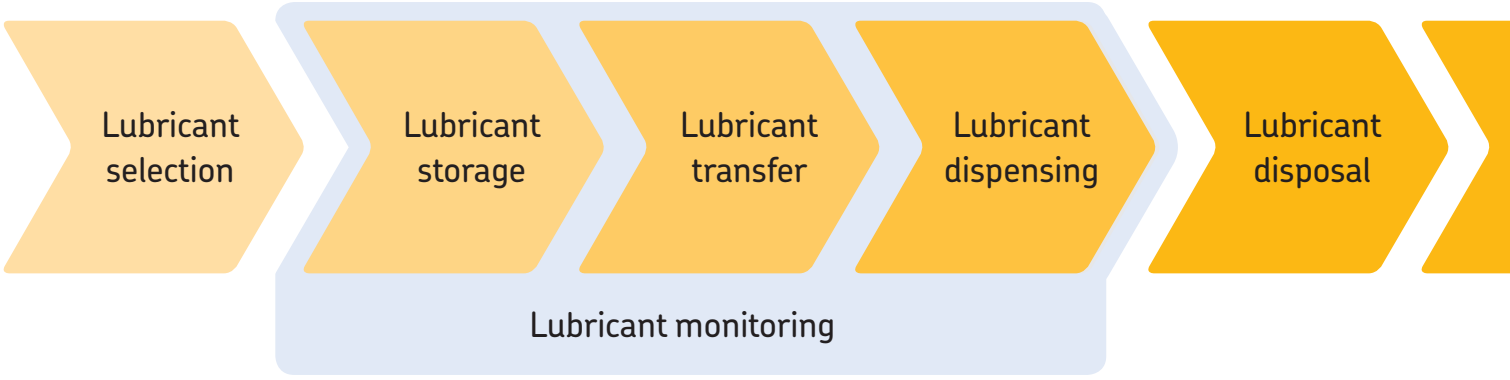
From lubrication to lubrication management

A good lubrication programme can be defined by applying the 5R approach:

"The right lubricant, in the right amount, reaches the right point at the right time using the right method"

This simple and logical approach, however, requires a detailed action plan that must include aspects as varied as:

- Logistics and supply chain
- Lubricant selection
- Lubricant storage, transfer and dispensing
- Lubrication tasks planning and scheduling
- Lubricant application procedures
- Lubricant analysis and condition monitoring
- Lubricant disposal
- Training



Selecting a suitable grease for a particular bearing is a crucial step if the bearing is to meet design expectations in its application. Use the SKF LubeSelect to select the right lubricant for your application.

During storage, maintenance and transfer steps, the lubricant can easily get contaminated due to lack of lubrication knowledge or simply lack of attention. To minimize the risks of lubricant contamination in storage and transfer, we recommend the use of the Oil storage station and Oil handling containers LAOS series. For the transfer of greases, we offer an extensive range of SKF Grease Pumps, SKF Grease Filler Pumps and SKF Bearing Packer.

For the correct lubricant dispensing, consider the range of SKF Grease Guns and SKF range of single and multi point lubricators. SKF DialSet helps you select the right lubricator settings for the application.

For the monitoring of the lubricant, SKF offers the following tools: SKF Oil Levellers, SKF Oil Check Monitor and SKF Grease Test Kit.

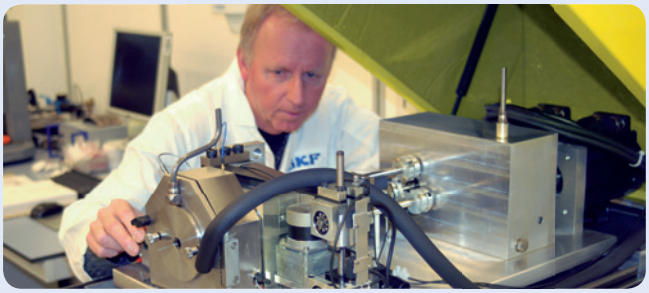
Lubrication management

Just as asset management takes maintenance to a higher level, a lubrication management approach allows lubrication to be seen from a wider point of view. This approach helps to effectively increase machine reliability at a lower overall cost.

SKF Lubrication Management process

- **SKF Client Needs Analysis:** Normally implies one day of assessment and provides an overview on the lubrication programme maturity
- **SKF Lubrication Audit:** Detailed assessment. Normally implies five days and provides a thorough analysis of the lubrication programme
- **Improvement proposal:** Formulation of specific activities
- **Design and implementation:** Execution of the proposed activities
- **Optimisation:** Reassessment and implementation of additional improvement proposals

SKF lubricants



SKF Engineering and Research Centre in the Netherlands

SKF lubricants offer major competitive advantages:

- Designed and tested to perform under real conditions
- Product data include specific test results enabling a better selection
- Strict quality control of every production batch helps ensure consistent performance
- Quality control allows SKF to offer a five–year shelf-life* from the date of production

Production processes and raw materials greatly influence grease properties and performance. It is virtually impossible to select or compare greases based only on their composition. Therefore, performance tests are needed to provide crucial information. In over 100 years, SKF has accrued vast knowledge about the interaction of lubricants, materials and surfaces.

This knowledge has led SKF, in many cases, to set industry standards in bearing lubricant testing. Emcor, ROF, ROF+, V2F, R2F and Bequiet are just some of the multiple tests developed by SKF to assess the performance of lubricants under bearing operating conditions. Many of them are widely used by lubricant manufacturers worldwide.

* SKF LGFP 2 food grade grease offers a two-year shelf-life from the date of production

SKF lubricant selection

Selecting a grease can be a delicate process. SKF has developed several tools in order to facilitate the selection of the most suitable lubricant. The wide range of tools available includes those from easy-to-use application driven tables to advanced software allowing for grease selection based upon detailed working conditions.

The basic bearing grease selection chart provides you with quick suggestions on the most commonly used greases in typical applications.

Basic bearing grease selection

Generally use if:

Speed = M, Temperature = M and Load = M	LGMT 2	General purpose

Unless:

Expected bearing temperature continuously >100 °C *(210 °F)*	LGHP 2	High temperature
Expected bearing temperature continuously >150 °C *(300 °F)*, demands for radiation resistance	LGET 2	Extremely high temperature
Low ambient –50 °C *(–60 °F)*, expected bearing temperature <50 °C *(120 °F)*	LGLT 2	Low temperature
Shock loads, heavy loads, frequent start-up / shut-down	LGEP 2	High load
Food processing industry	LGFP 2	Food processing
Biodegradable, demands for low toxicity	LGGB 2	Biodegradable

Note: – For areas with relatively high ambient temperatures, use LGMT 3 instead of LGMT 2
– For special operating conditions, refer to the SKF bearing grease selection chart

With additional information like speed, temperature, and load conditions, LubeSelect for SKF greases is the easiest way to select the right grease. For additional information, visit www.aptitudeexchange.com. Additionally, the SKF bearing grease selection chart provides you with a complete overview of SKF greases. The chart includes the main selection parameters, such as temperature, speed and load, as well as basic additional performance information.

Bearing operating parameters

Temperature

L	= Low	<50 °C	*(120 °F)*
M	= Medium	50 to 100 °C	*(120 to 230 °F)*
H	= High	>100 °C	*(210 °F)*
EH	= Extremely high	>150 °C	*(300 °F)*

Load

VH	= Very high	C/P <2
H	= High	C/P ~4
M	= Medium	C/P ~8
L	= Low	C/P ≥15

C/P = Load ratio **C** = basic dynamic load rating, kN
P = equivalent dynamic bearing load, kN

Speed		**for ball bearings**
EH	= Extremely high	n d_m over 700 000
VH	= Very high	n d_m up to 700 000
H	= High	n d_m up to 500 000
M	= Medium	n d_m up to 300 000
L	= Low	n d_m below 100 000

Speed		**for roller bearings SRB/TRB/CARB**	**CRB**
H	= High	n d_m over 210 000	n d_m over 270 000
M	= Medium	n d_m up to 210 000	n d_m up to 270 000
L	= Low	n d_m up to 75 000	n d_m up to 75 000
VL	= Very low	n d_m below 30 000	n d_m below 30 000

n d_m = rotational speed, r/min x 0,5 (D+d), mm

SKF bearing grease selection chart

Grease	Description	Application examples	Temperature range [1] LTL	HTPL	Temp.	Speed
LGMT 2	General purpose industrial and automotive	Automotive wheel bearings Conveyors and fans Small electric motors	–30 °C (–20 °F)	120 °C (250 °F)	M	M
LGMT 3	General purpose industrial and automotive	Bearings with d>100 mm Vertical shaft or outer bearing ring rotation Car, truck and trailer wheel bearings	–30 °C (–20 °F)	120 °C (250 °F)	M	M
LGEP 2	Extreme pressure	Forming and press section of paper mills Work roll bearings in steel industry Heavy machinery, vibrating screens	–20 °C (–5 °F)	110 °C (230 °F)	M	L to M
LGWA 2	Wide temperature [4], extreme pressure	Wheel bearings in cars, trailers and trucks Washing machines Electric motors	–30 °C (–20 °F)	140 °C (285 °F)	M to H	L to M
LGFP 2	Food compatible	Food processing equipment Wrapping machines Bottling machines	–20 °C (–5 °F)	110 °C (230 °F)	M	M
LGGB 2	Biodegradable, low toxicity [3]	Agricultural and forestry equipment Construction and earthmoving equipment Water treatment and irrigation	–40 °C (–40 °F)	90 °C (195 °F)	L to M	L to M
LGBB 2	Wind turbine blade and yaw bearing grease	Wind turbine blade and yaw slewing bearings	–40 °C (–40 °F)	120 °C (250 °F)	L to M	VL
LGLT 2	Low temperature, extremely high speed	Textile and machine tool spindles Small electric motors and robots Printing cylinders	–50 °C (–60 °F)	110 °C (230 °F)	L to M	M to EH
LGWM 1	Extreme pressure, low temperature	Main shaft of wind turbines Centralised lubrication systems Spherical roller thrust bearing applications	–30 °C (–20 °F)	110 °C (230 °F)	L to M	L to M
LGWM 2	High load, wide temperature	Main shaft of wind turbines Heavy duty off road or marine applications Snow exposed applications	–40 °C (–40 °F)	110 °C (230 °F)	L to M	L to M
LGEM 2	High viscosity plus solid lubricants	Jaw crushers Construction machinery Vibrating machinery	–20 °C (–5 °F)	120 °C (250 °F)	M	VL
LGEV 2	Extremely high viscosity with solid lubricants	Trunnion bearings Support and thrust rollers on rotary kilns and dryers Slewing ring bearings	–10 °C (15 °F)	120 °C (250 °F)	M	VL
LGHB 2	EP high viscosity, high temperature [5]	Steel on steel plain bearings Dryer section of paper mills Work roll bearings and continuous casting in steel industry Sealed spherical roller bearings up to 150 °C (300 °F)	–20 °C (–5 °F)	150 °C (300 °F)	M to H	VL to M
LGHP 2	High performance polyurea grease	Electric motors Fans, even at high speed High speed ball bearings at medium and high temperatures	–40 °C (–40 °F)	150 °C (300 °F)	M to H	M to H
LGET 2	Extreme temperature	Bakery equipment (ovens) Wafer baking machines Textile dryers	–40 °C (–40 °F)	260 °C (500 °F)	VH	L to M

1) LTL = Low Temperature Limit
HTPL = High Temperature Performance Limit
2) mm^2/s at 40 °C (105 °F) = cSt.
3) LGGB 2 can withstand peak temperatures of 120 °C (250 °F)
4) LGWA 2 can withstand peak temperatures of 220 °C (430 °F)
5) LGHB 2 can withstand peak temperatures of 200 °C (390 °F)

Load	Thickener / Base Oil	NLGI	Base oil viscosity [2]	Vertical shaft	Fast outer ring rotation	Oscillating movements	Severe Vibrations	Shock load or frequent start up	Rust inhibiting properties
L to M	Lithium soap / mineral oil	2	110	●			+		+
L to M	Lithium soap / mineral oil	3	120	+	●		+		●
H	Lithium soap / mineral oil	2	200	●		●	+	+	+
L to H	Lithium complex soap / mineral oil	2	185	●	●	●	●	+	+
L to M	Aluminium complex / medical white oil	2	130	●					+
M to H	Lithium-calcium soap / synthetic ester oil	2	110	●		+	+	+	●
M to H	Lithium complex soap / synthetic PAO oil	2	68			+	+	+	+
L	Lithium soap / synthetic PAO oil	2	18	●				●	●
H	Lithium soap / mineral oil	1	200			+		+	+
L to H	Complex calcium sulphonate / synthetic PAO oil / mineral oil	2	80	●	●	+	+	+	+
H to VH	Lithium soap / mineral oil	2	500	●		+	+	+	+
H to VH	Lithium-calcium soap / mineral oil	2	1020	●		+	+	+	+
L to VH	Complex calcium sulphonate / mineral oil	2	400	●	+	+	+	+	+
L to M	Di-urea / mineral oil	2 to 3	96	+			●	●	+
H to VH	PTFE / synthetic fluorinated polyether oil	2	400	●	+	+	●	●	●

Wide applications greases

Special requirements

Low temperatures

High loads

High temperatures

● = Suitable + = Recommended

	LGMT 2	LGMT 3	LGEP 2	LGWA 2	LGFP 2	LGGB 2
	General purpose industrial and automotive	General purpose industrial and automotive	Extreme pressure	Wide temperature, extreme pressure	Food compatible	Biodegradable, low toxicity
DIN 51825 code	K2K-30	K3K-30	KP2G-20	KP2N-30	K2G-20	KPE 2K-40
NLGI consistency class	2	3	2	2	2	2
Soap type	Lithium	Lithium	Lithium	Lithium complex	Aluminium complex	Lithium/ calcium
Colour	Red brown	Amber	Light brown	Amber	Transparent	Off white
Base oil type	Mineral	Mineral	Mineral	Mineral	Medical white oil	Synthetic ester
Operating temperature range	–30 to +120 °C *(–20 to +250 °F)*	–30 to +120 °C *(–20 to +250 °F)*	–20 to +110 °C *(–5 to +230 °F)*	–30 to +140 °C *(–20 to +285 °F)*	–20 to +110 °C *(–5 to +230 °F)*	–40 to +90 °C *(–40 to +195 °F)*
Dropping point DIN ISO 2176	>180 °C *(>355 °F)*	>180 °C *(>355 °F)*	>180 °C *(>355 °F)*	>250 °C *(>480 °F)*	>250 °C *(>480 °F)*	>170 °C *(>340 °F)*
Base oil viscosity 40 °C, mm^2/s 100 °C, mm^2/s	 110 11	 120–130 12	 200 16	 185 15	 130 7,3	 110 13
Penetration DIN ISO 2137 60 strokes, 10^{-1} mm 100 000 strokes, 10^{-1} mm	 265–295 +50 max. (325 max.)	 220–250 280 max.	 265–295 +50 max. (325 max.)	 265–295 +50 max. (325 max.)	 265–295 +30 max.	 265–295 +50 max. (325 max.)
Mechanical stability Roll stability, 50 hrs at 80 °C, 10^{-1} mm V2F test	 +50 max. 'M'	 295 max. 'M'	 +50 max. 'M'	 +50 max. change 'M'		 +70 max. (350 max.)
Corrosion protection Emcor: – standard ISO 11007 – water washout test – salt water test (100% seawater)	 0–0 0–0 0–1*	 0–0 0–0	 0–0 0–0 1–1*	 0–0 0–0*	0–0	0–0
Water resistance DIN 51 807/1, 3 hrs at 90 °C	1 max.	2 max.	1 max.	1 max.	1 max.	0 max.
Oil separation DIN 51 817, 7 days at 40 °C, static, %	1–6	1–3	2–5	1–5	1–5	0,3–3
Lubrication ability R2F, running test B at 120 °C R2F, cold chamber test, –30 °C, +20 °C	 Pass, 120 °C *(250 °F)*	 Pass 120 °C *(250 °F)*	 Pass, 120 °C *(250 °F)*	 Pass, 100 °C *(210 °F)*		 Pass, 100 °C *(210 °F)**
Copper corrosion DIN 51 811, 110 °C	2 max. 110 °C *(265 °F)*	2 max. 130 °C *(265 °F)*	2 max.	2 max.		
Rolling bearing grease life ROF test L_{50} life at 10 000 r/min., hrs		 1 000 min., 130 °C *(265 °F)*			 1 000, 110 °C *(230 °F)*	 >300, 120 °C *(250 °F)*
EP performance Wear scar DIN 51350/5, 1 400 N, mm 4–ball test, welding load DIN 51350/4, N			 1,4 max 2 800 min.	 1,6 max. 2 600 min.	 1 100 min.	 1,8 max. 2 600 min.
Fretting corrosion ASTM D4170 FAFNIR test at –20 °C, +25 °C mg			 5,7*			
Low temperature torque IP186, starting torque, m Nm* IP186, running torque, m Nm*	 98, –30 °C *(–20 °F)* 58, –30 °C *(–20 °F)*	 145, –30 °C *(–20 °F)* 95, –30 °C *(–20 °F)*	 70, –20 °C *(–5 °F)* 45, –20 °C *(–5 °F)*	 40, –30 °C *(–20 °F)* 30, –30 °C *(–20 °F)*	 137, –30 °C *(–20 °F)* 51, –30 °C *(–20 °F)*	
Available pack sizes	35, 200 g tube 420 ml cartridge 1, 5, 18, 50, 180 kg	420 ml cartridge 0,5, 1, 5, 18, 50, 180 kg, TLMR	420 ml cartridge 1, 5, 18, 50, 180 kg TLMR	35, 200 g tube 420 ml cartridge 1, 5, 18, 50, 180 kg LAGD, TLSD, TLMR	420 ml cartridge 1, 18, 180 kg LAGD, TLSD, TLMR	420 ml cartridge 5, 18, 180 kg LAGD

* Typical value

Special requirements

LGBB 2	LGLT 2	LGWM 1	LGWM 2	LGEM 2	LGEV 2	LGHB 2	LGHP 2	LGET 2
Wind turbine blade and yaw bearing grease	Low temperature, extremely high speed	Extreme pressure, low temperature	High load, wide temperature	High viscosity plus solid lubricants	Extremely high viscosity with solid lubricants	EP high viscosity, high temperature	High performance polyurea grease	Extreme temperature
KP2G-40	K2G-50	KP1G-30	KP2G-40	KPF2K-20	KPF2K-10	KP2N-20	K2N-40	KFK2U-40
2	2	1	1–2	2	2	2	2–3	2
Lithium complex	Lithium	Lithium	Complex calcium sulphonate	Lithium	Lithium/ calcium	Complex calcium sulphonate	Di–urea	PTFE
Yellow	Beige	Brown	Yellow	Black	Black	Brown	Blue	Off white
Synthetic (PAO)	Synthetic (PAO)	Mineral	Synthetic (PAO)/ Mineral	Mineral	Mineral	Mineral	Mineral	Synthetic (fluorinated polyether)
–40 to +120 °C *(–40 to +250 °F)*	–50 to +110 °C *(–60 to +230 °F)*	–30 to +110 °C *(–20 to +230 °F)*	–40 to +110 °C *(–40 to +230 °F)*	–20 to +120 °C *(–5 to +250 °F)*	–10 to +120 °C *(15 to 250 °F)*	–20 to +150 °C *(–5 to +300 °F)*	–40 to +150 °C *(–40 to +300 °F)*	–40 to +260 °C *(–40 to +500 °F)*
>200 °C *(390 °F)*	>180 °C *(>355 °F)*	>170 °C *(>340 °F)*	>300 °C *(>570 °F)*	>180 °C *(>355 °F)*	>180 °C *(>355 °F)*	>220 °C *(>430 °F)*	>240 °C *(>465 °F)*	>300 °C *(>570 °F)*
68	18 4,5	200 16	80 8,6	500 32	1 020 58	400–450 26,5	96 10,5	400 38
265–295 +50 max.	265–295 +50 max.	310–340 +50 max.	280–310 +30 max	265–295 325 max.	265–295 325 max.	265–295 –20 to +50 (325 max.)	245–275 365 max.	265–295 –
+50 max.	380 max.		+50 max.	345 max. 'M'	+50 max. 'M'	–20 to +50 change 'M'	365 max.	±30 max. 130 °C *(265 °F)*
0–0 0–1*	0–1	0–0 0–0	0–0 0–0 0–0	0–0 0–0	0–0 0–0* 0–0*	0–0 0–0 0–0*	0–0 0–0 0–0	1–1
1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	0 max.
4 max, 2.5*	<4	8–13	3 max.	1–5	1–5	1–3, 60 °C *(140 °F)*	1–5	13 max. 30 hrs 200 °C *(390 °F)*
			Pass, 140 °C *(285 °F)* Pass, Pass	Pass, 100 °C *(210 °F)*		Pass, 140 °C *(285 °F)*	Pass, 120 °C *(250 °F)*	
1 max. 120 °C *(250 °F)*	1 max. 100 °C *(210 °F)*	2 max. 90 °C *(>195 °F)*	1 max.	2 max. 100 °C *(210 °F)*	1 max. 100 °C *(210 °F)*	2 max. 150 °C *(300 °F)*	1 max. 150 °C *(300 °F)*	1
	>1 000, 20 000 r/min. 100 °C *(210 °F)*		1 824*, 110 °C *(230 °F)*			>1 000, 130 °C *(265 °F)*	1 000 min. 150 °C *(300 °F)*	>700, 5 600 r/min.* 220 °C *(430 °F)*
0,4* 5 500*	2 000 min.	1,8 max. 3 200 min.*	1,5 max. 4 000 min.	1,4 max. 3 000 min.	1,2 max. 3 000 min.	0,86* 4 000 min.		8 000 min.
0–1*		5,5*	1,1*, 5,2*			0*	7*	
313, –40 °C *(–40 °F)* 75, –40 °C *(–40 °F)*	32, –50 °C *(–60 °F)* 21, –50 °C *(–60 °F)*	178, 0 °C *(32 °F)* 103, 0 °C *(32 °F)*	249, –40 °C *(–40 °F)* 184, –40 °C *(–40 °F)*	160, –20 °C *(–5 °F)* 98, –20 °C *(–5 °F)*	96, –10 °C *(14 °F)* 66, –10 °C *(14 °F)*	250, –20 °C *(–5 °F)* 133, –20 °C *(–5 °F)*	1 000, –40 °C *(–40 °F)* 280, –40 °C *(–40 °F)*	
420 ml cartridge 5, 18, 180 kg	180 g tube 0.9, 25, 170 kg	420 ml cartridge 5, 50, 180 kg TLMR	420 ml cartridge 5, 18, 50, 180 kg LAGD, TLSD, TLMR	420 ml cartridge 5, 18, 180 kg LAGD, TLSD	35 g tube 420 ml cartridge 5, 18, 50, 180 kg TLMR	420 ml cartridge 5, 18, 50, 180 kg LAGD, TLSD, TLMR	420 ml cartridge 1, 5, 18, 50, 180 kg LAGD, TLSD, TLMR	50 g (25 ml) syringe 1 kg

Low temperatures

High loads

High temperatures