SM-240E

Installation, Operation and Maintenance Instructions

MAGNETIC PULLEYS

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

Introduction

This manual details the proper steps for installing the Magnetic Pulley.

Careful attention to these Installation Requirements will assure the most efficient and dependable performance of this equipment.

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

CAUTION - STRONG MAGNET

This equipment includes one or more extremely powerful magnetic circuits. The magnetic field may be much stronger than the Earth's background field at a distance several times the largest dimension of the equipment.

- **If you use a heart pacemaker or similar device you must never approach the equipment because your device may malfunction in the magnetic field, with consequences up to and including death.**
- **To avoid serious pinch-type injuries caused by objects attracted to the magnet, keep all steel and iron objects well away from the equipment. Do not allow hands, fingers, and other body parts to be caught between the equipment and nearby steel or iron objects.**
- **Keep credit cards, computer disks, and other magnetic storage devices away from the equipment because magnetically stored information may be corrupted by the magnetic field.**
- **Keep electronic devices, such as computers or monitors, away from the equipment because exposure to the magnetic field may result in malfunction or permanent damage to such devices.**

Contact Eriez if you have a question regarding these precautions.

CAUTION

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

Table of Contents

ERIEZ MAGNETIC PULLEYS

CAUTION 4

PULLEY FURNISHED WITH SHAFT 5

- Description of Pulley 5
- Lifting and Handling 5
- Installation of Pulley 6
- Bearings, Drive Components, Product Belt, and Lagging 7
- Operation and Capacity 8
- Maintenance 8
- Spare Parts, Repairs and Alterations 8

PULLEY FURNISHED WITHOUT SHAFT 9

- Description of Pulley 9
- Lifting the Pulley before Shaft is Added 9
- Installing a Shaft in the Pulley 9
- Inserting a Shaft in a Pulley that uses Squeeze-Lock Hubs 10
- Inserting a Shaft in a Pulley that has Welded-On Hubs 11

Caution

Before removing the pulley from its shipping skid or shipping crate, read and understand the *Lifting and Handling* section of this manual.

Unless the instructions and illustrations for lifting the pulley are followed, the pulley can be damaged. Injury to handling personnel could result.

The pulley is furnished in either of two configurations:

- with a shaft
- without a shaft

Determine the configuration of your pulley and read carefully the *Lifting and Handling* section that applies to that configuration.

General comments that apply to pulleys of both configurations:

1. This is a strong permanent magnet pulley. Use caution when handling steel or partly steel items (tools, chains, etc.) near the pulley.
2. Never allow the pulley to contact steel supports, tables or machinery. Use lumber or other non-magnetic spacers (6" (150 mm) thick minimum) between the pulley and any steel or partly steel objects.
3. Hands, feet, or any part of the body must not get between the pulley and any steel or ferrous items unless both the pulley and the items are firmly anchored.
4. Lifting, handling or moving the pulley may result in injury unless caution and good work practices are observed at all times. You **must** follow instructions in this manual covering these operations.
5. Working around the pulley, even after it has been installed, requires the same alertness as necessary during lifting and moving it to the installation position. Most work in the installed pulley area will be maintenance work. See the maintenance sections of this manual for instructions.

If any part of this manual is not fully understood, contact your Eriez representative or call Eriez Customer Service Department at 1-800-439-3743 before proceeding with any installation steps.

Pulley Furnished with Shaft

DESCRIPTION OF PULLEY

The pulley has been furnished with a shaft either to Eriez standard shaft dimensions (only if you have specified this) or with a shaft to your dimensional specifications. In either case, the shaft is machined with a finish for use with readily available pillow blocks or flange bearings. Shaft material is normally 1040/1045 steel.

The shaft is locked to the pulley with keyed squeeze-lock hubs inserted in the bores of the pulley's end disks. Or it may be locked to the pulley with keyed set screw hubs welded to the outside of the end disks. In both cases the shaft is securely locked to the pulley.

The hub type used depends on the ratios of the pulley diameter, the shaft diameter, and the inside diameter of the internal magnet circuit. For example, if a relatively large diameter shaft is used with one of the smaller diameter pulleys, there may not be enough internal space left to insert a squeeze-lock hub into and through the end disks of the pulley. In this case a set screw hub on the outside of the end disks is used.

The end disks are hot rolled steel and 300 series stainless steel. They are recessed inside the ends of the shell and welded on their OD to the shell ID.

The pulley shell is 300 series stainless steel with at most one welded and ground seam parallel to the shaft. The shell is continuous across the pulley's face with no circumferential joints or seams.

The pulley face can be edge crown, center crown or flat for belt tracking. If the pulley is specified to be furnished with lagging, the face of the lagging is also edge crowned per CEMA Standard crowned.

Polarity of the pulley's magnet circuit is axial (i.e. the poles and the gaps between them are parallel to the shaft). The magnet circuit is built up of permanent magnets and steel flux conductors.

LIFTING AND HANDLING

To lift the pulley and shaft unit from its shipping crate or shipping skid, the following lift methods are recommended: Use chain, rope, cable, lift truck forks, or lifting straps arranged and located as shown and noted in the following figures. Note that the "how not to lift" method is also illustrated.

If a steel cable or lift chain is used, take care that it is not pulled against the pulley face, especially when it is being manually handled.

No matter what lifting device is being used, the shaft must be protected against nicks and scratches.

During lifting and while it is being moved laterally, the pulley will be attracted to any nearby steel structure (machinery, beams, columns). Keep the pulley several feet (1 meter) away from these or any other ferrous items during lifting and moving. Except for the added consideration of the magnet field and the pull it exerts on any steel nearby, just use a good work practice when lifting or moving or working around a magnetic pulley.

In summary, the simplest and safest lift and handling operation is as follows:

- Attach pillow blocks or bearings while the pulley is still on its skid or in its crate (remove top and ends of crate for access).
- Then lift and move the pulley with bearings attached using the lifting guides illustrated in Figure 1 on the following page.
- Next set the pulley down in its operating location so the bearings contact their supports. Keep the lifting tension on the pulley and bolt the bearings to their supports.
- Only then remove the lifting sling or fork supports.

Pulley Furnished with Shaft (cont.)

One of the arrangements illustrated and described in Figure 1 will work best for you. Just protect the shaft and the ends of the pulley from damage and observe the cautions previously discussed.

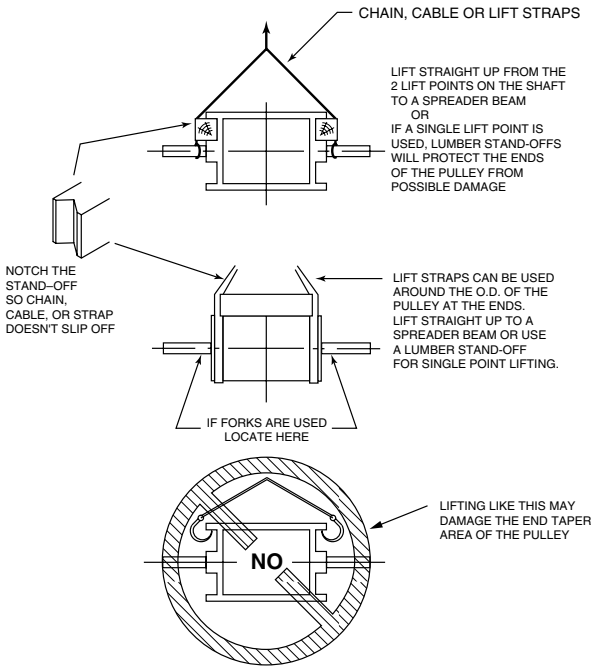

FIGURE 1.

INSTALLATION OF PULLEY

The pulley is usually intended for installation as the head pulley of a bulk product belt conveyor. Steel conveyor framework, skirts, belt slider plate, and belt support idlers must be farther than 18" (460 mm) from the face of pulleys less than 24" (610 mm) diameter. For pulleys more than 24" (610 mm) diameter, these members must be at least 30" (760 mm) away if they are steel. If these steel members are too close to the face of the pulley, they can short circuit and thereby weaken the working efficiency of the magnetic fields of the pulley.

Tramp iron can also “hang-up” on these close steel items because they are induced magnetically, becoming magnets themselves. This tramp iron build-up can break loose all at once, and since it is in a bunch, some can possibly bypass the magnetic pulley.

Therefore, use non-magnetic stainless steel for the skirts, belt support idlers, slider plate, and frame members that are close to the pulley face. Instead of stainless steel, consider using rubber support idlers and aluminum or wood for the other items listed.

Main supporting frame members positioned as in Figure 2 are acceptable because they are not in the magnetic field in the face area of the pulley. These frame members can be steel.

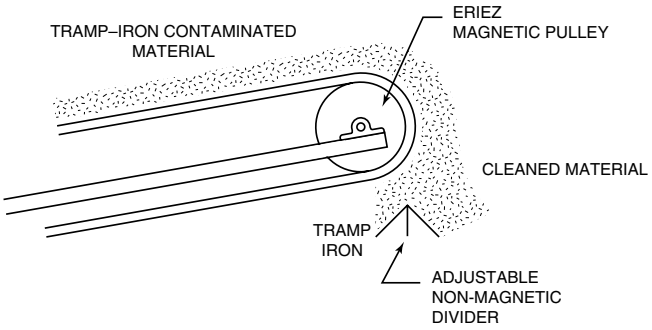

FIGURE 2.

Figure 2 also illustrates the installation of a divider (or splitter) under the pulley. This divider, when properly located and installed with forward and backward adjustment, causes a definite split between the streams of cleaned product and separated tramp iron.

The distance between the bottom run of the belt and the apex of the divider should also be adjustable. This distance must take into account the largest tramp iron expected and the fact that the tramp iron can take any orientation on the belt. But an excessive space here can contribute to product carryover (i.e. product going down the tramp iron chute). The sketch shows the behavior of a dry free flowing product. It is easy to obtain a good split with this kind of product. It discharges in a definite trajectory and any product carry over with this product will be minimal.

If the product is sticky or damp, more of it will cling to the belt. Adjustments of the divider position will have to be made to find the best position relative to the product trajectory and tramp iron release point.

Small and medium sized spherical shaped tramp iron is difficult to remove from the bottom of the belt. It has little tendency to break away from the magnetic field and to follow the belt away from its tangent point at the bottom of the pulley. Because of its shape, it wants to stay at the tangent point and roll.

If the installation allows use of a belt wiper (simply a strip of belt material glued or attached to the belt working surface), any rolling tramp iron will be knocked into the tramp iron chute by the wiper. A high wiper can contribute to product carry over so any wiper used must be the minimum height that is effective.

For cases where several factors interfere with obtaining a good split between product and tramp iron, the installation of a magnetic extension as illustrated in Figure 3 can be a plus. These unfavorable factors can be light fluffy material, wet sticky material, or spherical tramp iron.

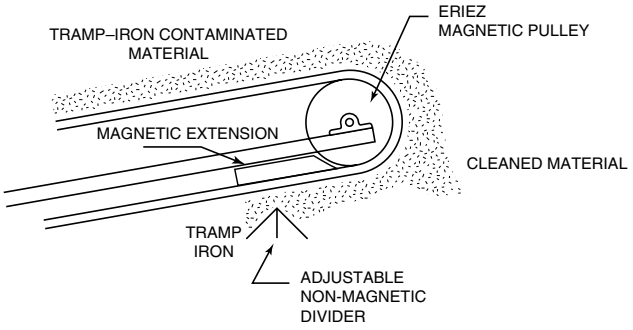

FIGURE 3.

The magnetic extension will move the split point back away from the pulley. This will reduce product carry over of light air borne product into the tramp iron chute. Sticky moist material will have more time and space to break free from the belt surface. The discharge end of the magnetic extension can have a diminishing magnetic strength at its end which will aid in a smooth release of spherical and other difficult to release tramp iron.

But most products, if dry and free flowing, allow a good split at the pulley location by using an adjustable divider alone.

BEARINGS, DRIVE COMPONENTS, PRODUCT BELT, AND LAGGING

Bearings - Use anti-friction ball or roller bearings in pillow block or flange bearing units. Good shaft seals in the pillow block or flange bearing units will cancel any concern regarding ferrous dust in proximity to the bearings. Open sleeve or babbited type bearings are not recommended for use on the shaft of any magnetic pulley. Lubricate the bearings per manufacturer's recommendations.

Drive components - If a chain drive is used, an enclosed guard that will keep ferrous dust away from drive chain and sprocket is required.

Product belt - The belt should be as thin as possible consistent with the product load, conveyor length, and other mechanical load factors. This does not mean that using a normal thickness belt has any unfavorable effects. It only means that the closer the ferrous material in the product can come to the face of the pulley, the more safety factor there will be to overcome any unfavorable factors that may come along later. Some of these factors might be capacity increases in the future, unexpected surges, belt slippage on the pulley allowing momentary thicker burden, or changes in product density or moisture content.

The belt should be laced with non-magnetic lacing.

Pulley lagging - Any lagging on the face of the pulley should be as thin as practical. Again in order to allow tramp iron to be close to the pulley face.

Summary - Other than accounting for the possible induction of nearby steel members and providing a means to split the product stream from the tramp iron stream, once the magnetic pulley is installed, it can be treated as a plain pulley with respect to its influence on conveyor design and component selection.

One point that should be considered is motor selection. The magnetic pulley will be heavier than a plain pulley of the same size. This can influence motor size selection.

Pulley Furnished with Shaft (cont.)

OPERATION AND CAPACITY

For maximum separation efficiency, the pulley should be operated at the following belt speeds:

PULLEY DIAMETER	BELT SPEED
8" 203 mm	140 fpm 43 mpm
12" 305 mm	210 fpm 64 mpm
15" 381 mm	240 fpm 73 mpm
18" 457 mm	270 fpm 82 mpm
20" 508 mm	300 fpm 91 mpm
24" 610 mm	340 fpm 104 mpm
30" 762 mm	400 fpm 122 mpm
36" 914 mm	440 fpm 134 mpm

We recommend that you do not exceed these figures. They are based on conveying dry free flowing products of medium density. Under some conditions, such as easily airborne light material, belt speeds less than those listed may result in a better operation.

In all cases, the capacity figures listed in the descriptive literature are based on the dry and free flowing material with tramp iron sizes and shapes usually encountered.

When processing wet, sticky, high density, or entangled material, the usual depth of material on the belt must be reduced to approach results experienced with the more favorable materials.

Heavy surges of material should be avoided because a thinner, more even flow will result in more efficient separation. A plow or spreader bar across the belt and positioned ahead of the pulley to level out the burden will make sure the tramp iron will enter the intense magnetic field close to the pulley face. More than one plow bar may be needed if the burden on the belt is very uneven or irregular.

MAINTENANCE

⚠ CAUTION

Before starting any maintenance work involving contact with the pulley or belt, stop the conveyor and lock out power to it to avoid personnel injury.

Hubs - If the pulley shaft is locked to the pulley with Squeeze-Lock hubs, these hubs require maintenance after installation.

A schedule for checking the torque and re-torquing the bolts in the hubs is given in Section II of this manual. To prevent any hub loosening that could result in shaft damage, or damage to the pulley itself, follow this schedule.

Pulley face cleaning - Any stray steel or iron (or any other object) that accidentally becomes entrapped between the pulley face and the belt should be removed at once to prevent damage to the belt and pulley. Fine iron which will gradually collect on the pulley face should be removed for the same reason. By occasionally brushing the pulley face, this source of belt wear can be eliminated...USE NON-MAGNETIC TOOLS.

Belt maintenance - Seal the splices and patch any rips or holes in the belt to keep any fine iron from penetrating to the pulley face. If the belt is replaced, specify non-magnetic lacing.

The belt should be tracked to keep the belt from weaving side to side. This helps prevent tramp iron from getting under the belt.

SPARE PARTS, REPAIRS AND ALTERATIONS

No spare parts are required.

Repairs, alterations, or disassembly of the magnetic pulley without written authorization and instruction by Eriez nullifies the responsibility and guarantee of the manufacturer.

Pulley Furnished without Shaft

DESCRIPTION OF PULLEY

The pulley is furnished complete without shaft. It is constructed so that a shaft can be added and attached securely to the pulley. Read the manual carefully and observe all cautions discussed about working around the magnetic pulley with a steel shaft.

For a full description of the pulley components and construction, read the description of pulley in *Pulley Furnished with Shaft* section of this manual. The pulley that is furnished without shaft is exactly the same as the pulley furnished with shaft.

LIFTING THE PULLEY BEFORE SHAFT IS ADDED

The best way to lift the pulley without a shaft is to leave it on its skid or in its shipping crate. Lift from the skid or crate and move to the location where the shaft will be added. Before setting the skid or crate down in the work area, clear that area of any loose steel or partly steel items.

Set the load down on a firm flat area with enough clearance at both ends of the pulley to be able to accommodate the shaft before it is installed in the pulley. Remove the crate top and ends to fully expose the pulley.

If the pulley must be separated from its crate or skid before its moved to the area where the shaft will be added, consider one of the lift methods described below after removing the crate top and ends. Clear the area of loose steel or partly steel items.

- Pass a non-magnetic pipe, tube, or rod thru the pulley and lift from it as illustrated in the top arrangement shown in Figure 1. The lift member you pass through the pulley does not have to fit the bore closely, but it has to have adequate strength for the pulley weight. Wrap the pipe, tube, or rod where it passes through the bore with a rubber sheet or thick tape so that the ID of the bore is not marred.
- If the pulley is the type with its end disks bored for later addition of Squeeze-Lock hubs, you can use hooks carefully placed in the hole so they engage the ID of the end disk. Use a piece of rubber sheet or carpet between the hook and the disk to protect the bored surface. Use standoffs as shown in the top view of Figure 1 to protect the edges of the pulley.

INSTALLING A SHAFT IN THE PULLEY

The shaft must be machined to match the pulley bore. The matching pulley bore may be the bore of separately furnished Squeeze-Lock hubs or the bore of set screw hubs that are welded to the pulley end disks.

The shaft must be keyed as dimensioned in the descriptive literature. Put a 1/8 (3 mm) x 45 degree chamfer on all shaft shoulders to make it easier to pass the shaft through welded on hub bores or to push Squeeze-Lock hubs onto the shaft.

We recommend 1040/1045 steel for the shaft you furnish. Other alloys may be considered but the alloy recommended has proven satisfactory for all but extreme belt tension loads on the pulley. Use CRS, which can fit the bores in an as purchased state, or use HRS which will have to be turned on its diameters to 63 micro inches. Stainless steel shafts are also acceptable.

⚠ CAUTION:

At all times keep in mind that a steel shaft will be attracted to the pulley. Do not allow the shaft to approach the pulley until all is ready for the assembly operation. Do not allow the shaft to approach the pulley with other than its end pointing at and in line with the center of the pulley. Extreme caution and alertness is necessary to avoid injury or equipment damage.

The pulley without a shaft can be furnished either with bores in the end disks to fit separately furnished Squeeze-Lock hubs or can be furnished with set screw hubs welded on the outside of the end disks. Refer to the appropriate section below for assembly.

Pulley Furnished without Shaft (cont.)

INSERTING A SHAFT IN A PULLEY THAT USES SQUEEZE-LOCK HUBS

With the pulley axis horizontal, insert a length of non-magnetic tubing through the pulley. The outside diameter of the tubing should be less than the inside diameter of the bores in the pulley end disks. The inside diameter of the tubing must be greater than the shaft diameter plus the height of the key that protrudes from the shaft.

A good tubing to use is the plastic drain tubing sold by builder's supply stores. This tubing comes in various diameters and is smooth inside allowing the shaft to slide easily.

Use a length of tubing about 3 to 4" (75 to 100 mm) shorter than the shaft. After pushing it through the pulley, let it extend from the pulley ends approximately equally on both ends. Attach a C-clamp where shown in Figure 4A to act as a stop.

Insert keys in the shaft to match the keyways in the hubs that will be added later. To prevent the keys from falling out of the shaft, use a few drops of adhesive between keys and keyway. Approach the pulley end with the shaft center in line with the tubing center. See Figure 4B. Support the shaft to maintain this alignment.

Insert the shaft and push it through the pulley until it is in the position shown in Figure 4C. The C-clamp will prevent the tubing from sliding through the pulley along with the shaft.

Now move the C-clamp to the position shown in Figure 4D. Pull the tubing through the pulley. The C-clamp on the shaft will keep the shaft in place and prevent it from following the tubing out of the pulley.

The shaft will now remain in the pulley resting on the pulley end disks.

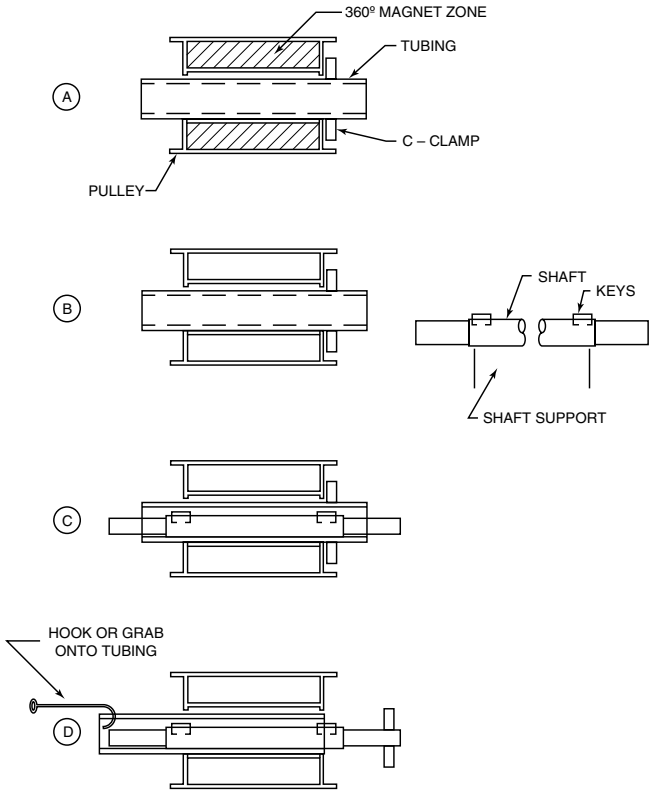

FIGURE 4.

Remove the C-clamp from the shaft end and check the position of the shaft ends relative to the ends of the pulley. Adjust the shaft position axially if necessary. Use a plastic or lead hammer if you make this adjustment by pounding on the shaft ends.

Slide an outer hub of the Squeeze-Lock hub units (furnished separately) over each end of the shaft and slide it toward the pulley end disk as far as it will go.

Raise the shaft and support it so that it is approximately concentric with the holes in the end disks. Work the outer hubs into the bored holes in the end disks.

Now slide the inner hubs over the shaft ends. Remove the shaft supports so that this inner hub can be moved up against the outer hub that is joined to the pulley end disks.

Raise and support the shaft again so it is concentric with the holes in the pulley end disks.

Assemble the hubs together per the instruction sheet for the hubs supplied in the hub container.

Follow the hubs instruction sheet with respect to continuing maintenance on the hubs.

INSERTING A SHAFT IN A PULLEY THAT HAS WELDED ON HUBS

The shaft can be installed in the pulley with the pulley axis either horizontal or vertical. Consider the pulley weight, diameter, width, and the shaft diameter, weight, and length when selecting which assembly method to use. Both the vertical and horizontal assembly operations are illustrated in Figure 5.

If the vertical method is used, carefully swing the pulley from its horizontal position into the vertical position using a sling of lifting straps tightly bound around the pulley near one end. The sling must be arranged so it cannot slip. Avoid letting the full weight of the pulley bear on one point on the end of the pulley shell.

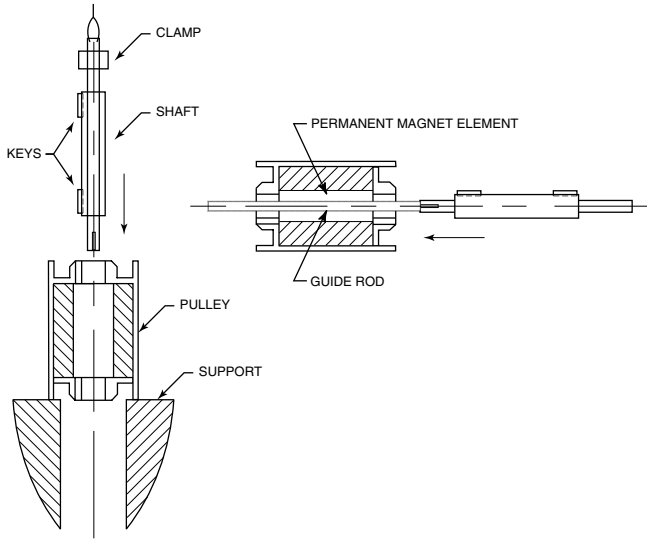

FIGURE 5.

To install the shaft with the pulley in either vertical or horizontal position, start by making sure the set screws in the hubs are backed off or removed. Check that the hub bores are clean and smooth. Are leading ends of shaft shoulders and keys chamfered?

Add keys to the shaft. Use adhesive to hold them in place so they can't loosen while the shaft passes through the pulley.

Lubricate the shaft OD and the ID of the hubs.

Pass the shaft through the pulley keeping keys in line with keyways. A non-magnetic guide rod smaller than the shaft diameter can be tapped into the shaft end that enters the pulley first. This will make assembly easier, especially if the pulley is wide.

If you pound on the shaft end to move it, use a lead or plastic hammer (or a piece of lumber between the shaft and a hard hammer).

When the shaft is in the correct position relative to the ends of the pulley, spot the shaft and key through the tapped holes in the hubs. Use thread Locktite on the set screws and tighten them securely against the key and shaft.

If the vertical assembly method was used to insert the shaft, carefully lower the pulley to the horizontal position, again taking steps to keep the full weight of the pulley from bearing on one point on the end of the pulley shell.

The pulley is now complete and identical to a pulley shipped from the factory complete with shaft. For further guidance on the use of this pulley refer to *Pulley Furnished with Shaft* section of this manual.

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
Manufacturing Facilities: AUSTRALIA • BRAZIL • CANADA • CHINA • INDIA • JAPAN • MEXICO • SOUTH AFRICA • UNITED KINGDOM • UNITED STATES

611-3C-AHA-SHAM ERIEZ MANUFACTURING CO ©2011 PRINTED IN USA