



SERVICE INSTRUCTIONS

**TURBINE MIXER MODEL TO, TCL & TC
DRIVE SERIES 'L'
MANUAL NO. 05-47708
REVISED 3/2018**

CUSTOMER:

P.O. NO.:

ITEM NO.:

MIXER MODEL NO.:

MIXER SERIAL NO.:

DRIVE SERIES & SIZE:

INPUT ASSEMBLY PARTS NO.:

SHAFT COUPLING DESIGN:

SEAL NO.:

DATE:

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FOREWORD

The information contained in this service instruction manual covers MixMor Model TO, TCL and TC Mixers with 'L' Series drive.

The mounting and/or mixer shaft seal determines the model. The following is a description of the models.

“TO” – Baseplate mounted for channel mounting over open tanks.

“TCL” – Flange mounted mixers with low-pressure stuffing box (10 PSIG maximum) for closed tank application.

“TC” – Flange mounted mixers with high-pressure stuffing box (150 PSIG maximum) for closed tank application.

The front page of this manual and the certified drawing gives the model and drive type and size of your mixer.

We have included information in this manual that covers installation, start-up, service, and trouble shooting to assure years of reliable mixer service. Should questions or problems occur that are not covered in this manual, consult your local representative or phone MixMor at our Los Angeles, California plant (323) 664-1941.

GENERAL INFORMATION

When apparent or suspected damage has been found on equipment, during transport from factory to user, both the carrier and MixMor must be notified immediately.

When receiving equipment, a check should be made to determine whether all inventoried parts are still in the shipment. Any discrepancy should immediately be reported to both the carrier and MixMor, if claim is to be made.

MixMor mixers do not require the service of a factory engineer upon installation. This service is not included in the price of the unit; therefore, it is to be furnished, it must be agreed upon, in writing, between MixMor and the purchaser.

MixMor warranty becomes void if the unit sold is not operated within the rating and mixing service conditions for which it was specifically sold. The purchaser shall take all necessary precautions to eliminate all external destructive conditions, including unusual variable loads affecting the critical speed of the system, severe shock loading, mechanical or thermal overloads and other conditions of which MixMor was not fully advised. The mixer must be installed and maintained in accordance with this service manual.

MixMor must be informed within thirty days, for warranty to cover the mixer in the event of any malfunction during the warranty period.

All personnel directly responsible for operation of equipment must be instructed on proper installation, maintenance and safety procedures.

Design improvements are implemented on a continuous basis. Therefore, we reserve the right to make change without notice. If any questions arise regarding the data or information in this manual, please contact MixMor in Los Angeles, California.

HANDLING INSTRUCTIONS

SAFETY

When handling or working on a MixMor mixer, safety precautions must always be remembered and followed. The proper tools, clothing and methods of handling should be used to prevent any accidents.

This manual lists a number of safety precautions. Follow them. Insist that your employees do the same. Safety precautions and equipment have been developed from past accidents. Follow and use them for your protection.

HANDLING

Do not support or lift the mixer in a manner, which could create excessive stress on parts or shaft extensions. Never allow shafting to support any weight of the drive assembly. A slightly bent shaft will cause extreme mixer vibration. Support the mixer with a lifting sling to prevent damaging of any external mixer parts.

INSTALLATION INSTRUCTIONS

STORAGE

If installation of the mixer and/or operation is to be delayed for more than one month after factory shipment, special rust preventative precautions should be taken. The precautions may be taken by the user or by the factory if full information concerning storage conditions is provided at the time of ordering. When prolonged storage is unavoidable, it should be indoor and preferable in a dry environment having a relatively constant temperature to avoid condensation problems. Always store the mixer shaft in a horizontal position, supporting it at several points.

LOCATION

The mounting location of the mixer has a definite effect on the flow pattern within the tank. The recommended location has been made with regard to your particular application and should be carefully followed to obtain optimum results.

MOUNTING

Securely bolt down the mixer to its foundation using proper size bolts, which will fit mounting holes. Bolts should be SAE Grade 5 or equivalent.

GEAR REDUCER

MixMor L Series drives are filled with oil from the factory. Consult the sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Standard lubricant is ISO VG220 mineral-based oil for drive sizes L12 thru L32, standard lubricant is Mobil SHC630 synthetic oil for drive sizes L42 thru L92. However, some units have special lubricants designed to operate in certain environments or to extend the service life of the lubricant. If in doubt about which lubricant is needed, consult MixMor. Refer to the Gear Lubrication instructions for additional information (pages no. 12 thru 14a). Mixers with motor frame sizes 320TC thru 360TC utilize an automatic pressure lubricator for the input assembly bearing, which must be installed and activated prior to start-up. Refer to Gear Reducer Lubrication instructions (pages 9 thru 12).

FLEXIBLE COUPLING

The mixer uses a flexible coupling to connect the motor output shaft to the gear reducer input shaft. After start-up, the mixers that utilize foot-mounted motors should be run until the operating temperature stabilizes. Coupling alignment should then be checked and any necessary corrections made. It is good to check the alignment, once more, after operating under a load for two or three weeks. Refer to page 18.

MIXER SHAFT - (Refer to manual front page for supplied coupling design)

Flange Coupling Design

Refer to drawing no. 05-51904, page 5. Handle the shaft carefully and always place it in a horizontal position, supporting it at several points. Slide the tapered end of the shaft (12) through the mixer mounting flange and into the flange coupling (10). Insert key (11) into the shaft and coupling keyway. Place the keeper plate (6) into the recess in the flange coupling and tighten hex head cap screw (13) to the recommended torque shown on the drawing. Tighten socket head set screw (9). Check the coupling rabbet faces for nicks or burrs. Raise the mixer shaft and tighten hex head cap screw (8) to the recommended torque.

Hollow Shaft Design

Refer to drawing no. 05-47822, page 5a. Handle the shaft carefully and always place it in a horizontal position, supporting it at several points. Slide the shaft (4) through the mixer mounting flange (3) and into the gear reducer hollow shaft (2) until the machined step or thrust collar is against the bottom of the hollow shaft. Align the shaft keyways and Insert key (6) into the hollow shaft. Place the keeper plate (5) on the top of the hollow shaft and tighten socket flat head cap screw (1) to the recommended torque shown on the drawing. Replace the hollow shaft cover.

IMPELLER

PBT4 & VFBT4 Impellers

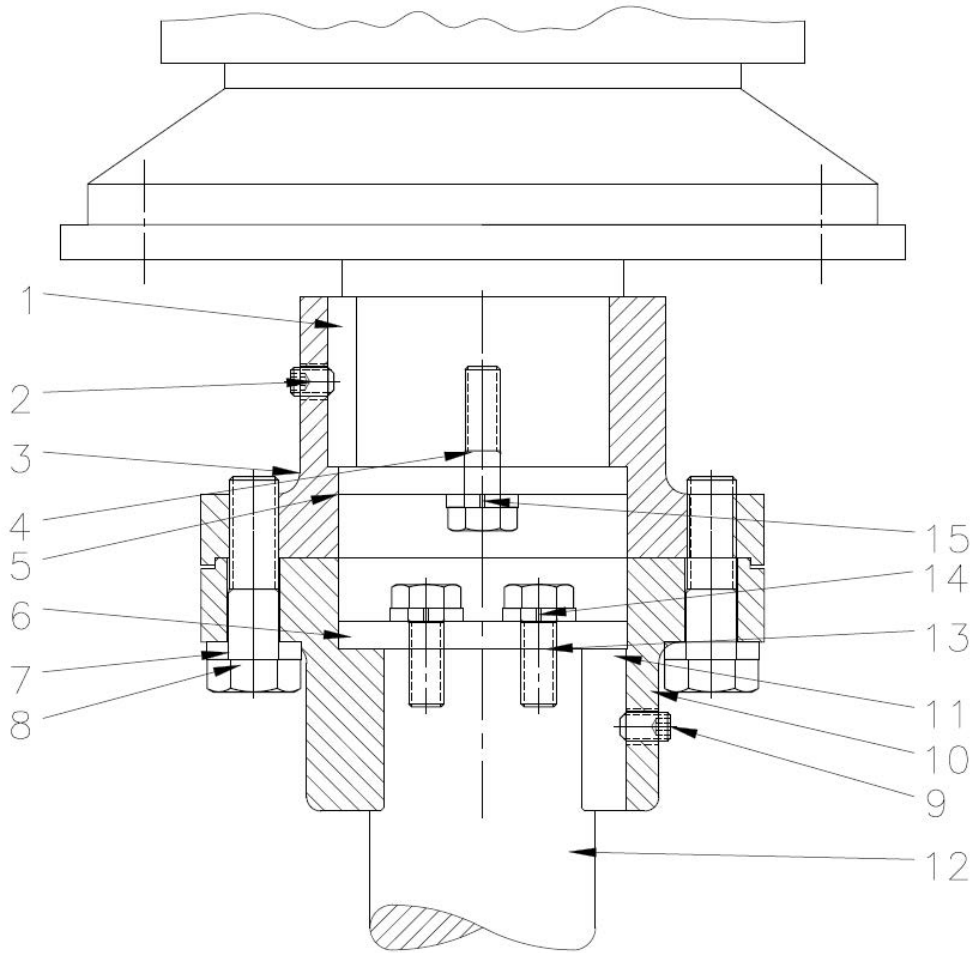
Refer to drawing no. 05-47830, page 5. The impeller hub is keyed and set screwed to the shaft. The shaft may be spot drilled for the set screws on larger, heavier impellers. The impeller assembly is statically balanced at the factory. The bolted assembly impeller will have the blades and hub ears match marked for assembly in the field.

FM3, FM4, FM3W & FM4W Impellers

Refer to drawing no. 05-47831, page 5. The impeller hub is keyed and set screwed to the shaft. The shaft may be spot drilled for the set screws on larger, heavier impellers.

REDUCER FLANGE COUPLING ASSEMBLY

Dwg. No. 05-51904

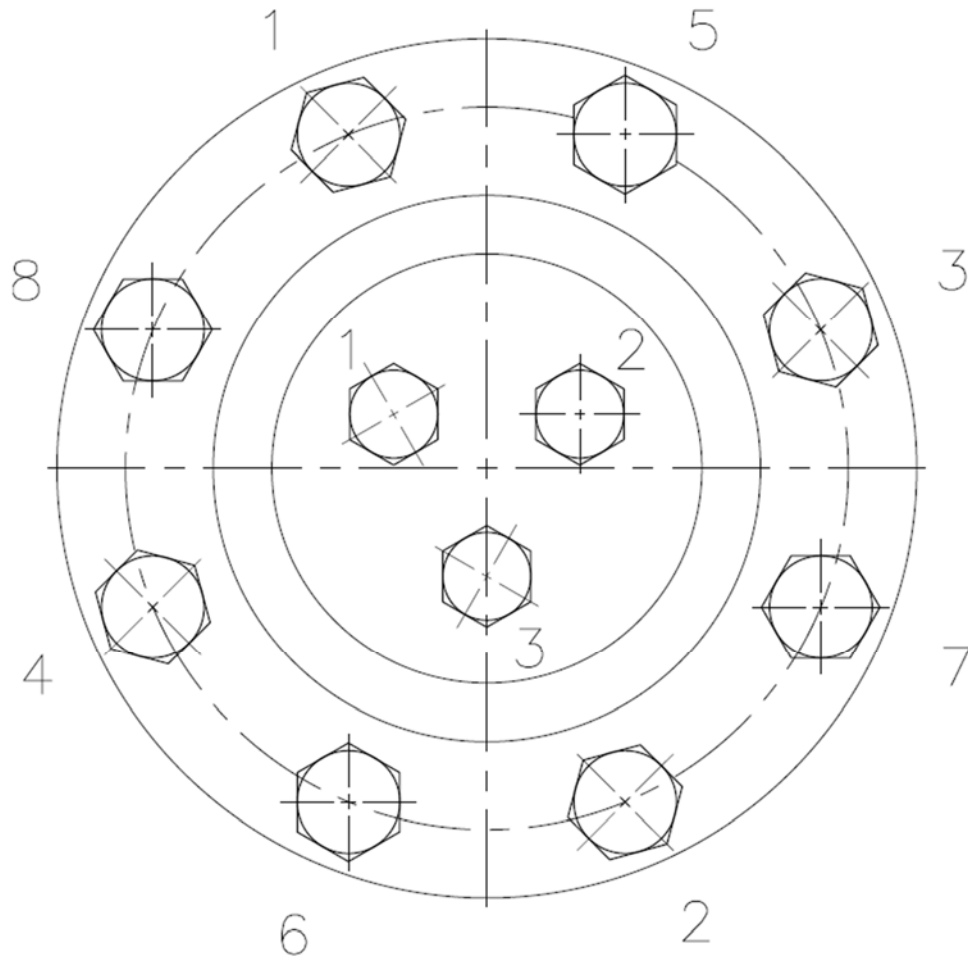


ITEM NO.	DESCRIPTION
1	KEY
2	SOCKET HEAD SET SCREW
3	GEAR REDUCER COUPLING
4	HEX HEAD CAP SCREW
5	KEEPER PLATE
6	KEEPER PLATE
7	LOCK WASHER
8	HEX HEAD CAP SCREW
9	SOCKET HEAD SET SCREW
10	MIXER SHAFT COUPLING
11	KEY
12	LOWER SHAFT
13	HEX HEAD CAP SCREW
14	LOCK WASHER
15	LOCK WASHER

RECOMMENDED TIGHTENING TORQUES, FT.-LB		
SCREW SIZE	NO. 8 HEX HEAD CAP SCREW GRADE 5	NO. 4 & 13 HEX HEAD CAP SCREW GRADE 8
1/2"-13	75	105
5/8"-11	150	210
3/4"-10	260	375
7/8"-9	430	600
1"-8	640	900

NOTE: PROVIDED TORQUE INTERVALS ARE FOR DRY THREADS. FOR LUBRICATED THREADS USE 75% OF THE TORQUE VALUE

BOLT TIGHTENING SEQUENCE FOR COUPLINGS

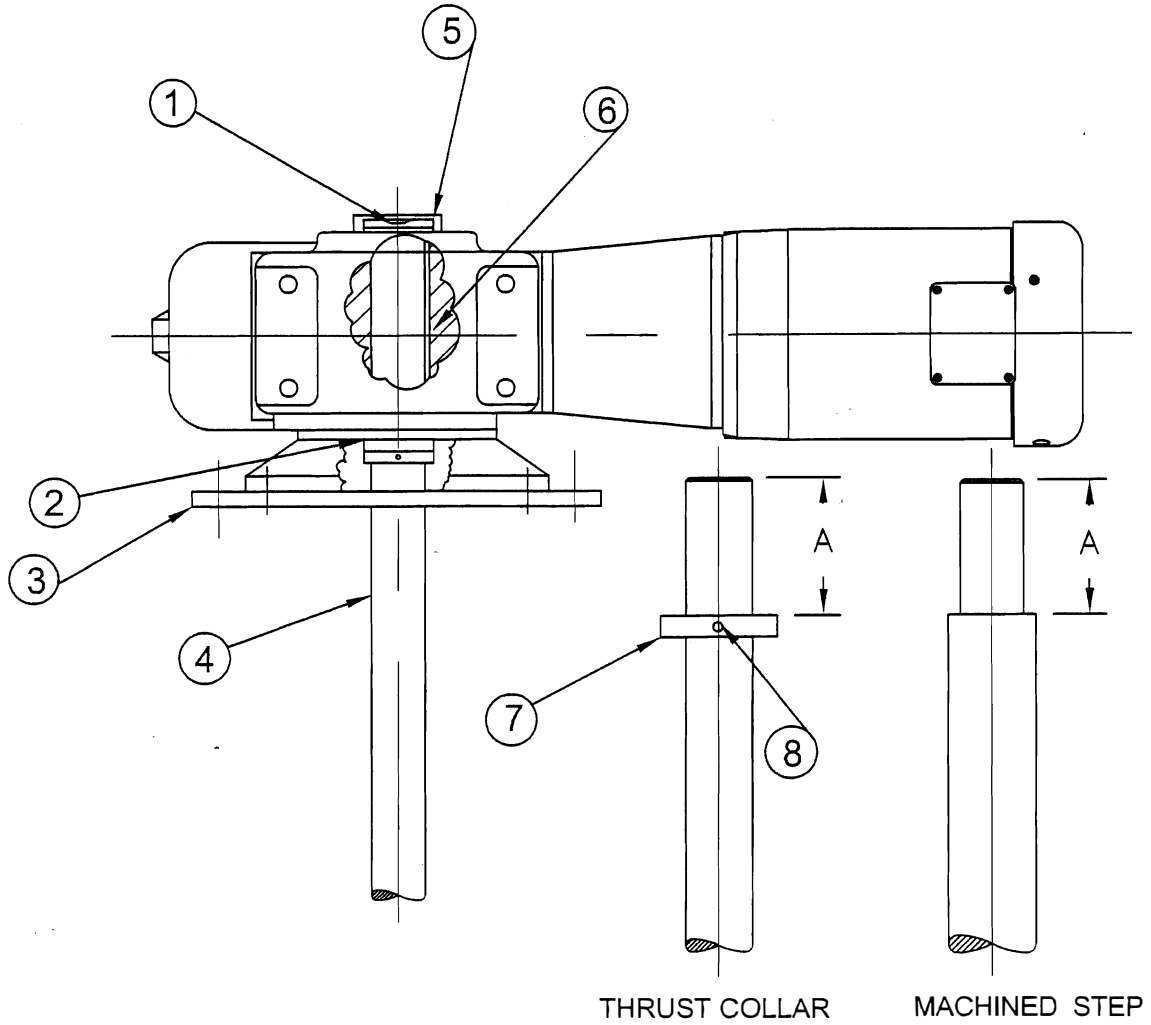


After coupling assembly and all nuts have been run down by hand, start wrench tightening following the sequence of the numbers indicated to the torque provided.

During the following steps, keep any gap between couplings even all around the circumference.

- First time around snug the hex head cap screws with a socket wrench
- Second time around tighten the hex head cap screws firmly
- Third time apply 25% recommended torque
- Fourth time apply 75% recommended torque
- Fifth time apply 100% recommended torque
- Continue tightening screws all around until they do not move under 100% recommended torque
- If possible, re-torque after 24 hours. Most of any screw preload loss occurs within the first 24.

MIXER SHAFT ASSEMBLY
Dwg. No. 05-47822

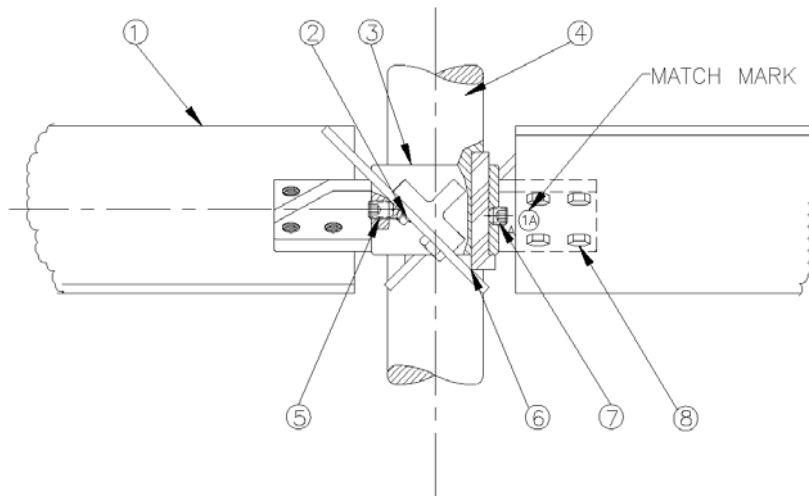


PART NO.	DESCRIPTION
1	SOCKET HEAD FLAT SCREW
2	HOLLOW BORE SHAFT
3	BASEPLATE
4	MIXER SHAFT
5	KEEPER PLATE
6	KEY
7	THRUST COLLAR
8	SOCKET HEAD SET SCREW (2)

DRIVE SIZE	TORQUE FT./LBS.
L12	150
L22	150
L32	150
L42	160
L52	640
L72	640
L82	640
L86	640

DRIVE SIZE	'A' DIM.
L12	8.40"
L22	10.30"
L32	11.14"
L42	13.97"
L52	17.71"
L72	20.25"
L82	23.89"
L86	29.05"

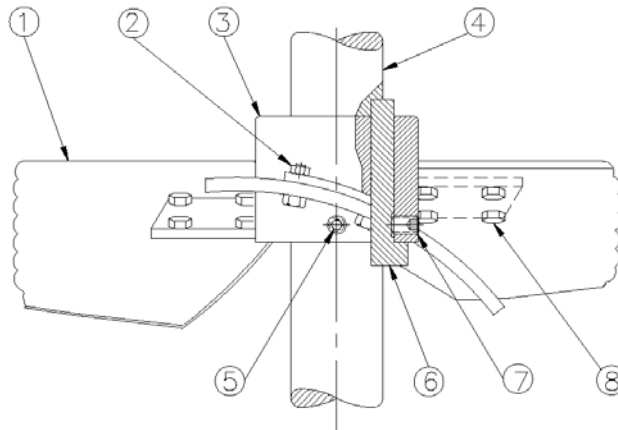
PBT4 & VFBT4 IMPELLERS
Dwg. No. 05-47830



Shafts may be spot drill for larger impeller set screws

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
1	BLADE	5	SOCKET HEAD SET SCREW
2	LOCK WASHER	6	HOOK KEY
3	HUB	7	SOCKET HEAD SET SCREW
4	SHAFT	8	HEX HEAD CAP SCREW

FM3, FM4, FM3W & FM4W IMPELLERS
Dwg. No. 05-47831



Shafts may be spot drill for larger impeller set screws

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
1	BLADE	5	SOCKET HEAD SET SCREW
2	HEX NUT	6	HOOK KEY
3	HUB	7	SOCKET HEAD SET SCREW
4	SHAFT	8	HEX HEAD CAP SCREW

MODEL TO, BASEPLATE BEARING AND PARTS
Dwg. No. 05-01605

GENERAL INFORMATION

This model mounts on a square baseplate. Depending upon drive size and mixer shaft design, mixer baseplate may incorporate a heavy-duty self-aligning ball bearing for additional shaft support. The following lubrication instructions apply if your baseplate has a bearing mounted onto it.

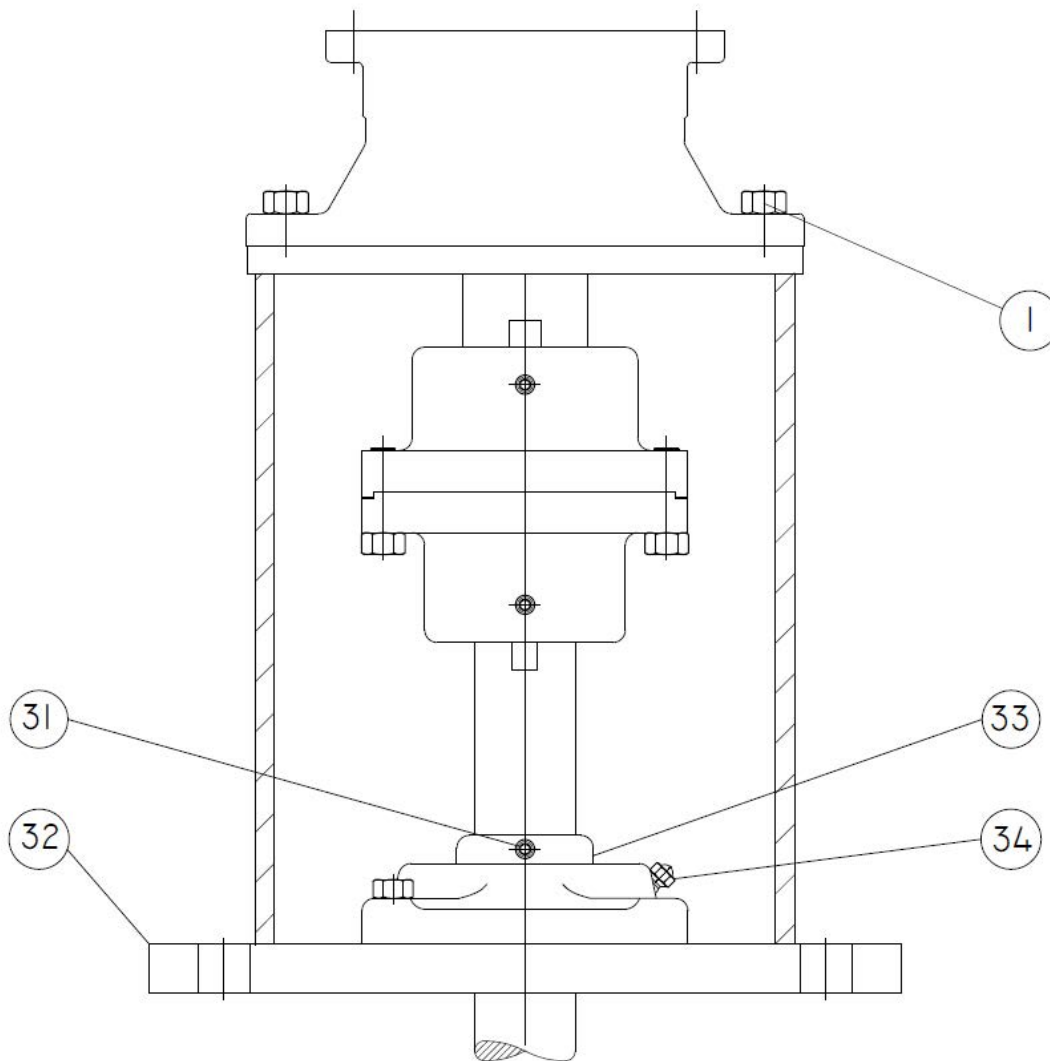
BASEPLATE BEARING LUBRICATION

The bearing should contain as much grease as practical, since a full bearing with consequent slight leakage is the best protection against entrance of foreign material. When establishing a relubrication schedule, note that a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals. A good starting point to establish a relubrication schedule is to relubricate the bearing weekly. If the mixer is operated in a clean, dry environment, the bearings will have to be relubricated less frequently.

Abnormal bearing temperatures may indicate faulty lubrication. Normal temperatures may range from “cool to warm to the touch” up to a point “too hot to touch for more than a few seconds”, depending upon the bearing size and surrounding conditions. High temperature with no grease showing at the seals, particularly if the bearing seems noisy usually indicates too little grease. Unusually high temperature accompanied by excessive leakage of grease indicates too much grease. Normal temperature and a slight showing of grease at the seals indicate proper lubrication.

Many ordinary cup greases are not suitable for lubrication. The bearing has been lubricated at the factory with No. 2 consistency lithium base grease, which is suitable for normal operating conditions. Relubricate with lithium base grease or a grease which is compatible with original lubricant and suitable for ball bearing service. In unusual or doubtful cases, consult with a reputable grease manufacturer.

MODEL TO PARTS
Dwg. No. 05-01605



PART No.	DESCRIPTION
1	HEX HEAD CAP SCREW
31	SOCKET HEAD SET SCREW
32	MOUNTING FLANGE
33	BEARING
34	GREASE FITTING

MODEL TCL AND TC, STUFFING BOX AND PARTS

GENERAL INFORMATION

The purpose of a stuffing box packing is to limit leakage to a practical level and not to stop leakage completely. If the gland is tightened to prevent all leakage, packing life will be shortened and shaft damage will occur. The stuffing box START-UP instructions should be carefully followed for long packing and shaft life.

The packing type furnished with the mixer is specified on the certified drawing. If the furnished packing is not satisfactory for the service conditions, it should be replaced.

LUBRICATION

The stuffing box is shipped without lubricant because of Federal regulations and the danger of using a lubricant that may contaminate the product. The stuffing box is normally furnished with a grease fitting and lantern ring for intermittent lubrication of the packing.

START-UP INSTRUCTIONS – Refer to Dwgs. No. 05-01604 and 05-01606

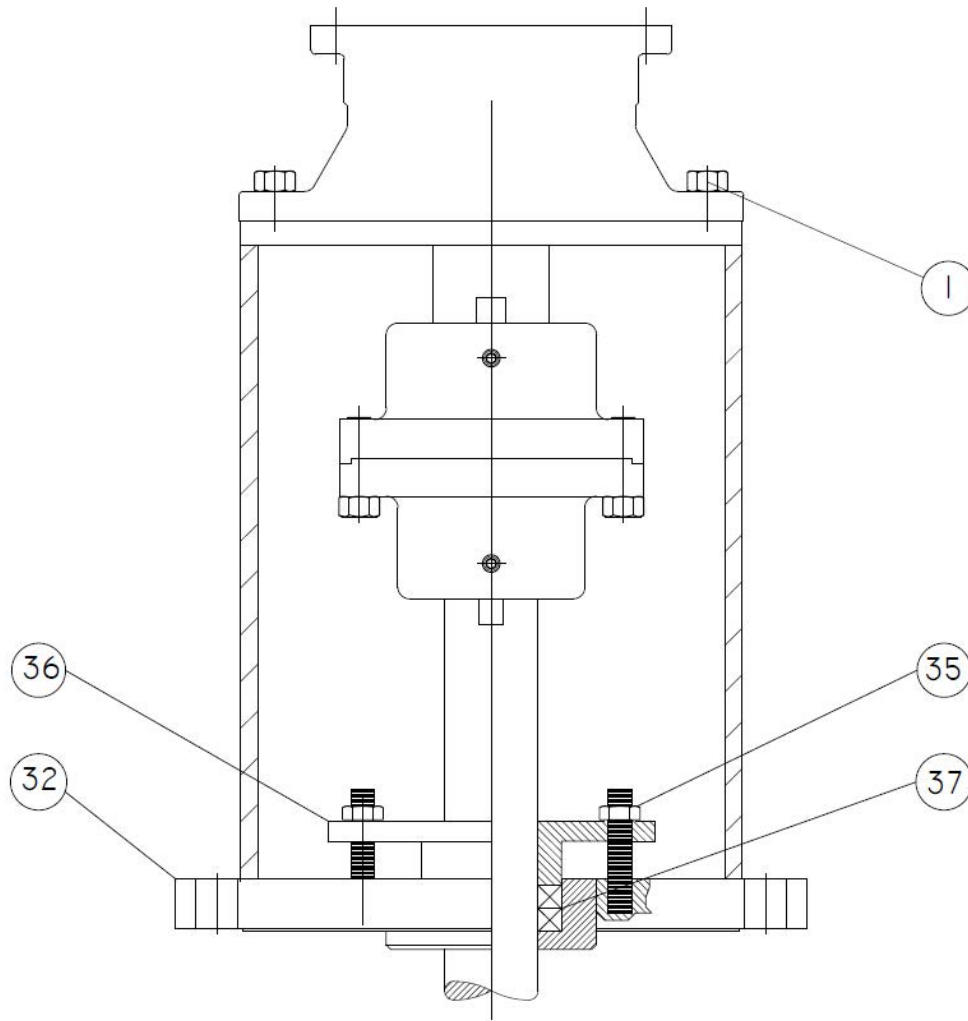
Prior to initial operation, the following procedure should be used to assure a long seal life.

1. Tighten the gland screws (35) to "finger tightness".
2. Start the mixer and run it until the stuffing box has reached a constant operating temperature. Stop the mixer and tighten opposite screws (35). Note: When tightening the screws, be careful to avoid cocking the follower (36). Even tightening of the follower will seat the packing (37) while it is warm and pliable.
3. Loosen gland screws (35) to finger tightness and re-start the mixer. Leakage may be excessive but do not tighten the screws for the first 20 to 30 minutes.
4. If leakage is excessive after this initial run-in period, adjust the follower by tightening the screws evenly, one flat or a sixth of a turn at a time. This should be done every 30 minutes until leakage is reduced to a normal level.
5. Adjustments must always be done gradually and held to a minimum tightness. Although this procedure may take several hours; it will pay dividends in increase packing and shaft life.

REPACKING PROCEDURE

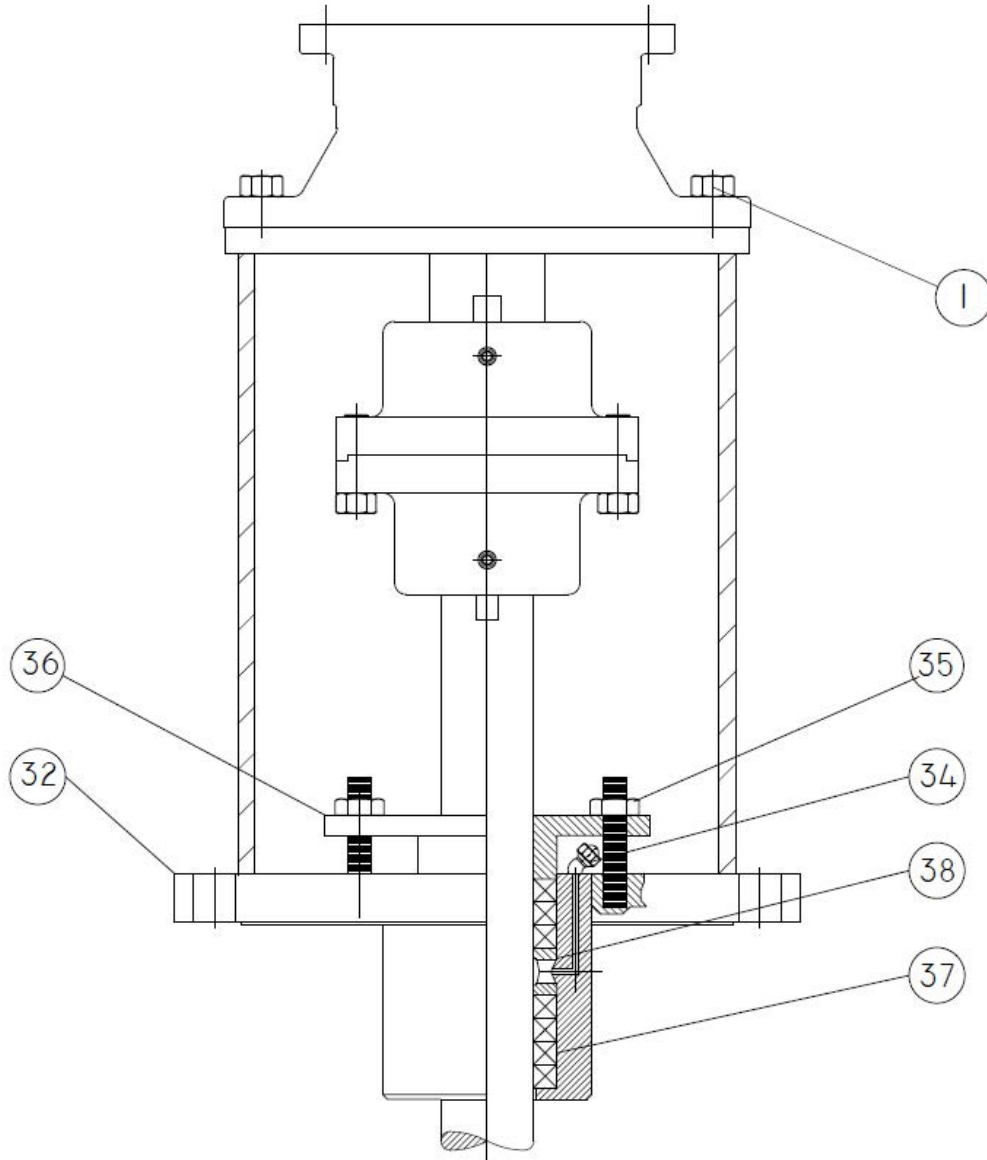
1. Remove the follower (36), all packing (37) and lantern ring (38) (Model TC only). Carefully avoid scoring the shaft with the packing hook or removal tool.
2. Inspect the shaft and lantern ring (38). Lantern ring, lubrication channel and holes must be free of packing and dirt. Minor shaft wear should be worked smooth. Where excessive wear exists, the shaft should be built-up and re-machined to give a smooth finish or it should be replaced. Clean stuffing box thoroughly, checking to insure the lubrication holes are free and clear.
3. The location of the lantern ring (38) should be predetermined for proper alignment between lubrication holes and grease lines or fittings.
4. Insert first ring of packing (37) into the box. Install a split spacer (preferably of wood) into the box against packing so that packing ring is firmly seated and spread to make a good seal against the inside walls of the box and the shaft. When tightening the follower, pull it up evenly so each ring will be packed squarely into the box, assuring a good seal. Repeat this procedure for each ring. The individual packing joints must be staggered at 90°.
5. After the box has been completely packed, replace the follower, tightening the screws (35) to finger tightness.
6. Start the mixer and run it until the stuffing box has reached a constant operating temperature. Stop the mixer and tighten the screws. When tightening, be careful to avoid cocking the follower. Even tightening of the follower will seat the packing (37) while it is warm and pliable.
7. Again, loosen the screws to finger tightness. Do not tighten the screws for the first 20 to 30 minutes, even though leakage may be excessive.
8. If leakage is excessive after this initial run-in period adjust the follower by tightening the screws. This should be done every 30 minutes until leakage is reduced to a normal level.
9. Adjustments must always be done gradually, over several hours and held to a minimum tightness to increase packing life.

MODEL TCL
Dwg. No. 05-01604



PART No.	DESCRIPTION
1	HEX HEAD CAP SCREW
32	MOUNTING FLANGE
35	LOCK NUT
36	FOLLOWER
37	PACKING

MODEL TC PARTS
Dwg. No. 05-01606



PART No.	DESCRIPTION
1	HEX HEAD CAP SCREW
32	MOUNTING FLANGE
34	GREASE FITTING
35	LOCK NUT
36	FOLLOWER
37	PACKING RINGS
38	LANTERN RING

STEADY BEARING

INSTALLATION – Refer to drawing No. 05-09794, Rev. 4

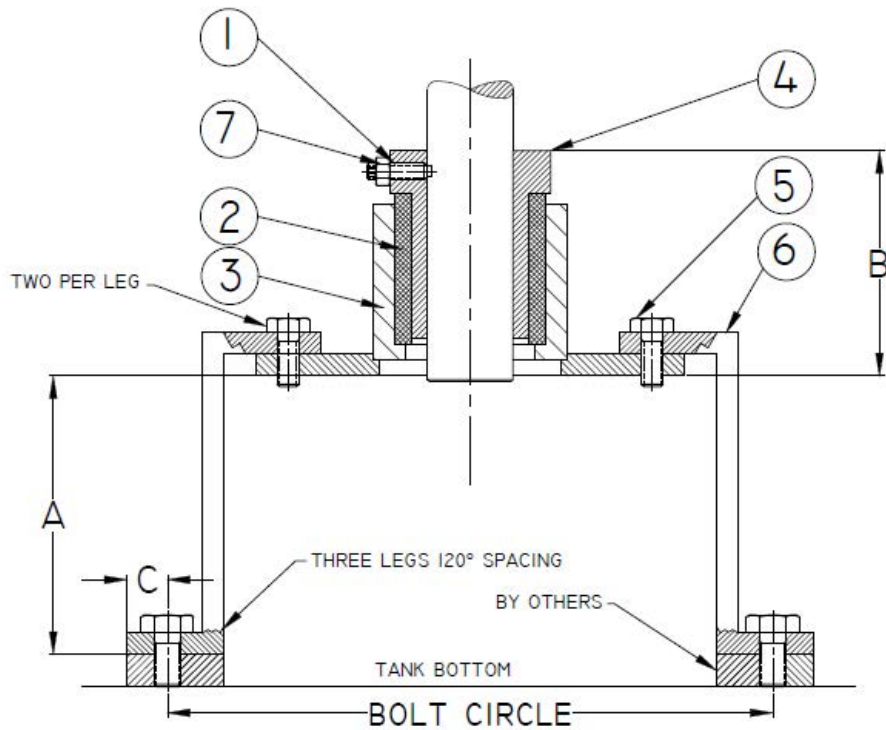
The steady bearing must be centered on the mixers shaft's axis of rotation. To assure that the bearing is properly located and to minimize bearing preload, it must be installed after the mixer is mounted onto the tank and after the shaft is installed.

To find the shaft's center of rotation, attach a marker that will contact the tank bottom to the end of the shaft. Remove the motor fan cover and rotate the motor fan. This will draw a circle on the tank bottom. Install the bearing in the center of the circle.

Spot drill the mixer shaft for the half dog point set screws (1) and lock in place with hex nut (7).

The shaft runout will differ depending upon the shaft length and diameter.

Dwg. No. 05-09794, Rev. 4



PART NO.	DESCRIPTION
1	HALF DOG POINT SOCKET HEAD SET SCREW
2	BUSHING*
3	CARTRIDGE
4	SHAFT WEAR SLEEVE*
5	HEX HEAD CAP SCREW*
6	STAND
7	HEX NUT

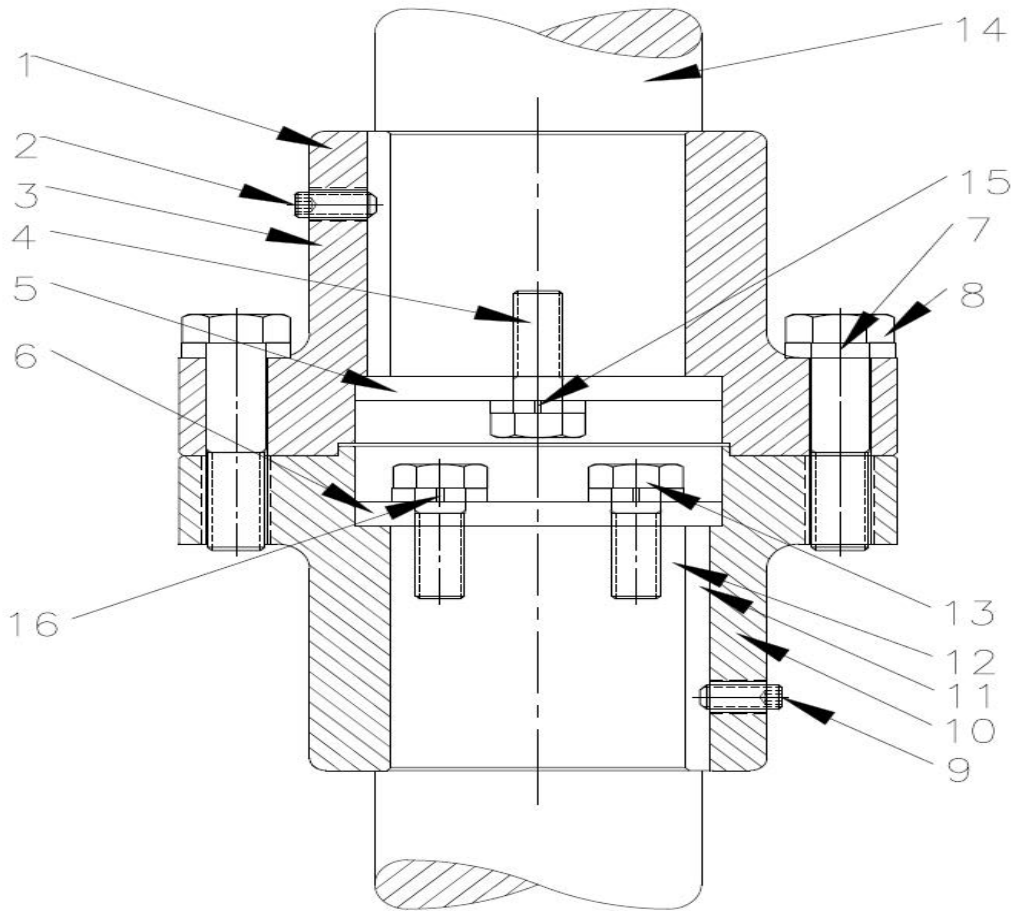
* RECOMMENDED SPARE PARTS

SHAFT DIA.	A	B	C	BOLT CIRCLE	HOLE SIZE
1½"-1¾"	5"	4"	¾"	11¾"	9/16"
2"-2¼"	5½"	5⅛"	15/16"	14⅛"	11/16"
2½"	6½"	5⅛"	15/16"	14⅛"	11/16"
2¾"-3"	6½"	6⅝"	15/16"	14⅛"	11/16"
3½"	7½"	6⅝"	15/16"	15⅜"	13/16"
4"-5"	7½"	6⅝"	1/16"	15⅜"	13/16"

DIMENSIONS ARE APPROXIMATE

INTANK FLANGE COUPLING ASSEMBLY

Dwg. No. 05-51905



ITEM NO.	DESCRIPTION
1	KEY
2	SOCKET HEAD SET SCREW
3	UPPER SHAFT COUPLING
4	HEX HEAD CAP SCREW
5	KEEPER PLATE
6	KEEPER PLATE
7	LOCK WASHER
8	HEX HEAD CAP SCREW
9	SOCKET HEAD SET SCREW
10	LOWER SHAFT COUPLING
11	KEY
12	LOWER SHAFT
13	HEX HEAD CAP SCREW
14	UPPER SHAFT
15	LOCK WASHER
16	LOCK WASHER

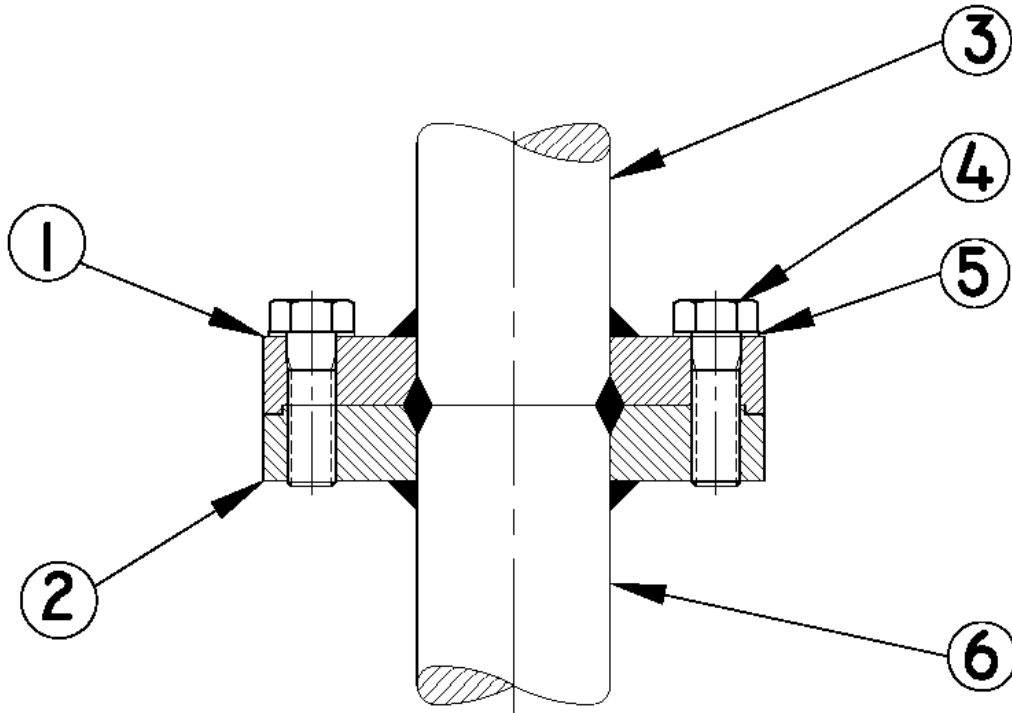
RECOMMENDED TIGHTENING TORQUES, FT.-LB				
SCREW SIZE	NO. 8 HEX HEAD CAP SCREW		NO. 4 & 13 HEX HEAD CAP SCREW	
	ALLOY STEEL GRADE 5	STAINLESS STEEL GRADE 5	ALLOY STEEL GRADE 8	STAINLESS STEEL GRADE 8
1/2"-13	75	45	105	45
5/8"-11	150	95	210	95
3/4"-10	260	150	375	150
7/8"-9	430	190	600	190
1"-8	640	280	900	280

NOTE: PROVIDED TORQUE INTERVALS ARE FOR DRY THREADS. FOR LUBRICATED THREADS USE 75% OF THE TORQUE VALUE

WELDED INTANK FLANGE COUPLING ASSEMBLY

Dwg. No. 05-48912

Revised 04/13



ITEM NO.	DESCRIPTION
1	UPPER SHAFT COUPLING
2	LOWER SHAFT COUPLING
3	UPPER SHAFT
4	HEX HEAD CAP SCREW
5	LOCK WASHER
6	LOWER SHAFT

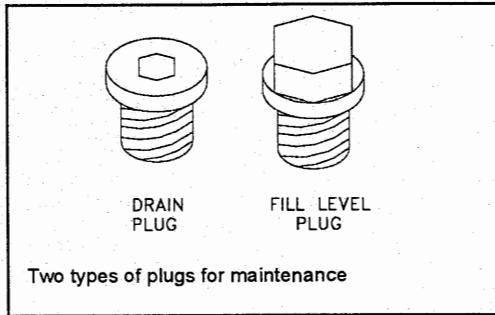
RECOMMENDED TIGHTENING TORQUES, FT.-LB		
SCREW SIZE	ALLOY STEEL GRADE 5	STAINLESS STEEL GRADE 5
1/2"-13	75	45
5/8"-11	150	95
3/4"-10	260	150
7/8"-9	430	190
1"-8	640	280

NOTE: PROVIDED TORQUE INTERVALS ARE FOR DRY THREADS. FOR LUBRICATED THREADS USE 75% OF THE TORQUE VALUE

GEAR REDUCER LUBRICATION

FILL LEVEL & DRAIN PLUGS

The drain plugs are metric socket head cap screws. They will be located at the lowest part of the gearbox for ease of draining. The fill level plug is a hex head cap screw. It will be located between the Autovent and drain plug. Both types of plugs will have gaskets included to prevent oil from leaking.



LUBRICANT

All NORD reducers are shipped from the factory properly filled with lubricant and all plugs are installed according to the mounting position given on the reducer nametag. Acceptable oil fill level is within 1/2 inch of the bottom of the fill plug threads.

OPERATION AND MAINTENANCE CHECKLIST

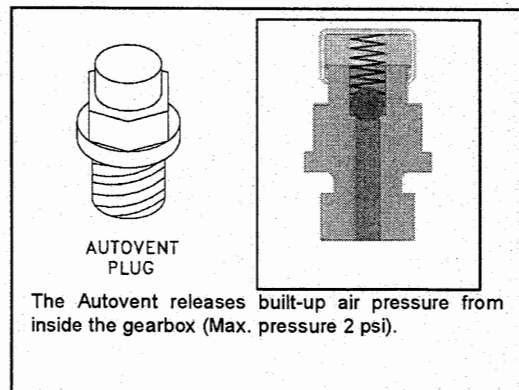
1. Operate the equipment as it was intended to be operated
2. Do not overload.
3. Run at correct speed.
4. Maintain lubricant in good condition and at proper level.
5. Dispose of used lubricant in accordance with applicable laws and regulations.
6. Apply proper maintenance to attached equipment at prescribed intervals recommended by the manufacturer.
7. Perform periodic maintenance of the gear drive as recommended by NORD.

LUBRICATION CAPACITY

DRIVE SIZE	QUARTS
L22	2.11
L32	3.49
L42	6.87
L52	12.15
L72	20.08
L82	40.15
L86	56.00

AUTOVENT PLUG

The Autovent plug is brass in color and will be located at the highest point on the gearbox. It operates like a check-valve to allow the reducer to relieve internal pressure while preventing lubricant contamination during cooling. A spring presses a ball or plunger against a machined orifice until pressure exceeds 2 psi. Above 2 psi the air is allowed to escape depressurizing the gearcase. When internal pressure drops below 2 psi, the autovent re-seals closing the unit to the outside environment. After shutdown, the reducer cools along with the air inside the reducer. The unit will temporarily maintain a slight vacuum until normalization occurs. NORD Gear supplies an Autovent as a standard feature.



MAINTENANCE

Mineral oil should be changed every 10,000 hours or after two years. For synthetic oils, the lubricant should be changed every 20,000 hours or after four years. In case of extreme operating conditions (e.g. high humidity, aggressive environment or large temperature variations), shorter intervals between changes are recommended. If in doubt about the intervals, consult MixMor or your lubricant supplier.

OIL SPECIFICATIONS

MixMor L Series drives are filled with oil from the factory. Consult the nameplate/tag adjacent to the fill plug to determine the type of lubricant installed at the factory. Drive sizes L12 thru L32 standard lubricant is ISO VG220 MIN-EP mineral oil with EP Additive and NLGI 2 MIN mineral based grease. Drive sizes L42 thru L92 standard lubricant is ISO VG220 PAO synthetic polyalphaolefin oil and NLGI 2 PAO synthetic grease. However, some units may have special lubricants designed to operate in certain environments, or to extend the service life of the lubricant. If in doubt about which lubricant is needed, consult MixMor.

Standard Oil Lubricants

ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
VG220	MIN-EP	0 to 40°C (32 to 104°F)	Mobilgear 600XP220	♣♠
	PAO	-35 to 60°C (-31 to 140°F)	Mobil SHC630	♣♠
	FG	-5 to 40°C (23 to 104°F)	Fuchs FM220	♣

Optional Oil Lubricants


ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
VG460	PAO	-35 to 80°C (-31 to 176°F)	Mobil SHC 634	-
	FG-PAO	-35 to 80°C (-31 to 176°F)	Mobil SHC Cibus 460	-
VG220	FG-PAO	-35 to 60°C (-31 to 140°F)	Mobil SHC Cibus 220	-
VG150	PAO	-35 to 25°C (-31 to 77°F)	Mobil SHC629	-

Grease Options (applied to greased bearings and seal cavities)

NLGI Grade	Grease Thickener	Grease Base Oil	Ambient Temperature Range	Manufacturer Brand/Type	Notes
NLGI 2	Li-Complex	MIN	-30 to 60°C (-22 to 140°F)	Mobil Grease XHP222	♣♠
	Li-Complex	PAO	-40 to 80°C (-40 to 176°F)	Mobil / Mobilith SHC 220	♣♠
	Polyurea	FG-PAO	-30 to 80°C (-22 to 176°F)	Mobil SHC Polyrex 222	♣

♣ Stocked Lubricants

- ♠ Standard product on serviceable gear units
- ♣ Standard product on maintenance free gear units

 IMPORTANT NOTE	
<ul style="list-style-type: none"> • The "Ambient Temperature" is intended to be an operation guideline based upon the typical properties of all the lubricant. The viscosity and other properties of the lubricant change based upon load, speed, ambient conditions, and reducer operating temperatures. The user should consult with their lubrication supplier & NORD gear before considering changes in oil type or viscosity. • To prevent reducer overheating, observe the maximum operating oil temperature limits: Mineral Oil: 80-85 °C (176 – 180 °F). Synthetic Oil: 105 °C (225 °F). • In the following instances, please consult NORD for specific recommendations: <ul style="list-style-type: none"> ✓ Gear units will operate in high ambient temperature conditions exceeding 40 °C (104 °F). ✓ Gear units will operate in cold ambient temperature conditions approaching 0 °C (32 °F) or lower. ✓ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service. ✓ Fluid grease is required for lubricating the gear unit. • Observe the general lubrication guidelines outlined in user manual U10750. 	

Oil Formulation Codes

MIN-EP - Mineral Oil with EP Additive
 PAO-EP - Synthetic Polyalphaolefin Oil with EP Additive
 PAO - Synthetic Polyalphaolefin Oil
 PG - Synthetic Polyglycol Oil
 FG - Food-Grade Oil
 FG-PAO - Food-Grade, Synthetic Polyalphaolefin Oil
 FG-PG - Food-Grade, Synthetic Polyglycol Oil

Lubrication Notes

- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not to mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil or polyalphaolefin (PAO) synthetic oil.

AUTOMATIC LUBRICATOR



DRIVESYSTEMS

RETAIN FOR FUTURE USE

Automatic Lubricator

This lubricator is used only on input assembly no. 05-47755, for motor frame sizes 320TC thru 360TC, refer to page 23 for assembly details.

Principle of Operation

First the activation screw is threaded into the lubrication can-ister. Then the ring-eyelet on top of the activation screw is tightened until its breaking point. This causes a zinc-molyb-denum gas generator to drop into a citric acid liquid electro-lyte, which is contained within an elastic bladder. An electro-chemical reaction slowly releases small amounts of hydrogen gas and gradually pressurizes the bladder, pushing the piston towards the lubrication chamber.

Grease is continuously injected into the lubrication point until the bearing cavity is full. Any back pressure from the bearing will cause the system to neutralize. The bladder inside the canister will continue to slowly build pressure so that once the equipment resumes normal operation; the lubricator will also resume its normal function.

The lubricator contains approximately 120 cm³ or 120 ml (4.8 oz) of grease. For reference, a single stroke of a typical grease gun delivers approximately 1.0-1.2 cm³ (0.03-0.04 oz) of grease. This means the canister contains approximately 100 strokes of grease. See Figure 1 for a detailed view of the PERMA® Lubricator.

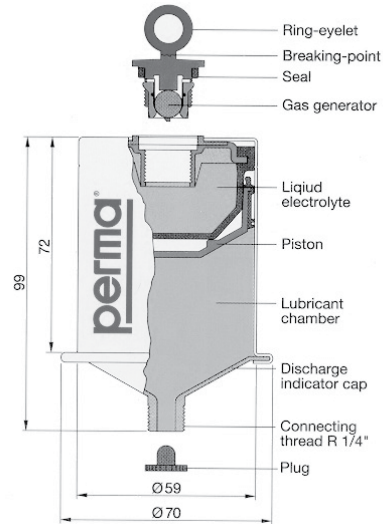


Figure 1 - PERMA® Automatic Lubrication Canister

STOP **HARMFUL SITUATION** STOP

- To prevent premature bearing failure, the lubrication dispenser must be activated prior to commissioning the gear reducer.
- The lubricator must only be used once and should never be opened or taken apart or permanent damage will result.
- Never unscrew the PERMA® canister from the lubrication point after activation or during the discharge period. This would cause a permanent pressure loss in the lubricator and would justify replacing the lubricator.

! **WARNING** !

- Avoid swallowing the gas generator, the liquid electrolyte, and the lubricant.
- Avoid contact of, the liquid electrolyte, and the lubricant with the eyes, skin or clothing.
- Observe all applicable MSDS sheets.
- Follow applicable local laws and regulations concerning waste disposal.

PERMA® Automatic Lubricator Options Supplied by NORD

NORD Part Number	28301000	28301010
Lubrication Option	Synthetic (standard)	Food Grade (optional)
PERMA® Classic Temperature Range ♦	0 to 40 °C (32 to 104 °F)	0 to 40 °C (32 to 104 °F)
Lubrication Volume	120 cm ³ or 120 ml (4.8 oz)	120 cm ³ or 120 ml (4.8 oz)
Grease Lubrication Mfg. / Type	Klüber / Petamo GHY 133	Lubriplate / FGL1
Lubrication Temperature Range ♦	-30 to 120 °C (-22 to 248 °F)	-18 to 120 °C (0 to 248 °F)

♦ The temperature range values shown do not apply to other components and/or lubricants within the gear reducer.

AUTOMATIC LUBRICATOR



DRIVESYSTEMS

RETAIN FOR FUTURE USE

Lubricator Service Interval

The Automatic lubricator should be inspected approximately every 6 months. At the end of the lubrication period the piston becomes clearly visible through the clear nylon discharge indicator cap located at the bottom of the PERMA® canister (Figure 1); this helps indicate that the lubricant has been fully discharged at which time the lubricator should be replaced. When operating the gear unit 8 hours/day or less a replacement interval of 12 months or 1 year is possible. Ambient temperature will influence the discharge rate and may extend or shorten the replacement interval.

Ambient Considerations

The grease discharge rate is affected by the ambient temperature. PERMA® indicates that the lubricator contents will dispense for a 12 month period when the average temperature is 20 °C (68 °F). Grease dispensing rates depend primarily on average ambient conditions and not extreme highs and lows. Lower ambient temperatures will lead to slower dispensing rates and higher ambient temperatures will lead to faster dispensing rates.

Average Ambient Temperature	Discharge Period Months ♦
0 °C (32 °F)	>18
10 °C (50 °F)	18
20 °C (68 °F)	12
30 °C (86 °F)	6
40 °C (104 °F)	3

♦ Values are approximate.

Discharge can also be influenced by type of lubricant, vibration, and by the mating connecting parts in the lubrication system.

Activating the Automatic Lubricator

- Loosen and remove the M8x16 assembly socket head cap screws (1251).
- Carefully remove the protective cover (1252) installed over the automatic lubricator (1250-1).
- Screw the activation screw (1250-2) into the automatic lubricator (1250-1) and twist the ring-eyelet until it reaches its breaking point.
- Re-fit the cartridge cover (1250-1) and re-install and tighten the assembly screws (1251).
- Mark the activation date on the adhesive label that is provided.

Figure 2 - Activating the Automatic Lubricator

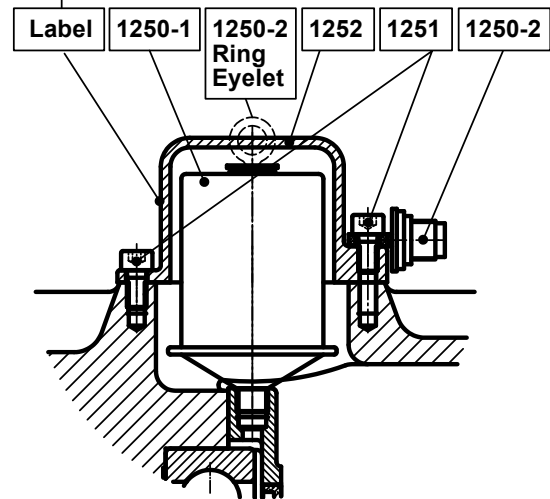
Attention!

Screw in the activation screw until the lug breaks off before commissioning the gear unit.

Dispensing time: 12 Months

Activation Date

Month	Year
1 2 3 4 5 6 7 8 9 10 11 12	11 12 13 14 15



- 1250-1 Automatic Lubricator
- 1250-2 Activation Screw
- 1251 Socket Head Cap Screws
- 1252 Protective Cover

AUTOMATIC LUBRICATOR



DRIVESYSTEMS

RETAIN FOR FUTURE USE

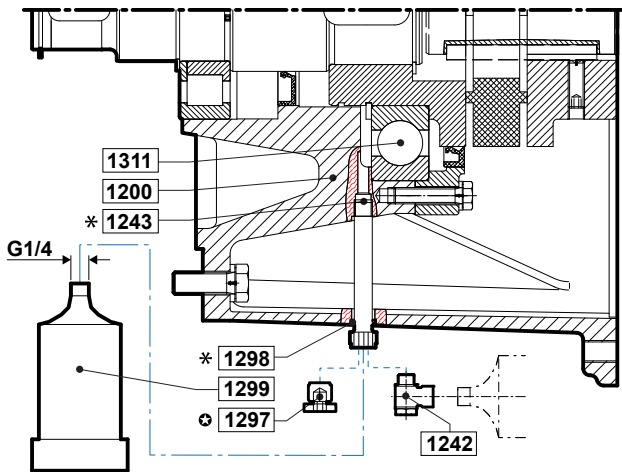
Grease Purge and Grease Drain Cup

Some versions of the NEMA (or IEC) adapters also include a grease purge and a grease drain cup (1299) for collecting old grease. The grease purge area is sealed for transportation.

It is recommended that the G1/4 sealing screw (1297) be removed and that the grease drain cup be installed after the automatic lubricant dispenser is activated.

The swivel fitting (1242) that NORD supplies allows the grease cup to be positioned at a 90° angle from its typical mounting. The swivel fitting allows the grease cup to be rotated so that it remains clear of any gear unit mounting obstructions.

Figure 3 – Grease Purge and Grease Cup Assembly



1200	NEMA or IEC Input Cylinder
1242	Swivel Fitting (P/N) 22006359
1243	Extension*
1297	Screw Plug ⚙
1298	Seal Ring*
1299	Grease Drain Cup (P/N 2830100)
1311	Bearing

* Supplied on certain input assembly sizes as needed.

⚙ Remove the screw plug to install either the grease drain cup or the swivel fitting with the grease drain cup.

Grease Cup Servicing

NORD suggests that with every second replacement of the automatic lubricator, the grease collection cup (NORD Part No. 28301210) should be emptied or replaced with a new one. Follow the steps below to service the grease cup.

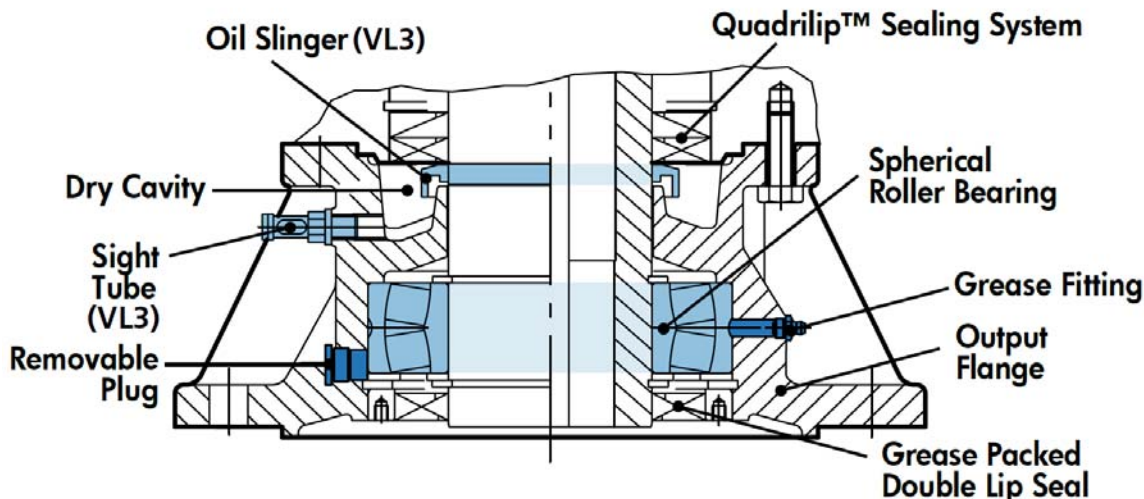
1. Unscrew the grease drain cup (1299) from either the outlet port of the NEMA or IEC input cylinder or from the extension (1243) that is secured to the NEMA or IEC input cylinder.
2. To empty the grease drain cup (1299) insert a stiff rod through the hole in the grey cap-end of the drain cup and push the internal plunger towards the thread-end of the drain cup. Please note that the dark gray end cap is bonded into place and cannot be removed.
3. Collect and properly dispose of the grease being pushed out of the drain cup. Due to the design of the container a residual amount of grease may remain in the container.
4. After emptying and cleaning the grease cup it can be fitted back onto the grease outlet port of the NEMA or IEC adaptor.
5. In the event the grease cup becomes damaged or it should be replaced with a new container. Consider replacing the grease cup (P/N 2830100) with every second replacement of the automatic lubricator.

Replacing the Automatic Lubricator

A new automatic lubricator can be ordered from NORD by specifying the appropriate Part Number from the table at the bottom of Page 1 of this manual. Reference Figure 2 and follow the steps below to replace the automatic lubricator.

1. Loosen and remove the M8x16 socket head cap screws (1251) holding the protective cover (1252) in place.
2. Unscrew the automatic lubricator (1250-1) from the bearing cover area of the NEMA or IEC input cylinder.
3. Install the new automatic lubricator and activate per the instructions on page 2.
4. Re-install the protective cover (1252) and the assembly screws (1251).
5. Note the activation date of the newly installed automatic lubricator

LOWER OUTPUT SHAFT BEARING



The lower spherical bearing is factory assembled with the proper amount and type of grease. Drive sizes L12 thru L32 standard grease is NLGI 2 MIN-EP mineral based grease. Drive sizes L42 thru L92 standard grease is NLGI 2 PAO synthetic grease. It should be re-lubricated after every 2,500 hours of operation or a minimum of every 6 months in normal operating conditions. In severe or high temperature conditions it should be re-lubricated after every 1,250 hours of operation or a minimum of every 6 weeks.

Prior to re-greasing the screw plug located opposite to the grease nipple must be removed. Re-grease with the appropriate volume. After re-greasing the screw plug must be reinstalled and tightened in the purge port. Do not mix grease formulations.

GREASE CAPACITY

Drive Series & Size		Re-Grease Volume
F12 thru F52	L12 thru L52	1 oz.
F62 thru F82	L62 thru L82	2 oz.
F92	L86 thru L92	3 oz.

Bearing Grease Options

Reducer Oil Type	NLGI Grade	Grease Thickener	Grease Base Oil	Ambient Temperature Range	Manufacturer Brand/Type
MIN-EP	NLGI 2	Li-Complex	MIN	-30 to 60°C (-22 to 140°F)	Mobil Grease XHP222
PAO	NLGI 2	Li-Complex	PAO	-40 to 80°C (-40 to 176°F)	Mobil / Mobilith SHC 220
FG or FG-PAO	NLGI 2	Polyurea	FG-PAO	-30 to 80°C (-22 to 176°F)	Mobil SHC Polyrex 222

NOTICE

Grease compatibility depends upon the type of thickener or soap complex used, the base oil type suspended within the thickener, and the type of additives used. The user should check with the lubrication supplier before making substitutions in brand and type in order to assure compatibility and to avoid causing possible damage to the extended bearing.

START-UP INSTRUCTIONS

When starting up any new piece of equipment, it is wise to proceed cautiously. Even though the best installation practices are followed, the possibilities of errors or omissions always exist. MixMor recommends that before the initial start-up, the following checklist should be followed:

1. Has all accessory equipment such as: breathers, level indicators, pressure gauges, switches, etc., been mounted? It is often necessary to box these items separately to prevent damage or loss in shipment.
2. Are mounting bolts tight? Check all external bolts, screws, accessories, etc., to make sure they have not become loose in shipping and handling.
3. Have all couplings been mounted to shaft extensions correctly with keys and fasteners in place?
4. Have bearings been greased?
5. Have couplings been tightened properly? Have necessary guards and safety devices been installed at all hazardous locations?
6. Has the gear reducer lubricant been checked as outlined in the GEAR REDUCER LUBRICATION section? Before start-up, mixers with motor frames 320TC thru 360TC, must have the input assembly automatic pressure lubricator installed and activated.
7. Have required electrical connections been made? Units should be wired in accordance with motor manufacturers' wiring diagram on the motor.
8. Have required piping connections been made?
9. Have mixer shaft seal instructions been followed?

Mixers are test run at the factory. However, during start-up, the following procedures are recommended:

1. If the reducer is equipped with heaters for cold temperature operation, turn on heaters and allow to rise to at least 65°F.
 2. Start unit slowly under as light a load as possible. Check rotation of the shaft against rotation arrow on the mixer housing. If necessary, reverse electrical leads on motors to have shaft rotation conform to direction shown on mixer.
 3. Prime mover electrical starting equipment should be arranged to start unit as slowly as possible to avoid severe impact loads.
 4. As the mixer is brought up to normal operating speed, it should be checked continuously for unusual sounds, excessive vibrations, excessive heat or leakage. If any of these develop, the unit should be shut down immediately and the cause determined and corrected.
- À
5. If possible, the mixer should be operated under a light load (approximately half-load) for one or two days to allow final breaking-in of gears. After this period, the unit can be operated under normal load.
 6. After the first 48 hours of operation, all external housing and mounting fasteners should be checked for tightness. Loose fasteners can cause alignment problems and excessive wear.
 7. The alignment of the flexible coupling should be checked and any necessary corrections made. It is good practice to check the alignment once more after operating under a load for two or three weeks.

GEAR REDUCER

PREVENTATIVE MAINTENANCE

Keep the shafts and dip stick/vent clean to prevent foreign particles from entering the shaft seals or gear case, which could cause premature wear. Never paint the vent plug. Check coupling set screws and all fasteners for tightness. Loose fasteners will cause alignment problems and excessive wear. Check endplay in shaft. Noticeable movement might indicate service or parts replacement. The lubrication instructions should always be carefully followed. Inspect the reducer periodically for oil leaks. When oil seals are new, a small amount of lubricant leakage may appear until the seals are seated.

Proper maintenance will result in years of trouble-free performance and an extended life.

TROUBLE SHOOTING

It is advisable to periodically inspect the gear reducer for signs of wear. Spare or replacement parts can often be ordered and obtained before disassembly is necessary, thus minimizing downtime. Most of the following observations can be visually inspected without disassembly and may, in some cases, require repair work.

CHECKLIST		
OBSERVATION	POSSIBLE SOURCE	ACTION
VIBRATION	1) Loose hardware 2) Bearing failure 3) Flexible coupling alignment 4) Foreign particles in bearings and gears	Be certain all external housing and mounting fasteners are Tight Replace bearings Check alignment of high-speed flexible coupling and condition of flexible member. Foreign particles will cause excessive wear. Take steps to prevent entrance of particles. Thoroughly flush drive and refill with new oil. Modify maintenance schedule to increase frequency of oil changes.
OVERHEATING	1) Incorrect oil 2) Oil level 3) Oil condition 4) Amount of grease in bearing 5) Wrong type of bearing grease 6) Bearing adjustment 7) Breather 8) Overloaded	Refer to Lubricating Instructions for correct oil. Flush drive and refill with correct oil. Check oil level and add or drain to correct level Check to see if oil is oxidized, dirty, or of high sludge content. Change oil. Refer to Lubrication Instructions. Make sure bearing does not have an insufficient or excessive amount of grease in it. Refer to Lubrication Instructions. If incorrect grease has been used, flush housing with grease. Adjustable tapered bearings must be set to proper axial play. All shafts should turn freely when not under load Breather must be free of any obstruction. Clean breather as required. Check mixer speed and impeller diameter against certified drawing. Has the specific gravity and/or viscosity of the product increased? Inspect for material build-up on impeller. Check shaft rotation against rotation arrow.

CHECKLIST

OBSERVATION	POSSIBLE SOURCE	ACTION
NOISE	<ol style="list-style-type: none"> 1) Bearing failure 2) Rust inside drive 3) Extended shut-down or improper storage 4) Overloaded 5) Refer to VIBRATION, Source No.'s 3 & 4 6) Refer to OVERHEATING, Source No.'s 1,2,3,4,5 & 6 	<p>Replace bearings</p> <p>Rust can be caused by entrance of water or humidity. Flush and thoroughly clean drive. Take steps to prevent further entrance of water and use a lubricant with good rust-inhibiting properties.</p> <p>When drives are not properly prepared for extended shut-down or storage in a moist atmosphere or a temperature condition which will cause condensation, destructive rusting of bearing, gears and shafts/seals will take place. Clean and replace parts as required.</p> <p>Overloading can cause excessive separation of gear teeth and loud operation. Refer to OVERHEATING, Source No. 8</p>
OIL LEAKING	<ol style="list-style-type: none"> 1) Worn oil seals 2) Oil in drywell leaking at output shaft 3) Plugged breather 4) Gear case/ cap joints 5) Drain plugs, sight glasses or pipe fittings 	<p>Replace defective seals</p> <p>During storage or when mixer is being installed, with oil in the reducer, oil can flow over the drywell and through the output shaft seal. Check if oil level is too high. Remove lower bearing assembly and drain drywell.</p> <p>Breather must be free of any obstructions. Clean breather as required.</p> <p>Tighten fasteners. If this does not stop leakage, remove covers or caps, clean surfaces and replace gaskets or apply new sealing compound.</p> <p>Remove and clean all fittings. Apply a pipe joint sealant and re-install fittings.</p>

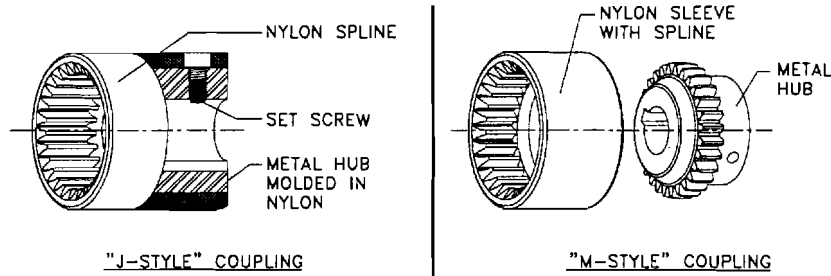
FLEXIBLE COUPLINGS

Depending on the size of the input adapter to the gearbox, NORD Gear supplies two styles of couplings - BoWex® (gear tooth) and Rotex® (jaw) couplings.

BoWex® Couplings

NORD C-face adapter input shafts have a machined spline on the end. NORD incorporates two styles of BoWex® couplings, the "J" and "M" styles. The "J" style is a one-piece coupling with a metal hub and nylon spline. The "M" style is a two piece coupling – the metal hub and a nylon sleeve. Nylon and steel components allow them to operate in high ambient temperatures without lubrication or maintenance.

- Nylon sleeves resist dirt, moisture, most chemicals and petroleum products
- No lubrication required
- Operating Conditions: -22°F - 195°F (-30°C - 90°C)
- Higher temperature coupling sleeve available up to 250°F (120°C)



BoWex® Mechanical Ratings

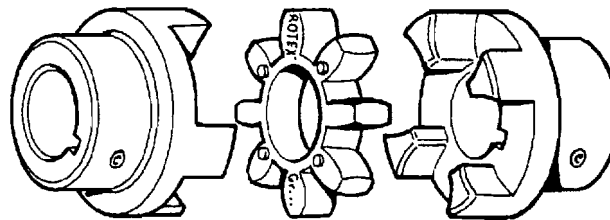
"J" Style

Coupling Type	Available Bore Sizes	Max. Torque	Input
J14	11, 14 mm 5/8 in.	20 Nm 177 lb-in	IEC 63, 71 NEMA 56C
J24	19, 24 mm 5/8, 7/8 in	40 Nm 354 lb-in	IEC 80 NEMA 56C, 140TC
J28	28mm 1 1/8 in	90 Nm 797 lb-in	IEC 100, 112 NEMA 180TC

"M" Style

Coupling Type	Available Bore Sizes	Max. Torque	Input
M38	38 mm 1 1/8, 1 3/8 in.	160 Nm 1,416 lb-in	IEC 132 NEMA 180TC, 210TC
M42	42 mm 1 5/8 in	200 Nm 1,770 lb-in	IEC 160 NEMA 250TC
M48	48 mm 1 7/8 in	280 Nm 2,478 lb-in	IEC 180 NEMA 280TC

Rotex® Couplings



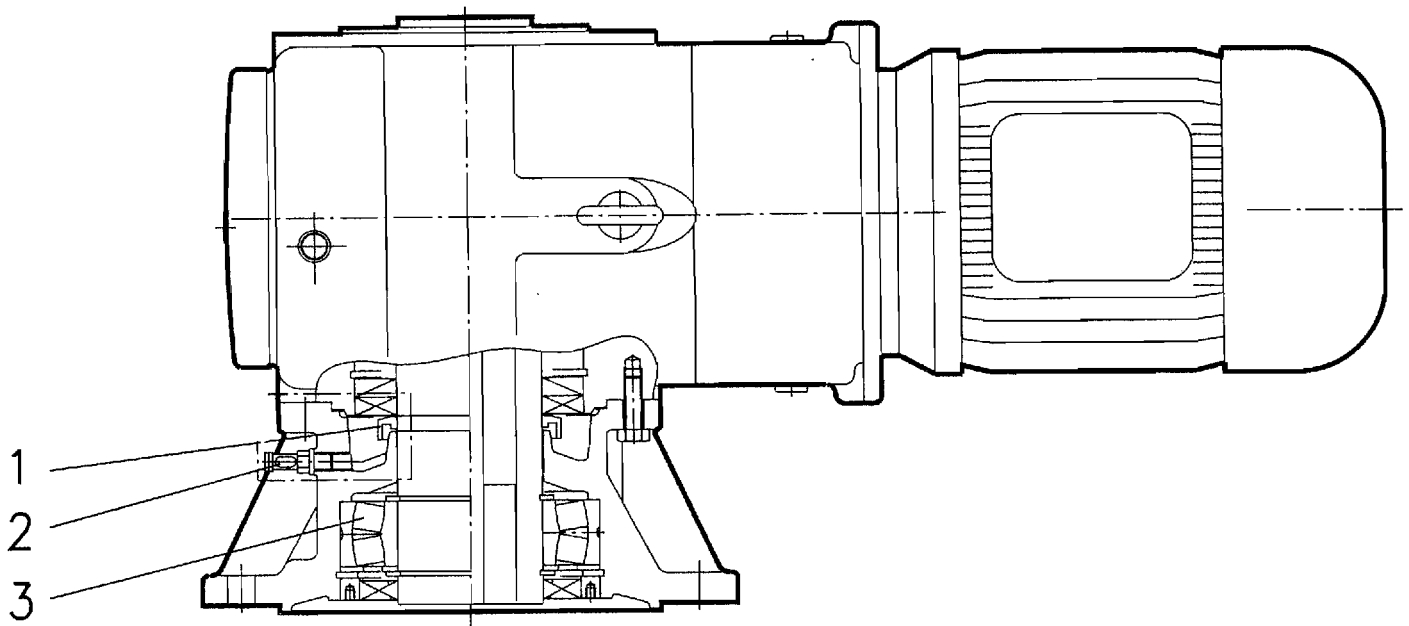
Rotex® Mechanical Ratings

Coupling Type	Available Bore Sizes	Max. Torque	C-Face Inputs	Spider
R48	42, 48 mm 1 5/8, 1 7/8 in	620 Nm 5,487 lb-in	IEC 160, 180 NEMA 250T, 280T	Urethane 92 Shore A Hardness Color: Yellow
R65	60 mm 2 1/8, 2 3/8 in	1,250 Nm 11,063 lb-in	IEC 225 NEMA 320T, 360T	
R90	65, 75, 80 mm 2 1/8, 2 3/8 in	4,800 Nm 42,480 lb-in	IEC 250, 280, 315 NEMA 360T, 400TS, 440TS	

OIL LEAKAGE PROTECTION CHAMBER

The output shaft assembly includes an oil leakage protection chamber, which traps any possible oil leakage through the quadrilip™ seal.

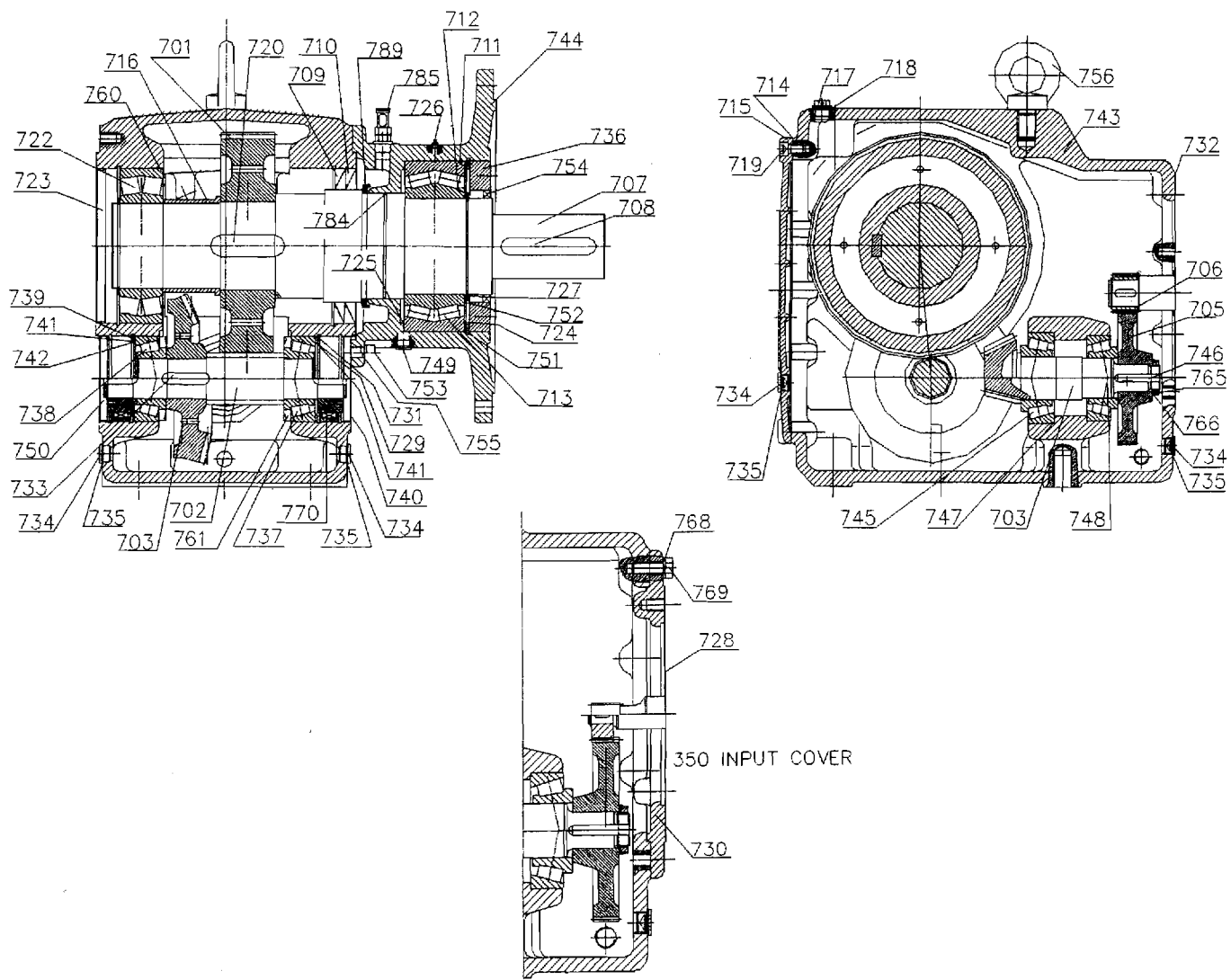
In case of lubricant leakage through the lower seals the lubricant runs over the slinger ring into the protection chamber flange and collects at the lowest point at which an oil indicator is placed. Alternately an oil-sensor can be used or the lubricant can be fed through a relief-pipe in place of the indicator.



ITEM NO.	DESCRIPTION
1	SLINGER RING
2	OIL-INDICATOR
3	SPHERICAL ROLLER BEARING

DRIVE SERIES L PARTS

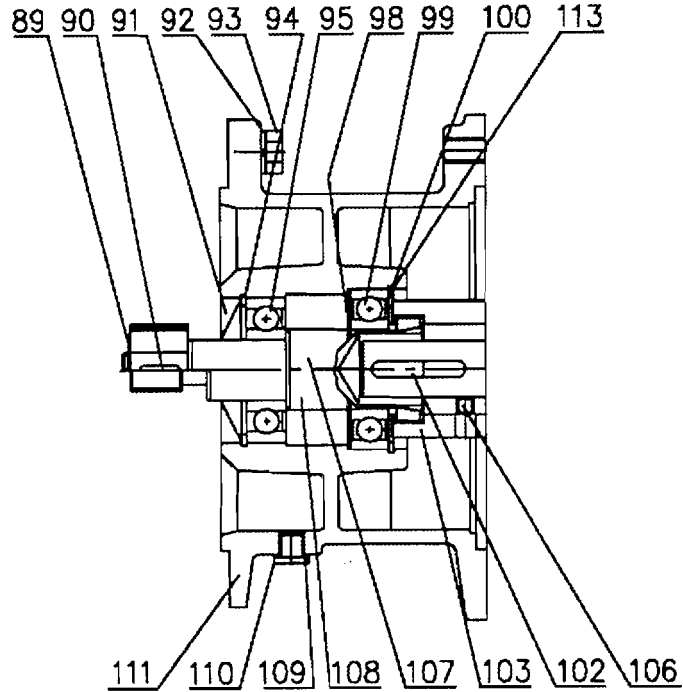
Dwg. No. 05-47754



PART NO.	DESCRIPTION	PART NO.	DESCRIPTION	PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
701	OUTPUT GEAR	718	GASKET+	735	GASKET+	751	RETAINING RING+
702	OUTPUT PINION SHAFT	719	SOCKET HEAD CAP SCREW	736	SEAL SLEEVE	752	AXIAL SHIM+
703	BEVEL GEAR SET	720	KEY	737	TAPER ROLLER BEARING+	753	SOCKET HEAD CAP SCREW
705	INPUT GEAR	722	SPHERICAL ROLLER BEARING+	738	TAPER ROLLER BEARING+	754	OIL SEAL+
706	INPUT PINION	723	SEALING PLUG+	739	RETAINING RING+	755	GROOVED PIN
707	OUTPUT SHAFT	724	SPACER	740	SEALING PLUG+	756	FLANGED EYE BOLT
708	KEY	725	AXIAL SHIM+	741	SHIM+	760	NILOS RING
709	OIL SEAL+	726	GREASE FITTING	742	SPACER	761	NILOS RING
710	OIL SEAL+	727	RETAINING RING+	743	GEAR CASE	765	SLOTTED ROUND NUT
711	SHIM+	728	GASKET+	744	FLANGE	766	TAB WASHER
712	SHIM+	729	SPACER	745	TAPER ROLLER BEARING+	768	LOCK WASHER
713	SPHERICAL ROLLER BEARING+	730	FLANGE COVER	746	KEY	769	HEX HEAD CAP SCREW
714	GASKET+	731	RETAINING RING+	747	SHIM+	770	BACKSTOP
715	GEAR CASE COVER	732	GASKET+	748	TAPER ROLLER BEARING+	784	'O' RING+
716	SPACER	733	KEY	749	DRAIN PLUG	785	OIL SENSOR
717	AUTO VENT	734	DRAIN PLUG	750	SEALING PLUG+	789	SLINGER RING

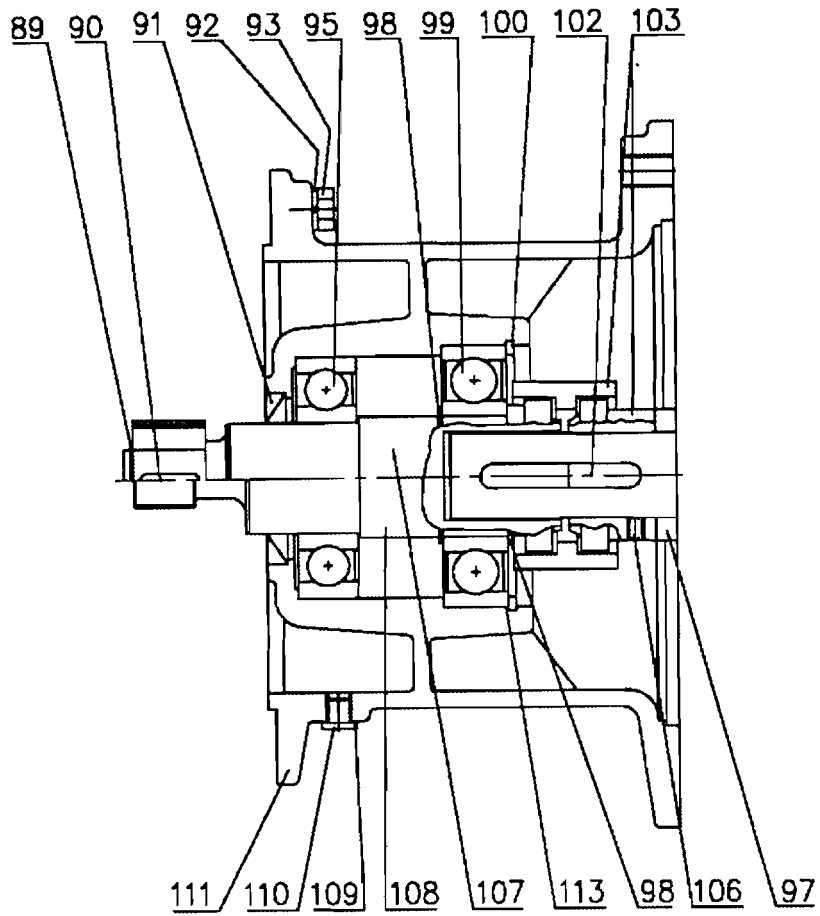
+ RECOMMENDED SPARE PARTS

INPUT ASSEMBLY
56C - 180 TC
Dwg. No. 05-47823



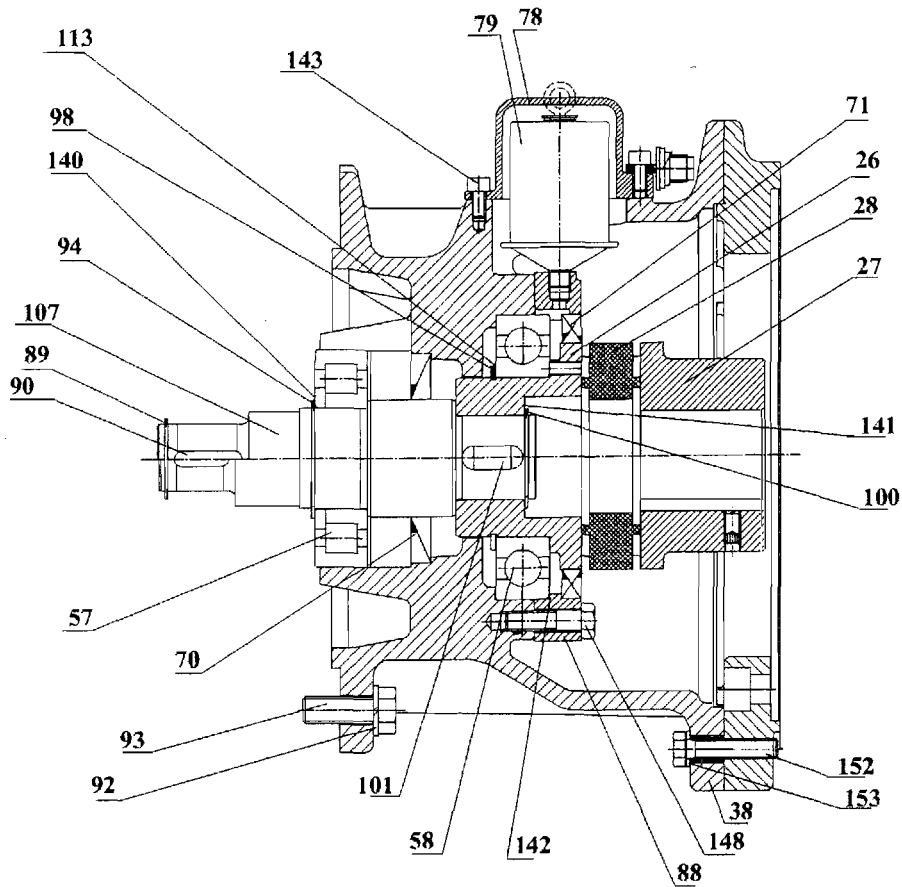
PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
89	RETAINING RING	102	KEY
90	KEY	103	COUPLING
91	SHAFT SEAL	106	SOCKET HEAD SET SCREW
92	WASHER	107	CLUTCH SHAFT
93	HEX HEAD CAP SCREW	108	CLUTCH PINION SHAFT
94	RETAINING RING	109	SEAL
95	CLUTCH SHAFT BEARING	110	OIL PLUG
98	RETAINING RING	111	MOTOR ADAPTER HOUSING
99	CLUTCH SHAFT BEARING	113	SHIM
100	RETAINING RING		

INPUT ASSEMBLY
210TC – 280 TC
Dwg. No. 05-47824



PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
89	RETAINING RING	102	KEY
90	KEY	103	COUPLING
91	SHAFT SEAL	106	SOCKET HEAD SET SCREW
92	WASHER	107	CLUTCH SHAFT
93	HEX HEAD CAP SCREW	108	CLUTCH PINION SHAFT
95	CLUTCH SHAFT BEARING	109	SEAL
97	SPACER	110	OIL PLUG
98	RETAINING RING	111	MOTOR ADAPTER HOUSING
99	CLUTCH SHAFT BEARING	113	SHIM
100	RETAINING RING		

INPUT ASSEMBLY
320TC - 360 TC
Dwg. No. 05-47755



PART NO.	DESCRIPTION	PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
26	COUPLING	88	BEARING COVER	113	SHIM+
27	COUPLING	89	RETAINING RING+	140	SHIM+
28	SPIDER+	90	KEY	141	SHIM+
38	ADAPTER HOUSING	92	LOCK WASHER	142	SHIM+
57	ROLLER BEARING+	93	HEX HEAD CAP SCREW	143	SOCKET HEAD CAP SCREW
58	BALL BEARING+	94	RETAINING RING+	148	HEX HEAD CAP SCREW
70	OIL SEAL+	98	RETAINING RING+	152	HEX HEAD CAP SCREW
71	OIL SEAL+	100	RETAINING RING+	153	LOCK WASHER
78	CARTRIDGE COVER	101	KEY		
79	LUBRICATOR CANISTER+	107	INPUT SHAFT		

+ RECOMMENDED SPARE PARTS

