THE MAIN PURPOSE of lubricating a bearing is to coat the rolling contact/ load bearing surfaces with a lubricant, minimizing direct metal-to-metal contact. This accomplishes the following:

- Reduces heat, friction and abrasion, prolonging useful life,
- Transports heat away from the load zone (oil),
- Slows or prevents corrosion, and
- Helps reduce the ingress of foreign matter into the bearing (grease).

Proper lubrication during assembly is critical. Please refer to the assembly instructions for lubrication requirements when assembling bearings. Proper lubrication during operation is also critical. The **type** and **quantity** of lubrication depends on the application—the load, RPM, and temperature all affect the needed lubrication. The majority (about 90%) of rolling element bearings are grease lubricated. Oil is generally utilized in high speed and high temperature applications.

Oil

When necessary (above 8,000 dn), oil can be pumped, drained, filtered, cooled and re-circulated. This is very effective in removing heat buildup, prolonging both bearing and lubricant life. Various types of oil lubrication delivery methods are available, such as static, constant level oilers, re-circulating, and oil mist delivery systems. Various additives are available to improve resistance to thinning, oxidation resistance, corrosion resistance, foaming resistance, extreme pressure properties, etc. Consult with a reputable supplier of oil and grease products to better choose the right lubricating oil for a particular application.

Grease

Type of Grease – Grease "stays put", is easy to handle, easy to meter using simple methods, and is helpful in further sealing a bearing from contaminants and moisture. A widely available, broadly used grease type is NLGI type 2, lithium complex based grease with extreme pressure additives (EP2). This grease type is available with various viscosity oils—hydrocarbon as well as synthetic. Synthetic greases perform well outside the range of standard hydrocarbon based greases, in both low and high temperatures. They also have the ability to retain their lubricating properties for a longer amount of time over standard hydrocarbon greases. Re-lubrication intervals can be extended. When harsh conditions are present or a high degree of reliability is demanded, Craft often recommends synthetics. For most applications, it is standard to use lithium complex, EP2 type grease with ISO VG 220. A consultation with one of many reputable grease suppliers should yield the right grease for the job. DO NOT MIX GREASES! The variations in additives between brands and types may cause problems.

Quantity of Grease – More bearings fail prematurely from over greasing than from grease starvation. How much grease is required in a bearing depends mainly on speed. The amount of grease to satisfy the needs of particular sizes and series of Craft bearings is based on the dn value, the product of which is expressed as a percentage of a full pack of grease. A full pack chart for various sizes follows this section. As used herein, *dn* = *d* (shaft diameter in inches) x *n* (shaft speed in revolutions per minute); for example:

A 3 7/16" bearing rotating 1400 rpm has a *dn* = 4,813 (3.4375 x 1400)	[50% pack]
A 4 15/16" bearing rotating 1400 rpm has a *dn* = 6,913 (4.9375 x 1400)	[33% pack]
A 65 mm bearing rotating 1400 rpm has a *dn* = 3,500 ([65 / 25.4] x 1400)	[75% pack]
A 100 mm bearing rotating 1400 rpm has a *dn* = 5,600 ([100 / 25.4] x 1400)	[50% pack]

dn value	% of Full Pack
0 – 2,000 *dn*	100
2,000 – 4,000 *dn*	75
4,000 – 6,000 *dn*	50
6,000 – 8,000 *dn*	33
8,000 and up *dn*	25 (synthetic grease or oil)

Above 8,000 *dn*, oil lubrication, or a synthetic grease is usually recommended. At very high speeds, oil is better suited than grease, and can be used to remove heat buildup in a bearing. For very low speeds and/or heavy loads, or very high speeds, contact our technical department.

Grease Fill Capacity

Following is a chart showing the amount of grease it takes to fully pack individual Craft bearings. The chart is divided into group sizes, by series. For larger sizes not shown, or special bearings, consult our technical department. Use the dn chart above to calculate the actual percentage of full pack to apply to your application.

Series	Group	Full Pack Amount
S1	108	2.0 oz
S1	200	3.0 oz
S1	208	5.3 oz
S2		7.5 oz
S1	300	6.3 oz
S2		10.5 oz
S1	308	10.5 oz
S2		1.0 lbs
S1	400	12.7 oz
S2		1.5 lbs
S1	408	14.4 oz
S2		2.0 lbs
S1	500	1.0 lbs
S2		2.6 lbs
S1	508	1.5 lbs
S2		3.1 lbs
S1	600	1.8 lbs
S2		3.2 lbs
S3		5.5 lbs
S1	608	2.0 lbs
S2		3.2 lbs
S3		8.0 lbs
S1	700	2.4 lbs
S2		4.4 lbs
S3		9.0 lbs

Series	Group	Full Pack Amount
S1	800	3.0 lbs
S2		6.0 lbs
S3		12.1 lbs
S1	900	3.1 lbs
S2		8.0 lbs
S3		15.5 lbs
S1	1000	4.2 lbs
S2		9.0 lbs
S3		17.5 lbs
S1	1100	4.3 lbs
S2		10.5 lbs
S3		21 lbs
S1	1200	4.4 lbs
S2		12.0 lbs
S3		23.9 lbs
S1	1300	6.0 lbs
S2		16.0 lbs
S3		26.5 lbs
S1	1400	6.7 lbs
S2		15.9 lbs
S3		33.5 lbs
S1	1500	7 lbs
S2		17 lbs
S3		35.5 lbs
S1	1600	8 lbs
S2		20 lbs

Grease Compatibility

A significant portion of grease lubrication failures can be attributed to mixing greases in a system without taking into consideration compatibility. Different thickener systems can react with each other to modify the physical and chemical structure resulting in the inability to hold or release the base oil. The end result is grease with unknown performance properties including load, shear, temperature stability, etc.

Many factors including environment can impact this reaction. An example is grease used in a cold climate or a chiller room may have a slower reaction rate as compared to a high temperature application. A high-speed bearing may be very sensitive to slight incompatibility as compared to a low speed bearing. Refer to the grease compatibility table below.

Grease incompatibility is due to the additives and base oil, so when changing from one grease system to another, the component should be cleaned if at all possible. If this is not possible, verify the greases are compatible and make an assessment of the application criticality and environment. If the grease thickener and base oil is noted to be compatible, purge or flush out as much of the old grease as possible. It is the end user's responsibility to verify the final application and product compatibility. Use caution as to not over grease.

Compatibility testing is an option, which includes heating and holding grease for a specific time at assumed operating temperature for mixtures of 10:90, 50:50, and 90:10. The grease is then inspected for visual abnormalities and can be tested for penetration and four-ball wear change.

Grease Compatibility Table

LEGEND ◯ Compatible Δ Borderline X Incompatible	Aluminum Complex	Barium Soap	Barium Complex	Bentone (Clay)	Calcium Stearate	Calcium 12 Hydroxy	Calcium Complex	Calcium Sulfonate	Lithium Stearate	Lithium 12 Hydroxy	Lithium Complex	Polyurea	Silica Gel	Sodium Soap
Aluminum Complex		X	X	X	X	◯	X	Δ	X	X	◯	X	◯	Δ
Barium Soap	X		N/A	X	N/A	N/A	Δ	Δ	Δ	N/A	Δ	N/A	◯	X
Barium Complex	X	N/A		X	X	◯	X	◯	X	X	X	X	N/A	X
Bentone (Clay)	X	X	X		◯	◯	X	X	X	X	X	X	Δ	X
Calcium Stearate	X	N/A	X	◯		◯	X	◯	◯	Δ	◯	X	N/A	N/A
Calcium 12 Hydroxy	◯	N/A	◯	◯	◯		Δ	Δ	◯	◯	◯	X	N/A	N/A
Calcium Complex	X	Δ	X	X	X	Δ		X	X	X	◯	Δ	X	X
Calcium Sulfonate	Δ	Δ	◯	X	◯	Δ	X		Δ	Δ	◯	X	Δ	X
Lithium Stearate	X	Δ	X	X	◯	◯	X	Δ		◯	◯	X	◯	X
Lithium 12 Hydroxy	X	N/A	X	X	Δ	◯	X	Δ	◯		◯	X	N/A	N/A
Lithium Complex	◯	Δ	X	X	◯	◯	◯	◯	◯	◯		X	◯	X
Polyurea	X	N/A	X	X	X	X	Δ	X	X	X	X		N/A	X
Silica Gel	◯	◯	N/A	◯	N/A	N/A	X	Δ	◯	N/A	◯	N/A		X
Sodium Soap	Δ	X	X	X	N/A	N/A	X	X	X	N/A	X	X	X	

Base Oil Compatibility Table

LEGEND: ○ Compatible, Δ Borderline, X Incompatible

	Mineral Oil	Ester Oil	Polygycol Oil	Silicone Oil (methyl)	Silicone Oil (phenyl)	Polyphenyl Ether Oil	Perfluorinated Aliphatic Ether Oil
Mineral Oil		○	X	X	Δ	X	X
Ester Oil	○		○	X	○	○	X
Polygycol Oil	X	○		X	X	X	X
Silicone Oil (methyl)	X	X	X		Δ	X	X
Silicone Oil (phenyl)	Δ	○	X	Δ		○	X
Polyphenyl Ether Oil	X	○	X	X	○		X
Perfluorinated Aliphatic Ether Oil	X	X	X	X	X	X	

Friction Reducing Anti-Seize Compounds

An anti-seize compound must be used on the spherical of the cartridge and housing to assure continued self alignment and prevention of fretting corrosion—which is caused by two heavily loaded metal surfaces rubbing or vibrating against one another, resulting in the formation of rust. Anti-seize compounds are available as copper base or nickel base metallic type and Teflon based types. In marine applications, nickel based anti-seize is the most common type.

Elastomer Oil Compatibility Table

LEGEND: ○ Compatible, Δ Borderline, X Incompatible

		Seal Material							
		Buna Nitrile	Butyl	Kalrez	Neoprene	Nordel (EPDM)	Silicone	Teflon (PTFE)	Viton
Base Oil	Mineral Oil	○	X	○	○	X	○	○	○
	Organic Ester	Δ	X	○	X	X	X	○	○
	Polygycol	○	○	○	○	○	○	○	○
	Phosphate Ester	X	○	○	X	○	○	○	○
	Silicone	○	○	○	○	○	X	○	○
	Polybutenes	Δ	○	○	Δ	○	○	○	○
	Fluorinated Ester	○	○	Δ	○	○	○	○	○
	Synthesized Hydrocarbon	Δ	X	○	○	X	X	○	○
	Chlorofluorinated Hydrocarbon	○	○	○	○	○	○	○	Δ
	Content Service Limit (°F)	225	250	550	225	300	450	500	400

Regular Maintenance

Due to the action of the rollers against the flanges of the clamp collars and the shoulders of the outer raceway, the held bearing requires more frequent lubrication than the float bearing. Held bearings should receive $1/8$ ounce (three to four shots) of grease every 250 operating hours, or at two-week intervals. Float bearings should receive $1/8$ ounce of grease every 500 hours, or once a month. As a general rule, non-synthetic greases should be cleaned out of the bearings and replenished with new grease annually. By utilizing synthetic grease, this time frame can be extended to three years, dependent on ambient conditions, severity of the application, and re-lube schedules. End user knowledge and experience concerning actual conditions, loads, and speeds, should always be taken into consideration.