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.

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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.

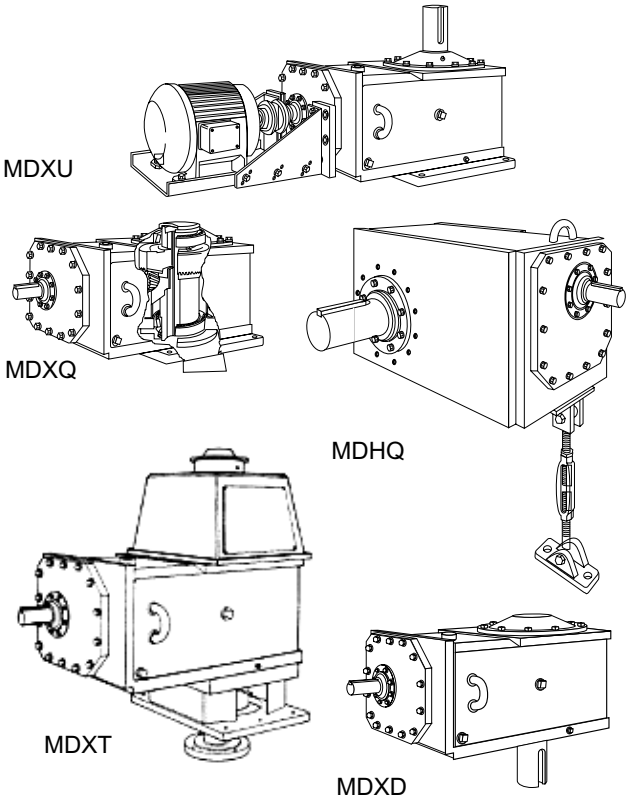
NAMEPLATE — Operate Falk gear drives only at horsepower, speed and ratio shown on nameplate. Before changing any one of these, submit complete nameplate data and new application conditions to the Factory for correct oil level, parts and application approval.

DISASSEMBLY & ASSEMBLY — Disassembly & assembly instructions and parts guides are available from the Factory or 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

The Falk Corporation (the "Company") warrants that, for a period of one year 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.



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 Falk 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 Falk Corporation 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 Falk 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.

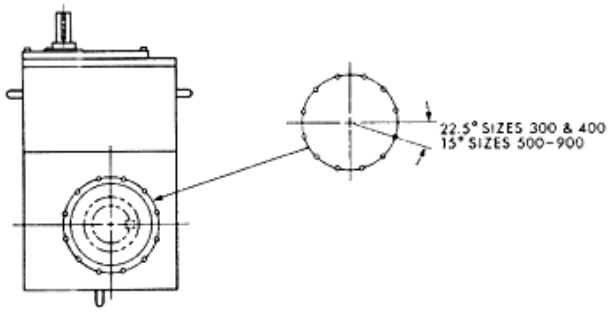


TABLE 1 — Unit Housing to Pedestal/Adapter Base Bolting Data

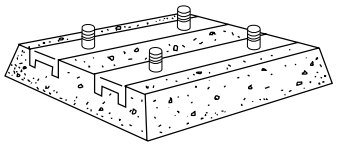
Unit Size	Quantity	Fastener Size	Bolt Circle	Register Dia. - Nom	Housing Thread Depth
300	8	.500-13 UNC	11.50	8.500	.72
400	8	.625-11 UNC	12.00	9.500	.90
500	12	.625-11 UNC	13.00	10.250	.90
600	12	.625-11 UNC	15.00	11.500	1.12
700	12	.750-10 UNC	17.00	13.000	1.12
800	12	.875-9 UNC	20.00	15.000	1.12
900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

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

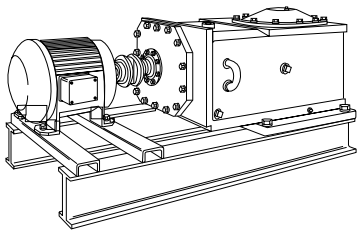
EFFECTS OF SOLAR ENERGY — If the gear drive operates in the sun at ambient temperatures over 100°F(38°C), then special measures should be taken to protect the drive from solar energy. This protection can consist of a canopy over the drive or reflective paint on the drive. If neither is possible, a heat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

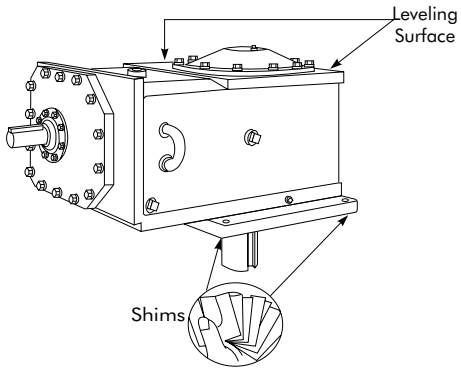


FOUNDATION, STEEL — When mounting gear drive on structural steel, it is recommended that an engineered design be utilized for a pedestal, adapter base or bed to provide sufficient rigidity, to prevent induced loads from distorting the housing and causing gear misalignment. In the absence of an engineered 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 — 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 Falk mounted on a bedplate, the components were accurately aligned at Falk 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 Falk 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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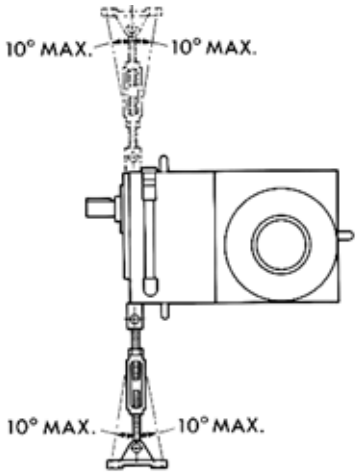


FOR "HORIZONTAL OUTPUT SHAFT"

TABLE 2 — Load Reaction Through Tie Rod

Unit Size	Load (lbs.)
300	5000
400	7000
500	9000
600	10000
700	14000
800	17000
900	17000

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 Falk bulletin. If the customer considers the movement excessive, jackscrew supports for the bracket extension are available from Falk. 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.

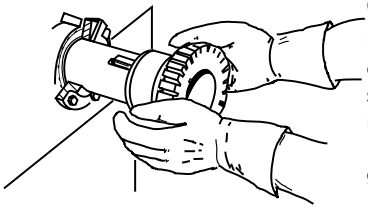
Motors and other components mounted on motor plates or motor brackets may become misaligned during shipment. ALWAYS check alignment after installation. Refer to "Shaft Connections" for coupling alignment instructions.

Shaft Connections

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

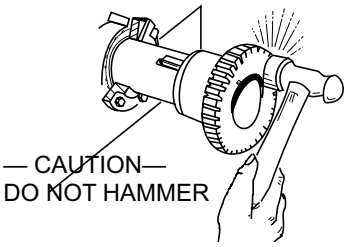
SHRINK DISC CONNECTIONS — Shrink disc assemblies used on drives with a horizontal and hollow low speed shaft, require special installation procedures and have metric fasteners. Refer to the supplementary instructions supplied with the shrink disc assembly.

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.

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

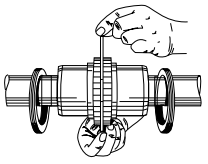
FLANGED TYPE RIGID COUPLINGS — are typically used on drives with vertical output shafts. The low speed shaft extension ends of the solid shaft drives are drilled and tapped to accommodate coupling keeper plates. Tightening torques for fasteners, including keeper plate fasteners are listed in Table 3.

TABLE 3 — Rigid Coupling Selection & Keeper Plate Fastener Data

Drive 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.

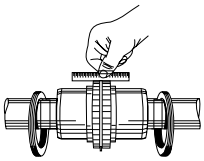
FALK FLUID COUPLINGS — Refer to the installation manual furnished with the fluid coupling for installation, alignment and startup instructions.



STEELFLEX® ILLUSTRATED

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.

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.

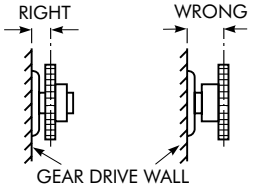


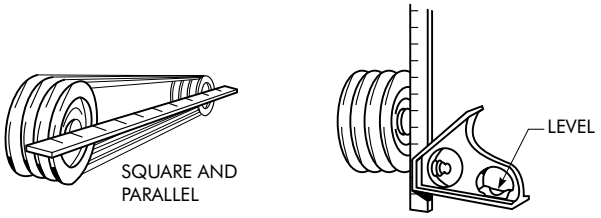
STEELFLEX ILLUSTRATED

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 the 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 4 — 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

Lubrication Recommendations

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

Lubricants listed in this manual are typical ONLY and should not be construed as exclusive recommendations. Industrial type petroleum based rust and oxidation inhibited (R & O) gear lubricants or industrial type sulfur-phosphorus extreme pressure (EP) gear lubricants are the recommended lubricants for ambient temperatures of 15°F to 125°F(-9°C to +52°C).

For drives operating outside the above temperature range refer to "Synthetic Lubricants" paragraphs, Page 5. Synthetic lubricants can also be used in normal climates.

VISCOSITY (IMPORTANT) — The proper grade for R & O and EP lubricants is found in Table 5. For cold climate conditions refer to Table 8, Page 6 and the "Synthetic Lubricant" paragraphs. Select a lubricant which has a pour point at least 10°F (5.5°C) below the expected minimum ambient starting temperature. Usable temperature ranges can sometimes be widened if specific application conditions are known.

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 should be increased one AGMA grade above that shown for the 50°F to 125°F(10°C to 52°C) range. That is, an AGMA Number 6 or 7 should be substituted for a 5 or 6 respectively, under this ambient condition.

TABLE 5 — Viscosity Grade Recommendations for R & O or EP 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

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Petroleum Based Lubricants

R & O GEAR LUBRICANTS (Table 9) — Industrial type petroleum based rust and oxidation inhibited (R & O) gear lubricants are the most common and readily available general purpose gear lubricants.

EXTREME PRESSURE (EP) LUBRICANTS (Table 7) — For highly loaded gear drives or drives loaded in excess of original estimates, industrial type petroleum extreme pressure lubricants are preferred. The EP lubricants currently recommended are of the sulphur-phosphorus type.

WARNING: *EP LUBRICANTS IN FOOD PROCESSING INDUSTRY — EP lubricants may contain toxic substances and should not be used in the food processing industry without the lubricant manufacturers' approval. Lubricants which meet USDA "H1" classification are suitable for food processing applications.*

Synthetic Lubricants

Synthetic lubricants of the polyalphaolefin 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.

WARNING*: SYNTHETIC LUBRICANTS IN FOOD PROCESSING INDUSTRY — Synthetic lubricants may contain toxic substances and should not be used in the food processing industry without the lubricant manufacturers' approval. Lubricants which meet USDA "H1" classification are suitable for food processing applications.*

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

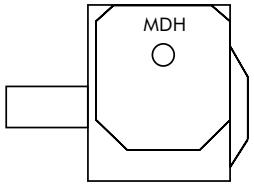


FIGURE 1
H.S. SHAFT ABOVE L.S. SHAFT CENTERLINE

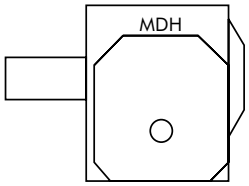
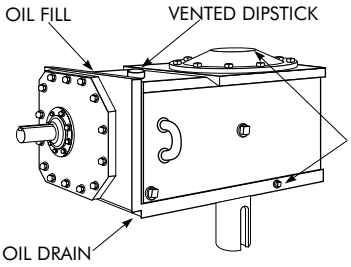


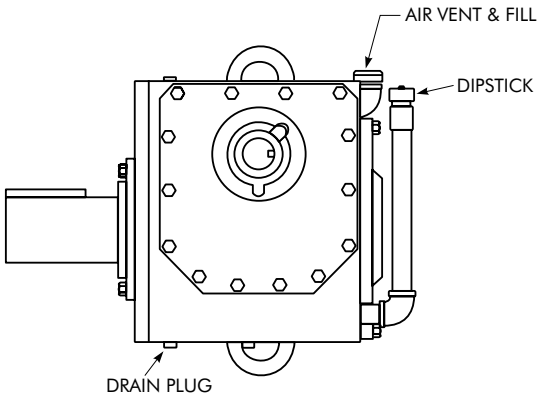
FIGURE 2
L.S. SHAFT ABOVE H.S. SHAFT CENTERLINE

MDX



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

MDH



MDXT

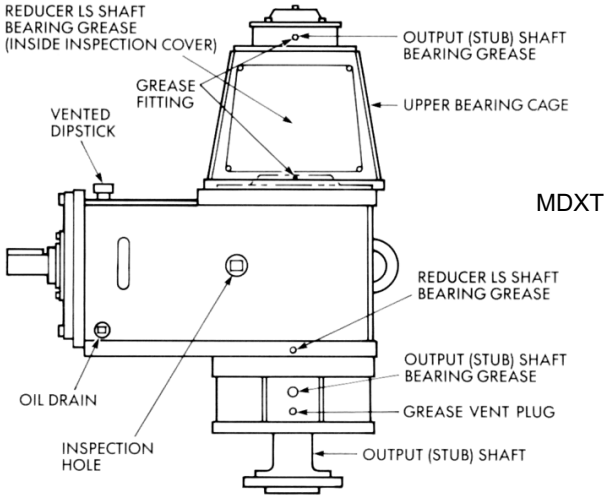


TABLE 7 — Extreme Pressure Lubricants

Maximum Operating Temperature 200°F(93°C)

Manufacturer	Lubricant
Amoco Oil Co. BP Oil Co. Chevron U.S.A. Inc. Citgo Petroleum Corp.	Permagear/Amogear EP Energear EP Gear Compounds EP Citgo EP Compound
Conoco Inc. Exxon Co. U.S.A. E.F. Houghton & Co. Imperial Oil Ltd.	Gear Oil Spartan EP MP Gear Oil Spartan EP
Kendall Refining Co. Keystone Div. Pennwalt Corp. Lyondell Petrochemical (ARCO) Mobil Oil Corp. Petro–Canada Products	Kendall NS-MP Keygear Pennant NL Mobilgear Ultima EP
Phillips 66 Co. Shell Oil Co. Shell Canada Limited Sun Oil Co. Texaco Lubricants	Philgear Omala Oil Omala Oil Sunep Meropa
Unocal 76 (East & West) Valvoline Oil Co.	Extra Duty NL Gear Lube AGMA EP

TABLE 8 — Polyalphaolefin Type Synthetic Lubricants ★

AGMA Viscosity Grade		. . .	2	4	5
ISO Viscosity Grade		32	68	150	220
Viscosity	cSt @ 40° C	28.8–35.2	61.2–74.8	135–165	198–242
	SSU @ 100° F	135–164	284–347	626–765	918–1122
Ambient Temperature Range †		– 30° to + 10°F (–3° 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)
Manufacturer		Lubricant			
Chevron USA, Inc.		. . .	. . .	. . .	Syn. Gear Lube Tegra 220
Conoco, Inc.		Syncon 32	Syncon 68	. . .	. . .
CPI Engineering Services, Inc.		CP–4620–32	CP–4620–68	CP–4620–150	CP–4620–220
		CP–4630–32 ‡	CP–4630–68 ‡	CP–4630–150 ‡	CP–4630–220 ‡
Exxon Co. USA		. . .	. . .	Spartan Synthetic EP 150 ‡	Spartan Synthetic EP 220 ‡
Mobil Oil Corp.		SHC 624	SHC 626	SHC 629	SHC 630
		. . .	. . .	Mobilgear SHC 150 ‡	Mobilgear SHC 220 ‡

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

† With complete application information, temperature range can sometimes be extended, consult Factory.

‡ Extreme Pressure EP lubricants contain phosphorus.

TABLE 9 — Petroleum Based R & O Gear Oils (Maximum operating temperature of lubricants 200°F(93°C)

AGMA Viscosity Grade		3	4	5	6	7
ISO Viscosity Grade		100	150	220	320	460
Viscosity	cSt @ 40° C	90-110	135-165	198-242	288-352	414-506
	SSU @ 100° F	417-510	626-765	918-1122	1335-1632	1919-2346
Manufacturer		Lubricant	Lubricant	Lubricant	Lubricant	Lubricant
Amoco Oil Co. BP Oil Co. Chevron U.S.A., Inc. Citgo Petroleum Corp.		Amer.Ind. Oil 100 Turbinol T–100 Machine Oil AW 100 Citgo Pacemaker 100	Amer.Ind. Oil 150 . . . . . Machine Oil AW 150 Citgo Pacemaker 150	Amer.Ind. Oil 220 Energol HLP-HD 220 Machine Oil AW 220 Citgo Pacemaker 220	Amer. Ind. Oil 320 . . . . . Machine Oil AW 320 Citgo Pacemaker 320	Amer. Ind. Oil 460 . . . . Citgo Pacemaker 460
Conoco Inc. Exxon Company, U.S.A. Houghton International, Inc. Imperial Oil Ltd.		Dectol R&O Oil 100 Teresstic 100 Hydro–Drive HP 500 Teresso 100	Dectol R&O Oil 150 Teresstic 150 Hydro–Drive HP 750 Teresso 150	Dectol R&O Oil 220 Teresstic 220 Hydro–Drive HP 1000 Teresso 220	Dectol R&O Oil 320 Teresstic 320 . . . . . Teresso 320	Dectol R&O Oil 460 Teresstic 460 . . . .
Kendall Refining Co. Keystone Lubricants Lyondell Petrochemical (ARCO) Mobil Oil Corp. Petro–Canada Products		Kenoil R&O AW 100 KLC–30 Duro 100 DTE Oil Heavy Harmony 100	Four Seasons AW 150 KLC–40 Duro 150 DTE Oil Extra Heavy Harmony 150 or 150D	. . . . . KLC-50 Duro 220 DTE Oil BB Harmony 220	. . . . Duro 320 DTE Oil AA Harmony 320	. . . . DTE Oil HH . . . . .
Phillips 66 Co. Shell Oil Co. Shell Canada Limited Texaco Lubricants		Magnus Oil 100 Morlina 100 Tellus 100 Regal Oil R&O 100	Magnus Oil 150 Morlina 150 Tellus 150 Regal Oil R&O 150	Magnus Oil 220 Morlina 220 Tellus 220 Regal Oil R&O 220	Magnus Oil 320 Morlina 320 Tellus 320 Regal Oil R&O 320	. . . . . Morlina 460 . . . . . Regal Oil R&O 460
Unocal 76 (East) Unocal 76 (West) Valvoline Oil Co		Unax RX 100 Turbine Oil 100 Valvoline AW ISO 100	Unax RX 150 Turbine Oil 150 Valvoline AW ISO 150	Unax RX 220 Turbine Oil 220 Valvoline AW ISO 220	Unax AW320 Turbine Oil 320 Valvoline AW ISO 320	Turbine Oil 460 Turbine Oil 460 . . . . .

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Lubricant Changes

OIL ANALYSIS REPORT— Checking oil condition at regular intervals is recommended. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change oil:

1. Water content is greater than 0.05% (500 ppm).
2. Iron content exceeds 150 ppm.
3. Silicon (dust/dirt) exceeds 25 ppm.
4. Viscosity changes more than 15%.

PETROLEUM LUBRICANTS — For normal operating conditions, change gear oils every 6 months or 2500 operating hours, whichever occurs first. 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 5 on Page 4. Lubricant suppliers can test oil from the drive periodically and recommend economical change schedules.

SYNTHETIC LUBRICANTS — *Synthetic lube change intervals can be extended to 8000-10,000 hours depending upon operating temperatures and lubricant contamination. Laboratory analysis is recommended for optimum lubricant life and gear drive performance. Change lube with change in ambient temperature, if required. Refer to Table 8 on Page 6.*

Lubrication Systems

SPLASH LUBRICATED UNITS — 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.

UNITS 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.

Bearing & Seal Greases

All MDX drives have one or two grease lubricated low speed shaft bearings and all drives have a grease purged high speed shaft oil seal. 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. Whenever changing oil in the drive regrease bearings and seal with one of the NLGI #2 greases listed in Table 10.

Some of these greases are of the EP type and may contain toxic substances not allowed in the food processing industry. A grease that meets the USDA "H1" classification is suitable for food processing applications.

GREASE LUBRICATED BEARINGS — All upper low speed shaft bearings and the lower low speed shaft bearings of drives with drywell are grease lubricated, in addition, the output shaft bearings of MDXT drives are grease lubricated. When changing oil in the drive, grease bearings with a NLGI #2 bearing grease selected from Table 10. Regrease these bearings as part of the standard maintenance program. Where process requirements permit, regreasing output shaft bearings of MDXT drives with a NLGI #2 EP (Extreme Pressure) 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 all 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.

TABLE 10 — Greases for Grease Lubricated Bearings & Grease Purged Seals

(0° to 200°F(-18° to +93°C)

Manufacturer	Lubricant
Amoco Oil Co. BP Oil Co. Chevron U.S.A., Inc. Citgo Petroleum Corp.	Amolith Grease No. 2 Energrease LS–EP2 Industrial Grease Medium Premium Lithium Grease No. 2
Conoco Inc. Exxon Company, U.S.A. E.F. Houghton & Co. Imperial Oil Ltd.	EP Conolith Grease No. 2 Unirex N2 Cosmolube 2 Unirex N2L
Kendall Refining Co. Keystone Div. Pennwalt Corp. Lyondell Petrochemical (ARCO) Mobil Oil Corp. Mobil Oil Corp Petro–Canada Products	Multi–Purpose Lithium Grease L421 Zeniplex 2 Litholine H EP 2 Grease Mobilith 22 Mobilith SHC 460 ★ Multipurpose EP2
Phillips 66 Co. Shell Oil Co. Shell Canada Limited Sun Oil Co. Texaco Lubricants	Philube Blue EP Alvania Grease 2 Alvania Grease 2 Ultra Prestige EP2 Premium RB Grease
Unocal 76 (East & West) Valvoline Oil Co.	Unoba EP2 Multilube Lithium EP Grease

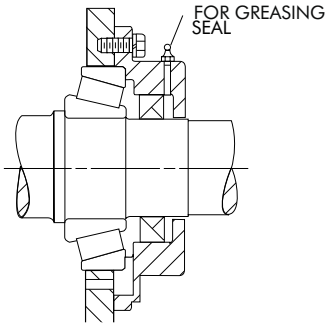
★ High performance synthetic alternate.

TABLE 11 — 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.



GREASE LUBRICATED SEALS — Most gear drives are furnished with grease purged seals on the H.S. shaft which minimize the entry of contaminants and abrasive dusts into the drive or backstop. Gear drives are shipped with NLGI #2 grease in the seal housing cavities unless otherwise specified. If grease could contaminate the product, as in the food and drug industries, it should be removed. A grease that meets USDA "H1" classification is suitable for food processing applications.

Periodically (at least every six months) depending upon the frequency and degree of contamination, purge contaminated grease from seals by slowly pumping fresh bearing grease through the seal, WITH A 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.*

COUPLINGS — Lubricate Falk Steelflex couplings in accordance with instructions in Manual 428-010 and Falk Gear couplings in accordance with instructions in Manual 458-010

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 or reclaimed oil of the correct type and viscosity. If determined to be in good condition by the supplier, reclaimed oil may be reused if it is filtered through a 40 micron or finer filter.

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 CHANGES — Refer to Page 7.

BEARING & SEAL GREASES — Refer to Page 7.

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, drain oil from housing and spray all internal parts with a rust preventive oil that is soluble in lubricating oil or add "Motorstor" ™ vapor phase rust inhibitor at the rate of one ounce per cubic foot of internal drive space (or 5% of sump capacity) and 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.

Periodically inspect stored or inactive gear drives and spray or add rust inhibitor every six months, or more often if necessary. Indoor dry storage is recommended.

Gear drives ordered for extended storage can be treated at the Factory with a special preservative and sealed to rust-proof parts for periods longer than those cited previously.

The vent cap and vented dipstick 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 vent cap and vented dipstick when preparing drive for operation.

Motorstor ™/VCI–10 (Add to Stored or Inactive Units)★

Unit Size	Motorstor™ Ounces Per Unit
300 & 400	1
500 & 600	2
700	3
800 & 900	5

★ Product of Daubert Chemical Company, Chicago, IL. (Formerly known as "Nucle Oil")

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