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

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 Rexnord 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.

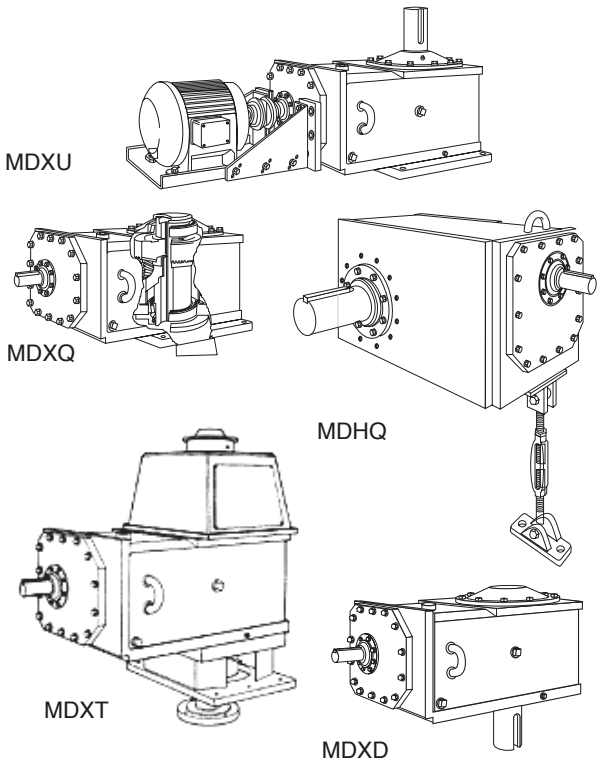
DISASSEMBLY AND ASSEMBLY — Disassembly & assembly instructions and parts guides are available from the Factory or Rexnord Representatives. When requesting information, please give complete data from the nameplate on the gear drive; Model, M.O. Number, Date, RPM, and Ratio.

***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 (the "Company") warrants that Ram Mixer gear drives (I) conform to Company's published specifications, and (II) are free from defects of material for three years from the date of shipment.

Company does not warrant any non-Company branded products or components (manufacturer's warranty applies) or any defects in , damage to, or failure of products caused by: (I) dynamic vibrations imposed by the drive system in which such products are installed unless the nature of such vibrations has been defined and accepted in writing by Company as a condition of operation; (II) failure to provide suitable installation environment; (III) use for purposes other than those for which designed, or other abuse or misuse; (IV) unauthorized attachments, modifications or disassembly, or (V) mishandling during shipping.



INSTALLATION INSTRUCTIONS

The following instructions apply to all standard Falk Type MDX and MDH gear drives. If a drive is furnished with special features, refer to the supplementary instructions shipped with the drive. The MDX Mixer is a right angle drive with vertical or horizontal output shaft designed primarily for mixer service. The basic drive is designed for pedestal mounting but may be furnished with a Rexnord mounted (bolt on) adapter base or with an independently supported output (stub) shaft and pedestal base (MDXT).

The standard drive may be furnished with a solid output shaft or hollow output shaft. A low speed shaft drywell feature is standard on vertical drives with either solid shaft extension down and with hollow shaft and may be furnished as an option on solid shaft extension up drives. Upper low speed bearings of all vertical drives and lower low speed bearings of drives with drywells are grease lubricated.

The MDXT drive is furnished with an output (stub) shaft independently supported by spherical roller bearings in externally mounted upper and lower bearing members (upper bearing cage and pedestal base). The output shaft is flexible coupling connected to the drive hollow shaft and the drive foundation is integral with the pedestal base. The standard MDXT output shaft is furnished with an integral coupling flange.

The low speed shaft extension ends of solid shaft drives are drilled and tapped (2 holes) for thrust coupling keeper plates, refer to "Shaft Connections" on Page 3.

MOUNTING — *CAUTION: Mount drive only in the position for which it was ordered, i.e., horizontal base for MDX or horizontal low speed shaft for MDH. 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.*

The basic RAM drive is designed for pedestal mounting (customer supplied) with a bolt circle on the housing underside that is concentric about the low speed shaft. The lower low speed seal cage or end cover has a close tolerance machined outside (register) diameter for accurate positioning of the drive on the pedestal. Refer to Table 1 for housing mounting bolt circle data.

The Factory supplied adapter base (optional) is registered on the lower L.S. seal cage or end cover and uses the same bolting as used for customer pedestal mounting.

The MDXT drive with an independently supported output shaft is supplied with a pedestal base which has a unique foundation bolt pattern.

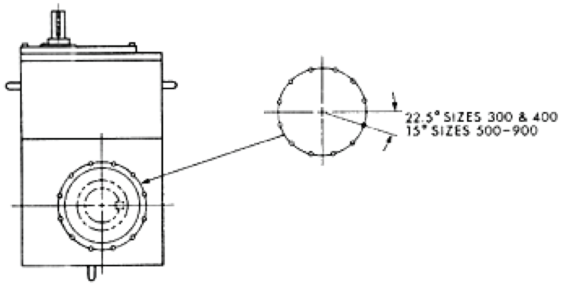


TABLE 1 — Unit Housing to Pedestal/Adapter Base Bolting Data

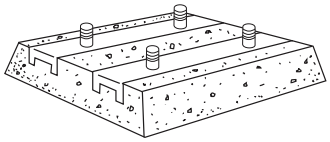
UNIT SIZE	Quantity	Fastener Size	Bolt Circle	Register Dia. — Nom.	Housing Thread Depth
300	8	.500-13 UNC	11.50	8.500	.72
400	8	.625-11 UNC	12.00	9.500	.90
500	12	.625-11 UNC	13.00	10.250	.90
600	12	.625-11 UNC	15.00	11.500	1.12
700	12	.750-10 UNC	17.00	13.000	1.12
800	12	.875-9 UNC	20.00	15.000	1.12
900	12	.875-9 UNC	20.00	15.000	1.12

WELDING — Do not weld on the gear drive or accessories without prior approval from Rexnord. 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.

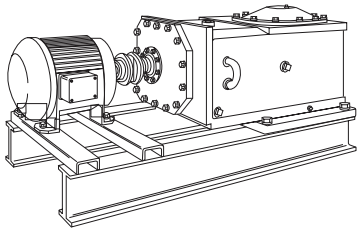
EFFECTS OF SOLAR ENERGY — If the gear drive operates in the sun at ambient temperatures over 100°F(38°C), then special measures should be taken to protect the drive from solar energy. This protection can consist of a canopy over the drive or reflective paint on the drive. If neither is possible, a heat exchanger or other cooling device may be required to prevent the sump temperature from exceeding the allowable maximum.

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

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.

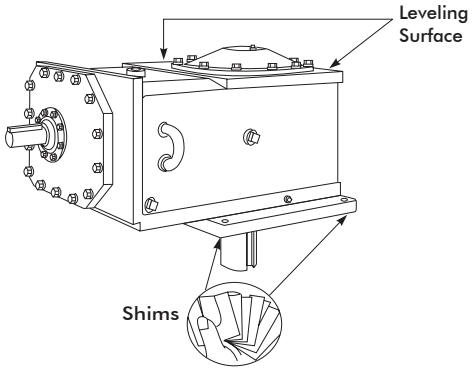


FOUNDATION, STEEL — When mounting gear drive on structural steel, it is recommended that an engineered design be utilized for a pedestal, adapter base or bed to provide sufficient rigidity, to prevent induced loads from distorting the housing and causing gear misalignment. In the absence of an engineered 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. Refer to "Fastener Tightening Torques" on Page 4.



GEAR DRIVE ALIGNMENT — TAlign 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 the 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.

HORIZONTAL OUTPUT SHAFT — When the drive is mounted for horizontal output, the torque reaction can be transmitted through the adapter base, pedestal, tie rod, or a combination thereof. The tie rod may be mounted above or below the drive and its angular position may vary as shown. For other positions, refer to the factory. If it is necessary to shorten the tie rod, cut off the excess from either threaded end.

The support to which the clevis bracket is to be fastened must sustain the torque reaction shown in Table 2. Use Grade 5 fasteners to anchor the clevis bracket; tighten to torques specified in "Fastener Tightening Torques" on Page 4.

Bolt the tie rod to both the clevis bracket and the drive anchor bracket and tighten bolts until seated against the brackets. DO NOT bend the brackets. Clearance between the clevis brackets and tie rod is required.

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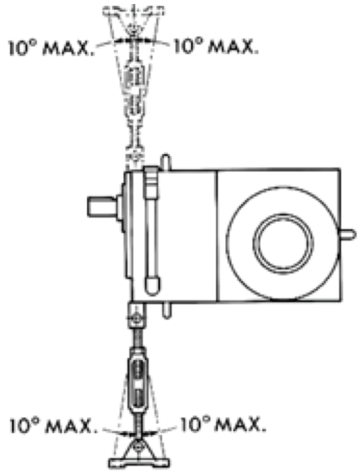


FOR "HORIZONTAL OUTPUT SHAFT"

TABLE 2 — Load Reaction Through Tie Rod

UNIT SIZE	Load (lbs.)
300	5000
400	7000
500	9000
600	10,000
700	14,000
800	17,000
900	17,000

MOTOR BRACKETS — The weight, location and starting torque of the motor will cause some brackets to deflect downward and to twist. This movement is within allowable engineered limits for motor-drive selections from the Rexnord bulletin. If the customer considers the movement excessive, jackscrew supports for the bracket extension are available from the Factory. To compensate for deflection caused by heavy motors AND to get CORRECT COUPLING ALIGNMENT, use more shims under the rear motor feet than the front feet.

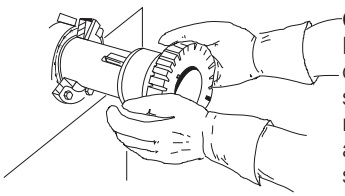
Motors and other components mounted on motor plates or motor brackets may become misaligned during shipment. ALWAYS check alignment after installation. Refer to "Shaft Connections" for coupling alignment instructions.

SHAFT CONNECTIONS

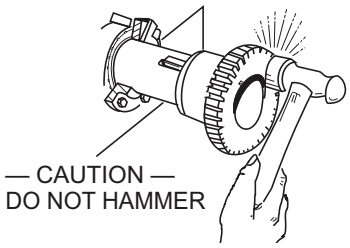
WARNING: *Provide suitable guards in accordance with OSHA standards.*

SHRINK DISC CONNECTIONS — Shrink disc assemblies used on drives with a horizontal and hollow low speed shaft, require special installation procedures and have metric fasteners. Refer to the supplementary instructions supplied with the shrink disc assembly.

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.

REXNORD COUPLINGS — (Except fluid type) Detailed installation manuals are available from the Factory, your local Rexnord 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 shaft drives are drilled and tapped to accommodate coupling keeper plates. Tightening torques for fasteners, including keeper plate fasteners are listed in Table 3.

TABLE 3 — Rigid Coupling Selection & Keeper Plate Fastener Data

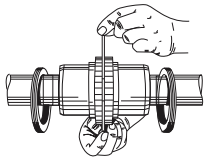
UNIT SIZE	Rigid Coupling Size ★	Coupling Flange Fastener Tightening Torque lb-in.	Keeper Plate Fastener Data †	
			Size	Bolt Circle
300	**1020G82**	900	.500-13 UNC	2.00
400	**1025G82**	1800	.500-13 UNC	2.50
500	**1030G82**	1800	.625-11 UNC	2.75
600	**1035G82**	3000	.625-11 UNC	3.75
700	**1040G82**	3000	.750-10 UNC	4.00
800	**1045G82**	3000	1.125-7 UNC	4.50
900	**1045G82**	3000	1.125-7 UNC	4.50

★ The outside diameter of the selected rigid coupling is less than the seal cage register diameter to accommodate pedestal mounting with coupling hub installed.

† Torque to Table 4 metal to metal values.

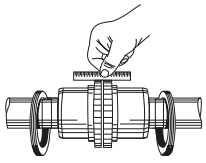
REXNORD FLUID COUPLINGS — Refer to the installation manual furnished with the fluid coupling for installation, alignment and startup instructions.

GAP AND 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

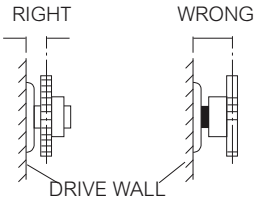
OFFSET ALIGNMENT — Align driving and driven shafts so that a straight edge will rest squarely on both couplings hubs as shown to the right and also at 90° intervals. Tighten foundation bolts of the connected equipment and recheck alignment and gap. The Steelfex coupling at the upper end of the MDXT output shaft is self aligning and is lubricated with LTG (Long Term Grease) at the Factory.

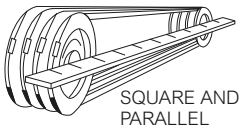


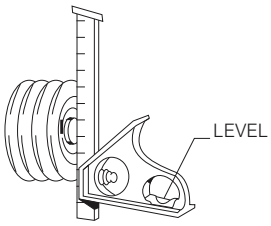
STEELFLEX ILLUSTRATED

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.







DO NOT over tighten belts or chains. Adjust chains 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.

PINION MOUNTING — Mount pinion as close to the drive as possible to avoid undue bearing load and shaft deflection. Refer to Factory for pinion alignment instructions.

FASTENER TIGHTENING TORQUES

Use the tightening torque values specified in Table 4, for fastening Falk gear drives, motors, keeper plates 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 3 — Tightening Torques (lb-in) ± 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	90	70	.875-9	4560	3750
.3125-18	185	145	1.000-8	6800	5600
.375-16	330	255	1.125-7	8900	7000
.500-13	825	640	1.250-7	12600	10000
.625-11	1640	1280	1.375-6	16500	13000
.750-10	2940	2290	1.500-6	22100	17500

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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 7 or 8 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 5 for summary of lubricant type.
3. Using proper lubricant table and viscosity grade, select desired lubricant manufacturer name.
4. Refer to Table 6 for approximate oil capacity to purchase.

TABLE 5 — Summary of Lubricant Type and Greases

Petroleum-Based		
R & O Inhibited See Table 9A	Extreme Pressure (EP) See Table 9B	Micropitting Resistant See Table 9C
Synthetic Lubricant, Polyalphaolefin Type (PAO)		
R & O Inhibited See Table 10A	Extreme Pressure (EP) See Table 10B	Micropitting Resistant See Table 10C
Synthetic Lubricant, Polyalphaolefin Glycol Type (PAG)		
See Falk GMax 6000 (Paragraph to Right)		
Conventional Grease		
See Table 11		
Food Grade Lubricant & Grease		
See Page 12		

VISCOSITY (IMPORTANT)

The proper viscosity grade for petroleum-based lubricant is found in Table 7. For synthetic lubricant viscosity grades, refer to Table 8 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 operates in a typical indoor environment where the ambient temperature is within 70°F to 125°F (21°C to 52°C), the oil viscosity may be increased one ISO grade above that shown for the 50°F to 125°F(10°C to 52°C) range. That is, an ISO VG 320 or 460 may be substituted for a 220 or 320 respectively, under this ambient condition.

LUBRICANT TYPES

PETROLEUM-BASED LUBRICANTS (TABLES 9A, 9B & 9C) — 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 10A, 10B & 10C) — 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 8.

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.*

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).

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 9B & 10B) — 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.

MICROPITTING RESISTANT LUBRICANTS (TABLES 9C & 10C) — 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.

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 7 provides viscosity grade selections for petroleum-based lubricants. See Table 8 for synthetic lubricants.

OIL LEVELS

Fill the drive with oil to the level indicated on the oil level dipstick. Approximate oil capacities (for ordering oil) are listed in Table 6.

Before starting, if conditions permit, 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 6 — Approximate Oil Capacity

Gallons

Drive Size	Type MDX	Type MDH		
		Figure 1		Figure 2
		Double	Triple & Quad.	All Reductions
300	7	11	14	11
400	9	10	17	13
500	13	13	25	18
600	19	19	37	26
700	24	24	45	33
800	44	43	81	59

TABLE 7 — Viscosity Grade Recommendations For Petroleum-Based Lubricants

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

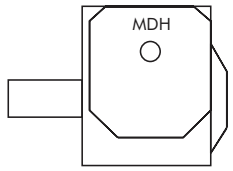


FIGURE 1
H.S. SHAFT ABOVE L.S. SHAFT CENTERLINE

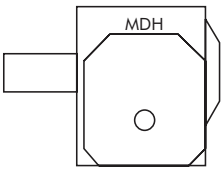
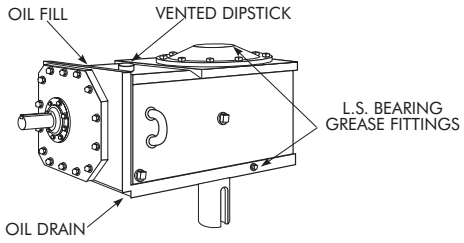


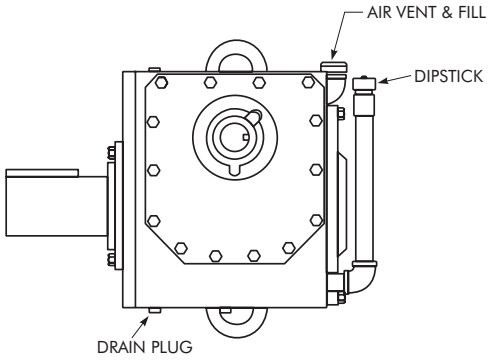
FIGURE 2
L.S. SHAFT ABOVE H.S. SHAFT CENTERLINE

MDX



NOTE: OIL FILL AND DIPSTICK POSITIONS REVERSED ON SIZES 800 & 900

MDH



MDXT

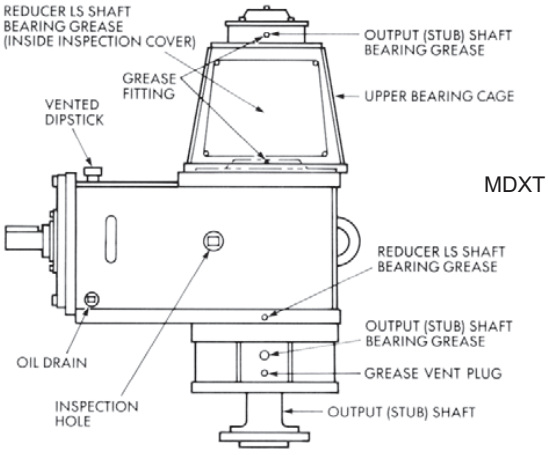


TABLE 8 — Viscosity Grade Recommendations for Synthetic Lubricants

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

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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 MDX drives are splash lubricated. The lubricant is picked up by the revolving elements and distributed to all bearings except the L.S. shaft bearings and gear meshes.

DRIVES WITH 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. If drive is equipped with an external pump, check immediately after starting to see that pump is circulating oil properly.

NON-STANDARD MOUNTING — For drives with non-standard mounting, including tilted, refer to instructions provided with the drive for oil levels and bearing lubrication.

PREVENTIVE MAINTENANCE

AFTER FIRST WEEK — Check alignment of 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 — Proceed as follows:

1. Operate drive until old sump oil reaches normal operating temperature. Shut down drive 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) by rapidly pouring or pumping a charge equal to 25 -100% of the initial fill volume 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 —

1. 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 oil level mark on the dipstick, have the oil analyzed for water content. Moisture in the oil may indicate that a seal or the heat exchanger is leaking. If so, replace the defective part immediately and change the oil. DO NOT fill above the mark indicated as leakage or undue heating may result.
2. Check coupling alignment to make certain that foundation settling has not caused excessive misalignment.
3. If drive is equipped with a fan, periodically clean accumulated foreign matter from the fan, guard, and deflector.
4. If drive is equipped with a torque arm, check for free movement.
5. Purge grease from grease lubricated seals **WITH HAND GREASE GUN**. Regrease those bearings requiring grease lubrication.

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.

TABLE 9A —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 mm^2/s is equivalent to cSt (centistokes).

TABLE 9B — 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 mm^2/s is equivalent to cSt (centistokes).

TABLE 9C — 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 mm^2/s is equivalent to cSt (centistokes).

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TABLE 10A — 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 mm^2/s is equivalent to cSt (centistokes).
● Minimum viscosity index of 120.

TABLE 10B — 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	- - -	- - -	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 mm^2/s is equivalent to cSt (centistokes).

TABLE 10C — 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 mm^2/s is equivalent to cSt (centistokes).

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 7. 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 8.

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

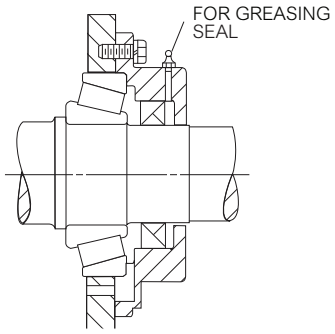
All drives have a grease purged high speed shaft oil seal. All MDX & MDXT drives have grease lubricated bearings. Gear drives are shipped with NLGI #2 grade grease in the seal housing cavities and in those bearings requiring grease lubrication unless otherwise specified. Refer to Table 11 for grease recommendations.

GREASE LUBRICATED BEARINGS — All upper low speed shaft bearings and the lower low speed shaft bearings of drives with a drywell are grease lubricated at the Factory. All MDX drives have one or two grease lubricated low speed shaft bearings. All MDXT drives have four grease lubricated low speed shaft bearings (2 drive, 2 output shaft), the drive upper low speed grease fitting is accessed by removal of the labeled inspection cover.

Where process requirements permit, regreasing output shaft bearings of MDXT drives with a NLGI #2 EP (Extreme Pressure) grade grease is recommended. Remove pressure relief plugs while regreasing MDXT output shaft bearings, then replace. The MDXT drive upper low speed shaft bearing grease fitting is accessed by removing the upper bearing cage inspection cover. Before installing a drive note the location of the bearing grease fittings and grease labels for future maintenance reference. Note that some fittings may be ABOVE the oil level line and others BELOW. If a grease fitting will become inaccessible after the drive is installed, replace the fitting with a pipe extension (and the fitting) so that the grease fitting will be in an accessible location after the drive is installed.

Grease bearings during oil change intervals or every 6 months or 2500 hours of operation, whichever occurs first. The LS shaft bearing regreasing capacities are listed in Table 12

GREASE LUBRICATED SEALS — All drives are furnished with grease purged seals on the H.S. shaft which minimize the entry of contaminants and abrasive dusts into the drive. 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 11 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 20. Simply purging grease with grease gun will not remove all grease and cross-contamination will likely occur. Refer to gear drive assembly/disassembly instructions. Grease registered as H1 by NSF, National Sanitation Foundation, is suitable for food processing applications.*

TABLE 11 — Conventional NLGI #2 Grade Grease ▲ for Grease Lubricated Bearings & Grease Purged Seals

0° to +200°F (-18° to +93°C)

Manufacturer	Lubricant
Chevron / Texaco / Caltex	Multifak EP 2
Citgo Petroleum Corp.	Lithoplex RT 2 Premium Lithium EP 2
ExxonMobil / Esso	Mobilux EP 2 Mobilith SHC 460 ■
Petro-Canada Lubricants	Precision General Purpose EP2
Phillips 66 / Conoco / 76 Lubricants / Kendall	Multiplex Red
Shell Oil Co.	Gadus S1 V220-2
Total Lubricants USA / Keystone Div. Penwalt Corp.	Multis 2 or Multis EP 2

▲ Not suitable for food grade applications.
■ 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 factory or lubricant supplier for recommendations.

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TABLE 12 — L.S. Shaft Bearing Regreasing Capacity (Ounces)†

Drive Size	Bearing Location	Solid Shaft		Hollow Shaft	MDXT Stub Shaft
		Ext. Down	Ext. Up		
300	Upper Lower	3 3	3 3‡	3 3	2 2
400	Upper Lower	3 3	3 5‡	3 3	2 2
500	Upper Lower	4 3	4 5‡	4 3	3 3
600	Upper Lower	4 3	4 6‡	4 3	4 4
700	Upper Lower	6 5	6 11‡	6 5	6 5
800	Upper Lower	12 10	12 16‡	12 10	12 8
900	Upper Lower	12 10	12 16‡	12 10	12 8

† The quantities of grease (in ounces) listed in the table are for relubrication of the bearings which have been originally packed with grease in assembly and are an approximate guide. The actual requirements are dependent upon load, speed and operating conditions and can only be determined from experience of the equipment operator.

‡ These bearings are normally oil lubricated. Quantity listed is for grease lubrication option.

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 vaper-phase rust inhibitor at the rate of 2% of sump capacity as shown in Table 13. 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.

TABLE 13 — Nox-Rust VCI-10

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

Drive Size	NOX-RUST VCI-10 (2% of Sump Capacity)		
	Gallons	Quarts	Ounces
300 & 400	0.3	1.36	43.5
500 & 600	0.7	2.96	94.7
700	0.9	3.60	115.2
800 & 900	1.6	6.48	207.4

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

FOOD GRADE LUBRICANTS

Guidance for selecting petroleum-based and synthetic-based food grade lubricants are shown below in Table 14. For general lubrication guidlines, refer to the first part of the "Lubrication Recomendation" Section.

FOOD GRADE LUBRICANT SELECTION PROCESS

1. Refer to Table 15 or 16 for proper lubricant viscosity grade based on ambient temperature range.
2. Refer to Table 14 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 6 for approximate oil capacity to purchase.

TABLE 14 — Summary of Food Grade Lubricants and Greases

Petroleum-Based	
R & O Inhibited See Table 17A	Extreme Pressure (EP) See Table 17B
Synthetic Lubricant, Polyalphaolefin Type (PAO)	
R & O Inhibited See Table 18A	Extreme Pressure (EP) See Table 18B
Synthetic Lubricant, Polyalkylene Glycol Type (PAG)	
Extreme Pressure (EP) See Table 19	
Food Grade Grease	
See Table 20	

TABLE 15 — Viscosity Grade Recommendations For Food Grade Petroleum-Based Lubricants

Output RPM	Ambient Temperature Range			
	+15° to +60°F (–9° to +16°C)		+50° to +125°F (+10° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
Below 80	150	4	320	6
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.

FOOD GRADE LUBRICANTS (TABLES 17A, 17B, 18A, 18B, 19 & 20) — 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 17A, 17B, 18A, 18B, 19 & 20 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 15 provides viscosity grade selections for petroleum-based lubricants. See Table 16 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.*

TABLE 16 — 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

PREVENTIVE MAINTENANCE

AFTER FIRST WEEK — Check alignment of 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 — Proceed as follows:

1. Operate drive until old sump oil reaches normal operating temperature. Shut down drive 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) by rapidly pouring or pumping a charge equal to 25 -100% of the initial fill volume 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 —

1. 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 oil level mark on the dipstick, have the oil analyzed for water content. Moisture in the oil may indicate that a seal or the heat exchanger is leaking. If so, replace the defective part immediately and change the oil. DO NOT fill above the mark indicated as leakage or undue heating may result.
2. Check coupling alignment to make certain that foundation settling has not caused excessive misalignment.
3. If drive is equipped with a fan, periodically clean accumulated foreign matter from the fan, guard, and deflector.
4. If drive is equipped with a torque arm, check for free movement.
5. Purge grease from grease lubricated seals WITH HAND GREASE GUN. Regrease those bearings requiring grease lubrication.

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.

TABLE 17A — 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 mm^2/S is equivalent to cSt (centistokes)

TABLE 17B — 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 mm^2/S is equivalent to cSt (centistokes)

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TABLE 18A — 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 mm^2/S is equivalent to cSt (centistokes)

TABLE 18B — 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 ▲	28.2-35.2	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**
Petro-Canada	---	---	---	Purity FG Synthetic EP 220	---

▲ Kinematic viscosity in units of mm^2/S is equivalent to cSt (centistokes)

TABLE 19 — 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 ▲	28.2-35.2	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**
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 mm^2/S is equivalent to cSt (centistokes)

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 15. 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 16.

GREASE-LUBRICATED SEALS AND BEARINGS

All drives have a grease purged high speed shaft oil seal. All MDX & MDXT drives have grease lubricated bearings. Gear drives 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 11 for grease recommendations.

GREASE LUBRICATED BEARINGS — All upper low speed shaft bearings and the lower low speed shaft bearings of drives with a drywell are grease lubricated at the Factory. All MDX drives have one or two grease lubricated low speed shaft bearings. All MDXT drives have four grease lubricated low speed shaft bearings (2 drive, 2 output shaft), the drive upper low speed grease fitting is accessed by removal of the labeled inspection cover.

Remove pressure relief plugs while regreasing MDXT output shaft bearings, then replace. The MDXT drive upper low speed shaft bearing grease fitting is accessed by removing the upper bearing cage inspection cover. Before installing a drive note the location of the bearing grease fittings and grease labels for future maintenance reference. Note that some fittings may be ABOVE the oil level line and others BELOW. If a grease fitting will become inaccessible after the drive is installed, replace the fitting with a pipe extension (and the fitting) so that the grease fitting will be in an accessible location after the drive is installed.

Grease bearings during oil change intervals or every 6 months or 2500 hours of operation, whichever occurs first. The LS shaft bearing regreasing capacities are listed in Table 12.

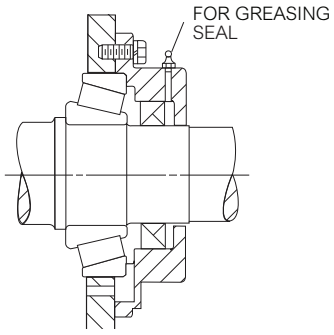
TABLE 20 — Food Grade Grease ▲ for Grease Lubricated Bearings & Grease Purged Seals, NLGI #2 Grade
0° to +200°F(-18° to +93°C)

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
Kluber 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 factory or lubricant supplier for recommendations.

GREASE LUBRICATED SEALS — All drives are furnished with grease purged seals on the H.S. shaft which minimize the entry of contaminants and abrasive dusts into the drive. 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.*

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 20. Simply purging grease with grease gun will not remove all grease and cross-contamination will likely occur. Refer to gear drive assembly/disassembly instructions. Grease registered as H1 by NSF, National Sanitation Foundation, is suitable for food processing applications.

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.*

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