MMPM-460E

Installation, Operation and Maintenance Instructions

CDA WET DRUM MAGNETIC SEPARATOR

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506–1402 U.S.A.
WORLD AUTHORITY IN SEPARATION TECHNOLOGIES

Introduction

New improvements in magnetic materials and technology are applied in Eriez Model CDA wet drum separators. Permanent rather than electro magnets are used; new magnetic circuits have been designed to concentrate the separating force within the actual depth of the slurry flow; improved tanks take maximum advantage of better separating efficiency.

Eriez wet drum separators are designed and ruggedly built for long, hard service - but certain installation, operating and maintenance procedures must be observed. A careful reading of these instructions will assure the separators' most efficient and dependable performance.

Before starting the drum installation, read and understand the entire manual.

If there are any questions or comments about the manual, please call Eriez at 814-835-6000 for Magnetic Separator assistance.

CAUTION

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

Safety Notice

Eriez strongly emphasizes that the drum installation should be away from normal personnel travel and work zones.

It may be necessary for the user to install protective guarding, fencing, barriers, or other devices to suit the specific installation in order to protect personnel.

Guarding must be able to be lifted off or otherwise opened so normal maintenance and adjustments can be performed.

Whether the drum is open or enclosed, workers must be instructed as follows:

⚠ WARNING

Shut down and lockout all power to the drum and drive motor and to all power driven equipment in the drum area prior to performing maintenance, cleaning, or adjustments in this area.

Failure to observe this warning could result in severe personal injury or death.

Warning and caution plates and decals on the magnet must not be removed or painted over.

The following is a caution that applies to permanent magnet drums. This caution is repeated in the installation section of this manual:

⚠ CAUTION: STRONG MAGNET

This equipment includes one or more extremely powerful magnetic circuits. Steel and iron tools and other objects near the magnet will be attracted strongly. Such objects may jump suddenly and unexpectedly to the magnet surface, creating the risk of serious pinch-type injuries. Keep all mild steel and iron objects well away from the magnet at all times. When handling or servicing the equipment do not allow hands, fingers, or other body parts to be caught between the magnet and nearby steel or iron objects.

Personnel that use heart pacemakers must not handle or service this equipment because the magnetic field may affect pacemaker operation. These personnel should always stay at least 3 feet (1 meter) away from the magnetic components.

The magnetic field may damage information stored on credit cards, computer discs, and other magnetic storage media brought near the magnet. Do not move, store, install, or operate this equipment near a television or computer display, permanent damage to the display device may result.

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ERIEZ CDA WET DRUM MAGNETIC SEPARATOR

General Description

A wet drum separator consists of a magnetic drum, tank and supporting frame assembled as follows:
A stationary agitating type alternating pole magnetic element is mounted on a stationary shaft. A cylindrical stainless steel shell encloses this assembly and is secured to drum heads. The drum heads and shell assembly rotate on bearings around the fixed shaft and magnetic element. The entire drum assembly is supported in a tank, which controls the water level and discharge of the separator. The tank and drum assembly is supported in a frame with provision for mounting a motor drive. Separators may be of single or multiple drum type. A schematic of a typical wet drum magnetic separator is presented in Figure 1.

CDA wet drum separators are designed for and used in ferromagnetic ore concentration and beneficiation.

The magnetic concentrate may be introduced to the second or third drum of a multiple drum separator for additional cleaning and upgrading and this is the usual procedure in iron ore beneficiation. All three tank styles can be used in this manner. If the unit is a double drum, the tank is normally built as a double unit and it cannot be separated into two individual tanks. Triple drum units are usually supplied with a double tank and a single tank which are joined together in the field to permit ease of shipment, handling and servicing.

Any of these three styles of machines may be supplied in multiple units with two, three, or even more drums in a common tank. Description and instructions for single machines apply also to multiple drum separators.

The various magnetic separation stages employed to beneficiate magnetite has resulted in different wet drum tank styles as well as different magnetic field configurations. The concurrent and the counter-rotation tank styles are used when treating coarse milled ore in the cobber separation. These tank styles are shown on Figures 1 and 2. When treating coarse feed, both of these tanks have tailings orifices that allow the passage of the coarse tailings particles.

Innovations in both magnetic circuit design and materials of construction are applied to Eriez wet drum magnetic separators. This results in maximum magnetite recovery while operating with a maximum amount of wear and maintenance. Refinements in the magnetic circuit, tank design, and drive system have resulted in further improvements in metallurgical performance and operation.

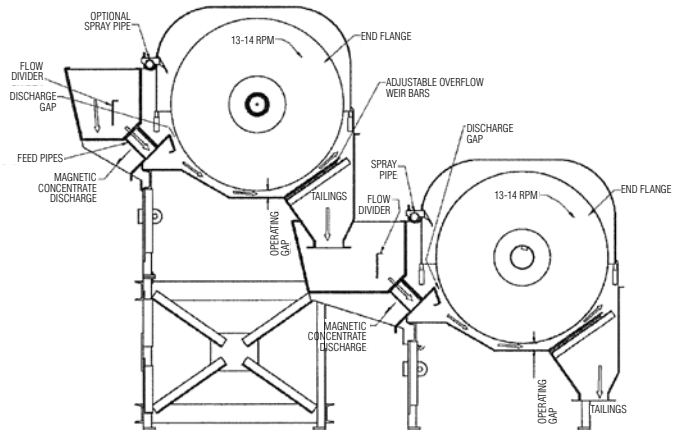


FIGURE 1

The magnetic drum consists of a stationary, shaft-mounted permanent magnetic circuit completely enclosed by a rotating drum. The magnetic circuit is comprised of segments of alternating permanent magnets that spans an arc of approximately 120-130+ degrees. The shaft mounted magnetic circuit is enclosed in a rotating stainless steel shell, or drum, secured to the drum heads. The shell and drum heads rotate on bearings around the fixed shaft and magnetic element.

The peak magnetic field intensity on the drum is approximately 2500 gauss and is effective in removing ferromagnetic constituents. The magnetic drum is mounted in a tank. Slurry is fed to the tank and subsequently to the magnetic field portion of the drum. The magnetic material is attracted to the drum shell by the magnetic circuit and is rotated out of the slurry stream. The magnetic material discharges from the drum shell when it is rotated out of the magnetic field. Separators may be of single or multiple drum type.

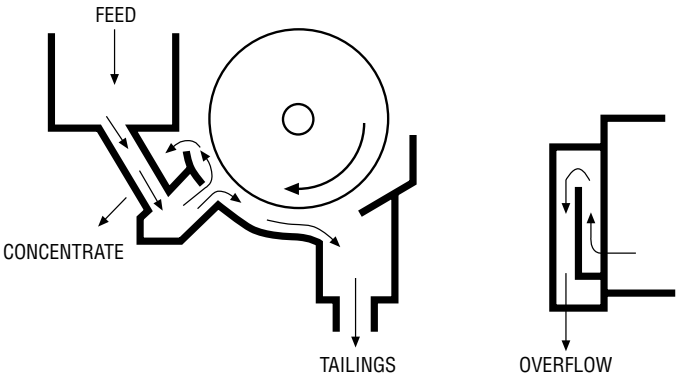


FIGURE 2

Magnetic Element

The magnetic circuit is computer-designed using a finite element analysis. The magnet arc is typically 120 to 130+ degrees from the pickup pole to the last discharge pole. This arc accommodates both the tank design in relation to the pickup area of the ferrous material, the transfer area, and the discharge area.

Each individual pole of the magnet is covered by a stainless steel can to protect the ceramic magnet material used. Each pole is bolted and welded to hanger plates. The hanger plates are welded to the stationary shaft that supports the magnet assembly in the drum. Figure 3 illustrates the general magnetic element construction.

The magnetic element is supported on a shaft that is held stationary within the drum. The position of the magnetic element relative to the magnetite discharge section can be adjusted for optimal performance. (Reference the section on magnet positioning).

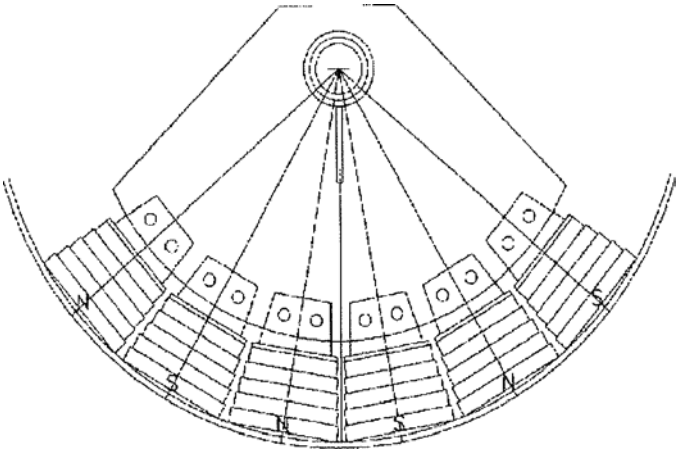


FIGURE 3
Typical wet drum magnetic element construction. The magnets are enclosed in a stainless steel canister.

Counter Rotation Self-Leveling Wet Drum Magnetic Separator

The Eriez Self-Leveling wet drum magnetic separator represents the newest available technology for heavy media applications. This separator combines the best engineering and operational features available to provide excellent mechanical and metallurgical performance.

All other wet drum tanks used in heavy media applications have leveling spigots and a full width overflow that must be maintained during operation. A deviation in the overflow may result in inefficiencies in the performance and the loss of magnetite. A new Eriez development is the counter-rotation Self-Leveling tank. This tank has several attributes that provide operational advantages as follows:

Self-Leveling Tank - Attributes

- Self-Leveling overflow - There are no discharge spigots to adjust or monitor.
- Constant Tank Level - Maintains constant tank level at any flow rate.
- High Capacity - Tank design accommodates surges and fluctuations in the feed rate.
- High Magnetite Recovery - The tank has a “built-in” scavenging zone.
- Ease of Operation - No adjustments or monitoring required.

The Self-Leveling tank has been engineered combining many features that allow ease of operation, inspection, and maintenance as follows:

Self-Leveling Tank - Engineered Features

- Engineered for “hands-free” operation.
- Magnetic element - Multiple magnetic elements including the strongest in the industry.
- 132 degree magnetic arc provides excellent resulting in high magnetite recoveries.
- Direct Drive, belt or chain drives
- Greasable bearings with the grease fittings located on each end. The bearings can be lubricated during operation.
- Oversized feedbox to contain surges and fluctuations in the feed rate.
- Jacking bolts to position the drum. Easily positioned with hand tools.
- Inspection ports to check the bottom gap of the drum.

Counter Rotation

The drum in the counter-rotation separator rotates opposite the slurry flow (see Figure 2). This design is most effective in producing high magnetic iron recoveries. Any particle carrying magnetite must travel throughout most of the magnetic arc and against the rotation of the drum to be lost to the tailings. Also, the relatively short discharge path of the magnetic concentrate allows for higher feedrates.

Feed is introduced to the drum, which is rotating in a direction opposite that of the pulp flow. Magnetic material is picked up by the drum and immediately discharged. Since tailings must flow under the large magnetic arc of the drum surface before being discharged, losses are held to a minimum.

Counter-Current (Steffenson)

The counter-current or Steffenson type tank style is shown in Figure 4. This tank style is commonly used in the finisher stage to treat fine concentrates. The feed enters the separator at the bottom of the tank and the drum rotates in the same direction as the slurry flow. The nonmagnetics must migrate through the magnetic field to a full width overflow. This design, with the full width overflow, allows the tank to be self-leveling. There are no tailings spigots that must be adjusted to match the flow of the separator feed. This design is most effective for producing a clean magnetite concentrate. The magnetic element should incorporate several agitating magnetic poles to provide a high degree of cleaning. Since the finisher feed consists of fairly well liberated magnetite, extreme magnetic field strengths are not required for collection.

⚠ CAUTION

No magnetite should be present in the wash water. Wash water minimum pressure should be 10 pounds/ square inch (.7 bar) or 22 feet (6.7 m) head.

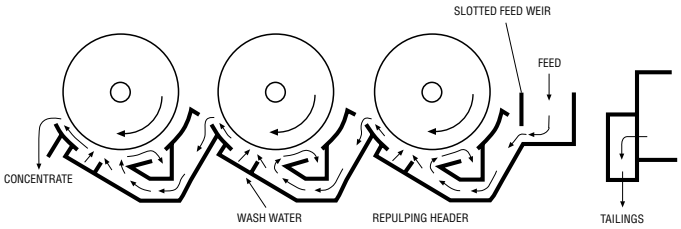


FIGURE 4

Installation

This section of the instructions will include installation, mechanical run and electrical troubleshooting.

Drum and Tank Assembly

Handling

The drum and tank assembly should always be lifted using a spreader beam.

DO NOT apply slings to drum shell or heads to lift drum.

If the drum is removed from the tank, DO NOT rest drum on shell surface. Supports for shaft ends should be provided for this purpose.

DO NOT allow workmen to stand on or rest heavy objects on shell surface.

Installation

The drum and tank assemblies may be shipped individually, which means that the drums should be installed into the frame one at a time but care must be taken in selection of the correct drums to make up the double drum assemblies.

Install the lower support frame into position. Refer to the Outline drawings in this manual for frame dimensions.

Install the upper tank assembly onto the lower frame. It is recommended that a 12" long guide rod be used to align the mounting holes. This is advised because in shipment it is expected that the tolerance of the center line of the mounting holes will vary slightly. Make sure the upper frame is level after all bolts are secured. Shim between mounting plates if required (See Figure 5).

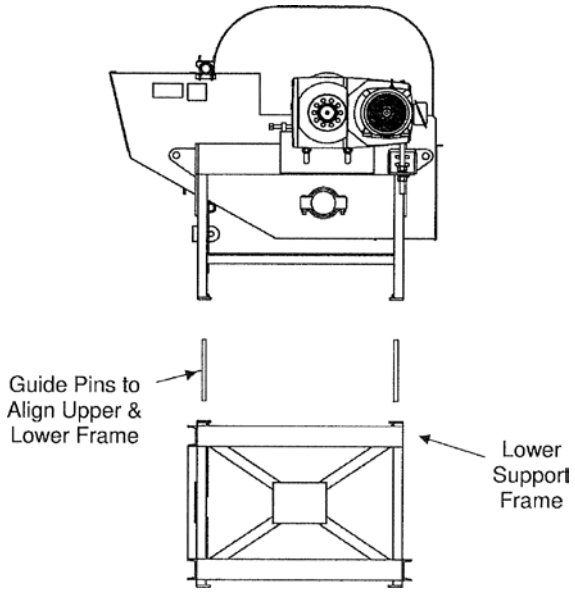


FIGURE 5

The drum and frame assembly should be checked across the width and length to make sure it is level. If not, shims should be placed between the frame pads and supporting foundation. The drum and tank assembly should then be secured prior to setting the second drum.

Caution should also be taken to insure that in making up double drums the discharge lip of the first drum feeds the second properly.

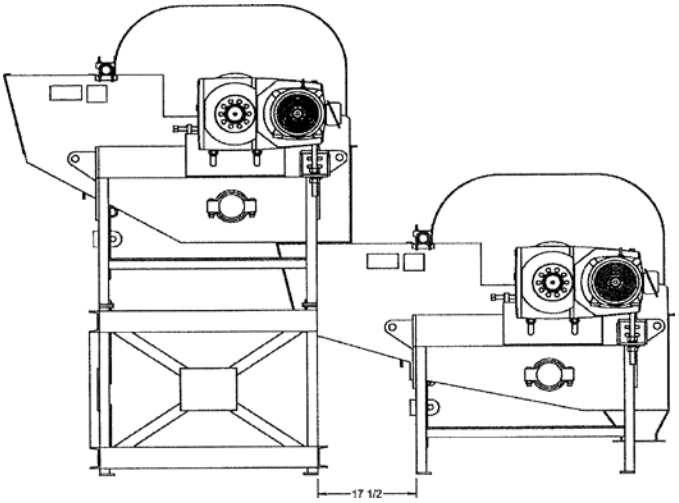


FIGURE 6

Once leveled and anchor bolts tightened the bottom tank assembly can be slid into position. The bottom tank and lower support frame are 17-1/2" apart. This is the ideal location to assure that the upper tank will be located properly. This means that the discharge lip of the upper tank feeds properly into the lower tank (See Figure 6).

The drums can now be installed into the tanks. The drums should always be handled using a suitable spreader beam unless directed by Eriez factory trained personnel. The drums should always be lifted at the shaft. The non-drive end of the drum should be located in the tank with the magnet adjusting arm available (See Figure 7). Lower the drum into the tank: It will make little difference which one is installed first. Use guide rods to align the drum bearing or drum clamp block into position. Center the drum in the tank. Measure from tank side plate to drum head there should be about 1-3/8" on either side. Install mounting bolts into the bearings and clamp blocks. We will adjust the drum location before installing the motor reducer.

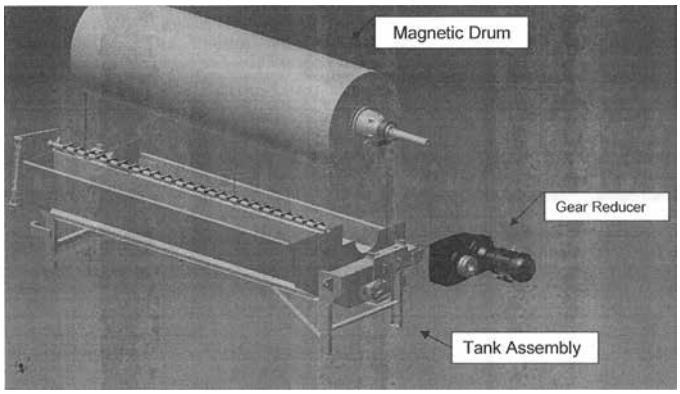


FIGURE 7

Once the drum is located and the “gap” adjusted we can now mount the motor reducer. Elsewhere in this manual are instruction from the reducer manufacturer on how to fit the reducer onto the shaft using the Shrink Disc.

Drum Positioning

The position of the drum relative to the tank is set at the factory prior to shipment. The drum is set with an operating gap per chart (see Table 1). This is the gap between the drum and the tank at the six o’clock position. The drum is set with a discharge gap per chart (see Table 1). This is the gap between the drum and the magnetite discharge lip (see Figure 10).

Positioning of the drum in the tank is easily accomplished by utilizing jacking bolts. The jacking bolts are located on the clamp blocks that hold the magnet shaft at each end. There is a separate set of jacking bolts to adjust both the horizontal position as well as the vertical position as shown in Figures 8 and 9. The jacking bolts are 3/4" diameter and are adjusted with a 1-1/8" hand wrench.

Access to the discharge gap is through a small window cut into the side of the tank on each end.

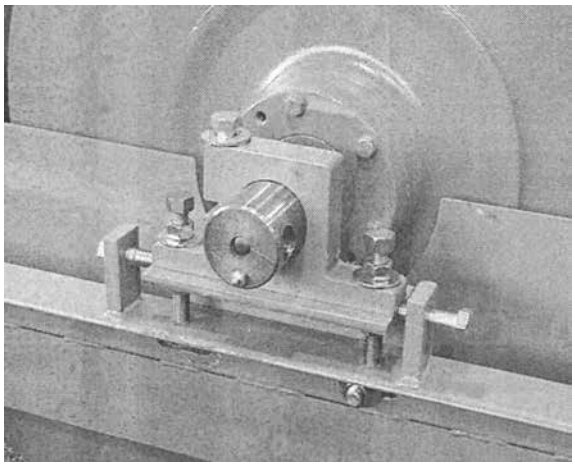


FIGURE 8

Non-drive side - Jacking bolts to position the drum

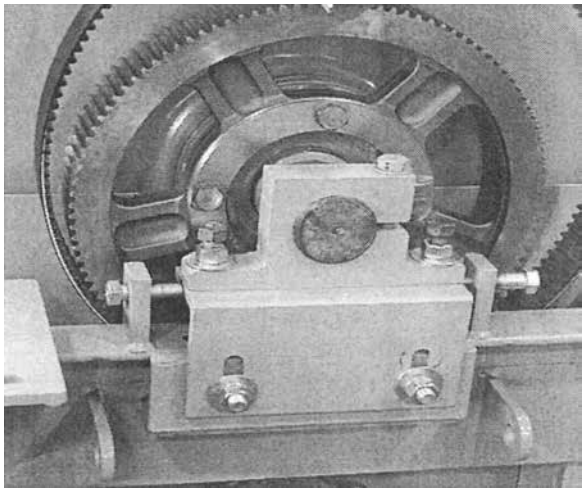


FIGURE 9
Drive Side - Jacking Bolts to Position the Drum

Magnetic Element Positioning

The magnetic element is supported by the shaft which is held securely at each end by a clamp block. The magnet position is indicated by a scribed and painted sector on the end of the shaft. The magnetic element can be positioned by loosening the clamp blocks and rotating the shaft. The shaft is rotated with the use of a turnbuckle in the hole on the non-drive side. Reference Figure 11 for details on the adjustment of the magnetic element. (Figure 11 does not show turnbuckle)

The magnetic element should be set so that the center of the last magnetic pole is 2" (50mm) above the magnetic discharge lip as shown in Figure 10. The centerline of the last magnetic pole can be located simply by sliding a bolt along the drum shell from the 12 o'clock position down towards the magnetic discharge lip.

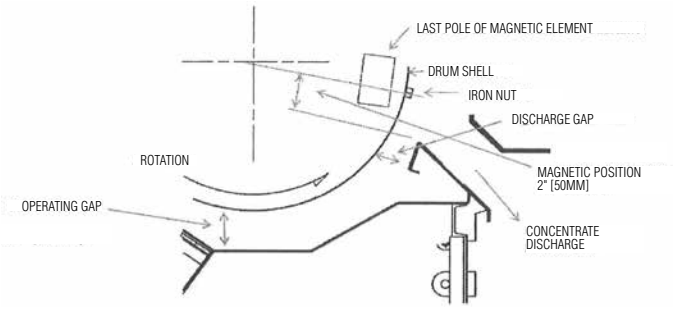


FIGURE 10
Drum and Magnetic Element Positioning

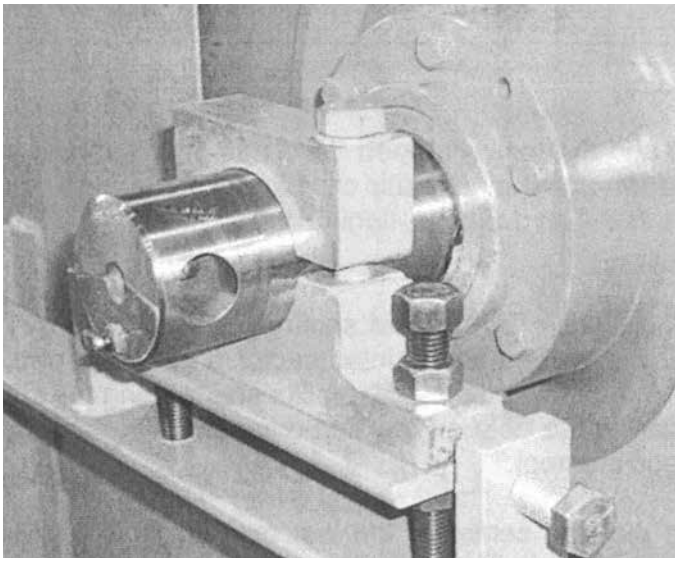


FIGURE 11
Magnetic element adjustment. The magnet shaft is held by clamp blocks at each end. Magnetic arc is scribed on the end of the shaft.

Drum Diameter	Tank Style	Operating Gap	Discharge Gap
36 (915)	Self Leveling	1.75 (44)	1.5 (38)
	Counter Rotation	1.25 (32)	1.25 (32)
	Counter Current	1.25 (32)	1.25 (32)
48 (1219)	Self Leveling	2 (50)	1.5 (38)
	Counter Rotation	1.25 (32)	1.5 (38)
	Counter Current	1.5 (32)	1.5 (38)

Measurements in inches (mm)

TABLE 1:
Operating and Discharge Gap

Electrical Motor & Gear Reducer

Electrical connections, maintenance, etc. supplied by the motor manufacturer, which is attached with these instructions, should be followed. If the separator & gear reducer motor was prepared for long term storage follow the instructions at the end of this manual to prepare for operation.

Water Connections

Repulping connections should be made with a minimum pressure of ten pounds per square inch or 22 feet head. Prior to start-up water leaks should be checked and eliminated.

Operation

Prior to Start-Up

1. Make sure a “Soft Start” control is running the motor. This will prevent damage that can result if material is solidified between the magnetic drum and the tank.
2. Be sure that there are no foreign objects in the tank, especially in the gap between the tank and the drum. A good way of checking is to use a piece of rubber hose of approximately 1" (25 mm) in diameter and move this piece of hose from one end of the drum to the other.
3. Element adjustment arm should be properly secured.
4. Check all electrical connections. Terminal boxes close to the wet drum separator should be waterproofed.
5. The set collars on the shaft located on the inner side of the bearing toward the drum should be secured. This set collar will keep the drum from working its way out of the saddle block during operation.

Start-Up

1. Rotate drum. These drums should be rotating ≈17 RPM or as specified in outline drawings. Check for RPM by means of a tachometer or manual timing.
2. Turn on spray water and check for free flowing water over concentrate discharge. Turn on water to header and process water to feed box. Water rates must be set either by the use of gauges or manual sampling.
3. After the speed of the drum and water rates are set, feed can be introduced.

Operating Procedures

1. Sampling is recommended at various feed points, mag discharge and tailings. In initial set up it is recommended that each individual drum be sampled to verify performance. After the drum has been set, it is recommended that a monthly check of each product from each drum be sampled. Sampling can be done either by automatic samplers or the use of sample cutters.
2. Performance checked should be based on feed vs. products. The performance of the drum will vary upon feed rates, feed density, feed size, and feed composition. Other adjustments like water rate, drum speed and even element position should be changed to compensate for variance in feed.
3. The initial setting of drum speed should be ≈17 RPM or as specified in outline drawings.
4. Gap between drum and tank (operating gap) has been set at the factory per chart (See Table 1) and this should not be changed.
5. The discharge gap, per chart (See Table 1) has been set at the factory. This gap should be changed only if the magnetic content in the feed is increased with the other operating parameters remaining the same. By opening up the gap this will allow a faster discharge of magnetics out of the magnetic field.

Shutdown

1. When shutdown of a drum is required for maintenance, etc., it is recommended that the feed be cut off first and then allow the water to wash away whatever solids are left in the tank. The injector water should be turned off last, after insuring that no solids will move back into the injector and plug the lines.

Maintenance

Maintenance Scheduling

Drums

These Eriez drums are supplied with greaseable ball bearings. These are cartridge bearings that have inner and outer seals. This, from experience, is the best system and provides excellent service when a regular lubrication schedule is followed. Weekly greasing will purge any contamination from the bearings. Grease zerks are located on each bearing cartridge. Sufficient grease should be pumped through the zerk to allow spent grease to be purged from the bearing. Grease purging on each end is through the seals at the inner race or through grease relief located at the top of the bearing cap (See Figures 12 & 13). Lubricate the bearings with any general purpose extreme pressure lithium based grease such as Shell Albida LC 2, Texaco Starplex 2, or Pennzoil Complex 2 to name a few.

The drum wear wrap should be checked for punctures and grooves and replaced before water can enter the drum interior and cause serious damage. The wear wrap should be inspected every two weeks.

Gear Reducers

Using the correct amount of oil in gear reducers is important. Too little or too much oil can cause overheating and rapid wear of gears, bearings, and seals. The approximate amount of oil required is given on the lubrication nameplate attached to the reducer housing.

To Fill the Gear Reducer:

1. Place it in the desired operating position, and with the unit not running, remove the breather plug and the oil level plug.
2. Fill slowly through the breather until oil begins to drain from the oil level hole (see table that follows for recommended lubricant). If lubricant cannot be pumped into the unit, a street ell in the breather hole will be helpful in pouring in the oil.
3. Allow oil to settle for a few minutes, check again and replace oil level plug, remove street ell (if used) and replace breather plug. The gear reducer used on Eriez drums are accurately filled, adjusted and tested at the factory. They will need no maintenance other than proper lubrication for good service life.

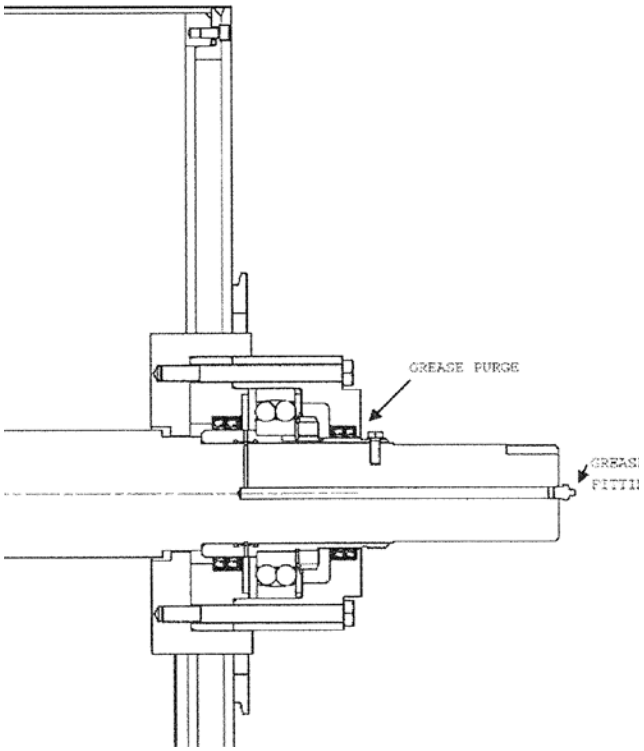


FIGURE 12
Non Drive Side

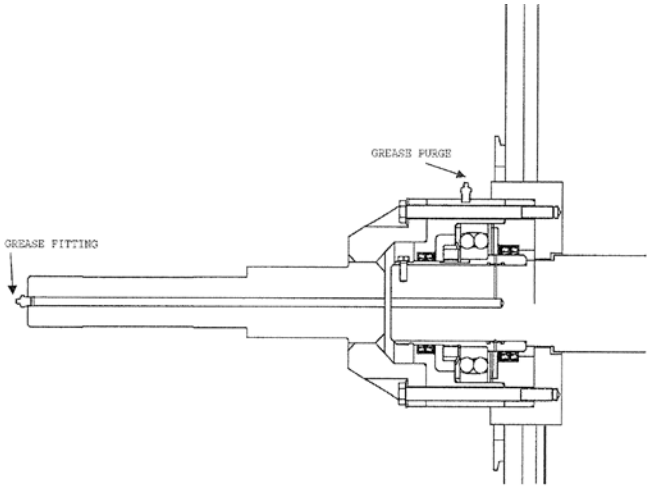


FIGURE 13
Drive Side

Lubricants and Operating Temperatures

When helical bevel reducers are operated, heat is generated. A maximum gear case temperature of 200 °F is not uncommon for units operating in normal ambient temperature. No damage will result from this temperature if the gear reducer is operated at rated capacity and the proper oil is used. XP 100/ XP 150 oil should be used for this reducer. See the chart below for recommended lubricants.

Recommended Oils

All reducers are filled with oil from the factory. Consult sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Standard is XP 100, 150. When replenishing use the same type of oil.

Relubrication

First oil change occurs after 500 hours or 6 months. Thereafter, lubricant should be changed every 2500 service hours or after 6 months. In case of extreme operating (e.g. high humidity, aggressive environment or large temperature variations), shorter intervals between changes are recommended.

Table 2, Recommended Oils, lists the oils that may be used to lubricate the Bevel Gear portion of the unit.

		Ambient Temperature °F(C)		
		14° - 41° (-10° - 5°)	**32° - 95° (0° - 35°)**	**86° - 122° (30° - 50°)**
Manufacturers	**Gulf Oil**	EP Lubricant HD 68	EP Lubricant HD 100 HD 150	EP Lubricant HD 220 HD 320 HD 460
	Esso Oil	Spartan EP 68	Spartan EP 100 EP 150	Spartan EP 220 EP 320 EP 460
	Mobil Oil	Mobilgear 600 XP 68 (ISO VG 68)	Mobilgear 600 XP 100, 150 (ISO VG 100, 150)	Mobilgear 600 XP 220, 320, 460 (ISO VG 220, 320, 460)
	Shell Oil	Omala S2 G 68	Omala S2 G 100 150	Omala S2 G 220 320 460
	Caltex Oil	--	Meropa 100 150	Meropa 220 320 460
	BP Oil	Energol GR-XP 68	Energol GR-XP 100 GR-XP 150	Energol GR-XP 220 GR-XP 320 GR-XP 460

TABLE 2
Recommended Oils

Storage

The inside of these reducers have been coated with rust preventive oil. If housing is not going into service for some appreciable time, it should be filled completely with the recommended oil. Before operating, drain oil to correct operating level. Reducers should be stored in a heated room that has a relatively even temperature and humidity.

Bearing - Preventive Maintenance Program

An effective preventive maintenance program is essential in today's industry. This is the only way that high productivity from machinery can be reliably depended upon. This outline contains basic guidelines for organizing or improving a bearing maintenance program in your plant.

First, start with proper installation:

1. Clean shaft, removing burrs, flat spots, etc.
2. Assure that bearing support structure is firm, in alignment, and provides a flat mounting surface.
3. Clean bearing bore of any foreign material.
4. Provide support for shaft so that bearing may be slipped into position.
5. If an expansion-type bearing is used, locate it so there is allowance for expansion.
6. Remove shaft support (from Step 4) shimming bearing if necessary, and bolt it securely to support structure.
7. Check for free rotation.
8. Make sure bearing has been properly lubricated.

After initial periods of running, check the following:

1. Inspect for signs of shifting in support structure, or any evidence of binding
2. Check tightness of locking collars or adapter nuts
3. Make sure mounting bolts are still secure
4. Check housing cap bolts for tightness
5. Re-inspect for sufficient expansion allowance
6. Check bearing temperature. Note that it is not uncommon for a bearing to run as much as 70 °F to 80 °F above room ambient.

Lubrication is important! It provides the following essential functions:

1. Reduces friction
2. Protects precision-machined bearing surfaces
3. Helps seal out contaminants
4. Conducts heat away from rolling elements and races
5. Improves fatigue life of bearing surfaces

Maintenance Considerations

- **Dirt and Abrasives:** Keep bearing as full of lubricant as possible. Re-lubricate frequently to purge contaminated lubrication from the bearing and seals. Never allow dirt or abrasives to pack solidly around the bearing; where possible, provide deflectors to protect bearing from falling dirt or water.
- **Moisture**: Re-lubricate at frequent intervals with lithium based or other suitable moisture resistant grease. Do not use soda based grease on extremely wet applications.
- **Corrosives**: Frequent lubrication is essential to purge any contaminated grease from the bearing. Also consult lubricant manufacturers for suggestions on special additives in the grease to protect against specific corrosives.
- **Heavy or Shock Loads**: Extreme pressure (EP) type grease will help. Also, a ductile, malleable, or steel bearing housing can be used.
- **Intermittent Service**: Use a stable grease, such as lithium grease. At the end of a running season, fill the bearing completely to protect against moisture condensation. At subsequent start-up, remove grease fitting and allow surplus lubricant to run out during initial running.
- **Vibration**: Use EP grease and consider reducing bearing clearances to retard false brinnelling.

Remember:

- Grease does not last forever. Re-lubrication is necessary. Establish a re-lubrication schedule, and stick to it.
- Never mix grease types.
- Consult lubrication manufacturers if specific lubrication problems are encountered.
- Make sure that grease fittings are accessible to maintenance personnel.
- Use clean grease. Do not store grease in open cans. Discard any suspect or unidentified grease.
- Clean grease fittings before lubricating. Do not pump contaminants into bearing.
- Make sure grease is getting into bearing. A good check is to inspect bearing seals for purging of contaminated lubricant out of bearing.

Lubricant Points	Pillow Block Bearings	Internal SKF BRGS	Speed Reducer
Specification of Lubricant	Lithium Base Grease NLGI Grade #2	NLGI Grade #2	Oil XP 100 / XP 150 Oil
Quantity	1.2 oz.	1.2 oz (per bearing)	~13.9 gals
First Change	3 months		500 hours or 6 months
Frequency of Change	3 to 6 months	3 to 6 months	2500.00 hrs or 6 months
Remarks	If dirty or wet condition exist, lube more often		

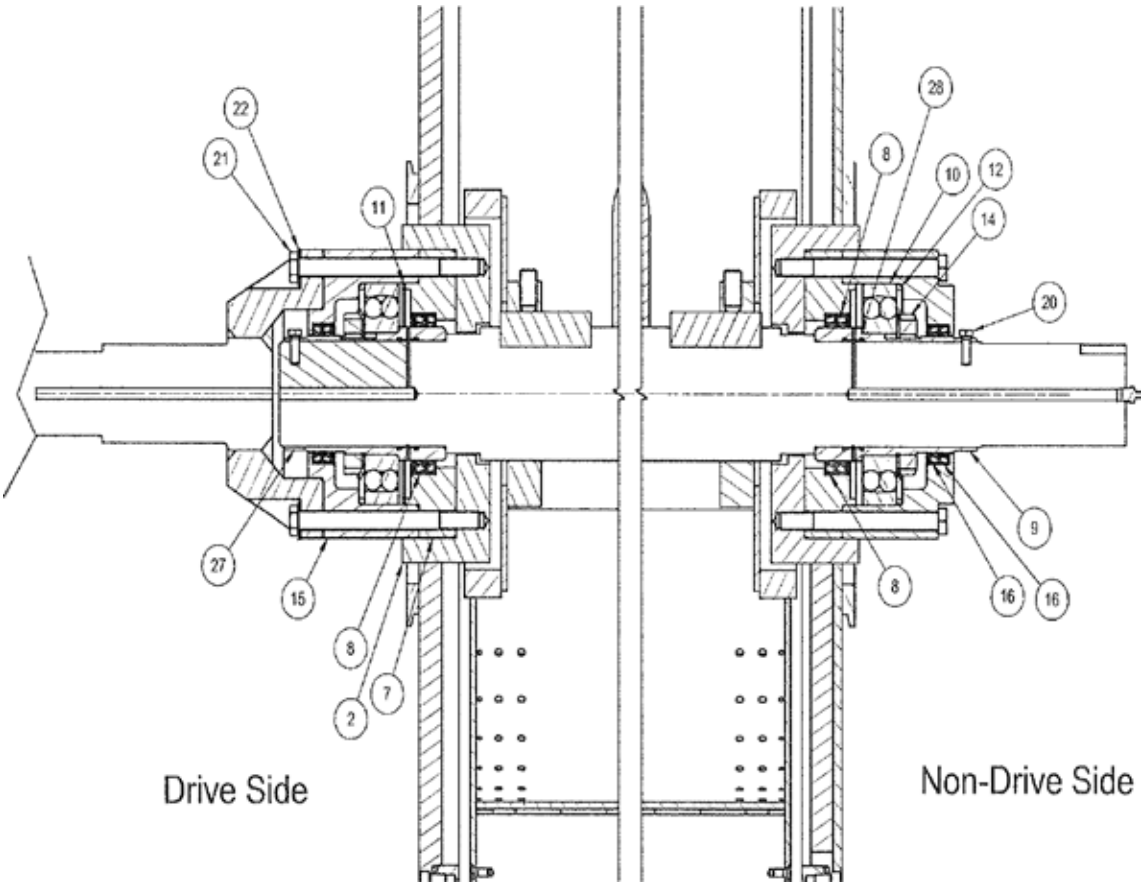
TABLE 3
Lubrication Chart

Installation and Removal of Drum Bearings

Installation Procedure (see Figure below):

- On a work bench build the sleeve assembly
- Start with item #9 sleeve (non-drive side) or item #27 (drive side)
- Press on item #10 bearing
- Install double oil seals item #8 with the side marked “oil side” out
- Install item #11 spacer ring (drive side only) & item #7 inner hub over seals.
- Screw on the nut item #14 with the chamber toward the bearing. Tighten the nut just enough to make sure the bearing and shoulder make contact. Unscrew the nut, place the lock washer in position and tighten the nut firmly again. Lock the nut by bending one of the tabs from the washer down in the nut slot.
- Push oil seals item #16 into position. Pay attention to direction. The first seal is “oil side” in and the second “oil side” out.
- Install bearing spacer item #12 up against the bearing outer race
- Install item #15 (non-drive side) or item #18 (drive-side) outer hub over bearings
- Use socket head cap screws (3/8 - 16" x 1-1/2") to clamp assembly together
- Install O-rings item #28 into sleeves (add grease into O-rings to allow smooth installation)
- Slide sleeve assembly onto shaft & into drum head item #2
- Install item #20 sleeve screw through sleeve and into shaft. Shaft is “spot” machined.
- Install drive extension item #22 (drive side only) with bolts item #21.
- Once everything is in the proper position torque 5/8" Φ bolts to 150 ft - lbs

Removal: Reverse of Installation.



Troubleshooting

Problem 1: Reasons for Poor Performance and Corrections

1. Low Recovery of Magnetite

a. Low Water Level
Decrease tails discharge diameter until approximately 1/4" flows over the overflow weir

b. Magnet Position Incorrect
If concentrate is dry, rotate magnet toward discharge. If concentrate is dilute, rotate magnet toward feed end.

c. Operating Gap Too Large
Readjust drum positioning to correct gap

d. Low Magnetite Content in Feed
Cannot normally be adjusted (common secondary separators)

e. Clay in Feed Slurry
Use flocculant to eliminate clay at thickener

f. Flocculant in Feed Slurry
Use dispersant to eliminate flocculant from thickener

2. Flooding Over Sides of Tank

a. Too Small Tails Discharge Diameter
Increase tails discharge diameter until approximately 1/4" flows over overflow weir

b. Feed Solids Too High
Increase operating gap and recheck overflow

c. Drum Positioned Too Near Feed End
Reposition drum

d. Surge Condition
Install surge capacity ahead of separator or improve control of feed rate

e. Blockage Under Drum
Can be checked by passing a piece of rubber belting under drum and moving from side to side. If blockage is found, raise drum and remove.

3. Low Concentrate Gravity

a. Magnet Position Too High
Reposition Magnet

b. Water Level High
Readjust tails bushings size

c. Discharge Gap Too Wide
Move drum forward

4. Uneven Distribution of Magnetics on Discharge

a. Drum not Parallel to Discharge Gap
Readjust drum position

b. Tank and Drum not Level
Shim legs until level

c. Blockage Under Drum
Check and remove

Problem 2: Drum won't rotate because motor protection kicks in and prevents motor rotation.

1. Check whether the drum shell has been dented enough so the shell rubs against or jams against the stationary internal magnet element, causing the motor to overload.

Solution:
Try to revolve the drum. (Mechanical assistance will be needed for large drums). If there is internal interference, the solution may require the shell to be removed and repaired. This should be done under the supervision of a factory trained technician. However, if you can locate a defined dent or depression causing this interference you may be able to make a fix without removing the shell. First rotate the shell until the depressed area is as far away from the internal magnet element as possible. Repair the dent with the drum shell in place. Don't allow dirt or other contaminants to enter the drum during the repair.

2. Is motor protection sized correctly?

Solution:
Replace with correct heater size if necessary.

Problem 3: Drum will not rotate even though there is no internal interference.

1. Faulty zero speed switch (if supplied)

Solution:
Replace or correct wiring.

2. Motor Reducer is defective.

Solution:
Is the motor fan running? If not the motor or gear reducer must be repaired or replaced.

3. Drum bearings are bad.

Solution:
Replace bearings.

4. The drum is not sealed and magnetite is leaking into the drum.

Solution:
Drum must be removed from service and rebuilt.

Annex: Direct Drive

Taper-Grip® Bushing Introduction

The keyless Taper-Grip® bushing system provides a simple and reliable shaft attachment for Sumitomo speed reducers and gearmotors. This system allows bi-directional shaft rotation operation with a powerful, slip-free grip. To assure peak performance of your equipment, please read, understand and follow these installation instructions.

STOP Prior to installation of the Cyclo® BBB4 into the driven shaft, ensure that the shaft length meets or exceeds the minimum shaft engagement value "TT" detailed in Table 1.

Do not operate until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm installation section in this manual for instructions.

⚠ CAUTION

The Cyclo® BBB4 must be externally supported prior to insertion of driven shaft into bushing. External support MUST be maintained until all bushing socket head cap screws have been tightened to the appropriate operational torque.

Components of Taper-Grip® Bushing

As shown in Figure 3, the Taper-Grip® bushing includes the bushing, thrust collar, and socket head cap screws

Shaft Diameter (in)	Tolerance (in)
1-3/16 - 1-15/16	+0 / -0.0015
2 - 3-1/8	+0 / -0.0018
3-3/16 - 4-11/16	+0 / -0.0021
4-3/4 - 6-1/2	+0 / -0.0025

Shaft Diameter (in)	Tolerance (in)
(30 - 50)	(+0/-39)
(50 - 80)	(+0/-46)
(80 - 120)	(+0/-54)
(120 - 180)	(+0/-63)

Cyclo® BBB4 Size	TT	
	mm	in
4A	208	8.19
4B	242	9.53
4C	279	10.98
4D	326	12.83
4E	359	14.13
4F	412	16.22

[1] Based on ISO/JIS/DIN h8

TABLE 1
Driven Shaft Tolerance[1]
and Minimum Shaft Engagement (TT)

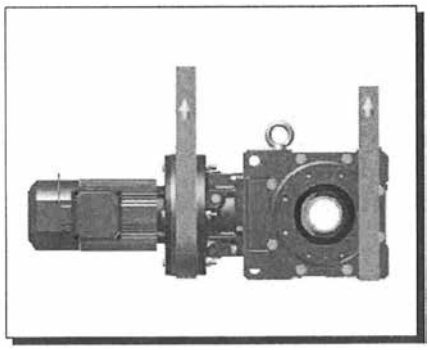


FIGURE 1

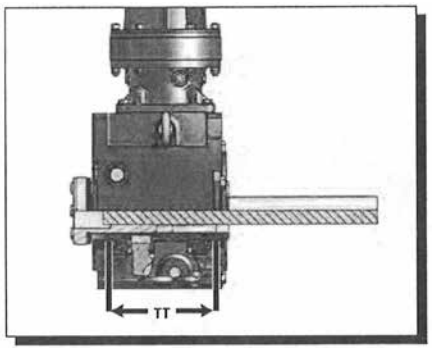


FIGURE 2

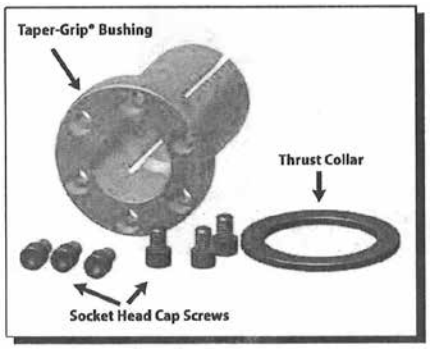
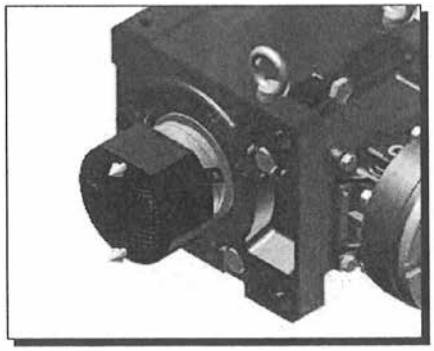


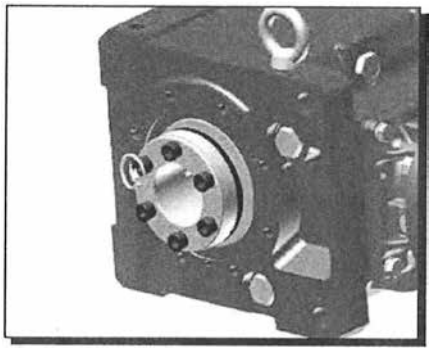
FIGURE 3

Taper-Grip® Bushing Installation onto Driven Shaft

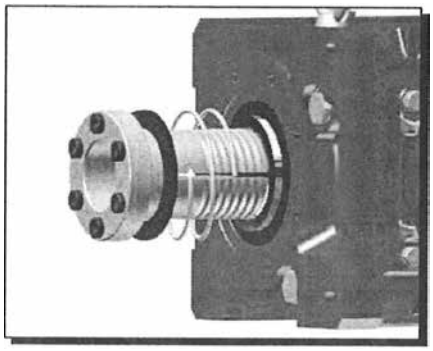
1. **Remove bushing cover if unit was supplied with one**



2. **Loosen socket head cap screws**

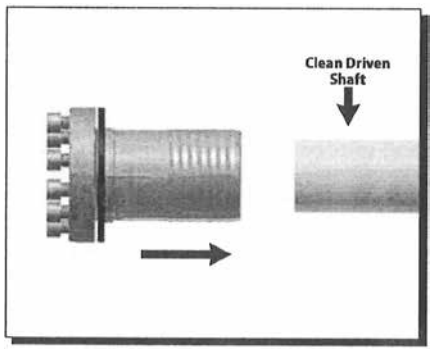


3. **Remove (unscrew) Taper-Grip® bushing from the unit**

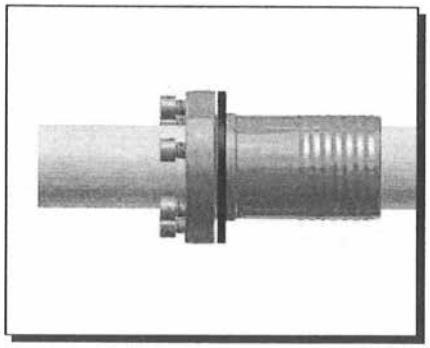


4. **Clean all grease, oil and/or anti-seize paste from the driven shaft. Failure to do so could result in damage to shaft.**

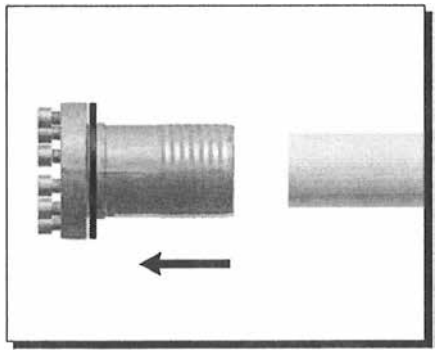
   Slide Taper-Grip® bushing onto driven shaft



5. **Inspect and test Taper-Grip® bushing on shaft**
   - Check shaft for burrs, corrosion, or warpage. Repair or replace shaft as necessary.
   - Slide bushing back and forth along shaft, checking for surface irregularities and fit
   - Verify bushing is sized correctly for the shaft diameter



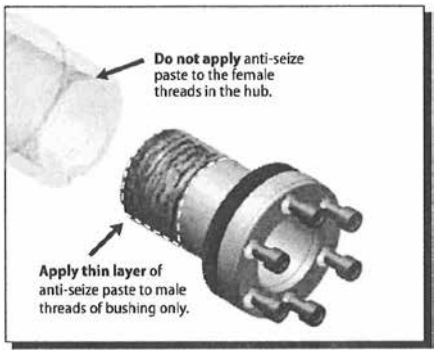
6. **Remove Taper-Grip® bushing from driven shaft**



7. **Apply a thin layer of anti-seize paste to the male threads of the Taper-Grip® bushing only**

⚠ Ensure that the anti-seize paste does not enter the Taper-Grip® bushing bore.

Do not apply anti-seize paste to the female threads in the hub.

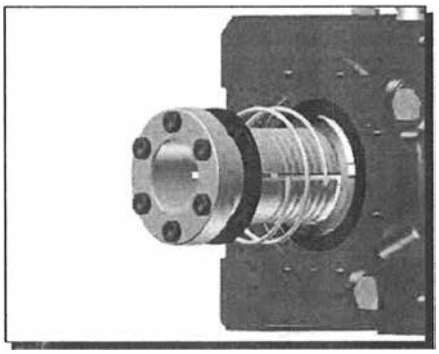


8. Screw Taper-Grip® bushing into Cyclo® BBB4 leaving approximately 1mm gap between the bushing flange and thrust collar.

⚠ Do not apply grease, oil, or anti-seize paste to the driven shaft or the bushing bore before placing the unit onto driven shaft. Use of these friction-minimizing products will adversely affect the ability of the unit to transmit torque.

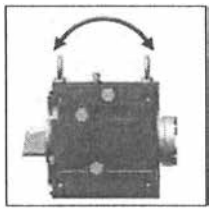
⚠ CAUTION

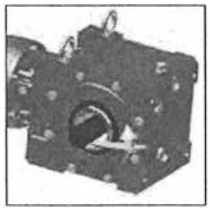
The Cyclo® BBB4 must be externally supported prior to insertion of driven shaft into bushing. External support must be maintained until all bushing socket head cap screws have been tightened to the appropriate operational torque.

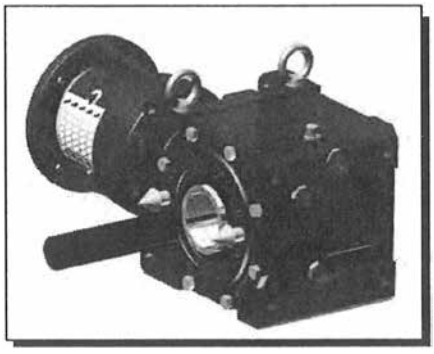


9. Mount or slide the Cyclo® BBB4 onto the driven shaft to the desired location

STOP Do not rock or pry the unit

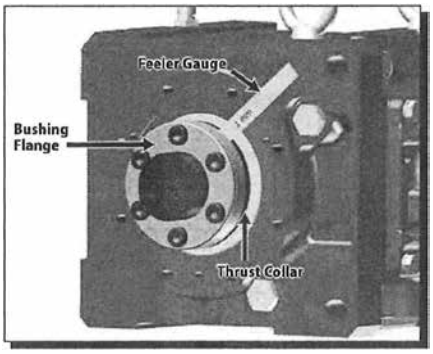






10. Screw Bolts into Taper-Grip® bushing.

- Lightly oil threads of each bolt before inserting
- Finger tighten each bolt to secure in place
- Be sure to maintain the 1mm (approximate) gap between the thrust collar and the bushing flange

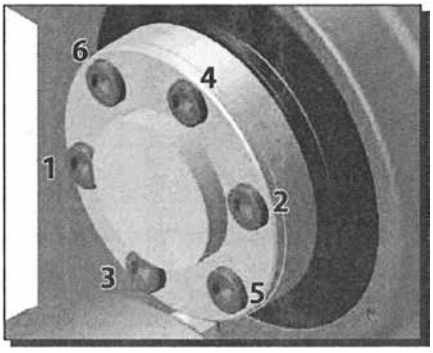


11. Tighten bushing bolts to the correct torque value

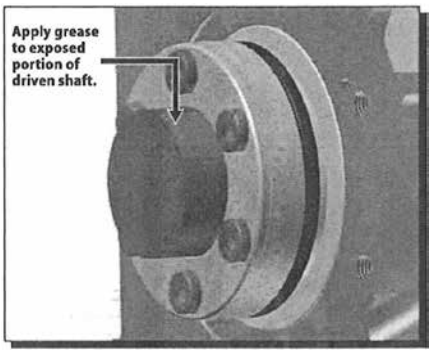
- Following a star pattern use a torque wrench to gradually tighten each socket head cap screw in 20% increment
- Refer to Table 2, Taper-Grip® Bushing Bolt Tightening Torques, for the correct operational screw torques

Cyclo® BBB4 Size	Screw Qty x Size	Screw Torque	
		lb - ft	N - m
4A	6 x M12	56	57
4B	6 x M12	104	140
4C	6 x M16	185	250
4D	6 x M16	223	300
4E	8 x M16	223	300
4F	10 x M16	223	300

TABLE 2
Taper-Grip® Bushing Bolt Tightening Torques

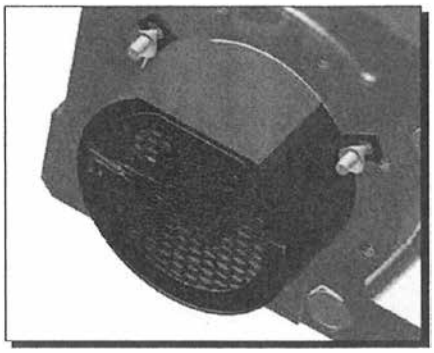


12. **In order to prevent corrosion, apply grease to the exposed portion of the driven shaft.**
    - After installing and tightening the bushing bolts with a torque wrench, apply grease or an anti-corrosion product to the exposed portion of the shaft



13. **For units that include a bushing safety cover, reinstall the guard over the Taper-Grip® bushing.**

Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm installation section in this manual for instructions



Keyed Hollow Bore Installation

Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm installation section in this manual for instructions.

CAUTION

The Cyclo® BBB4 must be externally supported prior to insertion of driven shaft into hollow bore.

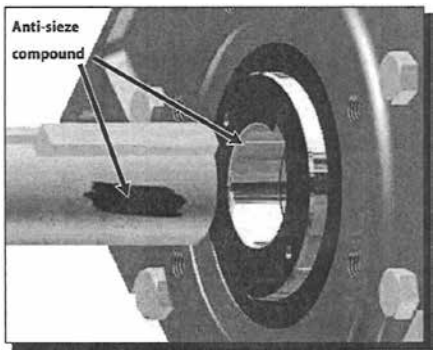
Bore and Shaft Tolerance Specifications

Unless otherwise specified, the tolerance of the Hollow Shaft Bore conforms to JIS H8.

If application involves high shock loading and/or large radial loads, a shaft tolerance of JIS js6 or JIS k6 is recommended.

Keyed Hollow Bore Installation onto Driven Shaft

1. **Apply anti seize compound to the driven shaft surface and inside the reducer keyed hollow bore.**

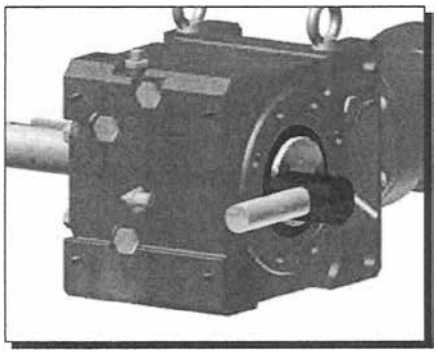


2. **Align the driven shaft with the reducer/ gearmotor bore and carefully slide unit onto the driven shaft to the desired location.**

If the fit is tight, strike on the keyed hollow bore with a wooden or hard rubber mallet to assist in the assembly

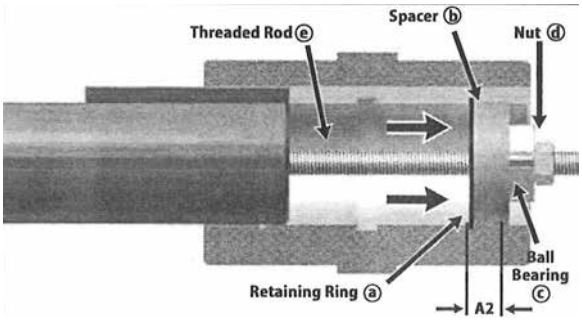
If using a mallet during installation, strike only against the unit's steel keyed hollow bore. Do not strike the reducer housing or oil seal as damage to the bearings, housing and/or seals may occur.

Note: If the fit is tight, use a jig such as the one shown in Table 3 to ease assembly. Sumitomo does not supply a mounting jig. This information is provided for reference only.



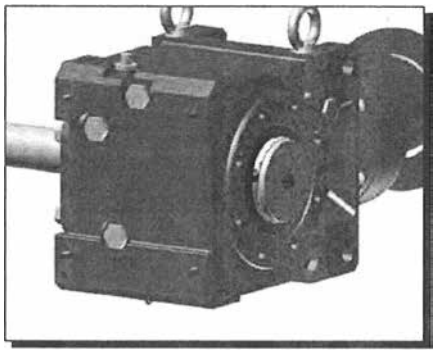
Size	a	b	c	d	e
	CC (ISO/JIS)	A2	Bearing	Nut	Threaded Rod
4A	55	25	51104	M16	M16 X 250
4B	65	25	51105	M20	M20 X 300
4C	75	25	51105	M20	M20 X 300
4D	85	35	51107	M24	M24 X 400
4E	100	35	51107	M24	M24 X 400
4F	120	46	51109	M30	M30 X 450

TABLE 3
Jig Dimensions



3. Once driven shaft has been completely inserted into the unit's keyed hollow bore, secure the shaft in place using a keeper plate as shown to the left, or some other means of securing the unit to the driven shaft.

⚠ Do not operate unit until the torque arm has been attached. Refer to the Torque Arm Installation section in this manual for instructions.



Shrink Disc Type Mounting Instruction

The keyless Shrink Disc provides a reliable commodity shaft attachment for Sumitomo speed reducers and gearmotors. This system allows bi-directional shaft rotation operation with a powerful, slip-free grip.

To assure peak performance of your equipment, please read, understand and follow these installation instructions.

STOP Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm Installation section in this manual for instructions.

⚠ CAUTION

The Cyclo® BBB4 must be externally supported prior to insertion of driven shaft into hollow bore. External support must be maintained until all shrink disc socket head cap screws have been tightened to the appropriate operational torque.

Bore and Shaft Tolerance Specifications

Refer to the certified outline drawing or Cyclo® BBB4 Catalog for recommended machine shaft dimensions.

Unless otherwise specified, the tolerance of the Shrink Disc Bore conforms to JIS H8.

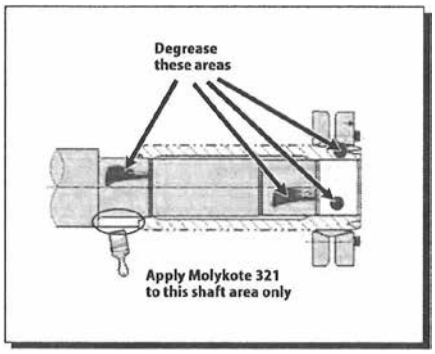
If application involves high shock loading and/or radial loads, a shaft tolerance of JIS js6 or JIS k6 is recommended.

Shrink Disc Type Hollow Bore Installation onto Shaft

⚠ Before placing unit onto driven shaft, do not apply grease, oil, or anti-seize paste to the entire driven shaft or to the bore of the shrink disc. Use of these friction-minimizing products will adversely affect the ability to the unit to transmit torque. Never tighten locking screws before shaft installation. Inner ring may become permanently contracted even at low tightening torques.

1. Clean and degrease contact surfaces; reducer shaft and bore, and the machine driven shaft.
Apply Molykote 321 or an equivalent dry film lubricant to the driven shaft shoulder opposite from the shrink disc.

STOP Do not apply any friction minimizing compound to the driven shaft at or near the shrink disc.

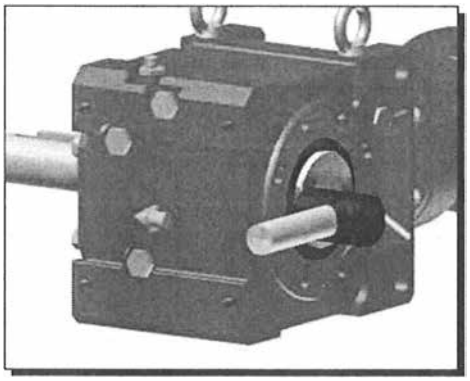


2. Align the driven shaft with the bore of reducer/gearmotor bore and carefully slide unit onto the driven shaft to the desired location.

If the fit is tight, strike on the reducer hollow bore with a mallet to assist in the assembly.

⚠ If using a mallet during installation, strike only against the unit's steel hollow bore. Do not strike the reducer housing or oil seal, as damage to the bearings, housing, and/or seals may occur.

If the fit is tight, use a jig such as the one shown in the Keyed Hollow Bore Installation section to ease assembly. Sumitomo does not supply a mounting jig. This information is provided for reference only.



Size	Model (Typical)	Bolt	Bolt Torque	
			lb - ft	N - m
4A	TAS-3071-55x68	10 x M6x25 ISO/JIS grade 10.9	9	12
4B	TAS-3071-65x80	7 x M8x30 ISO/JIS grade 12.9	26	34
4C	TAS-3071-75x100	12 x M8x35 ISO/JIS grade 12.9	26	34
4D	TAS-3071-85x110	9 x M10x40 ISO/JIS grade 12.9	51	68
4E	TAS-3071-100x140	10 x M12x45 ISO/JIS grade 12.9	87	118
4F	TAS-3071-120x165	8 x M16x55 ISO/JIS grade 12.9	214	290

TABLE 4
Shrink Disc Bolt Tightening Torques

World Authority in Separation Technologies
Headquarters: 2200 Asbury Road, Erie, PA 16506-1402 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
Manufacturing Facilities: AUSTRALIA • BRAZIL • CANADA • CHINA • INDIA • JAPAN • MEXICO • SOUTH AFRICA • UNITED KINGDOM • UNITED STATES

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