

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) or industrial type extreme pressure (EP) gear lubricants are the recommended gear lubricants. They can be formulated using petroleum or synthetic base stocks.

LUBRICANT SELECTION PROCESS

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

TABLE 1 — Summary of Lubricant Type and Greases

Petroleum-Based	
R & O Inhibited See Table 4A	Extreme Pressure (EP) See Table 4B
Synthetic Lubricant, Polyalphaolefin Type (PAO)	
R & O Inhibited See Table 5A	Extreme Pressure (EP) See Table 5B
Conventional Grease	
See Table 6	

VISCOSITY (IMPORTANT)

The proper viscosity grade for petroleum-based lubricant is found in Table 2. For synthetic lubricant viscosity grades, refer to Table 3 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.

If a gear drive (excluding semi-high speed and high speed drives) operates in a typical indoor environment where the ambient temperature is within 70° to 125°F (21° to 52°C), the oil viscosity may be increased one ISO grade above that shown for the 50° to 125°F (10° to 52°C) range. That is, an ISO VG 320 (AGMA 6) or ISO VG 460 (AGMA 7) may be substituted for an ISO VG 220 (AGMA 5) or ISO VG 320 (AGMA 6) respectively, under this ambient condition.

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.

LUBRICANT TYPES

PETROLEUM-BASED LUBRICANTS (TABLES 4A & 4B) — 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 5A & 5B) — 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 3.

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 4B & 5B) — 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.

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.

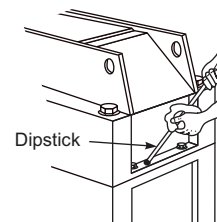
CLIMATE CONDITIONS — Ambient temperature in immediate vicinity of gear drive is very important for determining viscosity grade. Table 2 provides viscosity grade selections for petroleum-based lubricants. See Table 3 for synthetic lubricants.

OIL LEVELS

Prior to filling gear drives, remove the inspection cover (on drives so equipped) and flood the oil troughs with a generous flow of oil to the bearings. Fill the drive with oil to the level indicated on the oil dipstick or appropriate plug. Approximate oil capacities are given on the drive nameplate.

LUBRICATION SYSTEMS

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.

TABLE 2 — Viscosity Grade Recommendations for Petroleum-Based Lubricants

Drive Description	Classification Symbol (Drive Type)	Drive Size	Normal Climates			
			+15° to +60°F (-9° to +16°C)		+50° to +125°F (+10° to +52°C)	
			ISO-VG	AGMA	ISO-VG	AGMA
Parallel Shaft and Horizontal Right Angle Roller Bearings Fabricated Steel Housings	Y1	50-135, 2050-2135	See Manual 148-050			
	YF1	1080-1135				
	Y1	140-195, 2140-2165				
	YF1	1140-1195				
Vertical Right Angle Fabricated Steel Housings	Y2 & YB2	50-195	See Manual 148-050			
	Y2 & YB2	2050-2245				
	Y3, YB3 & 4	50-135, 2050-2135				
Parallel Shaft Sleeve and Roller Bearings Cast Iron Housings	Y3, YB3 & 4	140-195, 2140-2245	See Manual 148-050			
	YBX2	50-135, 2070-2135				
Right Angle Horizontal and Vertical Cast Iron Housings	YBX3	50-135, 2070-2135	See Manual 148-050			
	YBX2	140-195, 2140-2195				
	YBX3	140-195, 2140-2195				
Parallel Shaft Sleeve and Roller Bearings Cast Iron Housings	GHC, GHF	5	100	3	220	5
	GDA, GDF	6-9	150	4	220	5
	GRA, GRF	10-13	150	4	220	5
	2000 GHB1	2050-2120	See Manual 148-050			
Right Angle Horizontal and Vertical Cast Iron Housings	GHB	3-5	See Manual 148-050			
	GDB	6-9	150	4	220	5
	GRB	10-12	150	4	220	5
	GDX	4, 5	100	3	220	5
	GDX, GRX	6-12	150	4	220	5
Parallel Shaft Semi-High Speed Sleeve, Roller and Ball Bearings	DTC	3 & 5	150	4	220	5
	YHF1	1080-1135	100	3	220	5
	YH1	2050-2125	100	3	220	5
	YH2	2050-2175	150	4	220	5
	GHCH	5	68	2	100	3
	GHCH	6-13	100	3	150	4
Parallel Shaft High Speed Sleeve Bearings	S Press Lube	All Sizes	46†	1†	68	2
	S Splash Lube	All Sizes	100	3	150	4
Motoreducers Concentric Shaft Speed Reducers	Q, P, YQA, YPA	All Sizes	46†	1†	68	2
	All E & C Types	All Sizes	150	4	220	5
Shaft and Flange Mounted Drives	FC & FZ Types	2040-2130 Sizes	See Manual 318-100			
	FC, FCB, FZ & FZB Types	1020-1130 Sizes	See Manual 318-040			
	J Types	5107-5315	See Manual 378-200			
		5407-5608	See Manual 378-206			

† Lubricant inlet temperature to gear drive must not exceed 100°F(38°C) when using an ISO VG 46 (AGMA No. 1) oil (193 to 235 SSU at 104°F; 41.5-50.6 cSt at 40°C) in a pressure lubrication system.



TABLE 3 — Viscosity Grade Recommendations for Synthetic Lubricants

Drive Description	Classification Symbol (Drive Type)	Drive Size	Cold Climates				Normal Climates			
			-30° to +10°F (-34° to -12°C)		-15° to +50°F (-26° to +10°C)		+15° to +60°F (-9° to +16°C)		+50° to +125°F (+10° to +52°C)	
			ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA
Parallel Shaft and Horizontal Right Angle Roller Bearings Fabricated Steel Housings	Y1	50-135, 2050-2135	See Manual 148-050							
	YF1	1080-1135								
	Y1	140-195, 2140-2165								
	YF1	1140-1195								
Vertical Right Angle Fabricated Steel Housings	Y2 & YB2	50-195	See Manual 148-050							
	Y2 & YB2	2050-2245								
	Y3, YB3 & 4	50-135, 2050-2135								
Parallel Shaft Sleeve and Roller Bearings Cast Iron Housings	Y3, YB3 & 4	140-195, 2140-2245	See Manual 148-050							
	YBX2	50-135, 2070-2135								
Right Angle Horizontal and Vertical Cast Iron Housings	YBX3	50-135, 2070-2135	See Manual 148-050							
	YBX2	140-195, 2140-2195								
Parallel Shaft Sleeve and Roller Bearings Cast Iron Housings	YBX3	140-195, 2140-2195	32	---	68	2	100	3	220	5
	GHC, GHF	5	32	---	68	2	150	4	220	5
	GDA, GDF	6-9	32	---	68	2	150	4	220	5
Right Angle Horizontal and Vertical Cast Iron Housings	GRA, GRF	10-13	32	---	68	2	150	4	220	5
	2000 GHB1	2050-2120	See Manual 148-050							
Right Angle Horizontal and Vertical Cast Iron Housings	GHB	3-5	See Manual 148-050							
	GDB	6-9	32	0	68	2	150	4	220	5
	GRB	10-12	32	0	68	2	150	4	220	5
	GDX	4, 5	32	0	68	2	100	3	220	5
	GDX, GRX	6-12	32	0	68	2	150	4	220	5
Parallel Shaft Semi-High Speed Sleeve, Roller and Ball Bearings	DTC	3 & 5	32	0	68	2	150	4	220	5
	YHF1	1080-1135	32	---	68	2	100	3	220	5
	YH1	2050-2125	32	---	68	2	100	3	220	5
	YH2	2050-2175	32	---	68	2	150	4	220	5
	GHCH	5	32	---	68	2	68	2	100	3
Parallel Shaft High Speed Sleeve Bearings	GHCH	6-13	32	---	68	2	100	3	150	4
	S Press Lube	All Sizes	32	0	68	2	46†	1†	68	2
Motoreducers	S Splash Lube	All Sizes	32	0	68	2	100	3	150	4
	Q, P, YQA, YPA	All Sizes	32	0	68	2	46†	1†	68	2
Concentric Shaft Speed Reducers	All E & C Types	All Sizes	32	0	68	2	150	4	220	5
	FC & FZ Types	2040-2130 Sizes	See Manual 318-100							
	FC, FCB, FZ & FZB Types	1020-1130 Sizes	See Manual 318-040							
Shaft and Flange Mounted Drives	J Types	5107-5315	See Manual 378-200							
	J Types	5407-5608	See Manual 378-206							

† Lubricant inlet temperature to gear drive must not exceed 100°F(38°C) when using an ISO VG 46 (AGMA No. 1) oil (193 to 235 SSU at 104°F; 41.5-50.6 cSt at 40°C) in a pressure lubrication system.

TABLE 4A —Petroleum Based R&O (Rust & Oxidation) Inhibited Lubricants ^
Maximum operating temperature of lubricants 200°F (93°C)

ISO Viscosity Grade	46	68	100	150	220	320	460
AGMA Viscosity Grade	1	2	3	4	5	6	7
Viscosity cSt @ 40°C ■	41.4-50.6	61.2-74.8	90-110	135-165	198-242	288-352	414-506
Viscosity SSU @ 100°F	193-235	284-347	417-510	626-765	918-1122	1335-1632	1919-2346
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Hyspin AWS 46	Hyspin AWS 68	Hyspin AWS 100	Hyspin AWS 150	Hyspin AWS 220	---	---
	Castrol Paradene R&O 46	Castrol Paradene R&O 68	Castrol Paradene R&O 100	Castrol Paradene R&O 150	Castrol Paradene R&O 220	Castrol Paradene R&O 320	Castrol Paradene R&O 460
	Castrol Paradene AW 46	Castrol Paradene AW 68	Castrol Paradene AW 100	Castrol Paradene AW 150	Castrol Paradene AW 220	Castrol Paradene AW 320	---
Chevron / Texaco / Caltex	Rando HD 46	Rando HD 68	Rando HD 100	Rando HD 150	Rando HD 220	Rando HD 320	---
Citgo Petroleum Corp.	Pacemaker T 46	Pacemaker T 68	Pacemaker T 115	Pacemaker T 150	Pacemaker SD 220	Pacemaker SD 320	Pacemaker SD 460
Exxon Mobil / Esso	DTE Medium	DTE Heavy Medium	DTE Heavy	DTE Oil Extra Heavy	DTE Oil BB	DTE Oil AA	DTE Oil HH
	---	---	Vacuoline 525	Vacuoline 528	Vacuoline 533	Vacuoline 537	Vacuoline 546
Petro-Canada Lubricants	TurboFlo R&O 46	TurboFlo R&O 68	TurboFlo R&O 100	TurboFlo R&O 150	TurboFlo R&O 220	TurboFlo R&O 320	---
Phillips 66 / Conoco / 76 Lubricants / Kendall	Multipurpose R&O 46	Multipurpose R&O 68	Multipurpose R&O 100	Multipurpose R&O 150	Multipurpose R&O 220	Multipurpose R&O 320	Multipurpose R&O 460
	Morlina S2 B 46	Morlina S2 B 68	Morlina S2 B 100	Morlina S2 B 150	Morlina S2 B 220	Morlina S2 B 320	Morlina S2 B 460
Shell Oil Co.	---	---	Morlina S2 BA 100	Morlina S2 BA 150	Morlina S2 BA 220	Morlina S2 BA 320	Morlina S2 BA 460
	---	Azolla ZS 68	Azolla ZS 100	Cirkan ZS 150	Cirkan ZS 220	Cirkan ZS 320	---
Total Lubricants USA / Keystone Div. Penwalt Corp.	---	Azolla ZS 68	Azolla ZS 100	Cirkan ZS 150	Cirkan ZS 220	Cirkan ZS 320	---
Whitmore Manufacturing Company	Hyperion 46	Hyperion 68	Hyperion 100	Hyperion 150	Hyperion 220	Hyperion 320	Hyperion 460

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

TABLE 4B — Petroleum Based EP (Extreme Pressure) Lubricants ^
Maximum operating temperature of lubricants 200°F (93°C)

ISO Viscosity Grade	46	68	100	150	220	320	460
AGMA Viscosity Grade	1	2	3	4	5	6	7
Viscosity cSt @ 40°C ■	41.4-50.6	61.2-74.8	90-110	135-165	198-242	288-352	414-506
Viscosity SSU @ 100°F	193-235	284-347	417-510	626-765	918-1122	1335-1632	1919-2346
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Alpha SP 46	Alpha SP 68	Alpha SP 100	Alpha SP 150	Alpha SP 220	Alpha SP 320	Alpha SP 460
Chevron / Texaco / Caltex	---	Meropa 68	Meropa 100	Meropa 150	Meropa 220	Meropa 320	Meropa 460
	---	Ultra Gear 68	---	Ultra Gear 150	Ultra Gear 220	Ultra Gear 320	Ultra Gear 460
Citgo Petroleum Corp.	---	EP Compound 68	EP Compound 100	EP Compound 150	EP Compound 220	EP Compound 320	EP Compound 460
Exxon Mobil / Esso	---	Mobilgear 600 XP 68	Mobilgear 600 XP 100	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320	Mobilgear 600 XP 460
Fuchs Lubricants Company	---	---	---	---	GearMaster CLP Oils 220	---	---
Kluber Lubrication	Kluberoil GEM 1 N 46	Kluberoil GEM 1 N 68	Kluberoil GEM 1 N 100	Kluberoil GEM 1 N 150	---	---	---
Petro-Canada Lubricants	---	Enduratex EP 68	Enduratex EP 100	Enduratex EP 150	Enduratex EP 220	Enduratex EP 320	Enduratex EP 460
Phillips 66 / Conoco / 76 Lubricants / Kendall	---	Extra Duty Gear Oil 68	Extra Duty Gear Oil 100	Extra Duty Gear Oil 150	Extra Duty Gear Oil 220	Extra Duty Gear Oil 320	Extra Duty Gear Oil 460
	---	Omala S2 G 68	Omala S2 G 100	Omala S2 G 150	Omala S2 G 220	Omala S2 G 320	Omala S2 G 460
Shell Oil Co.	---	Omala S2 G 68	Omala S2 G 100	Omala S2 G 150	Omala S2 G 220	Omala S2 G 320	Omala S2 G 460
Total Lubricants USA / Keystone Div. Penwalt Corp.	---	Carter EP 68	Carter EP 100	Carter EP 150	Carter EP 220	Carter EP 320	Carter EP 460

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

TABLE 5A — Synthetic PAO (Polyalphaolefin) R & O (Rust & Oxidation) Inhibited Lubricants ▲

ISO Viscosity Grade	32	46	68	100	150	220	320
AGMA Viscosity Grade	0	1	2	3	4	5	6
Viscosity cSt @ 40°C ■	28.8-35.2	41.4-50.6	61.2-74.8	90-110	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	193-235	284-347	417-510	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Alphasyn T 32	Alphasyn T 46	Alphasyn T 68	Alphasyn T 100	Alphasyn T 150	Alphasyn T 220	Alphasyn T 320
	Castrol Isolube 32	Castrol Isolube 46	Castrol Isolube 68	Castrol Isolube 100	Castrol Isolube 150	Castrol Isolube 220	Castrol Isolube 320
Chevron / Texaco / Caltex	Cetus HiPerSYN Oil 32	Cetus HiPerSYN Oil 46	Cetus HiPerSYN Oil 68	Cetus HiPerSYN Oil 100	Cetus HiPerSYN Oil 150	Cetus HiPerSYN Oil 220	Cetus HiPerSYN Oil 320
Citgo Petroleum Corp.	---	---	CITGEAR Synthetic HT 68	CITGEAR Synthetic HT 100	CITGEAR Synthetic HT 150	CITGEAR Synthetic HT 220	CITGEAR Synthetic HT 320
Exxon Mobil / Esso	Mobil SHC 624	Mobil SHC 625	Mobil SHC 626	Mobil SHC 627	Mobil SHC 629	Mobil SHC 630	Mobil SHC 632
Kluber Lubrication	---	---	Klubersynth G 4 68	Klubersynth G 4 100	Klubersynth G 4 150	Klubersynth G 4 220	---
Petro-Canada Lubricants	Synduro SHB 32	Synduro SHB 46	Synduro SHB 68	---	Synduro SHB 150	Synduro SHB 220	---
Phillips 66 / Conoco / 76 Lubricants / Kendall	---	---	Syncon R&O 68	Syncon R&O 100	Syncon R&O 150 ●	Syncon R&O 220 ●	Syncon R&O 320 ●
Shell Oil Co.	---	---	Morlina S4 B 68	Morlina S4 B 100	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 5B — Synthetic PAO (Polyalphaolefin) EP (Extreme Pressure) Lubricants ▲

ISO Viscosity Grade	32	46	68	100	150	220	320
AGMA Viscosity Grade	0	1	2	3	4	5	6
Viscosity cSt @ 40°C ■	28.8-35.2	41.4-50.6	61.2-74.8	90-110	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	193-235	284-347	417-510	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	---	---	Castrol Isolube EP 68	Castrol Isolube EP 100	Alphasyn EP 150 Castrol Isolube EP 150	Alphasyn EP 220 Castrol Isolube EP 220	Alphasyn EP 320 Castrol Isolube EP 320
	---	---	---	---	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 100	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	---	---	---	---	Enduratex Synthetic EP 150	Enduratex Synthetic EP 220	Enduratex 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).

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.

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 2. 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 3.

GREASE-LUBRICATED SEALS AND BEARINGS

Some gear drives have one or more grease lubricated bearings and grease purged seals. Gear drives and external backstops are shipped with NLGI #2 grade grease in the seal housing cavities and in those bearings requiring grease lubrication unless otherwise specified. Refer to Table 6 for grease recommendations.

GREASE LUBRICATED BEARINGS — Grease bearings during oil change intervals or every 6 months or 2500 hours of operation, whichever occurs first. Remove pressure relief plug when greasing bearing on vertical hollow shaft drives. Pump grease into bearing cage until it appears at the plug. Replace pressure relief plug

GREASE LUBRICATED SEALS — Most gear drives and all B1F pawl type backstops are furnished with grease purged seals which minimize the entry of contaminants and abrasive dusts into the drive or backstop. Grease seals during oil change intervals. 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 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 6 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. A grease registered as H1 by NSF, National Sanitation Foundation, is suitable for food processing applications. Refer to gear drive assembly/disassembly instructions. Simply purging grease with grease gun will not remove all grease and cross-contamination will likely occur.*

TABLE 6 — Conventional NLGI #2 Grade Grease ▲ for Grease Lubricated Bearings & Grease Purged Seals
0° to +200°F (-18° to +93°C)

Manufacturer	EP Lubricant for Gear Drive	Lubricant for Backstop Seals ■
Chevron / Texaco / Caltex	Multifak EP 2	---
Citgo Petroleum Corp.	Lithoplex RT 2 Premium Lithium EP 2	---
ExxonMobil / Esso	Mobilux EP 2 Mobilith SHC 460 ●	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.
- High performance synthetic alternate.

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.

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. 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 vent cap and vented dipstick (on drives so equipped) should be replaced with a plug (vent cap and vented dipstick should be attached to gear drive for future use) so that the protective rust inhibiting atmosphere is sealed inside the drive. Install vent cap and vented dipstick (on drives so equipped) 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.*