

HOW TO USE THIS MANUAL

This manual provides detailed instructions on installation and maintenance of gear drives and couplings. Use the table of contents below to locate required information.

CAREFULLY FOLLOW THE INSTRUCTIONS IN THIS MANUAL FOR OPTIMUM PERFORMANCE AND TROUBLE FREE SERVICE.

TABLE OF CONTENTS

Installation Instructions.....	Pages 1 & 2
Shaft Connections	Pages 2 & 3
Tightening Torques.....	Page 3
Lubrication Recommendations.....	Pages 4 thru 9
Lubricant Selection Process	Page 4
Preventative Maintenance.....	Page 5
Lubricant Analysis and Changes.....	Page 8
Stored and Inactive Gear Drives.....	Page 9
Food Grade Lubricants	Pages 10 thru 13
Food Grade Lubricant Selection Process.....	Page 10
Preventive Maintenance.....	Page 12
Lubricant Analysis and Changes.....	Page 12
Stored and Inactive Gear Drives	Page 13
Reliability Package (Appendix A).....	Page 14

INTRODUCTION

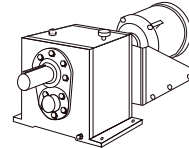
Credit for long service and dependable operation of a gear drive is often given to the engineers who designed it, or the craftsmen who constructed it, or the sales engineer who recommended the type and size. Ultimate credit belongs to the mechanic on the job who worked to make the foundation rigid and level, who accurately aligned the shafts and carefully installed the accessories, and who made sure that the drive received regular lubrication. The details of this important job are the subject of this manual.

NAMEPLATE — Operate Falk gear drives only at horsepower, speed and ratio shown on nameplate. Before changing any one of these, submit complete nameplate data and new application conditions to the Factory for correct oil level, parts and application approval.

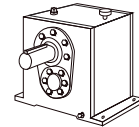
DISASSEMBLY & ASSEMBLY — Disassembly and assembly instructions and parts guides are available from the Factory or Rexnord-Falk Representatives. When requesting information, please give complete data from the nameplate on the gear drive; Model, M.O. Number, Date, RPM, and Ratio.

WARNING: Consult applicable local and national safety codes for proper guarding of rotating members. Lock out power source and remove all external loads from drive before servicing drive or accessories.

WARRANTY — Rexnord Industries (the “Company”) warrants that, for a period of three years from the date of shipment, the product described herein will deliver successfully its rated output as indicated on the nameplate, provided, it is properly installed and maintained, correctly lubricated, and operated in the environment and within the limits of speed, torque or other load conditions for which it was sold. Such product is expressly not warranted against failure or unsatisfactory operation resulting from dynamic vibrations imposed upon it by the drive system in which it is installed unless the nature of such vibrations has been fully defined and expressly accepted in writing by the Company as a condition of operation.



Type FZ



Type FC

INSTALLATION INSTRUCTIONS

The following instructions apply to standard Falk Type FC & FZ drives shown above. If a drive is furnished with special features, refer to the supplementary instructions shipped with the drive.

WELDING — Do not weld on the gear drive or accessories without prior approval from the Factory. Welding on the drive may cause distortion of the housing or damage to the bearings and gear teeth. Welding without prior approval could void the warranty.

EFFECTS OF SOLAR ENERGY — If the gear drive operates in the sun at ambient temperatures over 80°F (27°C), then special measures should be taken to protect the drive from solar energy. This protection can consist of a canopy over the drive or reflective paint on the drive. If neither is possible, a heat exchanger or other cooling device may be required to prevent the sump temperature from exceeding the allowable maximum.

HORIZONTAL MOUNTING — Mount gear drive with base horizontal, unless it has been specifically ordered for mounting in another position. If it is necessary to mount the drive in a different position from that for which it was ordered, consult the Factory for changes necessary to provide proper lubrication.

NON-HORIZONTAL MOUNTING — For gear drives with non-horizontal mounting, including tilted, vertical and wall mounted, refer to instructions provided with the drive for oil levels and bearing lubrication.

LIFTING INSTRUCTIONS — Lift UltraMax drives by means of a sling (with adequate lifting capacity) wrapped around the high speed and low speed shaft extensions for drive Sizes 2040 through 2090 and Sizes 2100 through 2130 when equipped with an electric fan. Standard drive Sizes 2100 through 2130 are equipped with lifting lugs welded to the side of the drive. Refer to Figure 1. When lifting a drive with a sling, make certain that the shaft extension keyways do not come in contact with the sling as the sharp corners could cut the sling.

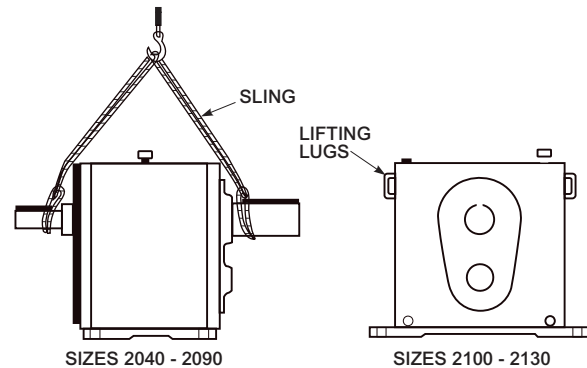
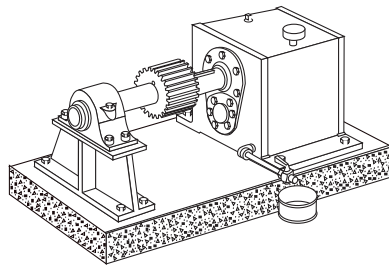


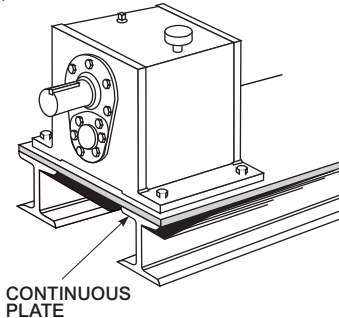
Figure 1

FOUNDATION, GENERAL — To facilitate oil drainage, elevate the gear drive foundation above the surrounding floor level. If desired, replace the drives oil drain plug with a valve, but provide a guard to protect the valve from accidental opening or breakage.

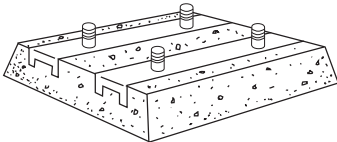


When an outboard bearing is used, mount drive and outboard bearing on a continuous foundation or bedplate and dowel both in place.

FOUNDATION, STEEL — When mounting gear drive on structural steel, it is recommended that an engineered design be utilized for a pedestal, adapter base or bed to provide sufficient rigidity, to prevent induced loads from distorting the housing and causing gear misalignment. In the absence of an engineered design, it is recommended that a base plate, with thickness equal to or greater than the thickness of the drive feet, be securely bolted to steel supports and extend under the entire drive as illustrated.



FOUNDATION, CONCRETE — If a concrete foundation is used, allow the concrete to set firmly before bolting down the gear drive. For the best type of mounting, grout structural steel mounting pads into the mounting base, as illustrated, rather than grouting the drive directly into the concrete.



MOTOR BRACKETS — Falk motor brackets provide an economical “soft mounting” for standard NEMA T & U frame AC induction type electric motors. The weight, location, and starting torque of the motor will cause cantilevered motor brackets to deflect downward or twist to varying degrees.

The drive/coupling/motor selections found in the Rexnord selection guide are engineered to be within acceptable deflection limits as determined by Rexnord. However, because the bracket is a “soft motor support”, deflection and vibration magnitude of the bracket may exceed levels normally considered acceptable for rigidly mounted machinery.

For applications using other than standard selection guide drive/coupling/motor selections, the use of a motor plate is recommended. If a motor bracket is to be used, it becomes the customer’s responsibility to support the rear of the motor bracket as necessary to diminish motor bracket deflection and vibration to within satisfactory levels as determined by the customer.

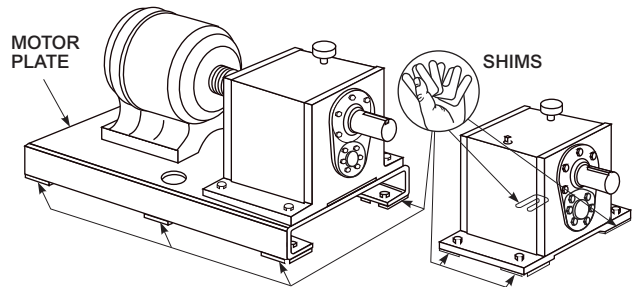
When using other than standard T-frame motors refer to Manual 317-315.

GEAR DRIVE ALIGNMENT —Align drive with driven equipment by placing broad, flat shims under all mounting pads. Start at the low speed shaft end and level across the length and then the width of the drive. Check with a feeler gauge to make certain that all pads are supported to prevent distortion of housing when drive is bolted down. After drive is aligned with driven equipment and bolted down, align prime mover to drive input shaft. Refer to Page 3 for coupling alignment.

If equipment is received from Factory mounted on a bedplate, the components were accurately aligned at the Factory with the bedplate mounted on a large, flat assembly plate. Shim under the bedplate foot pads until the gear drive is level and all feet are in the same plane.

Check high speed shaft coupling alignment. If the coupling is misaligned, the bedplate is shimmed incorrectly. Re-shim bedplate and recheck high speed coupling alignment. If necessary, realign motor.

Motors and other components mounted on motor plates or motor brackets may become misaligned during shipment. ALWAYS check alignment after installation. Refer to Page 3 for coupling alignment instructions.

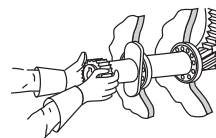


SHAFT CONNECTIONS

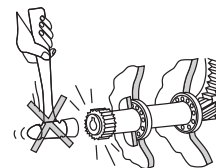
WARNING: Provide suitable guards in accordance with OSHA standards.

COUPLING CONNECTIONS — The performance and life of any coupling depends largely upon how well the coupling is installed and serviced. Refer to the coupling manufacturer’s manual for specific instructions.

CORRECT METHOD Heat interference fitted coupling hubs, pinions, sprockets or pulleys to a maximum of 275°F (135°C) and slide onto gear drive shaft.



INCORRECT METHOD DO NOT drive coupling hub, pinion, sprocket or pulley onto the shaft. An endwise blow on the shaft/coupling may damage gears and bearings.

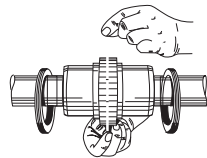


— CAUTION — DO NOT HAMMER

COUPLINGS — Detailed installation manuals are available from the Factory, your local Rexnord-Falk Representative or Distributor—just provide size and type designations stamped on the coupling. For lubricant requirements and a list of typical lubricants meeting Rexnord specifications, refer to appropriate coupling service manual.

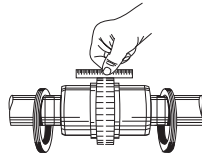
Flanged Type Rigid Couplings are typically used on drives with vertical output shafts. The low speed shaft extension ends of the solid vertical shaft drives are drilled and tapped to accommodate coupling keeper plates. Tightening torques for fasteners, including keeper plate fasteners are listed in Table 1.

GAP & ANGULAR ALIGNMENT — If possible, after mounting coupling hubs, position the driving and driven equipment so that the distance between shaft ends is equal to the coupling gap. Align the shafts by placing a spacer block, equal in thickness to required gap, between hub faces, as shown above, and also at 90° intervals around the hub. Check with feelers.



STEELFLEX® ILLUSTRATED

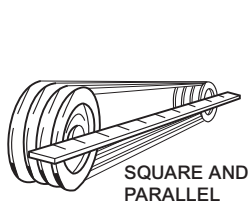
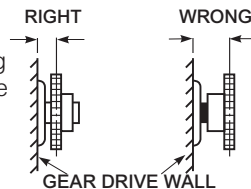
OFFSET ALIGNMENT — Align driving and driven shafts so that a straight edge will rest squarely on both couplings hubs as shown to the right and also at 90° intervals. Tighten foundation bolts of the connected equipment and recheck alignment and gap.



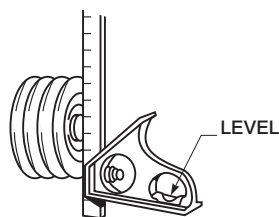
STEELFLEX ILLUSTRATED

SPROCKETS, PULLEYS OR SHEAVES — Mount power take-offs as close to the gear drive housing as possible to avoid undue bearing load and shaft deflection.

Align the output shaft of the gear drive square and parallel with the driven shaft by placing a straightedge across the face of the sprockets or sheaves as illustrated. Check horizontal shaft alignment by placing one leg of a square against the face of the sheave or sprocket with the spirit level on the horizontal leg of the square.



SQUARE AND PARALLEL



LEVEL

DO NOT over tighten belts or chains. Adjust to manufacturers' specifications. Adjust belts as follows:

The ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Check the belt tension frequently during the first 24 to 48 hours of run-in operation. Over tightening belts shortens belt and bearing life. Keep belts free from foreign material which may cause slippage. Inspect the V-belt periodically; tighten the belts if they are slipping.

OUTBOARD BEARING — Mount the outboard bearing and gear drive on a common foundation so that they will shift as an assembly if settling should occur. Bring the outboard bearing to the correct horizontal position with broad flat shims under the mounting pad. Align accurately so that the load is equally divided between the two drive bearings and the outboard bearing. Mount a stop bar against the pillow block foot on the load side when large horizontal load components are exerted on the pillow block.

BACKSTOPS — To prevent damage to backstops due to incorrect motor shaft rotation at start up, couplings are NOT assembled when gear drives are furnished with backstops. After completing the electrical connection, check motor and gear drive shaft rotations. Then complete alignment and assembly of coupling.

FASTENER TIGHTENING TORQUES

Use the tightening torque values specified in Table 1, for fastening Falk gear drives, motors, and accessories to their mounting surfaces with non-lubricated fasteners. DO NOT use these values for "torque locking" fasteners or for fastening components with aluminum feet or with soft gaskets or vibration dampers on the mounting surface. If the tightening torque exceeds the capacity of the torque wrench, use a torque multiplier. Use Grade 5 fasteners for diameters through 1.50", for larger diameter fasteners, use ASTM A-354 Grade BC.

TABLE 1 — Tightening Torques (lb-ft) ± 5% — (DO NOT Lubricate Fasteners)

Thread Dia-UNC	Metal to Metal	Metal to Concrete	Thread Dia-UNC	Metal to Metal	Metal to Concrete
.250-20	7	6	1.250-7	1060	840
.312-18	15	12	1.375-6	1360	1100
.375-16	27	22	1.500-6	1840	1460
.500-13	67	54	1.750-5	3900	2700
.625-11	134	108	2.000-4.5	5900	4100
.750-10	242	194			
.875-9	395	315			
1.000-8	590	475			
1.125-7	740	590			

WATER COOLING

WATER COOLED HEAT EXCHANGERS — Install a shut-off or control valve in the water line to the heat exchanger to regulate the water flow through the exchanger. Also install a water flow gauge between the control valve and the exchanger to determine actual flow rate. Discharge water to an OPEN DRAIN to prevent back pressure.

Lubrication Recommendations

INTRODUCTION

Carefully follow instructions on the drive nameplate, warning tags and installation manuals furnished with the drive.

Lubricants listed in this manual are typical products ONLY and should not be construed as exclusive recommendations. Industrial type petroleum-based rust and oxidation inhibited (R & O), industrial type extreme pressure (EP) or industrial type micropitting resistant gear lubricants are the recommended gear lubricants. They can be formulated using petroleum or synthetic base stocks.

The section on food grade lubricants provides guidance selecting lubricants for applications needing this class of lubricants. Food grade lubricants are formulated using petroleum or different types of synthetic base stocks.

LUBRICANT SELECTION PROCESS

1. Refer to Table 4 or 5 for proper lubricant viscosity grade based on ambient temperature range. See Falk GMax 6000 paragraph on this page for ambient air temperature range if using this lubricant.
2. Refer to Table 2 for summary of lubricant type.
3. Using proper lubricant table and viscosity grade, select desired lubricant manufacturer name.
4. Refer to Table 3 for approximate oil capacity to purchase.

TABLE 2 — Summary of Lubricant Type and Greases

Petroleum-Based		
R & O Inhibited See Table 6A	Extreme Pressure (EP) ♦ See Table 6B	Micropitting Resistant ♦ See Table 6C
Synthetic Lubricant, Polyalphaolefin Type (PAO)		
R & O Inhibited See Table 7A	Extreme Pressure (EP) ♦ See Table 7B	Micropitting Resistant ♦ See Table 7C
Synthetic Lubricant, Polyalphaolefin Glycol Type (PAG)		
See Falk GMax 6000 (Paragraph to Right)		
Conventional Grease		
See Table 8		
Food Grade Lubricant & Grease		
See Page 10		

♦ DO NOT use in drives equipped with internal backstop.

VISCOSITY (IMPORTANT)

The proper viscosity grade for petroleum-based lubricant is found in Table 4. For synthetic lubricant viscosity grades, refer to Table 5 and the "Synthetic Lubricants" paragraphs.

Viscosity grade is determined by ambient air temperature in immediate vicinity of gear drive. Lubricant selections must have a pour point at least 10°F (5.5°C) below the expected minimum ambient starting temperature.

LUBRICANT TYPES

PETROLEUM-BASED LUBRICANTS (TABLES 6A, 6B & 6C) — Industrial type petroleum-based rust and oxidation inhibited (R & O) gear lubricants are the most common and readily available general purpose gear lubricants.

SYNTHETIC LUBRICANTS (TABLES 7A, 7B & 7C) — Synthetic lubricants of the polyalphaolefin (PAO) type are recommended for cold climate operation, high temperature applications, extended temperature range (all season)

operation and/or extended lubricant change intervals. The proper viscosity grade of synthetic lubricant is given in Table 5.

Polyalkylene glycols (PAG) are another class of synthetic lubricants. They have similar performance properties as PAO synthetics - low pour point, stable at elevated temperature and high viscosity index. PAG's have exceptional tolerance to water contamination.

WARNING: Polyalkylene glycols (PAG's) are not compatible with petroleum mineral oil or PAO synthetic lubricants and must not be topped off with either lubricant. In addition, petroleum mineral oils or PAO synthetic lubricants must not be used to top off systems containing PAG's. Do not use PAG's in gear drives with painted interior housing walls unless paint compatibility is checked. Compatibility with oil seals and gasket materials must be checked prior to use. PAG lubricants are not compatible with polycarbonate sight glass. Use glass sight glass.

Falk GMax 6000 – Rexnord markets Falk GMax 6000, a polyalkylene glycol lubricant. It is available in ISO VG 135 and covers ambient air temperature range -30° to +125°F (-34° to +52°C). Gear drives equipped with internal backstop can use GMax in ambient temperatures above -20°F (-29°C).

WARNING: GMax 6000 is not compatible with petroleum mineral oil or PAO synthetic lubricants and must not be topped off with either lubricant. In addition, petroleum mineral oils or PAO synthetic lubricants must not be used to top off systems containing GMax 6000. Do not use GMax 6000 in gear drives with painted interior housing walls unless paint compatibility is checked. Compatibility with oil seals, and gasket materials must be checked prior to use. GMax 6000 is not compatible with polycarbonate sight glass. Use glass sight glass.

ANTI-WEAR (AW) LUBRICANTS — For moderately loaded gear drives or operating conditions challenging for conventional R & O oils, industrial type anti-wear (AW) lubricants are suggested. These lubricants contain anti-wear additives that provide stronger thicker lubricant film to help maintain surface separation. Synthetic lubricants by inherent nature of base stock properties provide anti-wear performance.

EXTREME PRESSURE (EP) LUBRICANTS (TABLES 6B & 7B) — For highly loaded drives or for drives loaded in excess of original estimates, industrial-type petroleum EP lubricants are preferred. EP lubricants are manufactured from petroleum or synthetic base lubricants. Anti-scuff is another term used to describe EP lubricants.

CAUTION: EP LUBRICANTS & INTERNAL BACKSTOPS — Do not use EP lubricants or lubricant formulations including sulfur-phosphorus (EP), chlorine, lead derivatives, graphite or molybdenum disulfides in drives equipped with internal cartridge type backstops. Lubricant formulations may change over time. Some lubricants in Tables 6A & 7A may contain higher amounts of additives to reduce friction, resulting in lubricant properties approaching that of extreme pressure (EP) lubricants; end user should consult lubricant manufacturer/supplier and Rexnord as necessary. Typically EP lubricants in Tables 6B & 7B contain these additives.

MICROPITTING RESISTANT LUBRICANTS (TABLES 6C & 7C) — Micropitting resistant lubricants are specially developed for surface hardened gearing commonly used in modern industrial gear drives. These lubricants contain additives to

resist formation of micropitting and other conventional forms of gear wear. Highly loaded gear drives or applications where operating loads are not well defined may benefit from this type of lubricant. Generally lubricants are available in limited number of viscosity grades.

CAUTION: MICROPITTING RESISTANT LUBRICANTS & INTERNAL BACKSTOPS — Do not use micropitting resistant lubricants in drives equipped with internal cartridge type backstops. These lubricants are listed in Tables 6C & 7C.

WARNING: LUBRICANTS IN FOOD PROCESSING INDUSTRY — Generally conventional gear lubricants are classified as H2 by NSF (National Sanitation Foundation) since they contain harmful substances and should not be used in the food processing industry. Lubricants registered as H1 by NSF are suitable for food processing applications.

CAUTION: CLIMATE CONDITIONS — Ambient temperature in immediate vicinity of gear drive is very important for determining viscosity grade. Table 4 provides viscosity grade selections for petroleum-based lubricants. See Table 5 for synthetic lubricants.

OIL LEVELS

Fill the drive with lubricant to the level indicated on the oil dipstick. Approximate oil capacities are given on the drive nameplate and in Table 3 below.

TABLE 3 — Types FC & FZ
Approx. Oil Capacities★ — Gallons

DRIVE SIZE	Standard — Types FZ & FC — Horizontal		
	Double	Triple	Quadruple
2040	2.4	2.4	2.4
2050	3.5	3.5	3.5
2060	4.4	4.8	4.8
2070	6.5	7.0	7.0
2080	9.0	10.0	10.0
2090	14.0	15.5	15.5
2100	20.0	21.0	21.0
2110	27.0	30.0	30.0
2120	36.0	39.0	39.0
2130	48.0	54.0	54.0

★ Oil capacities are approximate. Exact quantities vary with ratio and input speed. Always fill drive to level indicated on the dipstick.

BACKSTOP EQUIPPED DRIVES — Sizes 2040 thru 2090, Types FC & FZ drives, use an internal/cartridge type backstop which is continuously lubricated. 50% or more of the backstop is immersed in oil at all times. Sizes 2100 thru 2130, Types FC & FZ drives, use a self contained, wedge ramp type, externally mounted backstop which

TABLE 4 — Viscosity Grade Recommendations For Petroleum-Based Lubricants

Output RPM	Normal Climates			
	+15° to +60°F (-9° to +16°C)		+50° to +125°F (+10° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
Output RPM Below 80	150	4	320	6
Output RPM 80 & Above	150	4	220	5

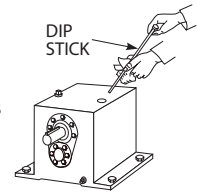
is prelubricated and sealed at assembly. The external backstops (Type PRT) do require additional lubrication at specific intervals. Refer to Manual 568-810 for details. These backstops also contain grease purgeable seals. See paragraph on Page 8, for grease lubricated seals.

OIL PUMPS — When selecting a lubricant for a gear drive equipped with an oil pump, cold temperature oil viscosity is important. Lubricant viscosity at start-up generally should not exceed 1725 cSt (8,000 SSU). When exceeding this viscosity, pump cavitation is possible, preventing oil circulation. A sump heater may be required or it may be possible to use a lower viscosity oil to minimize pump cavitation.

LUBRICATION SYSTEMS

SPLASH LUBRICATED DRIVES — Standard Type FC & FZ drives are splash lubricated. The lubricant is picked up by the revolving elements and distributed to all bearings and gear meshes.

OIL PUMPS — Occasionally gear drives are equipped with oil pumps, either for special lubrication considerations or for external cooling. When so equipped, run the lubrication system for several minutes to fill the system components. Verify that the pump is circulating oil properly then recheck the oil level.



Before starting the gear drive, rotate the input shaft by hand to check for any obstruction. Then start the drive and allow it to run without a load for several minutes. Shut down and recheck oil level. Add oil to compensate for cooler, filter, etc., oil capacities. If everything is satisfactory, the drive is ready for operation.

PREVENTIVE MAINTENANCE

AFTER FIRST WEEK — Check alignment of the total system and realign where necessary. Also, tighten all external bolts and plugs where necessary. DO NOT readjust the internal gear or bearing settings in the drive, these were permanently set at the Factory.

AFTER FIRST MONTH'S SERVICE — Proceed as follows:

1. Operate drive until old sump oil reaches normal operating temperature. Shut the drive down and drain immediately.
2. Immediately flush drive with an oil of the same type and viscosity grade as the original charge (warmed to approximately 100°F (38°C) in cold weather). Rapidly pour or pump a charge equal to 25-100% of the initial fill volume through the drive or until clean oil flows through the drain.
3. Close the drain and refill the drive to the correct level with new oil of the correct type and viscosity.

PERIODICALLY — Carefully check the oil level of the drive when it is stopped and at ambient temperature, add oil if needed. If the oil level is ABOVE the high level mark on the dipstick, have the oil analyzed for water content. Moisture in the oil may indicate that the heat exchanger or a seal is leaking. If so, replace the defective part immediately and change the oil. DO NOT fill above mark indicated as leakage or undue heating may result. Also check coupling alignment to make certain that foundation settling has not caused excessive misalignment. If drive is equipped with a fan, periodically clean accumulated foreign matter from the fan, fan guard and deflector to allow adequate air flow.

TABLE 5 — Viscosity Grade Recommendations for Synthetic Lubricants

Output RPM	Cold Climates				Normal Climates					
	-30° to +10°F (-34° to -12°C)		-15° to +50°F (-26° to +10°C)		0° to +80°F (-18° to +27°C)		+10° to +125°F (-12° to +52°C)		+20° to +125°F (-7° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA
Below 80	32	0	68	2	150	4	320	6	320	6
80 & Above	32	0	68	2	150	4	220	5	320	6

TABLE 6A — Petroleum Based R & O (Rust & Oxidation) Inhibited Lubricants [▲]
Maximum Operating Temperature of Lubricants 200°F (93°C)

ISO Viscosity Grade	150	220	320
AGMA Viscosity Grade	4	5	6
Viscosity cSt @ 40°C ■	135-165	198-242	288-352
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Hyspin AWS 150 Castrol Paradene R&O 150 Castrol Paradene AW 150	Hyspin AWS 220 Castrol Paradene R&O 220 Castrol Paradene AW 220	--- Castrol Paradene R&O 320 Castrol Paradene AW 320
Chevron / Texaco / Caltex	Rando HD 150	Rando HD 220	Rando HD 320
Citgo Petroleum Corp.	Pacemaker T 150	Pacemaker SD 220	Pacemaker SD 320
Exxon Mobil / Esso	DTE Oil Extra Heavy Vacuoline 528	DTE Oil BB Vacuoline 533	DTE Oil AA Vacuoline 537
Petro-Canada Lubricants	TurboFlo R&O 150	TurboFlo R&O 220	TurboFlo R&O 320
Phillips 66 / Conoco / 76 Lubricants / Kendall	Multipurpose R&O 150	Multipurpose R&O 220	Multipurpose R&O 320
Shell Oil Co.	Morlina S2 B 150 Morlina S2 BA 150	Morlina S2 B 220 Morlina S2 BA 220	Morlina S2 B 320 Morlina S2 BA 320
Total Lubricants USA / Keystone Div. Penwalt Corp.	Cirkan ZS 150	Cirkan ZS 220	Cirkan ZS 320
Whitmore Manufacturing Company	Hyperion 150	Hyperion 220	Hyperion 320

▲ Minimum viscosity index of 90.
■ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).

TABLE 6B — Petroleum Based EP (Extreme Pressure) Lubricants ^{▲♦}
Maximum Operating Temperature of Lubricants 200°F (93°C)

ISO Viscosity Grade	150	220	320
AGMA Viscosity Grade	4	5	6
Viscosity cSt @ 40°C ■	135-165	198-242	288-352
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Alpha SP 150	Alpha SP 220	Alpha SP 320
Chevron / Texaco / Caltex	Meropa 150 Ultra Gear 150	Meropa 220 Ultra Gear 220	Meropa 320 Ultra Gear 320
Citgo Petroleum Corp.	EP Compound 150	EP Compound 220	EP Compound 320
Exxon Mobil / Esso	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320
Fuchs Lubricants Company	---	GearMaster CLP Oils 220	---
Kluber Lubrication	Kluberoil GEM 1 N 150	---	---
Petro-Canada Lubricants	Enduratex EP 150	Enduratex EP 220	Enduratex EP 320
Phillips 66 / Conoco / 76 Lubricants / Kendall	Extra Duty Gear Oil 150	Extra Duty Gear Oil 220	Extra Duty Gear Oil 320
Shell Oil Co.	Omala S2 G 150	Omala S2 G 220	Omala S2 G 320
Total Lubricants USA / Keystone Div. Penwalt Corp.	Carter EP 150	Carter EP 220	Carter EP 320

▲ Minimum viscosity index of 90.
■ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).
♦ DO NOT use in drives equipped with internal backstop.

TABLE 6C — Petroleum Based Micropitting Resistant Lubricants ^{▲♦}
Maximum Operating Temperature of Lubricants 200°F (93°C)

ISO Viscosity Grade	150	220	320
AGMA Viscosity Grade	4	5	6
Viscosity cSt @ 40°C ■	135-165	198-242	288-352
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name
Kluber Lubrication	---	Kluberoil GEM 1 N 220	Kluberoil GEM 1 N 320

▲ Minimum viscosity index of 90.
■ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).
♦ DO NOT use in drives equipped with internal backstop.

TABLE 7A — Synthetic PAO (Polyalphaolefin) R & O (Rust & Oxidation) Inhibited Lubricants [▲]

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ■	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Alphasyn T 32 Castrol Isolube 32	Alphasyn T 68 Castrol Isolube 68	Alphasyn T 150 Castrol Isolube 150	Alphasyn T 220 Castrol Isolube 220	Alphasyn T 320 Castrol Isolube 320
Chevron / Texaco / Caltex	Cetus HiPerSYN Oil 32	Cetus HiPerSYN Oil 68	Cetus HiPerSYN Oil 150	Cetus HiPerSYN Oil 220	Cetus HiPerSYN Oil 320
Citgo Petroleum Corp.	---	CITGEAR Synthetic HT 68	CITGEAR Synthetic HT 150	CITGEAR Synthetic HT 220	CITGEAR Synthetic HT 320
Exxon Mobil / Esso	Mobil SHC 624	Mobil SHC 626	Mobil SHC 629	Mobil SHC 630	Mobil SHC 632
Kluber Lubrication	---	Klubersynth G 4 68	Klubersynth G 4 150	Klubersynth G 4 220	---
Petro-Canada Lubricants	Synduro SHB 32	Synduro SHB 68	Synduro SHB 150	Synduro SHB 220	---
Phillips 66 / Conoco / 76 Lubricants / Kendall	---	Syncon R&O 68	Syncon R&O 150 ●	Syncon R&O 220 ●	Syncon R&O 320 ●
Shell Oil Co.	---	Morlina S4 B 68	Morlina S4 B 150	Morlina S4 B 220	Morlina S4 B 320

▲ Minimum viscosity index of 130. Consult lubricant supplier/manufacturer for maximum operating temperature.

■ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).

● Minimum viscosity index of 120.

TABLE 7B — Synthetic PAO (Polyalphaolefin) EP (Extreme Pressure) Lubricants ^{▲♦}

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ■	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	---	Castrol Isolube EP 68	Alphasyn EP 150 Castrol Isolube EP 150	Alphasyn EP 220 Castrol Isolube EP 220	Alphasyn EP 320 Castrol Isolube EP 320
Chevron / Texaco / Caltex	---	---	Tegra Synthetic Gear Lubricant 150	Tegra Synthetic Gear Lubricant 220	Tegra Synthetic Gear Lubricant 320
Citgo Petroleum Corp.	---	CITGEAR Synthetic EP Gear 68	CITGEAR Synthetic EP Gear 150	CITGEAR Synthetic EP Gear 220	CITGEAR Synthetic EP Gear 320
Exxon Mobil / Esso	---	---	Mobil SHC Gear 150	Mobil SHC Gear 220	Mobil SHC Gear 320
Fuchs Lubricants Company	---	---	---	Renolin Unisyn CLP 220	Renolin Unisyn CLP 320
Kluber Lubrication	---	---	Klubersynth EG 4 150	Klubersynth EG 4 220	Klubersynth EG 4 320
Petro-Canada Lubricants	---	---	Enduralex Synthetic EP 150	Enduralex Synthetic EP 220	Enduralex Synthetic EP 320
Phillips 66 / Conoco / 76 Lubricants / Kendall	---	---	Syncon EP Plus Gear Oil 150	Syncon EP Plus Gear Oil 220	Syncon EP Plus Gear Oil 320
Shell Oil Co.	---	Omala S4 GX 68	Omala S4 GX 150	Omala S4 GX 220	Omala S4 GX 320
Whitmore Mfg. Company	---	---	Decathlon HD 150	Decathlon HD 220	Decathlon HD 320

▲ Minimum viscosity index of 130. Consult lubricant supplier/manufacturer for maximum operating temperature.

■ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).

♦ DO NOT use in drives equipped with internal backstop.

TABLE 7C — Synthetic PAO (Polyalphaolefin) Micropitting Resistant Lubricants ^{▲♦}

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ■	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Chevron / Texaco / Caltex	---	---	---	---	Pinnacle WM 320
Exxon Mobil / Esso	---	---	---	---	Mobil SHC Gear 320 WT
Kluber Lubrication	---	---	Klubersynth GEM 4 N 150	Klubersynth GEM 4 N 220	Klubersynth GEM 4 N 320
Petro-Canada Lubricants	---	---	---	---	Harnex 320
Phillips 66 / Conoco / 76 Lubricants / Kendall	---	---	---	---	Syncon WTL 320
Whitmore Manufacturing Company	---	---	Decathlon F 150	Decathlon F 220	Decathlon F 320

▲ Minimum viscosity index of 130. Consult lubricant supplier/manufacturer for maximum operating temperature.

■ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).

♦ DO NOT use in drives equipped with internal backstop.

LUBRICANT ANALYSIS AND CHANGES

OIL ANALYSIS REPORT — Checking oil condition at regular intervals is recommended. Analyze oil samples approximately every 1000 hours for petroleum lubricants or every 3000 hours for synthetic lubricants. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change petroleum or polyalphaolefin type synthetic lubricants:

1. Water content is greater than 500 ppm (parts per million) (0.05%).
2. Iron content exceeds 150 ppm.
3. Silicon (dust/dirt) exceeds 25 ppm, above reference sample from new oil container.
4. Copper content exceeds 75 ppm.
5. TAN (Total Acid Number) 50% increase above reference sample from new oil container.
6. Viscosity changes more than ±15%.
7. Solid particle contamination code exceeds 25/22/18 for particle sizes ≥4/≥6/≥14 microns, respectively per ISO 4406.

Guidelines for when to change Falk GMax 6000 polyalkylene glycol type lubricant are:

1. Water content is greater than 3%.
2. Iron content exceeds 150 ppm.
3. Silicon (dust/dirt) exceeds 25 ppm, above reference sample from new oil container.
4. Copper content exceeds 75 ppm.
5. Viscosity changes more than ±15%.
6. Solid particle contamination code 25/22/18 per ISO 4406.

Laboratory analysis is recommended for optimum lubricant life and gear drive performance.

PETROLEUM LUBRICANTS — In the absence of oil analysis, change gear oils every 6 months or 2500 operating hours, whichever occurs first. Change oil more frequently when gear drives operate in extremely humid, chemical or dust laden atmospheres. In these cases, lubricants should be changed every 3 to 4 months or 1500 to 2000 hours. If the drive is operated in an area where temperatures vary with the seasons, change the oil viscosity grade to suit the temperature, refer to Table 4. Lubricant suppliers can test oil from the drive periodically and recommend economical change schedules.

SYNTHETIC LUBRICANTS — In the absence of oil analysis, synthetic lube change intervals can be extended to 8000 hours depending upon operating temperatures. Laboratory analysis is recommended for optimum lubricant life and drive performance. Change lube with change in ambient temperature, if required. Refer to Table 5.

Falk GMax 6000 change interval can be up to 15,000 hours. It has broad temperature range so seasonal oil changes are generally not needed. The condition of GMax must be monitored to maintain lubricant properties and cleanliness.

GREASE-LUBRICATED SEALS AND BEARINGS

All type FC & FZ gear drives and external backstops have grease purged seals, which minimize the entry of contaminants and abrasive dusts into the drive or backstop. In addition, some specially mounted gear drives have one or more grease lubricated bearings. Gear drives and external backstops are shipped with NLGI #2 grade grease in the seal housing cavities unless otherwise specified.

Whenever changing oil in the drive, grease the bearings where appropriate and purge the seals with one of the NLGI #2 grade greases listed in Table 8.

CAUTION: External backstop purged seals must use grease without EP additives.

Depending upon the degree of contamination, it may be necessary to purge contaminated grease from seals more often (at least every 3 to 6 months). Slowly pump fresh bearing grease through the seal, **WITH HAND GREASE GUN**, until fresh grease flows out along the shaft. Wipe off purged grease.

CAUTION: Rapid regreasing with a power grease gun can force grease inward past the seals and plug the oil drain back system causing seal leaks.

WARNING: Greases in Table 8 contain harmful substances not allowed in the food processing industry. If grease could contaminate the product, as in the food and drug industries, the grease originally supplied with gear drive must be removed and replaced with grease listed in Table 16. Refer to gear drive assembly/disassembly instructions. Simply purging grease with grease gun will not remove all grease and cross-contamination will likely occur. Grease registered as H1 by NSF, National Sanitation Foundation, is suitable for food processing applications.

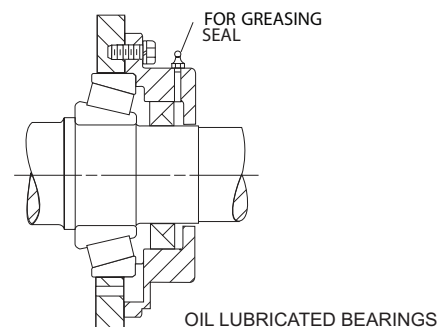
TABLE 8 — Conventional NLGI #2 Grade Grease▲ for Grease Lubricated Bearings & Grease Purged Seals
0° to +200°F (-18° to +93°C)

Manufacturer	EP Grease ■	Grease Without EP Additives
Chevron / Texaco / Caltex	Multifak EP 2	---
Citgo Petroleum Corp.	Lithoplex RT 2 Premium Lithium EP 2	---
ExxonMobil / Esso	Mobilux EP 2	Unirex N2
Petro-Canada Lubricants	Precision General Purpose EP2	Precision XL EMB Grease Precision Synthetic EMB
Phillips 66 / Conoco / 76 Lubricants / Kendall	Multiplex Red	---
Shell Oil Co.	Gadus S1 V220-2	Gadus S2 V100 - 2
Total Lubricants USA / Keystone Div. Penwalt Corp.	Multis EP 2	Multis 2

▲ Not suitable for food grade applications.
■ Caution: Do not use EP grease in external backstop purged seals.

Grease application or re-lubrication should be done at temperatures above 20°F (-7°C). If grease must be applied at cooler temperatures consult lubricant supplier for recommendations.

TYPICAL BEARING & SEAL ASSEMBLIES



STORED & INACTIVE GEAR DRIVES

Each gear drive is protected with rust preventive that will protect parts against rust for a period of 4 months in an outdoor shelter or 12 months in a dry building after shipment from the Factory.

If a gear drive is to be stored, or is inactive after installation beyond the above periods, add Nox-Rust VCI-10▲ vapor-phase rust inhibitor. For drives that have oil installed, add Nox-Rust VCI-10 vapor-phase rust inhibitor at the rate of 2% of sump capacity as shown in Table 9. For drives without oil, add Nox-Rust VCI-10 vapor-phase rust inhibitor at the rate of one ounce per cubic foot of internal drive space. Rotate the shafts several times by hand. Before operating, drives which have been stored or inactive must be filled to the proper level with oil meeting the specifications given in this manual. Refer to Manual 128-014 for "Start-up after Storage" instructions.

▲ Product of the Daubert Chemical Company, Chicago, Illinois.

Periodically inspect stored or inactive gear drives and add Nox-Rust VCI-10 every six months, or more often if necessary. Indoor dry storage is recommended.

The vented dipstick should be replaced with a plug (vented dipstick should be attached to gear drive for future use) so that the protective rust inhibiting atmosphere is sealed inside the drive. Install vented dipstick when preparing drive for operation.

WARNING: *The rust preventative oil from the factory and Nox-Rust VCI-10 are not H1 registered with the NSF (National Sanitation Foundation) as suitable for food processing applications. When Food Grade Lubricants are to be used, it is the end users responsibility to properly flush and prepare the drive for Food Grade service. Contact the lubricant manufacturer for specific information and flushing procedures.*

TABLE 9 — Nox-Rust VCI-10

(Add to stored or Inactive Drives with conventional gear lubricants)

Unit Size	Oil Capacity Gallons	NOX-RUST VCI-10		
		2% of Sump Capacity Gallons	2% of Sump Capacity Ounces	2% of Sump Capacity Quarts
2040	2.4	0.05	6	0.2
2050	3.5	0.07	9	0.3
2060	4.8	0.10	12	0.4
2070	7.0	0.14	18	0.6
2080	10.0	0.20	26	0.8
2090	15.5	0.31	40	1.2
2100	21.0	0.42	54	1.7
2110	30.0	0.60	77	2.4
2120	39.0	0.78	100	3.1
2130	54.0	1.08	138	4.3

FOOD GRADE LUBRICANTS

Guidance for selecting petroleum-based and synthetic-based food grade lubricants are shown below in Table 10. For general lubrication guidelines, refer to the first part of the "Lubrication Recommendation" Section.

FOOD GRADE LUBRICANT SELECTION PROCESS

1. Refer to Table 11 or 12 for proper lubricant viscosity grade based on ambient temperature range.
2. Refer to Table 10 for summary of food grade lubricant type.
3. Using proper food grade lubricant table and viscosity grade, select desired lubricant manufacturer name.
4. Refer to Table 3 for approximate oil capacity to purchase.

TABLE 10 — Summary of Food Grade Lubricants and Greases

Petroleum-Based	
R & O Inhibited See Table 13A	Extreme Pressure (EP) ♦ See Table 13B
Synthetic Lubricant, Polyalphaolefin Type (PAO)	
R & O Inhibited See Table 14A	Extreme Pressure (EP) ♦ See Table 14B
Synthetic Lubricant, Polyalkylene Glycol Type (PAG)	
Extreme Pressure (EP) ♦ See Table 15	
Food Grade Grease	
See Table 16	

♦ DO NOT use in drives equipped with internal backstop.

TABLE 11 — Viscosity Grade Recommendations For Food Grade Petroleum-Based Lubricants

Output RPM	Normal Climates			
	+15° to +60°F (-9° to +16°C)		+50° to +125°F (+10° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
Output RPM Below 80	150	4	320	6
Output RPM 80 & Above	150	4	220	5

OIL PUMPS — When selecting a lubricant for a gear drive equipped with an oil pump, cold temperature oil viscosity is important. Lubricant viscosity at start-up generally should not exceed 1725 cSt (8,000 SSU). When exceeding this viscosity, pump cavitation is possible, preventing oil circulation. A sump heater may be required or it may be possible to use a lower viscosity oil to minimize pump cavitation.

TABLE 12 — Viscosity Grade Recommendations for Food Grade Synthetic Lubricants

Output RPM	Cold Climates				Normal Climates					
	-30° to +10°F (-34° to -12°C)		-15° to +50°F (-26° to +10°C)		0° to +80°F (-18° to +27°C)		+10° to +125°F (-12° to +52°C)		+20° to +125°F (-7° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA
Below 80	32	0	68	2	150	4	320	6	320	6
80 & Above	32	0	68	2	150	4	220	5	320	6

FOOD GRADE LUBRICANTS (TABLES 13A, 13B, 14A, 14B, 15 & 16) — Food grade lubricants are a class of lubricants registered as H1 by NSF, National Sanitation Foundation. They contain base stock and additives which comply with Food and Drug Administration Title 21 CFR 178.3570 regulations for lubricants with incidental food contact. Base stock can be petroleum oil or different types of synthetic lubricant. Food grade lubricants are not same as biodegradable or environmentally friendly lubricants.

Rust and corrosion inhibitors used to protect gear drive during shipment are not qualified as food grade fluids. Flush out inhibitor oil before filling with food grade lubricant.

Tables 13A, 13B, 14A, 14B, 15 & 16 list food grade lubricants that have performance properties meeting Rexnord/Falk specifications. They are not exclusive recommendations but serve as a guide for making proper lubricant selections.

CLIMATE CONDITIONS — Ambient temperature in immediate vicinity of gear drive is very important for determining viscosity grade. Table 11 provides viscosity grade selections for petroleum-based lubricants. See Table 12 for synthetic lubricants.

Polyalkylene glycols (PAG) are another class of synthetic lubricants. They have similar performance properties as PAO synthetics - low pour point, stable at elevated temperatures, and high viscosity index. PAG's have exceptional tolerance to water contamination.

WARNING: Polyalkylene glycols (PAG's) are not compatible with petroleum mineral oil or PAO synthetic lubricants and must not be topped off with either lubricant. In addition, petroleum mineral oils or PAO synthetic lubricants must not be used to top off systems containing PAG's. Do not use PAG's in gear drives with painted interior housing walls unless paint compatibility is checked. Compatibility with oil seals and gasket materials must be checked prior to use. PAG lubricants are not compatible with polycarbonate sight glass. Use glass sight glass.

CAUTION: EXTREME PRESSURE (EP) LUBRICANTS & INTERNAL BACKSTOPS — Do not use EP lubricants in drives equipped with internal cartridge type backstops. These lubricants are listed in Tables 13B, 14B & 15.

TABLE 13A — Food Grade Petroleum-Based R & O (Rust & Oxidation) Inhibited Lubricants — NSF (National Sanitation Foundation) H1 Registered
 Maximum operating temperature of lubricants 200°F (93°C)

ISO Viscosity Grade	150	220	320
AGMA Viscosity Grade	4	5	6
Viscosity cSt @ 40°C ▲	135-165	198-242	288-352
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name
Bel-Ray Company, Inc.	No-Tox Gear Oil ISO 150	No-Tox Gear Oil ISO 220	No-Tox Gear Oil ISO 320
Kluber Lubrication	Paraliq P 150	---	---
Lubriplate Lubricants Co.	Lubriplate FMO 900-AW	Lubriplate FMO 1100-AW	Lubriplate FMO 1700-AW

▲ Kinematic viscosity in units of mm²/S is equivalent to cSt (centistokes)

TABLE 13B — Food Grade Petroleum-Based EP (Extreme Pressure) Lubricants ♦ — NSF (National Sanitation Foundation) H1 Registered
 Maximum operating temperature of lubricants 200°F (93°C)

ISO Viscosity Grade	150	220	320
AGMA Viscosity Grade	4	5	6
Viscosity cSt @ 40°C ▲	135-165	198-242	288-352
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name
Petro-Canada	Purity FG EP 150	Purity FG EP 220	Purity FG EP 320
Total Lubricants USA, Inc.	Nevastane EP 150	Nevastane EP 220	Nevastane EP 320

▲ Kinematic viscosity in units of mm²/S is equivalent to cSt (centistokes)

♦ DO NOT use in drives equipped with internal backstop.

TABLE 14A — Food Grade Synthetic PAO (Polyalphaolefin) R & O (Rust & Oxidation) Inhibited Lubricants — NSF (National Sanitation Foundation) H1 Registered
 Maximum operating temperature of lubricants 200°F (93°C)

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ▲	28.2-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
ExxonMobil	Mobil SHC Cibus 32	Mobil SHC Cibus 68	Mobil SHC Cibus 150	Mobil SHC Cibus 220	Mobil SHC Cibus 320
Kluber Lubrication	Kluberoil 4 UH1 N 32	Kluberoil 4 UH1 N 68	Kluberoil 4 UH1 N 150	Kluberoil 4 UH1 N 220	Kluberoil 4 UH1 N 320
Lubriplate Lubricants Co.	Lubriplate SFGO Ultra 32	Lubriplate SFGO Ultra 68	Lubriplate SFGO Ultra 150	Lubriplate SFGO Ultra 220	Lubriplate SFGO Ultra 320
Total Lubricants USA, Inc.	Nevastane SL 32	Nevastane SL 68	Nevastane SL 150	Nevastane SL 220	Nevastane SL 320

▲ Kinematic viscosity in units of mm²/S is equivalent to cSt (centistokes)

TABLE 14B — Food Grade Synthetic PAO (Polyalphaolefin) EP (Extreme Pressure) Lubricants ♦ — NSF (National Sanitation Foundation) H1 Registered
 Maximum operating temperature of lubricants 200°F (93°C)

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ▲	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Petro-Canada	---	---	---	Purity FG Synthetic EP 220	---

▲ Kinematic viscosity in units of mm²/S is equivalent to cSt (centistokes)

♦ DO NOT use in drives equipped with internal backstop.

TABLE 15 — Food Grade Synthetic PAG (Polyalkylene Glycol) EP (Extreme Pressure) Lubricants ♦ — NSF (National Sanitation Foundation) H1 Registered
 Maximum operating temperature of lubricants 200°F (93°C)
 See Warning Note below.

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ▲	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100° F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Exxon Mobil	---	---	Glygoyle 150	Glygoyle 220	Glygoyle 320
Kluber Lubrication	---	---	Klubersynth UH1 6-150	Klubersynth UH1 6-220	Klubersynth UH1 6-320
Lubriplate	---	---	PGO-FGL Synthetic Gear Oil 150	PGO-FGL Synthetic Gear Oil 220	PGO-FGL Synthetic Gear Oil 320

WARNING: Polyalkylene glycol (PAG) lubricants are not compatible with petroleum mineral oils or PAO synthetic lubricants. PAG's must not be mixed or used to top off either petroleum mineral oils or PAO synthetic lubricants.

- ▲ Kinematic viscosity in units of mm²/s is equivalent to cSt (centistokes).
- ♦ DO NOT use in drives equipped with internal backstop.

PREVENTIVE MAINTENANCE

AFTER FIRST WEEK — Check alignment of the total system and realign where necessary. Also, tighten all external bolts and plugs where necessary. DO NOT readjust the internal gear or bearing settings in the drive, these were permanently set at the Factory.

AFTER FIRST MONTH'S SERVICE — Proceed as follows:

1. Operate drive until old sump oil reaches normal operating temperature. Shut the drive down and drain immediately.
2. Immediately flush drive with a food grade oil of the same type and viscosity grade as the original charge (warmed to approximately 100°F (38°C) in cold weather). Rapidly pour or pump a charge equal to 25-100% of the initial fill volume through the drive or until clean oil flows through the drain.
3. Close the drain and refill the drive to the correct level with new food grade oil of the correct type and viscosity.

PERIODICALLY — Carefully check the oil level of the drive when it is stopped and at ambient temperature, add oil if needed. If the oil level is ABOVE the high level mark on the dipstick, have the oil analyzed for water content. Moisture in the oil may indicate that the heat exchanger or a seal is leaking. If so, replace the defective part immediately and change the oil. DO NOT fill above mark indicated as leakage or undue heating may result. Also check coupling alignment to make certain that foundation settling has not caused excessive misalignment. If drive is equipped with a fan, periodically clean accumulated foreign matter from the fan, fan guard and deflector to allow adequate air flow.

LUBRICANT ANALYSIS AND CHANGES

OIL ANALYSIS REPORT (FOOD GRADE) — Checking oil condition at regular intervals is recommended. Analyze oil samples approximately every 1000 hours for food grade petroleum lubricants or every 3000 hours for food grade synthetic lubricants. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change food grade lubricants:

1. Water content is greater than 500 ppm (parts per million) (0.05%).

2. Iron content exceeds 150 ppm.
3. Silicon (dust/dirt) exceeds 25 ppm, above reference sample from new oil container.
4. Copper content exceeds 75 ppm.
5. TAN (Total Acid Number) 50% increase above reference sample from new oil container.
6. Viscosity changes more than ±15%.
7. Solid particle contamination code exceeds 25/22/18 for particle sizes ≥4/≥6/≥14 microns, respectively per ISO 4406.

Guidelines for when to change food grade polyalkylene glycol type lubricant are:

1. Water content is greater than 3%.
2. Iron content exceeds 150 ppm.
3. Silicon (dust/dirt) exceeds 25 ppm, above reference sample from new oil container.
4. Copper content exceeds 75 ppm.
5. Viscosity changes more than ±15%.
6. Solid particle contamination code 25/22/18 per ISO 4406.

Laboratory analysis is recommended for optimum lubricant life and gear drive performance.

PETROLEUM LUBRICANTS (FOOD GRADE) — In the absence of oil analysis, change gear oils every 6 months or 2500 operating hours, whichever occurs first. Change oil more frequently when gear drives operate in extremely humid, chemical or dust laden atmospheres. In these cases, lubricants should be changed every 3 to 4 months or 1500 to 2000 hours. If the drive is operated in an area where temperatures vary with the seasons, change the oil viscosity grade to suit the temperature, refer to Table 11. Lubricant suppliers can test oil from the drive periodically and recommend economical change schedules.

SYNTHETIC LUBRICANTS (FOOD GRADE) — In the absence of oil analysis, synthetic lube change intervals can be extended to 8000 hours depending upon operating temperatures. Laboratory analysis is recommended for optimum lubricant life and drive performance. Change lube with change in ambient temperature, if required. Refer to Table 12.

GREASE-LUBRICATED SEALS AND BEARINGS

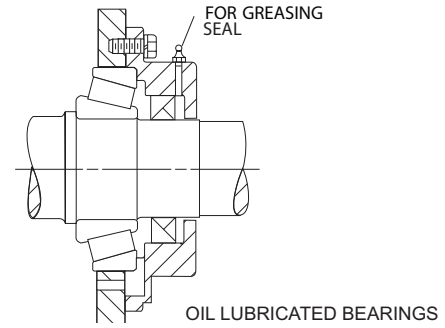
All type FC & FZ gear drives and external backstops have grease purged seals, which minimize the entry of contaminants and abrasive dusts into the drive or backstop. In addition, some specially mounted gear drives have one or more grease lubricated bearings. Gear drives and external backstops are shipped with NLGI #2 grade grease in the seal housing cavities unless otherwise specified.

Whenever changing oil in the drive, grease the bearings where appropriate and purge the seals with one of the NLGI #2 grade greases listed in Table 16. Depending upon the degree of contamination, it may be necessary to purge contaminated grease from seals more often (at least every 3 to 6 months). Slowly pump fresh bearing grease through the seal, **WITH HAND GREASE GUN**, until fresh grease flows out along the shaft. Wipe off purged grease.

CAUTION: *Rapid regreasing with a power grease gun can force grease inward past the seals and plug the oil drain back system causing seal leaks.*

If grease could contaminate the product, as in the food and drug industries, the grease originally supplied with gear drive must be removed and replaced with grease listed in Table 16. Refer to gear drive assembly/disassembly instructions. Simply purging grease with grease gun will not remove all grease and cross-contamination will likely occur. Grease registered as H1 by NSF, National Sanitation Foundation, is suitable for food processing applications.

TYPICAL BEARING & SEAL ASSEMBLIES



STORED & INACTIVE GEAR DRIVES

Prior to shipment from the factory, all Rexnord enclosed gear drives are protected internally against corrosion with a rust preventative oil. A vapor phase rust inhibitor may also be added.

WARNING: *These corrosion inhibitors are not H1 registered with the NSF (National Sanitation Foundation) as suitable for food processing applications. When Food Grade Lubricants are to be used, it is the end users responsibility to properly flush and prepare the drive for Food Grade service. Contact the lubricant manufacturer for specific information and flushing procedures.*

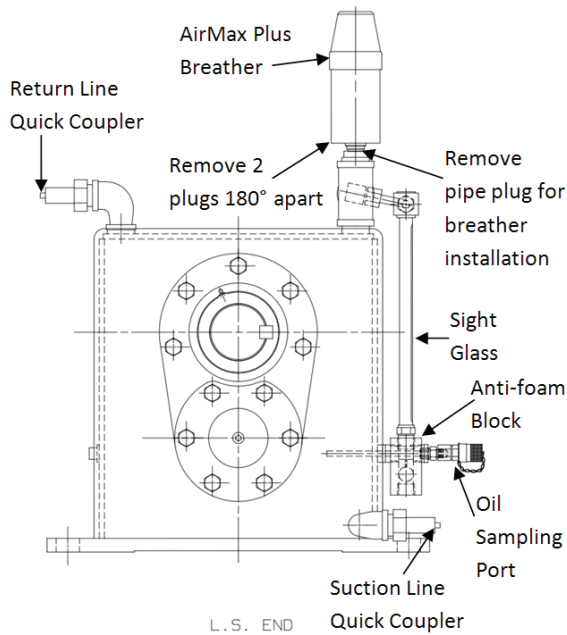
TABLE 16 — Food Grade Grease[▲] for Grease Lubricated Bearings & Grease Purged Seals, NLGI #2 Grade
0° to +200°F (-18° to +93°C)

Manufacturer	Lubricant
Bel-Ray Company, Inc.	No-Tox HD Grease 2
Chevron USA, Inc. (Texaco/Caltex)	Chevron FM ALC EP 2
Exxon Mobil	Mobil SHC Polyrex 462
Klüber Lubrication	Klubersynth UH1 14-222
Lubriplate	Lubriplate FGL-2
Total Lubricants USA, Inc.	Nevastane HT/AW 2
Petro-Canada	Purity FG
Phillips 66 / Conoco / 76 Lubricants / Kendall	Food Machinery Grease 2

▲ NSF (National Sanitation Foundation) H1 Registered.

Grease application or re-lubrication should be done at temperatures above 20°F (-7°C). If grease must be applied at cooler temperatures consult lubricant supplier for recommendations.

**RELIABILITY PACKAGE
(LUBRICATION PACKAGE)**



applications it is recommended that the oil level sight glass be marked once steady state operating conditions have been reached). There is a secondary nameplate that is permanently attached to the gearbox with drive screws, at the same level as the label, to indicate the oil level if anything were to happen to the static oil level label.

OIL SAMPLING — The oil sampling port that is included allows users to easily draw oil samples for lubrication analysis. Refer to the Oil Analysis Report section (Page 4) of this document for detailed recommendations on oil content. The oil sample port has a screw on cover that needs to be unscrewed in order to access the valve to the sampling port. The valve can then be actuated by screwing on the threaded oil sample port adapter included in our Oil Sample Kit (sold separately; see Table A1). The sampling bottle is composed of PET (polyethylene terephthalate) which is compatible with most industrial lubricants; however, user should confirm compatibility prior to use. It should be noted that the cleanliness of the bottle can greatly affect the results of an oil sample analysis; therefore user is cautioned to use care to avoid contamination of the sample. The oil sample should be taken shortly after the unit has been shut down to ensure the oil is properly mixed. It is important to initially purge some oil from the oil sampling port and discard this purge, prior to collecting the sample. Be sure to check the oil level in the drive after the sample has been collected (additional oil may need to be added to ensure proper level).

INTRODUCTION

The UltraMax Reliability Package includes an enhanced desiccant and particulate filter, Viton seals, oil level sight glass, oil sample port, and quick disconnects for oil return and suction lines. The Reliability Package will come preassembled from the Factory, with the exception of AirMax Plus breather mounted to the gearbox.

OIL CHANGE AND/OR OIL FILTERING — Quick couplers are provided to allow users to easily filter and/or change oil in the gear drive. The 0.75" male quick couplers that are supplied meet the dimensional requirements of ISO 7241-1 Series B for the most widely used Industrial Interchange. Male coupler fittings are installed on the gearbox requiring female coupler fittings on the oil suction and return lines. Refer to Page 7 for Preventative Maintenance recommendations (oil change intervals).

INSTALLATION AND MAINTENANCE INSTRUCTIONS

AIRMAX PLUS — Remove the pipe plug from the gearbox as depicted in the illustration above. Screw the breather onto the gearbox. For detailed breather installation and maintenance instructions, refer to the literature included with the AirMax Plus breather (GR3-002). For all Falk UltraMax drive sizes, remove two (2) red plastic pipe plugs from the bottom air vents located 180° apart. Falk AirMax Plus breathers have visual indication when they need to be changed. As the breather functions, the silica gel material changes color from blue to pink as it absorbs moisture. When all the material has turned pink in color, it is time to replace the breather. Life of breather is dependent on operating conditions and ambient conditions (humidity). Breather should be changed every twelve (12) months regardless of color.

OIL LEVELS — Fill drive to the height located on the oil level sight glass with approved lubricant [refer to Page 3 for Lubrication Recommendations; DO NOT USE GMAX 6000 or other types of polyalkylene glycol (PAG) lubricants which are incompatible with the polycarbonate sight glass]. The oil level sight glass is intended to be used when the gearbox is not running; in the static condition. Therefore, the sight glass contains a label that indicates that the oil level is a static oil level. *(oil levels tend to fluctuate based on oil churning and are dependent on speed and direction of rotation; for continuous direction, and continuous speed*

TABLE A1 — Sample Port Adapter, Sampling Kit and Breathers for use by Maintenance Professionals

Usage	Part	Part Number
ALL SIZES	Oil Sampling Kit (includes oil sample port adapter, case of 12 sample bottles, vacuum pump, 20' of tubing, and labels)	10097025
2040F TO 2070F	AirMax Plus HG-1 Breather	10097978
2080F TO 2130F	AirMax Plus HG-8 Breather	10096606