Installation, Operation and Maintenance Instructions

EDDY CURRENT SEPARATOR

MODEL ECS REA CARTRIDGE DESIGN 12 – 48

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506-1440 U.S.A.
WORLD AUTHORITY IN ADVANCED TECHNOLOGY FOR MAGNETIC, VIBRATORY and INSPECTION APPLICATIONS

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Eddy Current Separator

Principles of Operation

The nonferrous metallic separator consists of an external drum, an internal permanent magnetic rotor, a drive, and belt conveyor.

The external drum shell of non-metallic composite material rotates at conventional speed. The internal full diameter Rare Earth alternating polarity rotor turns at much higher RPM than the external shell.

Through the induction of eddy currents and the resulting repelling forces, the alternating magnetic field selectively repels the nonferrous metals and physically separates them from other materials with minimum product loss.

General Description

The Eddy Current Separator (ECS) is furnished with a 12" diameter eddy current rotor, tail pulley, pillow block bearings, conveyor belt side guides, protective hood, and optional product discharge hoppers and splitter assemblies. The frame is of welded structural steel construction.

The rotor drive consists of an electric motor, coupled to the rotor by sheaves and matched v-belts with a fully enclosed belt guard.

The rotor speed can be of fixed or variable speed depending on options purchased. (See Electrical section of this manual for details.)

The conveyor belt drive consists of an electrical motor, with a shaft mounted gear reducer on the tail pulley shaft. The belt speed can be fixed or variable speed depending on options purchased. (See Electrical section of this manual.)

The ECS is shipped completely assembled. The optional pan feeder and control are separate and require hook-up.

The Eddy Current Separator is designed to operate with a minimum amount of ferrous material in the waste stream. If necessary, Eriez Drum, Pulleys and Belt Magnets should be placed upstream to remove this material.

Eddy Current Separator Application

Ferrite Type Eddy	Light Duty Material Recovery Facility (MRF) Metals Sorting 4" Products
REM Type Eddy	Many MRFs
RE Type Eddy	Majority of Applications including...ASR Shredder Fluff, MRF, MSW, Plastic, Glass, Ash, Foundry, Computer Scrap

WARNING

⚠ PROVISION MUST BE MADE TO SHUT DOWN THE USER FEED CONVEYOR BEFORE STOPPING THE EDDY CURRENT SEPARATOR. THIS WILL PREVENT MATERIAL LAYING ON THE SEPARATOR CONVEYOR BELT WITH THE ROTOR STILL COASTING. STRAY FERROUS LAYING IN THE ROTOR AREA COULD HEAT UP AND CAUSE DAMAGE TO THE BELT AND ROTOR.

Installation

Use care in uncrating to avoid damage to the equipment.

Unit has been adjusted and tested at the factory prior to shipment. Pulleys have been installed with care to provide alignment of shafts and bearings.

If there is a question of damage to the separator from rough handling in shipment, shaft alignment and belt adjustment should be checked. Particularly check the Electrical Control for any concealed damage to terminal boards, etc.

When preparing to bolt the unit in the installation, shims should be used to ensure that all legs are sitting on a firm surface. The ECS should be leveled square. Do not pull bolts to frame by tightening, but shim from mounting surface to legs to prevent any twisting of the frame when hold down bolts are tightened. Note that all support legs should be supported rigidly from below.

Optional feeder shall be shipped either loose or secured on frame work. If loose, feeder shall be lifted and placed onto mounting pads. If on frame work, release securing cables/straps that hold feeder.

Turn now to the Electrical section of this manual to wire and check the control.

*The rotor bearing blocks are equipped with thermocouple plug sensors. They should be wired with thermocouple wire to a temperature controller supplied by the customer. A “Red Lion” model T48 or OMEGA CNi3222 are options. They can accept signals from thermocouple RTD elements.

See page 20 for manufacturer’s information. The controllers should be set at a maximum temperature of 200ºF.

Operation

A. Clear the installation area of any loose tools or other materials which may be attracted to the magnetic rotor.

The main disconnect and Eddy Current Separator hatch panels, if supplied, must be closed.

The Emergency Stop switch must be pulled out.

B. Manual Mode (Local)

The hand mode of operation is primarily intended for maintenance. The rotor will not run in this mode as it is possible to damage the shell or conveyor belt if the rotor is running with the conveyor off.

Move the auto-hand selector switch into the hand mode. Push the conveyor start button to start the conveyor belt. Note that the conveyor start/stop push buttons only work in this mode.

Momentarily start the conveyor drive in the "Hand Mode" and observe the direction of the belt. If belt rotation is incorrect, check the motor leads. If belt adjustment is necessary, due to misalignment during shipping, reposition the bearings on the tail pulley by take-up screws on either side of the pulley. Do not over tighten, as it is possible to pull the rotor shell into the rotor. It may be necessary to loosen one side rather than tighten the other to track the belt. The belt should only be tightened enough to allow the belt to run and track properly.

Check the guides along the lower edges of the side guide. They should be within 1/8" of the belt. Improperly adjusted guides can cause damage to the belt.

C. Auto Mode (Local) Push System Start push button. The conveyor starts first followed by the rotor.

Note: The start button must be held for a second or two for the speed switch to close.

With the conveyor tracked and running, observe the direction of rotation of the rotor. If the rotation is wrong, check motor leads.

To stop, push the Emergency Stop Button.

D. Automatic Mode (Remote)

The system operates the same as in Local Automatic.

The system will not run in remote mode if the hand-auto selector switch is in the hand mode.

Splitter Setting

The splitter setting will vary depending on material being sent to the machine. Ideally a factory representative should be present during start-up to set the splitter and explain the various adjustments that may be required to optimize recovery. If one is not present and you are dealing with MSW or mixed recyclables, start with the splitter set 12" horizontally from the rotor surface and vertically set at the rotor centerline. Fine tune from this point. Typical splitter gaps for aluminum beverage cans are 12" on Ferrite, 15-18" on REM, and 20-24" on RE. Alternate method: Run product on conveyor with rotor off, and set splitter approximately 1-2" in front of material trajectory.

Maintenance

A. Pulleys and Rotor

The Eddy Current Separator is designed to operate with a minimum amount of ferrous material in the feed. For this reason, the rotor shell must be checked daily for any metallic particles stuck to the O.D. This is done by turning the machine off, opening the access door and rotating the rotor shell by hand to view the entire circumference. Remove any foreign matter immediately. Serious damage to the rotor shell will occur if cleaning is not done on a regular basis.

Shell surfaces with missing tile(s) can be repaired with brushable ceramic (Devcon). See attached sheet.

The magnetic rotor in an Eriez Eddy Current Separator incorporates high strength permanent magnets arranged in a special circuit. These magnets are bonded to the rotor hub and are then wrapped under tension with carbon fiber, using a proprietary process. Eriez has analyzed and tested the bonding and wrapping processes and the resulting rotor structure (including a test to destruction) to assure the integrity of the complete assembly. Because the rotor operates at high speed in close proximity to personnel and other equipment, failure could result in severe damage and/or personnel injury or death. It is important that the rotor structural integrity not be compromised by third party repairs. Any repair affecting the structural integrity of the ECS high speed rotor should be carried out only by Eriez or Eriez technicians.

CAUTION!

NEVER ATTEMPT TO CLEAN THE MACHINE WHILE IT IS RUNNING!

B. Conveyor Belt

Check the conveyor belt for holes, cuts etc. that go all the way through. Patch immediately as fine materials will go through to the shell and cause severe damage. Worn areas of the belt should also be repaired to prevent the eventual formulation of holes.

Belt Repair - The ECS is furnished with a urethane conveyor belt with cleats and sidewalls. Most rips, punctures, cuts, etc can be quickly repaired with the optional belt repair kit which includes heat gun, urethane, fabric, tools, clamps, instructions and plastic case. The kit is **highly recommended**.

Check the guides along the lower edges of the side guides regularly. They should be within 1/8" of the belt. If they have taken a set or are full of material, clean and readjust or replace. Improperly adjusted guides can allow contaminants to work into the rotor assembly causing damage.

Observe the belt tracking while the machine is warm and running. If necessary, adjust.

Note: An endless belt is supplied with the unit. If replaced with a spliced belt, make sure the lacing is non-metallic and is covered both top and bottom with a flexible flap cold vulcanized to the belt.

C. Gear Reducer

Refer to individual section for manufacturer's instructions.

D. Bearings

1. Tail Pulley Pillow Blocks. Lubricate every two months with a lithium base

NLG1 grade 2 grease. The bearings should be lubricated while rotating and the grease pumped in slowly until a slight bead forms around the seals.

2. Rotor Pillow Blocks. Lubricate every month with Mobilith AW3, XHP223, or equivalent. The bearings should be lubricated while rotating using the top offset grease fitting. Add .5oz (12" through 48" wide units) or .7oz (60" wide units) of grease. The grease will purge out through the relief hole or around the seal.

Maintenance (cont.)

3. Inner Shell Bearing. The inner shell bearing grease purge chamber incorporates grease fittings. The actual bearings are lubed and sealed for life; the grease injected through the fitting in the purge chamber is intended to provide an additional seal to prevent damage from contamination. The grease will purge out around the shaft area, thereby, flushing out contaminants. Check the shaft in this area at least every two weeks for visible grease. If no grease is visible, clean the area between the shaft and the grease retainer and add only AW3 or XHP223 grease through the fitting until grease is discharged around the shaft. A relief plug is provided and should be removed during lubing so as not to damage the bearing seal with excessive pressure.

E. Sheaves and V-Belts

Check for shiny spots, frays or splits. Replace as required.

F. Daily Preventative Maintenance

See decal on ECS, a copy of which is shown on the following page.

MSDS Name:	**DEVCON® Brushable Ceramic white**
Manufacturer Name:	ITW Devcon
Stock No.:	11770

Components:

BRUSHABLE CERAMIC WHITE HARDENER

BRUSHABLE CERAMIC WHITE RESIN

ITW Performance Polymers (Finished Goods) Product Code : 11770

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**BRUSHABLE CERAMIC WHITE RESIN**
Manufacturer Name:	ITW Devcon
Address:	30 Endicott Street Danvers, MA 01923
MSDS Revision Date:	10/10/2006
Emergency telephone number	(800) 424-9300

HMIS

Health Hazard	2*
Fire Hazard	1
REACTIVITY	1
Personal Protection	x

* Chronic Health Effects:

In the US, call CHEMTREC: (800) 424-9300

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS#	
Bisphenol A diglycidyl ether resin	25068-38-6	30 - 60 by Weight
Fillers	N/A	30 - 60 by Weight
Titanium dioxide	13463-67-7	1 - 5 by Weight

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: WARNING! Potential Sensitizer. Irritant.

Primary Routes of Exposure: Eyes. Skin. Inhalation. Ingestion.

Potential Health Effects:

Eye Contact: Can cause moderate irritation, burning sensation, tearing, redness, and swelling. Overexposure may cause lacrimation, conjunctivitis, corneal damage and permanent injury..

Skin Contact: Can cause skin irritation; itching, redness, rashes, hives, burning, and swelling. Allergic reactions are possible.
May cause skin sensitization, an allergic reaction, which becomes evident on reexposure to this material.

Inhalation: Respiratory tract irritant. High concentration may cause dizziness, headache, and anesthetic effects. May cause respiratory sensitization with asthma-like symptoms in susceptible individuals.

Ingestion:	Causes irritation, a burning sensation of the mouth, throat and gastrointestinal tract and abdominal pain.
Chronic Health Effects:	Prolonged skin contact may lead to burning associated with severe reddening, swelling, and possible tissue destruction
Signs/Symptoms:	Overexposure can cause headaches, dizziness, nausea, and vomiting.
Target Organs:	Eyes. Skin. Respiratory system. Digestive system.
Aggravation of Pre-Existing Conditions:	Individuals with pre-existing skin disorders, asthma, allergies or known sensitization may be more susceptible to the effects of this product.

Rotor Ferrous Wheel	Devcon Lbs. Required
12″	1
24″	1
36″	1-1/2
48″	2
60″	2-1/2

Required Maintenance

IMPORTANT! TURN OFF AND LOCK OUT POWER TO THE EDDY CURRENT SEPARATOR WHILE CARRYING OUT ALL PROCEDURES WHICH INVOLVE CONTACT WITH THE MACHINE. FAILURE TO DO THIS MAY RESULT IN SERIOUS PERSONAL INJURY OR DAMAGE TO THE EDDY CURRENT SEPARATOR.

DAILY:

- Check for and remove any metal particles stuck to the belt or the outer surface of the rotor shell.
- Check for and remove debris build-up on and around the motors.
- Check for and remove debris build-up on the splitter and discharge chutes.
- Check for and patch holes and worn spots on the conveyor belt.
- Adjust side guides and brushes for minimum clearance to the conveyor belt (plastic guides 1/4"). Remove any material build-up in the side guide brushes (if fitted).
- Observe and adjust conveyor belt tracking after the machine warms up.
- Check the feeder tray (if any) for material build-up and clean as required.

EVERY TWO WEEKS:

- Add Mobilith AW3 or equivalent at the fittings at the end of the rotor until grease is discharged around the shaft.
- Check and lube the tail pulley bearings as specified in the IOM.

CAUTION!

Door must be closed while unit is running. Failure to observe this precaution may result in damage to the machine and/or serious personal injury.

IMPORTANT!

With unit turned off check rotor shell for ferrous contamination on a daily basis

MAXIMUM ROTOR SPEED

2600 RPM

ECS Separator Belt or Rotor Installation Procedure

The following procedure is recommended for the installation of an endless conveyor belt or a new or replacement rotor for an Eddy Current Separator. Special items required are two 3"ID pipes eight feet long. These pipes will slide over the ends of the rotor and tail pulley shafts during belt removal or replacement.

A. Belt Change Procedure

1. Working from the drive side, remove the belt guard, driven sheave, V-belt and loosen the reducer torque arm.

2. Remove both side guide assemblies from the machine. If you have a standard unit skip to step 7.

3. Remove side guide access hatch, Fig 1 marked "A" (flip three latches).

4. Remove remaining top half of side guide, Fig 1 marked "B" (four bolts to side guide supports).

5. Remove bolts on side guide supports (4), Fig 1 marked "C", releasing slide plate. Remove.

6. Remove four nuts holding bottom half of side guide, Fig 1 marked "D". Remove bottom half.

7. Slice belt across width and remove towards the front of the unit from the underside while standing in first discharge chute.

8. After the belt is removed, inspect rotor shell carefully for any damage. If there is any evidence of a shell breach, notify factory immediately.

9. While in the process of installing the new belt, do not allow any material to attach itself to the rotor. If the ECS is allowed to run with material stuck to the shell, severe damage could occur

10. Loosen pillow blocks and take up on tail pulley, Fig 1 marked "E". It may be helpful to remove the motor from the reducer as this is a shaft mounted unit and the motor will swivel downward if the support arm is removed to allow full adjustment of the take up. Mark the location of the rotor pillow blocks.

11. Clean out any material that may be caked up inside the lower side guides or around brushes.

12. If installing a belt that is weld spliced, reference instructions supplied in welding kit.

B. Rotor Installation Procedure

1. Ensure that the magnetic rotor is clean and free of any foreign objects.

2. Slide pipes onto rotor drive side and tail pulley shaft ends. (See Fig 2.)

3. Place belt onto pipe.

4. Lifting the tail pulley and rotor with the pipes, slide the belt into place. See Fig 2.

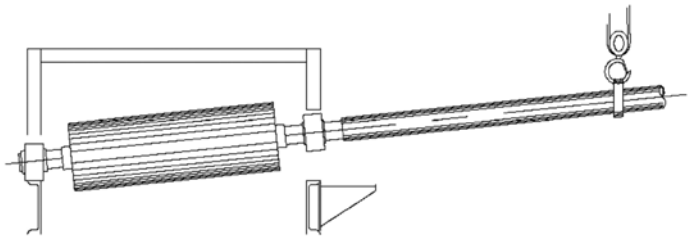


Fig. 2

5. Reinstall pillow block bearings at the original locations.

6. Replace V-belt, Sheave, belt guard and readjust reducer torque arm.

7. Adjust belt for proper tracking. Be careful not to over tension the belt, as the shell that surrounds the rotor could be pulled into the spinning rotor and result in damage.

8. When the belt is tracking at the center at the pulleys, readjust the belt skirting to within 1/8" of belt surface. Check the tracking on the underside of the unit to make sure the side walls are not rubbing along the side guides.

9. Allow the unit to run at least 30 minutes prior to running material while closely monitoring the belt tracking.

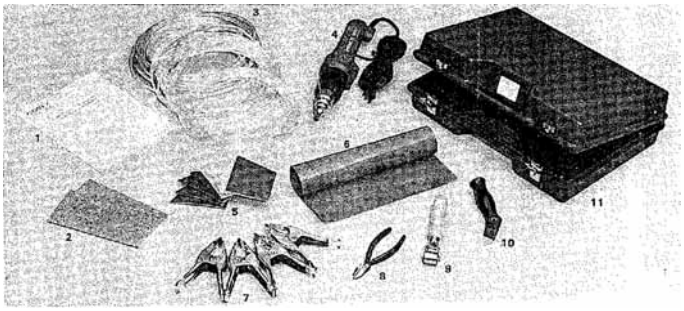
10. Continue to monitor the belt tracking periodically. The belt may need some break in time and this could result in the belt tracking off and causing damage to the belt.

ECS Separator Belt or Rotor Installation Procedure (cont.)

C. Belt Repair Kit Information

Welding Kit

Contains all the necessary tools and materials required to splice all styles of conveyor belting endless by heat welding.



Description	Quantity
1. NOVITANE Welding Procedure Manual	1 only
2. 16 Gauge Galvanized Steel (4" wide x long)	2 each
3. NOVITANE Welding Rod - 3 sizes	
1/8" Round	75 Ft.
5/32" Triangular	50 Ft.
1/4" Triangular	50 Ft.
4. Stelnel Hot Air Gun #HG-2000-E with a 9 mm nozzle,	1 only
5. Welding Trial Belt Samples	
IG-120185-COS (12)	3 each
FG-90/85 K (8)	3 each
6. Teflon Coated Glass Fabric (010" x 72" wide x 12" long)	1 only
7. Spring Clamps (2" opening x 6" long)	4 each
8. Cutting Pliers	1 only
9. Roller (1" wide x 1" diem)	1 only
10. Angle Head Utility Knife	1 only
11. Carrying Case	1 only

Replacement of ECS Rotor Bearings 'OSB' DESIGN

Caution must be observed, as this is a high-powered magnet.

Be careful to keep tools away from the magnetic fields.

All lifting devices that are close to the magnet must be non-magnetic.

Slacken the conveyor belt before starting.

A. Removal of rotor bearing from non-drive side.

1. Support the rotor shaft and shell. (see Figure 1)

2. Loosen the housing mounting bolts (36) and completely remove the setscrew in the bearing locknut.

3. Rotate the bearing lock nut with a spanner wrench until the bearing is free.

4. With a sharp blow from a brass hammer, strike the end of the adapter nut sleeve. This should loosen the bearing so that it easily pulls off the shaft.

B. Removal of the rotor bearing from the drive side.

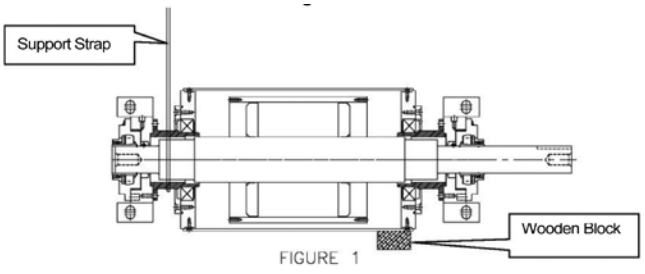


FIGURE 1

1. Support the shaft as shown. (See Figure 2 on next page)

2. Remove the belt guard, driven sheave and sheave bushing.

3. Loosen the bearing housing mounting bolts (27) and completely remove the setscrew in the bearing lock nut.

4. Remove the bearing lock nut. Strike the bearing adapter nut with a brass hammer. This should loosen the bearing (16) so that it easily pulls off the shaft.

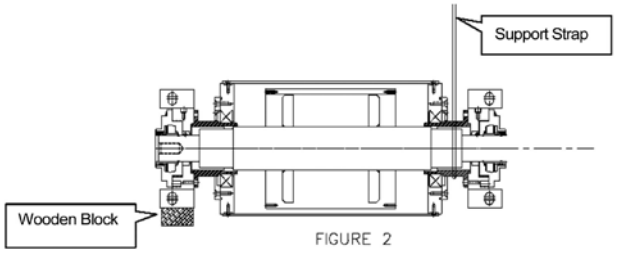


FIGURE 2

C. Installation of new rotor bearing. Start with the drive end.

1. During assembly it is best practice to remove all of the weight from the bearing via slings or blocks. Clean shaft and bearing adapter sleeve of any light oil. Use a clean rag. There is no need for solvents "Never Seize" etc.

2. Slide the drive end bearing into position on to the shaft. Measure the distance from the end of the shaft to the center line of the pillow block. This is 9 3/16" (233mm). If the bearing will not slip onto the shaft or move axially, turn locknut counter clockwise to expand the adapter sleeve.

3. Rotate the locknut clockwise by hand until it is tight & the adapter sleeve grips and does not spin on the shaft. This is the starting point. Scribe a line on the locknut above the adapter sleeve slot.

4. Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar and hammer, clockwise one full turn.

5. Tighten locknut setscrew until 3/32" Allen key bends (or 25 in-lbs).

6. Tighten flange bolts to 600 in-lbs (1/2-13 UNC bolts).

Replacement of ECS Rotor Bearings 'OSB' DESIGN (cont.)

D. Installation of new rotor bearings. Non-drive side

1. Slide the drive end bearing into position on to the shaft. Measure the distance from the end of the shaft to the center line of the pillow block. This should be 4 13/32" (112mm).

2. Hand tighten but leave 1/16" (1.5mm) minimum gap between the flange housing and the mounting pillow block.

3. It is important to note that the 1/16" (1.5mm) minimum gap between the flange housing and the mounting surface must be maintained while getting the bearing hand tight to the shaft.

4. Wearing gloves, rotate the locknut clockwise, by hand, until adapter sleeve grips and does not spin or move axially on the shaft. If needed, tap on the locknut outer diameter while turning the locknut to assist with this step. At this point you should have difficulty in rotating the locknut by hand and you should not be able to move the bearing axially along the shaft by hand. If the bearing can be moved axially along the shaft then continue rotating the nut gradually until it grips. Scribe a line on the locknut above the adapter sleeve slot.

5. Insert flange housing bolts and pull the housing flush with its mounting surface by alternately tightening the bolts to 600 in-lbs.

6. Lock bearing to shaft by rotating locknut, with a spanner wrench clockwise by 1 full turn.

7. Tighten locknut setscrew until 3/32" Allen key bends (or 25 in-lbs).

8. Rotate the shaft by hand, no binding or excessive drag should be felt if excessive drag loosen the second bearing and reinstall starting with step 1.

9. Lubricate rotor bearing with recommended lubricant (20) until grease appears along the shaft.

Note: An 8" Spanner wrench is required for above procedure.

E. Removal of shell bearing

1. Remove rotor assembly from the machine and place it on workbench. Lift assembly at the pillow blocks or shaft. (See Figure 3) shows preparation to remove drive side shell bearing.

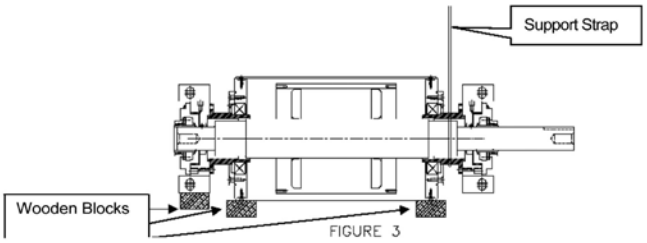


FIGURE 3

2. Remove pillow block and rotor bearing as described in section A.

3. With shaft supported as shown in (See Figure 4), remove inner hub (10) it will pull out of the inner bearing.

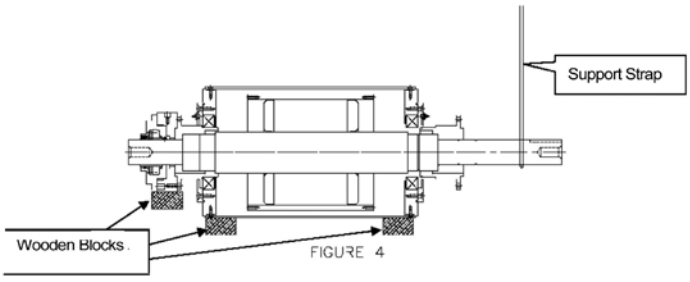


FIGURE 4

4. Remove shell screws (12).

5. Pull out end flange (2), inner bearings (5) and grease retainer (3). You may need 2 pieces of threaded rod M-8-1.25 and a 3/8" thick. (See Figure 5)

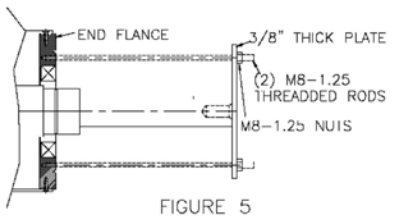


FIGURE 5

Replacement of ECS Rotor Bearings ‘OSB’ DESIGN (cont.)

F. Installation of shell bearing.

1. Press new shell bearing (5) into end flange (2).

2. Push end flange back into shell and realign screw holes (support like Fig. 3).

3. Install flat head screws (9). Use Loctite (14)

4. Install grease retainer (3) on both sides.

5. Install inner hub through shell bearing bore.

Position pillow block per drawing 3N-200901229. The end of shaft to center line of pillow block mounting hole 9 3/16” (233mm) and from pillow block mounting hole to end flange of 4 13/32” (112mm).

6. Bolt inner hub to pillow block.

7. Locate Rotor bearing (16).

8. Install new rotor bearing as described in Section B & C.

9. Lube (20) inner bearings through the grease retainer fitting.

10. Lube should appear around the inner hub.

G. Reinstall onto machine.

1. Lift rotor assembly by the shaft. (See Figure 5).

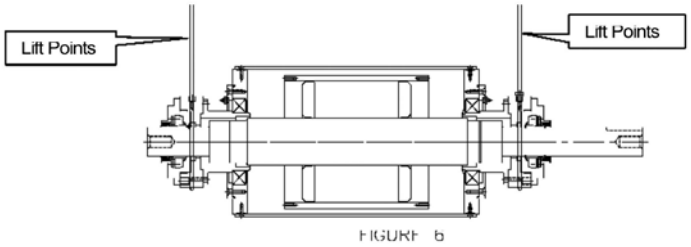


FIGURE 5

2. Place back into the exact position on the ECS.

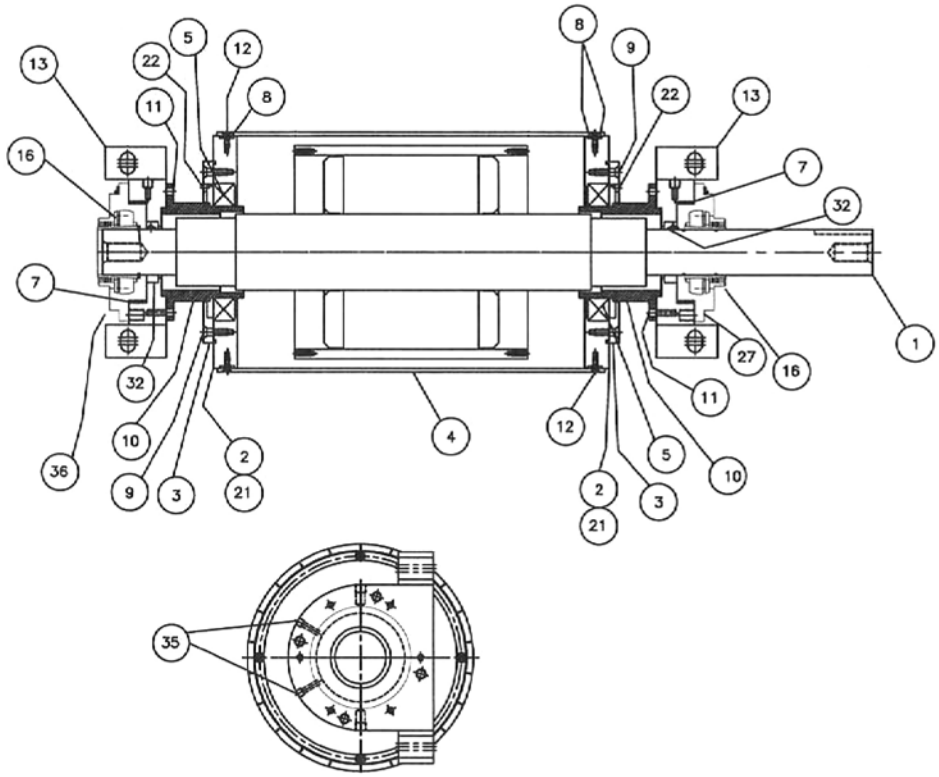
3. Tighten pillow block bolts.

4. Reinstall sheave bushing and sheave.

5. Align V-belts

6. Install belt guard and track conveyor belt.

Replacement of ECS Rotor Bearings ‘OSB’ DESIGN (cont.)



2	37		VALVE RELIEF
4	36		HEX HD BOLT
2	35		PIPE PLUG
2	32		SEAL
4	27		HEX HEAD BOLT GR 5
2	26		READ INSTRUCTION MANUAL LABEL
2	25		CRUSH WARNING HAZARD LABEL
2	24		MAGNETIC FIELD HAZARD LABEL
	23		
4	22		GREASE ZERK
2	21		BREATHER FILTER VENT
1	20		GREASE
2	16		BEARING DODGE GRIP TIGHT
	15		
1	14		LOCTITE
2	13		PILLOW BLOCK
24	12		SCREW FLAT HD GR2
12	11		HEX HD BOLTS
2	10		INNER HUB
12	9		BOLT GR2
4	8		O-RING
	7		
	6		
2	5		BEARING
1	4		SHELL
2	3		GREASE RETAINER
2	2		END FLANGE
1	1		ROTOR ELEMENT
ITEM	ITEM NO.	REF NO.	DESCRIPTION OF PART

Instruction Manual Dodge® Grip-Tight Adapter Mount Ball Bearings

WARNING

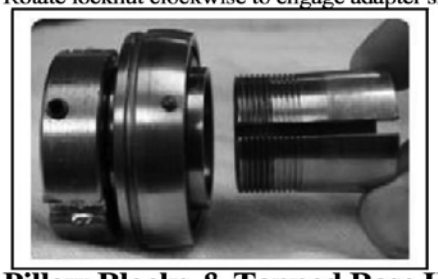
To ensure that drive is not unexpectedly started, turn off, lock out, and tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

Shaft & Mounting Surface Inspection

Shaft should be smooth, straight, & within commercial tolerances (Table 1). Remove burrs & align mounting surfaces within 2 degrees.

Assemble Adapter & Bearing

1) If the locknut is loose from the bearing,
FIRST place locknut into bearing inner ring groove,
THEN insert adapter into bearing bore until it rests against the locknut.
Rotate locknut clockwise to engage adapter sleeve.



Pillow Blocks & Tapped Base Housings

NOTE: For Tapped Base (TB) housings drill mounting holes with 1/16" minimum bolt clearance to assist with proper installation.

2) During installation it is best practice is to remove all of the weight from the bearing via slings or jacks. However, if it is difficult to remove all weight then insure the dead weight on the bearing during installation does not exceed the values listed in Table 2.

Table 2: Maximum Dead Load On Bearing During Installation

	Maximum Dead Load Per Bearing
Series	(lbs)
203-206	60
207-210	65
211-214	70
215-218	75

3) Slide the unit into position onto the shaft. If the unit will not slip onto the shaft, turn locknut counter-clockwise to expand adapter sleeve.

4) Wearing gloves, rotate locknut clockwise, by hand, as tight as possible until adapter sleeve grips and does not spin on the shaft or move axially. If needed, tap on locknut outer diameter while turning locknut to assist with this step. Scribe the line on the locknut above the adapter sleeve slot.

5) Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar & hammer, clockwise by amount shown in Table 3. NOTE: The use of air chisels is not recommended.

6) Center housing & mounting bolts over mounting holes & tighten bolts to proper torque (Table 4). Tighten locknut setscrew until 3/32" Allen key bends (25 in-lbs).

7) Repeat above steps for mounting 2nd housing. Do not tighten mounting bolts on 2nd housing until second bearing has been completely locked to the shaft. Bolts must fit freely between housing & mounting surface. If the mounting bolts do not fit freely, loosen mounting bolts on both housings & center both units. If the bolts still will not fit freely, remove one unit from the shaft, reposition housing, & reinstall.

Table 1 - Shaft Tolerances

Shaft Size (in)	Commercial Shaft Tolerances (in)
Up to 1 1/2"	+0.000" / - 0.002"
1 5/8" - 2 1/2"	+0.000" / - 0.003"
2 11/16" - 3 7/16"	+0.000" / - 0.004"

Table 3 - Locknut Rotation From Handtight

Series	Shaft Size GT (Normal Duty)	Shaft Size GTM (Medium Duty)	Locknut Rotation
203 - 204	1/2" - 3/4" 17 - 20 mm	--- ---	1/2 Turn
205 - 210	7/8" - 1 3/4" 25 - 45 mm	3/4" - 1 1/2" 20 - 40 mm	2/3 Turn
211 - 218	1 15/16" - 2 15/16" 50 - 75 mm	1 11/16" - 3 1/2" 45 - 85 mm	1 Turn

Table 4 - Mounting Bolt Torque (in-lbs)

Metal Housings		Non-Metallic Polymer Housing			
All Housing Types		Pillow Block, 2 & 4 Bolt Flange, Flange Bracket		Tapped Base	
Bolt Size (in)	Dry Torque (in lbs)	Bolt Size (in)	Dry Torque (18-8 Stainless) (in lbs)	Bolt Size (in)	Dry Torque (18-8 Stainless) (in lbs)
3/8	240	3/8	225	3/8	175
7/16	384	7/16	350	7/16	350
1/2	600	1/2	500	1/2	400
5/8	1200	9/16	650		
3/4	2100	5/8	1000		
7/8	2040				

WARNING

Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that the correct procedure be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance, and operating procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to ensure 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 Baldor Electric Company nor are the responsibility of Baldor Electric Company. 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 equipment in the system and potential hazards involved. When risk to persons or property may be involved, a holding device or shear bars must be an integral part of the driven equipment.

Instruction Manual Dodge® Grip-Tight Adapter Mount Ball Bearings (cont.)

All Flange Housings

WARNING: Special attention to the installation procedure for flange bearings is necessary to maintain the proper internal clearance & achieve maximum life. The installation of the first flange differs from the installation of the second flange.

(See step 1 **Assemble Adapter & Bearing** page 1)

2) During installation it is best practice is to remove all of the weight from the bearing via slings or jacks. However, if it is difficult to remove all weight then insure the dead weight on the bearing during installation does not exceed the values listed in Table 2.

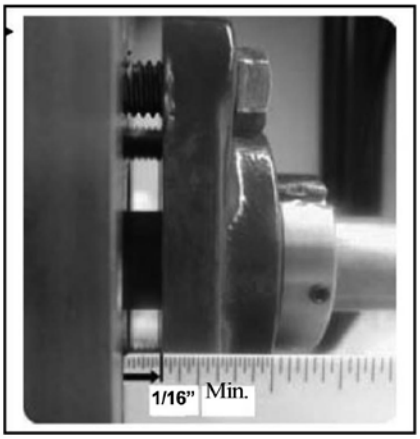
3) Slide the FIRST unit into position onto the shaft. If the bearing will not slip onto the shaft or more axially, turn locknut counter clockwise to expand adapter sleeve.

4) (Using gloves) rotate locknut clockwise by hand until it is tight & adapter sleeve grips & does not spin on the shaft. This is the starting point. Scribe a line on the locknut above the adapter sleeve slot.
(If needed, tap on locknut outer diameter while turning locknut to assist with this step.)

5) Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar & hammer, clockwise by amount shown in Table 2.
NOTE: The use of air chisels is not recommended.

6) Tighten locknut setscrew until 3/32" Allen key bends (or 25 in-lbs). Tighten housing bolts to proper torque (Table 3).

7) Slide the **SECOND** flange onto the shaft and hand tighten as in step 4 but leave 1/16" minimum gap between the flange housing & the mounting surface. See picture to the right.



8) It is important to note that the 1/16" minimum gap between the flange housing and the mounting surface must be maintained while getting the bearing hand tight to the shaft. Wearing gloves, rotate the locknut clockwise, by hand, until adapter sleeve grips and does not spin or move axially on the shaft. If needed, tap on the locknut outer diameter while turning the locknut to assist with this step. At this point you should have difficulty in rotating the locknut by hand and you should not be able to move the bearing axially along the shaft by hand. If the bearing can be moved axially along the shaft by hand then continue rotating the nut gradually until it grips the shaft. Scribe a line on the locknut above the adapter sleeve slot.

9) Insert housing bolts & pull the housing flush with mounting surface by alternately tightening the bolts to the proper torque (Table 4).

10) Lock bearing to shaft by rotating locknut, with a spanner wrench or drift pin & hammer, clockwise by amount shown in Table 3. Tighten locknut setscrew until 3/32" Allen key bends (25 in-lbs).

11) Rotate the shaft by hand, no binding or excessive drag should be felt. If excessive drag is felt, loosen the second bearing & reinstall starting at step 8.

Dismounting All Units

1) Remove all weight from the bearing via slings or jacks & secure the shaft from rotation.

2) LOOSEN THE HOUSING MOUNTING BOLTS & COMPLETELY REMOVE SETSCREW IN THE LOCKNUT.

3) Rotate locknut counter clockwise with spanner wrench or drift pin & hammer until bearing is free.

Table 5 - Suggested Lubrication Intervals in Weeks

Hours Run Per	RPM 1 to 250 RPM	251 to 500 RPM	501 to 750 RPM	751 to 1000 RPM	1001 to 1500	1501 to 2000	2001 to 2500	2501 to Max
8	12	12	10	7	5	4	3	3
16	12	7	5	4	2	2	1	1
24	10	5	3	2	1	1	1	1

Lubrication: (Use compatible Lithium base NGLI #2 grease & see Table 5)

The Dodge Grip-Tight bearing has been greased from the factory & is shaft ready. When re-lubricating slowly add grease until fresh grease is seen purging past the seal. In the higher speed ranges, excess grease may cause temporary bearing overheating. The amount of grease a bearing will take for a specific high speed application is best determined by experience. When establishing a re-lubrication schedule, note that a small amount of grease at frequent intervals is preferred to a large amount of grease at infrequent intervals. Lubrication recommendations are intended for standard products applied in general operating conditions. For modified products, high temperature applications, and other anomalous applications contact product engineering at 864-284-5700

Manufacturer's Information

GROVE GEAR

FLEX-A-LINE SPEED REDUCERS

Installation, Lubrication and Maintenance Instructions

CONGRATULATIONS!

Your decision to purchase an American Crafted Speed Reducer from Grove Gear will provide you with many years of trouble free service if the following installation and maintenance instructions are adhered to.

Selection Information

Read ALL instructions prior to operating reducer. Injury to personnel or reducer failure may be caused by improper installation, maintenance or operation.

Written authorization from Grove Gear is required to operate or use reducers in man lift or people moving devices.

Check to make certain application does not exceed the allowable load capacities published in the current catalog.

Buyer shall be solely responsible for determining the adequacy of the product for any and all uses to which Buyer shall apply the product. The application by Buyer shall not be subject to any implied warranty of fitness for a particular purpose.

Safety Alert

⚠WARNING

- For safety, Buyer or User should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The User is responsible for checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.
- Hot oil and reducers can cause severe burns. Use extreme care when removing lubrication plugs and vents.
- Make certain that the power supply is disconnected before attempting to service or remove any components. Lock out the power supply and tag it to prevent unexpected application of power.
- Reducers are not to be considered fail safe or self-locking devices. If these features are required, a properly sized, independent holding device should be utilized. Reducers should not be used as a brake.
- Any brakes that are used in conjunction with a reducer must be sized or positioned in such a way so as to not subject the reducer to loads beyond the catalog rating.
- Lifting supports including eyebolts are to be used for vertically lifting the gearbox only and no other associated attachments or motors.
- Use of an oil with an EP additive on units with backstops may prevent proper operation of the backstop. Injury to personnel, damage to the reducer or other equipment may result.
- Overhung loads subject shaft bearings and shafts to stress which may cause premature bearing failure and/or shaft breakage from bending fatigue, if not sized properly.

CAUTION

- Test run unit to verify operation. If the unit tested is a prototype, that unit must be of current production.
- If the speed reducer cannot be located in a clear and dry area with access to adequate cooling air supply, then precautions must be taken to avoid the ingestion of contaminants such as water and the reduction in cooling ability due to exterior contaminants.
- Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Important Information

In the event of the resale of any of the goods, in whatever form, Resellers/Buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

> *The manufacturer makes no warranties or representations, express or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitably meet the requirements of their intended use. In no event will the manufacturer be liable for consequential, incidental or other damages. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under Section 2-719 of the Uniform Commercial Code, the manufacturer shall have no liability to Buyer for consequential damages.*

Resellers/Buyers agree to also include this entire document including the warnings above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This instructions manual should be read together with all other printed information such as catalogs, supplied by Grove Gear.

General Operation

1. Run the motor which drives the reducer and check the direction of reducer output rotation. Consult motor nameplate for instructions to reverse the direction of rotation.
2. Attaching the load: On direct coupled installations, check shaft and coupling alignment between speed reducer and loading mechanism. On chain/sprocket and belt/pulley installation, locate the sprocket or pulley as close to the oil seal as possible to minimize overhung load. Check to verify that the overhung load does not exceed specifications published in the catalog.
3. High momentum loads: If coasting to a stop is undesirable, a braking mechanism should be provided to the speed reducer output or the driven mechanism.

CAUTION The system of connected rotating parts must be free from critical speed, torsional or other type vibration, no matter how induced. The responsibility for this system analysis lies with the purchaser of the speed reducer.

Installation

1. Mount the unit to a rigid flat surface using grade 5 or higher fasteners. The mounting fasteners should be the largest standard size that will fit in the base mounting hole. Shim as required under flange or base feet which do not lie flat against the mounting surface.
2. For shipment, pipe plugs are installed in the unit and a vent plug is packed separately. After mounting the unit in position, remove the appropriate pipe plug and install the vent plug in the location shown on page 5. On double reduction units both the primary and the secondary must be vented. Failure to vent the unit can cause premature seal wear or loss of seal and oil. These conditions are not covered by warranty. Check for correct oil level. Contact the factory for level and vent recommendations on non-standard mounting positions. **Grove Gold** units with optional internal pressure compensating system do not use vents. See (internal pressure compensating system) under **Lubrication** for further information.
3. **Grove Gold** units include synthetic oil and an internal pressure compensation system pre-installed at the factory. It is not necessary to vent these units, and they can be used as supplied from the factory. Do not loosen the nut holding the stem of the pressure compensator, and do not block the hole in the stem. Do not blow pressurized air into the hole, and avoid spraying washdown chemicals directly into the hole.
4. Connect motor to speed reducer.

WARNING Depending upon gear geometry and operating conditions worm gear reducers may or may not backdrive. Special consideration should be given to high inertia loads connected to the output shaft. Consult the factory for further details.

DO NOT CHANGE MOUNTING POSITIONS WITHOUT CONTACTING FACTORY.

CAUTION Altering the mounting position may require special lubrication provisions which must be factory installed.

CAUTION Do not operate the reducer without making sure it contains the correct amount of oil. Do not overfill or underfill with oil, or injury to personnel, reducer or other equipment may result. **Grove Gold** units are lubed and sealed for life, so in most applications it will not be necessary to drain or re-fill the unit.

CAUTION A unit cannot be used as an integral part of a machine superstructure which would impose additional loads on the unit other than those imposed by the torque being transmitted either through a shaft-mounted arrangement, and any shaft mounted power transmitting device. *(e.g., sprockets, pulleys, couplings)*

CAUTION For safe operation and to maintain the unit warranty, when changing a factory installed fastener for any reason, it becomes the responsibility of the person making the change to properly account for fastener grade, thread engagement, load, tightening torque and the means of torque retention.

Lubrication - Standard Units

With the exception of unit sizes 2700, 2800 and 21000 which are shipped dry, all standard reducers ordered from the factory are filled with lubricant to operate within a 30° to100° F ambient temperature range. Double and triple reduction units have separate oil sumps and must be filled/checked independently. Prior to startup, verify that the oil is at the level shown on the drawings on page 5. If the ambient temperature will be outside the range for the lubricant installed at the factory, drain and refill the reducer with the proper viscosity lubricant prior to use. Consult the chart on page 4 or the factory for alternate lubricants.

Change Intervals: Standard compounded lubricants should be changed every six months or 2500 operating hours, whichever comes first. Factory installed synthetic lubricants should be changed every two years or 6000 hours, whichever comes first.

Internal pressure compensating system: Grove Gold and stainless steel reducers come standard with an internal pressure compensating system and synthetic oil pre-installed at the factory. It is not necessary to vent these reducers, and they can be used as supplied from the factory.

CAUTION Oil should be changed more often if reducer is used in a severe environment. *(i.e. dusty, humid)*

CAUTION In the Food and Drug Industry (including animal food), consult the lubrication supplier for recommendation of lubricants which are acceptable to the Food and Drug Administration and/or other authoritative bodies having jurisdiction. Factory supplied oil is not suitable for these applications or this industry.

CAUTION Do not mix different oils in the reducer. Oils should be compatible with Viton® seal material.

Special Lubrication Requirements - Sizes 218 & Larger

Units shipped from the factory are assembled to properly lubricate all internal components based on a specific assumed mounting orientation. The factory assumed mounting orientations are given below. If a size 218 or larger unit will be mounted in a different orientation than listed below, or run with sustained input speeds less than 900 RPM, it should be specified with the order. The unit can then be modified to assure proper lubrication.

Factory Assumed Mounting Orientation	Applicable Unit Styles*	
Worm Over	B, T, F, H, FH, C,	Single Reduction
	D, DT, DF, DH, DFH	Double Reduction Worm-Worm
	DX, DXT, DXH, DXFH,	Double Reduction Helical-Worm
	TT	Triple Reduction Worm-Worm-Worm
Worm Under	U	Single Reduction
	DU	Double Reduction Worm-Worm
Vertical Output	VL/VH, FE	Single Reduction
	DVL/DVH, DFE	Double Reduction Worm-Worm
	DXVL/DXVH, DXFE	Double Reduction Helical-Worm
Vertical Input	J	Single Reduction
	DJ	Double Reduction Worm-Worm
	DXJ	Double Reduction Helical-Worm

** Includes 'M' and 'MQ' versions of all styles listed*

The precision-made gears and bearings in Grove Gear Speed Reducers require high-grade lubricants of the proper viscosity to maintain trouble-free performance. For best results, use lubricants on the following chart for worm gear reducers:

Manufacturer	30° to 100° F Ambient Temperature AGMA Compounded No. 7	50° to 125° F Ambient Temperature AGMA Compounded No. 8
Amoco Oil Co.	Worm Gear Oil	Cylinder Oil #680
Chevron USA, Inc.	Cylinder Oil #460X	Cylinder Oil #680X
Exxon Co. USA	Cylesstic TK-460	Cylesstic TK-680
Gulf Oil Co.	Senate 460	Senate 680D
Mobile Oil Corp.	600 W Super Cylinder	Extra Hecla Super
Shell Oil Co.	Valvata Oil J460	Valvata Oil J680
Sun Oil Co.	Gear Oil 7C	Gear Oil 8C
Texaco	Honor Cylinder Oil	650T Cylinder Oil
Union Oil Co. of CA	Steaval A	Worm Gear Lube 140

Standard factory-installed lubricant, shipped with 6.00" C.D. and smaller units.

Some gear lubricants contain E.P. additives that can be corrosive to gear bronze. Avoid lubricants that are compounded with sulfur and/or chlorine.

For temperature ranges not shown, contact factory.

For lubrication requirements of **Grove Gold** or helical reducers (primaries of helical/worm reducers, ratio multipliers, and styles BAMCQ, BAMC, and BA), contact factory.

Oil Capacities (pints) - Standard Units

Mounting Position	UNIT SIZE													
	213	215	217	220	224	226	230	232	242	252	2600	2700*	2800*	21000*
Worm Over	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5	8 1/4	12 1/2	19 1/2	35	48	72
Worm Under	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5 1/2	8	13 1/2	20 1/2	32 3/4	51 1/4	80
Vertical Output	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5	8	13 1/2	20	20 3/4	28 3/4	40
Vertical Input	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5	8	13 1/2	20 1/3	36 1/2	50	75
Extended Bearing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8	12	17	27	40	63	102

**Shipped Dry*

Worm over on Secondary Unit of Double Reduction	N/A	N/A	N/A	N/A	12	19 1/4	20	30 1/3	50 1/3	71 1/2	107 1/4

16 oz. = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
1 gallon = 128 oz. = 231 cu. in.

CAUTION

Always check for proper oil level after filling. Capacities vary somewhat with model and mounting position. Oil should rise to bottom edge of level hole. Do not overfill.

Synthetic Lubricants

Synthetic lubricants provide the potential for numerous benefits including wider temperature range and increased interval between changes. Use of synthetics can cause problems if they are not compatible with the seals or the conventional lubricants they replace. For continuous duty at normal ambient temperatures (-10°F to 105°F) we recommend the use of Mobil SHC 634 which is compatible with the standard compounded oil shipped in our product and the Viton® seal material used through size 252. For other temperatures, or for intermittent operation below 20° F, contact the factory for a recommendation.

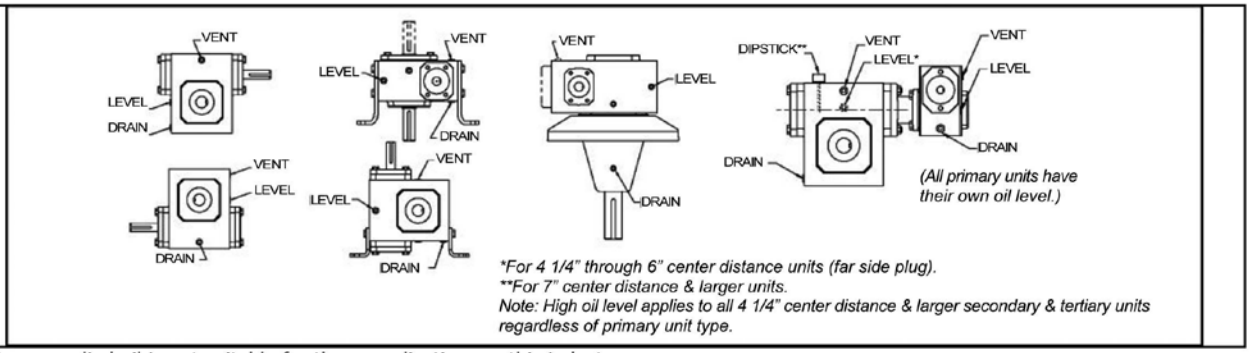
For synthetic lubrication to be used in helical reducers (primaries of helical/worm reducers, ratio multipliers, and styles BAMCQ, BAMC, and BA), contact factory.

Lubrication - Grove Gold

All **Grove Gold** reducers are shipped from the factory filled with synthetic lubricant suitable for continuous operation within a -10° F to 105° F ambient environment. If ambient temperature will be outside the above range, or if operation will be intermittent at temperatures below 20° F, consult the factory for lubrication recommendations. The unit is factory filled with the correct amount of oil for most mounting positions. If the unit will operate at input speeds below 900 RPM, or if a 230 or larger unit is to operate with one of its shafts in a vertical position, consult the factory for special lubrication considerations.

CAUTION

In the Food and Drug Industry (including animal food), consult the lubrication supplier for recommendation of lubricants which are acceptable to the Food and Drug Administration and/or other authoritative bodies having jurisdiction.



Factory supplied oil is not suitable for these applications or this industry.

Standard Speed Reducer Mounting Positions & Vent Plug, Level and Drain Locations

Maintenance - Standard Units

Your Grove Gear reducer has been tested and adjusted at the factory. Dismantling or replacement of components must be done by Grove Gear to maintain the warranty.

Inspect vent plug often to insure it is clean and operating.

CAUTION Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Seals: The Grove Gear line of speed reducers utilize premium quality seals which are the state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Replacement can be easily accomplished by following the steps below:

1. Remove the worn seal without damaging the shaft surface or the seal bore. This can be done by drilling a .062 diameter hole in the seal casing (being careful not to drill into the bearing behind the seal). Screw a #10 sheet metal screw into the hole and pry out the seal.
2. Clean the seal bore of sealant.
3. Before installing the new seal, use electrical tape to cover any keyways on the shaft to prevent seal lip damage.
4. Grease the seal lips with bearing grease and apply a sealant to the seal bore.
5. Slide the seal into the shaft being careful not to fold the inner lip over on any shaft steps.
6. Press the seal into its bore with a sleeve that presses on the seal casing, being careful to keep the seal square in its bore.

Maintenance - Grove Gold

Your **Grove Gold** reducer has been tested and adjusted at the factory. Dismantling or replacement of components must be done by Grove Gear to maintain the warranty.

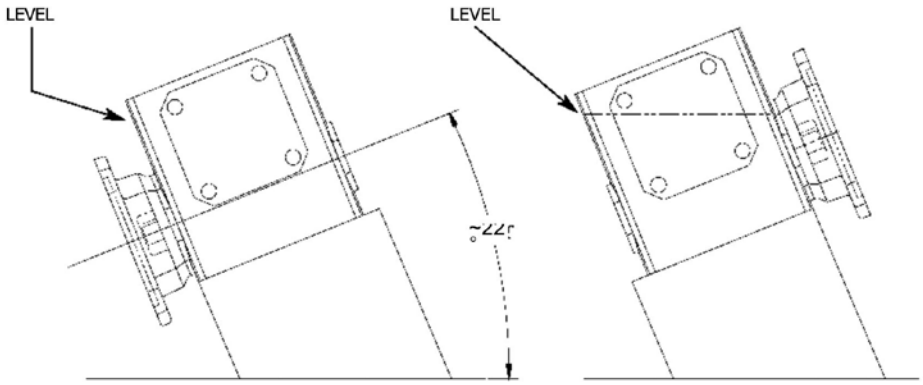
Inspect the stem of the pressure compensating system often to ensure it is clean and operating properly.

CAUTION Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Seals: The **Grove Gold** line of speed reducers utilize premium quality seals which are state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Replacement can easily be accomplished by following the procedure given under **Maintenance - Standard Units** above.

If seal leakage has resulted in the loss of a significant amount of oil, it may be necessary to add more lubricant. For normal ambient temperature conditions, Grove Gear recommends Mobil SHC 634 synthetic gear oil for worm drives, and Mobil SHC 150 for helical drives. For all worm drives, fill the gearbox to the level indicated in the diagram below.

Standard Oil Level for Grove Gold Reducers



CAUTION Always check for proper oil level after filling. Do not overfill or underfill with oil, or injury to personnel, reducer, or other equipment may result.

CAUTION Do not mix different oils in the reducer.

Class of Service

All capacity ratings are based on American Gear Manufacturers Association (AGMA) Standards. Load conditions must be within cataloged ratings published in the current Grove Gear Catalog (available upon request).

Warranty From Grove Gear - See catalog pages 192-195 for warranty terms and conditions.

GROVE GEAR
A Division of REGAL-BELOIT

Engineering Data

Single Reduction Parts List

Item # Description

Basic Single Reduction Unit

1. Gear Housing
2. Pipe Plug
3. Vent Plug
4. Splash Guard
5. Input Cover
6. O-Ring
7. Hex Head Cap Screw
8. Input Oil Seal
9. Input Bearing
10. Input Bearing
*11. Retaining Screw
12. Input Shaft
13. Output Cover
14. Output Cover
15. O-Ring
16. Output Cover Gasket (as required)
17. Output Oil Seal
18. Output Bearing
19. Hex Head Cap Screw
***20. Single Output Shaft
***21. Double Output Shaft
22. Gear Spacer
23. Gear Key (only used on size 2-5/8" center distance and larger units)
24. Output Gear (supplied only as output assembly on size 1-1/3" through 2-3/8" center distance units)
25. Input Cover (only used on size 4-1/4" center distance and larger units)
26. Input Cover
27. Input Oil Seal
*28. Retaining Ring - Shaft
29. Double Input Shaft
170. Internal Pressure Compensation Chamber (optional)
171. Internal Pressure Compensation Chamber Stem Plug
172. Internal Pressure Compensation Chamber Stem Nut

**not used on 4-1/4" center distance and larger units*

Quill Motor Flange Unit

30. Double Input Shaft
40. Quill Motor Flange
41. Input Oil Seal
42. Hex Head Cap Screw
43. Retaining Ring - Shaft
44. Retaining Ring - Housing (only used on size 4-1/4" center distance and larger units)
45. Quill Input Shaft

Hollow Output Shaft Unit

50. Gear Housing
51. Output Cover
52. Output Oil Seal
53. Output Bearing
54. Gear Spacer
***55. Output Shaft
56. Setscrew
57. Gear Key (only used on size 2-5/8" center distance and larger units)

Item # Description

58. Output Gear (supplied only as output assembly on size 1- 1/3" through 2-3/8" center distance units)

Mounting Bracket Options

70. Horizontal Mounting Foot
71. Cap Screw
72. High and Low Riser Bracket
73. Hex Head Cap Screw
74. "J" Mount Bracket
75. Output Flange
76. Machine Faced Output Cover (only used on size 2-3/8" center distance and larger solid output shaft units)
77. Hex Head Cap Screw
78. Torque Bracket
79. Hex Head Cap Screw

Extended Bearing Unit

90. Flange
91. Output Shaft
92. Bearing
93. Output Oil Seal
94. Hex Head Cap Screw
95. Pipe Plug
96. Expansion Plug
*97 Flange Cover
*98 Gasket
*99 Hex Head Cap Screw

**only used on size 5-1/4" center distance and larger units*

Long Motor Flange and Coupling Kit

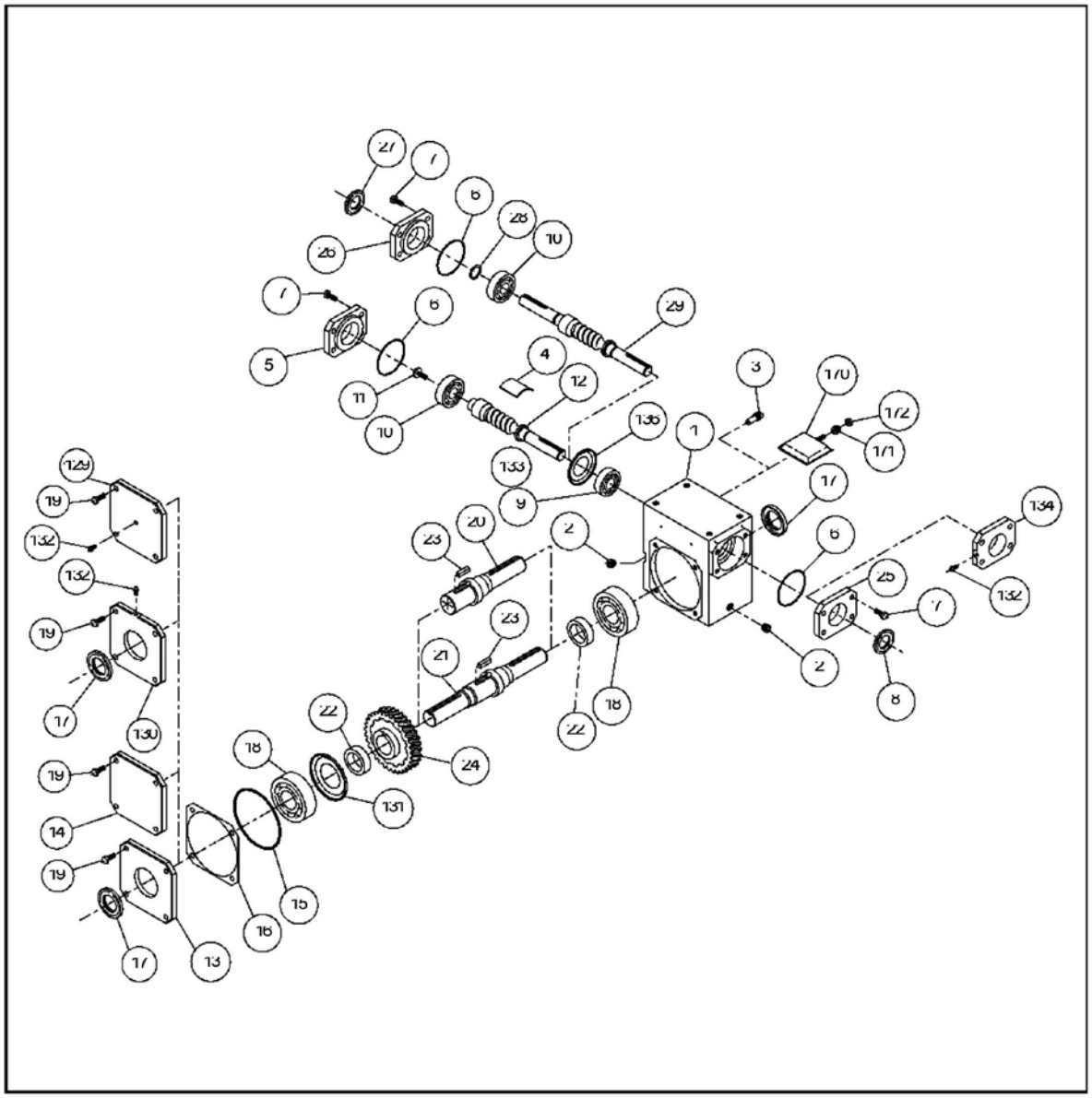
110. "C" Face Motor Flange
111. Hex Head Cap Screw
112. Coupling Key - Reducer Shaft
113. Setscrew - Reducer Shaft
114. Coupling Gear - Reducer Shaft
115. Coupling Sleeve
116. Setscrew - Motor Shaft
117. Coupling Gear - Motor Shaft
118. Coupling Key - Motor Shaft

Vertical Shaft Required Parts (Supplied only when mounting position involves a vertical shaft.)

*129. Output Cover
*130. Output Cover
*131. Output Bearing Grease Retainer
132. Grease Fitting
133. Sealed Ball Bearing (only used on size 1-3/4" through 2-5/8" center distance units)
**134. Input Cover
**136. Input Bearing Grease Retainer

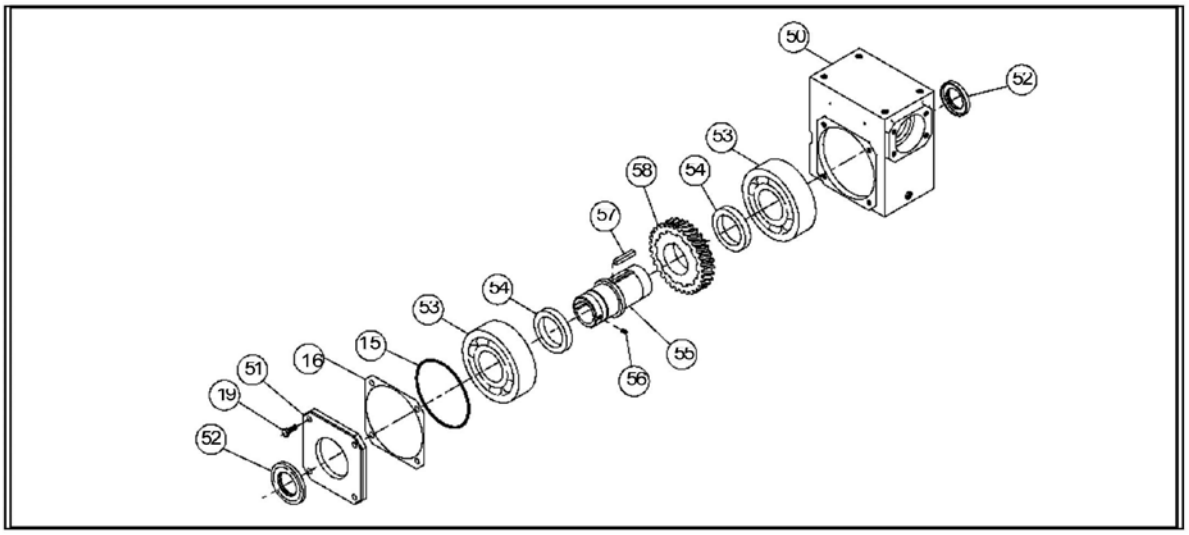
** Only used on size 4-1/4" center distance and larger units.*
*** Only used on size 3" center distance and larger units.*
**** Supplied only as output assembly on size 1-1/3" through 2-3/8" center distance units.*

Basic Single Reduction Unit

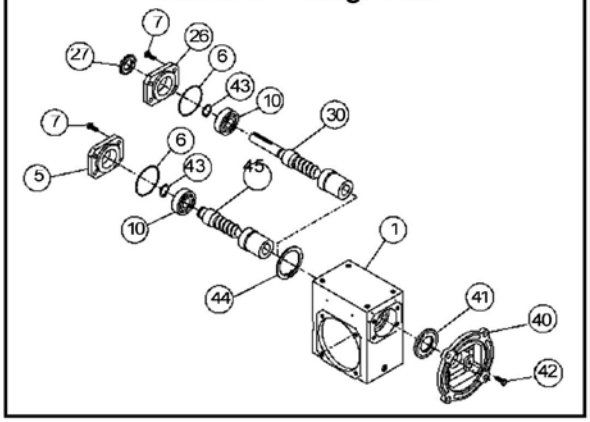


Multiple Parts List

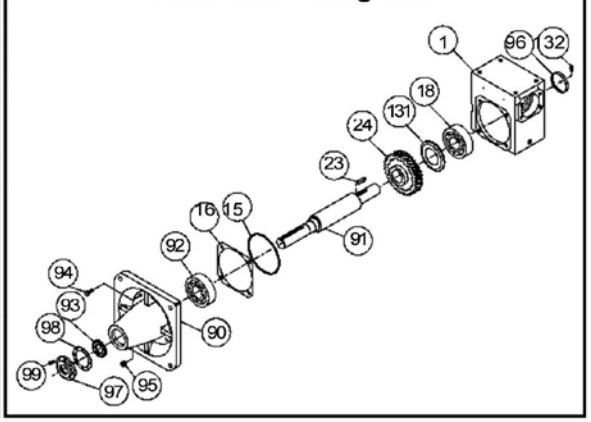
Hollow Output Shaft Unit



Quill Motor Flange Unit

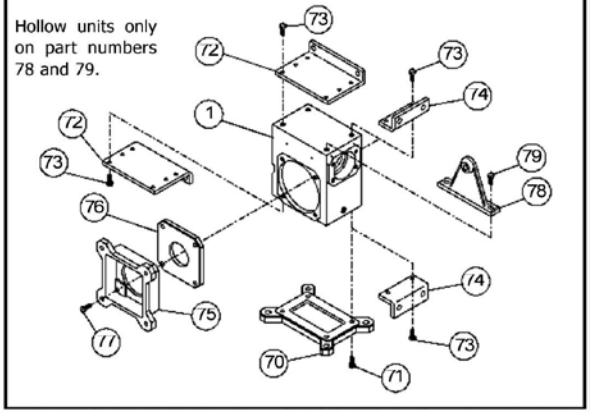


Extended Bearing Unit

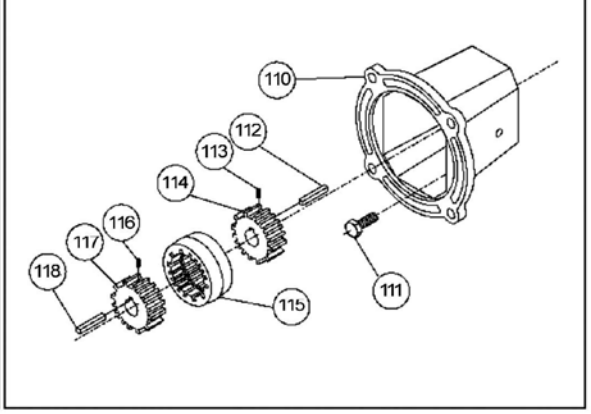


Mounting Bracket Options

Hollow units only on part numbers 78 and 79.

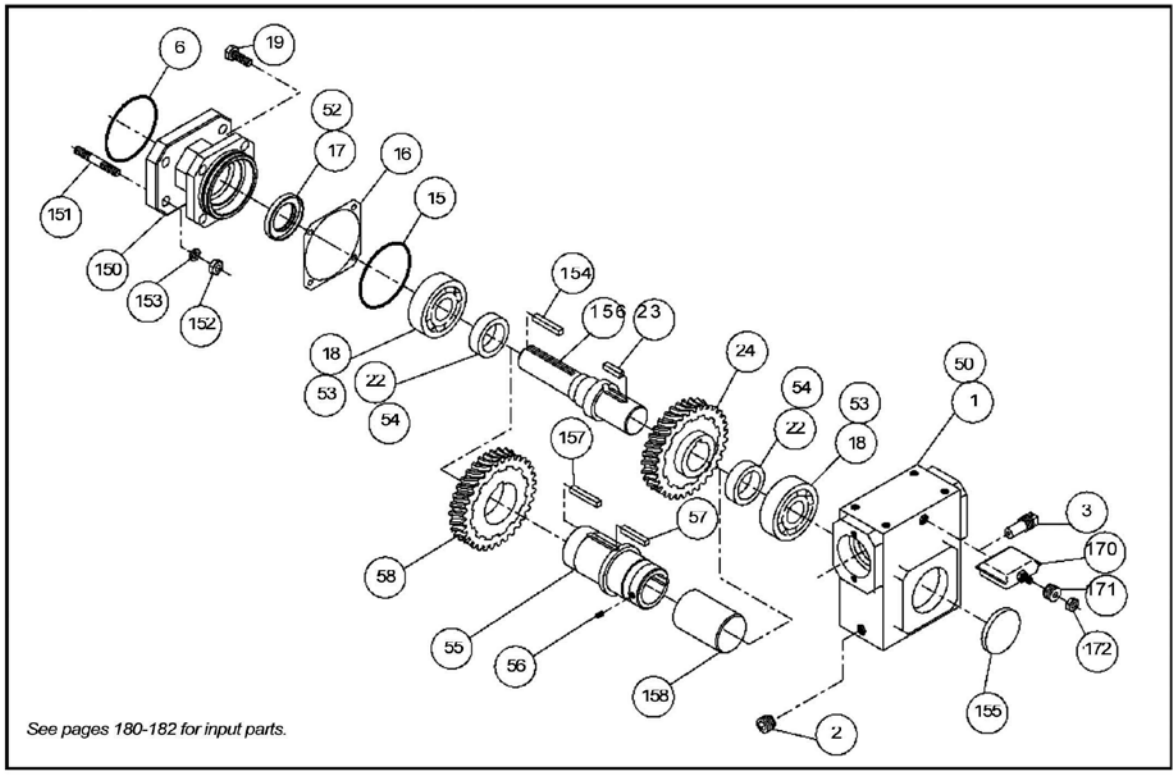


Long Motor Flange & Coupling Kit



Parts List

Primary Unit for Double Reduction Worm/Worm Styles & Triple Reduction Worm/Worm/Worm Styles



See pages 180-182 for input parts.

Item #	Description
1.	Gear Housing
2.	Pipe Plug
3.	Vent Plug
6.	O-Ring
15.	O-Ring
16.	Output Cover Gasket (as required)
17.	Output Oil Seal
18.	Output Bearing
19.	Hex Head Cap Screw
22.	Gear Spacer
23.	Gear Key (only used on size 2-5/8" center distance and larger primary units)
24.	Output Gear (supplied only as output assembly on size 1-1/3" through 2-3/8" center distance primary units)
*50.	Gear Housing
*52.	Output Oil Seal
*53.	Output Bearing
*54.	Gear Spacer

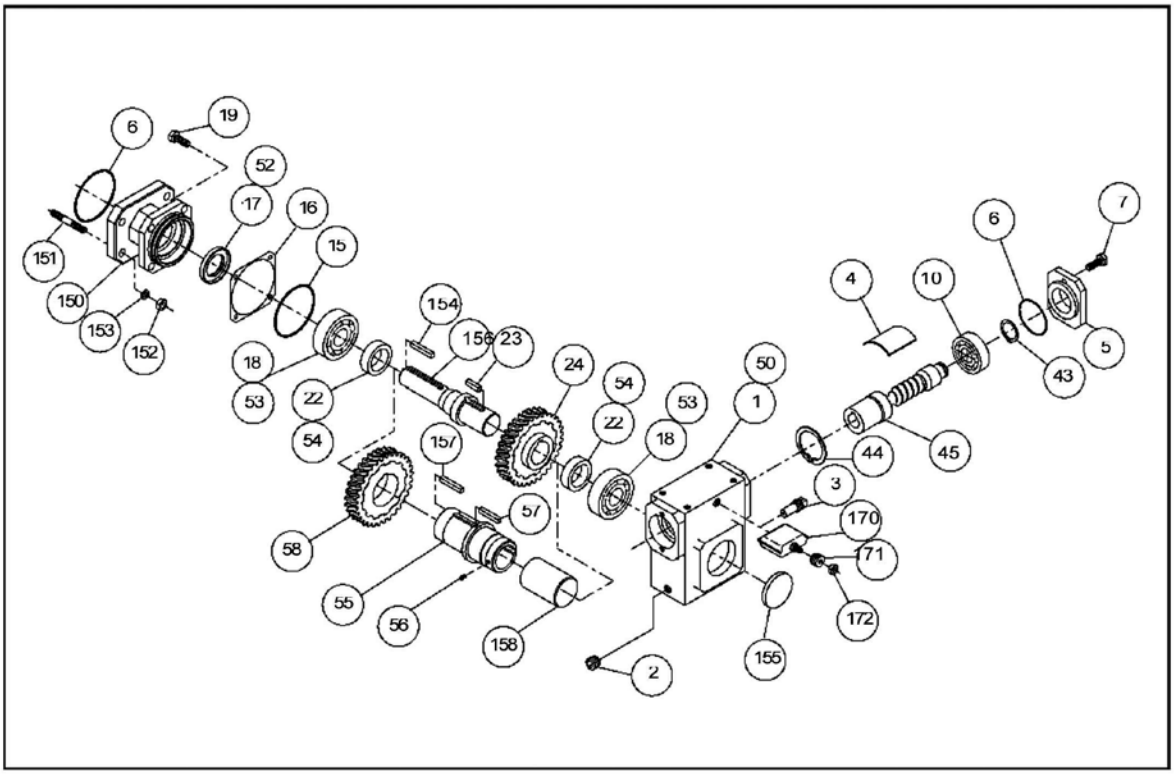
Item #	Description
**55.	Output Shaft
*56.	Setscrew
*57.	Gear Key (only used on size 2-5/8" center distance and larger primary units)
*58.	Output Gear (supplied only as output assembly on size 1-1/3" through 2-3/8" center distance primary units)
150.	Double Reduction Adaptor
151.	Stud
152.	Hex Nut
153.	Lock Washer
154.	Primary Solid Output Key
155.	Expansion Plug
156.	Primary Solid Output Shaft
*157.	Primary Hollow Output Key
*158.	Hollow Shaft Plug
170.	Internal Pressure Compensation Chamber (optional)
171.	Internal Pressure Compensation Chamber Stem Plug
172.	Internal Pressure Compensation Chamber Stem Nut

** Only used on size 7", 8", and 10" center distance secondary units for double reduction worm/worm styles.*
***Supplied only as output assembly on size 1-1/3" through 2-3/8" center distance units.*

Engineering Data

Parts List

Secondary Unit For Triple Reduction Worm / Worm / Worm Styles



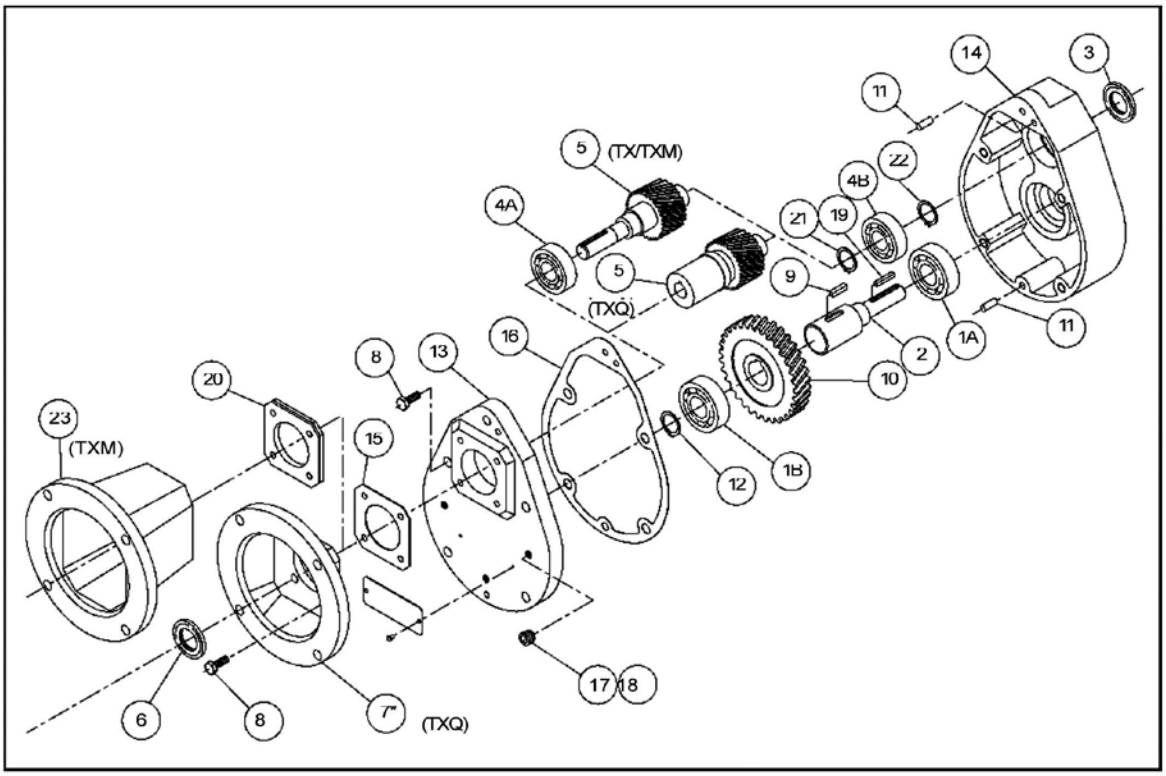
Item #	Description
1.	Gear Housing
2.	Pipe Plug
3.	Vent Plug
6.	O-Ring
15.	O-Ring
16.	Output Cover Gasket (as required)
17.	Output Oil Seal
18.	Output Bearing
19.	Hex Head Cap Screw
22.	Gear Spacer
23.	Gear Key (only used on size 2-5/8" center distance and larger secondary units)
24.	Output Gear (supplied only as output assembly on size 1-1/3" through 2-3/8" center distance secondary units)
*50.	Gear Housing
*52.	Output Oil Seal
*53.	Output Bearing
*54.	Gear Spacer

Item #	Description
*55.	Output Shaft
*56.	Setscrew
*57.	Gear Key (only used on size 2-5/8" center distance and larger secondary units)
*58.	Output Gear (supplied only as output asssembly on size 1-1/3" through 2-3/8" center distance secondary units)
150.	Triple Reduction Adaptor
151.	Stud
152.	Hex Nut
153.	Lock Washer
154.	Secondary Solid Output Key
155.	Expansion Plug
**156.	Secondary Solid Output Shaft
*157.	Secondary Hollow Output Key
*158.	Hollow Shaft Plug
170.	Internal Pressure Compensation Chamber (optional)
171.	Internal Pressure Compensation Chamber Stem Plug
172.	Internal Pressure Compensation Chamber Stem Nut

** Only used on size 7", 8", and 10" center distance tertiary units for triple reduction worm/worm/worm styles.*
***Supplied only as output assembly on size 1-1/3" through 2-3/8" center distance units.*

Parts List

Helical Primary



Item #	Description
1A.	Bearing, Output (Ball) — Extension End
1B.	Bearing, Output (Ball) — Inboard End
2.	Shaft, Output (state output frame size)
3.	Seal, Oil (Output)
4A.	Bearing, Input (Ball) — Extension End (N/A for TXQ)
4B.	Bearing, Input (Ball) — Inboard End
5.	Shaft, Input (state ratio); on TXQ also state frame size.
6.	Seal, Oil (Input)
*7.	Flange, Motor (TXQ only)
8.	Screw — 8 req. on Model I & II; 11 req. on Model III
9.	Key, Gear
10.	Gear, Output (state ratio)

Item #	Description
11.	Pin, Dowel — 2 req.
12.	Spacer, Low Speed — 2 req.
13.	Cover, Housing
14.	Housing, Gear
15.	Gasket, Input Cover
16.	Gasket, Housing
17.	Plug, Pipe — 2 req.
18.	Plug, Vent
19.	Key, Output Shaft
20.	Cover, Input, Seal Retainer
21.	Ring, Retaining, Internal, Input Shaft
22.	Ring, Retaining, External, Input Shaft
23.	Flange, Motor (TXM only)

**Motor Flange replaces input cover on 'TXQ' Model.*

Include the complete model description and serial number of the reducer when ordering replacement parts.

Installation, Operation and Maintenance Instructions

HVF FEEDERS AND HVC CONVEYORS

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506-1440 U.S.A.
WORLD AUTHORITY IN ADVANCED TECHNOLOGY FOR MAGNETIC, VIBRATORY and INSPECTION APPLICATIONS

Table of Contents

ERIEZ HVF FEEDERS AND HVC CONVEYORS

Introduction

This manual describes Eriez' new mechanical vibrating feeders and conveyors.

The easy-to-clean, all-metal pans provide low cost movement to a wide variety of materials. The pans can be supplied open or enclosed, with liners or screens, and with a variety of inlets and outlets.

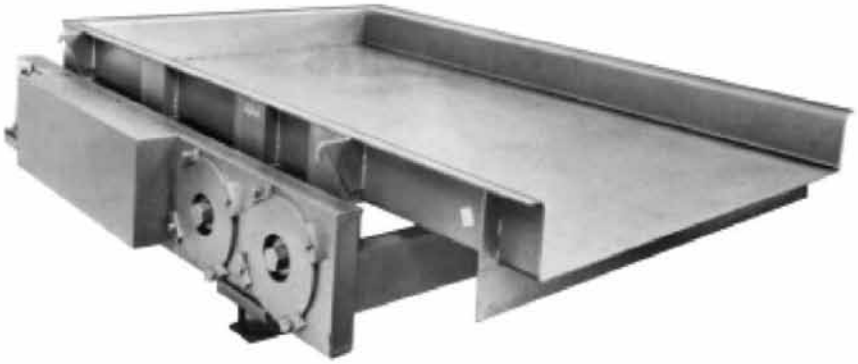
A careful reading of these Installation, Operation and Maintenance Instructions will assure the most efficient and dependable performance of this equipment.

Please include the model and serial number found on the nameplate with any correspondence concerning your feeder or conveyor.

WARNING: Suspension mounting inherently involves risk of damage to property or injury to personnel located under or near the equipment, should a suspension component fail. As with all suspended equipment, access to the area under this machine should be restricted. Specifications for suspension components given in this manual are suggestions only, and the user is entirely responsible for final selection of suspension method and details. Select and properly use suspension components with rated capacities (including all appropriate reduction factors) that provide adequate safety when the weight of the equipment and all possible loading conditions and upsets are taken into account. Consult Eriez at 814-835-6000 if additional information regarding Eriez equipment is needed to make this selection.

CAUTION: Safety labels must be affixed to this product. Should the safety label(s) be damaged, dislodged or removed, contact Eriez for replacement.

Introduction (cont.)



TYPICAL ERIEZ MODEL HVF HIGH VOLUME FEEDER

TYPICAL ERIEZ MODEL HVC HIGH VOLUME CONVEYOR

Installation

Shipping Damage

When you receive your feeder or conveyor, examine it carefully for damage. If damage is found, report it immediately to Eriez Magnetics and the carrier.

Handling

It is important to handle this equipment carefully to avoid twisting or bending the frame or pans. If lift lugs are provided, they must be used; otherwise, lift with slings.

A spreader board over the pan should be used to prevent your chain or cable from bending the pan while lifting.

An excessively large amount of weight placed on the pans or springs could damage the unit.

Installation

Feeders are usually suspended from hooks on the pan with rubber isolation springs. Base mounting is used only where the headload from customer's material is small.

The isolation assemblies should be welded to suitable overhead structure or hopper (Figure 1). Wire rope and/or turnbuckles may be used for greater suspension heights. For proper operation, all sus¬pension points should have nearly equal tension.

When base mounting is used, attach the spring pads provided to floor or framework. Be sure that there is adequate clearance between any solid object and the pan or base.

Feeders are usually suspended with a downslope of up to 10 degrees. At this downslope the Model HVF feeders can attain velocities of up to 100 feet per minute (.5 mps), depending upon material characteristics.

⚠ Warning: Suspension components provided by Eriez have been properly sized for the equipment weight and normal operating loads, including reasonable upset conditions and safety factors. However, the design cannot take account of extreme operating or installation conditions of which Eriez may not be aware. The ultimate decision as to the adequacy of any sus¬pension component, whether Eriez-supplied or customer-supplied, is the responsibility of the installer and user.

You should select all suspension components with proper consideration of the equipment weight, normal and upset operating loads, and safety factors. If you need any further information about the equipment characteristics for your suspension design, please contact Eriez. The suspension design itself should be carried out by properly qualified engineering personnel, Failure to observe these precautions can result in death, serious personnel injury, and/ or equipment damage.

Hopper Design and Feeder Capacity

For vibratory feeders to perform at maximum capacity, it is important to design bins and hoppers for optimal material flow patterns. This is best achieved with the following guidelines.

The hopper throat opening T (see Figure 1) should be at least 2.5 times the largest particle diameter, for randomly sized material. 'Diameter' here refers to the size of the largest circle that will barely con¬tain an irregularly-shaped particle. For applications with all particles nearly the same size, T should be 5 times the nominal particle diameter.

T = Hopper-Throat Opening H = Gate-Height Opening

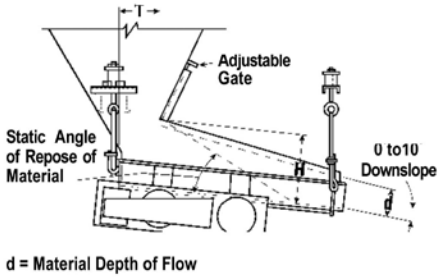


FIGURE 1

Installation (cont.)

Best flow patterns result when the gate height H is at least twice the throat dimension T, as shown in Figure 2. Values of H equal to T are acceptable, but when H becomes less than T material flow patterns are not uniform and usually result in dead zones where little or no flow occurs, as shown in Figure 3.

FIGURE 2

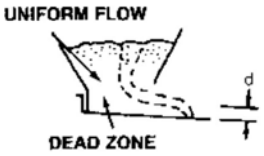


FIGURE 3

The capacity of a vibratory feeder is given by:

Q = (W x d x D x v) / K

Where	English	Metric
Q = capacity	TPH	MTPH
W = tray width	inches	mm
d = material depth	inches	mm
D = material density	lb/cuft	g/cu cm
v = flow velocity	ft/min	m/min
K = constant	4,800	16,700

Along with the hopper design, the flow velocity v depends on material characteristics such as particle size, size distribution, and moisture content.

Wiring

Wiring to the motor should enter from a flexible conduit. Use of a motor starter and circuit protection is recommended. Wiring must be properly sized to prevent line voltage drop.

Motors commonly supplied are 1725 rpm, dual voltage polyphase. Connect wiring according to the manufacturer's instructions, usually located on the nameplate or in the conduit box cover.

Motor rotation should be such that the top of the pulley rotates in the opposite direction from the feed of the pan. However, some materials feed better with the belt turning in the same direction as the feed.

When controller is supplied connect according to instructions enclosed with this equipment.

Special Troughs and Attachments

Eriez Engineering Service Department should always be consulted before undertaking the design or construction of special troughs. The troughs as furnished by Eriez should not be modified or attachments added without first consulting Eriez, as the feeders and conveyors are a tuned mass system and damage will result. Doing so will void the warranty.

Operation

Deflection

Eriez mechanical conveyors and feeders are normally set at approximately 7/16-inch (11 mm) pan deflection. This can be checked with an Eriez deflection sticker. The sticker is read while the equipment is operating by looking at the optical illusion in which the printed circles appear as double. Read the deflection where a pair of circles just touch together. A deflection sticker is shown actual size in Figure 4

The deflection may also be read by holding a pencil very steadily (resting against a solid object) and touching the pan side with the pencil point while the pan is operating. Then stop the equipment and measure the deflection indicated by the line drawn on the side of the pan.

Do not operate at pan deflections greater than 7/16-inch (11 mm) because spring damage will result.

The total of pan deflection and base deflection must not exceed 11/16-inch (17 mm). These deflections should be taken at full voltage and with material feeding at maximum capacity.

Deflection Adjustment

The deflection may be changed by means of the adjustable drive sheave. Making the sheave smaller in pitch diameter will slow down the eccentric shaft and decrease the deflection. Increasing the drive sheave pitch diameter will increase deflection.

To adjust the drive sheave:

1. Loosen motor plate mounting bolts (Figure 5).
2. Slide motor plate forward to loosen belt.
3. Loosen set screws that lock sheave halves.
4. Turn sheave halves so they move apart to decrease the pitch diameter or turn the opposite way to increase diameter.
5. Replace key and tighten set screws.
6. Reinstall belt and pull motor tight against belt.
7. Tighten motor plate mounting bolts.

If the driven sheave is removed, the tapered bushing must be carefully tightened to prevent slipping on the shaft. Tighten each bolt in the bushing until each is tightened to about 10 ft. lb (7 Nm). Be sure to recheck the torque because tightening one bolt will loosen the others.

NOTE: Material build-up on pan may increase pan deflection and cause tray, base or tuning spring failure.

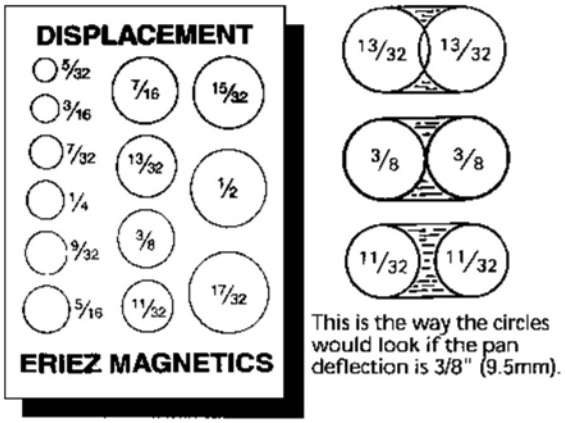


FIGURE 4

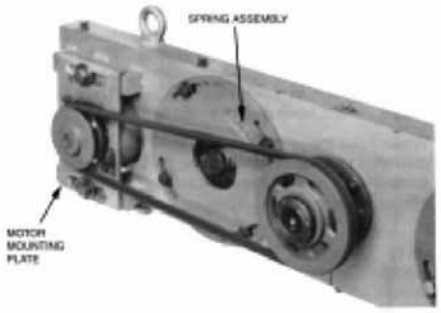
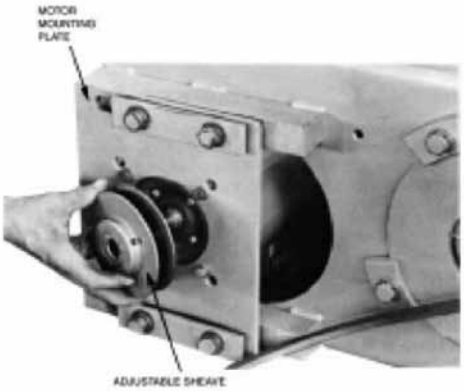


FIGURE 5



CAUTION: Do not operate the unit with any associated equipment in direct contact with any part of the vibratory unit.

Operation (cont.)

The manual variable speed drive (MVS) consists of a variable pitch sheave with an adjustment handwheel on the motor and a spring loaded companion sheave on the eccentric shaft. The companion sheave will change pitch diameter in response to changes made to the adjustable motor sheave while remaining at the same center distance.

In operation, turning the handwheel counterclockwise while the motor is running will increase the speed and deflection and turning the handwheel clockwise will decrease speed and deflection.

The motor sheave has an internal maximum speed stop which is factory set; however this stop may be overpowered and damaged by continued turning the handwheel with excessive force after the maximum speed stop has become engaged. This will cause the unit to over-deflect beyond its design deflection and cause premature failures. When the handwheel is turned to the point where the maximum speed stop is engaged, DO NOT FORCE IT TO TURN ANY FURTHER!

When replacing belts, be sure to set the motor at the same center distance as it came from the factory. Incorrect center distances will cause the maximum speed to increase which will cause the unit to over-deflect and fail.

To set the proper center distance, you must open the motor sheave until the belt can ride at the smallest pitch diameter at the bottom of the groove. Then position the belt in the driven sheave so that the top of the belt is even with the outside diameter of the driven sheave (at the maximum pitch diameter).

Slide the motor mount back until there is some tension on the belt and lock the mount in that location. Upon starting the motor, turning the handwheel counterclockwise will give the proper belt tension.

Some MVS drives use asymmetrical belts which means that one side of the belt is made at a different angle than the other. On these units it is necessary to install the belt so that the sides of the belt match the sides of the sheaves.

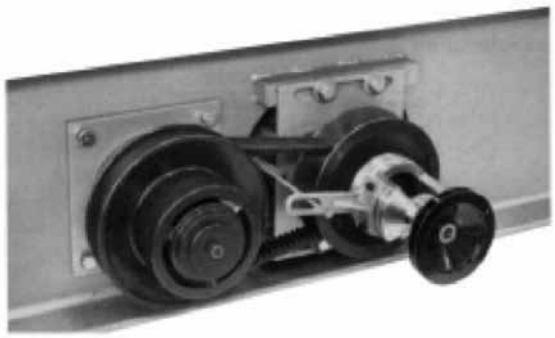


FIGURE 7

Maintenance

Lubrication

Bearings should be lubricated approximately every 200 hours of operation with grease gun suitable for roller bearings.

This bearing is factory lubricated with No. 2 consistency lithium base grease which is suitable for most applications. However, extra protection is necessary if bearing is subjected to excessive moisture, dust, or corrosive vapor. In these cases, bearing should contain as much grease as speed will permit (a full bearing with consequent slight leakage through the seal is the best protection against contaminant entry).

In extremely dirty environments, the bearing should be purged daily to flush out contaminants. For added protection, it is advisable to shroud the bearing from falling material.

The following table is a general guide for normal operating conditions. However, some situations may require a change in lubricating periods as dictated by experience. If the bearing is exposed to unusual operating conditions, consult a reputable grease manufacturer.

Suggested Lubrication Period in Weeks

Hours Run Per Day	251 to 500 RPM	501 To 750 RPM	751 To 1000 RPM	1001 To 1500 RPM
8	12	10	7	5
16	7	5	4	2
24	5	3	2	1

Adjustments

DEFLECTION

As mentioned earlier, the deflection is set at time of manufacture at approximately 7/16 inch (11 mm). Deflection may be adjusted by changing the speed as described in the preceding section.

SPRING ANGLE

Spring angle is factory set at the optimum setting.

If special conditions warrant changing the spring angle proceed as follows (see Figure 8):

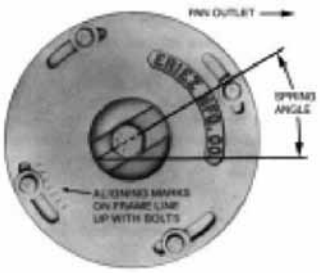


FIGURE 8

1. Loosen spring center bolt.
2. Loosen clamp bolts.
3. Rotate spring in the base channel to the desired angle. Normally all springs are set at the same angle.

NOTE: Alignment marks on the spring frame represent 5°.

4. Tighten clamp bolts.
5. Tighten center bolts and torque to required values.

Torque spring center bolts as follows:

If these springs are removed for any reason, they must be replaced and set at the same angle of inclination from the horizontal as originally set.

When replacing motors, replace with an identical hp, rpm and voltage motor and insure all sheaves are in proper alignment. Excessive belt wear will result if belts are operated misaligned. Always replace worn belts.

Maintenance (cont.)

FIGURE 9

Spring Replacement

1. Note angle at which old spring is set.
2. Remove old spring as shown (Figure 9).
3. Install new spring and set angle as described earlier.

NOTE: It is best to replace springs one at a time so that the pan will be supported by the remaining springs.

Belt

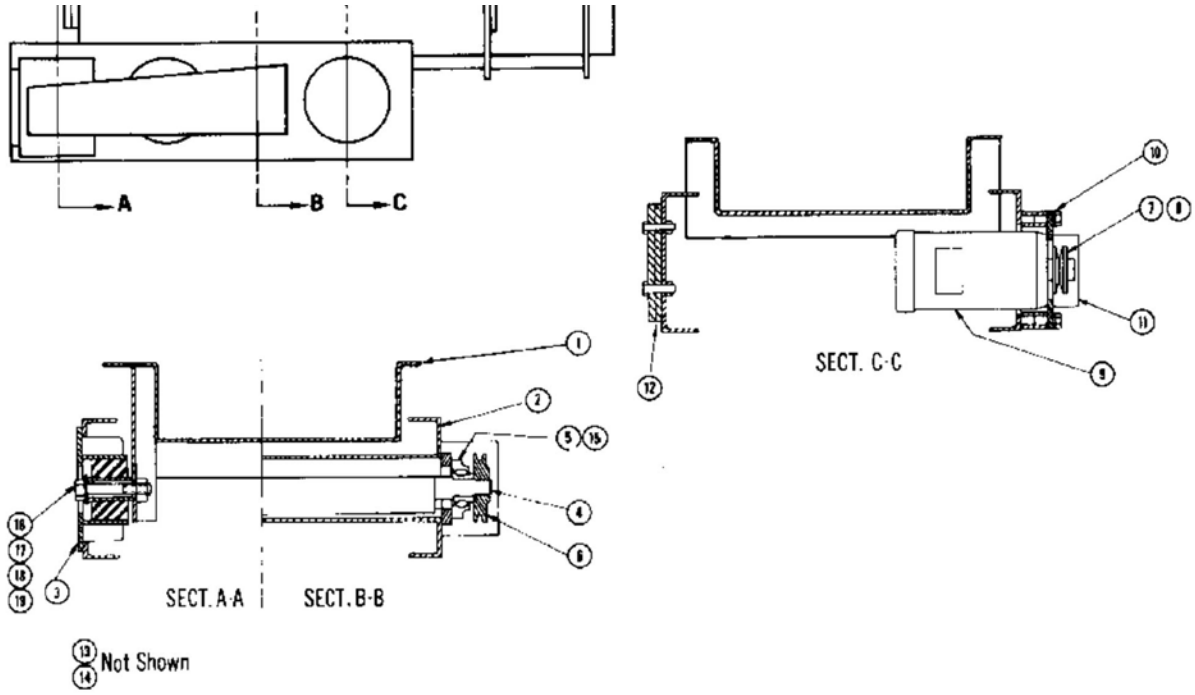
Periodically inspect the belt for tension and wear. The belt should be tensioned to allow approximately 1/2-inch (13 mm) deflection at the midspan when moderate pressure is applied by hand. Excessively loose or tight belts will wear rapidly.

A new belt should be readjusted after a few hours of operation.

Bearing Replacement

When replacing bearings DO NOT use set screws to attach collar to shaft. Doing so will cause prema¬ture bearing failure. The eccentric shaft must be able to move freely on the inner race of the bearing.

Spare Parts



Item Number	Name	Quantity	Item Number	Name	Quantity
1.	Trough	1	9.	Motor	1
	(Specify width and length)			(Specify HP, RPM, phase and Hz)	
2.	Base Assembly	1	10.	Motor Mounting Plate	1
	(Specify width and length)		11.	Belt Guard	1
3.	Spring Assembly	As Req'd	12.	Balance Weights	As Req'd
	(Specify outside diameter)		13.	Vibration Isolator	4
4.	Eccentric Shaft	1		(Specify size)	
	(Specify diameter and length)		14.	Isolator Base Plate	4
5.	Flange Bearing	2	15.	Bearing Closure	2
6.	(Specify diameter of bore) Driven Sheave	1		Spring Center Bolt	
	(Specify size)			(Specify size)	
7.	Variable Pitch Drive Sheave	1	16.	3/4 – 10	As Req'd
	(Specify size)		17.	1 – 8	As Req'd
8.	"V" Belt	1	18.	1-1/4 – 7	As Req'd
	(Specify size)		19.	2 – 4-1/4	As Req'd

NOTES: Parts not listed above (screws, nuts, washers, electrical cord, terminals, etc.) are standard items available at any industrial or electrical supply house. When ordering parts, be sure to specify feeder model and syle, part number and quantity.

Troubleshooting

PROBLEM	CAUSE	REMEDY
Low Deflection	a. Heavy load on pan b. Pan hitting fixed object c. Unit out of tune due to damaged springs d. Belt slipping e. Motor stalling due to incorrect voltage f. Shaft running too slow due to incorrect ratio g. Object added to pans h. Malfunctioning control i. Loose Spring bolts j. Material build-up on pan	a. Reduce load, improve hopper design b. Provide clearance c. Replace springs d. Tighten belt, replace if worn e. Check motor wiring and voltage and correct f. Check RPM and correct g. Remove object h. Check on direct line i. Tighten Spring bolts j. Keep pan clean
No Deflection	a. See 'Low Deflection' b. Motor failure c. No electricity d. Broken, loose or thrown belt	a. See 'Low Deflection' b. Replace motor and find cause of failure c. Check for electricity at terminals d. Check belt and install properly
High Deflection	a. Shaft running too fast b. Broken or damaged springs c. Object added to pans d. Excessive temperature e. Material build-up on pan	a. Check RPM and correct b. Replace springs c. Remove object d. Remove heat or reduce speed e. Keep pan clean
Noisy Operation	a. Mounting has come loose or is inadequate b. Pan hitting material or object c. High deflection d. Cracks or breaks in pan or frame e. Loose object on pan f. Bearing failure g. Loose spring bolts	a. Check mounting and correct b. Provide clearance c. See 'High Deflection' d. Repair cracks or breaks e. Remove or secure objects f. Replace bearing g. Tighten bolts
Motor Overload Protection Tripping	a. High deflection b. Inadequate ventilation c. Incorrect voltage d. Excessively tight belt e. Defective motor f. Bearing failure g. Operating on two legs of three phase line h. Pan jammed against external object or base	a. See 'High Deflection' b. Provide air circulation c. Check motor wiring and voltage d. Loosen belt e. Replace motor f. Replace bearings g. Check terminals and fuses h. Provide clearance

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World Authority in Advanced Technology for Magnetic, Vibratory and Inspection Applications
HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506-1440 U.S.A.
Telephone 814/835-6000 • 800/345-4946 • Fax 814/838-4960 • International Fax 814/833-3348
Web Site: http://www.eriez.com **e-mail: eriez@eriez.com**
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