

Installation, Operation and Maintenance Instructions



SUSPENDED ELECTROMAGNETS FOR HAZARDOUS LOCATIONS

**SE-700U SERIES, MANUAL CLEANING
SE-700USC SERIES, SELF CLEANING**

Introduction

This manual applies to Eriez Magnetics' Suspended Magnets for use in hazardous locations: Series SE-700U and SE-700USC

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

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

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Warning

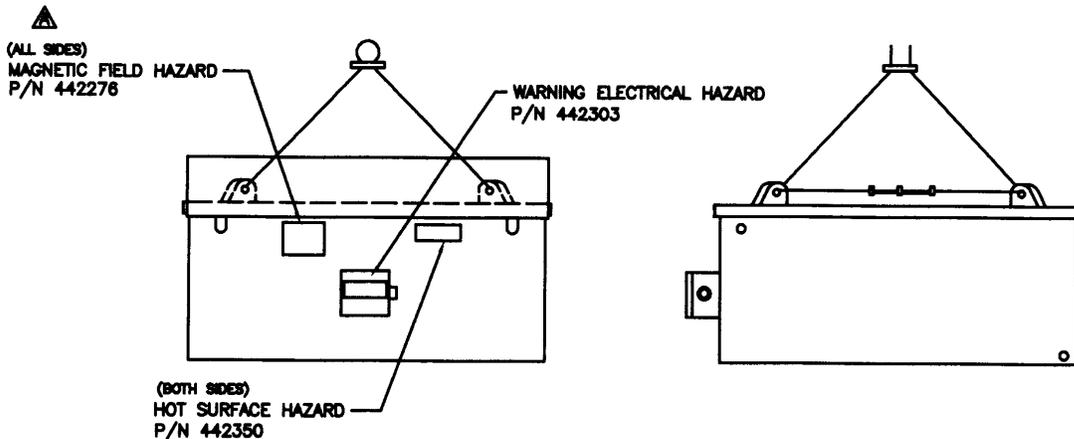
Suspended electromagnets with self-cleaning belts are normally suspended above conveyor belts away from personnel working areas. Eriez has no control over this location or adjacent areas.

Under certain conditions it may be necessary for the user to install additional safety devices to protect operating personnel.

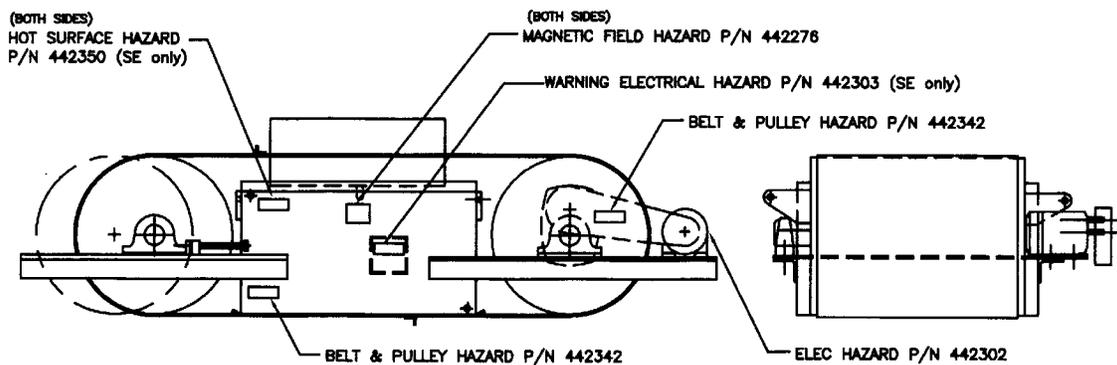
Suspended electromagnets with self-cleaning belts have pinch points where the belt goes over the pulleys. When the belt is running this is a hazardous area. Workers should be instructed not to perform duties on this equipment unless it is shut down and the electric supply source is locked out.

When either a self-cleaning or a manual cleaning electromagnet is energized, workers should never extend parts of their bodies into the magnetic field area between the conveyor and the magnet face. Tramp iron pieces will be attracted suddenly and unexpectedly to the magnet potentially pinning an arm etc. with enough force to cause severe injury.

Warning and Caution plates and decals on the magnet must not be removed or painted over. It is important that these warnings and cautions be legible and that they be followed. Note the magnetic field warning at the front of this document.



SAFETY DECAL LOCATIONS - MANUAL CLEANING MODELS



SAFETY DECAL LOCATIONS - SELF-CLEANING MODELS



General Description

Suspended electromagnets for hazardous locations are heavy duty DC powered separators designed for use over a moving bed of material from which iron is to be removed. Basically, they are box-shaped units with coils inside to generate a powerful magnetic field.

There are two basic types available: manual cleaning (U), and self-cleaning (USC). There are four sizes available in each type.

Manual Cleaning magnets are designed for use where small amounts of tramp iron are suspected. They are furnished with turnbuckles for suspension from four built-in suspension lugs. With Manual Cleaning magnets it is necessary to shut off the power periodically to discharge the accumulated tramp iron. Manual Cleaning Units may be installed over the head pulley or over the conveyor.

Self-Cleaning magnets consist of a Manual Cleaning unit with a short belt conveyor built around it to provide automatic discharge of tramp iron. These magnets, furnished with turnbuckles for four-point suspension, can also be used over the head pulley or over the conveyor.

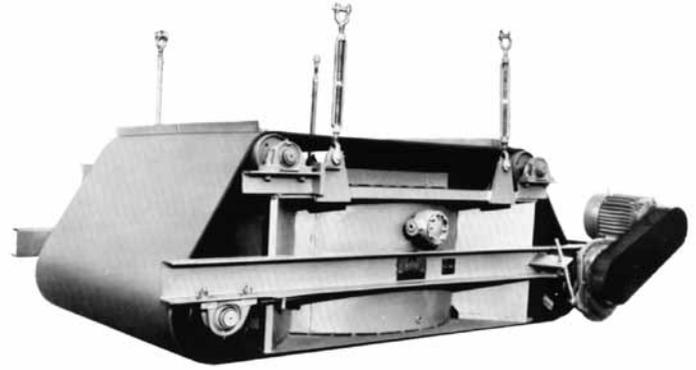


FIGURE 1
Typical air-cooled self-cleaning
suspended electromagnet



FIGURE 2
Typical manual cleaning
suspended electromagnet

Installation

GENERAL

Use care in uncrating to avoid damage to the equipment.

Be sure the magnet is oriented properly and that the load is evenly distributed among the four hangers.

IMPORTANT: Check the area upstream, downstream, on the sides and underneath the magnet for carbon steel or other ferrous metals. Specifically look for carbon steel conveyor belt idlers, slider beds, side frames or any other metals in the area. All carbon steel or ferrous metals within the magnetic field of the magnet (up to 3-feet or possibly more for larger size magnets) will become induced or “magnetized” and will reduce the separation efficiency of the suspended electromagnet. For this reason, replace all carbon steel or other ferrous metals with 304 or 316 stainless steel, aluminum, plastic, wood or other non-magnetic materials in the area of the magnet for the best magnetic separation efficiency.

⚠ CAUTION

The self-cleaning magnet has moving parts that could be hazardous to personnel. For this reason the unit should be located in an area not easily accessible to personnel or if it is not possible or practical, then guarded in accord with OSHA requirements to prevent unintentional contact of personnel with moving parts.

MAGNET POSITIONS

Position 1 (in-Line)

The preferred installation of a suspended magnet is over the trajectory of material discharged from the belt conveyor. This is referred to as POSITION 1 (see Figs. 3 and 4).

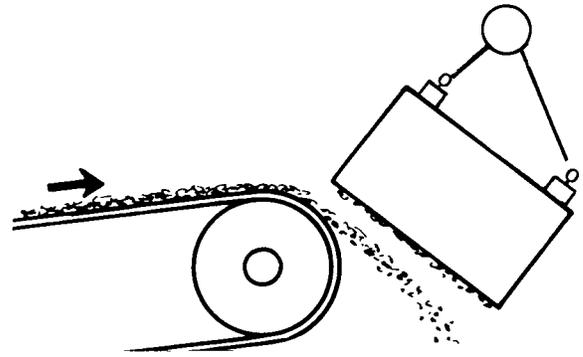


FIGURE 3
Manual Cleaning Position 1

For optimum separation in Position 1 installations, provision must be made to adjust the location of the magnet to suit the trajectory of the material.

For Position 1 installations with conveyor belt speeds of less than 350 fpm (107 m/min), greater separation will be achieved by using a nonmagnetic head pulley.

If a Self-Cleaning unit is being installed, examine the area to make sure that the self-cleaning belt around the separator has adequate room to run properly and that provisions have been made to collect the discharged tramp iron. A hinged non-magnetic splitter, adjustable in length, will be required to prevent extracted tramp iron from reentering the product.

Position the magnet so that the face of the belt is approximately 2" (50 mm) from the trajectory of the material being discharged. The centerline of the magnet should be approximately perpendicular to the material at that point.

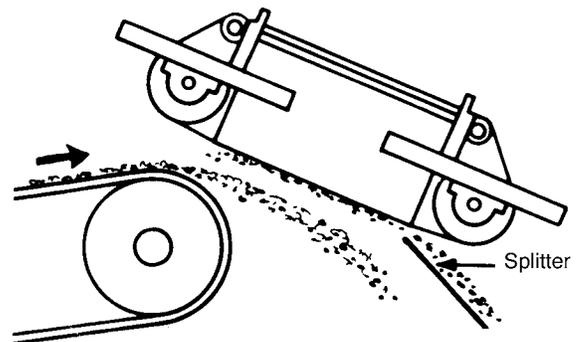


FIGURE 4
Self-Cleaning Position 1

Position 2 (Cross-belt)

Installation of the separator over the moving bed of material at right angles to the conveyor is referred to as POSITION 2 (see Figs. 5 and 6). This location normally presents a more difficult separation problem than Position 1 and usually requires a stronger magnet.

Installation (continued)

For Position 2 installations, steel conveyor idlers cannot be used in the length of the conveyor beneath the separator as they will become “magnetized” and reduce the separation efficiency of the magnet. Any conveyor idlers beneath the separator must be made of rubber, wood, or some other non-magnetic material.

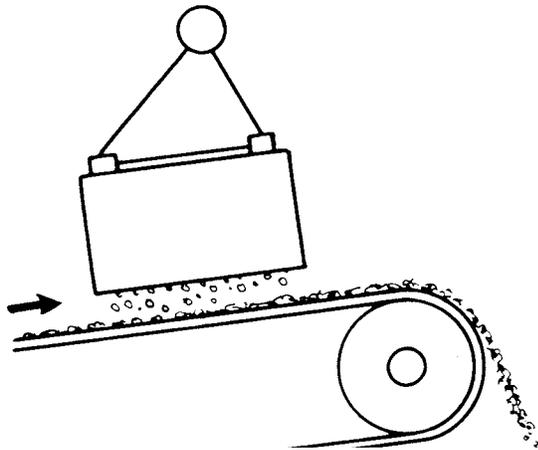


FIGURE 5
Manual Cleaning Position 2

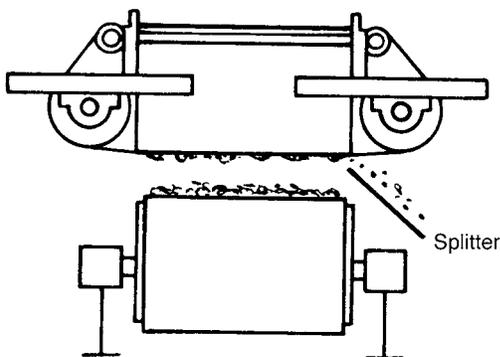


FIGURE 6
Self-Cleaning Position 2

Both the Manual Cleaning and the Self-Cleaning units should be installed on the centerline of the material conveyor and parallel to the slope of the conveyor.

MAGNETS WITH PERMANENT MAGNET EXTENSIONS

The belt should just touch one outer corner of the large magnet and one outer corner of the permanent magnet extension. See Fig. 7 and Page 10. The amount of sag in the middle of the magnet will vary. A sag of 1 to 2 inches (25 to 50 mm) may be seen on small units and 2 to 3 inches (50 to 75 mm) of sag on large units.

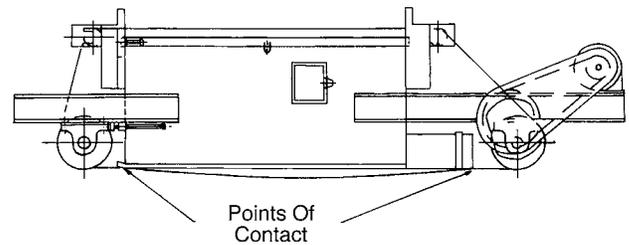
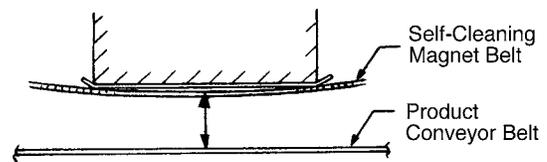


FIGURE 7

SUSPENSION HEIGHT

Each size magnet is designed for a specific suspension height. This distance (see sketch) is measured from the magnet face to the product conveyor belt.



Specified suspension height should be considered a maximum and the magnet should be lowered as close to the actual burden as possible. When lowering the magnet to the burden, be sure that plowing does not occur. If the unit is a Self-Cleaning magnet, make sure that the separator belt has room to operate and discharge tramp iron properly. A clearance of 3" (75 mm) between the magnet or belt and the top of the burden should be maintained for Self-Cleaning units; this clearance can be reduced to 2" (50 mm) for Manual Cleaning units.

BURDEN DEPTH

The best separator performance is achieved by controlling the burden depth. A plow or leveler positioned above the conveyor and **before** the magnet will help level high spots or surges in Position 2 installations. For Position 1 installations, the recommended installation location is calculated on expected tonnage. Any variation from this rate changes the trajectory of the burden with respect to the working surface of the magnet and may result in poor separation.

Installation (continued)

GUIDELINES FOR MAGNET INSTALLATION

Generally, sufficient application data is available so that we can prepare an installation drawing which will show the magnet location that will provide optimum tramp iron removal. However, for those instances where there is not enough information to permit preparation of a drawing, the guidelines that follow should be helpful. Observing these guidelines will not necessarily result in an ideal magnet location but as you approximate these conditions more closely, performance will be improved. **It is important to provide for adjustment of the magnet position so optimum results can be obtained under actual operating conditions.**

Position 1 mounting - magnet over the conveyor head pulley.

Determine where the highest point of the material trajectory occurs and position the magnet so that the face is 2" (50 mm) for a manual cleaning magnet and 3" (75 mm) if unit is self-cleaning type, above material and the magnet center line passes through the high point of the trajectory. See Figure 8.

Note: The normal magnet angle with respect to a horizontal plane will be in the range of 15-25°. As belt speeds increase, installation angles tend to decrease.

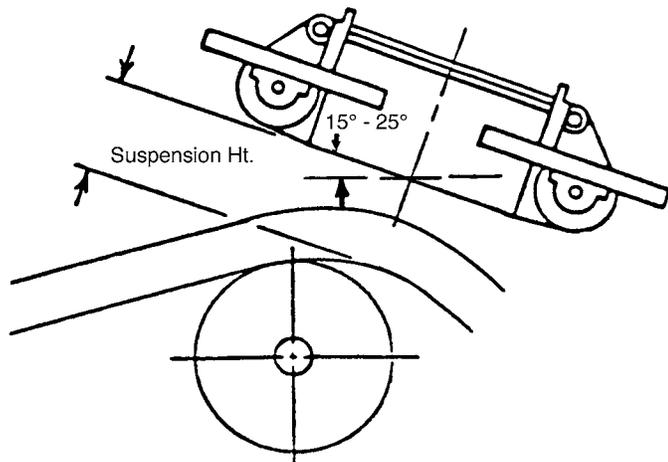


FIGURE 8

In cases where belt speeds are slower (usually 350 fpm (107 m/minute) or less) the material trajectory will not rise higher than the top of the pulley but, rather, will follow around the periphery of the pulley and “fall-off” the downstream side. For this condition, the magnet centerline should pass through the center of the pulley.

Note: **A head pulley of non-magnetic material (series 300 stainless steel) is required to avoid magnetic inducement that would be present with a mild steel pulley.** See Figure 9.

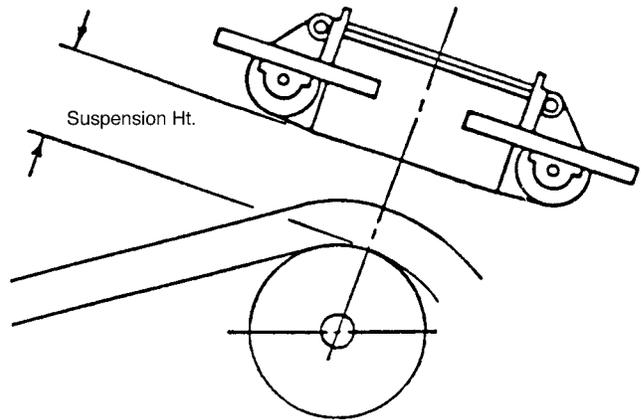


FIGURE 9

Installation (continued)

Position 2 mounting - magnet across the conveyor belt.

Position the magnet so that it is centered over the width of the conveyor and the face (bottom) is parallel to the slope of the conveyor.

When a self-cleaning magnet is installed over a troughed conveyor belt, the magnet must be high enough so that a piece of iron on the magnet belt will clear the edge of the conveyor belt. However, caution must be exercised so that the rated suspension height of the magnet is not exceeded. See Figure 10.

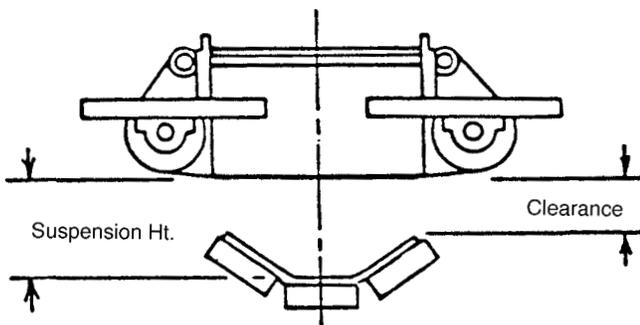


FIGURE 10

WIRING

Wiring for Eriez electromagnets is very simple (see Figure 11). Connect the two DC leads from the DC power source to the two terminal posts in the magnet outlet box, using suitable insulated or taped pressure type copper or al-cu connectors. If and as required, an equipment grounding conductor may also be brought in and terminated at the green ground screw.

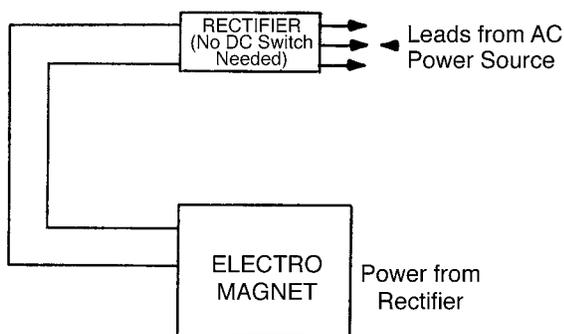


FIGURE 11

Note: Either wire from the rectifier can be connected to either wire in the outlet box, unless indicated on the magnet.

Do not break DC side of rectifier with switch or fuses. Magnet energy must have a decay path either thru the bridge rectifier or a free wheeling diode connected across the coil in a blocking direction. Consult Eriez Engineering Department for further information.

All wiring must be done strictly in accordance with applicable code requirements for the specific location.

For self-cleaning units, follow the motor manufacturer's instructions packed with the shipment for motor connection, operation and maintenance, and see Figure 12 for other instructions concerning motor control. The speed-responsive (zero-speed) switch, a safety device supplied as an integral part of the unit, must be used as indicated in Figure 12. Other motor control devices (starter, disconnect or breaker, pilot devices such as push-button stations, etc.) are ordinarily supplied by the customer and installed in suitable locations. Note that the manual reset type of motor starter must be used in order to comply with the conditions of use of this unit in hazardous locations. Any such auxiliary equipment must be of a type approved for the specific location and installed in accordance with electrical codes that apply.

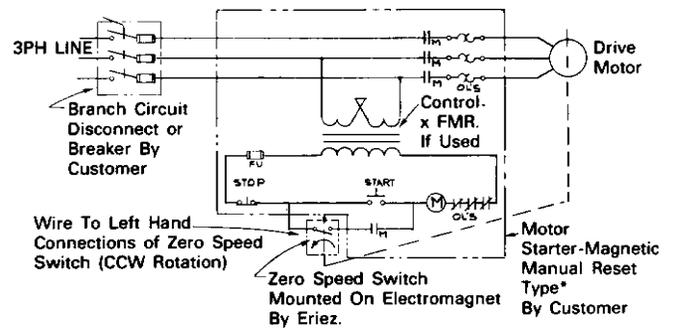


FIGURE 12

Operation

The preceding circuit is typical only and may be modified to suit other control requirements as long as the intent of the circuit is not changed, that is, that the motor starter will drop out if the belt speed falls below one-half (± 10 rpm) of operating speed.

The zero speed switch is factory set and sealed for this condition, and must not be altered if the integrity of the system in hazardous locations is to be maintained.

Note: The Manual reset overload protection type of motor starter is the only type that will comply with the conditions of use in hazardous locations.

START-UP OF SELF-CLEANING UNITS

1. Be sure the frame is visibly square and has not been damaged or twisted.
2. After installation, momentarily close the AC switch to the belt drive to determine if the belt is running in the right direction. The bottom of the belt should be running toward the motor. Also check to see if the belt tends to wander and, if so, in which direction.

3. Belt Adjustment

(a) The smaller Suspended Electromagnets utilize a two-pulley design. The tail pulley has approximately 6" (150 mm) of take-up available for both belt stretch and tracking purposes. To track the belt, the tail pulley should be moved in a direction to tighten the belt on the side to which the belt wanders.

(b) The larger magnets have a four-pulley design and have two take-up adjustments. The bottom tail pulley is initially used to take up the slack (adjust both sides evenly). Tracking is achieved by adjusting the small pulley located on the same end so that the belt is tightened on the side to which it wanders.

Note: Never start the belt drive and allow it to run continuously until the belt is properly trained.



Maintenance

MANUAL CLEANING MODELS:

No maintenance other than periodic removal of tramp iron is required for air-cooled Manual Cleaning units.

SELF-CLEANING MODELS:

CAUTION

These magnets operate with a surface temperature approximately 80°C above ambient. This is approximately 200°F and will be hot to the touch.

1. Lubricate bearings on a schedule consistent with other equipment in use with your product and environment. An NGL1 No. 2 lithium-base grease is recommended.
2. Check V-belt tension frequently. Adjust by tightening the reducer torque arm as required.
3. For motor and reducer maintenance, refer to the manufacturer's instruction sheets packed with the shipment.
4. If the separator is to be installed inside a fabricated enclosure, provisions must be made to maintain and adjust moving parts as required.
5. After initial run in, check all fasteners for proper tightness. Refer to Torque Table on Page 15.
6. After 250 hours of running check pulley hubs and tighten set screws to 17 lb. ft. (23 Nm) torque.
7. Proper adjustment for belt tension and tracking is vital to trouble free operation of the self-cleaning system, and should be checked frequently. To track these belts you should proceed in the following manner:

The smaller Suspended Electromagnets utilize a two-pulley design. The tail pulley has approximately 6" (150 mm) of take-up available for both belt stretch and tracking purposes. To track the belt, the tail pulley should be moved in a direction to tighten the belt on the side to which the belt wanders.

The larger magnets have a four-pulley design and have two take-up adjustments. The bottom tail pulley is initially used to take up the slack (adjust both sides evenly). Tracking is achieved by

adjusting the small pulley located on the same end so that the belt is tightened on the side to which it wanders.

8. Once the belt has been trained, further adjustment may be required to achieve proper tension. Excess tension applied in an effort to keep the belt flat against the face of the magnet can lead to pulley, shaft or bearing failure. It is normal for the belt to sag due to its own weight and this becomes more prevalent on the larger units. Efficient operation can be achieved without applying excess tension so the belt should be tightened only enough to prevent slipping on the pulleys when it is conveying iron off the face of the magnet. Usually a sag of up to 3" (75 mm) is not detrimental unless it interferes with material flow. See sketches below.

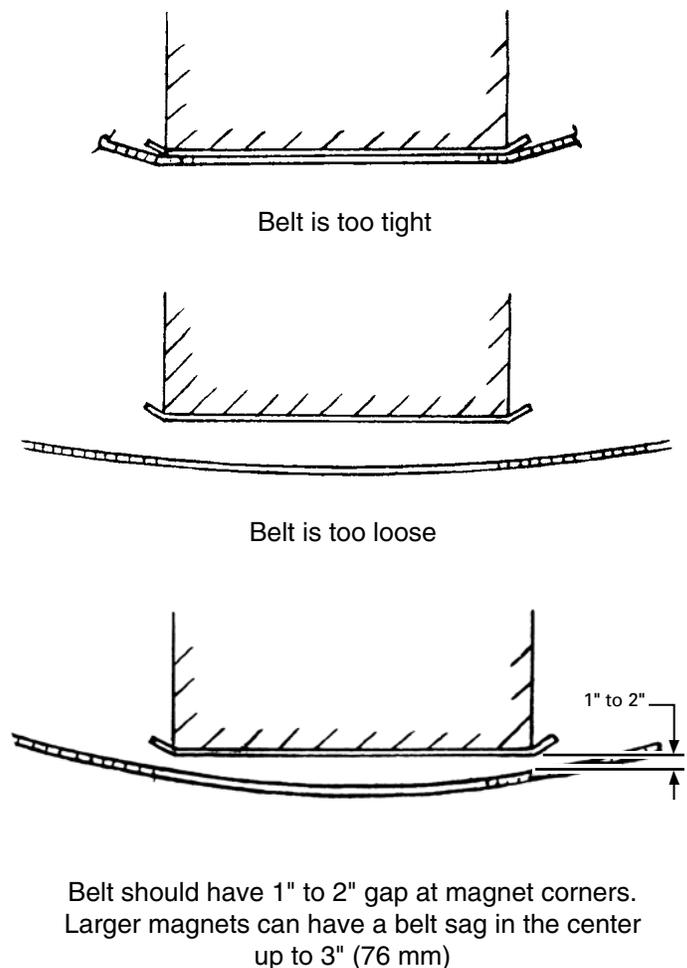
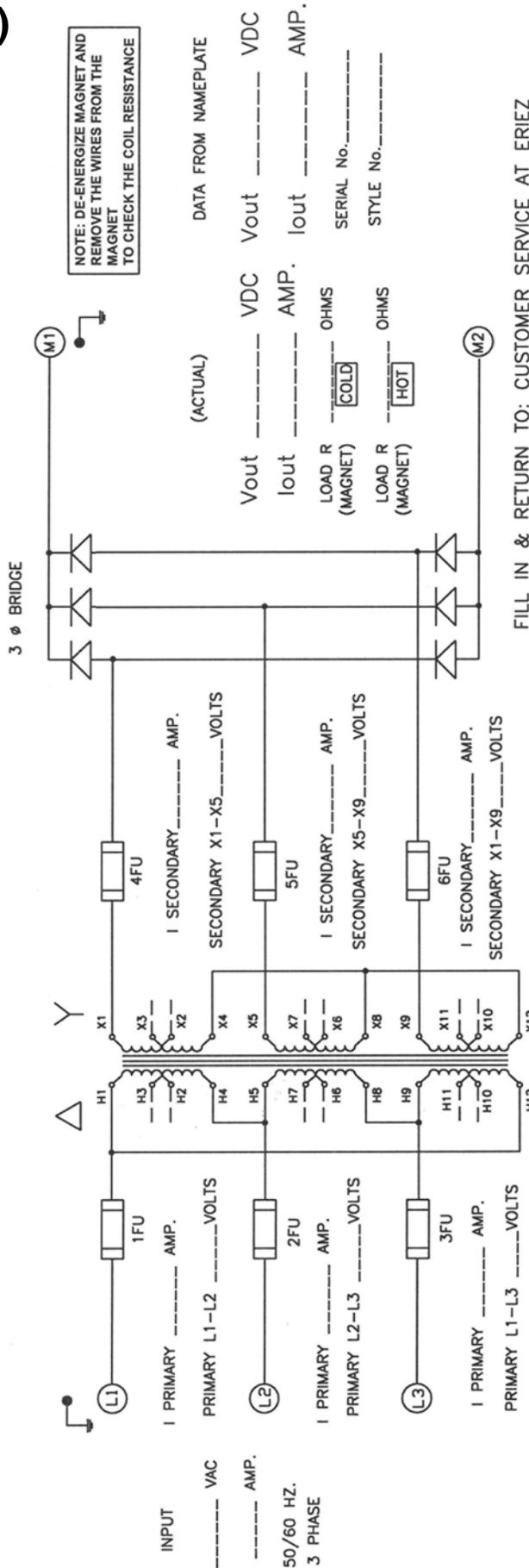


FIGURE 13



Maintenance (continued)



FILL IN & RETURN TO: CUSTOMER SERVICE AT ERIEZ

OUR FAX No. 814-838-4960

E-MAIL: service@eriez.com

YOUR FAX No. _____

E-MAIL: _____

NAME _____

RATING: EXAMPLE 10K42

10000 WATTS (DC) OUTPUT

4 = 460 VAC INPUT

2 = 230 VDC OUTPUT

Troubleshooting

GENERAL

On self-cleaning units, stop the belt before troubleshooting or performing checks and maintenance. Do not allow the belt to remain stationary for more than 30 minutes with the magnet energized; heat may damage the belt.

PROBLEM	PROBABLE CAUSE	SOLUTION
1. Magnet will not attract iron.	<ul style="list-style-type: none"> (a) Magnet is not turned on or the magnet voltage is low. (b) Magnet is not installed at the proper suspension height. (c) Parts not being attracted are non-magnetic. (d) Induced iron in the area of the magnet prohibits the extraction of tramp iron. (e) Magnet is overheated. (f) Magnet coils are grounded. (g) Magnet coil is shorted or open. 	<ul style="list-style-type: none"> (a) Check power switch and check DC voltage at magnet terminals; adjust as required. (b) Check location of magnet with respect to burden and confirm that it is within the recommended suspension height at the centerline of the magnet. (c) Check missed tramp iron with small permanent magnet to confirm that it is magnetic. (d) Check area around the separator with a small steel probe to see if the structure or conveyor components are themselves acting as a magnet and attracting iron. Replace with a non-magnetic material as required. (e) Check for proper DC voltage at the magnet terminals and check for proper current. Current should be approximately 30% lower than nameplate current. Correct voltage. Allow magnet to cool. (f) Take megohm reading between each magnet terminal and ground. 0.5 megohms should be minimum reading. (g) Check for rated current at rated voltage at magnet OR measure DC resistance of cold magnet. The resistance should equal the nameplate voltage divided by nameplate amperes.

Troubleshooting (continued)

GENERAL (continued)

PROBLEM	PROBABLE CAUSE	SOLUTION
3. Adjusting Suspension		<p>(a) Manual Cleaning units - prior to hanging magnet, loosen cable clamps, adjust cable length and tighten clamps.</p> <p>(b) Self-Cleaning units - adjust turnbuckle length by turning the turnbuckle body.</p>

ADJUSTMENT GUIDE FOR MANUAL CLEANING UNITS (All general items also apply)

PROBLEM	PROBABLE CAUSE	SOLUTION
1. Magnet will not attract iron.	<p>(a) Magnet face is overloaded with already-extracted iron.</p> <p>(b) Magnet set too far from burden.</p> <p>(c) Magnet set too close to burden.</p> <p>(d) Magnet not aligned with belt.</p>	<p>(a) Examine face of the magnet for build-up of excessive quantities of extracted tramp iron. Discharge more frequently as required.</p> <p>(b) Check for proper clearance between the magnet and burden. Adjust for proper gap.</p> <p>(c) Check for proper clearance between the magnet and the burden. If too close, material surges can occur and the surge may act as a wiper.</p> <p>(d) Position magnet with center above centerline of belt and edges parallel to edges of belt.</p>

ADJUSTMENT GUIDE FOR SELF-CLEANING UNITS

PROBLEM	PROBABLE CAUSE	SOLUTION
1. Tramp iron re-entering the product.	<p>(a) Not enough clearance for the iron to be discharged from the product magnet.</p> <p>(b) Splitter improperly positioned.</p>	<p>(a) For Self-Cleaning units in Position 2, check to see that enough clearance has been allowed between bottom of magnet and edge of conveyor belt for maximum sizes to be discharged. Adjust as necessary.</p> <p>(b) For Self-Cleaning units in Position 1, check splitter for proper location and clearance with respect to the magnet. Adjust splitter angle and length as required.</p>



Troubleshooting (continued)

BOLT TORQUE

BOLT SIZE	PLAIN		PLATED	
	Lb.-Ft.	Newton Meter	Lb.-Ft.	Newton Meter
1/4 -20	8	11	6	8
5/16 - 18	17	23	13	18
3/8-16	31	42	23	31
1/2 -13	76	103	57	77
5/8 - 11	150	203	112	152
3/4 - 10	266	361	200	271
7/8 - 9	430	583	322	437
1 - 8	644	873	483	655

These values apply to unlubricated Grade 5 bolts with flat or no washers under the head.



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