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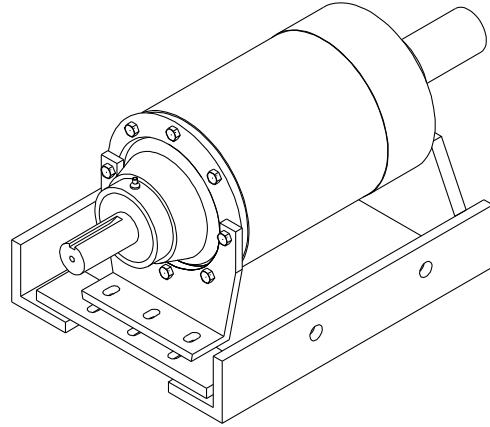
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Section I — Introduction

The following instructions apply to Mercury and Mars Planetgear™ 7000 Speed Reducers. To assure long life and performance of the Planetgear 7000 speed reducers, the following practices should be followed.

1.1 BASIC OPERATION AND DESIGN

The Planetgear 7000 unit is a concentric shaft speed reducer that uses a simple planetary design, which utilizes a sun gear as the input, a ring gear as the fixed element, and a planetary carrier as the output. Power is transmitted from the reducer input shaft, through a splined connection to the input gear (sun gear) of the first reduction. The input gear drives the planet gears, which in turn drive the planetary carrier assembly. This carrier assembly is then connected to the next reduction sun gear or to the output shaft through a splined connection. Each carrier represents a single reduction. The reducer output shaft rotates in the same direction as the input shaft, regardless of the number of reductions. Reference Figure 1.2 for a detailed representation.

All gearing has been made of a high grade alloy steel and case hardened for maximum life. Three points of contact, with a minimum of six gear teeth engaged allow for a smooth transmission of power during normal operation and under extreme spike loads. Self contained input and output shaft assemblies use a double row of tapered roller bearings mounted to a steel alloy shaft to provide high overhung and thrust load capacity. This feature also keeps all external shaft forces isolated from the gearing. Included in both shaft assemblies are two seals with a grease purgeable cavity between them. This design prevents contamination from entering the gear reducer under extreme conditions. The input shaft assembly also has the ability to add a backstop option to eliminate reducer counter rotation when the input driver is shut off.

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1.2 SECTIONAL VIEW AND COMPONENT IDENTIFICATION Reference Figure 1.2

1.3 NAMEPLATE INFORMATION

Note location of serial number and model number on nameplate. When contacting the factory, have the serial number available, as this unique number fully describes the reducer and allows for the most efficient and accurate exchange of information. Reference Figure 1.3 for name plate illustration.

Operation of the reducer shall not differ from the application data warranted on the nameplate. Any deviations from this data requires submission of new application information along with all nameplate data to the factory or service center for approval. All data changes require a revised nameplate.

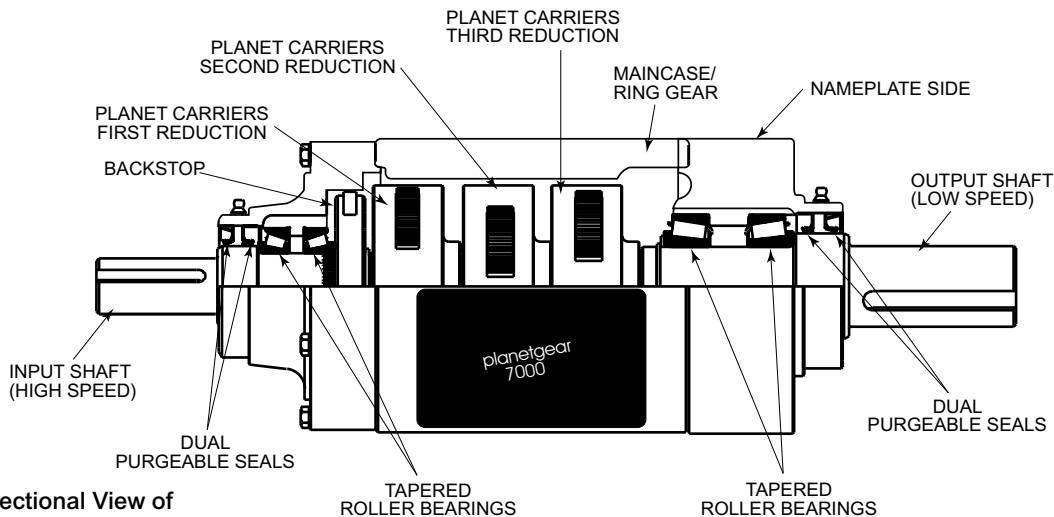


Figure 1.2 Sectional View of a Planetgear Speed Reducer

Rexnord® Planetgear™ 7000
Speed Reducers

REXNORD INDUSTRIES, LLC
WWW.REXNORD.COM

MODEL NO.

SERIAL NO.

CUST. PO.

SIZE

RPM IN

RATIO

RPM OUT

REDUCER ONLY

MAX. TORQUE OUT LB. IN.

SERVICE HP

SERVICE FACTOR

MOTORIZED REDUCER

MOTOR HP

SERVICE CLASS

DATE

OIL CAP.

APPROX. U.S. GAL.

OUTPUT SPEED	MERCURY & MARS LUBRICATION				VENUS THRU JUPITER PLUS LUBRICATION			
	AMBIENT TEMPERATURES 10°F - 80°F (-10°C - 18°C)		AMBIENT TEMPERATURES 100°F - 125°F (40°C - 52°C)		AMBIENT TEMPERATURES 10°F - 80°F (-10°C - 18°C)		AMBIENT TEMPERATURES 100°F - 125°F (40°C - 52°C)	
RPM BELOW 20	ISO-VG 100	AGMA 3	ISO-VG 150	AGMA 4	ISO-VG 150 EP	AGMA 4 EP	ISO-VG 320 EP	AGMA 6 EP
20 RPM AND ABOVE	100	3	150	4	150 EP	4 EP	220 EP	5 EP

IMPORTANT: FILL TO THE LEVEL INDICATED WITH A PREMIUM QUALITY INDUSTRIAL TYPE PETROLEUM EXTREME PRESSURE LUBRICANT (SULFUR-PHOSPHORUS TYPE) CONTAINING OXIDATION, RUST AND FOAM INHIBITORS. FOR DETAILED LUBRICATION INSTRUCTIONS, SEE LUBRICATION BULLETIN. UNDER NORMAL CONDITIONS, THE INITIAL LUBRICANT CHANGE SHOULD BE PERFORMED AFTER 250 HOURS. ALL CHANGES THEREAFTER SHOULD BE PERFORMED EVERY 2500 HOURS OR EVERY SIX MONTHS WHICHEVER COMES FIRST.

P/N 1886026201

Figure 1.3 Reducer Nameplate

158-110

January 2015

Supersedes 11-07

Rexnord
3001 W. Canal St., Milwaukee, WI 53208-4200 USA
Telephone: 414-342-3131 Fax: 414-937-4359 www.rexnord.com

Section II — Installation

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

EFFECTS OF SOLAR ENERGY — Special measures should be taken to protect drives operating in direct sunlight at ambient temperatures over 100°F (38°C). 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 reducer sump temperature from exceeding the allowable maximum oil temperature of 200°F (93°C).

2.1 HANDLING OF SPEED REDUCER

Disconnect all mounting bolts from the reducer before lifting. Use a double rope sling of ample strength, wrapped around the input and the output shafts when lifting the speed reducer; reference Figure 2.1. Reference Table 18 (Page 29) for reducer weights. Be sure the reducer is properly secured and balanced to prevent shifting during suspension.

WARNING: To avoid personal injury or product damage, never attempt to lift the reducer with an eyebolt threaded into the top of the reducer maincase.

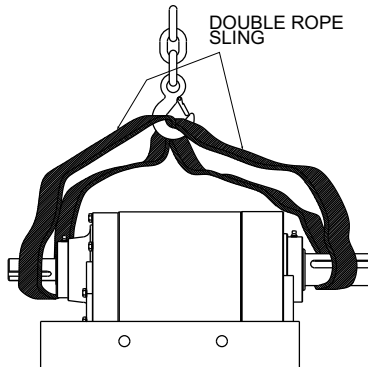


Figure 2.1 Reducer Handling

2.2 REDUCER MOUNTING

It is essential that the speed reducer be securely bolted to a solid, level, and vibration free foundation.

If the reducer mounting surface is not horizontal, refer to Table 19 (Page 29) for Maximum Allowable Tilts for Standard Reducers.

NOTE: If the reducer is tilted, the oil requirements may change.

Bolts should be of the correct size to fit mounting holes. They should be SAE Grade 5 or equivalent (Grade 8.8 or better for metric applications). Fasteners shall be torqued according to Table 18 (Page 29). The use of a rigid structural steel base-plate is strongly recommended as a foundation. If a concrete foundation is used, grout structural steel mounting pads into the concrete rather than grouting the reducer directly into the concrete. Allow the concrete to cure before torquing the reducer mounting bolts down.

Align the reducer with driven equipment by placing broad flat shims underneath all mounting pads of the reducer. Start at the low speed end and level across the length and width of the reducer. Check with a feeler gauge to make certain there is no clearance and that all pads are supported to prevent distortion of housing when reducer is bolted down. After the reducer has been aligned with the driven equipment and bolted down, align prime mover to the reducer input shaft. If the reducer is received coupled to a motor, it has been aligned properly at the factory. However, because alignment may have been disturbed during shipment, it is best to check alignment and then realign if necessary. The reliability and long life of the reducer requires careful installation of accessories and accurate alignment of the connecting shafts. Check final alignment of motor shaft, coupling, and reducer shaft after reducer is in final working position.

2.3 MOUNTING OF TRANSMISSION ACCESSORIES

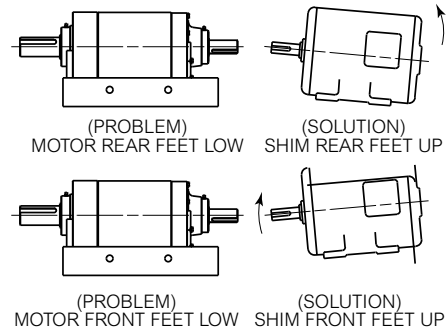
WARNING: When the Planetgear 7000 speed reducer is connected to a motor or driven equipment through the use of couplings, sprockets, gears or belt drives, all rotating parts must be properly guarded with guarding that conforms to OSHA requirements to prevent personal injury or property damage..

2.3.1a MOTORS (STANDARD UNITS)

When direct coupling motors to the Planetgear 7000 reducer, follow the four step process shown below to achieve proper motor to reducer alignment. Refer to coupling manufacture specifications to determine required alignment accuracy. Note: Steps 1 to 4 may have to be repeated several times to achieve manufacturers required accuracies.

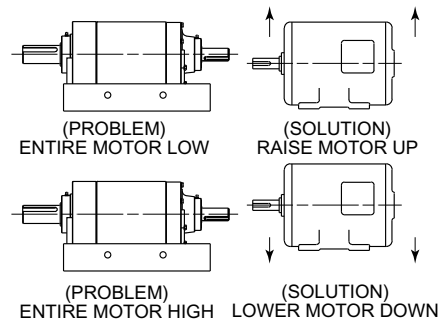
STEP 1 (Side view plane)

Correct for *angular misalignment* in the *side view* plant



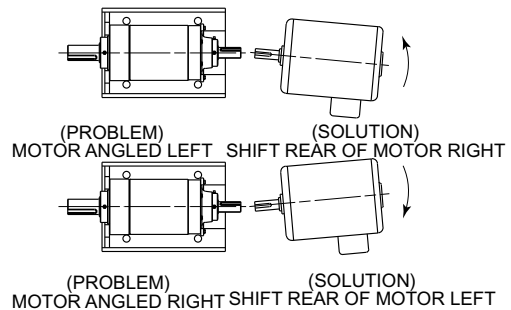
STEP 2 (Side view plane)

Correct for *parallel misalignment* in the *side view* plant



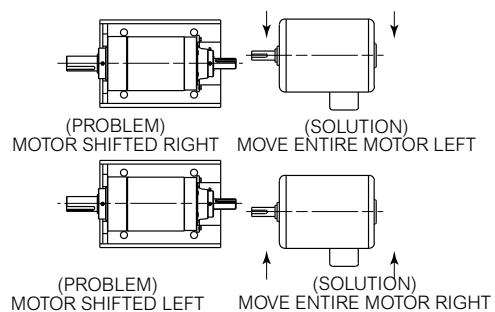
STEP 3 (Top view plane)

Correct for *angular misalignment* in the *top view* plant



STEP 4 (Top view plane)

Correct for *parallel misalignment* in the *top view* plant



2.3.1b. MOTORS (C-FACE & IEC MOTOR FLANGE UNITS)

1. Mount the reducer C-face coupling or IEC motor flange coupling onto the motor shaft with the appropriate size key. The motor shaft to coupling fit should be snug and may require light tapping (Note: Warming up the coupling and applying an Anti-seize compound to the motor shaft is helpful). Note: A loose fit coupling should be avoided and a heavy fit could damage motor bearings if the coupling is pressed onto the motor shaft with extreme force.

CAUTION: Never turn down the motor shaft diameter to allow for easy coupling installation, as this will cause coupling movement and wear during operation.

- 2.a. C-FACE: Locate the C-Face coupling 0.688 to 0.750" from the motor face (Hint: Standard keystone is helpful for this purpose). Refer to the illustration in Figure 2.3.1 b.
- 2.b. IEC MOTOR FLANGE COUPLING: Locate the coupling 13.0 to 14.0mm from the motor face. Refer to the illustration in Figure 2.3.1 c.
- 3. Tighten the coupling set screws; one located over the key and the other located at 90° (degrees). After tightening the set screws, the gap between the motor face and the coupling should be measured again to insure that the tolerance has been maintained. If the tolerance is not within the specification, loosen the set screws and repeat steps 2 and 3.
- 4. Mount the motor with coupling to the reducer. Align the internal spline end of the coupling with the external spline end of the reducer input gear.

CAUTION: Be careful not to roll the seal when installing or removing the coupling and motor. This could result in oil leakage during operation.

5. Align the mounting holes of the motor with the mounting holes of the reducer, and fasten, reference Table 18 (Page 29) for recommended bolt torques.

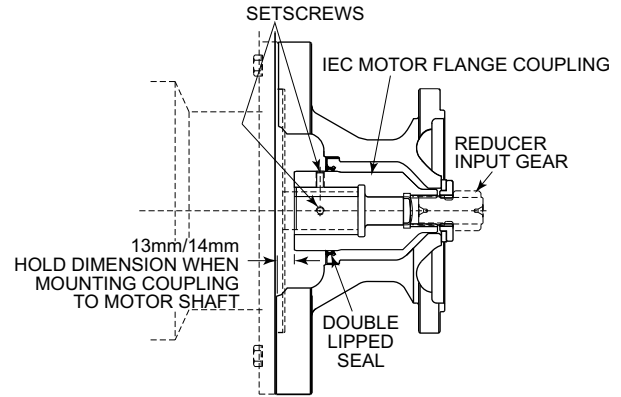


Figure 2.3.1c IEC Cross Section

2.3.2 COUPLINGS

Mount the reducer coupling hub on the input shaft and the motor coupling hub on the motor shaft as instructed in the manual shipped with the coupling. If the coupling is not a Rexnord® Omega®, refer to the manufacturers literature for installation instructions. If Rexnord does not mount the motor, the couplings are mounted for shipment only. Coupling bolts and coupling instructions are packed inside the coupling elements. Note: Prior to the installation of the element, check both coupling hubs for the required parallel and angular alignment; Reference Figure 2.3.2.

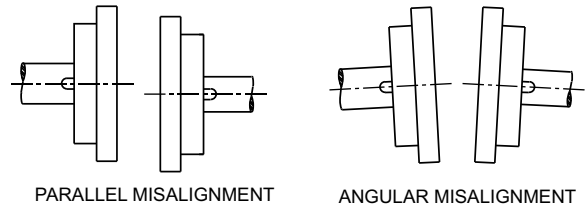


Figure 2.3.2 Parallel and Angular Misalignment

2.3.3 SPROCKETS OR SHEAVES

Prior to installing sprockets or sheaves, review the manufacturers requirements for chain or belt tension and required alignment. When mounting the sprocket or sheave to the shaft, locate it as close as possible to the reducer. This will minimize the overhung load and prolong bearing life.

When using a Planetgear 7000 top motor mount accessory, the belt tension can be changed by varying the height of the motor mount plate. This can be done by adjusting the four threaded support bolts. Reference Figure 2.3.3.

NOTE: Mount sheaves and belts as close to the reducer as possible to avoid undue overhung loading on the bearings.

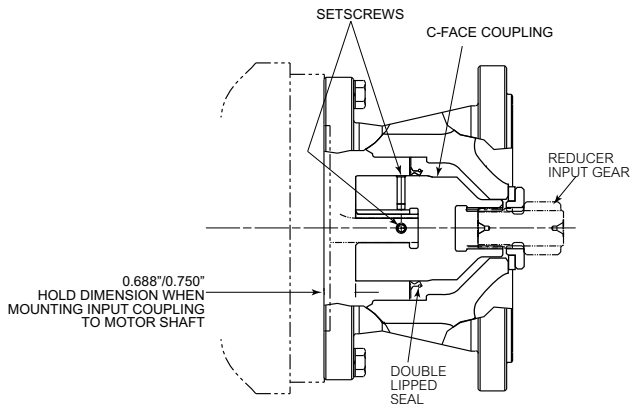


Figure 2.3.1b C-Face Cross Section

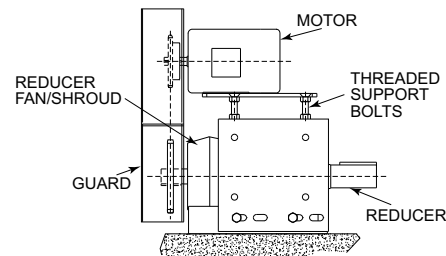


Figure 2.3.3 Planetgear Top Motor Mount

Section III — Lubrication

INTRODUCTION

Carefully follow instructions on the drive nameplate, warning tags and installation manuals furnished with the drive. Failure to follow instructions will void warranty.

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

Summary of allowable lubricant types by unit size can be found in Table 1

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

TABLE 1 — Summary Of Allowable Lubricant Types For Planetgear Footmounted Units *

UNIT SIZE	Allowable Lubricant Types
Mercury	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Mars	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Venus	Extreme Pressure, Micropitting Resistant
Atlas	Extreme Pressure, Micropitting Resistant
Luna	Extreme Pressure, Micropitting Resistant
Earth	Extreme Pressure, Micropitting Resistant
Polaris	Extreme Pressure, Micropitting Resistant
Delta	Extreme Pressure, Micropitting Resistant
Neptune	Extreme Pressure, Micropitting Resistant
Neptune Plus	Extreme Pressure, Micropitting Resistant
Orion	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Orion Plus	Extreme Pressure, Micropitting Resistant
Saturn	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Saturn Plus	Extreme Pressure, Micropitting Resistant
Titan	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Titan Plus	Extreme Pressure, Micropitting Resistant
Jupiter	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Jupiter Plus	Extreme Pressure, Micropitting Resistant

* Follow recommendations found in the Lubrication Section of this manual.

LUBRICANT SELECTION PROCESS

1. Refer to Table 4 or 5 for proper lubricant viscosity grade based on ambient temperature range.
2. Refer to Table 2 for summary of lubricant types.
3. Using proper lubricant table and viscosity grade, select desired lubricant manufacturer and name.
4. Refer to Table 3 for approximate oil capacity to purchase.

VISCOSITY (IMPORTANT)

The proper viscosity grade for petroleum-based lubricant is found in Table 4. For synthetic lubricant viscosity grades, refer to Table 5 and the "Synthetic Lubricants" paragraphs. Viscosity grade is determined by ambient air temperature in the immediate vicinity of the gear drive. Lubricant selections must have a pour point at least 10°F (5.5°C) below the expected minimum ambient starting temperature.

TABLE 2 — Summary of Lubricant Type and Greases

Petroleum-Based		
R & O Inhibited See Table 6A	Extreme Pressure (EP) See Table 6B	Micropitting Resistant See Table 6C
Synthetic Lubricant, Polyalphaolefin Type (PAO)		
R & O Inhibited See Table 7A	Extreme Pressure (EP) See Table 7B	Micropitting Resistant See Table 7C
Conventional Grease		
See Table 8		
Food Grade Lubricant & Grease		
See Page 10		

LUBRICANT TYPES

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

SYNTHETIC-BASED LUBRICANTS (TABLES 7A, 7B & 7C) — Synthetic lubricants of the polyalphaolefin (PAO) type are recommended for cold climate operation, high temperature applications, extended temperature range (all season) operation and/or extended lubricant change intervals. The proper viscosity grade of lubricants is given in Table 5. Usable temperature ranges can sometimes be widened if specific application conditions are known.

WARNING: Polyalkylene glycol (PAG) based synthetic lubricants cannot be used in Planetgear units.

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

MICROPITTING RESISTANT LUBRICANTS (TABLE 6C & 7C) — Micropitting resistant lubricants are specially developed for surface hardened gearing commonly used in modern industrial gear drives. These lubricants contain additives to resist formation of micropitting and other conventional forms of gear wear. Generally these lubricants are available in limited number of viscosities.

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

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

OIL LEVELS

From the nameplate or the oil capacity chart below, determine the quantity of oil needed. Fill reducer to the oil fill plug as described in the Maintenance section (Section V) for horizontally mounted units or the Vertical Service section (Section VII) for vertically mounted units.

NOTE: Quantities are approximate. Always fill drive to the specified level.

TABLE 3 — Approximate Oil Capacity *

REDUCER SERIES	Reduction Type			
	S/D/T Gallons	S/D/T Liters	Quad Gallons	Quad Liters
Mercury	0.25 (0.50)	0.95 (1.90)	0.38 (0.61)	1.45 (2.30)
Mars	0.25 (0.50)	0.95 (1.90)	0.38 (0.61)	1.45 (2.30)

S= Single, D= Double, T= Triple, Quad= Quadruple

() - Vertically oriented reducers

* Quantities are approximate. Always fill drive to the specified level.

TABLE 4 — Viscosity Grade Recommendation For Petroleum-Based Lubricants

OUTPUT SPEED	AMBIENT TEMPERATURES			
	+15° to +60°F (-9° to +16°C)		+50° to +125°F (+10° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
RPM BELOW 20	100	3	150	4
20 RPM And ABOVE	100	3	150	4

LUBRICANT CHANGES

OIL ANALYSIS REPORT — Checking oil conditions at regular intervals is recommended. Analyze oil samples approximately every 1,000 hours for petroleum lubricants or every 3,000 hours for synthetic lubricants. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change petroleum or polyalphaolefin type synthetic lubricants:

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

Laboratory analysis is recommended for optimum lubricant life and gear drive performance. Oil samples should be taken from the oil level hole, not the drain hole.

PETROLEUM LUBRICANTS — In the absence of oil analysis, change gear oils every 6 months or 2,500 operating hours, whichever occurs first. Change oil more frequently when gear drives operate in extremely humid, chemical or dust laden atmospheres. In these cases, lubricants should be changed every 3 to 4 months or 1,500 to 2,000 hours. If the drive is operated in an area where temperatures vary with the seasons, change the oil

viscosity grade to suit the temperature, refer to Table 4. Lubricant suppliers can test oil from the drive periodically and recommend economical change schedules.

SYNTHETIC LUBRICANTS — In the absence of oil analysis, synthetic lube change intervals can be extended to 8,000 hours depending upon operating temperatures. Laboratory analysis is recommended for optimum lubricant life and drive performance. Change lube with change in ambient temperature, if required. Refer to Table 5.

GREASE PURGED SEALS

All drives are furnished with grease purged seals which minimize the entry of contaminants and abrasive dusts into the drive. Drives are shipped with NLGI #2 grade grease in the seal housing cavities unless otherwise specified.

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

Depending upon the degree of contamination, periodically (at least every six months), purge contaminated grease from seals by slowly pumping fresh bearing grease through the seal, **WITH HAND GREASE GUN**, until fresh grease flows out along the shaft. Wipe off purged grease.

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

WARNING: Greases in Table 8 contain harmful substances and are not allowed in the food processing industry. If grease could contaminate the product, as in the food and drug industries, the grease originally supplied with gear drive must be removed and replaced with a grease listed in Table 14. Simply purging grease with a grease gun will not remove all grease and cross-contamination will likely occur. Grease registered as H1 by NSF, (National Sanitation Foundation) is suitable for food processing applications.

STORED & INACTIVE GEAR DRIVES

Refer to Section VIII (Storage Procedures) for details on stored & inactive gear drives.

TABLE 8 — Conventional Grease ▲ For Grease Purged Seals

0° to +200°F (-18° to +93°C)

Manufacturer	Lubricant
Chevron / Texaco / Caltex	Multifak EP 2
Citgo Petroleum Corp.	Lithoplex RT 2 Premium Lithium EP 2
ExxonMobil / Esso	Mobilux EP 2
Petro-Canada Lubricants	Precision General Purpose EP2
Phillips 66 / Conoco / 76 Lubri-cants / Kendall	Multiplex Red
Shell Oil Co.	Gadus S2 V100 - 2
Total Lubricants USA / Keystone Div. Penwalt Corp.	Multis 2 or Multis EP 2

▲ Not suitable for food grade applications.

Grease application or re-lubrication should be done at temperatures above 20°F. If grease must be applied below 20° F consult factory or lubricant supplier for recommendations.

TABLE 5 — Viscosity Grade Recommendation For Synthetic Lubricants

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

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

ISO Viscosity Grade	100	150
AGMA Viscosity Grade	3	4
Viscosity cSt @ 40°C ■	90-110	135-165
Viscosity SSU @ 100°F	417-510	626-765
Manufacturer	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Hyspin AWS 100 Castrol Paradene R&O 100 Castrol Paradene AW 100	Hyspin AWS 150 Castrol Paradene R&O 150 Castrol Paradene AW 150
Chevron / Texaco / Caltex	Rando HD 100	Rando HD 150
Citgo Petroleum Corp.	Pacemaker T 115	Pacemaker T 150
Exxon Mobil / Esso	DTE Heavy Oil Vacuoline 525	DTE Oil Extra Heavy Vacuoline 528
Petro-Canada Lubricants	TurboFlo R&O 100	TurboFlo R&O 150
Phillips 66 / Conoco / 76 Lubricants / Kendall	Multipurpose R&O 100	Multipurpose R&O 150
Shell Oil Co.	Morlina S2 B 100	Morlina S2 B 150
Total Lubricants USA / Keystone Div. Penwalt Corp.	Azolla ZS 100	Cirkan ZS 150
Whitmore Manufacturing Company	Hyperion 100	Hyperion 150

▲ Minimum viscosity index of 90.

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

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

ISO Viscosity Grade	100	150
AGMA Viscosity Grade	3	4
Viscosity cSt @ 40°C ◆	90-110	135-165
Viscosity SSU @ 100°F	417-510	626-765
Manufacturer	Lubricant Name	Lubricant Name
Castrol Industrial Lubricants	Alpha SP 100	Alpha SP 150
Chevron / Texaco / Caltex	Meropa 100 ---	Meropa 150 Ultra Gear 150
Citgo Petroleum Corp.	EP Compounds 100	EP Compounds 150
Exxon Mobil / Esso	Mobilgear 600 XP 100	Mobilgear 600 XP 150
Kluber Lubrication	Kluberoil GEM 1 N 100	Kluberoil GEM 1 N 150
Petro-Canada Lubricants	Enduratex EP 100	Enduratex EP 150
Phillips 66 / Conoco / 76 Lubricants / Kendall	Extra Duty Gear Oil 100	Extra Duty Gear Oil 150
Shell Oil Co.	Omala S2 G 100	Omala S2 G 150
Total Lubricants USA / Keystone Div. Penwalt Corp.	Carter EP 100	Carter EP 150

▲ Minimum viscosity index of 90.

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

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

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

▲ Minimum viscosity index of 90.

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

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

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

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

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

♦ Minimum viscosity index of 120.

TABLE 7B — Synthetic PAO (Polyalphaolefin) EP (Extreme Pressure) Lubricants ▲

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

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

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

TABLE 7C — Synthetic PAO (Polyalphaolefin) Micropitting Resistant Lubricants ▲

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

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

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

FOOD GRADE LUBRICANTS

Guidance for selecting petroleum-based and synthetic-based food grade lubricants are shown below in Table 9. For general lubrication guidelines, refer to the first part of the “Lubrication Recommendation” section.

FOOD GRADE LUBRICANT SELECTION PROCESS

1. Refer to Table 10 and 11 for proper lubricant viscosity grade based on ambient temperature range.
2. Refer to Table 9 for summary of lubricant types.
3. Using proper lubricant table and viscosity grade, select desired lubricant manufacturer and name.
4. Refer to Table 3 for approximate oil capacity to purchase.

TABLE 9 — Summary of Food Grade Lubricants and Greases

Petroleum-Based	
R & O Inhibited See Table 12A	Extreme Pressure (EP) See Table 12B
Synthetic Lubricant, Polyalphaolefin Type (PAO)	
R & O Inhibited See Table 13A	Extreme Pressure (EP) See Table 13B
Food Grade Grease	
See Table 14	

FOOD GRADE LUBRICANTS (TABLES 12A, 12B, 13A & 13B) — Food grade lubricants are a class of lubricants registered as H1 by NSF (National Sanitation Foundation). They contain base stock and additives which comply with Food and Drug Administration Title 21 CFR 178.3570 regulations for lubricants with incidental food contact. Base stock can be petroleum oil or different types of synthetic lubricant. Food grade lubricants are not the same as biodegradable or environmentally friendly lubricants.

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

Tables 12A, 12B, 13A 13B & 14 list food grade lubricants that have performance properties meeting Rexnord specifications. They are not exclusive recommendations but serve as a guide for making proper lubricant selections.

CLIMATE CONDITIONS — Ambient temperature in immediate vicinity of gear drive is very important for determining viscosity grade. Table 10 provides viscosity grade selections for petroleum-based lubricants. See Table 11 for synthetic lubricants.

LUBRICANT CHANGES

OIL ANALYSIS REPORT (FOOD GRADE) — Checking oil conditions at regular intervals is recommended. Sample

oil for analysis approximately every 1,000 hours for petroleum food grade lubricants or every 3,000 hours for synthetic food grade lubricants. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change petroleum or polyalphaolefin type synthetic food grade lubricants:

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

Laboratory analysis is recommended for optimum lubricant life and gear drive performance. Oil samples should be taken from the oil level hole, not the drain hole.

PETROLEUM LUBRICANTS (FOOD GRADE) — In the absence of oil analysis, change gear oils every 6 months or 2,500 operating hours, whichever occurs first. Change oil more frequently when gear drives operate in extremely humid, chemical, or dust laden atmospheres. In these cases, lubricants should be changed every 3 to 4 months or 1,500 to 2,000 hours. If the drive is operated in an area where temperatures vary with the seasons, change the oil viscosity grade to suit the temperature, refer to Table 10. Lubricant suppliers can test oil from the drive periodically and recommend economical change schedules.

SYNTHETIC LUBRICANTS (FOOD GRADE) — In the absence of oil analysis, synthetic lube change intervals can be extended to 8,000 hours depending upon operating temperatures. Laboratory analysis is recommended for optimum lubricant life and drive performance. Change lube with change in ambient temperature, if required. Refer to Table 11.

TABLE 10 — Viscosity Grade Recommendation for Food Grade Petroleum-Based Lubricants

OUTPUT SPEED	AMBIENT TEMPERATURES			
	+15° to +60°F (-9° to +16°C)		+50° to +125°F (+10° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
RPM BELOW 20	100	3	150	4
20 RPM And ABOVE	100	3	150	4

TABLE 11 — Viscosity Grade Recommendation for Synthetic Lubricants

Ambient Temperature Range	Cold Climates				Normal Climates			
	-30° to +10°F (-34° to -12°C)		-15° to +50°F (-26° to -10°C)		0° to +80°F (-18° to +27°C)		+10° to +125°F (-12° to +52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA
RPM BELOW 20	32	0	68	2	150	4	320	6
20 RPM And ABOVE	32	0	68	2	150	4	220	5

TABLE 12A — Food Grade Petroleum-Based R & O (Rust & Oxidation) Inhibited Lubricants – NSF (National Sanitation Foundation) H1 Registered
 Maximum Operating Temperature of Lubricants 200°F (93°C)

ISO Viscosity Grade	100	150
AGMA Viscosity Grade	3	4
Viscosity cSt @ 40°C ▲	90-110	135-165
Viscosity SSU @ 100°F	417-510	626-765
Manufacturer	Lubricant Name	Lubricant Name
Bel-Ray Company, Inc.	---	No-Tox Gear Oil ISO 150
Kluber Lubrication	Paraliq P 100	Paraliq P 150
Lubriplate Lubricants Co.	Lubriplate FMO 500-AW	Lubriplate FMO 900-AW

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

TABLE 12B — Food Grade Petroleum-Based EP (Extreme Pressure) Type Lubricants – NSF (National Sanitation Foundation) H1 Registered
 Maximum Operating Temperature of Lubricants 200°F (93°C)

ISO Viscosity Grade	100	150
AGMA Viscosity Grade	3	4
Viscosity cSt @ 40°C ▲	90-110	135-165
Viscosity SSU @ 100°F	417-510	626-765
Manufacturer	Lubricant Name	Lubricant Name
Petro-Canada	Purity FG EP 100	Purity FG EP 150
Total Lubricants USA, Inc.	Nevastane EP 100	Nevastane EP 150

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

TABLE 13A — Food Grade Synthetic PAO (Polyalphaolefin) R&O (Rust & Oxidation) Inhibited Lubricants – NSF (National Sanitation Foundation) H1 Registered
 Maximum Operating Temperature of Lubricants 200°F (93°C)

ISO Viscosity Grade	32	68	150	220	320
AGMA Viscosity Grade	0	2	4	5	6
Viscosity cSt @ 40°C ▲	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Viscosity SSU @ 100°F	134-164	284-347	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name	Lubricant Name
ExxonMobil	Mobil SHC Cibus 32	Mobil SHC Cibus 68	Mobil SHC Cibus 150	Mobil SHC Cibus 220	Mobil SHC Cibus 320
Kluber Lubrication	Kluberoil 4 UH1 N 32	Kluberoil 4 UH1 N 68	Kluberoil 4 UH1 N 150	Kluberoil 4 UH1 N 220	Kluberoil 4 UH1 N 320
Lubriplate Lubricants Co.	Lubriplate SFGO Ultra 32	Lubriplate SFGO Ultra 68	Lubriplate SFGO Ultra 150	Lubriplate SFGO Ultra 220	Lubriplate SFGO Ultra 320
Total Lubricants USA, Inc.	Nevastane SL 32	Nevastane SL 68	Nevastane SL 150	Nevastane SL 220	Nevastane SL 320

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

TABLE 13B — Food Grade Synthetic PAO (Polyalphaolefin) EP (Extreme Pressure) Lubricants – NSF (National Sanitation Foundation) H1 Registered
 Maximum Operating Temperature of Lubricants 200°F (93°C)

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

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

GREASE PURGED SEALS

All drives are furnished with grease purged seals which minimize the entry of contaminants and abrasive dusts into the drive. Drives are shipped with NLGI #2 grade grease in the seal housing cavities unless otherwise specified.

Whenever changing oil in the drive, purge the seals with one of the NLGI #2 grade greases listed in Table 14. Depending on degree of contamination, periodically (at least every 6 months), purge the contaminated grease from seals by slowly pumping fresh bearing grease through the seal, **WITH HAND GREASE GUN**, until fresh grease flows out along the shaft. Wipe off purged grease.

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

Greases in Table 8 contain harmful substances not allowed in the food processing industry. If grease could contaminate the product, as in the food and drug industries, the grease originally supplied with gear drive must be removed and replaced with a grease listed in Table 14. Simply purging grease with grease gun will not remove all grease and cross-contamination will likely occur. Grease registered as H1 by NSF, (National Sanitation Foundation) is suitable for food processing applications.

STORED AND INACTIVE GEAR DRIVES

See Storage Procedures (Section VIII).

Prior to shipment from the factory, all Rexnord enclosed drives are protected internally against corrosion with rust preventative oil. When ordered for Long Term Storage, a vapor phase rust inhibitor may also be added.

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

TABLE 14 — Food Grade Grease For Grease Purged Seals
0° to +200°F (-18° to +93°C)

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

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

Section IV — Start-up

WARNING: Never operate the speed reducer at speeds and/or loads that exceed the limits specified on the nameplate. Exceeding these limits may result in personal injury or machinery damage. Check to insure that all rotating equipment is properly guarded according to OSHA standards.

CAUTION: All speed reducers are shipped without oil but may have been treated with a rust preventative oil. A vapor phase inhibitor may also be added. Be sure to fill the unit to the proper level prior to start-up.

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

CAUTION: When starting up new equipment, proceed cautiously.

4.1 PRE START-UP CHECKLIST

- ① Has the reducer been filled with the proper oil type and to the correct oil level?
- ② Are all mounting bolts high strength ANSI 818.2.1 Grade 5 or ISO 898/1 Grade 8.8 and tightened according to torque specifications in Table 18 (Page 29)?
- ③ Are all input and output shaft couplings, sprockets, pinions, etc. mounted with full engagement and keys in place?
- ④ Have couplings and reducer seals been properly greased?
- ⑤ Are coupling connections properly aligned and fastened?
- ⑥ Have all pipe plugs (oil fill, oil level, and oil drain) been inserted and properly tightened?
- ⑦ Have all electrical connections been made?
- ⑧ Does the motor shaft rotate in the proper direction?
- ⑨ Are all guards in place and properly secured?

4.2 INITIAL START-UP

It is recommended that all Planetgear 7000 speed reducers be run-in for a period of time before introduction to full service. This will allow the gearing to mate properly prior to being exposed to any high load conditions. The following procedure is recommended for initial start-up.

4.2.1 PRIME MOVER

The prime mover should be set up to maximize the amount of time necessary to get to the rated speed. This will avoid any instantaneous gear loads that could exceed the rating of the speed reducer or other components.

4.2.2 REDUCER ROTATION

If the reducer is equipped with an internal backstop, an arrow located on the top of the maincase will indicate the direction of rotation during operation. Make sure the motor shaft will rotate in that direction. If necessary, reverse the leads on the motor so that the proper motor direction is attained.

4.2.3 START-UP

Start the reducer under as light a load as possible. As the unit is brought up to normal operating speed, check for unusual noises, excessive vibration, or excessive heat and oil leakage. If any of these conditions exist, shut down the unit immediately and determine the cause of the problem. Refer to Section 9.0 Troubleshooting (Page 28) for assistance.

4.3 POST START-UP CHECKLIST

- ① After approximately forty hours of use, check all foundation and mounting bolts and tighten as required. Note: Always recheck alignment after tightening.
- ② The oil used in the initial start-up of a new reducer should be completely drained and replaced after 500 hours of use. A thorough cleaning of the gear case using a flushing oil should be performed to remove any foreign matter during the first oil change.

Section V — Maintenance

WARNING: DO NOT PERFORM ANY MAINTENANCE PROCEDURES WHILE REDUCER IS IN OPERATION. DOING SO MAY RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE. TO INSURE SAFETY DURING MAINTENANCE, ACTIVATE ALL ELECTRICAL AND/OR MECHANICAL LOCKOUTS.

NOTE: ALL EXTERNAL PLUMBING (PIPE NIPPLE, PIPE PLUGS, FITTINGS) ARE STANDARD NPT (NATIONAL PIPE THREAD) CONNECTIONS.

5.1 FILLING OIL

1. Chose correct oil type (reference Section 3.0).
2. Determine correct oil quantity (reference Nameplate or Section 3.0).

NOTE: Special applications may have different oil quantity requirements. Refer to the nameplate for specific oil quantity.

3. Remove oil fill plug and the oil level plug (reference Figure 5.1).

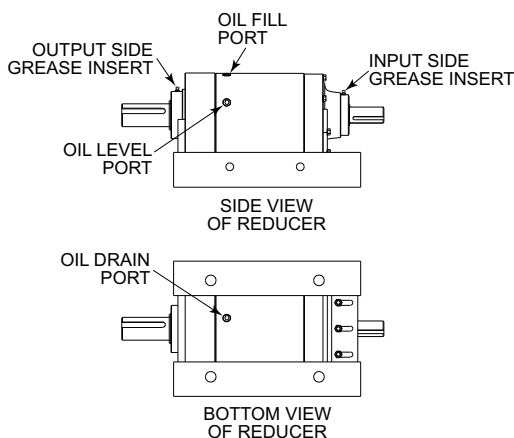


Figure 5.1 Reducer Oil Ports and Grease Insert Locations

NOTE: There are two side plugs. The oil level plug is highest from horizontal of the two.

NOTE: Reference Section 7.0 Vertical Service Instructions (Page 25).

4. Fill reducer at oil fill port.
5. Reducer oil capacity is reached when oil starts to pour out of the bottom of the oil level port. Allow several minutes for oil to settle, then recheck oil level. Add oil if necessary.

NOTE: Oil should be checked or added when reducer is at ambient temperature.

CAUTION: Underfilling reducer may cause product damage. Overfilling reducer may cause excessive oil temperatures.

6. Replace oil level plug, sealing it in the process using thread sealant.
7. Replace oil fill plug, sealing it in the process using thread sealant.

8. Start up reducer under a no load condition. Run reducer for a few minutes.
9. Stop reducer and recheck oil at the oil level port. If necessary, add oil.

5.2 DRAINING OIL

1. Clean external surfaces to avoid contaminants from entering unit when plugs are removed.
2. Remove oil fill plug for ventilation (reference Figure 5.1).

CAUTION: Care should be taken when removing the oil fill plug. The possibility of pressurized air inside the reducer may exist. Once threads are free to hand rotate, place a heavy cloth over the plug and rotate counterclockwise until removed.

3. With the proper size oil drain pan (reference oil quantity on nameplate) in place, remove the drain plug.

CAUTION: Oil may be hot. Do not drain until oil is at ambient or a safe temperature.

4. After oil is removed, replace oil drain plug, sealing it in the process using thread sealant.
5. Reference Section 5.1 for filling reducer with oil.

5.3 ADDING GREASE TO REDUCER SEALS

1. Clean grease inserts, reference Figure 5.1 for location.
2. Refer to the Lubrication section to determine the correct grease for the application. Attach grease gun to grease insert and pump grease into seal carrier.
3. Stop greasing when a sufficient amount of grease purges out of seal carrier next to shaft.

NOTE: Grease should purge from outboard seal onto shaft, if this does not occur, refer to Section 6.2 to check for proper seal installation.

4. Clean purged grease from reducer.

5.4 REPLACING SEALS IN SERVICE Reference Section 6.2 for procedure.

Section VI —Disassembly and Assembly Instructions

The following instructions are for the Mercury and Mars speed reducers. This is a guide for disassembly, parts replacement, and reassembly. Note, one drawing is used to represent the entire line of reducers and therefore may not agree in every detail. To expedite service, when ordering parts or requesting information, supply the following information: model number, reducer size, ratio, serial number, HP, motor RPM, and the build date from the reducer nameplate. No ratio change should be made without first consulting a Rexnord representative. All bearings and seals used on standard Planetgear 7000 speed reducers are listed in Table 20 and Table 21 (Page 30).

REQUIRED EQUIPMENT

Standard mechanic's tools: arbor press (hydraulic press optional), torque wrench, dial indicator with magnetic base, and hoist.

CAUTION: Always take the necessary safety precautions when working with an arbor press, hydraulic press or with any hand tools.

6.1 TAKING REDUCER OUT OF SERVICE

WARNING: DO NOT PERFORM ANY MAINTENANCE PROCEDURES WHILE REDUCER IS IN OPERATION. DOING SO MAY RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE. TO INSURE SAFETY DURING MAINTENANCE, ACTIVATE ALL ELECTRICAL AND/OR MECHANICAL LOCKOUTS.

1. Disconnect all attached equipment.
2. Remove all reducer mounting bolts.
3. Lift reducer using the double rope sling method explained in Section 2.1.
4. Drain oil from reducer, reference Section 5.2 for procedure.

NOTE: Care should be taken to protect the shafts from damage. Damaged shaft may cause problems when reinstalling couplings, sprockets, or sheaves.

6.2 REPLACING SEALS

6.2.1 REMOVING SEALS (Input/Output Sub-Assembly)

NOTE: If unit is equipped with a fan and shroud, remove fan and shroud.

1. Take reducer out of service. Reference Section 6.1 for procedure.
2. Clean shaft extensions.
3. Position reducer vertically. Reference Figure 6.2.1.1.
4. With a hammer and punch carefully pierce the outboard seal flange. Reference Figure 6.2.1.1.

CAUTION: Do not damage the seal surface on the hub. A damaged seal surface may result in leakage during reducer operation.

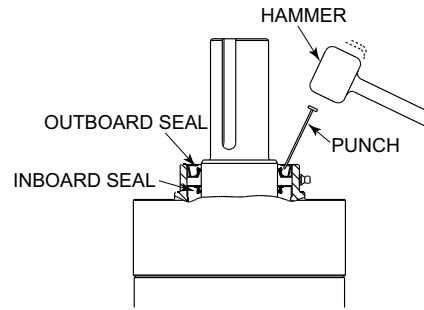


Figure 6.2.1.1 Piercing of Outboard Seal with Punch

5. From the pierced hole use the punch to pry the seal out of the housing. Reference Figure 6.2.1.2.
6. With a hammer and punch carefully pierce the inboard seal flange. Reference Figure 6.2.1.3.

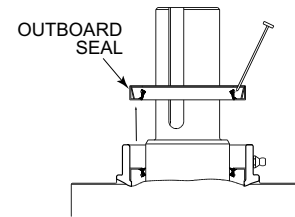


Figure 6.2.1.2 Removal of Outboard Seal

CAUTION: Do not damage the seal surface on the hub. A damaged seal surface may result in leakage during reducer operation.

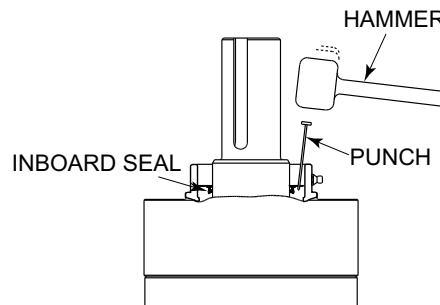


Figure 6.2.1.3 Piercing of Inboard Seal with Punch

7. From the pierced hole use the punch to pry the seal out of the housing. Reference Figure 6.2.1.4.

CAUTION: Do not allow loose particles to fall into bearings. Contamination in bearings may cause premature damage to the bearings. If contamination falls into the bearings, remove assembly and flush out bearings.

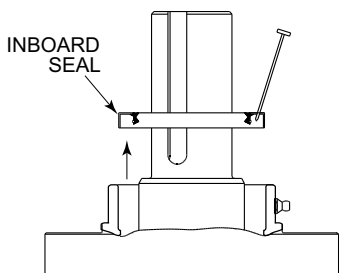


Figure 6.2.1.4 Removal of Inboard Seal]

8. Clean seal surfaces to prepare for installation of new seals.

6.2.2 INSTALLING NEW SEALS (OUTPUT ASSEMBLY)

RECOMMENDED TOOLING:

RING 2.75" I.D. x 4.00" O.D. x 3/8" THICK (70 mm I.D. x 100 mm O.D. x 9 mm THICK)

TUBE 2.75" I.D. x 3.50" O.D. x 5" MINIMUM LENGTH (70 mm I.D. x 90 mm O.D. x 130mm MIN. LENGTH)

RAE 4.50" O.D. x 3/8" THICK (115 mm O.D. x 9 mm thick)

1. Remove seals from assembly. Reference Section 6.2.1.
2. With the reducer mounted vertically, carefully place the double lipped inboard seal over the shaft with garter spring side down. Reference Figure 6.2.2.1.

CAUTION: Extreme care must be taken to not roll the lip of the seal or cut the seal on the keyway.

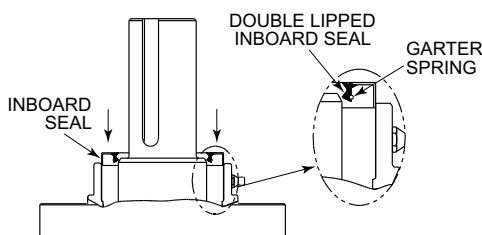


Figure 6.2.2.1 Orientation of Inboard Seal for Installation

3. Place the ring on the seal. Reference Figure 6.2.2.2.
4. Place the tube on the ring. Reference Figure 6.2.2.2.
5. Place the plate on the tube. Reference Figure 6.2.2.2.

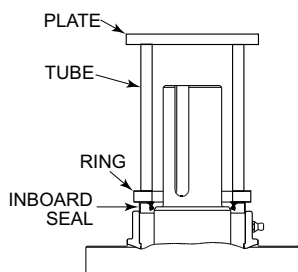


Figure 6.2.2.2 Placement of Tooling for Installation of Inboard Seal

6. With an arbor press, push the seal into the hub. Stop pressing when the ring seats on the hub.
7. Remove the tools.
8. Place the tube directly on the seal and the plate on the tube. Reference Figure 6.2.2.3.

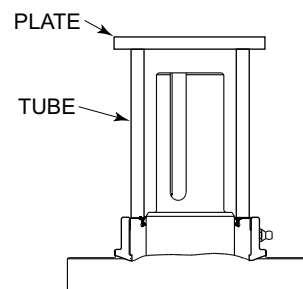


Figure 6.2.2.3 Preparation for Final Installation of Inboard Seal

9. With an arbor press, push seal into the hub. Stop pressing when seal seats fully inside the hub. Reference Figure 6.2.2.4.

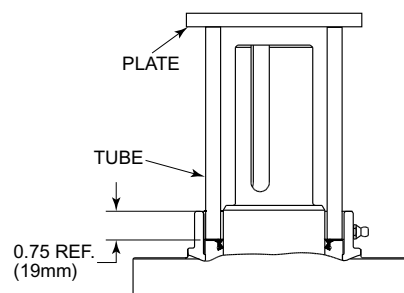


Figure 6.2.2.4 Final Installation of Inboard Seal

10. Carefully place the outboard seal over the shaft with garter spring side up. Reference Figure 6.2.2.5.

CAUTION: Extreme care must be taken to not roll the lip of the seal or cut the seal on the keyway.

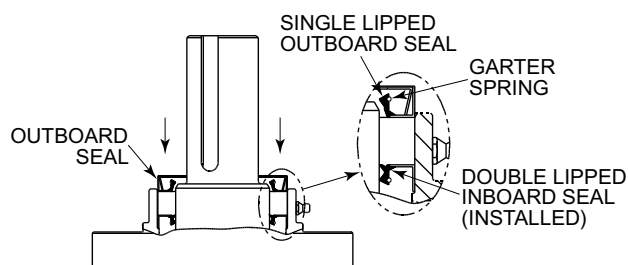


Figure 6.2.2.5 Orientation of Outboard Seal for Installation

11. Place the ring on the seal. Reference Figure 6.2.2.6.
12. Place the tube on the ring. Reference Figure 6.2.2.6.
13. Place the plate on the tube. Reference Figure 6.2.2.6.

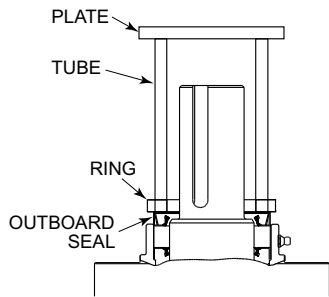


Figure 6.2.2.6 Placement of Tooling for Installation of Outboard Seal

14. With an arbor press, push the seal into the hub. Stop pressing when the ring seats on the hub.
15. Remove the tools.

6.2.3 INSTALLING NEW SEALS (INPUT ASSEMBLY) RECOMMENDED TOOLING:

RING 2.13" I.D. x 3.00" O.D. x 3/8" THICK (55 mm O.D. X 75 mm I.D. x 9 mm THICK)

TUBE 2.13" I.D. x 2.97" O.D. x 5" MINIMUM LENGTH (55mm O.D. X 75 mm I.D. x 130 mm MIN. LENGTH)

PLATE 3.50" O.D. x 3/8" THICK (90 mm O.D. X 9 mm THICK)

1. Remove seals from assembly. Reference Section 6.2.1.
2. With the reducer mounted vertically, carefully place the inboard seal over the shaft, garter spring side down. Reference Figure 6.2.3.1.

CAUTION: Extreme care must be taken to not roll the lip of the seal or cut the seal on the keyway.

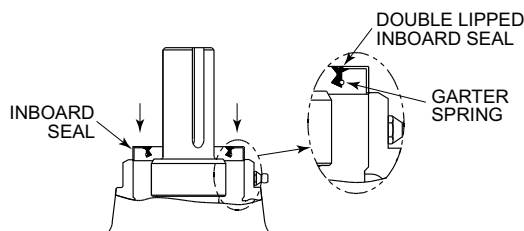


Figure 6.2.3.1 Orientation of Inboard Seal for Installation

3. Place the ring on the seal. Reference Figure 6.2.3.2.
4. Place the tube on the ring. Reference Figure 6.2.3.2.
5. Place the plate on the tube. Reference Figure 6.2.3.2.

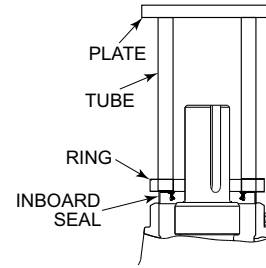


Figure 6.2.3.2 Placement of Tooling for Installation of Inboard Seal

6. With an arbor press, push the seal into the hub. Stop pressing when the ring seats on the hub.
7. Remove the tools.
8. Place the tube directly on the seal and the plate on the tube. Reference Figure 6.2.3.3.

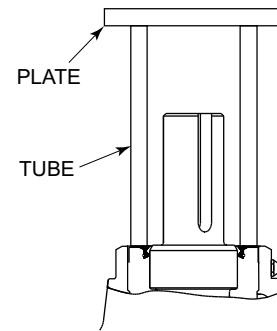


Figure 6.2.3.3 Preparation for Final Installation of Inboard Seal

9. With an arbor press, push seal into the hub. Stop pressing when seal seats fully inside the hub. Reference Figure 6.2.3.4.

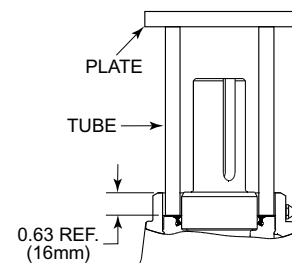


Figure 6.2.3.4 Final Installation of Inboard Seal

- Carefully place the outboard seal over the shaft, garter spring side up. Reference Figure 6.2.3.5.

CAUTION: Extreme care must be taken to not roll the lip of the seal or cut the seal on the keyway.

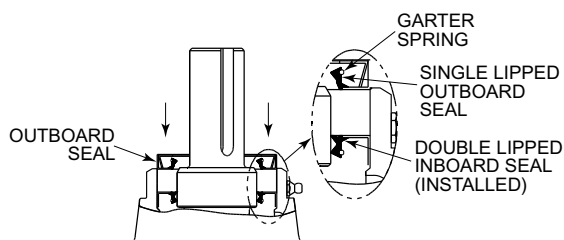


Figure 6.2.3.4 Final Installation of Inboard Seal

- Place the ring on the seal. Reference Figure 6.2.3.6
- Place the tube on the ring. Reference Figure 6.2.3.6.
- Place the plate on the tube. Reference Figure 6.2.3.6.

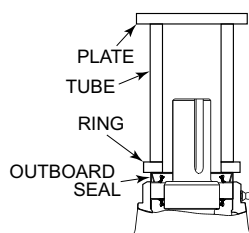


Figure 6.2.3.6 Placement of Tooling for Installation of Outboard Seal

- With an arbor press, push the seal into the hub. Stop pressing when the ring seats on the hub.
- Remove the tools.
- If unit was equipped with a fan and shroud, replace fan and shroud (reference Section 6.7, Page 24).

6.3 REPLACING BEARINGS – INPUT/ OUTPUT SHAFT ASSEMBLIES

6.3.1 REMOVING INPUT OR OUTPUT SHAFT ASSEMBLIES TO REPLACE BEARINGS

- Take reducer out of service (reference Section 6.1).
 - Clean all external surfaces to prevent contaminants from entering unit when disassembled.
 - Drain oil from unit (reference Section 5.2).
- NOTE:** For better results, mount reducer in the vertical position with the assembly to be removed facing up.
- Remove the bolts that attach assembly to the maincase.

- With a wedge or blade, break the seal between the housing and the maincase to allow for removal of the assembly.

NOTE: It is recommended that the input assembly be removed first, then the gear train, and finally the output assembly (reference Section 6.5 for additional information).

- Remove assembly by lifting it straight up away from the maincase.

CAUTION: If removing assembly by hand, care should be taken when gripping the keyway of the shaft. The keyway is very sharp and can cause serious injury.

NOTE: Place all removed parts on a clean dry surface to avoid contact with contaminants.

6.3.2 DISASSEMBLING INPUT SHAFT ASSEMBLY TO REPLACE BEARINGS

- Remove endbell from reducer. Reference Section 6.3.1.
- Support hub to expose the inboard side of the endbell. Reference Figure 6.3.2.1.

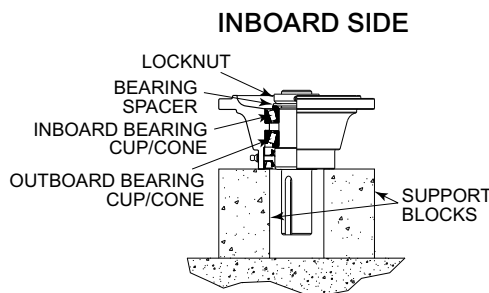


Figure 6.3.2.1 Input Endbell

NOTE: Allow space between the shaft extension and the working surface.

- Loosen set screw on locknut.
- Remove locknut from shaft. Store in clean spot.
- Remove bearing spacer from shaft. Store in clean spot.
- With an arbor press or a hydraulic press, press the inboard end of the shaft through the inboard bearing cone.
- At this time, the shaft will be free and can be separated from the housing. The inboard bearing cone will be free to remove and discard.
- To remove the outboard bearing from the shaft, one of two procedures can be used. 1.) Support the shaft by the bearing cone with the inboard end of the shaft facing up. With an arbor press or hydraulic press, press down on the inboard end of the shaft (reference Figure 6.3.2.2). 2.) With a hammer and punch, carefully strike the bearing cone towards the inboard end of the shaft (reference Figure 6.3.2.3, next page).

NOTE: Take care not to damage the shaft bearing surface or seal surface.

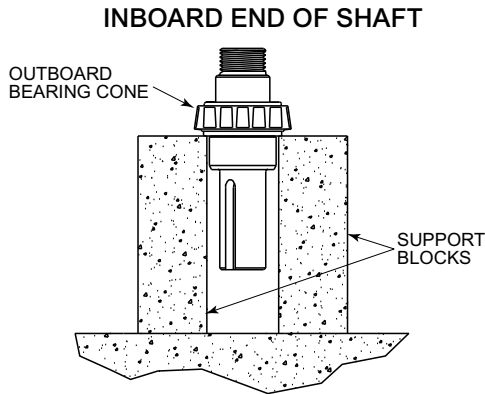


Figure 6.3.2.2 Removal of Outboard Bearing Cone (Option #1)

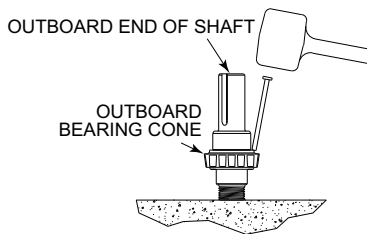


Figure 6.3.2.3 Removal of Outboard Bearing Cone (Option #2)

9. With a hammer and punch, tap out the inboard and outboard bearing cups from the housing.

NOTE: Take care not to damage the bearing surface of the housing.

6.3.3 DISASSEMBLING OUTPUT SHAFT ASSEMBLY TO REPLACE BEARINGS

1. Remove endbell from reducer. Reference Section 6.3.1.
2. Support hub to expose the inboard side of the endbell. Reference Figure 6.3.3.1.

NOTE: Allow space between the shaft extension and the working surface.

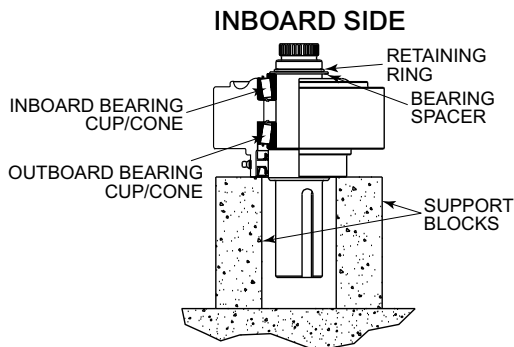


Figure 6.3.3.1 Output Endbell

3. Remove external retaining ring.
4. Remove bearing spacer. Store in a clean spot.

5. With an arbor press or a hydraulic press, press the inboard end of the shaft through the inboard bearing cone.
6. At this time, the shaft will be free from the housing and can be separated from the housing. The inboard bearing cone will be free to remove and discard.
7. To remove the outboard bearing from the shaft, two procedures can be used. 1.) Support the shaft by the bearing cone with the inboard end of the shaft facing up. With an arbor press or hydraulic press, press down on the inboard end of the shaft. Reference Figure 6.3.3.2. 2.) With a hammer and punch, carefully strike the bearing cone to knock it towards the inboard end of the shaft. Reference Figure 6.3.3.3.

NOTE: Take care not to damage the shaft bearing surface or seal surface.

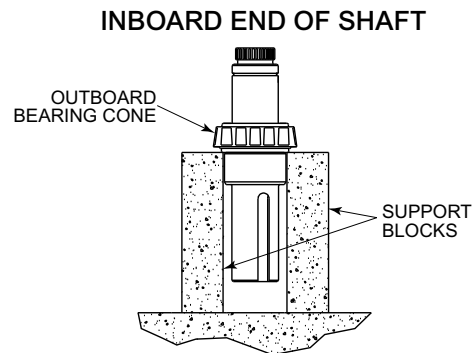


Figure 6.3.3.2 Removal of Outboard Bearing Cone (Option #1)

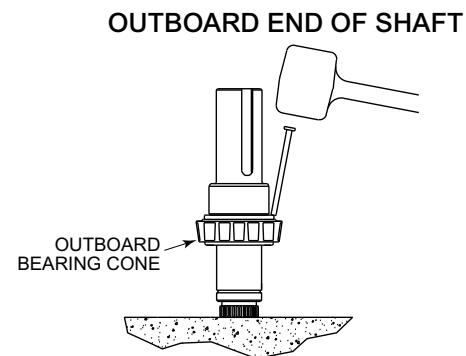


Figure 6.3.3.3 Removal of Outboard Bearing Cone (Option #2)

8. With a hammer and punch, tap out the inboard and outboard bearing cups from the housing.

NOTE: Take care not to damage the bearing surface of the housing.

6.3.4 INSTALLING BEARING CUPS INTO INPUT OR OUTPUT HOUSINGS

1. Clean machined surfaces on housing where bearing cups are located.

NOTE: If high spots or burrs occurs after disassembly, use discretion to remove them. Bearing cup has to be seated perfectly to insure proper bearing alignment.

2. Place bearing cup squarely on the bearing bore. With an arbor press or a hydraulic press and flat disc push bearing cup into housing until seated.

NOTE: This procedure applies to both inboard and outboard bearing cup. Be sure to push cups in evenly. Any misalignment may result in a damaged housing or bearing cup.

NOTE: Take care not to scratch or gauge bearing surface. Any damage done may result in premature damage of the bearings.

3. With a 0.001" or 0.040 mm feeler gage, make sure that there is no gap between the housing and the bearing cups to insure proper cup seating. Reference Figure 6.3.4a and Figure 6.3.4b.

INBOARD SIDE OF INPUT HOUSING

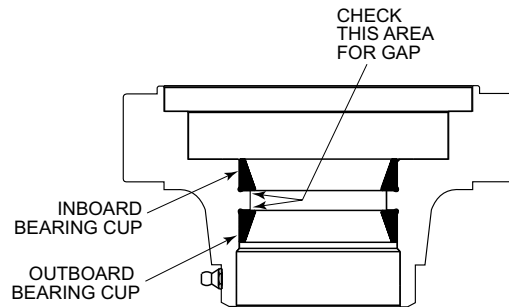


Figure 6.3.4a Installation of Bearing Cups in Input Housing

INBOARD SIDE OF OUTPUT HOUSING

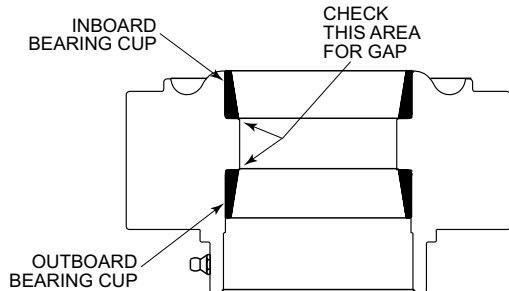


Figure 6.3.4b Installation of Bearing Cups in Output Housing

NOTE: Any gap between hub and bearing cups can result in excessive axial bearing clearance or bearing misalignment and ultimately result in premature bearing damage.

6.3.5 ASSEMBLING INPUT SHAFT ASSEMBLIES

1. Clean bearing surface on shaft. With a thread chase (18 threads per inch) chase thread where set screw was located.
2. Make sure bearing cups are clean and installed properly in housing. Reference Section 6.3.4.
3. Set shaft on end with the spline end of the shaft facing up.

CAUTION: Pilot assembly so that it will not fall over.

4. Place the outboard bearing cone squarely on the inboard end of the shaft with the smaller diameter of the bearing facing inboard. Reference Figure 6.3.5.1 (next column).

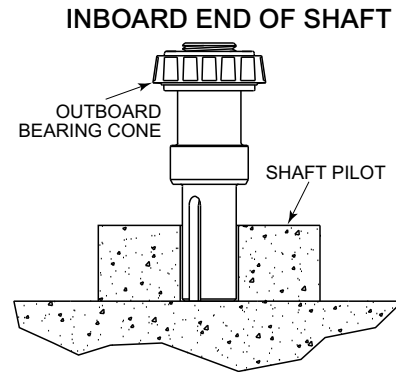


Figure 6.3.5.1 Placing Outboard Bearing Cone onto Shaft

5. With an arbor press or a hydraulic press carefully push bearing cone until it bottoms on shaft shoulder.

NOTE: DO NOT push on bearing rollers or bearing cage. Reference Figure 6.3.5.2 for location.

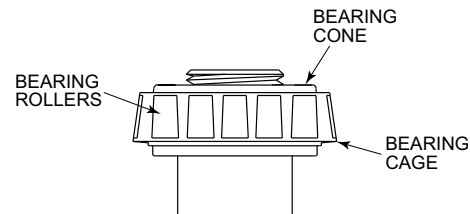


Figure 6.3.5.2 Location of Bearing Components

6. With a 0.001" or 0.040 mm feeler gage, make sure that there is no gap between the shaft shoulder and the bearing cone to insure proper cone seating. (reference Figure 6.3.5.3).

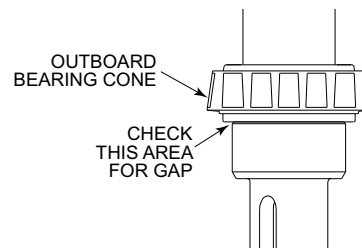


Figure 6.3.5.3 Checking for Zero Clearance with Feeler Gauge

NOTE: Any gap between shaft and bearing cone can result excessive axial bearing clearance or bearing misalignment and ultimately result in premature bearing damage.

7. Carefully set the housing, outboard side face down, onto the outboard bearings.
8. While rotating the housing on bearings, apply clean oil to the bearings.
9. Place the inboard bearing cone squarely on the inboard end of the shaft with the smaller diameter of the bearing facing the outboard. Reference Figure 6.3.5.4.

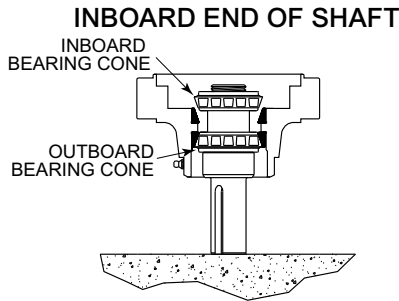


Figure 6.3.5.4 Placing Inboard Bearing Cone onto Shaft

10. With an arbor press or a hydraulic press carefully push bearing cone. When bearings begin to approach the bearing cup, apply clean oil to inboard bearings.

NOTE: DO NOT push on bearing rollers or bearing cage. Reference Figure 6.3.5.2.

11. Press inboard bearing until it touches the surface of the bearing cup.

NOTE: Do not over push bearings into cup. This might cause the bearings to Brinell the cup.

NOTE: An indication when the inboard bearing is fully seated is when the hub will not rotate on the shaft freely.

12. Clean and place the bearing spacer onto the shaft.
13. Clean locknut. Place it with the grooved side down (or groove towards bearings) and thread on locknut until it is unable to rotate.
14. Mark the location of the locknut.
15. Loosen locknut approximately 5/16" (8 mm) from original mark.
16. Tighten set screw on locknut.
17. Hold housing on its' side, and with a blunt instrument, rap on the inboard side of shaft. Reference Figure 6.3.5.5.

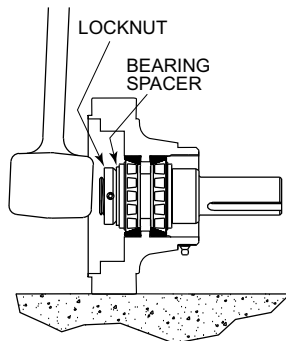


Figure 6.3.5.5 Final Assembly of Input Shaft Housing

NOTE: Shaft should be able to rotate freely at this time. Replace seals after bearing clearance has been established.

18. Reference Axial Bearing Clearance, Section 6.4 for proper bearing endplay.

6.3.6 ASSEMBLING OUTPUT SHAFT ASSEMBLY

1. Clean bearing surface on shaft.
2. Make sure bearing cups are clean and installed properly in housing. Reference Section 6.3.4.
3. Set shaft on end with the spline end of the shaft facing up.

CAUTION: Pilot assembly so that it will not fall over.

4. Place the outboard bearing cone squarely on the inboard end of the shaft with the smaller diameter of the bearing facing inboard. Reference Figure 6.3.6.1.

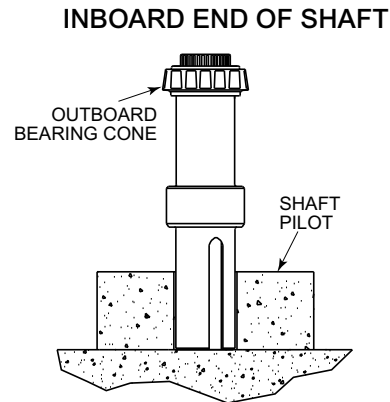


Figure 6.3.6.1 Placing Outboard Bearing Cone onto Shaft

5. With an arbor press or a hydraulic press carefully push bearing cone until it bottoms on shaft shoulder.

NOTE: DO NOT push on bearing rollers or bearing cage. Reference Figure 6.3.6.2 for location.

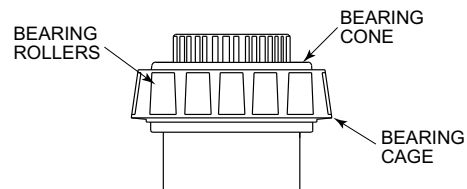


Figure 6.3.6.2 Location of Bearing Components

6. With a 0.001" or 0.040 mm feeler gage, make sure that there is no gap between the shaft shoulder and the bearing cone to insure proper cone seating. Reference Figure 6.3.6.3 next page.

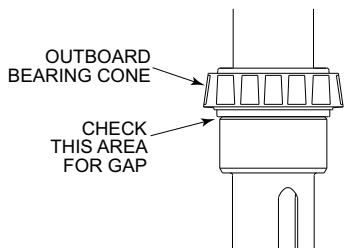


Figure 6.3.6.3 Checking for Zero Clearance with Feeler Gauge

NOTE: Any gap between shaft and bearing cone can result excessive axial bearing clearance or bearing misalignment and ultimately result in premature bearing damage.

7. Carefully set the housing, outboard side face down, onto the outboard bearings.
8. While rotating the housing on bearings, apply clean oil to the bearings.
9. Place the inboard bearing cone squarely on the inboard end of the shaft with the smaller diameter of the bearing facing the outboard. Reference Figure 6.3.6.4.
10. With an arbor press or a hydraulic press carefully push bearing cone. When bearings begin to approach the bearing cup, apply clean oil to inboard bearings.

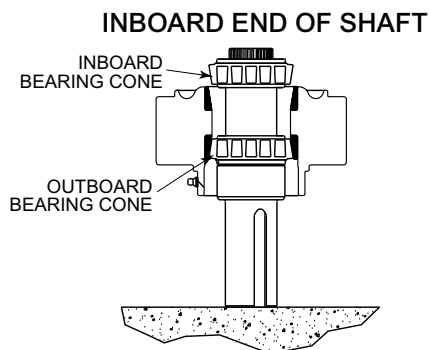


Figure 6.3.6.4 Placing Inboard Bearing Cone onto Shaft

NOTE: DO NOT push on bearing rollers or bearing cage. Reference Figure 6.3.6.2.

11. Press inboard bearing until it touches the surface of the bearing cup.

NOTE: Do not over push bearings into cup. This might cause the bearings to Brinell the cup.

NOTE: An indication when the inboard bearing is fully seated is when the hub will not rotate on the shaft freely.

12. Clean and place the bearing spacer onto the shaft.
13. Clean and attach external retaining ring on output shaft. If retaining ring was destroyed after disassembly, replace with an Eaton 1065-R retaining ring external.
14. Hold housing on its side and with a blunt instrument, rap on the inboard side of shaft. Reference Figure 6.3.6.5 (next column).

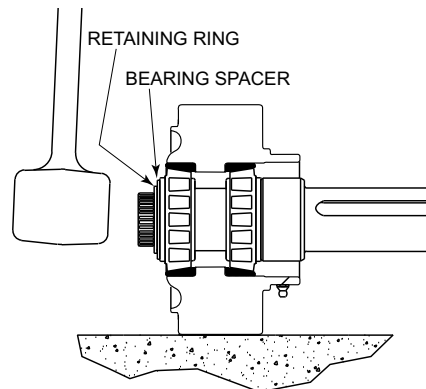


Figure 6.3.6.5 Final Assembly of Output Shaft Housing

NOTE: Shaft should be able to rotate freely at this time. Replace seals after bearing clearance has been established. No axial bearing clearance measurements need to be taken.

6.4 SETTING PROPER AXIAL BEARING CLEARANCES ON INPUT SHAFT ASSEMBLIES

6.4.1 MEASURING AXIAL CLEARANCE ON INPUT ASSEMBLY

1. Support housing to allow the shaft to rotate freely (reference Figure 6.4.1).

NOTE: Axial clearance should be checked while seals are removed.

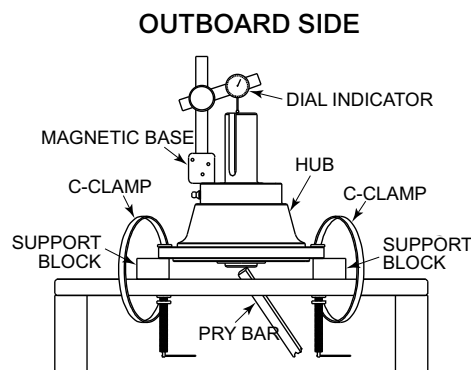


Figure 6.4.1 Setting Axial Bearing Clearance

2. Affix the hub to the support table with C-Clamps or bolting to table (reference Figure 6.4.1).
3. While exerting downward force by hand on the end of the shaft, rotate shaft 6 to 10 times to align the bearing rollers.
4. Use a dial indicator with a magnetic base to take measurements.

NOTE: Use a dial indicator that has a balanced dial with 0.0001" or 0.01mm graduations.

5. Affix the magnetic base of the dial indicator to a flat area of the housing (reference Figure 6.4.1).
6. Place the stem of the dial indicator perpendicular to the end of the shaft.

NOTE: Place stem of dial indicator as close to the center of the shaft as possible.

7. Record the reading of the dial indicator when the indicator has engaged the shaft.
8. With a pry bar, push the inboard end of the shaft up (reference Figure 6.4.1).

NOTE: Use a constant swift force when pushing on the pry bar. Excessive force not required. DO NOT rotate shaft while pushing on shaft. The object is to lift the shaft only.

9. Record reading of the dial indicator. Take the difference between the two readings. The difference is the axial bearing clearance.

NOTE: 0.001" to 0.004" (0.03 to 0.10 mm) axial bearing clearance is recommended. Do steps 3 thru 9 several times to insure an accurate measurement has been made.

10. See Sections 6.4.2 and 6.4.3 for adjusting for too much or too little axial bearing clearance.

6.4.2 ADJUSTING FOR TOO MUCH AXIAL BEARING CLEARANCE

NOTE: If axial bearing clearance is too excessive, it might be necessary to remove the locknut and spacer and press the inboard bearing again. Reference Section 6.3.5 - steps 11 to 18.

1. Loosen set screw on locknut.
2. Mark the position of the locknut.
3. Rotate locknut 1/16" to 1/8" (1.5 to 3.0 mm) in the clockwise direction from mark to tighten locknut.

NOTE: The measurement given is an estimate.

4. Tighten set screw on locknut.
5. Follow procedures in Section 6.4.1 to determine new axial bearing clearance.
6. Repeat first 5 steps if axial bearing clearance is found to be still too much.

6.4.3 ADJUSTING FOR TOO LITTLE AXIAL BEARING CLEARANCE

1. Loosen set screw on locknut.
2. Mark the position of the locknut.
3. Rotate locknut 1/16" to 1/8" (1.5 to 3.0 mm) in the counter clockwise direction from mark to loosen locknut.

NOTE: The measurement given is an estimate.

4. Tighten set screw on locknut.
5. Hold housing on its side and with a blunt instrument, rap on inboard side of shaft. Reference Figure 6.3.5.5, Page 21.

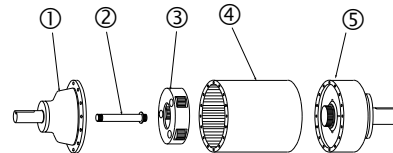
6. Follow procedures in Section 6.4.1 to determine new axial bearing clearance.
7. Repeat first 6 steps if axial bearing clearance is found still to be too little.

6.5 GEAR TRAIN DISASSEMBLY

Place gears in a clean dry place in the order of disassembly. Exploded view drawings of a specific gear train may be requested from the factory by specifying the reducer serial number, model number, size, ratio, and rating. To order replacement components, please give the previously stated information about the reducer and the items needed. Reference the following sketches for general exploded view drawings.

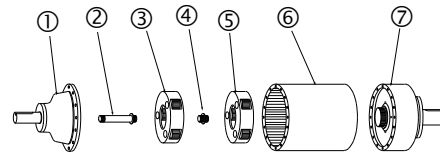
NOTE: It is recommended that the input assembly be removed first, then the gear train, and finally the output assembly.

- Single Reduction disassembly - Remove input assembly (1) from maincase (4). Remove input gear (2), and last stage carrier (3). Remove output assembly (5) from maincase.



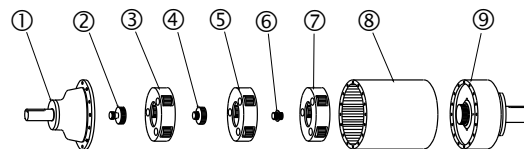
SINGLE REDUCTION

- Double Reduction disassembly - Remove input assembly (1) from maincase (6). Remove input gear (2), first stage carrier (3), last stage sun gear (4), and last stage carrier (5). Remove output assembly (7) from maincase.



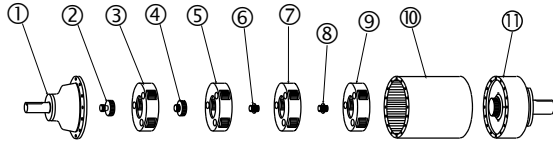
DOUBLE REDUCTION

- Triple Reduction disassembly - Remove input assembly (1) from maincase (8). Remove input gear (2), first stage carrier (3), second stage sun gear (4), second stage carrier (5), last stage sun gear (6), and last stage carrier (7). Remove output assembly (9) from maincase.



TRIPLE REDUCTION

- Quadruple Reduction disassembly - Remove input assembly (1) from maincase (10). Remove input gear (2), first stage carrier (3), second stage sun gear (4), second stage carrier (5), third stage sun gear (6), third stage carrier (7), last stage sun gear (8), and last stage carrier (9). Remove output assembly (11) from maincase.



QUADRUPLE REDUCTION

6.6 GEAR TRAIN ASSEMBLY

The gear train can be assembled in the reverse order of disassembly. Reference Section 6.5.

NOTE: It is recommended that the output subassembly be installed first, then the gear train and finally the input subassembly. Unit should be assembled in the vertical position, with input shaft up.

6.7 FAN AND SHROUD INSTALLATION

6.7.1 SHROUD CLIP INSTALLATION

- Remove mounting bolts from input subassembly / maincase in the following locations and install shroud clips (reference Figure 6.7.1a).

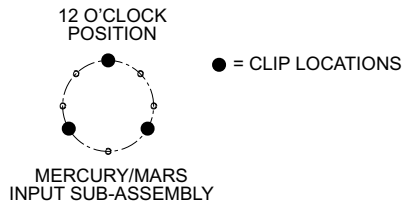


Figure 6.7.1a Location of Shroud Clips

- Align shroud clip with center of reducer (reference Figure 6.7.1 b) and tighten bolts to torque requirements of Table 18, Page 29.

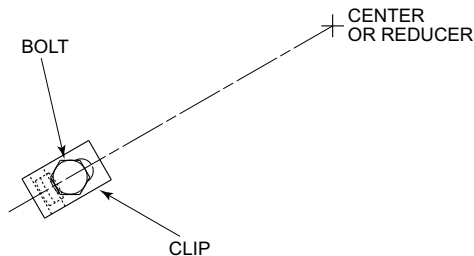


Figure 6.7.1B Location of Shroud Clips

6.7.2 FAN INSTALLATION

- From Figure 6.7.2, determine the distance from the end of the input shaft to the front edge of the fan.

REDUCER SIZE	NA Inch Shaft	NA Metric Shaft
Mercury	1.88"	48 mm
Mars	2.38"	60 mm

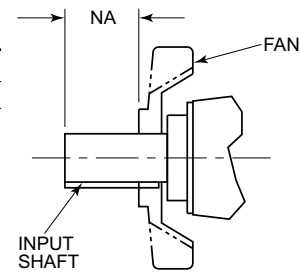


Figure 6.7.2 Dimensions for Location of Fan

- Position the fan on the input shaft to the determined "NA" distance.
- Locate the setscrew which is 90° from the keyway to the spotting hole on the shaft.
- Tighten setscrews (2). Reference Table 18, Page 29 for torque requirements.
- Install key.

6.7.3 FAN SHROUD INSTALLATION

- Position the fan shroud so that it fits tight over the shroud clips. Check to insure that when the input shaft is rotated, the fan does not interfere with the shroud. Gently bend the shroud clips to position the shroud.

NOTE: The fan shroud should be predrilled for the shroud clips.

- Using bolts and washers that were removed originally during disassembly, fasten the shroud to the shroud clips. Once fastened, rotate input shaft to insure no interference with fan.

Section VII — Vertical Service

NOTE: ALL EXTERNAL PLUMBING (PIPE NIPPLE, PIPE PLUGS, FITTINGS) ARE STANDARD NPT (NATIONAL PIPE THREAD) CONNECTIONS.

Vertical service can be either input, or output shaft up. Standard reducers are not designed for vertical applications. Modifications are made at the factory to convert a standard reducer for vertical service.

Planetgear 7000 speed reducers used in a vertical orientation or most inclined orientations require an oil reservoir lubrication system. Any mounting orientation other than horizontal must be stated at order placement so Rexnord can determine the requirement for a reservoir kit.

The reservoir kit works by providing an adequate head of

oil to lubricate the uppermost bearing while allowing for oil expansion. A plastic tube acts as a purge line to eliminate trapped air below the seals.

CAUTION: Failure to use a properly installed reservoir kit will cause premature speed reducer damage.

Assemble components as shown in Figure 7.1a & Table 15, and Figure 7.2a & Table 16. It is difficult to determine all potential field installation interference points. If necessary please substitute different pipe fittings as required. In doing so, it is important that the bottom of the reservoir is at or above the uppermost bearing. Holes have been drilled by the factory to facilitate both right hand or left hand oil reservoir mounting. Apply pipe sealant to all threaded connections during assembly.

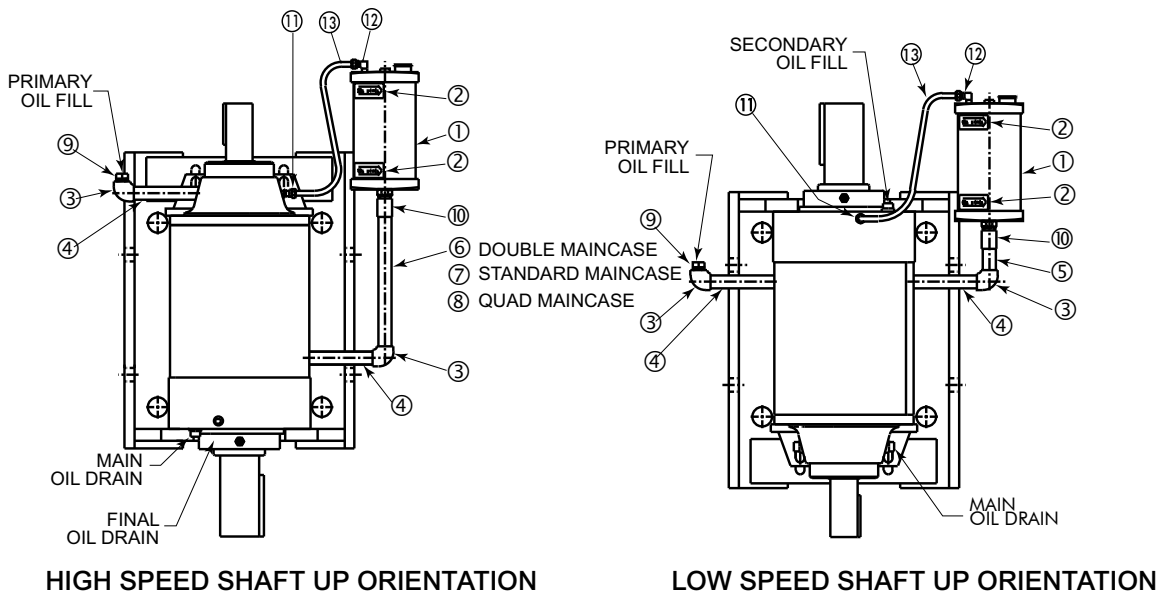


Figure 7.1a Vertical Service Shaft Orientations (Standard Reducers)

TABLE 15 — Vertical Service (Standard Reducers)

Mercury	Mars	Item	Description
Quantity	Quantity	Item	Description
1	1	13	1/4" O.D. PLASTIC TUBE x 24" LG. (600 mm)
1	1	12	1/8" NPT x 1/4" O.D. TUBE 90° BRASS FITTING
1	1	11	1/8" NPT x 1/4" O.D. TUBE STRAIGHT BRASS FITTING
1	1	10	3/8" NPT PIPE COUPLING
1	1	9	3/8" NPT SQ. HD. PIPE PLUG
1	1	8	3/8" NPT x 10" LG. PIPE NIPPLE (250 mm)
1	1	7	3/8" NPT x 8" LG. PIPE NIPPLE (200 mm)
1	1	6	3/8" NPT x 5" LG. PIPE NIPPLE (125 mm)
1	1	5	3/8" NPT x 2" LG. PIPE NIPPLE (50 mm)
2	2	4	3/8" NPT x 4" LG. PIPE NIPPLE (100 mm)
2	2	3	3/8" NPT x 90° PIPE ELBOW
2	2	2	OIL LEVEL DECALS
1	1	1	RESERVOIR 1 PINT (.47 L)

FILLING OIL

The speed reducer should be completely filled with oil prior to start-up. Refer to the Lubrication section for correct oil type and viscosity.

NOTE: When replacing oil plug, seal it in the process using thread sealant.

1. Begin by filling the reducer thru the primary oil fill in the maincase until full. Reference Figure 7.1a.
2. Plug primary oil fill and fill thru secondary oil fill until full if orientation is low speed shaft up.
3. Plug secondary oil fill and fill reservoir until proper oil level is reached.
4. Start reducer under a no-load condition.

NOTE: During start-up and initially after, it is important to monitor the oil level, as any remaining trapped air may need to purge out. Add oil as needed if this occurs.

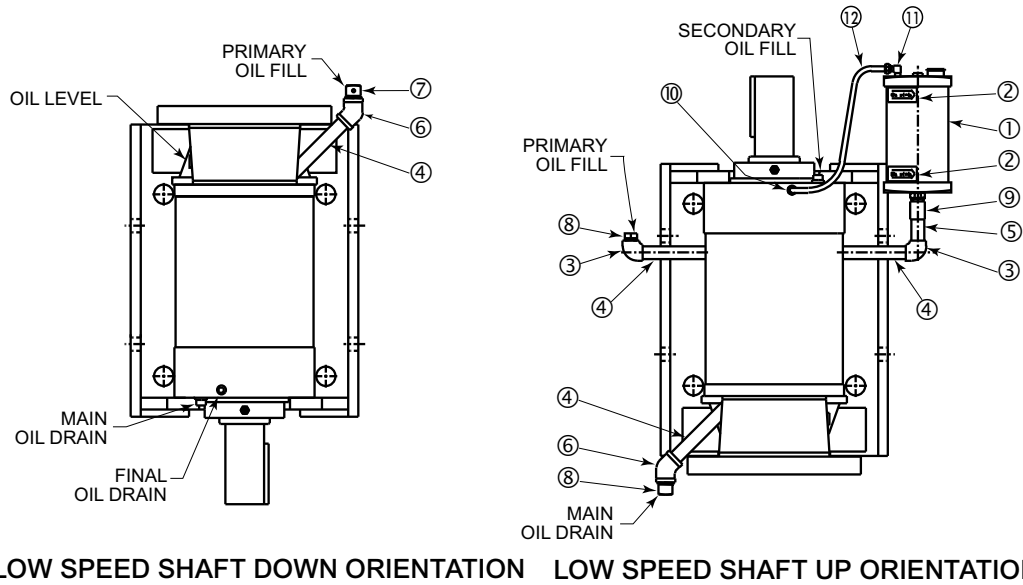


Figure 7.2a Vertical Service Shaft Orientations (Standard Reducers)

TABLE 16 — Vertical Service (Standard Reducers)

Mercury	Mars		
Quantity	Quantity	Item	Description
1	1	12	1/4" O.D. PLASTIC TUBE x 24" LG. (600 mm)
1	1	11	1/8" NPT x 1/4" O.D. TUBE 90° BRASS FITTING
1	1	10	1/8" NPT x 1/4" O.D. TUBE STRAIGHT BRASS FITTING
1	1	9	3/8" NPT PIPE COUPLING
2	2	8	3/8" NPT SQ. HD. PIPE PLUG
1	1	7	3/8" SQ. HD. VENT PLUG
1	1	6	3/8" NPT x 45° ELBOW
1	1	5	3/8" NPT x 2' LG. PIPE NIPPLE (50 mm)
3	3	4	3/8" NPT x 4' LG. PIPE NIPPLE (100 mm)
2	2	3	3/8" NPT x 4' LG. PIPE NIPPLE (100 mm)
2	2	2	OIL LEVEL DECALS
1	1	1	RESERVOIR 1 PINT (.47 L)

DRAINING OIL

CAUTION: Oil may be hot. Do not drain oil until oil is at ambient or a safe temperature.

NOTE: When replacing oil plug, seal it in the process using thread sealant.

1. Begin by draining oil from main oil drain in maincase. Reference Figure 7.1a.
2. Plug main oil drain and begin draining oil from final oil drain if orientation is high speed shaft up.

Section VIII — Storage Procedures

8.1 SPARE PARTS STORAGE

1. On receipt of spare parts, unpack and spray or dip the parts in a rust preventative such as Mobilarna 524, or equivalent.
2. Place parts on a wood pallet in a dry place. Cover loosely with plastic, DO NOT wrap or store parts in news print as it is corrosive.
3. Re-spray parts every six months. Spray parts every three months if high humidity exists.
4. If rust develops, remove rust with a medium grit emery cloth and re-spray with rust preventative.
5. When ready to install parts, make sure all parts rotate freely. Clean all grime from the parts before installation.

8.2 STORED AND INACTIVE REDUCERS

1. Preparation For Storage
 - A. If a reducer is to be stored or is inactive after installation; fill the reducer with the correct type and amount of lubricant. For drives that have oil installed, add Nox-Rust VCI-10 * vapor-phase rust inhibitor at the rate of 2% of sump capacity. For drives without oil, add Nox-Rust VCI-10 vapor-phase rust inhibitor at the rate of one ounce per cubic foot of internal drive space. Seal the reducer completely; replace the vent plug with a solid pipe plug to keep rust inhibiting atmosphere sealed inside.
 - B. After approximately three months, rotate the input shaft such that the output shaft rotates a full 360°. This will insure that all internal parts will remain coated and will also keep the bearings from becoming lacquered. Noncompliance with this procedure may cause bearing damage during start-up.

- C. Every six months inspect the stored or inactive reducer and add Nox-Rust VCI-10 * if necessary. Dry, indoor storage is recommended.

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

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

2. Preparation For Start-up

Rotate shafts until the bearings move freely. This is to assure that the bearings have not become lacquered. Reducer may be operated without draining the lubricant described in Section 8.2-A.

8.3 LONG TERM STORAGE

Reducer can be ordered from the factory prepared for long term storage. Field preparation for long-term storage is described in Section 8.2.

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



Section IX — Troubleshooting

This troubleshooting guide addresses questions that may be encountered in regards to Planetgear 7000 speed reducers.

EXCESSIVE TEMPERATURE [more than 200°F (93°C)]

POSSIBLE CAUSES:	POSSIBLE SOLUTIONS:
OVERLOAD	<ul style="list-style-type: none"> Compare actual reducer load with rated load on the nameplate. If the HP or torque is greater, or the speed is slower than stated on the nameplate, the reducer is probably overloaded. Contact a Rexnord Planetgear Representative; may require a speed change or a larger unit.
TIGHT OR DEFECTIVE BEARINGS	<ul style="list-style-type: none"> Inspect bearings for excessive wear or discoloration due to heat. If either is present, replace the bearings. Refer to Section 6.0 for replacing bearings.
EXCESSIVE AMBIENT TEMPERATURE	<ul style="list-style-type: none"> Provide ventilation for the reducer. Paint white if reducer is in direct sun light. If conditions are extreme, contact a Rexnord Planetgear Representative for assistance.
IMPROPER OIL, OIL LEVEL, OLD, OR CONTAMINATED OIL	<ul style="list-style-type: none"> Make sure lubricant is correct for reducer. A mistake frequently made is to use automotive oil. This is incorrect and will frequently cause the reducer to overheat. Check the oil level in the reducer. Too much as well as too little oil can cause the reducer to overheat. Check to see that oil has not lost its lubricating property. If oil viscosity is too low, this will result in high oil temperatures.
PLUGGED SHROUD	<ul style="list-style-type: none"> Make sure area immediately in front of fan shroud is clear.
OVERSPEED	<ul style="list-style-type: none"> Reduce input speed to reduce oil temperature. If reducer input speed is above the stated value on the nameplate, this would raise oil temperature due to increase in internal windage.
RESTRICTED VENT PLUG	<ul style="list-style-type: none"> Remove and clean vent plug. Replace vent plug.

BEARING DAMAGE

IMPROPER ADJUSTMENT	<ul style="list-style-type: none"> Adjust bearing to proper axial bearing clearance as instructed in Section 6.0.
LACK OF LUBRICATION, IMPROPER LUBRICATION, OLD, OR CONTAMINATED OIL	<ul style="list-style-type: none"> Replace damaged bearings as instructed in Section 6.0. Note: Check hub and shaft for potential damage or heat distress.
EXCESSIVE OVERHUNG LOAD	<ul style="list-style-type: none"> Reduce overhung load. Move the sprocket or sheave closer to the bearings or increase the diameter of both the driven and the driver

BEARING NOISE

DEFECTIVE BEARING	<ul style="list-style-type: none"> Inspect and replace bearings if necessary. Reference Section 6.0.
IMPROPER BEARING ADJUSTMENT	<ul style="list-style-type: none"> Adjust bearing endplay. Reference Section 6.0.
WRONG OR INSUFFICIENT LUBRICATION	<ul style="list-style-type: none"> Make sure that enough oil of the correct grade is used. Reference Section 3.0.

LEAKAGE

DAMAGED OR WORN SEALS	<ul style="list-style-type: none"> Replace seals. Reference Section 6.0.
BEARINGS OUT OF ADJUSTMENT	<ul style="list-style-type: none"> Reset bearings. Reference Section 6.0.
EXCESSIVE TEMPERATURE, CAUSING BRITTLE SEALS	<ul style="list-style-type: none"> Isolate reducer from source of extreme temperature. Install high temperature seals.
ABRASIVE OR CORROSIVE ATMOSPHERE	<ul style="list-style-type: none"> Isolate reducer seal area from environment. Re-grease frequently.
RESTRICTED VENT PLUG	<ul style="list-style-type: none"> Remove and clean vent plug. Replace vent plug.
SPLIT-LINE LEAKAGE	<ul style="list-style-type: none"> Make sure fasteners are torqued correctly. Reference Table 18. Remove suspect hub. Visually inspect mating surfaces for rises or dings. File smooth (do not allow file shavings to enter gearing or bearings) apply gasket eliminator and replace hub.

DAMAGE OF FASTENERS

FAILURE OF FASTENERS	<ul style="list-style-type: none"> Make sure fasteners are torqued correctly. Reference Table 18. Make sure the correct grade of fastener is used. All reducer fasteners should be ANSI B18.2.1 Grade 5 or ISO 898/1 Grade 8.8 or Check length of fastener.
FASTENER LOOSENING	<ul style="list-style-type: none"> Make sure fasteners are torqued correctly. Reference Table 18. For highly vibratory environments, loctite fasteners and torque, or use studs and double nut.

Section X — Tables

TABLE 17 — Average Weights – lb (kg)

REDUCER SERIES	Reducer Only	Reducer * w/Top Motor mount	Reducer * w/Scoop	Reducer * w/Slidebase	Reducer * w/Scoop & Slidebase
Mercury	144 (65)	205 (93)	280 (127)	181 (82)	341 (155)
Mars	150 (68)	311 (96)	286 (130)	187 (85)	347 (157)

* Does not include motor weights.

TABLE 18 — Torque Requirements ★

For Dry Fasteners – Inch															
SAE	DIA	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2
General Purpose Grade 2	Torque (ft-lb)	6	12	21	34	52	75	104	178	184	256	380	530	700	930
High Strength Grade 5	Torque (ft-lb)	9	18	33	53	80	116	160	285	460	690	850	1200	1570	2080
Alloy Steel Grade 8	Torque (ft-lb)	13	26	47	74	114	164	225	400	650	970	1370	1940	2540	3370

For Dry Fasteners – Metric															
Grade	Nominal Dia	M5	M6	M7	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
8.8	Torque (Nm)	6.15	10.5	17.5	26	51	89	141	215	295	420	570	725	1070	1450
10.9	Torque (Nm)	8.65	15	25	36	72	125	198	305	420	590	800	1020	1510	2050
12.9	Torque (Nm)	10.4	18	29	43	87	150	240	365	500	710	960	1250	1810	2450

★ The torques shown produce a clamp load of 80% of proof load. They assume clean, dry threads with a torque coefficient of 1.2, and a coefficient of friction of 0.14.
 Plated threads need only ¾ torque shown.
 Well lubricated threads need only ½ torque shown.
 Source: Rexnord Engineering Specification: GES8-19, 04/10/79.

TABLE 19 — Maximum Allowable Tilts for Standard Reducers

REDUCER SERIES	Maximum Reducer Tilt (Degrees) High Speed Shaft Up	REDUCER SERIES	Maximum Reducer Tilt (Degrees) Low Speed Shaft Up
MERCURY/MARS (Single/Double Maincase)	14°	MERCURY/MARS (Single/Double Maincase)	30°
MERCURY/MARS (Triple Maincase)	11°	MERCURY/MARS (Triple Maincase)	30°
MERCURY/MARS (Quadruple Maincase)	8°	MERCURY/MARS (Quadruple Maincase)	30°

NOTE: If any reducer application exceeds maximum allowable tilt, consult a Planetgear representative for possible modifications.



Section XI — Tables: Replacement Seals and Bearings

TABLE 20 — Bearings for Standard Speed Reducers – (All Bearings are “Timken” Unless Noted Otherwise)

REDUCER SERIES	Input Bearings		Output Bearings	
	Inboard Cup/Cone	Outboard Cup/Cone	Inboard Cup/Cone	Outboard Cup/Cone
Mercury Mars	LM 501310/LM501349 LM 501310/LM501349	LM 501310/LM501349 LM 501310/LM501349	JM205110/JM205149 JM205110/JM205149	JM205110/JM205149 JM205110/JM205149

TABLE 21 — Seals for Standard Speed Reducers – (All Seals are “Chicago Rawhide” Unless Noted Otherwise)

REDUCER	Input Seals				Output Seals			
	Nitrile		Viton		Nitrile		Viton	
	Inboard	Outboard	Inboard	Outboard	Inboard	Outboard	Inboard	Outboard
Mercury Mars	CR19993 CR19993	CR20004 CR20004	CR19995 CR19995	CR20002 CR20002	CR26220 CR26220	CR26209 CR26209	CR26204 CR26204	CR26208 CR26208



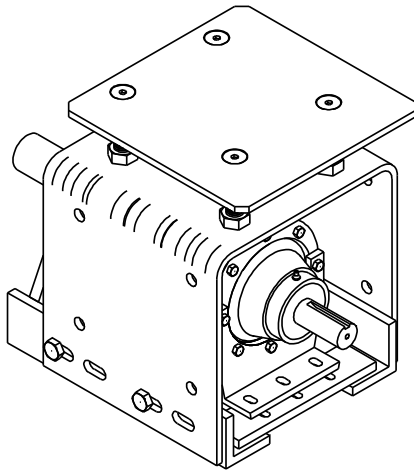
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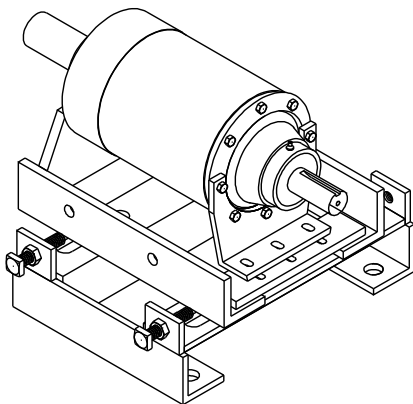
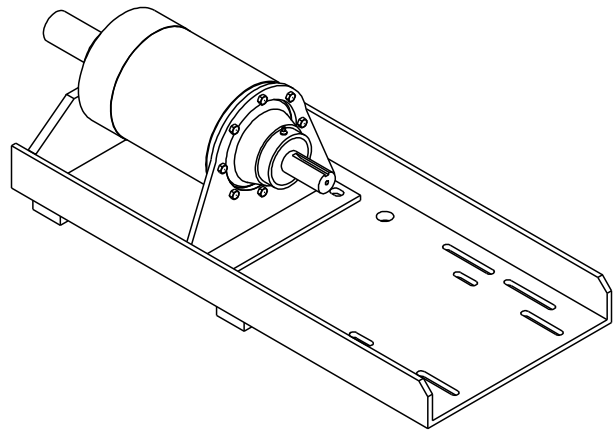
Section XIII — Accessories

Contact a Rexnord Account Executive or refer to Planetgear

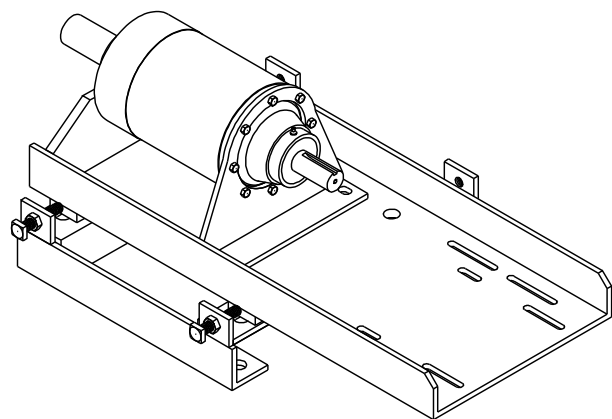
**Reducer with
Top Motor Mount**



**Reducer with
Scoop Motor Mount**



**Reducer with
Slidebase**



**Reducer with
Scoop and Slidebase**