

CHEVRON LUBRICANTS

# CALTEX GREASE TOOLKIT



CALTEX



# Caltex and Chevron Toolkit Greases Available by Thickener Type

## Clay

Thermatex® EP

## Lithium

Multifak® Moly EP

Multifak® EP

Marfak® Multipurpose

## Lithium Complex

Delo® Grease ESI® EP

Delo® Heavy Duty Moly 5% EP

Delo® Starplex EP

## Polyurea

Black Pearl® Grease EP

SRI Grease



# Caltex Grease Toolkit








This toolkit is designed as a hands-on approach to help the end-user focus on selecting the right premium Caltex and Chevron greases for various segments, applications, and conditions to ensure operational reliability, while allowing for consolidation of greases within their organization.

Throughout this toolkit we will refer to segment, application, and condition icons - these have been defined below for your quick reference:




## Key Segments:

-  Automotive
-  Fleet/Owner Operator
-  Service Trucks
-  Buses
-  Construction
-  Agriculture
-  Mining
-  Manufacturing
-  Marine
-  Power Generation
-  Oil and Gas

## Applications:

-  Electric Motors
-  Centralized Systems
-  Gears
-  Couplings
-  Bearings - Heavy Loaded
-  Bearings - Light Loaded
-  Multipurpose

## Conditions:

-  High Temperature
-  Low Temperature
-  High Speed
-  Low Speed
-  Shock / Extreme Load
-  High Moisture
-  Boundary Film Lubrication

With grease, you are not just selling lubricants – you are selling reliability and at Chevron, we want to help you maximize equipment reliability through knowledge, products and services in order to attain dependable and efficient performance across various operations.

# Thermatex® EP



## Grease Description

- Designed for application for temperature between 135°C and up to 260°C, dependent on re-greasing intervals
- Excellent resistance to water wash-off
- Check compatibility with other greases
- Prevents grease loss from bearings at high temperatures
- NLGI grade 2

## Key Segments Applications Conditions



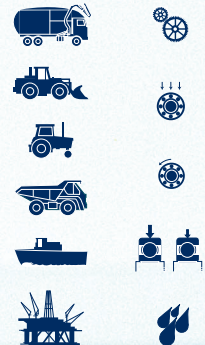
# Multifak® Moly EP

## Grease Description

- Manufactured utilizing selected base oils, a lithium-12 hydroxystearate thickener, 3% molybdenum disulphide (moly), an extreme pressure additive, and rust & oxidation inhibitors
- Approved for Volvo Construction Equipment requirements for grease performance
- NLGI grade 2



## Key Segments Applications Conditions



# Multifak® EP

## Grease Description

Manufactured utilizing high viscosity index base oils, a lithium-12 hydroxystearate thickener, an extreme pressure additive, and rust and oxidation inhibitors

- Multipurpose grease
- Good oxidation stability
- NLGI grades 0, 1, 2 and 3
- NLGI grade 2 meets NLGI LB classification



## Key Segments Applications Conditions



# Marfak® Multipurpose

## Grease Description

- Multipurpose automotive applications where EP is not required
- Industrial ball and roller bearings use where EP is not required
- Good oxidation life
- NLGI grade 3



## Key Segments Applications Conditions



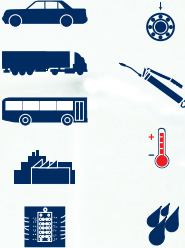
# Delo® Starplex EP

## Grease Description

- Lithium complex thickener with high viscosity index base oils
- Multipurpose grease for bearings, chassis, and general lubrication
- Approved for NLGI certification mark GC-LB for NLGI grades 1 and 2



## Key Segments Applications Conditions





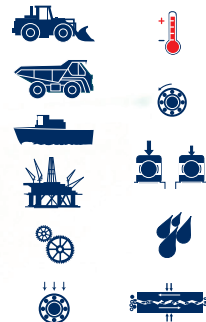
# Delo® Heavy Duty Moly 5% EP

## Grease Description

- Lithium complex thickened with heavy viscosity base oil
- Designed for heavy shock loading applications
- Formulated with 5% MoS<sub>2</sub> to meet CAT and other OEM mining requirements
- NLGI grades 1 and 2



## Key Segments Applications Conditions



# Delo® Grease ESI®

## Grease Description

- Lithium complex thickened with medium/heavy viscosity base oil
- Excellent pumpability versus other mid-high viscosity base oil heavy-duty greases
- Approved for NLGI certification mark LB
- Extended service protection for chassis, bearings, fifth wheels and king pins
- Excellent water washout resistance
- NLGI grade 2



## Key Segments Applications Conditions



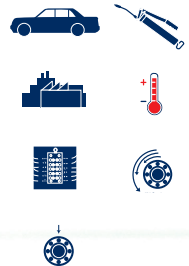
# Black Pearl® Grease EP

## Grease Description

- Polyurea thickened with premium base oil
- Excellent pumpability for centralized greasing systems
- Superb high speed/high temperature in roller bearings
- Check compatibility with other greases
- NLGI grade 2
- Approved for NLGI Certification mark GC-LB



## Key Segments Applications Conditions



# SRI Grease

## Grease Description

- Premium ashless polyurea thickener
- Can be used as a “life pack” lubricant in sealed bearings
- For use in anti-friction bearings operating at high speeds (10,000 rpm and greater)
- Primary recommendation for electric motor bearings
- Check compatibility with other greases
- NLGI grade 2

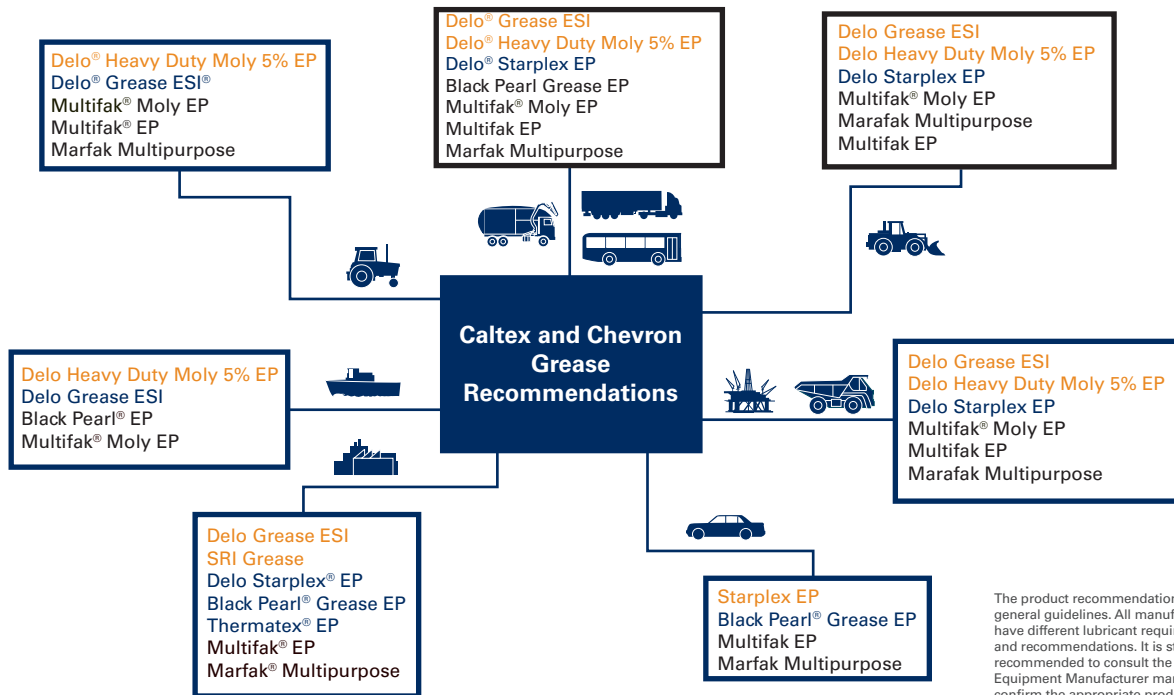


## Key Segments Applications Conditions



# Caltex and Chevron Greases

## Protection Performance for All Key Segments (Typical Recommendations)

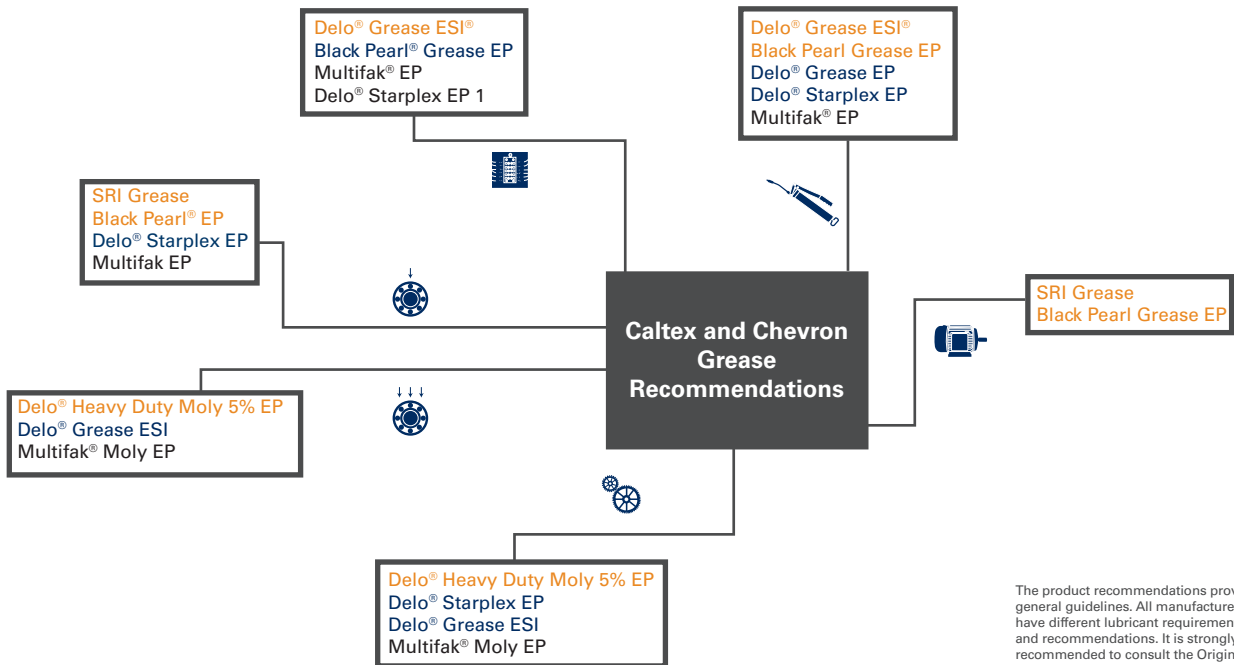


■ Highest Performance Operations ■ Severe Operations ■ Standard Operations

The product recommendations provide general guidelines. All manufacturers have different lubricant requirements and recommendations. It is strongly recommended to consult the Original Equipment Manufacturer manual to confirm the appropriate product is used for the application and it is the responsibility of the end user to ensure that products are used in the applications which they are intended for.

# Caltex and Chevron Greases

Protection Performance for All Applications (Typical Recommendations, Check Conditions)

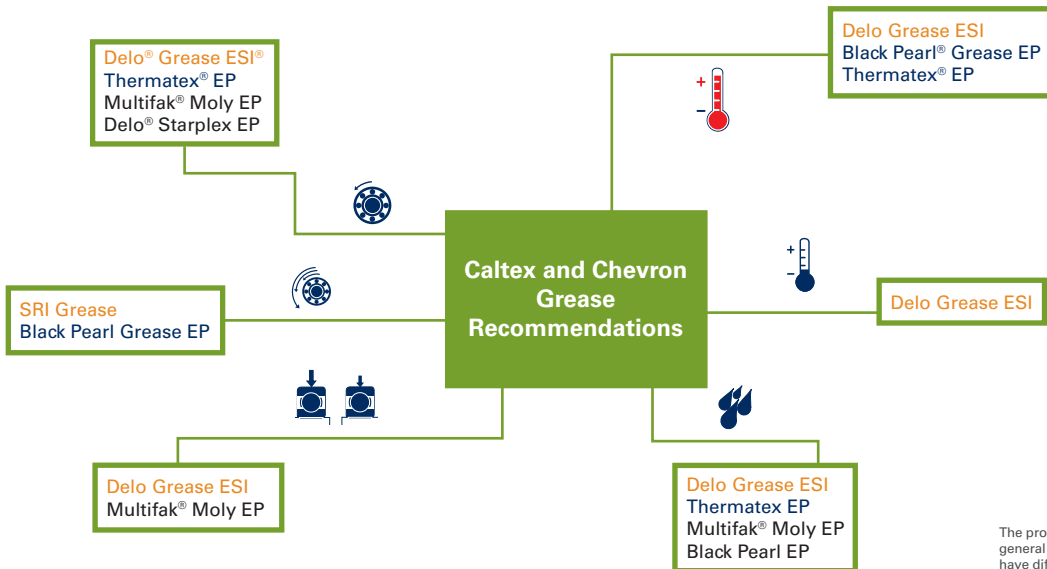


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# What Is a Grease?

## Grease Definition (ASTM)

- "A solid to semifluid product of dispersion of a thickening agent in liquid lubricant. Other ingredients imparting special properties may be included."

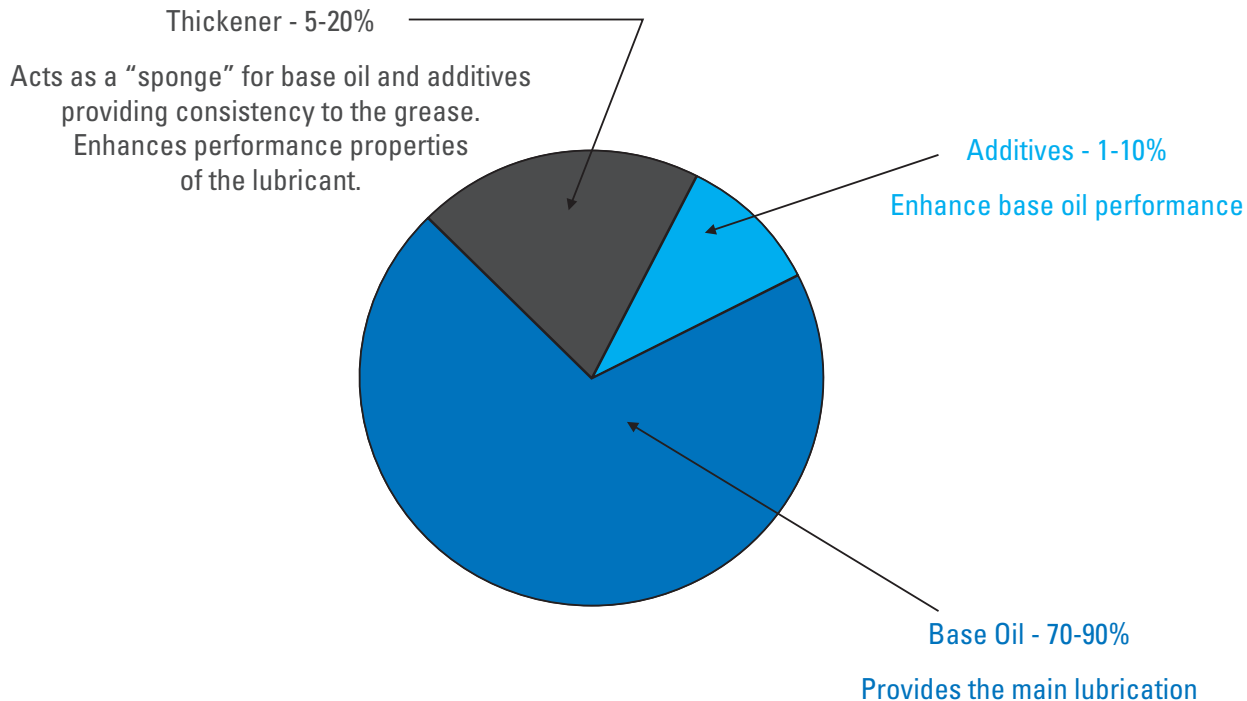
## General Grease Components

- Base oil
- Thickener
- Additives





# General Composition



# General Functions and Purpose

- Lubricate contact surfaces
- Reduce friction and wear
- Protect against rust and corrosion
- Lubrication is infrequent or “sealed for life”
- Oil lubrication is not practical
- Seal out liquid contaminants
- Minimize re-lube intervals
- Minimize leaks (housekeeping)
- Extreme applications — where oil doesn’t work



# Penetration Numbers

NLGI - National Lubricating Grease Institute

## Choosing Consistency - Understanding NLGI Grade Number

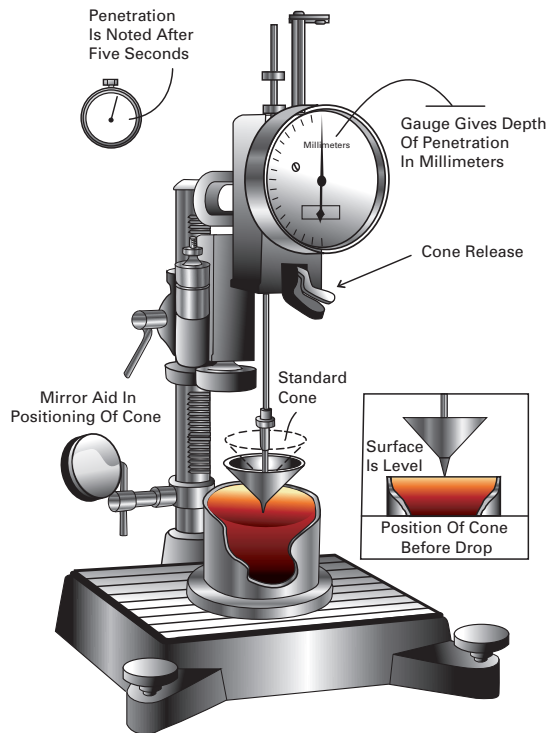
Higher NLGI Grade Number = Harder/Stiffer Grease

Lower NLGI Grade Number = Softer/Fluid Grease

### Number      Worked Penetration, $P_{60}$

000	445-475
00	400-430
0	355-385
1	310-340
2	265-295
3	220-250
4	175-205
5	130-160
6	85-115

(Worked Penetration for a grease is achieved when a grease is churned 60 round-trip strokes in a standard worker (a standard piece of grease equipment to work grease to simulate real world grease activity) at 77° F (25° C)).



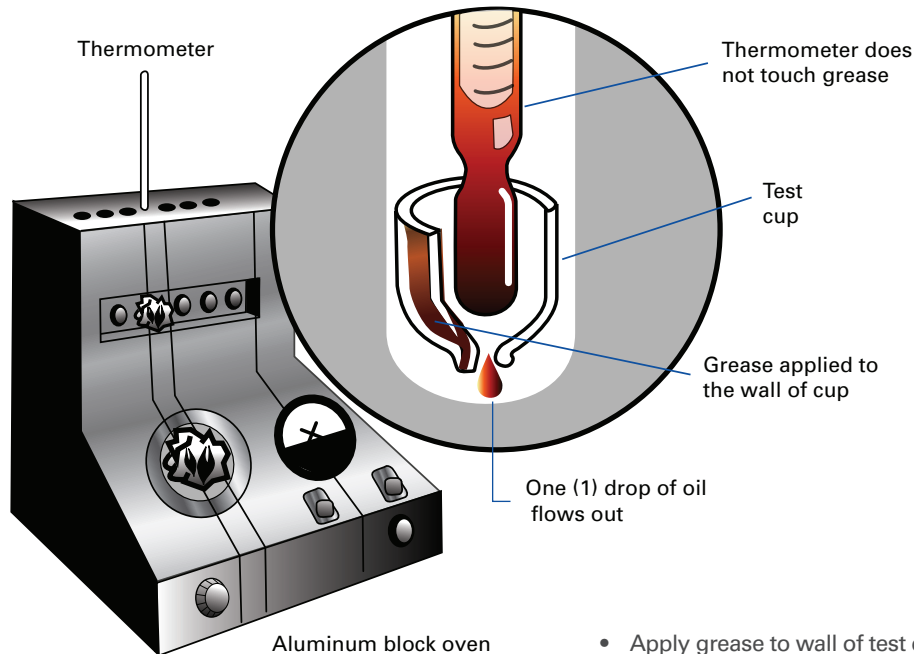
*Penetrometer Instrument Illustration*

# Base Oil Viscosity

- Most important characteristic of grease
- Oil does the lubricating
- Thickener holds it together
- ISO viscosity grade 100, motors, high-speed
- ISO viscosity grade 220, most applications
- ISO viscosity grade 320, higher loads, medium speeds
- ISO viscosity grade 460+, highest loads, slowest speeds



# Dropping Point Measurement



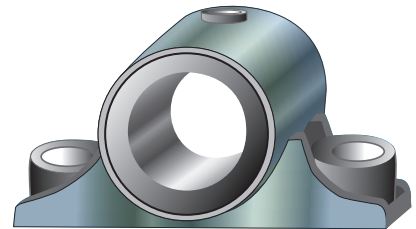
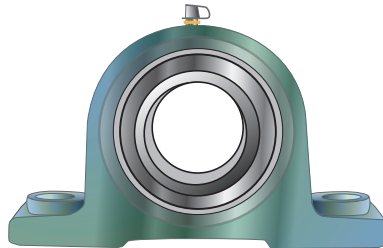
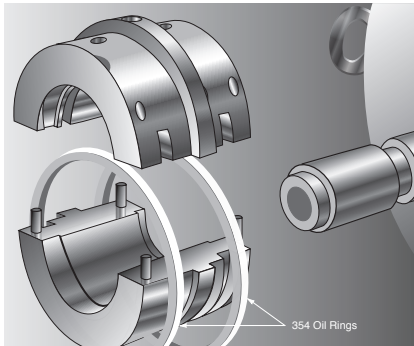
- Apply grease to wall of test cup.
- Select oven temperature as defined in ASTM D 2265.
- Measure the “dropping point” of the grease when one (1) drop of oil falls from the test cup.

# NLGI Service Categories

Category	Service	Performance
<b>LA</b> chassis	Frequent re-lubrication intervals (<3200 km). Mild duty (non-critical applications.)	Oxidation resistant, shear stable, and corrosion and wear protective.
<b>LB</b> chassis	Prolonged re-lubrication intervals (>3200 km). Mild to severe duty (high loads, vibration, exposure to water).	Oxidation resistant, shear stable and corrosion and wear protective even under heavy loads and in presence of aqueous contamination. Temperature range -40 to 120°C.
<b>GA</b> wheel bearings	Frequent re-lubrication intervals. Mild duty (non-critical applications.)	Temperature range -20 to 70°C.
<b>GB</b> wheel bearings	Mild to moderate duty (cars, trucks in urban and highway service).	Oxidation and evaporation resistant, shear stable, and corrosion and wear protective. Temperature range -40 to 120°C with occasional excursions to 160°C.
<b>GC</b> wheel bearings	Mild to severe duty (vehicles in frequent stop-and-go service, trailer hauling, mountain driving, etc.).	Oxidation and evaporation resistant, shear stable, and corrosion and wear protective. Temperature range -40 to 120°C with frequent excursions to 160°C and occasional excursions to 200°C.

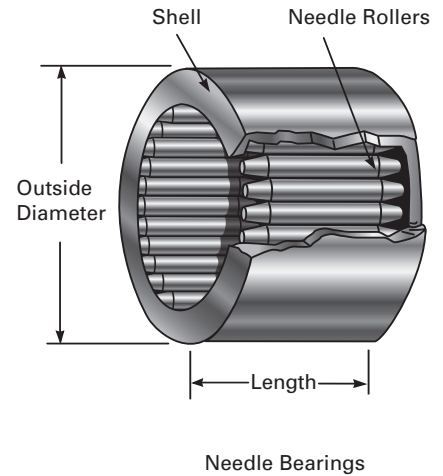
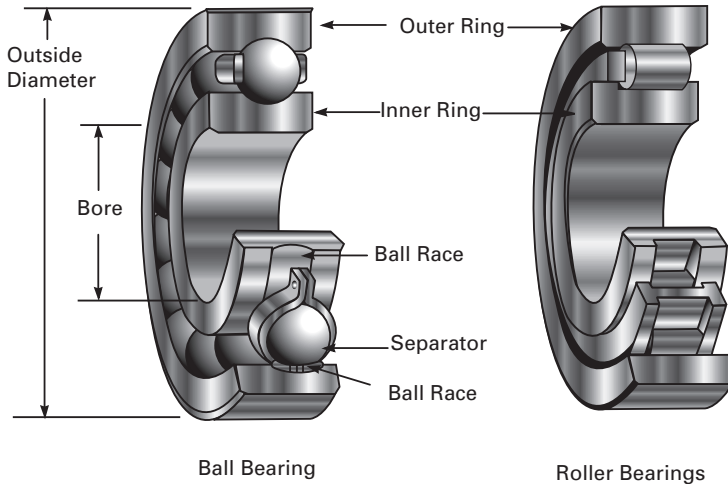
# Typical Greased Bearing Types

## JOURNAL AND PLAIN BEARINGS



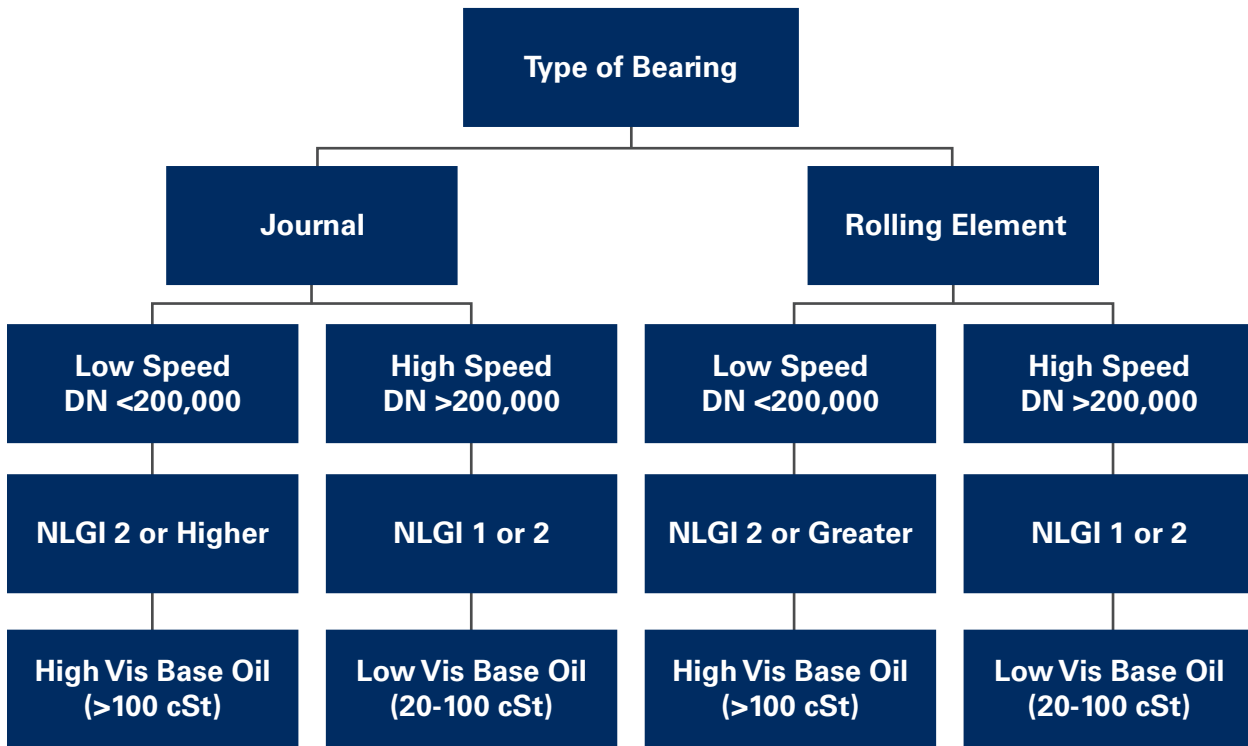
# Typical Greased Bearing Types

## ROLLING ELEMENT BEARINGS





# General Grease Bearing Recommendations



Note: US Bearing Mfgs -  $DN = N \times RPM$ ; where N is bore diameter (in mm).

European Bearing Mfgs -  $nD = ((D1+D2))/2 \times RPM$ ; where D1 and D2 are the outer and inner bore diameters respectively (in mm).

# Selection Guidelines

## Key First Information Gathering:

- Evaluating equipment recommendations and conditions
- Review OEM requirements
- Review NLGI consistency/penetration numbers
- Review NLGI service categories
- Understand operating conditions of equipment and lubricant
- Evaluate intervals and any problems with current greases
- Move to “Prescribe the Right Grease” selection criteria guidelines

## Next Step - “Prescribe the Right Grease”:

1. Where is it going?
2. How do we apply it?
3. How do we keep it in place?
4. Will it keep working?
5. Will it be compatible with the previous grease?

Refer to table on page 23.



# “Prescribe the Right Grease”

Application	Condition	Grease Property	Measurement
Where is it going?	Type of bearing component	Consistency Base oil	NLGI grade Viscosity/viscosity index
How do we apply it?	Application method - Grease gun - Centralized system - Hand applied	Consistency Pumpability Base oil	NLGI grade Lincoln ventmeter Viscosity/viscosity index
How do we keep it in place?	Vibration Shock load Water impingement	Additives/Solids Consistency Thickener Tackifiers	Film strength NLGI grade Emulsibility Water washout
Will it keep working?	Operating temperature	Thickener Thickener Base oil Additives	Dropping point Oxidation resistance Viscosity/viscosity index Oxidation resistance
	Water contamination	Additives Thickener	Rust protection Emulsibility
	Chemical contaminants	Additives Additives Thickener	Corrosion inhibition Film strength Resistance to chemicals
Will it be compatible with previous grease?	Other greases	Thickener	Review Table 1 (page 25)

# Compatibility and Changeover Practices

Grease changeover and compatibility are an important part of providing a customer reliable operations.

When provided with an opportunity to changeover a customer to a Caltex or Chevron grease – it's important to take into account key items for the transition:

1. Understand the application and conditions the grease will be applied — check OEM recommendations.
2. Confirm current competitive grease use and re-lubrication intervals.
3. Check current competitive grease details:
  - a. Thickener type
  - b. Base oil viscosity
  - c. NLGI grade number
  - d. Any equipment / performance problems experienced
  - e. Current application method – centralized system/grease gun/bulk, etc.
4. Confirm “best” Caltex or Chevron grease recommendation for the equipment/condition application and re-lubrication interval required by customer in accordance with the OEM recommendations.
5. Check compatibility of Caltex or Chevron grease and Competitor grease –Table 1 may be referenced as a guide (page 25).
6. If products are in green section – compatible – proceed with additional application questions and confirm final fit with customer and equipment application/conditions.
7. If product is in yellow section – may be compatible.
8. If products are in red – not compatible – a full cleanout and or purge of greased equipment must be conducted.
9. Failure to follow these steps risks a successful conversion and may result in poor equipment performance, loss of business, and possible failure/shutdown for the customer.

# Compatibility Chart

Compatible
  Check Compatibility with Chevron Lubetek®
  Not Compatible – Full Clean Out Required for Change

**Table 1 - Compatibility of Binary Grease Mixtures**

	Lithium	Lithium Complex	Aluminum Complex	Calcium	Calcium Sulfonate Complex	Barium Complex	Sodium	Bentone (Clay)	Polyurea
Lithium	Compatible	Compatible	Not Compatible	Compatible	Check Compatibility	Not Compatible	Not Compatible	Not Compatible	Check Compatibility
Lithium Complex	Compatible	Compatible	Not Compatible	Check Compatibility	Check Compatibility	Not Compatible	Not Compatible	Not Compatible	Check Compatibility
Aluminum Complex	Not Compatible	Not Compatible	Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible
Calcium	Compatible	Check Compatibility	Not Compatible	Compatible	Check Compatibility	Not Compatible	Not Compatible	Not Compatible	Check Compatibility
Calcium Sulfonate Complex	Check Compatibility	Check Compatibility	Not Compatible	Check Compatibility	Compatible	Not Compatible	Not Compatible	Not Compatible	Check Compatibility
Barium Complex	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Compatible	Not Compatible	Not Compatible	Not Compatible
Sodium	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Compatible	Not Compatible	Not Compatible
Bentone (Clay)	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Compatible	Not Compatible
Polyurea	Check Compatibility	Check Compatibility	Not Compatible	Check Compatibility	Check Compatibility	Not Compatible	Not Compatible	Not Compatible	Check Compatibility

Table 1 should be used only as a guideline for determining compatibility. For the purpose of changing products in the field, the compatibility of the greases in question should be determined by laboratory testing.

# Greasing Procedures

## Proper Intervals and Amounts

1. Proper greasing intervals should be based on a number of factors including: original equipment manufacturer (OEM) recommendations, ambient conditions, equipment operating hours, criticality of equipment or component and maintenance plan.
2. High Temperature Application
  - a. Greases fail more rapidly as temperature of operation increases. This failure typically lies in the melting point of the thickener or dropping point of the grease. Oxidation also increases rapidly as temperature rises.
  - b. Most mineral oil-based greases (of adequate dropping point) will operate successfully to about 250°F (121°C) at more frequent re-lubrication intervals. As service temperature rises, frequency of re-lubrication must increase.
  - c. If speed is high, bearing is large, or load severe, re-lubrication intervals should be even shorter. Where service is severe and/or contamination is unavoidable, re-lubrication is best carried out with a centralized lubrication system, and lubrication intervals may be measured in hours or minutes.
  - d. Listed below are general guidelines for re-lubrication intervals for rolling element bearings (assuming eight work hours per day). As always check specific OEM recommendations, ambient conditions and application before finalizing specific greasing intervals:
    - 180°F (82°C) 6 months
    - 220°F (104°C) 3 months
    - 300°F (149°C) 1 month
    - >300°F (149°C) 1 day to 1 month - check OEM recommendations and review grease type to determine correct interval at high temperatures.

# Greasing Procedures

## Proper Intervals and Amounts

- e. Care should be taken when operating machinery at these elevated temperatures. Evaluate the oil(s) used in the grease to ensure that the flash point of the oil(s) has not been exceeded.
3. Proper quantity of grease to be pumped into greased bearings/components should be determined by your Lubrication or Maintenance Engineer who will typically utilize: OEM recommendations, bearing dimensions, severity of conditions, grease selection criteria (see pages 20-23) and maintenance plan to ensure correct amount is applied. As a guideline the following formula can be used as reference:  
***Grams of grease required in bearing = 3.23 x Bearing outside diameter (OD in mm) x Width (W in mm)***
4. Under/over greasing reduces equipment reliability and increases potential failure rates and costs.

# Greasing Procedures

## General Guidelines

Greased bearing/component failures can normally be attributed to several consistent factors: lack of lubrication, contamination, incompatibility, overgreasing and grease usefulness. Addressing these items as outlined below can help improve greased bearing/component life when applied:

1. Lack of lubrication
  - a. Ensure all critical greased components are identified and scheduled in maintenance plan/intervals
  - b. Tag/color code fittings/equipment that may be hard to locate
  - c. Utilize delivery systems to help ensure grease gets to the component
  - d. Check or replace blocked fittings/inspect delivery system
  - e. Clean out or replace any blocked bearing/component areas
2. Contamination
  - a. Ensure all grease pumping or application equipment is contaminant free
  - b. Understand how to change out old and new grease containers and associated pumping equipment to eliminate contamination
  - c. Wipe grease fittings before application of grease
  - d. Do not leave grease containers open to the environment
3. Incompatibility
  - a. Try to consolidate number of greases used on site
  - b. Refer to pages 24-25 for changeover and incompatibility reference



# Greasing Procedures

## General Guidelines

### 4. Overgreasing

- a. Seals may rupture allowing grease to leak out of bearings into the environment or into other components like electric motor windings.
- b. Ensure correct amount is applied at appropriate intervals.
- c. Check for any grease hardening/thickener separation that may block grease application.

### 5. Grease usefulness

- a. Visually check new grease containers and contents when they are opened.
- b. A thin layer or small pools of separated oil on top of the grease in a newly opened container is acceptable.
- c. Check containers for dents/broken seals/general condition to ensure grease can be applied appropriately.
- d. Check color and texture with previous grease to ensure no noticeable changes from shelf life or wrong grease being utilized.

As always, consult your local Caltex representative if there are any questions or if product needs to be verified for application or useful life.

