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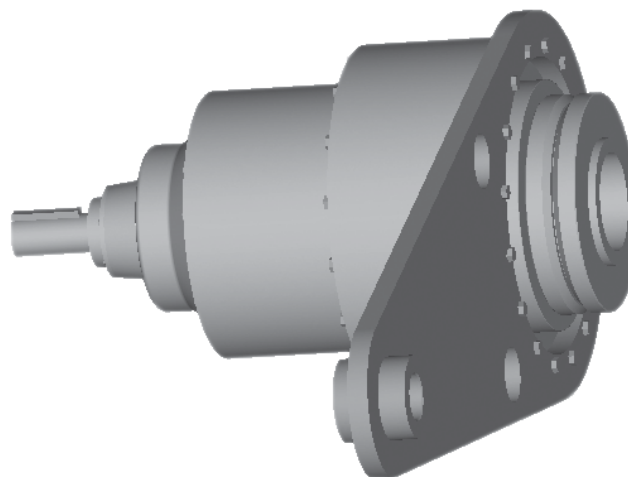
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Section I — Introduction

The following instructions apply to the standard catalog offering of the Orion Shaft-Mount, Planetgear™ Speed Reducer mounted in a horizontal position. To assure long life and performance of the Planetgear speed reducer, the following practices should be followed.

1.1 BASIC OPERATION AND DESIGN

The Planetgear speed reducer 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 speed 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 speed reducer output shaft rotates in the same direction as the input shaft, regardless of the number of reductions. See 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 to four points of contact, with a minimum of six to eight 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 drive counter rotation when the input driver is shut off.

1.2 SECTIONAL VIEW AND COMPONENT IDENTIFICATION

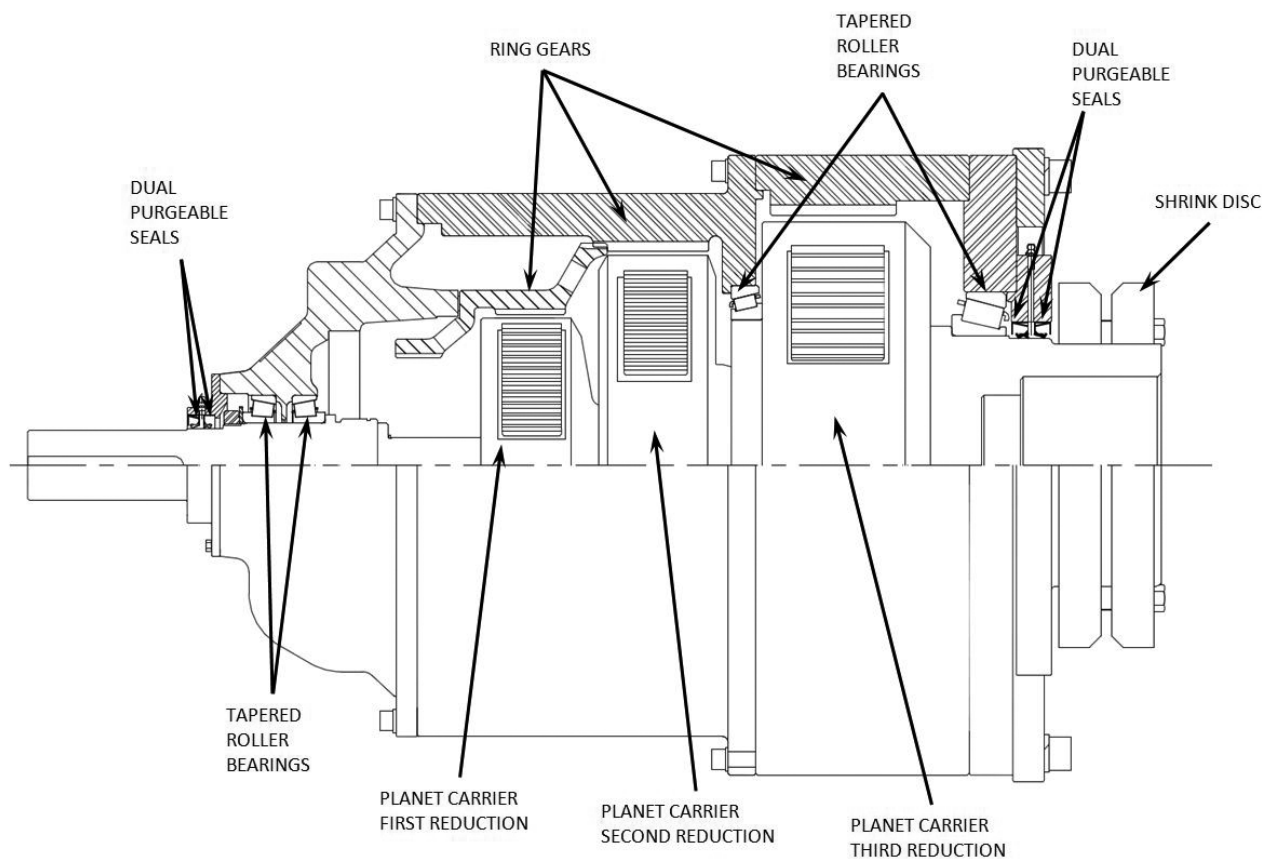


Figure 1.2 Sectional View of a Planetgear Speed Reducer

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 nameplate illustration.

Operation of the speed reducer shall not differ from the application data warranted on the nameplate. Any deviations from this data requires the 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.

Planetgear SMP™ Speed Reducers

REXNORD INDUSTRIES, LLC
WWW.REXNORD.COM

REDUCER ONLY

MODEL NO.

SERIAL NO.

CUST. PO.

SIZE

RPM IN

RATIO

RPM OUT

P/N 1886026801

MOTORIZED REDUCER

MOTOR HP

SERVICE CLASS

DATE

OIL CAP.

APPROX. U.S. GAL.

ORION

OUTPUT RPM	AMBIENT TEMPERATURES			
	15°F TO 60°F (-9°C TO 16°C)		50°F TO 125°F (10°C TO 52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
BELOW 10	150EP	4 EP	320EP	6 EP
10 AND ABOVE	150EP	4 EP	220 EP	5 EP

TITAN THRU HERCULES

OUTPUT RPM	AMBIENT TEMPERATURES			
	15°F TO 60°F (-9°C TO 16°C)		50°F TO 125°F (10°C TO 52°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
BELOW 10	220	5	320	6
10 AND ABOVE	100	3	150	4

IMPORTANT:
 FILL TO THE LEVEL INDICATED WITH A PREMIUM QUALITY INDUSTRIAL TYPE PETROLEUM BASED GEAR LUBRICANT CONTAINING OXIDATION, RUST AND FOAM INHIBITORS. ORION SMP UNITS REQUIRE EXTREME PRESSURE LUBRICANT (SULFUR- PHOSPHORUS TYPE). FOR DETAILED LUBRICATION INSTRUCTIONS, SEE LUBRICATION BULLETIN.
 UNDER NORMAL CONDITIONS, THE LUBRICANT SHOULD BE CHANGED EVERY 2500 HOURS OR EVERY SIX MONTHS WHICHEVER COMES FIRST.

Figure 1.3 Reducer Nameplate

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

Remove top motor mount plate. Using lifting chains of ample strength, hook through the lifting holes located on the input side top motor mount bracket, and through the lifting holes located on the torque arm, reference Figure 2.1a. For speed reducer component weights, reference Table 1 (Page 18). In order to prevent shifting during suspension, make sure the speed reducer is properly secured and balanced.

WARNING: To avoid personal injury or product damage, never attempt to lift the speed reducer using any method other than the one stated above in Section 2.1 "Handling of Speed Reducer".

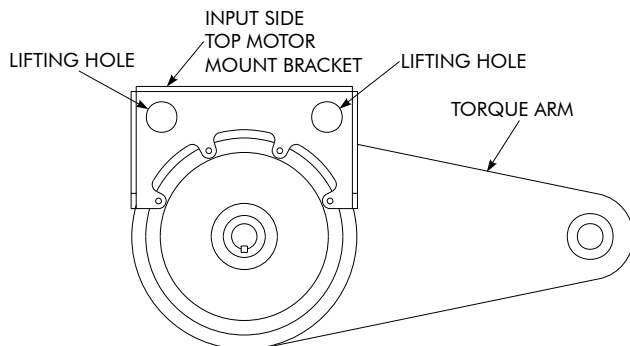


Figure 2.1a Speed Reducer Handling

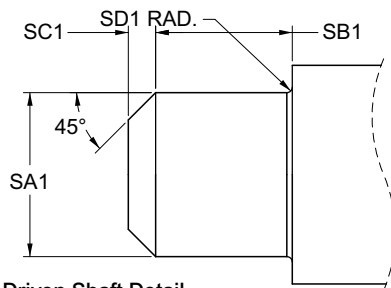


Figure 2.1b Driven Shaft Detail

2.2 REDUCER MOUNTING

Orion

Prior to installing the drive, verify the driven shaft for proper dimensions. Dimensions are found in Table 6, Page 15. Verify that dimension SA1 is within the allowable range. When dimensions are verified, proceed with the installation.

1. Insert torque arm mounting pins in torque arm on speed reducer; reference Figure 2.2a.

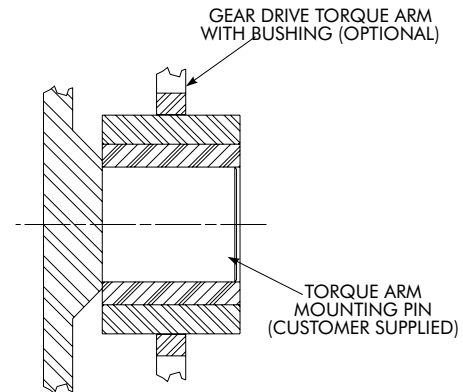


Figure 2.2a Insertion of Torque Arm Pins in Torque Arm

2. Installation Of Shrink Disc:

Important: Never tighten locking screws before shaft is inside the hub, otherwise plastic deformation of the hub projection may occur.

- a. Remove shipping spacers and screws, if used, provided for protection during transportation.
- b. Check if supplied locking screw threads, screw head bearing area and the tapers of the inner rings are lubricated. If not, lubricate them with a molybdenum disulfide grease such as Molykote Gn Paste.
- c. Slide Shrink Disc over the output shaft. The outer surface of the output shaft can be greased. **NOTE:** The output shaft bore and the shaft that the speed reducer will be mounted to **SHOULD NOT** be greased. Reference Figure 2.2b.

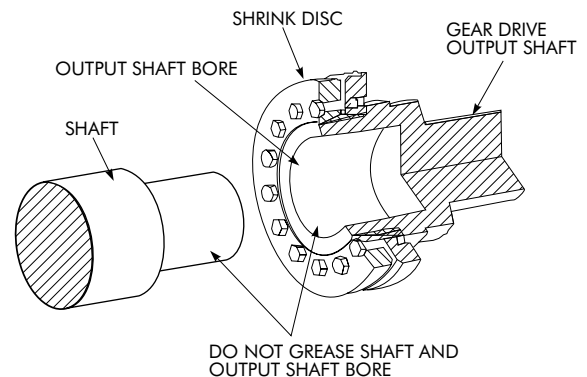


Figure 2.2b Placement of Shrink Disc onto Output Shaft

- d. Degrease output shaft bore and shaft seat. Lift speed reducer; reference Section 2.1. Align output shaft/shrink disc with the driven shaft.
 - e. Insert shaft or slide output shaft over the shaft until fully seated.
 - f. Take any three or four locking screws equally spaced and snug them up to establish a parallel or perpendicular position of Shrink Disc collars relative to output shaft shoulder. This will properly seat the collars on the taper of the inner ring and avoid cocking of the collars.
 - g. Using a torque wrench, tighten all locking screws gradually and all the way around in either clockwise or counterclockwise sequence (not in diametrically opposite sequence).
 - h. Tighten locking screws to 185 ft-lb of torque.
3. Align mounting holes of mounting pins to the mounting holes of the torque arm bracket.
 4. Tighten the bolts with washers, shimming if necessary. Reference Table 2 (Page 18) for recommended bolt torques. Reference Figure 2.2c.

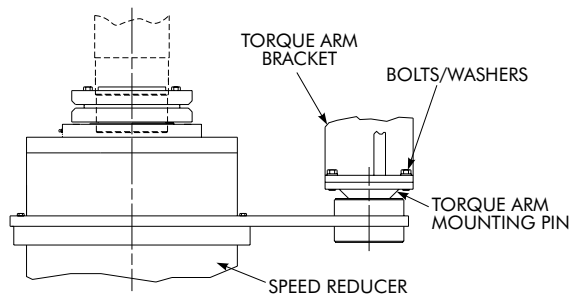


Figure 2.2c Mounting of torque Arm Pins to Torque Arm Bracket

2.3 MOTOR MOUNTING

WARNING: When the Rexnord Planetgear 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.

2.3.1 INSTALLING TOP MOTOR MOUNT PLATE

1. Place top motor mounting plate/cap screw assembly onto the mounting brackets so that the part number on the plate is towards the output end of the speed reducer; reference Figure 2.3.1a.

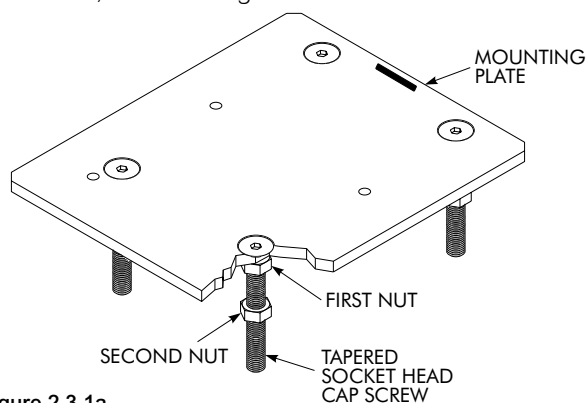


Figure 2.3.1a

2. Attach the third nut loosely onto each cap screw to hold the mounting plate/caps crew assembly onto mounting brackets; reference Figure 2.3.1b.

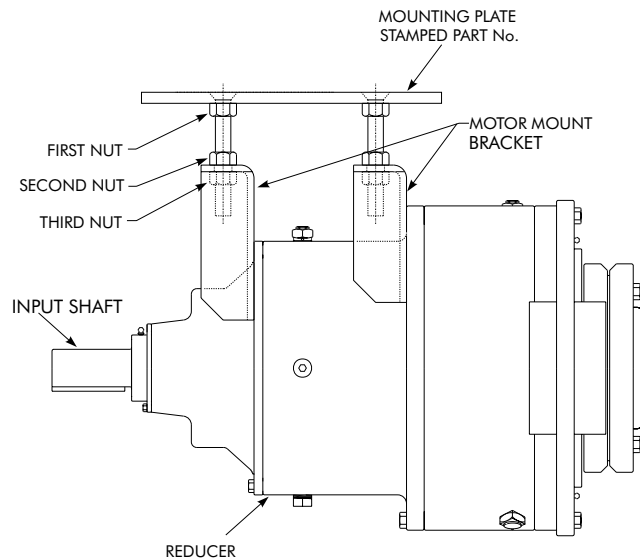


Figure 2.3.1b

2.3.2 SPROCKETS OR SHEAVES

Prior to installing sprockets or sheaves, review the manufacturer's 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 speed reducer. This will minimize the overhung load and prolong bearing life.

When using a Planetgear 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 2.3.2.

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

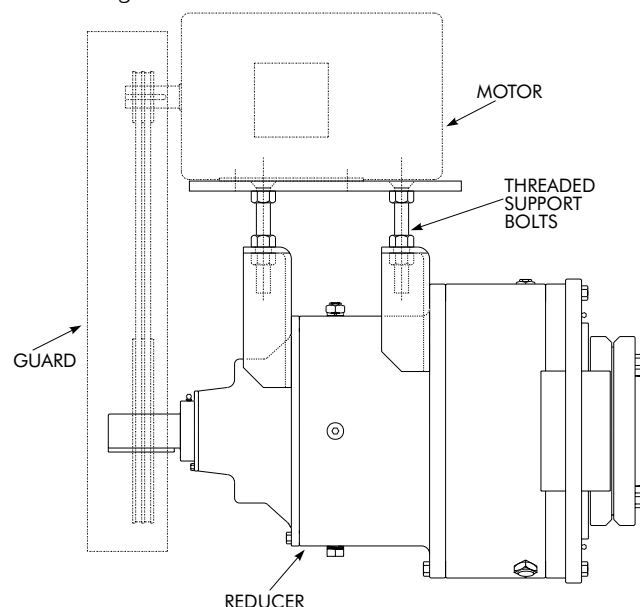


Figure 2.3.2 Planetgear Top Motor Mount

2.3.3 INSTALLING MOTOR

1. Loosely attach motor to mounting holes drilled in the top motor mounting plate using Grade 5 or equivalent bolts.
2. Check sheave alignment:

Sheave alignment should be checked by placing a straight edge or tight cord across the sheave faces so that it touches all four points of contact as illustrated in Figure 2.3.3. Ordinarily, a misalignment of more than one-half of one degree (one-eighth inch in one foot) will adversely affect belt life. Improper sheave alignment produces uneven wear on one side of the belt, causes the belt to roll over in the sheave or throws all the load on one side of the belt, stretching or breaking the cords on that side.

3. Tighten motor bolts. Reference Table 2 (Page 18) for recommended bolt torques.

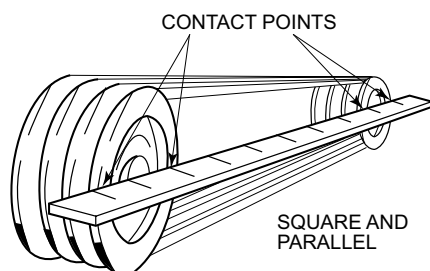


Figure 2.3.3 Alignment

2.3.4 C-FACE MOTOR INSTALLATION

1. Mount the reducer C-face 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. For quintuple reductions locate the C-face coupling 0.500 to 0.625 inches from the motor face (**Hint:** Standard 1/2" to 5/8" keystone is helpful for this purpose). Refer to the illustration in Figure 2.3.4a.

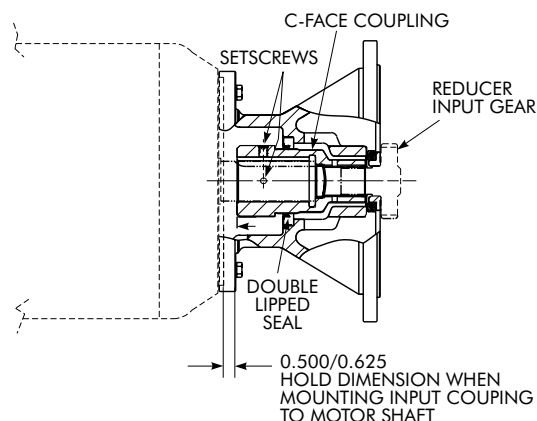


Figure 2.3.4a

3. Tighten the coupling setscrews; one located over the key and the other located at 90° (degrees). After tightening the setscrews, 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 setscrews 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 2, Page 18, for recommended bolt torques.

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 extreme pressure (EP) or industrial type micropitting resistant gear lubricants are the required 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.

WARNING: Failure to use extreme pressure or micropitting resistant type lubricants in Planetgear Orion SMP size units will void warranty.

Table 1 — Summary of Allowable Lubricant Types for Planetgear SMP units[▲]

Unit Size	Allowable Lubricant Types
Orion	Extreme Pressure, Micropitting Resistant
Titan	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Jupiter	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Gemini	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant
Hercules	Rust & Oxidation Inhibited, Extreme Pressure, Micropitting Resistant

▲ Follow recommendations found in the Lubrication Section of this manual

LUBRICANT SELECTION PROCESS

1. Refer to Tables 3 and 4 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 nameplate for approximate oil capacity to purchase.

Table 2 — Summary of Lubricant Type and Greases

Petroleum-Based	
Extreme Pressure (EP) See Table 5A	Micropitting Resistant See Table 5B
Synthetic Lubricant, Polyalphaolefin Type (PAO)	
Extreme Pressure (EP) See Table 6A	Micropitting Resistant See Table 6B
Conventional Grease See Table 7	
Food Grade Lubricant & Grease See Page 11	

VISCOSITY (IMPORTANT)

The proper viscosity grade for petroleum-based lubricants is found in Table 3. For synthetic lubricant viscosity grades, refer to Table 4 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.

LUBRICANT TYPES

PETROLEUM-BASED LUBRICANTS (TABLES 5A & 5B) — Industrial type petroleum-based extreme pressure (EP) lubricants are the most common and readily available general purpose gear lubricants.

SYNTHETIC-BASED LUBRICANTS (TABLES 6A & 6B) — 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 4. 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 5A & 6A) — EP lubricants are manufactured from petroleum or synthetic base lubricants. Anti-scuff is another term used to describe EP lubricants.

MICROPITTING RESISTANT LUBRICANTS (TABLES 5B & 6B) — 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 viscosity grades.

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

CLIMATE CONDITIONS — Ambient temperature in immediate vicinity of gear drive is very important for determining viscosity grade. Table 3 provides viscosity grade selections for petroleum-based lubricants. See Table 4 for synthetic lubricants.

OIL LEVELS

From the nameplate determine the quantity of oil needed. Fill reducer to the oil fill plug as described in the Maintenance section (Section V) of this manual.

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

TABLE 3 — Viscosity Grade Recommendation For Petroleum-Based Lubricants

Output Speed	AMBIENT TEMPERATURES			
	+15° to +60°F (-10° to +15°C)		+50° to +125°F (+10° to +50°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
RPM Below 10	150	4	320	6
10 RPM And Above	150	4	220	5

absence of more specific limits, the guidelines listed below may be used to indicate when to change petroleum or polyalphaolefin type synthetic lubricants:

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

LUBRICANT ANALYSIS AND 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

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.

Table 4 — 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 10 RPM	32	0	68	2	150	4	320	6
10 RPM & Above	32	0	68	2	150	4	220	5

Table 5A — Petroleum Based EP (Extreme Pressure) Lubricants[▲]

Maximum Operating Temperature of Lubricants 200°F (93°C)

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

▲ Minimum viscosity index of 90.

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

Table 5B — 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 6A — Synthetic PAO (Polyalphaolephin) EP (Extreme Pressure) Lubricants[▲]

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

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

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

Table 6B — Synthetic PAO (Polyalphaolephin) 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).

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 3. Generally 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 4.

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 7. 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 leaks.*

WARNING: *Greases in Table 7 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 13. 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.*

Table 7 — Conventional Grease[▲] for Grease Purged Seals
0°F to +200°F (-18°C to +93°C)

Manufacturer	Grease Name
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 Lubricants/ 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 (-7°C). If grease must be applied below 20°F (-7°C) consult lubricant supplier for recommendations.

STORED & INACTIVE GEAR DRIVES

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

FOOD GRADE LUBRICANTS

Guidance for selecting petroleum-based and synthetic-based food grade lubricants are shown below in Table 8. For general lubrication guidelines, refer to the first part of the “Lubrication Recommendation” section.

FOOD GRADE LUBRICANT SELECTION PROCESS

1. Refer to Tables 9 and 10 for proper lubricant viscosity grade based on ambient temperature range.
2. Refer to Table 8 for summary of lubricant types.
3. Using proper lubricant table and viscosity grade, select desired lubricant manufacturer and name.
4. Refer to nameplate for approximate oil capacity to purchase.

Table 8 — Summary of Food Grade Lubricants and Greases

Petroleum-Based Extreme Pressure (EP) See Table 11
Synthetic Lubricant, Polyalphaolefin Type (PAO) Extreme Pressure (EP) See Table 12
Food Grade Grease See Table 13

FOOD GRADE LUBRICANTS (TABLES 11, 12, & 13) —

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 drives during shipment are not qualified as food grade fluids. Flush out inhibitor oil before filling with food grade lubricant.

Tables 11, 12, and 13 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 9 provides viscosity grade selections for petroleum-based lubricants. See Table 10 for synthetic lubricants.

TABLE 9 — Viscosity Grade Recommendation For Food Grade Petroleum-Based Lubricants

Output Speed	AMBIENT TEMPERATURES			
	+15° to +60°F (-10° to +15°C)		+50° to +125°F (+10° to +50°C)	
	ISO-VG	AGMA	ISO-VG	AGMA
RPM Below 10	150	4	320	6
10 RPM And Above	150	4	220	5

LUBRICANT ANALYSIS AND CHANGES

OIL ANALYSIS REPORT (FOOD GRADE) — Checking oil conditions at regular intervals is recommended. Analyze oil samples approximately every 1,000 hours for food grade petroleum lubricants or every 3,000 hours for food grade synthetic lubricants. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change petroleum or polyalphaolefin type 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 $\geq 4/\geq 6/\geq 14$ 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 (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 9. Lubricant suppliers can test oil from the drive periodically and recommend economical change schedules.

Table 10 — Viscosity Grade Recommendation For Food Grade 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 10 RPM	32	0	68	2	150	4	320	6
10 RPM & Above	32	0	68	2	150	4	220	5

Table 11 — 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	150	220	320
AGMA Viscosity Grade	4	5	6
Viscosity cSt @ 40°C	135-165	198-242	288-352
Viscosity SSU @ 100°F	626-765	918-1122	1335-1632
Manufacturer	Lubricant Name	Lubricant Name	Lubricant Name
Petro-Canada	Purity FG EP 150	Purity FG EP 220	Purity FG EP 320
Total Lubricants USA, Inc.	Nevastane EP 150	Nevastane EP 220	Nevastane EP 320

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

Table 12 — Food Grade Synthetic EP (Extreme Pressure) PAO (Polyalphaolefin) Type 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).

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 10.

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 13. Depending upon the degree of contamination, periodically (at least every six 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 leaks.*

Greases in Table 7 contain harmful substances not allowed in the food processing industry. If grease could contaminate the product, as in the food and drug industries, the grease originally supplied with gear drive must be removed and replaced with grease listed in Table 13. 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.

Table 13 — Food Grade Grease for Grease Purged Seals NSF (National Sanitation Foundation) H1 Registered

0° to +200°F (-18° to +93°C)

Manufacturer	Grease Name
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.

STORED & INACTIVE GEAR DRIVES

See Storage Procedures (Section VII).

WARNING: *Rust preventative oil or vapor-phase 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.*

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 speed reducer 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 speed reducer been filled with the proper oil type and to the correct oil level?
2. Are all mounting bolts high strength (Grade 5) and tightened according to torque specifications in Table 2 (Page 18)?
3. Are speed reducer input shaft and motor shaft sheaves correctly mounted with full engagement and keys in place?
4. Are belts at correct tension?
5. Are sheave 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 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 SPEED REDUCER ROTATION

The input and output shafts of the speed reducer will rotate in the same direction.

4.2.3 START-UP

Start the speed reducer under as light a load as possible. As the speed reducer 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 speed reducer immediately and determine the cause of the problem. Refer to Troubleshooting (Section 8.0) for assistance.

4.3 POST START-UP CHECKLIST

1. After approximately forty hours of use, check all mounting bolts and tighten as required. **Note:** Always recheck alignment after tightening.
2. The oil used in the initial start-up of a new speed 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.
3. Check tension if using belts during the first 24-48 hours of run-in operation.

Section V — Maintenance

WARNING: DO NOT PERFORM ANY MAINTENANCE PROCEDURES WHILE SPEED 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.

5.1 FILLING SPEED REDUCER WITH OIL

1. Choose correct oil type; reference Section 3.0.
2. Determine correct oil quantity; reference Nameplate.
3. Remove oil fill plug (vent plug) and one of the two oil level plugs; reference Figure 5.1.
4. Fill speed reducer at oil fill port.
5. Speed Reducer oil capacity is reached when oil starts to pour out of the bottom of the 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 speed reducer is at ambient temperature

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

6. Replace oil level plug, sealing it in the process using thread sealant.
7. Replace oil fill plug (vent plug).
8. Start up speed reducer under a no load condition. Run speed reducer for a few minutes.
9. Stop speed reducer and recheck oil at the oil level port. If necessary, add oil.

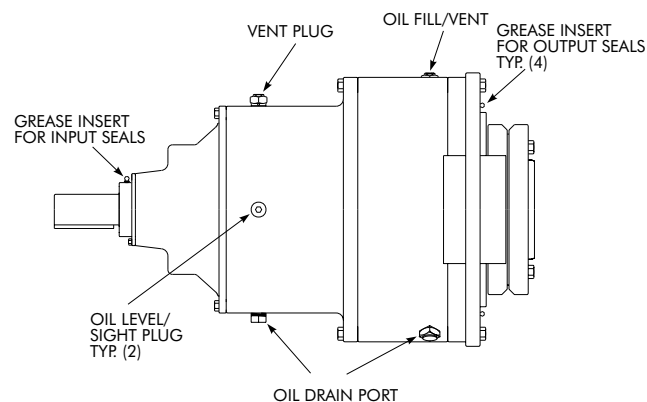


Figure 5.1

5.2 DRAINING OIL FROM SPEED REDUCER

CAUTION: Care should be taken when removing the vent plug. If vent has been clogged, the possibility of pressurized air inside the Speed Reducer may exist. Once threads are free to hand rotate, place a heavy cloth over the vent plug and rotate counterclockwise until removed.

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

1. Clean external surfaces to avoid contaminants from entering speed reducer when plugs are removed.
2. Remove oil fill plug (vent plug) for ventilation; reference Figure 5.1.
3. With the proper size oil drain pan (reference oil quantity on nameplate) in place, remove one of the drain plugs.
4. After oil is removed, replace oil drain plug, sealing it in the process using thread sealant.
5. Reference Section 5.1 for filling speed reducer with oil.

5.3 ADDING GREASE TO SPEED 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.
4. Clean purged grease from speed reducer.

Section VI — Disassembly and Assembly Instructions

For assembly drawings for the Orion Shaft-Mount speed reducer, please see the assembly drawings included in the documentation that accompanies the speed reducer. This is a guide for disassembly, parts replacement, and reassembly. Note: If only replacing seals, they are housed in the seal carriers which can be removed from the speed reducer. To expedite service, when ordering parts or requesting information, supply the following information: model number, speed reducer size, ratio, serial number, HP, motor RPM, and the build date from the speed reducer nameplate. No ratio change should be made without first consulting a Planetgear representative. All bearings and seals used on standard Planetgear speed reducers are listed in Table 3 and Table 4 (Page15).

REQUIRED EQUIPMENT

Standard mechanic's tools: arbor press or hydraulic press, 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.

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.

REMOVAL OF SHRINK DISC:

- A. Gradually release locking screws all the way around. Initially each screw should be released about a quarter of a turn only. Thus tilting and jamming of the collar will be avoided. DO NOT remove screws completely at this time otherwise collar may spring off.
- B. Any rust formed adjacent to hub must be removed first. Once the screws are loose, remove shaft or pull output shaft from hollow bore.

SPEED REDUCER REMOVAL

- A. Loosen all shrink disc tightening bolts uniformly, one by one in a continuous sequence, about a quarter turn per round.
- B. Shrink disc should be able to move after bolts have been loosened.
- C. Utilize 'hydraulic advantage' by accessing ports (1/8-27 NPT) located on hollow shaft face, and on outer diameter of hollow shaft (Figure 5.2)

Important: Do Not use any force on drive housing to remove unit

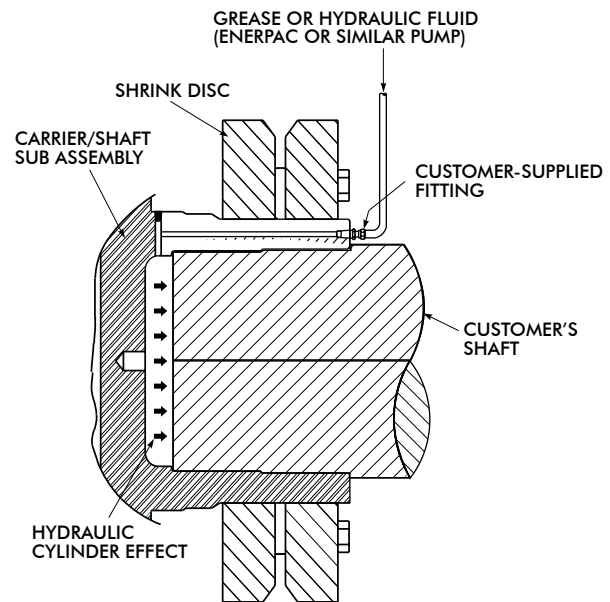


Figure 5.2

REINSTALLATION OF SHRINK DISC:

Upon removal of component, disassemble Shrink Disc. Clean and inspect all parts. Reinstall following the installation procedure beginning with Step "b" of the appropriate section.

Section VII — Storage Procedures

7.1 SPARE PARTS STORAGE

1. On receipt of spare parts, unpack and spray or dip the parts in a rust preventative such as Mobilama 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.

7.2 STORED AND INACTIVE SPEED REDUCERS

1. Preparation For Storage

- A. If a speed reducer is to be stored or is inactive after installation, fill the speed 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 speed 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°(degrees). 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 speed reducer and add rust inhibitor 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.*

2. Preparation For Start-up

Rotate shafts until the bearings move freely. This is to assure that the bearings have not become lacquered. Speed reducer may be operated without draining the lubricant described in Section 7.2-A.

7.3 LONG TERM STORAGE

Speed Reducer can be ordered from the factory for long term storage. Field preparation for long-term storage is described in Section 7.2-1.

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.*

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

Section VIII — Troubleshooting

This troubleshooting guide addresses questions that may be encountered in regards to Planetgear 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

Possible Causes:	Possible Solutions:
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

Possible Causes:	Possible Solutions:
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

Possible Causes:	Possible Solutions:
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 2. ● 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

Possible Causes:	Possible Solutions:
Failure of Fasteners	<ul style="list-style-type: none"> ● Make sure fasteners are torqued correctly. Reference Table 2. ● For highly vibratory environments, loctite fasteners and torque, or use studs and double nut.
Fastener Loosening	<ul style="list-style-type: none"> ● Make sure fasteners are torqued correctly. Reference Table 2. ● Make sure the correct grade of fasteners is used. All reducer fasteners should be Grade 5 or equivalent. ● Check length of fastener.

Section IX — Tables

TABLE 1 — Orion Shaft-Mount Speed Reducer — Average Weights (lb)

Reducer Only	Reducer † with Top Motor Mount
1092	1182

† Does not include motor weight.

TABLE 2 — Torque Requirements*

For Dry Fasteners (Inch)															
SAE	Diameter	1/4	5/16	3/8	7/16	1/2	1/16	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	265	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
Allow 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 Diameter Standard Pitch	M5	M6	M7	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
808	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	1220	1810	2450

* The torques shown produce a clamp load of 80% of proof load. They assume clean, dry threads with a torque coefficient of 0.2, and a coefficient of friction of 0.14.

Plated threads need only 3/4 torque shown.

Well lubricated threads need only 1/2 torque shown.

Source: Rexnord Engineering Specification: GES8-19, 04/10/79.

TABLE 3 — Bearings for Orion Shaft-Mount Speed Reducer

(All bearings are "Timken" unless noted otherwise)

Input Sub-Assembly Bearings				Output Sub-Assembly Bearings			
Inboard Cup/Cone		Outboard Cup/Cone		Inboard Cup/Cone		Output Cup/Cone	
362A/368A		3720/3780		LL641110/LL641149		67820/67885	

TABLE 4 — Seals for Orion Shaft-Mount Speed Reducer

(All seals are "Chicago Rawhide" unless noted otherwise)

Input Sub-Assembly Seals				Output Sub-Assembly Seals			
Inboard		Outboard		Inboard		Outboard	
CR-24898		CR-24910		180 x 210 x 15 AS		180 x 210 x 15 C	

TABLE 5 — Seals and Bearing for Orion Heavy Duty Shaft-Mount Speed Reducer

(All seals are "Chicago Rawhide", bearings are "Timken" unless noted otherwise)

Input Sub-Assembly Seals				Input Sub-Assembly Bearings			
Inboard		Outboard		Inboard Cup/Cone		Output Cup/Cone	
CR-29866		CR-29871		HM911210/HM911242		78551/78215C	

TABLE 6 — Driven Shaft Dimensions

Series		SA1 (h6)			SB1	SC1	SD1
		Nominal	+	-			
Orion	mm	135	135	134.98	155	2.8	1.5
	inch	5.315	5.315	5.314	6.102	0.11	0.06



Section X — Maintenance Log

Speed Reducer Serial Number _____

Date Installed _____

DATE	MAINTENANCE PERFORMED