

## How to Use This Manual

This manual provides detailed instructions on installation and maintenance of Falk parallel shaft Type DH and right angle Type DB gear drives. Use the table of contents below to locate required information.

**CAREFULLY FOLLOW THE INSTRUCTIONS IN THIS MANUAL FOR OPTIMUM PERFORMANCE AND TROUBLE FREE SERVICE OF YOUR FALK GEAR DRIVE.**

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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 power, speed and ratio shown on the 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.

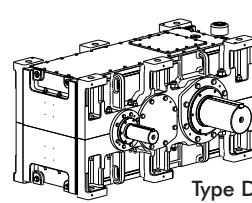
**DISASSEMBLY AND ASSEMBLY** — Disassembly & assembly instructions and parts guides are available from the Factory or Sale Representatives. When requesting information, please give complete data from the nameplate on the gear drive; Model, M.O. Number, Date, RPM, and Ratio.

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

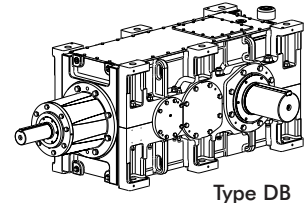
## Warranty

Rexnord Industries, LLC (the "Company") warrants that Drive One 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



Type DH



Type DB

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 standard Falk Type DH & DB drives. If a drive is furnished with special features, refer to the supplementary instructions shipped with the drive.

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

**NOTE:** Drives equipped with cooling fans may require removal of shroud when installing foundation fasteners.

**EFFECTS OF SOLAR ENERGY** — If the gear drive operates in the sun at ambient temperatures over 38°C (100°F), 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.

**MOUNTING POSITION** — Standard mounting positions for types DH & DB are with the input and output shafts horizontal.

Allowable mounting angles for standard oil levels are;

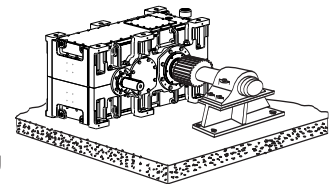
	Bridge	Slope
DH & DB	0° Up & 4° Down	± 1.5°

Consult the Factory for other angles.

If a gear drive is ordered for non-standard mounting positions, refer to the instructions provided with the drive for oil levels and bearing lubrication. If it is necessary to mount the gear drive in a different position from which it was ordered, refer to the Factory for required changes to provide proper lubrication.

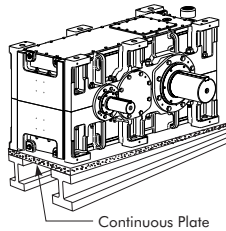
**FOUNDATION, GENERAL** — To facilitate oil drainage,

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.

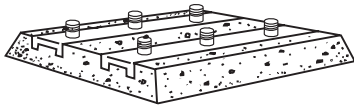


When an outboard bearing is used, mount drive and outboard bearing on a continuous foundation or bedplate, and dowel both in place.

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



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



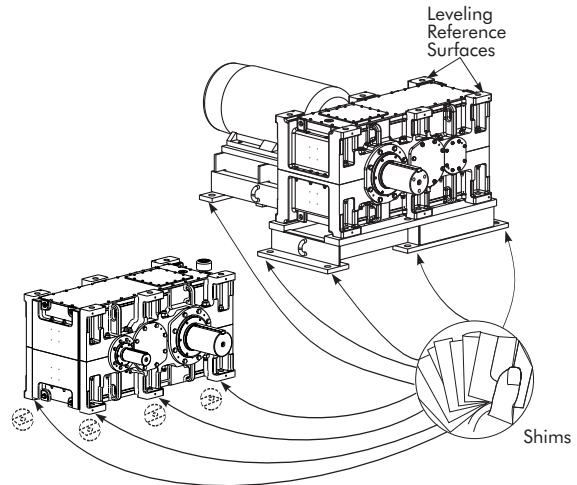
Motors and other components mounted on motor plates or motor brackets may become misaligned during shipment. ALWAYS check alignment after installation. Refer to Page 5 for coupling alignment instructions.

### Gear Drive Alignment

**FOOT MOUNTED DRIVES** – Align drive with driven equipment by placing broad, flat shims under all mounting pads. Jack screw holes are provided by mounting feet to facilitate alignment. See Table 8, Page 7 for fastener and wrench sizes. 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. Fasten drive to foundation using Class 8.8 fasteners, see Table 8 for fastener size. Tighten fasteners to the torque specified in Table 1, Page 4. If the required torque is not attainable, the fasteners may be tightened with a pre-torque of 270 N-m (200 lb-ft), then tightened an additional 60° of

rotation with a slugging wrench to achieve proper torque. After drive is aligned with driven equipment and bolted down, align prime mover to drive input shaft. Refer to Page 3 for coupling alignment.

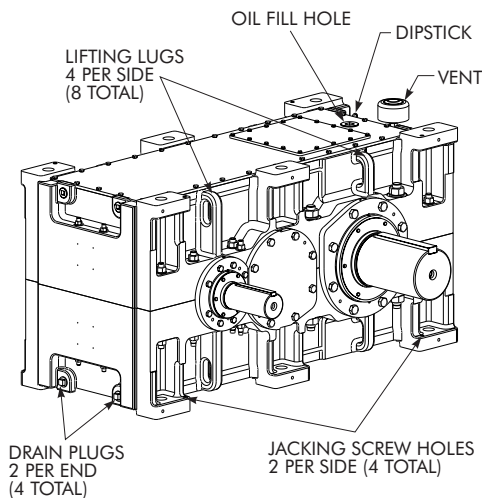
If equipment is received from the Factory mounted on a bedplate, the components were accurately aligned at the Factory with the bedplate mounted on a large, flat assembly plate. Shim under the bedplate foot pads until the gear drive is level and all feet are in the same plane.



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.

### Shaft Mounted Drives – General

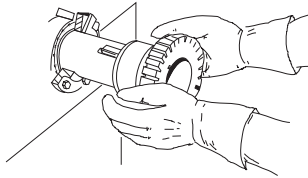
Shaft mount drives should never be mounted in a manner that restricts the natural movement of the drive. They should be allowed to move freely with the shaft on which it is mounted. Shaft mounted drives should always be used in conjunction with a torque reaction arm. See Appendix A for instructions.



## Shaft Connections

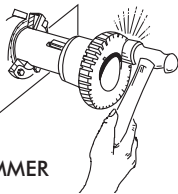
**WARNING:** Provide suitable guards in accordance with local and national standards.

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



### CORRECT METHOD

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



– CAUTION –  
DO NOT HAMMER

### INCORRECT METHOD

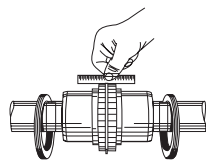
DO NOT drive coupling hub, pinion, sprocket or pulley onto the shaft. An endwise blow on the shaft/coupling may damage gears and bearings.

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

**FLANGED TYPE RIGID COUPLINGS** — These are typically used on drives with vertical output shafts. The low speed shaft extension ends of the solid vertical shaft drives are drilled and tapped to accommodate coupling keeper plates. Tightening torques for fasteners, including keeper plate fasteners are listed in Table 1, Page 4.

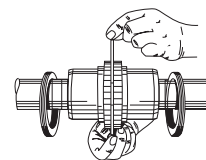
**FLUID COUPLINGS** — Refer to the installation manual furnished with the fluid coupling for installation and startup instructions. For Alignment Free Drives, refer to Appendix C.

**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 at right, and also at 90° intervals around the hub. Check with feelers.



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**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.

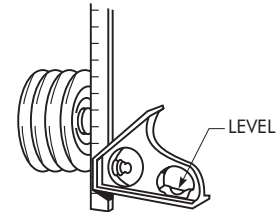
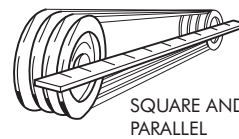
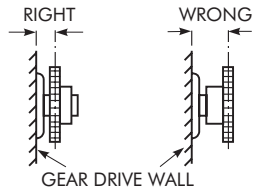


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**SPROCKETS, PULLEYS OR SHEAVES** — Mount power take-offs as close to the gear drive housing as possible to avoid undue bearing load and shaft deflection.

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.

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

**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.

**NON FALK COUPLINGS** — Refer to manufacturers' installation and maintenance instructions.

**BACKSTOPS** — To prevent damage to backstops due to incorrect motor shaft rotation at start up, couplings are NOT assembled when gear drives are furnished with backstops.

After completing electrical connections, check motor and gear drive shaft rotations. If rotations are correct, complete alignment and assembly of coupling.

### Fastener Tightening Torques

Use the tightening torque values specified in Table 1 for fastening gear drives, motors and accessories to their mounting surfaces with un-lubricated fasteners. DO NOT use these values for “torque locking” fasteners or for fastening components with aluminum feet or soft gaskets or vibration dampeners on the mounting surface. If the tightening torque exceeds the capacity of the torque wrench, use a torque multiplier. Use ISO property class 8.8 for metric fasteners. See Table 8, Page 7 for fastener and wrench size.

**TABLE 1 — Tightening Torques: ±5%**  
DO NOT Lubricate Fasteners

Metric Fasteners – Property Class 8.8				
Fastener Size	Metal to Metal		Metal to Concrete	
	Nm	lb-ft	Nm	lb-ft
M4 x .7	3	2	2	1.5
M5 x .8	6	5	5	3.5
M6 x 1.0	10	8	8	6
M8 x 1.25	24	18	19	14
M10 x 1.5	50	36	39	29
M12 x 1.75	84	62	68	50
M16 x 2	210	156	170	126
M20 x 2.5	415	305	330	246
M24 x 3	705	530	570	420
M30 x 3.5	1 440	1060	1 150	850
M36 x 4	2 520	1860	2 030	1500
M42 x 4.5	4 050	3000	3 250	2400
M48 x 5	6 100	4500	4 880	3600
M56 x 5.5	9 850	7300	7 860	5800

### Water Cooling

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

**INTERNAL COOLING TUBES** — Refer to Factory.

### Lubrication Systems

**SPLASH LUBRICATED DRIVES** — Standard horizontal shaft type DH & DB drives are splash lubricated. The lubricant is picked up by the revolving elements and distributed to the bearings and gear meshes.

**OIL PUMP LUBRICATED DRIVES (OPTIONAL)** — Standard horizontal shaft type DH & DB drives can be equipped with an internal gear driven oil pump. The system consists of an automatic reversing pump, driving gears and internal distribution. The system can be used for improved thermal capacity and lubrications accessories, i.e. filters. The pump system is rotation independent.

### 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 -9°C to +50°C (15°F to 125°F).

For drives operating outside the above temperature range refer to “Synthetic Lubricants” paragraphs. Synthetic lubricants can also be used in normal climates.

**VISCOSITY (IMPORTANT)** — The proper grade for R & O and EP lubricants is found in Table 3. For cold climate conditions refer to Table 5, Page 6 and the “Synthetic Lubricant” paragraphs.

If a gear drive operates in a typical indoor environment where the ambient temperature is within 21°C to 52°C (70°F to 125°F), the oil viscosity could be increased one AGMA grade above that shown for the 10°C to 52°C (50°F to 125°F) range. That is, an AGMA Number 6 or 7 could be substituted for a 5 or 6 respectively, under these ambient conditions.

**TABLE 2 — Viscosity Grade Recommendations for Petroleum Based R & O or EP Lubricants**

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

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

### Petroleum Based Lubricants

**R & O GEAR LUBRICANTS (Table 3)** — 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 4)** — 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 sulfur-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 5. Refer to Table 6 for Synthetic lubricants.

**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.

**TABLE 4 — Extreme Pressure Lubricants †**

Maximum Operating Temperature  
93°C(200°F)

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
Valvoline Oil Co.	AGMA EP

† Minimum viscosity index of 90.

**TABLE 3 — Petroleum Based R & O Gear Oils †** Maximum operating temperature of lubricants 93°C (200°F)

AGMA Viscosity Grade	4	5	6	7
ISO Viscosity Grade	150	220	320	460
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632	1919-2346
Viscosity cSt @ 40°C	135-165	198-242	288-352	414-506
Manufacturer	Lubricant	Lubricant	Lubricant	Lubricant
Amoco Oil Co. BP Oil Co. Chevron U.S.A., Inc. Citgo Petroleum Corp.	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 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. Pennzoil Products company Petro-Canada Products	Four Seasons AW 150 KLC-40 Duro 150 DTE Oil Extra Heavy Pennzbell AW Oil 150 Premium R & O 150	..... KLC-50 Duro 220 DTE Oil BB Pennzbell AW Oil 220 Premium R & O 220	..... ..... Duro 32 DTE Oil AA Pennzbell AW Oil 320 Premium R & O 320	..... ..... ..... DTE Oil HH Pennzbell AW Oil 460 .....
Phillips 66 Co. Shell Oil Co. Shell Canada Limited Sun Oil Co. Texaco Lubricants	Magnus Oil 150 Morlina 150 Tellus 150 Sunvis 9150 Regal Oil R&O 150	Magnus Oil 220 Morlina 220 Tellus 220 Sunvis 9220 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 150 Turbine Oil 150 Valvoline AW ISO 150	Unax RX 220 Turbine Oil 220 Valvoline AW ISO 220	Unax AW 320 Turbine Oil 320 Valvoline AW ISO 320	Turbine Oil 460 Turbine Oil 460 .....

† Minimum viscosity index of 90.

**TABLE 5 — Viscosity Grade Recommendations for Synthetic Lubricants ★**

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

★ Refer to Falk for viscosity recommendations when ambient temperatures are below -34°C (-30°F) or above 52°C (125°F).

**Bearing and Seal Greases**

All drives and some backstops have grease lubricated seals. Some specially mounted drives have grease lubricated bearings. Drives are shipped with NLGI #2 grease in the seal housing cavities unless otherwise specified. Refer to Table 7 for grease recommendations.

**GREASE LUBRICATED BEARINGS** — Torque arms with plain spherical bearings are grease lubricated. These bearings are lubricated at the Factory with an NLGI#2

grease. Refer to the preventive maintenance instructions for greasing instructions.

**GREASE LUBRICATED SEALS** — Drive One drives are furnished with grease purged seals which minimize the entry of contaminants into the drive. 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.

**TABLE 6 — Synthetic Lubricants – Polyalphaolefin Type ★**

AGMA Viscosity Grade	0S	2S	4S	5S	6S	7S
ISO Viscosity Grade	32	68	150	220	320	460
Viscosity cSt @ 40°C	28.8–35.2	61.2–74.8	135–165	198–242	288–352	414–506
Viscosity SSU @ 100°F	134–164	284–347	626–765	918–1122	1335–1632	1919–2346
Manufacturer	Lubricant					
Chevron U.S.A., Inc.	...	...	...	Clarity Synthetic PM Oil 220	...	...
	...	...	Syn. Gear Lube Tegra 150 †	Syn. Gear Lube Tegra 220 †	Syn. Gear Lube Tegra 320 †	Syn. Gear Lube Tegra 460 †
Conoco, Inc.	Syncon R & O 32	Syncon R & O 68	...	Syncon R & O 220 †	...	Syncon R & O 460 †
	...	...	Syncon EP 150 † ‡	Syncon EP 220 † ‡	Syncon EP 320 † ‡	Syncon EP 460 † ‡
Dryden Oil Co.	Drydene SHL Lubricant 32	Drydene SHL Lubricant 68	Drydene SHL Lubricant 150	Drydene SHL Lubricant 220	Drydene SHL Lubricant 320	Drydene SHL Lubricant 460
Exxon Co. U.S.A.	Teresstic SHP 32	Teresstic SHP 68	Teresstic SHP 150	Teresstic SHP 220	Teresstic SHP 320	Teresstic SHP 460
	...	...	Spartan Synthetic EP 150 †	Spartan Synthetic EP 220 †	Spartan Synthetic EP 320 †	Spartan Synthetic EP 460 †
Mobil Oil Corp.	SHC 624	SHC 626	SHC 629	SHC 630	SHC 632	SHC 634
	...	...	Mobilgear SHC 150 †	Mobilgear SHC 220 †	Mobilgear SHC 320 †	Mobilgear SHC 460 †
Pennziol Products Co.	Pennzgear SHD 32	Pennzgear SHD 68	Pennzgear SHD 150	Pennzgear SHD 220	Pennzgear SHD 320	Pennzgear SHD 460
	...	Super Maxol “S” 68 †	Super Maxol “S” 150 †	Super Maxol “S” 220 †	Super Maxol “S” 320 †	Super Maxol “S” 460 †
Petro-Canada Products	...	...	Super Gear Fluid 150EP †	Super Gear Fluid 220EP †	Super Gear Fluid 320EP †	Super Gear Fluid 460EP †
Phillips 66 Company	Syndustrial P Oil 32	...	...	...	...	...
	...	Syndustrial EP Oil 68 †	Syndustrial EP Oil 150 †	Syndustrial EP Oil 220 †	Syndustrial EP Oil 320 †	Syndustrial EP Oil 460 †
Shell Oil Co.	...	...	...	Hyperia 220	Hyperia 320	Hyperia 460
	...	...	...	Hyperia S 220 †	Hyperia S 320 †	Hyperia S 460 †
Sun Co.	...	...	...	Sunoco Challenge 220	Sunoco Challenge 320	...
	...	...	...	Sunoco Challenge EP 220 †	Sunoco Challenge EP 320 †	...
Texaco Lubricants Co.	Pinnacle 32	Pinnacle 68	Pinnacle 150	Pinnacle 220	Pinnacle 320	Pinnacle 460
	...	...	Pinnacle EP 150 †	Pinnacle EP 220 †	...	Pinnacle EP 460 †
Whitmore Mfg. Co.	...	...	Decathlon 4EP †	Decathlon 5EP †	Decathlon 6EP †	Decathlon 7EP †
76 Lubricants Company	...	...	76 Triton Syngear 4EP †	76 Triton Syngear 5EP †	...	76 Triton Syngear 7EP †

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

† Minimum viscosity index of 120.

‡ Extreme Pressure EP lubricant (contains sulphur phosphorus).

**TABLE 7 — Greases for Bearings and Seals**  
 -18° to +93°C (0° to 200°F)

Manufacturer	Lubricant
Amoco Oil Co. BP Oil Co. Chevron U.S.A., Inc. Citgo Petroleum Corp.	Amolith Grease No. 2 Energres 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.

### Oil Levels

**TYPES DH & DB** — Fill the drive with oil to the level indicated on the oil dipstick. Approximate oil capacities are given on the drive nameplate.

The inspection cover is sealed with a non hardening chemical gasket eliminator. When replacing the inspection cover, run a bead of Loctite Gasket Sealant #2 (or equivalent) around the perimeter of the inspection opening, making sure to circle the fastener holes.

**DRIVES WITH OIL PUMPS** — Occasionally gear drives will be equipped with oil pumps for cooling or special lubrication considerations. If a drive is equipped with an oil pump, fill the drive to the level marked on the dipstick. Run the lubrication system for several minutes to fill the system components. Verify that the pump is circulating oil properly, then recheck oil level. If necessary, add oil to compensate for filter and/or cooler.

Before starting the gear drive, rotate the input shaft to check for obstructions. Then start the drive and allow it to run without load for several minutes. Shut down and recheck oil level. If everything is satisfactory, the drive is ready for operation.

### 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. See Table 8 for fastener and wrench sizes.

**TABLE 8 — Fastener & Wrench Sizes**

Fastener		DRIVE SIZE			
		M1220	M1230	M1240	M1250
<b>Foot Mounting</b>	Screw Size	M42	M42	M48	M48
	Wrench Size	65mm	65mm	75mm	75mm
<b>Housing Top Plate</b>	Screw Size	M12	M12	M12	M12
	Wrench Size	18mm	18mm	18mm	18mm
<b>Housing Bottom</b>	Screw Size	M12	M12	M12	M12
	Wrench Size	18mm	18mm	18mm	18mm
<b>Inspection Cover</b>	Screw Size	M8	M8	M8	M8
	Wrench Size	13mm	13mm	13mm	13mm
<b>Jackscrews</b>	Screw Size	M16	M16	M16	M16
	Wrench Size	24mm	24mm	24mm	24mm
<b>Magnetic Drain Plugs</b>	Plug Size	1.250 NPT	1.250 NPT	1.250 NPT	1.250 NPT
	Wrench Size	15/16	15/16	15/16	15/16
<b>Other Plugs</b>	Plug Size	1.250 NPT	1.250 NPT	1.250 NPT	1.250 NPT
	Sq. Skt.	3/4	3/4	3/4	3/4
<b>Shaft Fan Shroud</b>	Screw Size	M12	M12	M12	M12
	Wrench Size	18mm	18mm	18mm	18mm
<b>Shaft Fan Setscrew</b>	Screw Size	M10	M10	M10	M10
	Hex Size	5mm	5mm	5mm	5mm

**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 38°C (100°F) 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.

### 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 500 ppm (0.05%).
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. Change oil more frequently when gear drives operate in extremely humid, chemical or dust laden atmospheres. In these cases, R & O and EP lubricants should be changed every 3 to 4 months or 1500 to 2000 hours. If the drive is operated in an area where the temperatures vary with seasons, change oil viscosity grade to suit temperature. Lubricant suppliers can test oil periodically and recommend economical change intervals.

**SYNTHETIC LUBRICANTS** — Synthetic lube change intervals can be extended to 8000 - 10,000 hours depending upon operating temperatures and lubricant contamination. Change oil more frequently when gear drives operate in extremely humid, chemical or dust laden atmospheres. In these cases, synthetic lubricants should be changed every 4 to 6 months or 4000 to 6000 hours. Laboratory analysis is recommended for optimum lubricant life and gear drive performance. Change lube with change in ambient temperature, if required. Refer to Table 6 for synthetic lubricant viscosity recommendations.

**GREASE LUBRICATED SEALS** — Depending on the frequency and degree of contamination (at least every six months or when changing oil in the drive), purge contaminated grease from seals by slowly pumping fresh grease, WITH A HAND GREASE GUN, through the seal cavity until fresh grease flows out along the shaft. Wipe off purged grease. Refer to Table 7 for NLGI #2 greases. Some of these greases are of the IP 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.

**CAUTION:** Rapid greasing with a power grease gun can force grease inward past the seals causing seal leaks.

**GREASE LUBRICATED BEARINGS (Torque Arm)** — Most shaft mounted drives have a grease lubricated bearings in the torque arm. Grease bearings during oil changes or at intervals of every 6 months or 2500 hours of operation whichever is less.

### Stored & Inactive Gear Drives

Each gear drive is protected with a rust preventative 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 preventative oil that is soluble in lubricating oil or add "Motorstor"™ vapor phase rust inhibitor at the rate of 1.05 liters per cubic meter (one ounce per cubic foot) of internal drive space (5% of sump capacity). Refer to Table 9 for Motorstor quantities. 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.

**TABLE 9 — Motorstor/VCI-10 ★**  
(Add to stored or inactive drives)

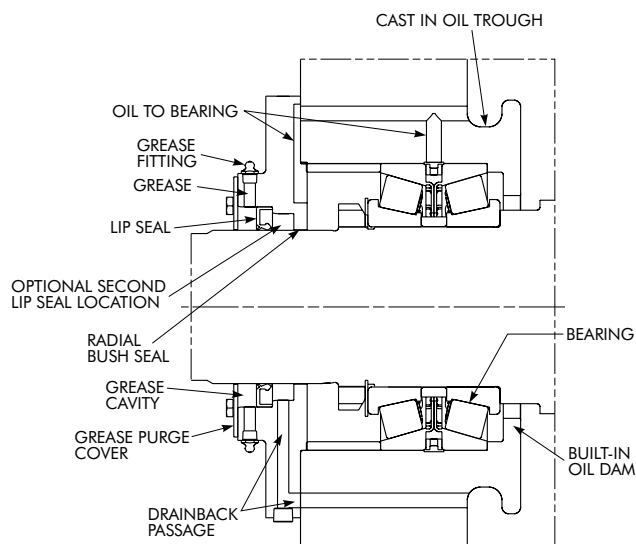
DRIVE SIZE	Motorstor	
	Milliliters Per Drive	Ounces Per Drive
M1220 - M1230	440	15
M1240 - M1250	590	20

★ Product of Daubert Chemical Company, Chicago, IL.

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



## Changing Hand of Drive

**Right/Left Hand Spare** — A Drive One Conveyor Drive can be used in a right hand or left hand application with a single low speed shaft extension and minimal change-over effort. The Conveyor Drive housing top and bottom halves are identical and therefore can be mounted on either end. Internal lubrication troughs and oil passage function in either position as well. Changing the drive from one hand to the other simply requires repositioning of the top and bottom plate, magnetic drain plugs, dipstick and breather.

To change hands of the drive, begin by cleaning the outside of the housing to prevent contamination of internal components and drain the oil. With inspection cover up, remove the AirMax breather and dipstick pipe fittings from the housing. Remove the top cover of the drive, threaded jacking holes are provided to break loose the sealant if required, (eyebolts threaded into jacking holes can be used for lifting). Remove internal oil distribution pan if present, (See additional instructions below if drive is equipped with an internal lubrication pump). Rotate the drive 180° so the bottom plate is now up. Remove the bottom plate, jacking holes are also provided.

Prepare top and bottom plate for reassembly by removing old sealant. Loctite Chisel Gasket Remover or equivalent can be used to aid in the removal of sealant. CAUTION: Gasket Remover can soften and remove paint. Prepare the housing surface in the same manner. Apply Loctite Activator 7649 or equivalent to the mating surfaces of the top plate and housing and allow to dry. Position the oil distribution pan in housing (if required) with large opening over the low speed gear. The tabs of the pan reside in the pockets of the housing and is secured by the cover plate. Apply a continuous bead of Loctite 515 Gasket Eliminator or equivalent to the housing mating surface to the inside of the bolt pattern. Assemble top plate to housing with the inspection cover over the low speed gear. Tighten fasteners to 85 N-m (62 lb-ft).

Remove pipe plugs from new dipstick and breather location. Rotate the drive 180° so the newly assembled top plate is down. Clean and prepare housing surface as previously mentioned for top plate. Apply a continuous bead of Loctite 515 Gasket Eliminator or equivalent to the housing mating surface to the inside of the bolt pattern. Assemble bottom plate to housing and tighten fasteners to 85 N-m (62 lb-ft). Install previously remove pipe plugs into old dipstick and breather location. Coat pipe threads with Loctite Pipe Joint Compound or equivalent prior to installation.

Position drive top side up. Install dipstick fitting in housing on side opposite the low speed gear. Assemble AirMax assembly fitting in housing on gear side. Reposition magnetic drain plugs such that they will be in the oil sump. Coat pipe threads with Loctite Pipe Joint Compound or equivalent prior to installation.

**Drives with an Internal Lubrication Pump** — When changing the hand of a drive with an internal lubrication pump, the pump must be moved to the cross-bar of what will be the bottom of the housing. All previous instructions for changing hands must be followed. In addition, to remove the oil pan, remove the fitting holding the fill tube into the oil pan. Remove the two fasteners mounting the pump bracket to the cross-bar and any shims that are used.

Prepare the pump for mounting on the opposite cross-bar by loosening the compression nut on the fittings securing the suction and output tubes to the pump. The tubes must remain in the same port on the pump. Rotate the output tube 180° and tighten compression nut. The suction tube should be rotated such that it will be approximately 10-20mm (0.375-0.750 inches) off the bottom of the drive sump. Position the pump in the housing. Align the pump gearset with a straight edge. The pump gearset back lash should be set between 0.15-0.56mm (0.006-0.022 inches) by adding or removing shim beneath the pump bracket.

After proper gear alignment and backlash is achieved, apply Loctite 242 threadlocker or equivalent to the threads of the pump mounting fasteners. Tighten fasteners to 85 Nm (62 lb-ft) and re-check alignment and backlash. When installing the oil pan, position pump output tube through coupling in pan. Install fitting to secure output tube. Continue with instructions as mentioned previously.

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## Fixed Torque Arm Installation

### Introduction

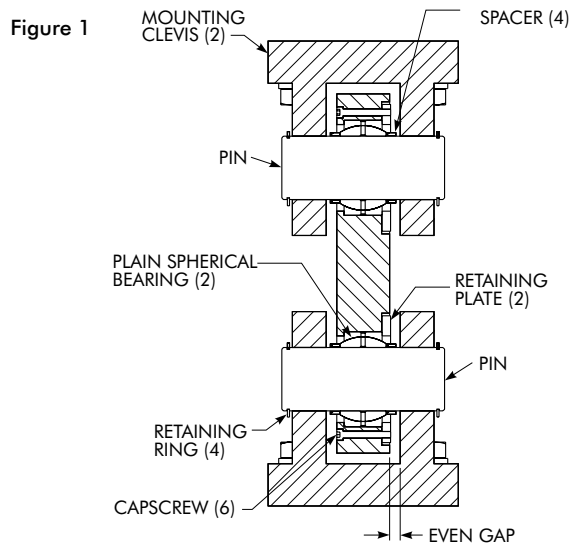
The Drive One spherical bearing link style torque arm is available for all shaft mounted Drive One Large Conveyor Drive Sizes, both parallel shaft Type DH and right angle Type DB. It is used to support the drive when mounted in a standard horizontal position. The torque arm accessory is suitable for use on swing bases, bedplates, Alignment Free or mounted directly to the drive. The torque arm requires mounting holes in the driven equipment support structure to provide for attachment. The customer is responsible for determining the structural integrity of their support member.

### Mounting

It is natural for the drive system to move during operation. This movement is due to runout from the driven equipment shaft and gear drive low speed shaft. Plain spherical bearings and a link are used to provide a resilient mounting support that accommodates the motion of the drive. To allow for maximum movement, the torque arm should be perpendicular to the supports and centered in the mounting clevis. Restricting the drive's motion will result in premature failure of the drive or driven equipment.

### Installation

1. Position the drive on the driven equipment shaft such that the torque arm link is centered in the mounting clevis. Ideally, the clevis mounting holes should be added to the structure after the drive has been secured to the driven equipment.  
NOTE: Do not fasten the torque arm to the support structure at this time.
2. Secure the drive to the driven equipment via the rigid coupling connection.
3. Mount the clevis to the drive or drive system. Locate the position of the clevis to be mounted to the support structure. Match drill the mounting holes for M24 Cl. 8.8 or 1 inch Grade 5 fasteners or better.
4. **(IF REQUIRED)** Mount plain spherical bearings into link. Secure bearings with retainer plate and cap screws. Apply Loctite 242 Threadlocker or equivalent to fastener threads prior to installation.
5. Install pin through one lug of clevis mounted to drive. Position spacer, then link (with spherical bearings previously installed) and finally second spacer on pin. Finish positioning pin within clevis. Install retaining rings to each side of pin to retain pin. Refer to Figure 1.
6. Install pin in clevis mounted to supporting structure in a similar manner. The drive may need to be rotated about the low speed shaft to install second pin. If the drive has a backstop, it may be necessary to disconnect the backstop to rotate the drive. Refer to the backstop instructions for removal.
7. Verify the torque arm link is centered in the clevis and is not restricting motion of the drive.

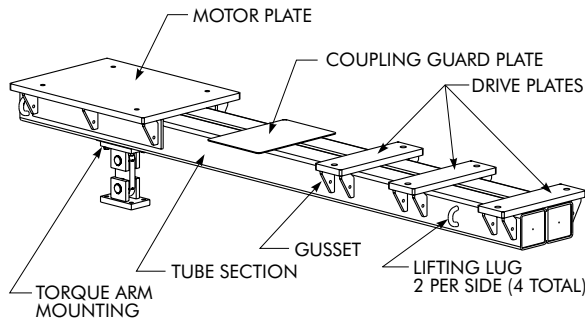


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## Swing Base Installation

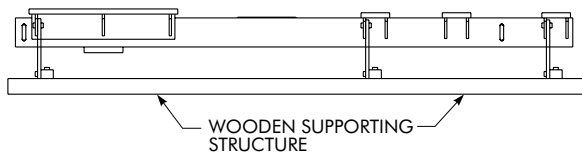
### Introduction

The Drive One Swing Base is a welded steel structure designed to support a motor and a right angle Type DB, shaft mounted drive. The swing base itself is a length of square cross-sectional tubing with plates welded to it for the motor and drive. The motor and drive plates are machined and are supported by gussets for additional strength. A torque arm attaches to the tube section near the motor end of the swing base.



### Supporting the Swing Base

The torque arm connection lug prevents the swing base from lying flat on the ground; therefore, a supporting structure is required for mounting the gear drive and motor to the swing base. This structure is typically built from wood and is unique to each swing base. All gussets have a 19 mm (0.75 inch) diameter hole for securing the swing base to the supporting structure.

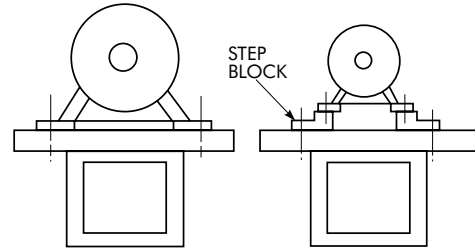


### Mounting Gear Drive to Swing Base

It is standard procedure to mount the drive to the swing base at the Factory. These instructions are to be followed when field mounting of the drive to the swing base is required. Use of broad, flat shims between the gear drive and mounting plate are recommended to prevent distortion of the housing when the drive is bolted down. Jacking screw holes are provided in gear drive housing to aid in fixing the shims. Begin at the low speed shaft end and level across the length and then the width of the gear drive. Use a feeler gauge to insure that all pads are supported. Bolt down the drive to the torque specified in Table 1, Page 4.

### Mounting Motor and Coupling Alignment

Shims are provided for motor mounting. Holes must be drilled into the swing base motor plate for mounting of the motor. Step blocks are also provided for some small frame motors. Use a feeler gauge to ensure that all motor pads are firmly seated. Motor mounting needs to be done in conjunction with coupling alignment to control angular and offset misalignment. Refer to the coupling manufacturer's manual for specific instructions. Bolt down the motor to the torque specified in Table 1, Page 4.

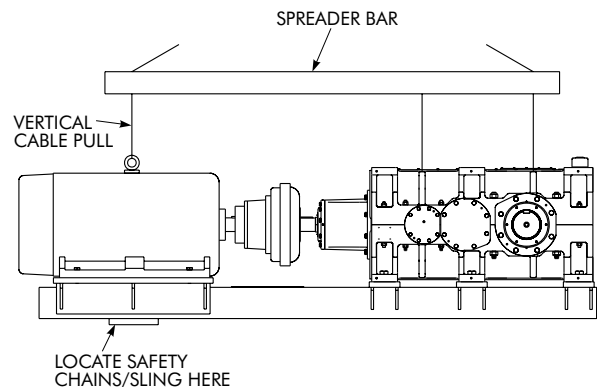


### Coupling Guard

The coupling guard must be trimmed in order to fit the height and shaft extension requirements. Refer to the coupling guard installation manual for instructions on trimming the guard. After the guard has been trimmed holes can be drilled in the coupling guard plate on the swing base. The guard can then be bolted down to the plate.

### Lifting the Swing Base Assembly

After the drive, motor, and coupling have been mounted to the swing base, the completed assembly can be lifted into position for installation on the driven shaft. The motor eyebolt and the lifting holes on the drive housing can be used as cable attachment points. The motor eyebolt is strongest when the cable pull is vertical. To insure that cable pull on the motor eyebolt is vertical, use of a spreader bar is recommended. See the sketch below. To ensure safety, chains or a sling should be placed behind the torque arm connection.



### Mounting Swing Base Assembly to Driven Equipment

Mount the gear drive to the driven shaft (See Page 2). Secure the torque arm to the foundation per the instructions in Appendix A.

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# Alignment Free Assembly and Installation

## Introduction

The Alignment Free Drive design consists of a shaft mounted drive, bell housing, motor adapter plate, torque arm, motor and coupling. When assembled, the bell housing, motor adapter, and motor locate off registers, resulting in alignment of the motor and gear drive shafts. Therefore, no additional alignment is required for the high-speed coupling.

## Assembly Instructions

The bell housing is fastened to the drive's high speed end using cap screws in tapped holes on that face, (see Table 1 for size and torque). The bell housing will locate on the bevel head of the drive. Read instructions provided with high speed coupling prior to assembly.

**TABLE 1 — Tightening Torques**

DRIVE SIZE	Bolt Size	Tightening Torque	
		N-m	lb-ft
M1220	M24	725	535
M1230	M24	725	535

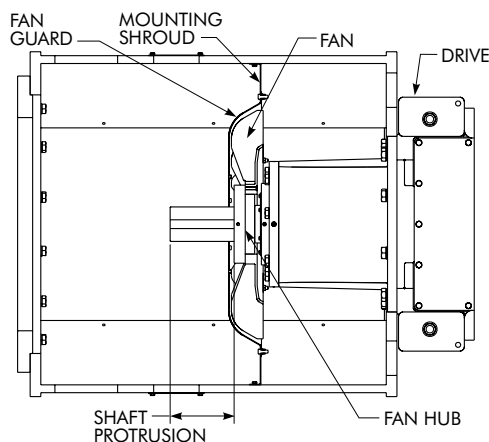
## Shaft Fan (Optional)

A shaft fan is provided on the high speed shaft for drive requiring a shaft fan. The fan must be assembled to the drive prior to mounting any type of coupling. Assemble the fan to the hub, apply Loctite 242 threadlocker or equivalent to the fasteners and tighten. Caution: over-tightening can crack the fan. Position the fan on the high speed shaft to the position indicated in Table 2 (See Figure 1). Apply Loctite 242 threadlocker or equivalent to the set screw and tighten.

**TABLE 2 — Fan Hub Location**

DRIVE SIZE	Shaft Protrusion	
	mm	Inch
M1220	205	8.07
M1230	205	8.07

FIGURE 1



Assemble the mounting shroud and fan guard inside the bell housing. Mounting shroud and fan guard cannot be assembled outside the bell housing. Install all fasteners loosely to ensure all fastener holes are aligned. When all fasteners are loosely installed, tighten starting with the mounting shroud to bell housing fasteners and finish with the fan guard fasteners. Rotate the high speed shaft by hand to verify there is no interference between the fan and guard.

## Fluid Coupling

Location of the fluid coupling on the high speed shaft of the drive is determined by the provided shaft spacer. Install the fluid coupling on the high-speed shaft of the gear drive per fluid coupling instructions.

Once the fluid coupling is installed, the motor adapter plate can be mounted to the bell housing, also being located by a register. Measurements must be taken to accurately position the motor half of the coupling hub on the motor shaft. First, measure the distance from the motor mounting face to the end of the motor shaft, (A). Then measure the distance from the motor adapter plate face to the hub on the fluid coupling, (B). Finally measure the distance from the hub flange to the hub end, (C). The desired gap can be found in Table 3, based on coupling size.

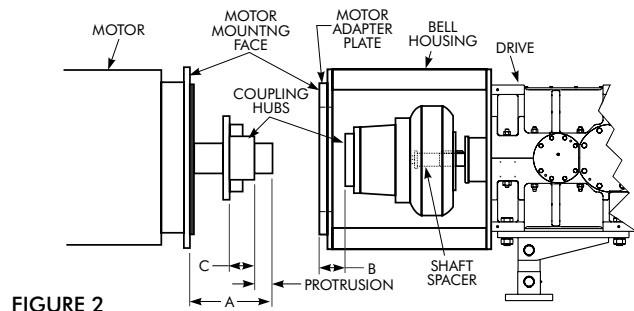
**TABLE 3 — Coupling Gap**

Fluid Coupling Size	Tschan Hub Size	Gap	
		mm	Inch
1480HFDD	260	7.5	0.295
1584HFDD	300	8.4	0.331
1660HFDD	360	9.0	0.354

Calculate the hub protrusion:

$$\text{Protrusion} = (A + \text{Gap}) - (B + C)$$

If the calculated protrusion is a negative value, the hub overhangs the shaft by that amount. (Figure 2)



Once the hub is correctly located on the motor shaft, the motor can be mounted to the motor adapter plate. The hubs will be aligned and come together to the proper gap. To fill the fluid coupling to the proper oil level, align the mark on the perimeter of the fluid coupling with the mark in the center of the inspection window on the bell housing on the side opposite the low speed shaft extension. To locate the correct mark on the fluid coupling, begin by aligning the fill hole of the fluid coupling with the mark in the inspection window. For fill angles less than 90°, rotate the fill plug upward until the marks line up. For fill angles greater than 90°, rotate the fill plug downward until the marks line up. When the proper marks are in-line, fill the fluid coupling with recommended fluid until fluid appears at the lip of the fill hole.

**Close Coupling**

If the drive requires a shaft fan, assemble prior to installing coupling.

Mount the motor to the motor adapter plate on the bell housing before installing the coupling. Once the motor is secured, measure the distance (D) between the end of the motor shaft and the high speed shaft of the drive, see Figure 3. Subtract the distance (D) from the length of the spacer coupling (BE). Then divide this value in half to find the overhang of each hub.  $[Overhang + (BE - D)/2]$  The overhang will be negative, this is the amount each hub overhangs the shaft. Once the overhang is determined, install the hubs according to the instructions provided with the coupling. Install the spacer sections and verify the gap is correct. If not, readjust the hub on the motor shaft. If the coupling is furnished with an interference fit, readjustment will not be possible, take extra care in making measurements. After the proper gap is set, finish installing the coupling per the instructions.

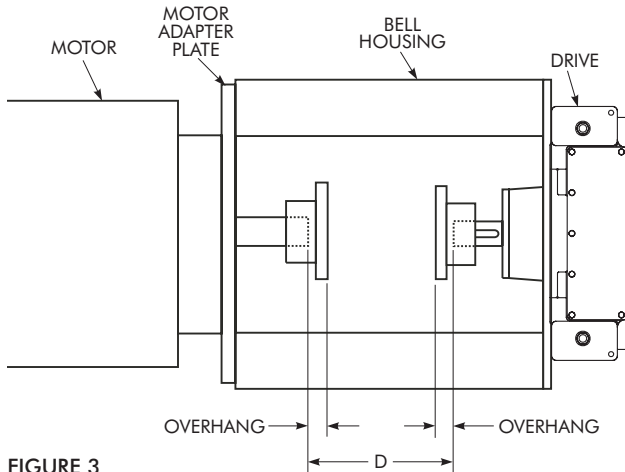


FIGURE 3

**Lifting the Alignment Free Drive**

Lifting points are provided on the corners of the motor side of the bell housing, see Figure 4. Lift by these and the provisions provided on the drive housing itself to maneuver the drive. DO NOT lift by the motor lifting eye.

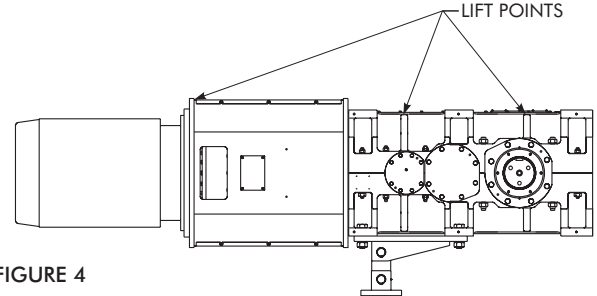


FIGURE 4

**Mounting the Drive**

Mount the Alignment Free Drive to the driven equipment per Page 2. The torque arm must be located on the extension side of the drive at the foot as shown in Figure 5. Connect the torque arm to the foundation per the torque arm installation instructions.

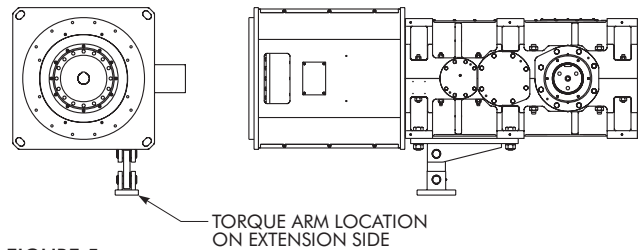


FIGURE 5

## Electric Fan Installation & Maintenance

### Installation

The installation and troubleshooting of electric cooling fans are to be carried out by a qualified electrician according to the applicable local, state, province and federal codes. Inspect for any damage that may have occurred during transit. Check all bolts, screws, set screws, etc. Re-tighten as required. Before installing, rotate the blade to be sure it does not rub. Adjust if necessary. Before installation, read the entire manual carefully.

This guide is pertinent only to electric fans furnished by the Factory and manufactured by Multifan Inc. (can be verified from nameplate on the electric fan). In the event the electric fan furnished by the Factory is of a special nature (manufactured by an alternate fan manufacturer), please contact the Factory for appropriate electric fan installation and maintenance instructions.

### General Safety Information

**Warning:** To reduce the risk of fire, electric shock, or personal injury, observe the following:

1. Use this electric fan only in the manner intended by the manufacture. If you have any questions, contact the Factory.
2. Before servicing or cleaning the fan, switch the power off at the service panel and lock out to prevent the power from being switched on accidentally.
3. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and Occupational Safety and Health Act (OSHA).
4. Fan motor must be securely and adequately grounded.
5. All working parts should be grounded.
6. When cleaning electrical equipment always use an approved cleaning agent. See CLEANING in NOTES section, Page 18.
7. For general ventilation and cooling use only. DO NOT use if hazardous or explosive materials and vapors are present.

### Guidelines For Installation

Before connecting the electric fan, check if the information on the fan motor name plate is in accordance with the actual main supply voltage, phase and frequency.

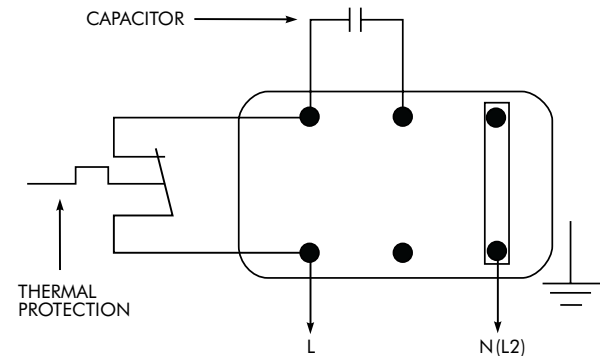
**Warning:** To reduce the risk of fire, electric shock, or personal injury, observe the following:

1. Switch off the main power supply and lock out before installing, servicing or making connections to the fan.
2. Installation work and electrical wiring must be done by a qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
3. The fan should be securely mounted. Recheck the mounting hardware and tighten as necessary.
4. The fan motor must always be grounded. The installation of a motor protection switch is recommended. See Figure 1 for wiring diagrams.
5. Mount the motor guard if removed. The motor guard must be installed at all times during operation to prevent injury to personnel by rotating fan blade.
6. Use liquid tight electrical fittings and conduit.

FIGURE 1

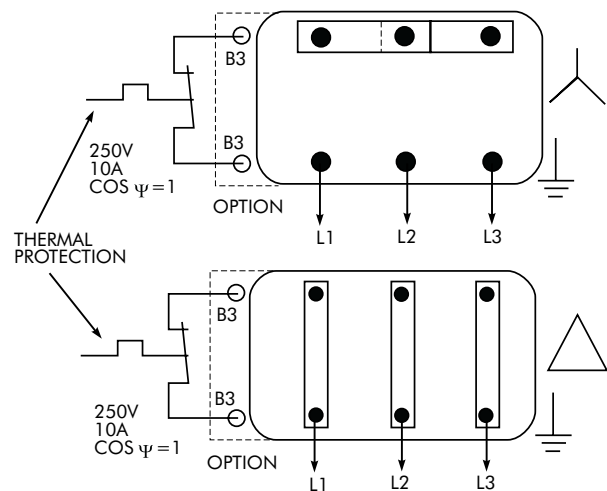
#### SINGLE PHASE TYPE - E

1 PHASE 220V - 50Hz
1 PHASE 240V - 50Hz
1 PHASE 110V - 60Hz
1 PHASE 220V - 60Hz
1 PHASE 240V - 60Hz



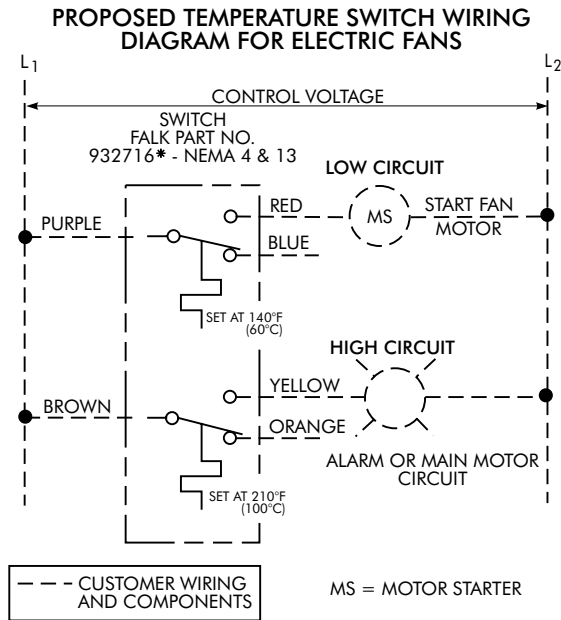
#### THREE PHASE TYPE - D

3 PHASE	$\Delta$ / $\star$
3 PHASE 220/380V - 50Hz	
3 PHASE 230/400V - 50Hz	
3 PHASE 240/415V - 50Hz	
3 PHASE 220/380V - 60Hz	
3 PHASE 208/360V - 60Hz	
3 PHASE 265/460V - 60Hz	



7. A temperature switch is provided to control oil sump temperature. See Figure 2 for proposed wiring. There are two separate circuits in the temperature switch. The low circuit is to operate the electric fan. It is recommended the fan motor be operated by the temperature switch through a motor starter relay (consult applicable local and national electrical codes). The high circuit is provided to operate either a high temperature alarm or main motor shutdown.

FIGURE 2



\* AC RATING - INDUCTIVE LOAD - 50% PF  
DC RATING - INDUCTIVE LOAD - L/R = 0.26

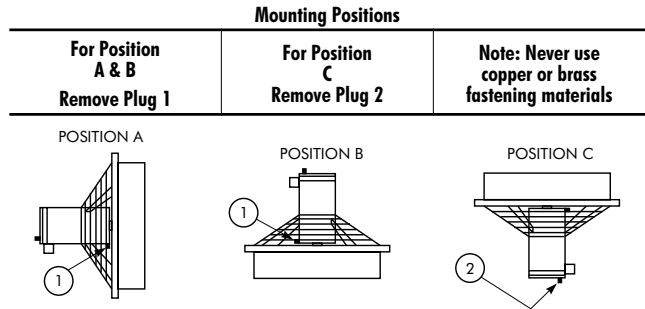
AC VOLTS	AMP	DC VOLTS	AMP
125	15	6-12**	15
250	15	24**	5
480	15	125	0.05
		250	0.03

\* MAXIMUM CONTINUOUS CURRENT  
\*\*Reference only.

- 8. Connect power to the motor using an approved wiring method. See Figure 1 for connection diagrams.
- 9. Before starting the fan, double-check to ensure there are no obstructions that could interfere with proper fan operation and airflow. Verify proper fan rotation, resulting in air flow directed at the adjacent face of the gear drive.

10. Remove proper condensation plug. See Figure 3 below. Do not discard. Plug is to be used during cleaning.

FIGURE 3



NOTES:

**AIR SUPPLY AND TEMPERATURE** — Sufficient air supply over the motor must be assured in all circumstances. Limits of operating ambient temperature are 14°F to 113°F (-10°C to 45°C).

**RESTRICTION ON USE** — Fan blade material is Polypropylene which is unsuitable and/or not recommended for certain chemicals. The following is a partial list of unsuitable chemicals for guideline purposes.

Chloro-Sulphonic Acid	Nitric Acid	Chloroform
Mixture of HNO3-HCL	Esters	1:2 Dichloroethylene
Mixture of HNO3-H2SO4	Benzene	Trichloroethylene
Sulfuric Acid, fuming	Gasoline	Diethyl Ether
Carbon Tetrachloride	Toluene	Chlorine, Liquid
Chlorobenzene	Xylene	

**CLEANING** — When cleaning fan, both condensation holes (Figure 3, Items 1 and 2) are to be temporarily plugged. If this is not done, guarantee is void. When cleaning electrical equipment, always use an approved cleaning agent.