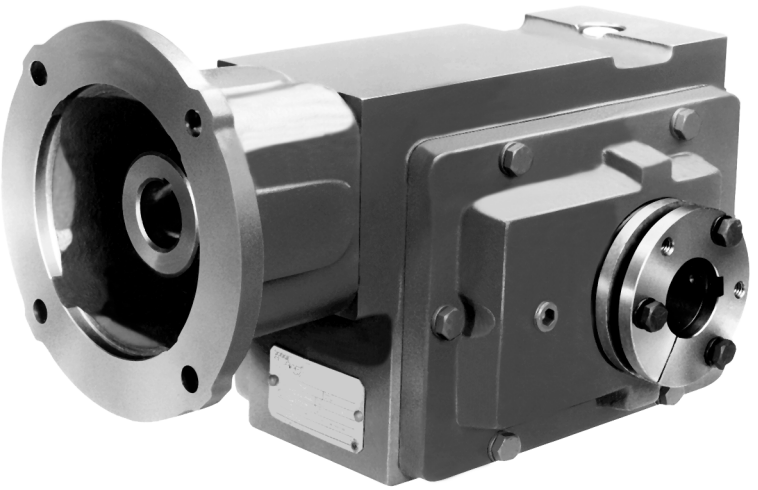
MASTER® COMBOGEAR RIGHT ANGLE C-FACE REDUCERS

SERVICE AND REPAIR
SIZES C150, C200, C262, C350



WARNING: Because of the possible danger to person(s) or property which may result from improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the Engineering information specified in the catalog. Proper installation, operation and maintenance procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Master Power Transmission nor are the responsibility of Master Power Transmission. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all the equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a failsafe device must be an integral part of the driven equipment beyond the speed reducer output shaft.

MASTER® POWER TRANSMISSION

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GENERAL INFORMATION

MASTER Power Transmission manufactures the the product described in this instruction manual.

PRODUCT DESCRIPTION

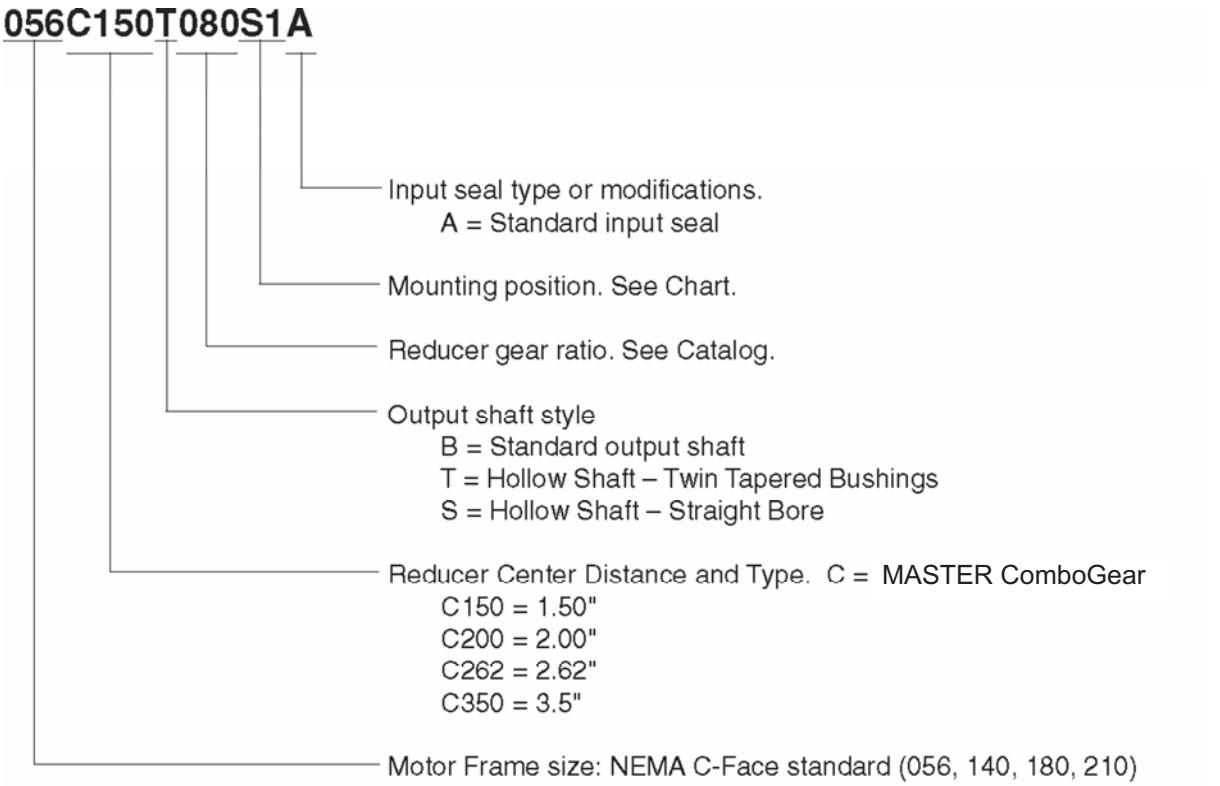
The MASTER ComboGear reducer is a double reduction worm-helical speed reducer that utilizes a C-Face motor adapter and 3-piece flexible coupling. This product is available in two basic configurations:

1. Solid Output Shaft: a standard solid output shaft extension that can be specified as left hand, right hand or double shaft configurations. See Mounting Position diagrams.

2. Hollow Output Shaft: uses a hollow through-bore output shaft in either of two configurations: 1) straight bore shaft with locking set screws, or 2) twin tapered bushings. Twin tapered bushing kits are available separately in a range of inch and metric bore sizes.

NOMENCLATURE

The part number indicates all the essential characteristics of the MASTER ComboGear.



Example shown: The part number shown indicates a C150 MASTER ComboGear with a 56C frame motor, twin tapered bushed hollow output shaft, an 80:1 gear ratio, is mounted in the S1 position and uses the standard input seal.

APPLICATION INFORMATION

The MASTER ComboGear reducer is designed to operate within the following temperature limits:

Ambient	–10 to +165°F
Oil Sump	–10 to +200°F

Where ambient temperatures exceed 100°F, care should be taken not to exceed 200°F sump temperature during unit operation.

The continuous rated input horsepower shown on the reducer nameplate is for service factor of 1.0 at an input speed of 1750 RPM. Before placing the reducer into service, check the nameplate to confirm that its horsepower rating is consistent with the motor horsepower and the desired service factor. Application versus service factor information and reducer ratings for different speeds can be found in your MASTER Engineering catalogs.

WARNING

TO ENSURE THAT DRIVEN EQUIPMENT IS NOT UNEXPECTEDLY STARTED, TURN OFF AND LOCK OUT AND TAG POWER SOURCE BEFORE WORKING NEAR THE EQUIPMENT. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY OR PROPERTY DAMAGE.

WARRANTY

The MASTER ComboGear Reducer is warranted under the MASTER "Standard Terms and Conditions of Sale" to be free of defects in material and workmanship. Warranty claims must be submitted to the company within one (1) year from the date of installation or three (3) years from the date of manufacture, whichever comes first. The warranty is valid providing the product is properly applied, installed, operated and maintained in accordance with our instruction manual. This warranty covers product replacement or repair only and excludes labor, equipment and/or downtime for removal and installation. This warranty shall not apply where equipment is operated above rated load capacity or is subject to accident, alteration, misuse or abuse. This warranty is in lieu of and excludes all other expressed or implied warranties.

NOTE: Service and repair under warranty should be performed only by a MASTER authorized service shop. Contact MASTER Warranty Administration for the nearest location.

MOUNTING POSITIONS

Reducers should always be ordered for the expected mounting position as different oil fill quantities are required and grease fittings are required on the upper bearings of vertical shaft units. See Lubrication section.

NOTE: The following mounting positions are generic in that many other assemblies of feet and flanges are available. The relationship of the input and output shafts to earth (down) are significant.

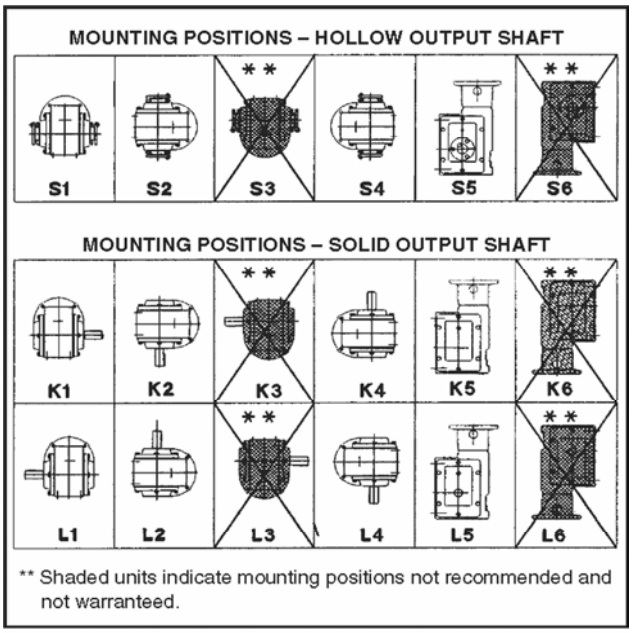


Figure 1

CHANGING THE OUTPUT SHAFT FROM K1 TO L1 (AND L1 TO K1)

Units should always be ordered to the required mounting position. However, it is possible to change output shaft location.

1. Drain oil from case. Remove the open bearing housing. Remove the output seal and discard.

2. Lift out the output shaft assembly and the intermediate shaft assembly.

3. Remove the closed bearing housing. Clean machined surfaces.

4. Remove tapered roller bearing cups and shims from each bore in each bearing housing and switch them . (Place cups and shims removed from bores in open bearing housing in closed bearing housing and vice versa.)

5. Apply a 1/16" bead of Loctite 515 or equivalent sealant to the closed bearing housing machined sealing surfaces. The bead of sealant must go completely around all bolt and dowel holes. Install the closed bearing housing. Evenly tighten the housing bolts. Lay the unit on the bench, closed bearing housing down.

6. The position of the wormgear must be adjusted so the worm contacts the center of the wormgear teeth. Failure to make this adjustment may cause reduced efficiency and life as well as overheating and tooth breakage.

7. Apply Prussian Blue lightly but evenly to both sides of five adjacent teeth on the bronze wormgear.

8. Install the intermediate shaft assembly into the gearcase so that the intermediate shaft pinion will be on the same side as the output gear when the reducer is reassembled. Install the open bearing housing and secure with two bolts at diagonal corners. The hollow dowel pins must be in place.

9. Rotate the input shaft so the “blued” wormgear teeth are rotated through the gear mesh. Then rotate in the opposite direction. Marks of contact will be made by the worm in the bluing on the wormgear teeth.

10. Remove the open bearing housing and intermediate shaft assembly. Examine the contact pattern on the wormgear teeth. The ideal pattern is centered in the wormgear teeth.

11. If the pattern is not centered, the intermediate shaft must be moved in the direction where the contact shows the heaviest. Remove a thin shim from the bearing cup on the side that the contact is heaviest and install it under the cup on the opposite side. Shims may be moved from one side to the other but the total number of shims must not be changed, as this controls the endplay of the bearings.

12. Repeat the above steps, cleaning, rebluing and inspecting each time, until the contact pattern is centered on the wormgear.

13. Install the intermediate and output shaft assemblies. Apply sealant to the gearcase machined sealing surfaces. Install the open bearing housing and tighten all bolts. Be sure all parts rotate freely.

14. Lubricate the shaft seal surface and seal bore liberally with SHC 634. Install a new seal, taking care not to cut or roll the lip or dislodge the seal garter spring. Seat the seal flush with the outside of the bearing housing. The use of a driver is recommended.

15. Fill unit with proper amount of lubricant. See charts. Use sealant on plug threads. Test unit.

MOTOR INSTALLATION

The MASTER ComboGear uses a standard NEMA C-face motor with a 3-piece flexible coupling. IEC motor adapters and couplings are available.

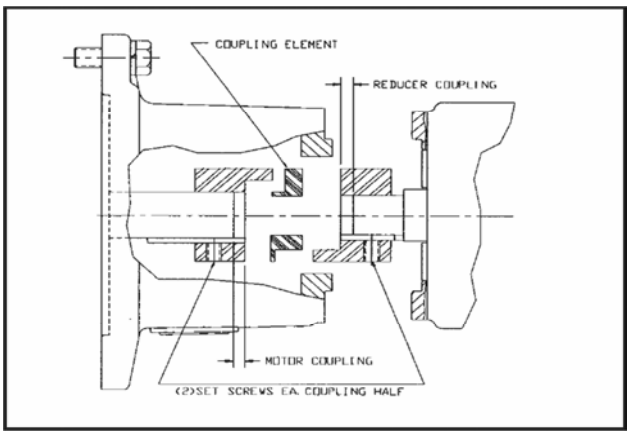
COUPLING LOCATION

The motor and reducer coupling halves must be properly located before assembly to prevent bearing and coupling failure. Refer to the following chart and reference diagram for proper locations.

REDUCER SIZE	MOTOR FRAME	MOTOR COUPLING	REDUCER COUPLING	REDUCER SIZE	MOTOR FRAME	MOTOR COUPLING	REDUCER COUPLING
C150	56	.090 / (3/32)	.00 (EVEN)	C200	56	.090 / (3/32)	.00 (EVEN)
C150	140	.030 / (1/32)	.00 (EVEN)	C200	140	.030 / (1/32)	.00 (EVEN)
C150	180	N.A.	N.A.	C200	180	.171 / (11/64)	.188 / (3/16)
C150	IEC71	.090 / (3/32)	.00 (EVEN)	C200	IEC71	.090 / (3/32)	.00 (EVEN)
C150	IEC80	.156 / (5/32)	.00 (EVEN)	C200	IEC80	.156 / (5/32)	.00 (EVEN)
C150	IEC90	.141 / (9/64)	.00 (EVEN)	C200	IEC90	.141 / (9/64)	.00 (EVEN)
C262	56	.090 / (3/32)	.00 (EVEN)	C350	56	.070 / (5/64)	.00 (EVEN)
C262	140	.030/ (1/32)	.00 (EVEN)	C350	140	.125 / (1/8)	.00 (EVEN)
C262	180	.090 / (3/32)	.00 (EVEN)	C350	180	.156 / (5/32)	.00 (EVEN)
C262	210	N.A.	N.A.	C350	210	.090 / (3/32)	.00 (EVEN)
C262	IEC71	.141 / (9/64)	.250 / (1/4)	C350	IEC71	.141 / (9/64)	.250 / (1/4)
C262	IEC80	.141 / (9/64)	.250 / (1/4)	C350	IEC80	.141 / (9/64)	.250 / (1/4)
C262	IEC90	.109 / (7/64)	.250 / (1/4)	C350	IEC90	.109 / (7/64)	.250 / (1/4)
C262	IEC100/112	.188 / (3/16)	.015 /(1/64)	C350	IEC100/112	.188 / (3/16)	.015 /(1/64)
C262	IEC132	.047 / (3/64)	.00 (EVEN)	C350	IEC132	.047 / (3/64)	.00 (EVEN)

N.A. (NOT APPLICABLE)

NOTE: IEC Motors are B5 flanges.



Units are shipped from the factory with the reducer half of the input coupling installed.

1. Drive key into motor shaft. Slide the input coupling half onto the motor shaft. Position the coupling half on the motor shaft as shown in the preceding chart. Tighten setscrews.

2. Insert the elastomer coupling element into the reducer-side coupling half. Visually align the openings in the coupling half with the ears on the motor side coupling half. Slip the motor straight into the motor adapter, insuring that the coupling engages properly. Once the coupling engages, slide the motor tenon into the motor adapter. Install and tighten four motor bolts.

WARNING: Keep fingers clear of mating flanges of motor and reducer to prevent pinching injury.

3. Insure that there is no binding or excess clearance between the coupling halves. The motor-side coupling half may be loosened with a hex wrench inserted through the adapter access hole; then use a screwdriver to gently pry the motor coupling half toward the reducer. The metal ears should not touch the face of the opposite coupling hub and should have no more than 1/32" clearance. Tighten setscrews securely.

4. Install the plastic safety cap into the adapter access hole.

INSTALLATION

IMPORTANT! While the basic MASTER ComboGear reducer is suitable for any approved mounting position, different oil levels are required for mounting positions other than K1/L1/S1. You must add the required amount of oil for the desired operating position.

IMPORTANT: RIGID MOUNTING OF THE REDUCER IS NOT RECOMMENDED.

System alignment problems indicate that rigid mounting of a reducer in a rigid system may cause "binding", leading to premature bearing, shaft or reducer failure. A system must have some flexible element that allows it to self-align during operation.

The ideal mounting for a hollow shaft reducer is to use a torque arm design. If a reducer uses a flange/bracket mounting concept, it is highly recommended that the reducer be mounted on the conveyor head shaft using the conveyor **pillow block on the opposite side** of the conveyor as a support bearing. A system with a rigidly mounted bearing close to a rigidly mounted reducer will probably be impossible to align and maintain.

TWIN TAPERED BUSHING INSTALLATION

WARNING: The output shaft bushings must be shielded to prevent contact, which may result in injury. Fabricate or contact MASTER for shields.

1. One bushing assembly is required to mount the reducer onto the driven shaft. One assembly consists of two tapered bushings, six bushing screws, bushing keys and a shaft key.

2. The driven shaft must extend through the full length of the reducer. The reducer should be mounted the recommended minimum distance from the shaft bearing (shown as dimension "A" in Fig. 2 and table. Dimension "A" is required for bolt clearance/jackscrew removal.)

3. Place one bushing on the shaft and position per dimension "A". If the reducer is positioned closer to the bearing than "A", place the screws (with lockwasher) in the unthreaded holes in the bushing before positioning the bushing on the shaft. Allow a minimum of 1/8" between the screw heads and the bearing. Do not grease the bushings.

4. Insert the output key in the shaft and bushing.

5. Place the reducer in position on the shaft aligning the hub keyway with the shaft key.

6. Insert screws through the unthreaded holes in the tapered bushing flange and align with the threaded holes in the backup plate. Tighten the screws slightly.

7. Place the second tapered bushing in position on the shaft and align the bushing with the shaft key. Align unthreaded holes in the bushing with the threaded holes in the backup plate. Insert bushing screws and tighten slightly.

8. Alternately and evenly tighten the screws in the bushing nearest to the driven equipment first. Torque the screws evenly, a small amount at a time, to the recommended torque wrench settings shown in the table. Repeat with the outer bushing.
NOTE: The bushing bolts must not protrude through the backup plate, as output seal damage may result. If, while tightening the bushing bolts, it appears that the bolts are starting to protrude through the backup plate, remove the bolts and install the appropriate size flat washer between the lockwasher and the tapered bushing flange on each bolt.

Shaft Design	Standard Shaft and Bushings	Nickel Plated Shaft/non-stick Bushings	-------	-------
Reducer Size	Wrench Torque	Wrench Torque	A* (Min.)	L (Min.)
C150	200 lb/in	**75 lb/in**	1.00	7.91
C200	200 lb/in	200 lb/in	1.25	8.81
C262	200 lb/in	200 lb/in	1.25	9.81
C350	200 lb/in	200 lb/in	1.50	12.00

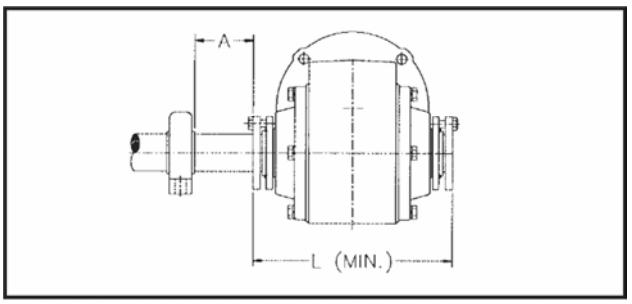


Figure 2

TWIN TAPERED BUSHING REMOVAL

1. Remove bushing screws.

2. Clean and lubricate the bushing screws and the threaded jackscrew holes in the tapered bushing flange. Install bushing screws in those threaded holes. Tighten the screws alternately and evenly until the bushings are free from the shaft.

3. If the reducer is too close to the driven to install the jacking screws, first loosen but do not remove the outer bushing. Then loosen the inner bushing screws as far as possible. Use two wedges spaced 180 degrees between the backup plate and the bushing flange. Drive the wedges in alternately until the bushing is free from the shaft.

STRAIGHT BORE BUSHING INSTALLATION

Mount the reducer on the driven shaft. If bushings are used, assemble the bushings in reducer first. A set of bushings for one reducer consists of one key-seated (drive) bushing and one plain (solid) bushing. The user's driven shaft must extend through the full length of the speed reducer. The location of the setscrews and key(s) is shown in the chart and diagram below. Shaft collars are used on the C150 & C262 only. The C200 & C350 do not require shaft collars as there is sufficient thread engagement for the setscrews in the hollowshaft.

NOTE: All keys are secured with setscrews.

NOTE: Two setscrews are used in each end. The third hole in the hollow shaft is for user convenience in removing the speed reducer from the driven shaft with use of a gear/bearing puller. Also, it is sometimes more accessible than trying to rotate the shaft to insert the required setscrews.

Place the output flange/brackets on the conveyor mounting surface using customer supplied mounting hardware. Tighten hardware sufficiently to hold output flange/bracket in place, but realize that final alignment (stated below) must be completed after all elements are installed.

Install the reducer on the shaft a sufficient distance from the conveyor side plate to allow access to bushing setscrews. Tighten all setscrews to 150 in lb torque.

Attach output/bracket flange and reducer together using mounting hardware provided. Tighten hardware sufficiently to hold reducer in place, but not tight. This will allow reducer to find it's own center of alignment by doing the final alignment.

Final alignment should be accomplished by running the conveyor/reducer (unloaded) and observing the reaction of the output flange/bracket. If the output flange/bracket appears to be in a bind, turn power off, stop unit, loosen the output flange/bracket mounting hardware on the reducer, and run the unit again to allow reducer to find it's own center of alignment. When it is evident the flange is no longer in a bind, tighten output flange/bracket mounting hardware to the recommended torque.

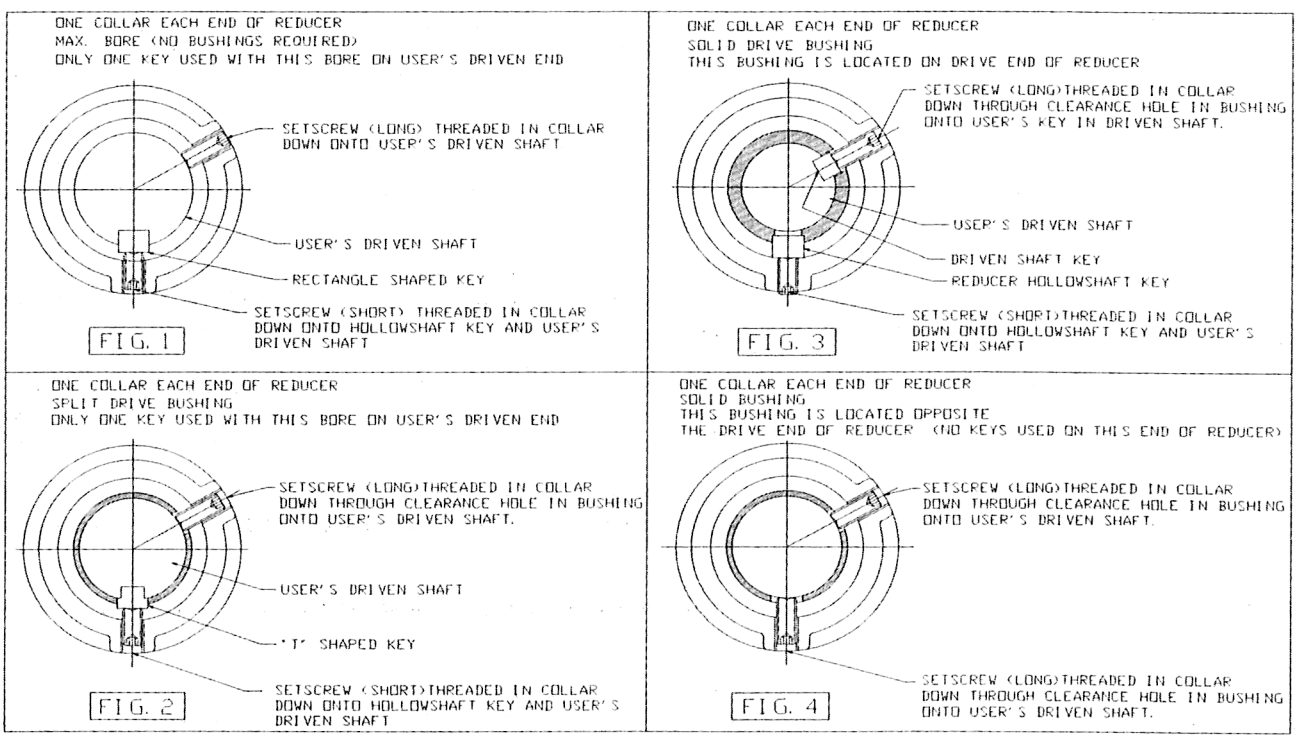
NOTE: Do not loosen hollowshaft setscrews when making final adjustment.

CASE SIZE	BORE SIZE	DRIVEN SIDE (FIG.)	OPPOSITE DRIVEN (FIG.)
C150	1	2	4
C150	1 1/16	2	4
C150	1 1/8	2	4
MAX. BORE	1 3/16	1	1
C200	1	7	8
C200	1 1/16	7	8
C200	1 1/8	7	8
C200	1 3/16	6	8
C200	1 1/4	6	8
C200	1 5/16	6	8
MAX. BORE	1 7/16	5	5
C262	1 3/16	3	4
C262	1 1/4	3	4
C262	1 5/16	3	4
C262	1 3/8	3	4
C262	1 7/16	3	4

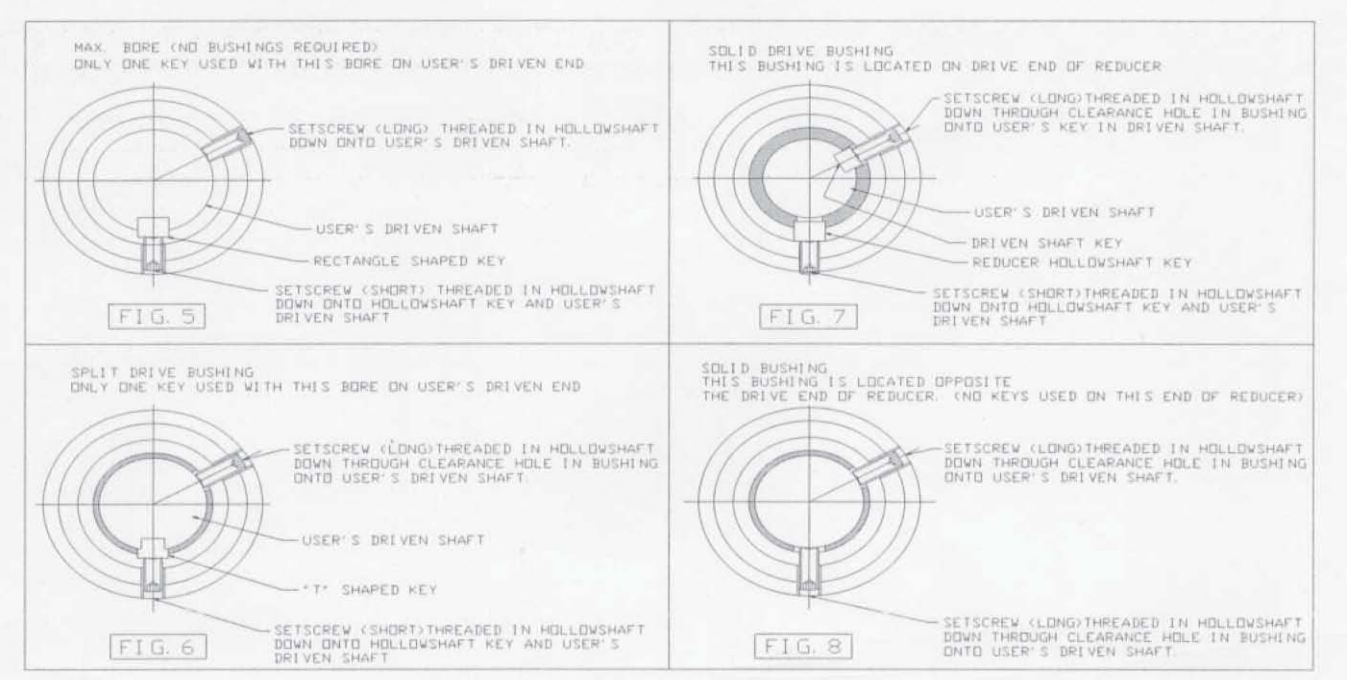
CASE SIZE	BORE SIZE	DRIVEN SIDE (FIG.)	OPPOSITE DRIVEN (FIG.)
C262	1 1/2	3	4
C262	1 5/8	2	4
C262	1 11/16	2	4
C262	1 3/4	2	4
MAX. BORE	1 15/16	1	1
C350	1 5/16	7	8
C350	1 3/8	7	8
C350	1 7/16	7	8
C350	1 1/2	7	8
C350	1 5/8	7	8
C350	1 11/16	7	8
C350	1 3/4	7	8
C350	1 7/8	6	8
C350	1 15/16	6	8
C350	2	6	8
MAX. BORE	2 3/16	5	5

ONLY THE C150 AND C262 CASE SIZES REQUIRE A SHAFT COLLAR

USE THIS DIAGRAM FOR THE C150 AND C262 MASTER COMBOGEAR



USE THIS DIAGRAM FOR THE C200 AND C250 MASTER COMBOGEAR



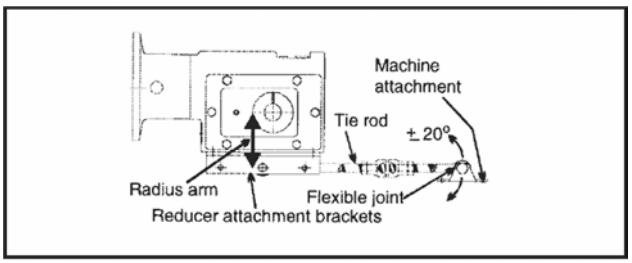


Figure 3

TORQUE ARM MOUNTING POSITIONS

Torque arm mounting is a common mounting for hollow-shaft units. The reducer hollow output shaft is slipped over and supported by the shaft extension of the head pulley. Torque reaction is taken by a torque arm (radius arm) and tie rod arrangement, preferably in tension. Typically, brackets are bolted to the foot holes of the gearcase to provide an attachment point for the tie rod. The opposite end of the tie rod is anchored (through a flexible joint) to the machine frame or floor. Since shafts and attachments seldom run true, the reducer may have eccentric movement. The tie rod and anchor joints must have enough freedom of movement to prevent metal fatigue in any of the torque reaction components. The proper orientation of the tie rod is at right angles (up to +/-20 degrees is normally acceptable) to a line between the point of attachment of the torque arm to the reducer and the output shaft. This is designated as the “radius arm” in Figure 3. Tie rod kits are available from Master.

INPUT SEALING SYSTEM

The MASTER ComboGear reducer (Fig. 4) incorporates the RELIALUBE system and requires no scheduled maintenance. Seals are normal wear items, strongly effected by operating environment, and may require periodic replacement.

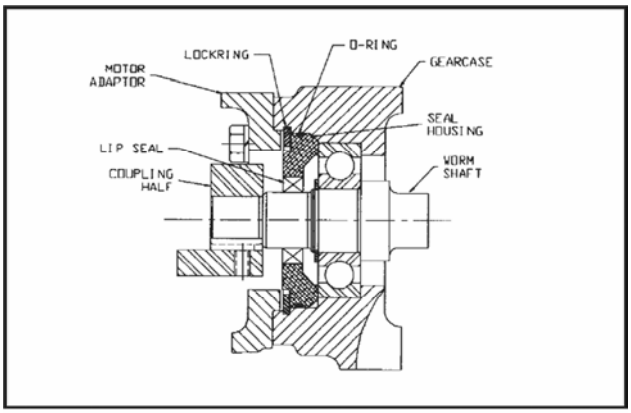


Figure 4 – Input Seal

The gearcase is not vented. The Relialube system requires no relocation or installation of breather vents for any approved mounting position, although the oil fill quantity must be changed for mounting positions other than the factory-standard K1/L1/S1 and grease fittings are required on output shaft up and down versions. Reducers should be ordered for the specific mounting position desired.

MAINTENANCE

The MASTER ComboGear reducer requires little maintenance, but an occasional inspection to check for hardware security, mounting integrity, leakage and general overall condition is good standard practice.
Seals are normal wear items and may require periodic replacement.

LUBRICATION – GENERAL

The standard lubricant is Mobil SHC 634, which is suitable for –10°F to +100°F ambient.

For low temperature operation, Mobil SHC 629 is suitable for –30°F to +60°F ambient.

For those food processing installations requiring USDA Class AA and H1 approvals, use Chevron FM460X which is suitable for use from +15°F to 110°F.

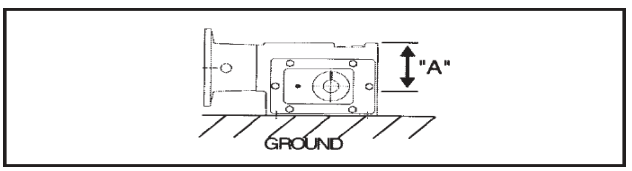
Stock units are factory filled with Mobil SHC 634 for the K1/L1/S1 mounting position unless specified at order.

LUBRICATION – OIL FILL LEVELS

To change from one mounting position to another, you MUST correct the oil quantity so the total oil in the gearcase is as listed below. Failure to follow these instructions will void warrantee. Oil is added to the prescribed level with the gearcase sitting in the K1/L1/S1 position, before the reducer is mounted in the desired position.

NOTE: Vertical output shaft (up or down) conversions require a new upper bearing housing equipped with grease fittings. Consult Renewal Parts.

Dimension “A” is measured with a dipstick inserted into the tapped fill hole from the machined top of the gearcase to the oil level with the gearbox set level on the ground.



Approximate oil volumes (fluid ounces) by case size and assembly. Divide ounce quantities by 16 for volumes in pints.

HOLLOW (TAPERED OR STRAIGHT BORE) OUTPUT SHAFT

Assm. Size	S1 H4 B2	Dist. “A” (in.)	S2 H1 B3	“A” (in.)	S4 H3 B1	“A” (in.)	S5 H5 B5	“A” (in.)
C150	24 oz.	2¾"	27 oz.	2¼"	27 oz.	2¼"	43 oz.	1½"
C200	40 oz.	3¾"	44 oz.	3¼"	44 oz.	3¼"	60 oz.	2 1/8"
C262	64 oz.	5¾"	112 oz.	2¾"	112 oz.	2¾"	112 oz.	2¾"
C350	168 oz.	6"	235 oz.	4"	235 oz.	4"	256 oz.	3 3/8"

SOLID OUTPUT SHAFT

Assm. Size	L1 K1 B2 H4	Dist “A” (in.)	L4 K2 B1 H1	“A” (in.)	K4 L2 B3 H3	“A” (in.)	L5 K5 B5 H5	“A” (in.)
C150	27 oz.	2¾"	32 oz.	1¾"	52 oz.	3/4"	48 oz.	3/4"
C200	40 oz.	3¾"	44 oz.	3"	68 oz.	1½"	68 oz.	1½"
C262	83 oz.	5¼"	96 oz.	3 3/8"	128 oz.	1¾"	128 oz.	1¾"
C350	168 oz.	6"	235 oz.	4½"	312 oz.	1½"	256 oz.	4"

LUBRICATION – VERTICAL OUTPUT SHAFT MOUNTINGS

Vertical output shaft assemblies such as K2/L2/K4/L4/S2/ S4 require periodic lubrication of the reducer bearings that are out of the oil splash. These units are equipped with grease fittings on the upper intermediate and output shaft bearings. Lubrication frequency is 2 pumps from a hand grease gun every 6 months or 2000 hours operation. Do not overgrease. The recommended lubricant is Shell Alvania #2.

NOTE: Units shipped from the factory for vertical output shaft mounting positions have grease fittings wired to plugs in the bearing housings. This prevents oil leakage through the fittings. Plugs must be replaced with grease fittings before use.

INPUT SEAL REPLACEMENT

The input seal on the all-position RELIALUBE design is considered a normal wear item with a finite life. If necessary, the input seal is easily replaced. Refer to assembly drawings.

1. Stop and lock out the motor.

2. Remove four bolts attaching the motor to the motor adapter. Remove the motor. The motor coupling half will come off with the motor.

3. Remove four bolts attaching the motor adapter to the reducer gearcase. Remove adapter. Do not remove the reducer-side input coupling half yet. Remove the large retaining ring from the bore of the input of the reducer gearcase.

4. Use two prybars, spaced 180º, behind the input coupling against the gearcase face and gently pry the input shaft out of the gearcase. The input seal housing will come out with it. It is not normally necessary to completely remove the input shaft from the gearcase.

5. Remove the input coupling (2 set screws). Slide the input seal carrier off of the input shaft.

6. Press the input seal out of the seal carrier. Clean the seal carrier and press the new input seal into the carrier with a driver slightly larger that the OD of the seal itself. Press the seal flat, flush with the outside of the seal carrier. The seal is oriented so that the garter spring is toward the inside of the gearcase. Insure that the O-ring around the OD of the seal carrier has not been damaged; replace if required.

7. Clean the input bore of the gearcase and the seal surface of the input worm shaft. Never use sandpaper or other abrasive to clean the seal surface! Inspect for worn bearings and damaged seal surface.

8. If the worm shaft was removed, carefully insert and bottom the worm shaft into the gearcase. Lubricate the O-ring on the OD of the seal carrier, as well as the lip of the new seal and seal surface of the input worm shaft with reducer lubricant.

9. Carefully slide the input seal carrier into the bore of the gearcase, making sure that the lip of the input seal slides over the seal surface. If the seal folds or shows evidence of tiny slivers of black material, the seal may be damaged and will not seal properly. Remove the seal carrier and replace the seal. Do not nick the seal lip on the shaft keyway.

10. Slide the seal carrier as far as possible into the bore of the gearcase. Use a hollow tool to press evenly on the seal carrier (not on the seal!) and drive the carrier into the case. The carrier must bottom against the input bearing.

11. Install the retaining ring in the groove in the gearcase bearing bore. Reinstall the reducer side coupling half and position it where it was originally.

12. Reinstall the motor adapter and motor.

13. Add oil to recommended level for assembly position.

OUTPUT SEAL REPLACEMENT – ALL

Never remove a seal by driving a screwdriver between the seal lip and the shaft seal surface. The condition of the shaft seal surface is critical to satisfactory lubricant sealing.

The best way to replace an output seal is to remove the output bearing housing, remove the bearing cup and shims (you MUST reinstall the shims), remove the seal, reinstall the bearing and shims and remount the bearing housing and press a new seal into place. Use a hollow driver with an OD slightly larger than the OD of the seal to press evenly on the metal seal housing, not contacting the seal lip area. The seal should be seated flush with the outer surface of the bearing housing with a smooth driver that contacts the seal near the OD. Do not scratch shaft seal surfaces or deform the seal on installation.

BOLT TYPES AND TORQUES

ComboGear uses all metric hardware except:
1) C-face adapter bolts (threaded into the gearcase),
2) motor bolts
3) coupling set screws

BOLT AND SET SCREW TORQUE

Case Size	Input Adaptor	Torque Grade 5	Bearing Housing	Torque Grade 8.8
C150	5/16x18	156 in.lbs.	M8x1.25	230 in.lbs.
C200	5/16x18	156 in.lbs.	M8x1.25	230 in.lbs.
C262	3/8x16	276 in.lbs.	M8x1.25	230 in.lbs.
C350	3/8x16	276 in.lbs.	M10x1.5	460 in.lbs.

Case Size	Bolt-on Foot	Torque Grade 8.8
C150	M8×1.25	230 in.lbs.
C200	M10×1.5	460 in.lbs.
C262	M10×1.5	460 in.lbs.
C350	M12×1.75	800 in.lbs.

Case Size	Hollow Shaft Straight Bore (Set Screws)	Torque Grade 45H
C150	M8	150 in.lbs.
C200	M8	150 in.lb.
C262	M8	150 in.lbs.
C350	M8	150 in.lbs.

Case Size	Coupling (Set Screws)	Torque Grade 5
C150	1/4×20	87 in.lbs.
C200	1/4×20	87 in.lbs.
C200	5/16×18	165 in.lbs.
C262	1/4×20	87 in.lbs.
C262	5/16×18	165 in.lbs.
C350	1/4×20	87 in.lbs.
C350	5/16×18	165 in.lbs.

LONG TERM STORAGE

During periods of long term storage (6 months or longer) special procedures must be followed to protect the reducer and insure that it will be in good condition when put into service.

1. Replace lubricant in the reducer with Mobil SHC634 blended with 2% by volume of Daubert Chemical Nox-Rust VCI-105. Fill gearcase 90% full. Rotate the input shaft at least 60 revolutions to distribute the lubricant.

2. Apply a thick coating of chassis-type grease, Cosmoline, Daubert Nox-Rust X-110 or equivalent coating to all unpainted surfaces including threads, bores, shafts and keyways.

3. If unit is equipped with a motor, measure stator insulation resistance with a megohmeter and record reading.

4. If unit is to be stored out of doors or in a damp or unheated indoor area, cover the entire exterior with rust preventive, then seal the unit in a moisture proof container or polyethylene bag with desiccant. Protect the enclosure from direct sunlight.

5. Rotate the input shaft at least 60 turns monthly to redistribute the lubricant.

Return to service from long term storage:

1. Remove all protective coatings. If unit has been stored more than 3 years or in high temperatures, replace all oil seals. Check hardware for proper tightness.

2. Drain and refill the reducer with the proper amount and type of lubricant.

3. If unit was equipped with a motor, check motor stator insulation resistance with a megohmeter. Compare to original reading. Resistance or less than 1 megohm or 50% of the original resistance requires the motor to be removed and dried. If drying does not restore the winding insulation resistance, the motor must be repaired or rewound.

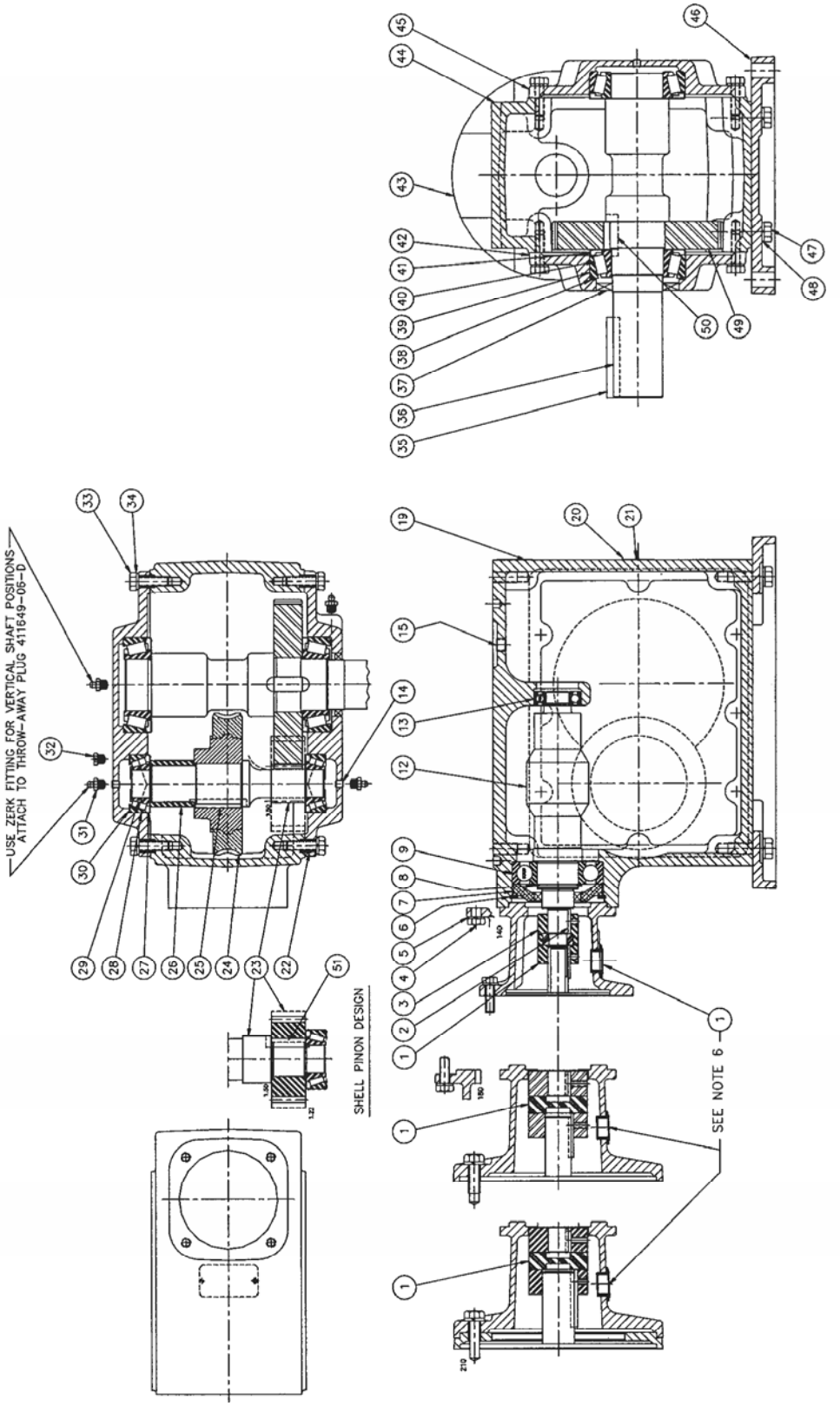
4. Motor drying: Refer to a motor repair shop.

5. When stored motors are found to be wet, motor should be disassembled and inspected. Remove endshields, inspect bearings and grease for moisture and rust. Replace/rebuild as necessary.

Renewal Parts

Solid Output Shaft MASTER ComboGear

SIZES C150B – C350B



Renewal Parts – MASTER ComboGear
SOLID SHAFT – SIZES C150B - C350B

ITEM	DESCRIPTION	QTY.	C150B	C200B	C262B	C350B
1	CPLNG. HUB (56C MTR.)	0-1	278900	278900	278900	278900
	CPLNG. HUB (140TC MTR.)	0-1	278901	278901	278901	278901
	CPLNG. HUB (180TC)	0-1	------	60222209W	278907	278907
	CPLNG. HUB (210TC)	0-1	------	------	------	60222209B
	CPLNG. ELEMENT 56/140	0-1	278911	278911	278911	278911
	CPLNG. ELEMENT 180TC	0-1	------	60222220A	60222211A	60222211A
2	KEY, INPUT SHAFT	1	276138	276138	276140	276140
3	CPLNG. HUB, REDUCER 56/140	0-1	278900	276143	278901	278901
	CPLNG. HUB, REDUCER 180	0-1	------	276145	275806	275806
	CPLNG. HUB, REDUCER 210	0-1	------	------	------	60222209C
4	HEX HEAD SCREW	4	53202	53202	51929	51929
5	LOCKWASHER	4	50253	50253	50250	50250
6	CIRCLIP	1	278702	278702	278716	278146
*7	OIL SEAL ASSM.	0-1	41162024A	41162024B	41162024C	41162024D
8	CIRCLIP	1	278710	278712	278715	278718
*9	BEARING, OPEN (1)	1	07914703E	07914703G	07914703N	07914703AA
12	WORM SHAFT	1	SEE GEAR CHART			
*13	BEARING	1	278883	07914702D	07914702K	07914702X
14	PIPE PLUG	1-3	41164738B	41164738B	41164738B	41164738B
15	PIPE PLUG	3-4	41164738A	41164738A	41164738A	41164738A
19	WARNING PLATE	1	60241524C	60241524C	60241524C	60241524C
20	NAMEPLATE	1	60200503C	60200503C	60200503C	60200503C
21	DRIVE SCREW	2	41163603B	41163603B	41163603B	41163603B
22	DOWEL PIN	4	41171506A	41171506A	41171506A	41171506B
23	INT. PINION SHAFT	1	SEE GEAR CHART			
24	WORM GEAR	1	SEE GEAR CHART			
25	KEY	1	41168812V	41168812K	55610	50999
26	SPACER	1	41162210AA	41162210AB	41162210AE	41162210AD
*27	GREASE RETAINER	2	41162401A	41162401D	41162401B	41162401W
*28/29	BEARING ASSEMBLY	2	41162601D	41162601E	41162601B	41162601AC
30	SHIM	1	41164250Y	41164250Z	41164250AA	41164250AB
31	ZERK FITTING	0-2	07901913AW	07901938AW	07901913AW	07901938AW
32	PLUG, THROW-AWAY	0-2	41164906D	41164906D	41164906D	41164906D
33	HEX HEAD SCREW (3)	12	60245207H	60245207H	60245207H	60245207K
34	LOCKWASHER (3)	12	50253	50253	50253	304603
35	KEY	1	55592	55025	55060	41168812D
36	OUTPUT SHAFT	1	60242112A	60242113A	60242114A	60242115A
*37	SEAL, OUTPUT	1	41162701FR	41162701FX	41162701FS	41162701FT
38	SHIM	1	41164250AC	41164250AD	41164250AE	41164250AF
*39/40	BEARING ASSEMBLY	2	41162601C	41162601A	41162601R	41162601AB
41	GREASE RETAINER	2	41162401C	41162401E	41162401R	41162401X
42	BEARING HSG., OPEN (2)	1	07920624A	07920618B	08692302A	08692308A
43	"C" FACE ADPT. 56/140	0-1	278574	278574	278476	278476
	"C" FACE ADPT. 180 (4)	0-1	------	07906722AB	278478	278478
	"C" FACE ADPT. 210 (5)	0-1	------	------	------	07906722AD
44	GEARCASE	1	08692202B	08693204B	08693206B	08693208B
45	BEARING HSG., CLOSED	1	07920628A	07920622B	08692306A	08693312A
46	BOLT ON FOOT	0-1	07914022A	07914020A	07914024A	07914026A
47	HEX HEAD SCREW	0-4	60245207A	60245207J	60245207J	60245207L
48	LOCKWASHER	0-4	50253	50684	304603	50469
49	HELICAL GEAR	1	SEE GEAR CHART			
50	GEAR KEY	1	41168812E	55087	55154	141168812AE

* RECOMMENDED SPARE PARTS FOR MINIMUM PROTECTION

(1) FOR A-5 MOUNTING ONLY USE SEALED BEARING 07914703F FOR C150, USE 07914703DD FOR C200, USE 07914703R FOR C262, USE 07914703BV FOR C350.

(2) BOLT ON PLATE ADAPTER. MUST USE 56/140 C-FACE ADAPTER FOR COMPLETE ASSEMBLY.

(3) BOLT ON PLATE ADAPTER, MUST USE 180 C-FACE ADAPTER FOR COMPLETE ASSEMBLY.

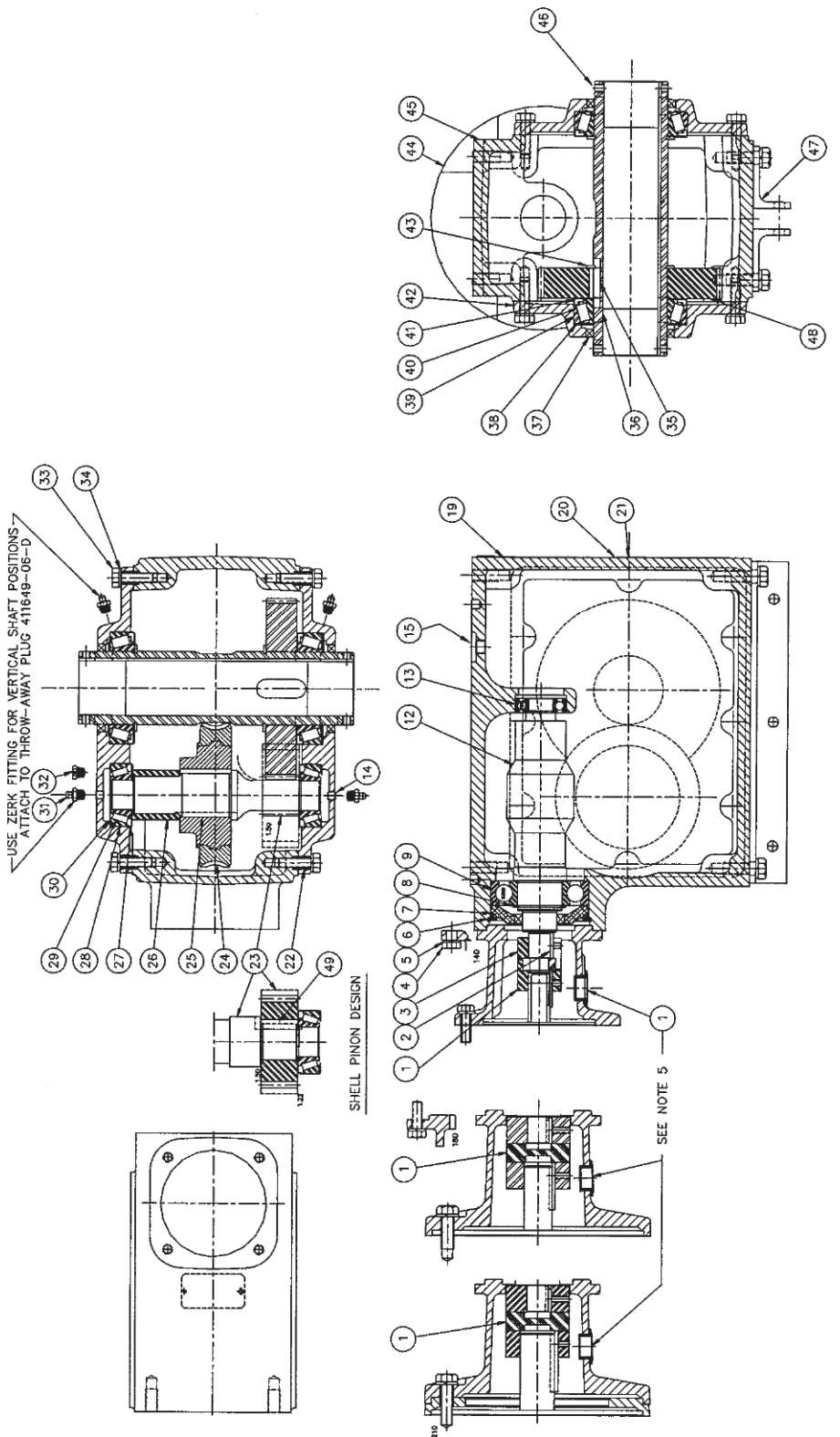
(4) SIZE C350 USE QTY. 16.

(5) FOR VERTICAL OUTPUT SHAFT MOUNTING REPLACE ONE STANDARD HOUSING WITH: 07920626B FOR C150, 07920620C FOR C200, 08692304B FOR C262, 08693310B FOR C350.

Renewal Parts

Straight Bore MASTER ComboGear

SIZES C150S – C350S



Renewal Parts – MASTER ComboGear

STRAIGHT BORE – SIZES C150S - C350S

ITEM	DESCRIPTION	QTY.	C150S	C200S	C262S	C350S
1	CPLNG. HUB (56C MTR.)	0-1	278900	278900	278900	278900
	CPLNG. HUB (140TC MTR.)	0-1	278901	278901	278901	278901
	CPLNG. HUB (180TC MOTOR	0-1	------	60222209W	278907	278907
	CPLNG. HUB (210TC)	0-1	------	------	------	60222209B
	CPLNG. ELEMENT 56/140	0-1	278911	278911	278911	278911
	CPLNG. ELEMENT 180/210TC	0-1		60222220A	60222211A	60222211A
2	KEY, INPUT SHAFT	1	276138	276138	276140	276140
3	CPLNG. HUB, REDUCER W/ 56/140	0-1	278900	276143	278901	278901
	CPLNG. HUB, REDUCER W/ 180TC	0-1	------	276145	275806	275806
	CPLNG. HUB, REDUCER W/ 210TC	0-1	------	------	------	60222209C
4	HEX HEAD SCREW	4	53202	53202	51929	51929
5	LOCKWASHER	4	50253	50253	50250	50250
6	CIRCLIP	1	278702	278702	278716	276146
*7	OIL SEAL ASSM.	1	41162024A	41162024B	41162024C	41162024D
8	CIRCLIP	1	278710	278712	278715	278718
*9	BEARING, OPEN (1)	1	07914703E	07914703G	07914703N	07914703AA
12	WORM SHAFT	1	SEE GEAR CHART			
*13	BEARING	1	278883	07914702D	07914702K	07914702X
14	PIPE PLUG	1-3	41164738B	41164738B	41164738B	41164738B
15	PIPE PLUG	3-4	41164738A	41164738A	41164738A	41164738A
19	WARNING PLATE	1	60241524C	60241524C	60241524C	60241524C
20	NAMEPLATE	1	60200503C	60200503C	60200503C	60200503C
21	NAMEPLATE PINS	2	41163603B	41163603B	41163603B	41163603B
22	DOWEL PIN	4	41171506A	41171506A	41171506A	41171506B
23	INT. PINION SHAFT	1	SEE GEAR CHART			
24	WORM GEAR	1	SEE GEAR CHART			
25	KEY	1	41168812V	41168812K	55610	50999
26	SPACER	1	41162210AA	41162210AB	41162210AE	41162210AD
27	GREASE RETAINER	2	41162401A	41162401D	41162401B	41162401W
*28/29	BEARING ASSEMBLY	2	41162601D	41162601E	41162601B	41162601AC
30	SHIM	1	41164250Y	41164250Z	41164250AA	41164250AB
31	ZERK FITTING	0-2	07901913AW	07901938AW	07901938AW	07901938AW
32	PLUG, THROW-AWAY	0-2	41164906D	41164906D	41164906D	41164906D
33	HEX HEAD SCREW (4)	12	60245207H	60245207H	60245207H	60245207K
34	LOCKWASHER (4)	12	50253	50253	50253	304603
35	KEY	1	41168812AA	41168812AB	41168812AC	41168812AD
36	OUTPUT SHAFT	1	07920702B	07920703B	07920704B	07920705B
*37	OUTPUT SEAL	2	41162701FS	41162701FT	41162701GD	41162701FW
38	SHIM	1	41164250AG	41164250AH	41164250AF	41164250AK
*39/40	BEARING ASSEMBLY	2	41162601GP	41162601BR	41162601GR	41162601GS
41	GREASE RETAINER	1-2	41162401AB	41162401M	41162401AC	41162401AD
	GREASE RETAINER (6.2 & 7.5 RATIO)	0-1	41162336A	41162401AG	41162336B	41162336C
42	BEARING HOUSING, OPEN	2	07920626A	07920620B	08692304A	08693310A
43	RETAINING RING	2	41163708A	150182	41163702BH	41163708D
44	C-FACE ADAPTOR (56/140)	0-1	278574	278574	278476	278476
	C-FACE ADAPTOR (180) (2)	0-1	------	07906722AB	278478	278478
	ADAPTOR PLATE (210TC) (3)	0-1	------	------	------	07906722AD
45	GEARCASE	1	08693202B	08693204B	08693206B	08693208B
46	STRAIGHT BORE BUSHING	2	SEE GEAR CATALOG			
47	TORQUE ARM BRKT. ASSM.	0-1	60232807J	60232807C	60232807L	60232807R
47	BRKT. HARDWARE ASSM.	0-1	60232807H	60232807S	60232807M	60232807P
48	HELICAL GEAR	1	SEE GEAR CHART			
50	BUSHING KEY	1	55025	60232101L	242296	243250
51	SET SCREW (OVER KEY)	1	278935	278899	278937	278899
52	SET SCREW (OVER SHAFT)	3	278936	278899	278938	278936
	SHAFT COLLAR (NOT SHOWN)	2	41162235A	------	41162235B	------

* RECOMMENDED SPARE PARTS FOR MINIMUM PROTECTION

(1) FOR A-5 MOUNTING ONLY USE SEALED BEARING 07914703F FOR C150, USE 07914703DD FOR C200, USE 07914703R FOR C262, USE 07914703B V FOR C350.

(2) BOLT ON PLATE ADAPTER FOR C200. MUST USE 56/140 C-FACE ADAPTER FOR COMPLETE ASSEMBLY.

(3) BOLT ON PLATE ADAPTER. MUST USE 180 C-FACE ADAPTER FOR COMPLETE ASSEMBLY.

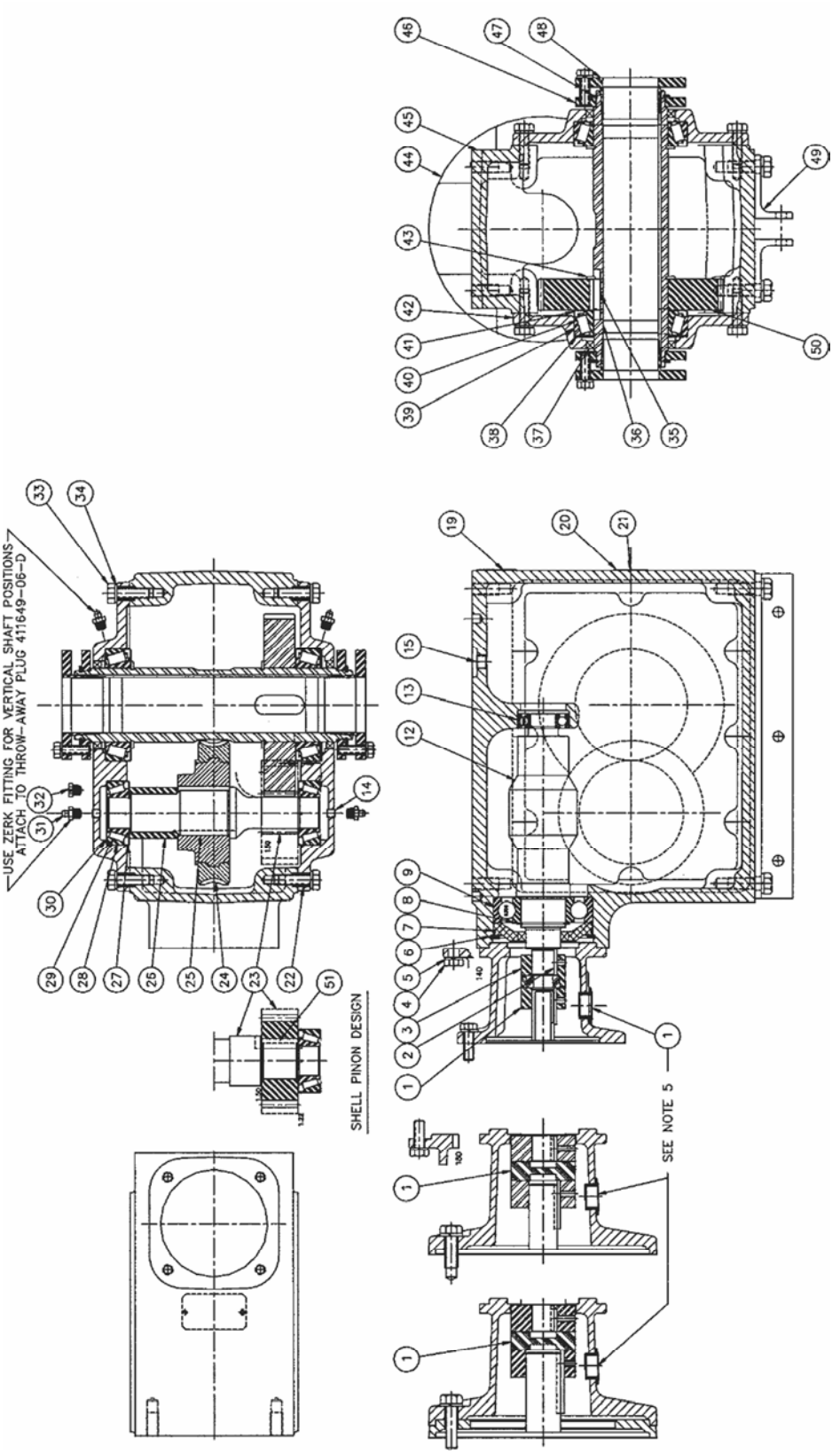
(4) SIZE C350 USE QTY. 16.

(5) FOR VERTICAL OUTPUT SHAFT MOUNTING, REPLACE ONE STANDARD HOUSING WITH: 07920626B FOR C150, 07920620C FOR C200, 08692304B FOR C262, 08693310B FOR C350.

Renewal Parts

Twin Tapered Bore MASTER ComboGear

SIZES C150T – C350T



Renewal Parts – MASTER ComboGear

TWIN TAPER BORE – SIZES C150T - C350T

ITEM	DESCRIPTION	QTY.	C150T	C200T	C262T	C350T
1	CPLNG. HUB (56C MTR.)	0-1	278900	278900	278900	278900
	CPLNG. HUB (140TC MTR.)	0-1	278901	278901	278901	278901
	CPLNG. HUB (180TC MOTOR	0-1	------	60222209W	278907	278907
	CPLNG. HUB (210TC)	0-1	------	------	------	60222209B
	CPLNG. ELEMENT 56/140	0-1	278911	278911	278911	278911
	CPLNG. ELEMENT 180/210TC	0-1		60222220A	60222211A	60222211A
2	KEY, INPUT SHAFT	1	276138	276138	276140	276140
3	CPLNG. HUB, REDUCER W/ 56/140	0-1	278900	276143	278901	278901
	CPLNG. HUB, REDUCER W/ 180TC	0-1	------	276145	275806	275806
	CPLNG. HUB, REDUCER W/ 210TC	0-1	------	------	------	60222209C
4	HEX HEAD SCREW	4	53202	53202	51929	51929
5	LOCKWASHER	4	50253	50253	50250	50250
6	CIRCLIP	1	278702	278702	278716	278146
*7	OIL SEAL ASSM.	1	41162024A	41162024B	41162024C	41162024D
8	CIRCLIP	1	278710	278712	278715	278718
*9	BEARING, OPEN (1)	1	07914703E	07914703G	07914703N	07914703AA
12	WORM SHAFT	1	SEE GEAR CHART			
*13	BEARING	1	278883	07914702D	07914702K	07914702X
14	PIPE PLUG	1-3	41164738B	41164738B	41164738B	41164738B
15	PIPE PLUG	3-4	41164738A	41164738A	41164738A	41164738A
19	WARNING PLATE	1	60241524C	60241524C	60241524C	60241524C
20	NAMEPLATE	1	60200503C	60200503C	60200503C	60200503C
21	NAMEPLATE PINS	2	41163603B	41163603B	41163603B	41163603B
22	DOWEL PIN	4	41171506A	41171506A	41171506A	41171506B
23	INT. PINION SHAFT	1	SEE GEAR CHART			
24	WORM GEAR	1	SEE GEAR CHART			
25	KEY	1	41168812V	41168812K	55610	50999
26	SPACER	1	41162210AA	41162210AB	41162210AE	41162210AD
27	GREASE RETAINER	2	41162401A	41162401D	41162401B	41162401W
*28/29	BEARING ASSEMBLY	2	41162601D	41162601E	41162601B	41162601AC
30	SHIM	1	41164250Y	41164250Z	41164250AA	41164250AB
31	ZERK FITTING	0-2	07901913AW	07901938AW	07901938AW	07901938AW
32	PLUG, THROW-AWAY	0-2	41164906D	41164906D	41164906D	41164906D
33	HEX HEAD SCREW (4)	12	60245207H	60245207H	60245207H	60245207K
34	LOCKWASHER (4)	12	50253	50253	50253	304603
35	KEY	1	41168812AA	41168812AB	41168812AC	41168812AD
36	OUTPUT SHAFT	1	07920702C	07920703C	07920704C	07920705C
*37	OUTPUT SEAL	2	41162701FS	41162701 FT	41162701GD	41162701FW
38	SHIM	1	41164250AG	41164250AH	41164250AF	41164250AK
*39/40	BEARING ASSEMBLY	2	41162601GP	41162601BR	41162601GR	41162601GS
41	GREASE RETAINER	1-2	41162401AB	41162401M	41162401AC	41162401AD
	GREASE RETAINER (6.2 & 7.5 RATIO)	0-1	41162336A	41162401AG	41162336B	41162336C
42	BEARING HOUSING, OPEN	2	07920626A	07920620B	08692304A	08693310A
43	RETAINING RING	2	41163708A	150182	41163702BH	41163708D
44	C-FACE ADAPTOR (56/140)	0-1	278574	278574	278476	278476
	C-FACE ADAPTOR (180) (2)	0-1	------	07906722AB	278478	278478
	ADAPTOR PLATE (210TC) (3)	0-1	------	------	------	07906722AD
45	GEARCASE	1	08693202B	08693204B	08693206B	08693208B
46	BACKING PLATE	2	41162518A	241384	242392	243115
47	SPIRAL LOCKRING	2	41163706F	421111	421112	41163706E
48	TWIN TAPER BUSHING KIT	1	SEE GEAR CATALOG			
49	TORQUE ARM BRKT. ASSM.	0-1	60232807J	60232807C	60232807L	60232807R
	BRKT. HARDWARE ASSM.	0-1	60232807H	60232807S	60232807M	60232807P
50	HELICAL GEAR	1	SEE GEAR CHART			

* RECOMMENDED SPARE PARTS FOR MINIMUM PROTECTION

(1) FOR A-5 MOUNTING ONLY USE SEALED BEARING 07914703F FOR C150, USE 07914703DD FOR C200, USE 07914703R FOR C262, USE 07914703BV FOR C350.

(2) BOLT ON PLATE ADAPTER FOR C200. MUST USE 56/140 C-FACE ADAPTER FOR COMPLETE ASSEMBLY.

(3) BOLT ON PLATE ADAPTER. MUST USE 180 C-FACE ADAPTER FOR COMPLETE ASSEMBLY.

(4) SIZE C350 USE QTY. 16.

(5) FOR VERTICAL OUTPUT SHAFT MOUNTING, REPLACE ONE STANDARD HOUSING WITH: 07920626B FOR C150, 07920620C FOR C200, 08692304B FOR C262, 08693310B FOR C350.

Gear Chart – MASTER ComboGear

SOLID OUTPUT SHAFT

SIZE C150B

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
7.5	5 X 1.50	276068	60241102	07915819B	07915613B
9.4	5 X 1.84	276068	60241102	07915819	07915613C
10	5 X 2.25	276068	60241102	07915819D	07915613D
15	5 X 2.76	276068	60241102	07915819D	07915613E
18	5 X 3.37	276068	60241102	07915819F	07915613F
20	5 X 4.13	276068	60241102	07915819G	07915613G
25	5 X 5.06	276068	60241102	07915819H	07915613H
30	7.5 X 4.13	276069	60240821	07915819G	07915613G
33.3	10 X 3.37	276070	60241163	07915819F	07915613F
38	7.5 X 5.06	276069	60240821	07915819H	07915613H
40	10 X 4.13	276070	60241163	07915819G	07915613G
50	10 X 5.06	276070	60241163	07915819H	07915613H
60	15 X 4.13	276072	60240828	07915819G	07915613G
75	15 X 5.06	276072	60240828	07915819H	07915613H
80	20 X 4.13	276074	60241164	07915819G	07915613G
90	18 X 5.06	276073	60241171	07915819H	07915613H
100	20 X 5.06	276074	60241164	07915819H	07915613H
125	30 X 4.13	276076	60241165	07915819G	07915613G
150	30 X 5.06	276076	60241165	07915819H	07915613H
160	40 X 4.13	276077	60241166	07915819G	07915613G
200	40 X 5.06	276077	60241166	07915819H	07915613H
240	60 X 4.13	276079	60241168	07915819G	07915613G
300	60 X 5.06	276079	60241168	07915819H	07915613H

SIZE C200B

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
9.42	5 X 1.84	276090	60241202	07915820C	07915614C
10	5 X 2.25	276090	60241202	07915820D	07915614D
15	5 X 2.76	276090	60241202	07915820E	07915614E
16.96	7.5 X 2.25	276091	60241204	07915820D	07915614D
18	5 X 3.37	276090	60241202	07915820F	07915614F
18.85	10 X 1.84	276092	60241205	07915820C	07915614C
20	5 X 4.13	276090	60241202	07915820G	07915614G
25	5 X 5.06	276090	60241202	07915820H	07915614H
30	7.5 X 4.13	276091	60241204	07915820G	07915614G
38	7.5 X 5.06	276091	60241204	07915820H	07915614H
40	10 X 4.13	276092	60241205	07915820G	07915614G
50	10 X 5.06	276092	60241205	07915820H	07915614H
60	15 X 4.13	276094	60241207	07915820G	07915614G
75	15 X 5.06	276094	60241207	07915820H	07915614H
80	20 X 4.13	276096	60241209	07915820G	07915614G
90	18 X 5.06	276095	60241208	07915820H	07915614H
100	20 X 5.06	276096	60241209	07915820H	07915614H
125	25 X 5.06	276097	60241210	07915820H	07915614H
150	30 X 5.06	276098	60241211	07915820H	07915614H
160	40 X 4.13	276099	60241213	07915820G	07915614G
200	40 X 5.06	276099	60241213	07915820H	07915614H
240	60 X 4.13	276101	60241215	07915820G	07915614G
300	60 X 5.06	276101	60241215	07915820H	07915614H

SIZE C262B

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
7.5 (1)	5 X 1.50	276102	60241302	07915821B	07915615B
9.4	5 X 1.84	276102	60241302	07915821M	07915615C
10	5 X 2.25	276102	60241302	07915821N	07915615D
14.1	7.5 X 1.84	276103	60241304	07915821M	07915615C
15	5 X 2.76	276102	60241302	07915821P	07915615E
17.04	7.5 X 2.25	276103	60241304	07915821N	07915615D
18	5 X 3.37	276102	60241302	07915821R	07915615F
20	5 X 4.13	276102	60241302	07915821S	07915615G
22.73	10 X 2.25	276104	60241305	07915821N	07915615D
25	5 X 5.06	276102	60241302	07915821T	07915615H
27.92	10 X 2.76	276104	60241305	07915821P	07915615E
30	7.5 X 4.13	276103	60241304	07915821S	07915615G
33.3	10 X 3.37	276104	60241305	07915821R	07915615F
38	7.5 X 5.06	276103	60241304	07915821T	07915615H
40	10 X 4.13	276104	60241305	07915821S	07915615G
50	10 X 5.06	276104	60241305	07915821T	07915615H
60	15 X 4.13	276106	60241307	07915821S	07915615G
75	15 X 5.06	276106	60241307	07915821T	07915615H
80	25 X 3.37	276109	60203712	07915821R	07915615F
90	40 X 2.25	276111	60241313	07915821N	07915615D
100	30 X 3.37	276110	60241311	07915821R	07915615F
125	30 X 4.13	276110	60241311	07915821S	07915615G
150	30 X 5.06	376110	60241311	07915821T	07915615H
160	40 X 4.13	276111	60241313	07915821S	07915615G
200	40 X 5.06	276111	60241313	07915821T	07915615H
240	60 X 4.13	276113	60241315	07915821S	07915615G
300	60 X 5.06	276113	60241315	07915821T	07915615H

(1) SHELL PINION RATIO. ALSO ORDER PINION SHAFT 07915821U AND KEY 50994.

SIZE C350B

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
6.2 (1)	5 X 1.22	276114	60207767	07915822A	07915616A
7.5 (1)	5 X 1.50	276114	60207767	07915822B	07915616B
9.4	5 X 1.84	276114	60207767	07915822C	07915616C
10	5 X 2.25	276114	60207767	07915822D	07915616D
15	5X 2.76	276114	60207767	07915822E	07915616E
18	5 X 3.37	276114	60207767	07915822F	07915616F
20	5 X 4.13	276114	60207767	07915822G	07915616G
22.61	10 X 2.25	276116	60242403	07915822D	07915616D
25	5 X 5.06	276114	60207767	07915822H	07915616H
30	7.5 X 4.13	276115	60207763	07915822G	07915616G
33.3	10 X 3.37	276116	60242403	07915822F	07915616F
38	7.5 X 5.06	276115	60207763	07915822H	07915616H
40	10 X 4.13	276115	60242403	07915822G	07915616G
47.12	25 X 1.84	276121	275593	07915822C	07915616C
50	10 X 5.06	276116	60242403	07915822H	07915616H
60	15 X 4.13	276118	60242404	07915822G	07915616G
64.19	12.67 X 5.06	276117	60207708	07915822H	07915616H
75	15 X 5.06	276118	60242404	07915822H	07915616H
80	29 X 4.13	276120	60242405	07915822G	07915616G
86	25 X 3.37	276121	275593	07915822F	07915616F
100	20 X 5.06	276120	60242405	07915822H	07915616H
125	25 X 5.06	276121	275593	07915822H	07915616H
150	30 X 5.06	276122	275594	07915822G	07915616H
160	40 X 4.13	276123	60242407	07915822G	07915616G
200	40 X 5.06	276123	60242407	07915822H	07915616H
240	60 X 4.13	276125	275595	07915822G	07915616G
300	60 X 5.06	276125	275595	07915822H	07915616H

(1) SHELL PINION RATIO. ALSO ORDER PINION SHAFT 07915821J AND KEY 55089.

Gear Chart – MASTER ComboGear

STRAIGHT & TAPER BORE OUTPUT

SIZE C150S & T

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
7.5	5 X 1.50	276068	60241102	07915819B	07915613K
9.4	5 X 1.84	276068	60241102	07915819C	07915613L
10	5 X 2.25	276068	60241102	07915819D	07915613M
15	5 X 2.76	276068	60241102	07915819E	07915613N
18	5 X 3.37	276068	60241102	07915819F	07915613P
20	5 X 4.13	276068	60241102	07915819G	07915613R
25	5 X 5.06	276068	60241102	07915819H	07915613S
30	7.5 X 4.13	276069	60240821	07915819G	07915613R
33.3	10 X 3.37	276070	60241163	07915819F	07915613P
38	7.5 X 5.06	276069	60240821	07915819H	07915613S
40	10 X 4.13	276070	60241163	07915819G	07915613R
50	10 X 5.06	276070	60241163	07915819H	07915613S
60	15 X 4.13	276072	60240828	07915819G	07915613R
75	15 X 5.06	276072	60240828	07915819H	07915613S
80	20 X 4.13	276074	60241164	07915819G	07915613R
90	18 X 5.06	276073	60241171	07915819H	07915613S
100	20 X 5.06	276074	60241164	07915819H	07915613S
125	30 X 4.13	276076	60241165	07915819G	07915613R
150	30 X 5.06	276076	60241165	07915819H	07915613S
160	40 X 4.13	276077	60241166	07915819G	07915613R
200	40 X 5.06	276077	60241166	07915819H	07915613S
240	60 X 4.13	276079	60241168	07915819G	07915613R
300	60 X 5.06	276079	60241168	07915819H	07915613S

SIZE C200S & T

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
9.42	5 X 1.84	276090	60241202	07915820C	07915614L
10	5 X 2.25	276090	60241202	07915820D	07915614M
15	5 X 2.76	276090	60241202	07915820E	07915614N
16.96	7.5 X 2.25	276091	60241204	07915820D	07915614M
18	5 X 3.37	276090	60241202	07915820F	07915614P
18.85	10 X 1.84	276092	60241205	07915820C	07915614L
20	5 X 4.13	276090	60241202	07915820G	07915614R
25	5 X 5.06	276090	60241202	07915820H	07915614S
30	7.5 X 4.13	276091	60241204	07915820G	07915614R
38	7.5 X 5.06	276091	60241204	07915820H	07915614S
40	10 X 4.13	276092	60241205	07915820G	07915614R
50	10 X 5.06	276092	60241205	07915820H	07915614S
60	15 X 4.13	276094	60241207	07915820G	07915614R
75	15 X 5.06	276094	60241207	07915820H	07915614S
80	20 X 4.13	276096	60241209	07915820G	07915614R
90	18 X 5.06	276095	60241208	07915820H	07915614S
100	20 X 5.06	276096	60241209	07915820H	07915614S
125	25 X 5.06	276097	60241210	07915820H	07915614S
150	30 X 5.06	276098	60241211	07915820H	07915614S
160	40 X 4.13	276099	60241213	07915820G	07915614R
200	40 X 5.06	276099	60241213	07915820H	07915614S
240	60 X 4.13	276101	60241215	07915820G	07915614R
300	60 X 5.06	276101	60241215	07915820H	07915614S

SIZE C262S & T

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
7.5 (1)	5 X 1.50	276102	60241302	07915821B	07915615K
9.4	5 X 1.84	276102	60241302	07915821M	07915615L
10	5 X 2.25	276102	60241302	07915821N	07915615M
14.1	7.5 X 1.84	276103	60241304	07915821M	07915615L
15	5 X 2.76	276102	60241302	07915821P	07915615N
17.04	7.5 X 2.25	276103	60241304	07915821N	07915615M
18	5 X 3.37	276102	60241302	07915821R	07915615P
20	5 X 4.13	276102	60241302	07915821S	07915615R
22.73	10 X 2.25	276104	60241305	07915821N	07915615M
25	5 X 5.06	276102	60241302	07915821T	07915615S
27.92	10 X 2.76	276104	60241305	07915821P	07915615N
30	7.5 X 4.13	276103	60241304	07915821S	07915615R
33.3	10 X 3.37	276104	60241305	07915821R	07915615P
38	7.5 X 5.06	276103	60241304	07915821T	07915615S
40	10 X 4.13	276104	60241305	07915821S	07915615R
42.23	15 X 2.76	276106	60241307	07915821P	07915615N
50	10 X 5.06	276104	60241305	07915821T	07915615S
60	15 X 4.13	276106	60241307	07915821S	07915615R
75	15 X 5.06	276106	60241307	07915821T	07915615S
80	25 X 3.37	276109	60203712	07915821R	07915615N
90	40 X 2.25	276111	60241313	07915821N	07915615M
100	30 X 3.37	276110	60241311	07915821R	07915615P
125	30 X 4.13	276110	60241311	07915821S	07915615R
150	30 X 5.06	376110	60241311	07915821T	07915615S
160	40 X 4.13	276111	60241313	07915821S	07915615R
200	40 X 5.06	276111	60241313	07915821T	07915615S
240	60 X 4.13	276113	60241315	07915821S	07915615R
300	60 X 5.06	276113	60241315	07915821T	07915615S

(1) SHELL PINION RATIO. ALSO ORDER PINION SHAFT07915821J AND KEY 55089.

SIZE C350S & T

RATIO		WORM SHAFT	WORM GEAR	HELICAL PINION	HELICAL GEAR
6.2 (1)	5 X 1.22	276114	60207767	07915822A	07915616J
7.5 (1)	5 X 1.50	276114	60207767	07915822B	07915616K
9.4	5 X 1.84	276114	60207767	07915822C	07915616L
10	5 X 2.25	276114	60207767	07915822D	07915616M
15	5 X 2.76	276114	60207767	07915822E	07915616N
18	5 X 3.37	276114	60207767	07915822F	07915616P
20	5 X 4.13	276114	60207767	07915822G	07915616R
22.61	10 X 2.25	276116	60242403	07915822D	07915616M
25	5 X 5.06	276114	60207767	07915822H	07915616S
30	7.5 X 4.13	276115	60207763	07915822G	07915616R
33.3	10 X 3.37	276116	60242403	07915822F	07915616P
38	7.5 X 5.06	276115	60207763	07915822H	07915616S
40	10 X 4.13	276115	60242403	07915822G	07915616R
47.12	25 X 1.84	276121	275593	07915822C	07915616L
50	10 X 5.06	276116	60242403	07915822H	07915616S
60	15 X 4.13	276118	60242404	07915822G	07915616R
64.19	12.67 X 5.06	276117	60207708	07915822H	07915616S
75	15 X 5.06	276118	60242404	07915822H	07915616S
80	29 X 4.13	276120	60242405	07915822G	07915616R
86	25 X 3.37	276121	275593	07915822F	07915616P
100	20 X 5.06	276120	60242405	07915822H	07915616S
125	25 X 5.06	276121	275593	07915822H	07915616S
150	30 X 5.06	276122	275594	07915822G	07915616S
160	40 X 4.13	276123	60242407	07915822G	07915616R
200	40 X 5.06	276123	60242407	07915822H	07915616S
240	60 X 4.13	276125	275595	07915822G	07915616R
300	60 X 5.06	276125	275595	07915822H	07915616S

(1) SHELL PINION RATIO. ALSO ORDER PINION SHAFT 07915821U AND KEY 50994.