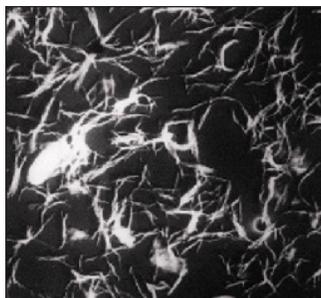




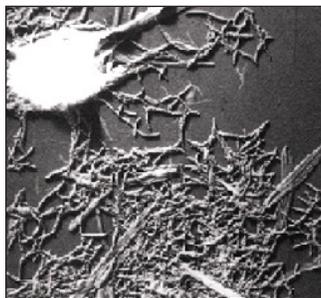
Overview

Grease is a semi-solid lubricant that is mostly oil (approximately 90%) with a dispersed metallic soap thickener and appropriate chemical additives. The liquid portion is usually a mineral or petroleum oil and provides the lubrication. The thickener primarily holds the oil in place and provides varying resistance to flow.

Grease Components



Lithium Complex Grease



Water-Stabilized Grease

Base Oil

Many different types of base oils may be used in the manufacture of a grease, including petroleum (naphthenic, paraffinic) and synthetic (PAOs, esters, silicones, glycols).

Just as with motor oils and transmission fluids, the viscosity of the base oil is the most significant property. A lighter, lower viscosity base oil is used to formulate low-temperature greases, while a heavier, higher viscosity base oil is used to formulate high-temperature greases.

Additives

Chemical additives of many types are often needed to augment or improve performance, or meet special needs. Some additives modify soap, others enhance natural characteristics of the oil, giving it longer life or improving its ability to protect against damage to the rolling contact surfaces.

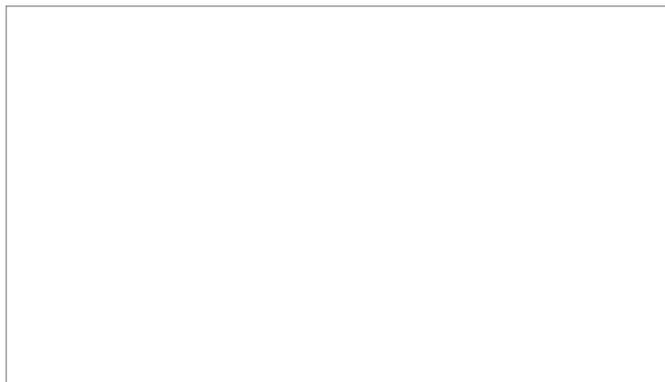
Antioxidants – These protect the grease during storage and in service.

Rust and Corrosion Inhibitors – Under extremely wet or humid operating conditions, the performance of most greases can be improved by a rust inhibitor.

Extreme Pressure (EP) Additives – These additives provide improved load carrying capability and give added protection under shock loads.

Thickeners

Thickeners are the ingredients added to a base oil in order to thicken it to a grease structure. The two basic types of thickeners are organic and inorganic. Organic thickeners can be either soap-based or non-soap based, while inorganic thickeners are non-soap based. Two distinct grease structures are shown in the electron photomicrographs at the left.



Grease Compatibility

In order to take on enhanced performance characteristics, including higher dropping points, a complex agent is added to the soap thickener to convert it to a soap salt complex thickener. The greases are then referred to as “complexes.” When greases made from different thickeners or base oils are mixed, the mixture may be poorer in service performance or physical properties than either of the component products. Incompatibility may show up in areas such as lower heat resistance, change in consistency, (usually softening), or decrease in shear stability. When changing greases in a system, it is important to purge the system before using a new grease to eliminate the chance of incompatible greases lessening the effectiveness of the new grease.

	Aluminum Complex	Barium	Calcium	Calcium 12-hydroxy	Calcium Complex	Clay	Lithium	Lithium 12-hydroxy	Lithium Complex	Polyurea
Aluminum Complex	Compatible	Incompatible	Incompatible	Compatible	Incompatible	Incompatible	Incompatible	Incompatible	Compatible	Incompatible
Barium	Incompatible	Compatible	Incompatible	Compatible	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible
Calcium	Incompatible	Incompatible	Compatible	Compatible	Incompatible	Compatible	Compatible	Borderline	Compatible	Incompatible
Calcium 12-hydroxy	Compatible	Compatible	Compatible	Compatible	Borderline	Compatible	Compatible	Compatible	Compatible	Incompatible
Calcium Complex	Incompatible	Incompatible	Incompatible	Borderline	Compatible	Incompatible	Incompatible	Incompatible	Compatible	Compatible
Clay	Incompatible	Incompatible	Compatible	Compatible	Incompatible	Compatible	Incompatible	Incompatible	Incompatible	Incompatible
Lithium	Incompatible	Incompatible	Compatible	Compatible	Incompatible	Incompatible	Compatible	Incompatible	Compatible	Incompatible
Lithium 12-hydroxy	Incompatible	Incompatible	Borderline	Compatible	Incompatible	Incompatible	Incompatible	Compatible	Compatible	Incompatible
Lithium Complex	Compatible	Incompatible	Compatible	Compatible	Incompatible	Incompatible	Compatible	Compatible	Compatible	Incompatible
Polyurea	Incompatible	Incompatible	Incompatible	Incompatible	Compatible	Incompatible	Incompatible	Incompatible	Incompatible	Compatible

Borderline
Compatible
Incompatible

Note: This chart is meant only to serve as a guideline for determining compatibility. For the purposes of changing products in the field, the compatibility of the greases in question should be determined by laboratory testing.

Grease Properties

- Grease consistency correlates to the firmness of the grease. Care must be taken to select the correct consistency for the application. If the grease is too hard, it may not adequately flow to the areas in need of lubrication. If it is too soft, it may leak away from the desired area.
- Oxidation stability has to do with the performance of a grease after being exposed to oxygen.
- Exposure to water may effect greases in several ways. First, it can cause grease to change consistency. Second, it may change the grease’s texture, perhaps becoming less adhesive. Third, it may form an emulsion with the grease, losing its lubricating effectiveness or washing away.
- A lubricant’s main job is to separate bearing surfaces to prevent wear. If the amount of lubricant is inadequate, the lubricant film becomes so thin that some parts come into contact. Known as boundary lubrication, it causes a modest level of wear on one or both bearing surfaces.
- Dropping Point is the temperature at which a grease turns from a semi-solid to a liquid state. Operating at a temperature above the dropping point may cause permanent thickener separation or alternation of grease properties.
- Mechanical Stability is a greases’ resistance to hardening or softening as it is worked in a bearing.
- Timken OK Load is the maximum load a lubricant will withstand without failure due to breakdown of the lubricant film.

Grease Selection



Penetrometer

The National Lubricating Grease Institute (NLGI) is an organization that produces new standards for grease performance, production, applications, etc.

The NLGI grade simply defines the consistency of lubricating grease in penetration limits or ranges by using a penetrometer.

Penetration is a measure of the depth to which a standard cone-shaped die penetrates a grease sample with a standard force applied at specified conditions. Therefore, soft greases are more easily penetrated resulting in a larger penetration number, while a hard or stiff grease will have a lower penetration number.

The penetration test is usually made after the grease has been “worked” in a grease worker for 60 strokes, in which case the term “worked penetration” is used.

The nine currently recognized NLGI grades of grease and the penetration specifications for them are shown in the following chart.

National Lubricating Grease Institute Consistency Grades

NLGI Grade	Worked Penetration at 25°C (77°F) mm/10	Description
000	445 to 475	Softest grease Just enough thickener to keep the oil from running out Gear case lubricant
00	400 to 430	Gear case lubricant
0	355 to 385	Low-temperature handling in centralized lubrication systems
1	310 to 340	Needle and multiple row roller bearings Number 0 and 1 greases generally are used for low temperature operation in centralized lubrication systems
2	265 to 295	Ball and roller bearings, moderately loaded and medium speed applications Most common grease grade Generally applied by gun
3	220 to 250	Wheel bearings, precision and high speed use Pre-lubed ball bearings, double-sealed and double-shielded type.
4	175 to 205	High speed, lightly loaded applications Water-pump grease
5	130 to 160	Very stiff grease. Pillow-block lubrication Rarely seen in modern equipment
6	85 to 115	Solid-type grease. Pillow-block lubrication Rarely seen in modern equipment

Applications

All of Lawson Products' greases are formulated to the highest possible standards. For this reason, all of the greases will meet or exceed the lubricating requirements in most industrial and institutional applications.

How to Use the Tables:

The listings under the **Applications** column in the charts are meant only as suggestions of where that specific grease may be used. It does not mean other greases will not work, nor does it mean that these are the only applications where the grease will work.

These charts are meant to serve as a guideline only. For specific lubrication requirements, consult the equipment manufacturer's specifications before recommending any grease. All of the greases are considered NLGI #2 greases, unless noted.

Aluminum Complex Base

Grease	Color	Temperature Range	Water Loss (%)	Timken Load (lbs.)	Food Grade	4-Ball Wear (mm)	Applications
EP/Red 99998	Clear Red	-25°F to +450°F (-31.5°C to +232°C)	N/A	N/A	No	0.35	General-purpose applications

Bentonite Base

Grease	Color	Temperature Range	Water Loss (%)	Timken Load (lbs.)	Food Grade	4-Ball Wear (mm)	Applications
Persist DN4380D	Red	-20°F to +350°F (-28°C to +176°C)	2.90	N/A	No	0.45	Bearings, ball joints, couplings
Super 77 High-Temperature Moly Grease 81397	Gray/Black	-20°F to +500°F (-20°C to +260°C)	N/A	N/A	No	0.35	General-purpose applications
Unlimited Slip [†] DN5890D	White	-20°F to +350°F (-28°C to +176°C)	10.00	N/A	No	N/A	Automotive/Fleet chassis lubrication, pins, hinges, latches
Break-In Grease* 97289	White	N/A	N/A	N/A	No	N/A	Engines and other automotive applications

*Comes in 8 oz. tube

[†]Not available in Canada

Synthetic

Grease	Color	Temperature Range	Water Loss (%)	Timken Load (lbs.)	Food Grade	4-Ball Wear (mm)	Applications
Vision DN4800D	Clear	-60°F to +750°F (-51°C to +399°C)	0.40	20	Yes	0.50	Food machinery, lawn equipment, low-temp, high-temp applications
HT1000 P47061	Black	-35°F to +1,000°F (-37°C to +538°C)	2.99	49	Bi	9.57	Ovens, boilers, roller bearings, power plants, blast furnaces

Other Bases

Grease	Base	Color	Temperature Range	Water Loss (%)	Timken Load (lbs.)	Food Grade	4-Ball Wear (mm)	Applications
Gold Rush DN4720D	OB Calcium Complex	Gold	-40°F to +570°F (-40°C to +299°C)	2.75	70	No	0.39	Wet operations, outdoors
Blue Grease HT* P35000	Calcium Sulfonate Complex	Blue	-15°F to +435°F (-26°C to 224°C)	0.30	65	No	0.75	Water pumps, generators, fifth wheel conveyors, exposed gears
Lawson Lube EP 94312	Lithium-12	Green	-20°F to +235°F (-29°C to +113°C)	N/A	60	No	0.45	Plain, sliding and anti-friction bearings

*NLGI Grade 1-1/2.