

# **INSTRUCTION MANUAL**

## **TAPERED BUSHED HELICAL SHAFT MOUNT REDUCERS AND SCREW CONVEYOR DRIVES**

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**TAPERED BUSHING MOUNTING PROCEDURE**

- I. For small bore bushings (see table 1) (Fig. 1)
  - 1) Fit the bushing key (1) into the keyway on the tapered bushing (2).
  - 2) Insert the tapered bushing (2) into the locking ring (3) and driving hollow hub, taking care that bushing key fits into hollow hub keyway.
  - 3) Turn locking ring counterclockwise two turns.
- II. For large bore bushings (Fig. 2)
  - 1) Fit single special key (4) into driven shaft keyway, taking care that set screw is nearest to driven machine.
  - 2) Insert the tapered bushing (2) into the locking ring (3) and driving hollow hub.
  - 3) Turn locking ring counterclockwise two rotations.

**REDUCER MOUNTING INSTRUCTIONS (FIG. 3)**

- 1) Fit bushing reducer assembly onto driven machine shaft (E).
- NOTE: On large bore bushings, take care special key fits into hollow hub keyway
- 2) Slide unit to desired position. The unit should not be mounted such that dimension "A" is less than 1/4" and not greater than one shaft diameter.
  - 3) Tighten locking ring (B) with special wrench (supplied), allowing the reducer to draw up to the bushing (C).
  - 4) Do not exceed 50 FT-LBS of torque on the locking ring.
  - 5) Insert and tighten set screw (D).

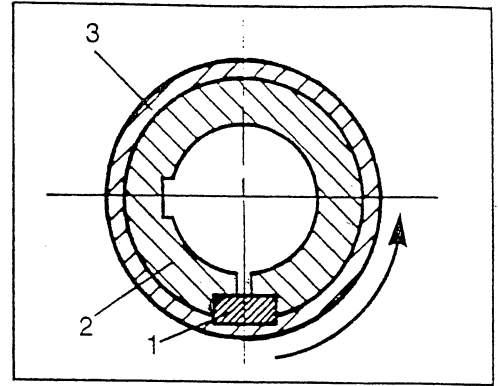
NOTE: Set screw (G), in large bore bushing key, is optional and used as an extra safety precaution when requested

NOTE: Inspect and tighten tapered bushing after 8 hours of use.

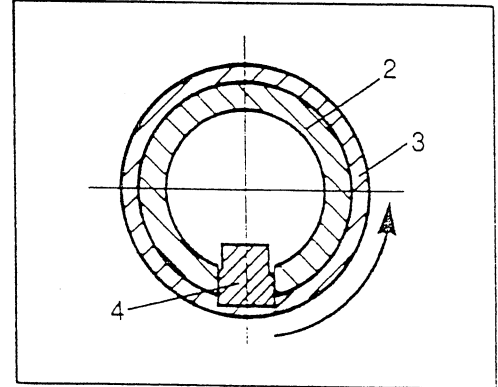
To remove bushings or reducer, reverse above procedures.

Caution: Do not remove screw (F)

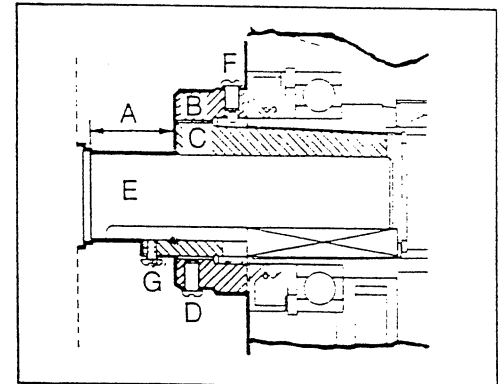
NOTE: Protective output shaft cap can be removed in applications where driven shaft is mounted through hollow shaft. In other applications, keep in place for protection against dirt and water.



**Figure 1**



**Figure 2**



**Figure 3**

**TABLE 1 BUSHING AVAILABILITY AND BORE REFERENCE**

SIZE	19/16	1	1 1/16	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3	3 1/8	3 1/4	3 3/8	3 1/2	3 5/8	4	4 1/8	4 1/4	4 3/8	4 1/2	
107	x	x	x	x	x	x	●	●																						
115		x			x	x	x	x	x	x	●	●			●	●														
203									x	x	x	x	x	●	●	●														
207												x	x	x	x	●	●	●												
215															x	x	x	●	●			●								
307																	x	x	x	●	●			●	●					
315																			x	x	x	x	x	●						

X SMALL BORE (FIGURE 1) ● LARGE BORE (FIGURE 2)

## INPUT SHAFT/SHEAVE MOUNTING PROCEDURE

Remove protective material from input shaft and clean shaft with cleaning solvent, if necessary, to remove any residue remaining on shaft.

Mount sheave on input shaft as near as possible to shaft shoulder. The center of the load should be located no farther out than the center of the input shaft. In this case, excessive overhung loads can occur and greatly reduce the life of the bearings. (Fig. 4)

Avoid any unusual forces when mounting the sheave. In particular **do not hammer on reducer or sheave in mounting the sheave**. If difficulties occur in the mounting of the sheave it is advised to use a soft mallet (neoprene type) or heat the sheave for easy installation.

Warning — Excessive belt tension can greatly reduce V-belt life as well as result in damage to the reducer and/or motor bearings. Follow V-belt manufacturers instructions and recommendations.

Once sheaves and V-belts have been installed, check for proper alignment.

**CAUTION** — For safety, user must provide a protective guard mounted around the V-belt and sheave particularly in cases where personnel could come in contact with the machine and cause personal injury.

## MOTOR LOCATION

If tension of V-belt is to be adjusted by the torque arm, install the motor such that the V-belt will be at about 90° from the center line between driven and input shafts (Fig. 5). Deviating much from this angle will require belt tensioning by some other means.

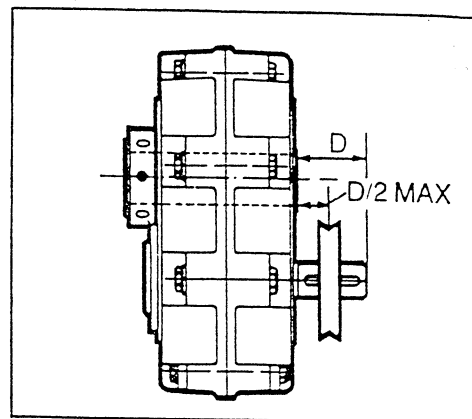


Figure 4

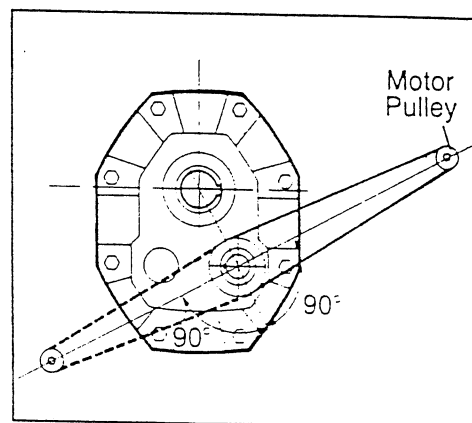


Figure 5

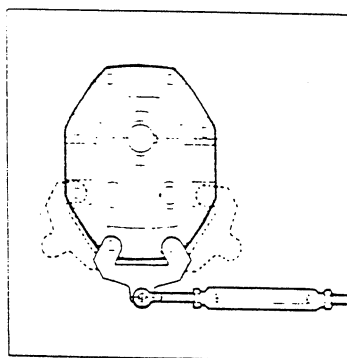


Figure 6

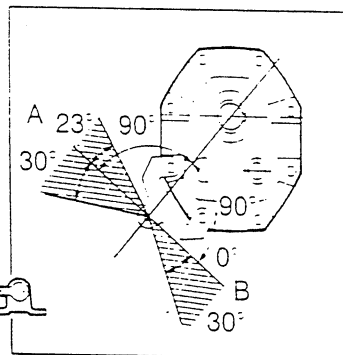


Figure 7

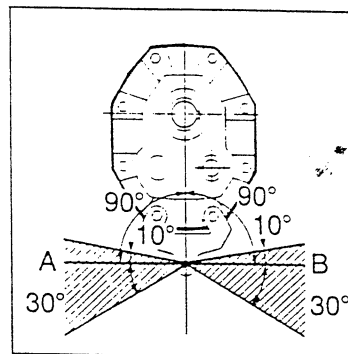


Figure 8

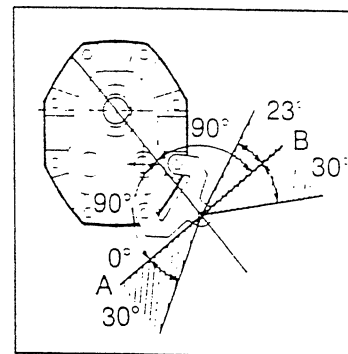


Figure 9

## TORQUE ARM MOUNTING PROCEDURE

Attach the torque arm housing bracket to the reducer housing. Three positions are recommended although eight positions are possible (Fig. 6).

Assemble the torque arm and attach the torque arm floor support to a rigid base.

Since all the reactive forces go through the torque arm, it is most advantageous to mount the torque arm at 90° to a line between the hollow shaft and the torque arm holding bolt (Figs. 7,8,9).

## REGION OF TORQUE ARM MOUNTING CAPABILITIES IN SHADED REGION

The torque arm must always be mounted so the reactive forces are in tension with the gearbox. This is dependent upon the rotation of the output shaft. For clockwise rotation, mount torque arm in section A. For counter-clockwise rotation, mount torque arm in section B (Figs. 7,8,9).



## BACKSTOP INSTALLATION

The backstop, used to prevent the reverse rotation of the gearbox, is mounted on the input shaft.

When ordered, backstop will be installed at the factory with rotational direction noted. If direction needs to be reversed follow the instructions below.

Types 107, 115, 203, 207 and 215 (Fig. 10).

- 1) Remove the four bolts (1), cover (2), outer race (3), and retaining ring (4).
- 2) Carefully remove the backstop (5), turn it over and reinstall.
- 3) Replace retaining ring (4), outer race (3), cover (2), and four bolts (1).

Types 307, 315 and 407 (Fig. 11).

- 1) Remove the four bolts (1) and cover (2). Note that the outer race (3) is held in place by two retaining rings.
- 2) Remove the inner retaining ring (4), and carefully remove the backstop (5), turn it over and re-install.
- 3) Remount the cover (2) and the four bolts (1).

**Caution:** For shaft mount reducers equipped with a backstop, never use E-P oil.

Backstops are not recommended for applications where personal safety is dependent upon its proper operation.

## MINIMUM SHEAVE SIZES

The National Electrical Manufacturers Association recommends certain limitations on sheave diameter and width for satisfactory motor operation. The selected sheave diameter should not be smaller nor the width greater than the dimensions shown.

Frame	Horsepower At			V-Belt Sheave (Inches)			
				Conventional		358	
	Synchronous Speed (RPM)			A, B, C, D and E Sections		3V, 5V and 8V Sections	
1800	1200	900	Min. Pitch Dia.	Max. Width	Min. Outside Dia.	Max. Width	
143T	1	.75	.50	2.2	4.25	2.2	2.25
145T	1.5-2	1	.75	2.4	4.25	2.4	2.25
182T	3	1.5	1	2.4	5.25	2.4	2.75
184T	—	2	1.5	2.4	5.25	2.4	2.75
184T	5	—	—	3.0	5.25	3.0	2.75
213T	7.5	3	2	3.0	6.50	3.0	3.375
215T	—	5	3	3.0	6.50	3.0	3.375
215T	10	—	—	3.8	6.50	3.8	3.375
254T	—	7.50	5	3.8	7.75	3.8	4
254T	15	—	—	4.4	7.75	4.4	4
256T	—	10	7.5	4.4	7.75	4.4	4
256T	20	—	—	4.6	7.75	4.4	4
284T	—	15	10	4.6	9	4.4	4.625
284T	25	—	—	5.0	9	4.4	4.625
286T	30	20	15	5.4	9	5.2	4.625
324T	40	25	20	6.0	10.25	6.0	5.25
326T	50	30	25	6.8	10.25	6.8	5.25
364T	—	40	30	6.8	11.50	6.8	5.875
364T	60	—	—	7.4	11.50	7.4	5.875

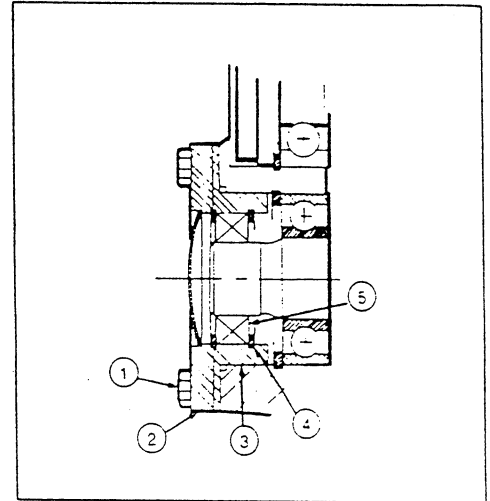


Figure 10

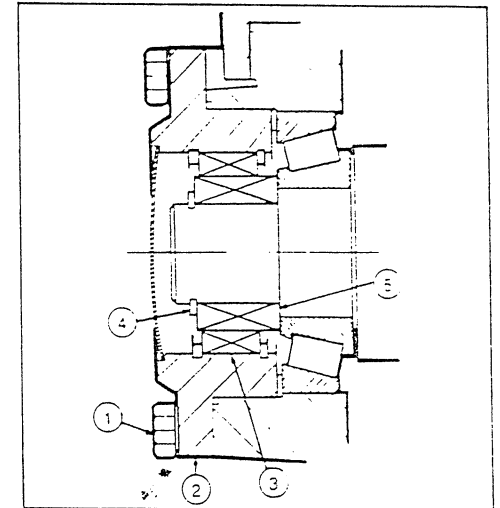


Figure 11



# LUBRICATION

## OIL CAPACITY

The amount of lubricant required for each unit varies greatly based on the mounting position

- Horizontal (four positions)
- Vertical

The oil levels shown are approximate values only and should be used as reference in determining how much oil to provide. The proper oil levels can only be determined by filling the reducer to the level of the plug. For usage of level plugs see figure 3.

**REDUCERS ARE SHIPPED WITHOUT OIL.**

TABLE 2

Make	Running conditions between 15°F and 60°F		Running conditions between 60°F and 165°F	
	without backstop	with backstop	without backstop	with backstop
AGMA lubricant	# 2 EP	# 2	# 4 EP	# 4
Cofran Mobil Oil Corp.	Cofran Sintogear 125 Mobil SHC 629			
Cities Service Co	CITGO EP Comp. #68	Pacemaker #68	Citgo EP Compo #150	Pacemaker #150
Fishe Bros. Refining	Lubriplate APG 80	Lubriplate Non. Det #2	Lubriplate APG 90	Lubriplate STM 90
Gulf Oil Corp.	EP Lubricant HD 68	Harmony 68	EP Lubricant HD 150	Harmony 150 D
Keystone Div.	KLC 543	KLC 543	KLC 432	KLC 432
Mobil Oil Corp	Mobil Gear 626	Mobil DTE heavy med.	Mobil Gear 629	Mobil DTE extra heavy
Shell Oil Corp.	Omala 68	Turbo 68	Omala 150	Turbo 150
Sun Oil Corp	Sunep 1050	Sunvis 931	Sunep 1060	Sunvis 975
Texaco, Inc	Meropa #1	Regal Oil PCR & O	Meropa #2	Regal Oil GR & O

TABLE 3 OIL LEVEL CAPACITIES IN QUARTS

REDUCER SIZE	HORIZONTAL				VERTICAL
	1	2	3	4	5
107	.80	.80	.80	.75	1.35
115	1.06	.95	.95	.80	1.50
203	1.85	1.85	1.85	1.50	2.40
207	2.65	2.40	2.40	2.15	3.70
215	4.25	3.75	3.75	3.50	4.25
307	5.25	5.50	5.50	5.15	6.90
315	9.0	8.75	8.75	8.0	10.0

NOTE: For proper oil level at other than horizontal position, maximum inclination allowed is: (See Fig. 4)  
A = 35° B = 30°  
For horizontal level (1). Table 3.

NOTE: After gearbox has been mounted, replace fill plug with supplied breather plug.

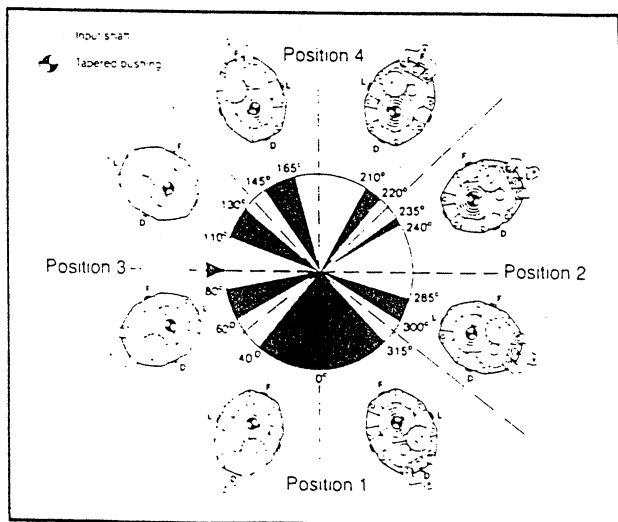


FIGURE 3

□ Area in which there is no plug available for proper level check. Please consult Table 3.

■ Area in which proper oil level can be found by using level plug indicated.

- F FILLING PLUG
- L LEVEL PLUG
- D DRAIN PLUG

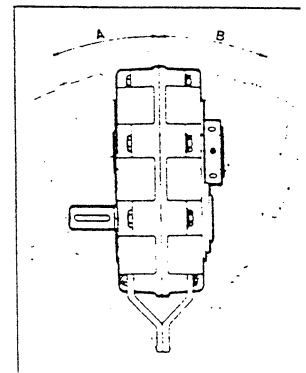
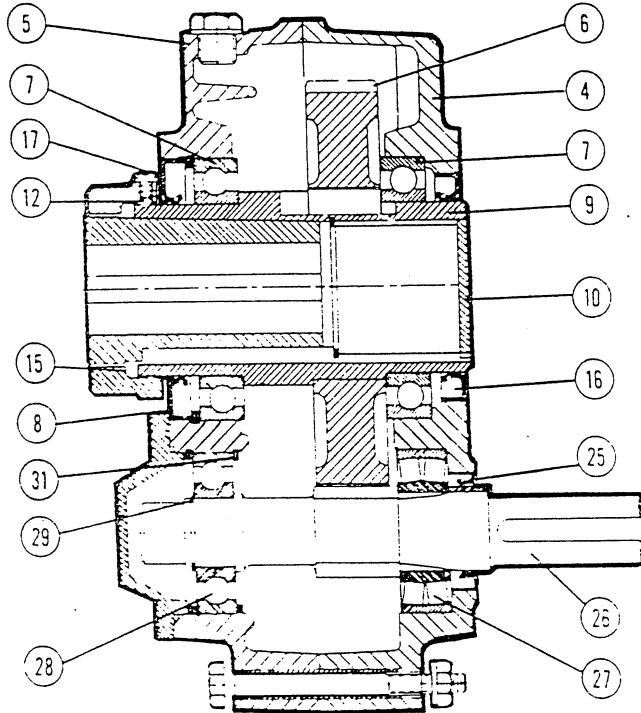


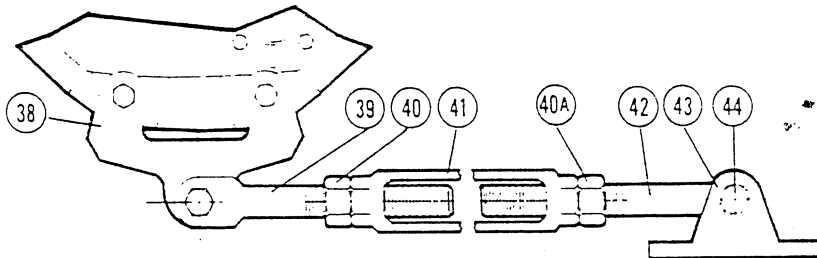
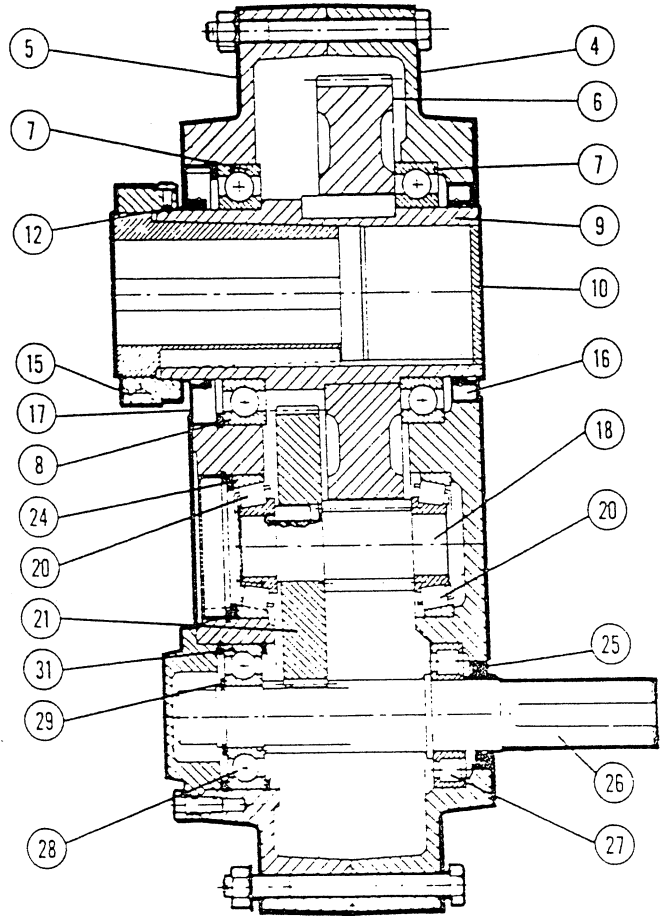
FIGURE 4

# PARTS LIST

## SINGLE REDUCTION



## DOUBLE REDUCTION



REF.					
4	Housing-Front	21-15	Intermediate Gear 15:1 Reducer	31	High Speed Bearing Retaining Ring-Rear
5	Housing-Rear	21-25	Intermediate Gear 25:1 Reducer	38	Torque Arm Housing Bracket
6	Slow Speed Gear	24	Intermediate Bearing Retaining Ring	39	Torque Arm Yoke and Pin Assembly
7	Slow Speed Bearing	25	High Speed Seal	40	Torque Arm Locking Nut-RH
8	Slow Speed Bearing Retaining Ring	26-05	High Speed Shaft and Pinion 5:1 Reducer	40A	Torque Arm Locking Nut-LH
9	Slow Speed Shaft	26-15	High Speed Shaft and Pinion 15:1 Reducer	41	Turnbuckle Body
10	Output Shaft Cap	26-25	High Speed Shaft and Pinion 25:1 Reducer	42	Torque Arm Rod-Support End
12	Bushing Ball Set	27	High Speed Bearing-Front	43	Torque Arm Floor Support
15	Bushing Collar	28	High Speed Bearing-Rear	44	Torque Arm Floor Support Bolt
16	Slow Speed Shaft Seal-Front	29	High Speed Shaft Retaining Ring-Rear	45	Complete Torque Arm Assembly (No. 39 thru 44)
17	Slow Speed Shaft Seal-Rear				
18	Intermediate Shaft and Pinion				
20	Intermediate Shaft Bearing				

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## SHAFT MOUNT PARTS

REFERENCE NUMBER	107	115	203	207	215	307	315
6	ZR-107-6	ZR-115-6	ZR-203-6	ZR-207-6	ZR-215-6	ZR-307-6	ZR-315-6
7				SEE TABLE 4			
8	ZR-107-8	ZR-115-8	ZR-203-8	ZR-207-8	ZR-215-8	ZR-307-8	ZR-315-8
9	ZR-107-9	ZR-115-9	ZR-203-9	ZR-207-9	ZR-215-9	ZR-307-9	ZR-315-9
12	ZR-107-12	ZR-107-12	ZR-107-12	ZR-107-12	ZR-107-12	ZR-107-12	ZR-107-12
15	ZR-107-15	ZR-115-15	ZR-203-15	ZR-207-15	ZR-215-15	ZR-307-15	ZR-315-15
16				SEE TABLE 5			
17				SEE TABLE 5			
18	ZR-107-18	ZR-115-18	ZR-203-18	ZR-207-18	ZR-215-18	ZR-307-18	ZR-315-18
20				SEE TABLE 4			
21-15	ZR-10715-21	ZR-11515-21	ZR-20315-21	ZR-20715-21	ZR-21515-21	ZR-30715-21	ZR-31515-21
21-25	ZR-10725-21	ZR-11525-21	ZR-20325-21	ZR-20725-21	ZR-21525-21	ZR-30725-21	ZR-31525-21
24	ZR-107-24	ZR-115-24	ZR-203-24	ZR-207-24	ZR-215-24	ZR-307-24	ZR-315-24
25				SEE TABLE 5			
26-05	ZR-10705-26	ZR-11505-26	ZR-20305-26	ZR-20705-26	ZR-21505-26	ZR-30705-26	ZR-31505-26
26-15	ZR-10715-26	ZR-11515-26	ZR-20315-26	ZR-20715-26	ZR-21515-26	ZR-30715-26	ZR-31515-26
26-25	ZR-10725-26	ZR-11525-26	ZR-20325-26	ZR-20725-26	ZR-21525-26	ZR-30725-26	ZR-31525-26
27				SEE TABLE 4			
28				SEE TABLE 4			
29	ZR-107-29	ZR-115-29	ZR-203-29	ZR-207-29	ZR-215-29	ZR-307-29	ZR-315-29
31	ZR-107-31	ZR-115-31	ZR-203-31	ZR-207-31	ZR-215-31	ZR-307-31	ZR-315-31
38	ZR-107-38	ZR-115-38	ZR-203-38	ZR-207-38	ZR-215-38	ZR-307-38	ZR-315-38
39	ZR-107-39	ZR-107-39	ZR-107-39	ZR-107-39	ZR-107-39	ZR-307-39	ZR-307-39
40	ZR-107-40	ZR-107-40	ZR-107-40	ZR-107-40	ZR-107-40	ZR-307-40	ZR-307-40
41	ZR-107-41	ZR-107-41	ZR-107-41	ZR-107-41	ZR-107-41	ZR-307-41	ZR-307-41
42	ZR-107-42	ZR-107-42	ZR-107-42	ZR-107-42	ZR-107-42	ZR-307-42	ZR-307-42
43	ZR-107-43	ZR-107-43	ZR-107-43	ZR-107-43	ZR-107-43	ZR-307-43	ZR-307-43
44	ZR-107-44	ZR-107-44	ZR-107-44	ZR-107-44	ZR-107-44	ZR-307-44	ZR-307-44
45	ZR-107-45	ZR-107-45	ZR-107-45	ZR-107-45	ZR-107-45	ZR-307-45	ZR-307-45

TABLE 4  
LIST OF BEARINGS

REDUCER TYPE	OUTPUT BEARINGS	INTERMEDIATE BEARINGS	INPUT BEARINGS	
	ITEM 7	ITEM 20	ITEM 27	ITEM 28
10705	6011	—	22205	6205
10715 25	6011	3604	6205	6205
11505	6013	—	22206	6305
11515 25	6013	30204	NJ206	6305
20305	6015	—	22207	6306
20315 25	6015	30205	NJ207	6306
20705	6017	—	22207	6306
20715 25	6017	30306	NJ207	21306
21505	6020	—	30210	30308
21515 25	6020	33206	NJ210	6308
30705	6024	—	4335	4388
30715 25	6024	33207	33210	30308
31505	16030	—	5335	5395
31515 25	16030	33210	33211	30309

TABLE 5  
LIST OF SEALS

REDUCER TYPE	OUTPUT SEAL-FRONT	OUTPUT SEAL-REAR	INPUT SEAL
	ITEM 16	ITEM 17	ITEM 25
107	55x72x10	55x90x10	24.85x40x8
11505	65x85x13	65x100x10	32x50x10
11515/25	65x85x13	65x100x10	30x50x10
20305	75x100x10	75x115x10	40x52x7
20315 25	75x100x10	75x115x110	35x52x10
207	85x110x12	85x130x13	35x55x9
215	100x120x12	100x150x13	55x68x8 10
307	120x150x15	120x180x15	55x80x10 12
315	150x180x15	150x180x15	60x85x13 15

# SHAFT MOUNT TROUBLESHOOTING CHART

PROBLEM	CAUSE	REMEDY
<b>NOISE AND VIBRATION</b>	Insufficient oil	Check oil level. Fill to proper level.
	Overspeed occurring	Check rated maximum speed for unit. Reduce speed or replace with larger unit.
	Worn gears or pinions	Check for overload. If overload is occurring reduce load or replace with reducer of sufficient capacity.
	Improper Torque Arm support installation	Check for rigidity of support.
<b>BEARING FAILURE</b>	Hollow shaft                      Incorrect mounting of torque arm	Replace bearings. See mounting instructions.
	Input shaft                      Excessive belt tension	Replace bearings. Check and reduce belt tension.
<b>OVERHEATING</b>	Overload	Check rated capacity of drive and replace with reducer of sufficient capacity.
	Improper oil level	Check oil level.
	Improper oil grade	Drain, rinse, and refill with proper grade oil (see table 2).
<b>OIL LEAKAGE</b>	Excessive oil	Check oil level. Drain to proper level.
	Breather Plug in incorrect position	Check for breather plug to be at top most position.

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A SUBSIDIARY OF A. O. SMITH CORPORATION



16752 Armstrong Ave., Irvine, CA 92714 • 714/474-0520  
Telex 678-458 • FAX 714/474-0543

531 No. Fourth St., Tipp City, OH 45371 • 513/667-2431  
Telex 288-097 • FAX 513/667-2431 Ext. 2339

In Canada: Sterling Power Systems  
799 Rennie St., Hamilton, Ont. L8H 7L4 • 416/547-2345  
Telex 061-8399