Operation and Maintenance Manual

Stand-Alone Conveyor

and Powering Kit

001009
Rev. A

Operation and Maintenance Manual

Stand-Alone Conveyor

and Powering Kit

U.S. and other patents pending.

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Use this page to record Service Bulletins and Notices that you receive to keep your manual updated.

Operation and Maintenance Manual
Stand-Alone Conveyor
and Powering Kit

Service Bulletin or Notice #	Dated	Title

Contents

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Safety (English)

For safety information in Spanish, refer to page page 17.

Safety Indicators

The following safety alert symbols and signal words are used throughout this document to indicate safety hazards. Please pay careful attention when you see them. The level of severity differs for each symbol or signal word. The definitions below can also be found in ANSI z535.4-2002.

Failure to comply with the instructions accompanying each safety alert symbol may result in property damage, personal injury, or even death. Personnel must follow all safety procedures and practices to ensure the safest possible operation of this equipment. However, at no time is this document a substitute for common sense. Personnel must ensure that the work environment is safe and free of distractions.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

When CAUTION is used ***with*** the safety alert symbol shown here, it indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

When CAUTION is used ***without*** the safety alert symbol shown here, it indicates a potentially hazardous situation which may result in equipment damage.

NOTICE

NOTICE

Calls attention to information that is significant to understanding the operation at hand.

ENVIRONMENTAL

ENVIRONMENTAL

Applies to conditions that may affect the environment but do not have an immediate, direct effect on personnel or equipment.

Safety Rules

Because it is impossible to anticipate every circumstance that might involve a hazard, the safety information provided in this equipment manual and on the machine is not all-inclusive. If this machine is operated or serviced using a procedure not specifically recommended by the manufacturer, the procedure shall be approved by a professional engineer to ensure it will not render the equipment unsafe. Use extreme caution and common sense at all times!

Know Your Equipment

- Read this manual completely before using or maintaining the equipment. Do not operate this machine unless you have a thorough knowledge of the controls, safety devices, emergency stops, and operating procedures outlined in this manual.
- Read and follow all safety notes. Failure to comply with these instructions may result in economic loss, property damage, and/or personal injury including death.
- Refer to the lockout/tagout guidelines on the following pages to safely perform maintenance and troubleshooting of this equipment.
- Observe and obey all safety labels. Replace worn labels immediately.
- Use this equipment solely for the purpose described in this manual.
- Only qualified personnel should attempt to operate or perform maintenance on this equipment. “Qualified personnel” is defined as:

> *...a person or persons who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training, or experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work—ANSI B30.2-1983*
>
> *...one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved—NEC 2002 Handbook*

Personal Safety

- Always wear safety glasses and hearing protection in an industrial environment.
- Utilize a filtering facepiece (dust mask) when working near sawdust.
- Wear proper clothing and appropriate personal protective equipment (e.g., safety glasses and hearing protection.) Do not wear loose clothing or jewelry. Confine long hair by tying it back.
- Use caution when lifting heavy parts or material.

Installing the Equipment

- Follow installation instructions completely.

Lockout/Tagout

- Before performing maintenance on the pneumatic or hydraulic systems, bleed the lines to eliminate pressure.
- Lockout/tagout all energized systems before performing maintenance on them. Refer to the *Lockout/Tagout Guidelines* section on page 12.

Keeping a Safe Environment

- Keep children away. All visitors should be kept a safe distance from the work area. Hazards may not be apparent to individuals unfamiliar with the machine.
- Keep work areas well lit.
- Keep the work area clean and free of any trip or slip hazards.
- Do not use the equipment in damp or wet locations, or expose it to rain or snow.

Operating and Maintaining the Equipment

- Ensure that all people, tools, and foreign objects are clear of the restricted zones before operating this equipment. The restricted zones are shown on page 16.
- Perform safety tests to ensure all E-stops are working properly before operating the equipment at the initial startup, after performing any maintenance, and in accordance with the maintenance schedule.
- In case of machine malfunction, stop the machine immediately using an E-stop and report the malfunction to a supervisor.
- Never leave the machine running unattended. Turn the power off! Do not leave the machine until all parts have come to a complete stop and all electrical power has been shut off.
- Check for worn or damaged parts regularly. Repair or replace them immediately.
- Keep the hydraulic, pneumatic, and electrical systems in good working order at all times. Repair leaks and loose connections immediately. Never exceed the recommended pressure or electrical power.
- Check that all safety devices are in working order before each shift starts. All protective guards and safety devices must be in place before and during use of the machine. Never disconnect or bypass any safety device or electrical interlock.
- Periodically inspect the quality of the finished product.

Electrical Safety

- Do not use any liquids in the interior of electrical cabinets.
- When using solvents on and around the machine, remove power to the machine to eliminate the chance of sparking, resulting in explosion or fire. Wear a respirator approved for use with solvents. Wear protective clothing, gloves, and safety glasses.

Lockout/Tagout

Lockout/Tagout Guidelines

All lockout/tagout guidelines must be met according to OSHA 29 CFR 1910.147. A specific procedure should be included in your company's energy control program. This manual is not intended to replace your company's de-energizing or lockout/tagout procedure required by OSHA, but merely to provide general guidance.

The term "lockout," as used in this manual, means placing a lockout device on any and all energy sources to ensure that the energy isolating device and the equipment being controlled cannot be re-energized or operated until the lockout device is removed. The photos on the next page show where the electrical disconnects are located for this machine.

- Energy sources include electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- In the case of electrical energy sources, the main power and control power to the machinery must be turned off and physically locked in the "off" position.
- A lockout device is usually a keyed padlock.
- If more than one person is working in a restricted zone, use a group lockout device that will allow each person to use a lock that can be removed only by the person performing the maintenance.

"Tagout" means that a prominent warning is securely fastened to an energy-isolating device to indicate that the equipment shall not be operated.

Electrical Lockout/Tagout Procedures

When Working on a Machine Outside the Machine's Main Electrical Enclosure

If working on the electrical transmission line to the machine, follow the procedure on page 15.

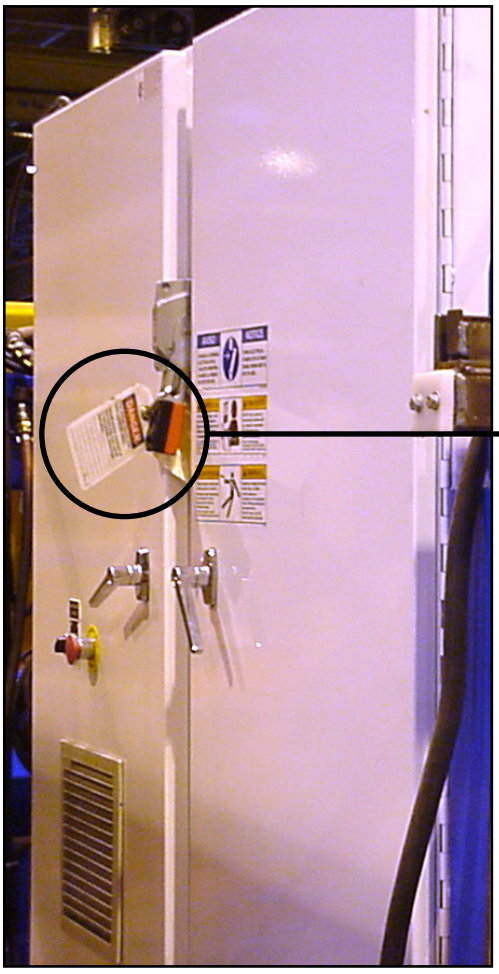
Before performing maintenance on any machine with electrical power, lockout/tagout the machine properly. When working on a machine outside of the machine's main electrical enclosure, not including work on the electrical transmission line to the machine, follow your company's approved lockout/tagout procedures which should include, but are not limited to the steps here.

1. Engage an E-stop on the machine.
2. Turn the disconnect switch handle to the "off" position. See Figure 6-1.

	WARNING
	**ELECTROCUTION HAZARD.** **When the disconnect switch is off, there is still live power within the disconnect switch's enclosure. Always turn off power at the building's power source to the equipment before opening this electrical enclosure!**

3. Attach a lock and tag that meet OSHA requirements for lockout/tagout.
4. Restrain or de-energize all pneumatic components, hydraulic components, and other parts that could have live or stored power.

Figure 6-1: Lockout/Tagout on the Main Electrical Enclosure



Sample of a Lock and Tag Attached to a Machine's Electrical Enclosure

When Working on a Machine Inside the Machine's Main Electrical Enclosure or in the Electrical Transmission Line to the Machine

Before opening the main electrical enclosure, or attempting to repair or replace an electrical transmission line to the machine, lockout/tagout the machine properly. Follow your company's approved lockout/tagout procedures which should include, but are not limited to the steps here.

1. Engage an E-stop on the machine.
2. Shut the power to the machine off at the machine's power source which is usually an electrical service entry panel on the facility wall. One example of a locked-out power source panel is shown in Figure 6-2.
3. Attach a lock and tag that meets OSHA requirements for lockout/tagout.
4. Open the door to the enclosure in which you need access, and using a multimeter, verify that the power is off.

Figure 6-2: Lockout/Tagout on the Power Source Panel

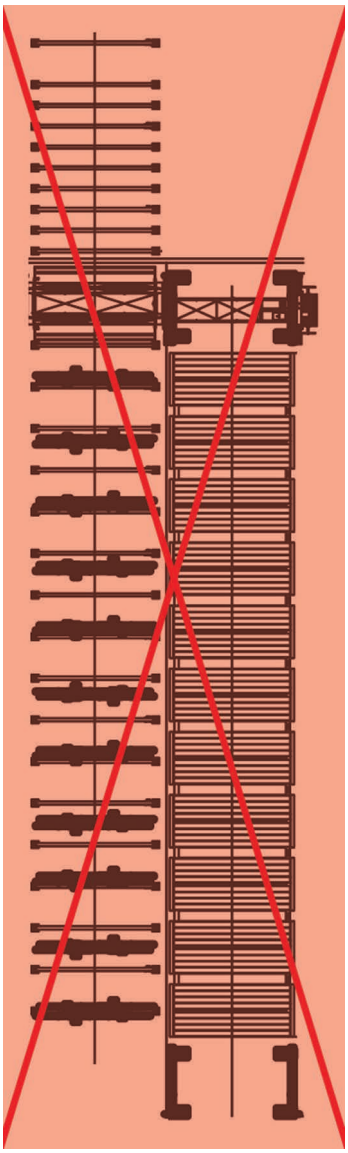
Troubleshooting With an Energized Machine

Only a qualified electrician, using the personal protective equipment and following the procedures recommended in NFPA 70E should ever attempt service or repair of or near an energized area or component of the machine.

Whenever maintenance is performed while the equipment is electrically energized, there is a potential electric arc flash hazard. Refer to NFPA 70E for the personal protective equipment required when working with electrically energized components. Pneumatic and hydraulic components may move unexpectedly if not de-energized. Physically restrain any components capable of movement when working on or near those components.

Restricted Zone

	DANGER
	Stay clear of the restricted zone when equipment is in use. Serious injury or death may result if personnel are in the restricted zone



Seguridad (Español)

Sea cuidadoso.

Protéjase.

Indicadores de seguridad

Los siguientes símbolos de alerta de seguridad y palabras de advertencia se utilizan a lo largo de este documento para indicar riesgos de seguridad. Preste suma atención cuando los vea. Cada símbolo o palabra indica un nivel de gravedad diferente. Las definiciones incluidas a continuación también pueden consultarse en la norma ANSI z535.4-2002.

El no cumplimiento de las instrucciones que acompañan a cada símbolo de alerta de seguridad puede producir daños a la propiedad, lesiones personales e incluso la muerte. El personal debe seguir todos los procedimientos y prácticas de seguridad establecidos para asegurar el uso más seguro posible de este equipo. No obstante, en ningún caso este documento reemplaza el sentido común. El personal debe asegurarse de que el entorno de trabajo sea seguro y esté libre de distracciones.

PELIGRO

Indica una situación de riesgo inminente que, si no se evita, producirá la muerte o lesiones graves.

ADVERTENCIA

Indica una situación potencialmente peligrosa que, si no se evita, podría producir la muerte o lesiones graves.

PRECAUCIÓN

Cuando la PRECAUCIÓN se utiliza ***con*** el símbolo de alerta de seguridad aquí ilustrado, indica una situación potencialmente peligrosa que, si no se evita, puede producir lesiones menores o moderadas.

Cuando PRECAUCIÓN se utiliza ***sin*** el símbolo de alerta de seguridad aquí ilustrado, indica una situación potencialmente peligrosa que podría producir daños al equipo.

AVISO

AVISO

Llama la atención a información importante para entender la operación que se desea realizar.

AMBIENTAL

AMBIENTAL

Se refiere a condiciones que pueden afectar el [illegible]pero que no tienen un efecto inmediato o directo sobre el personal o el equipo.

Reglas de seguridad

Debido a la imposibilidad de anticipar todas las circunstancias que podrían constituir un riesgo, la información de seguridad suministrada en este manual del equipo y sobre la máquina no es exhaustiva. Si se utiliza o realiza el mantenimiento de esta máquina utilizando un procedimiento no recomendado específicamente por el fabricante, el procedimiento deberá ser aprobado por un ingeniero profesional para asegurarse de que no afecte la seguridad del equipo. ¡Manéjese! siempre con suma precaución y sentido común!

Conozca su equipo

- Lea este manual en su totalidad antes de utilizar o mantener el equipo. No utilice esta máquina a menos que esté perfectamente familiarizado con los controles, los dispositivos de seguridad, los frenos de emergencia y los procedimientos operativos que se describen en este manual.
- Lea y siga todas las notas de seguridad. El no cumplimiento de estas instrucciones podría producir pérdidas económicas, daños a la propiedad y lesiones personales, incluida la muerte.
- Refiérase a las pautas de bloqueo/etiquetado proporcionadas en las siguientes páginas para realizar el mantenimiento y solucionar problemas de este equipo en forma segura.
- Observe y cumpla con todas las etiquetas de seguridad. Cambie las etiquetas gastadas inmediatamente.
- Utilice este equipo únicamente para el propósito que se describe en este manual.
- Sólo personal calificado debe intentar utilizar o realizar el mantenimiento de este equipo. Por "personal calificado" se entiende:

> *...una persona o personas que, por el hecho de poseer un título o certificado de capacitación profesional reconocido o que, por sus amplios conocimientos o experiencia, han demostrado con éxito estar capacitados para resolver problemas relacionados con el tema y el trabajo en cuestión —ANSI B30.2-1983*
>
> *...una persona que posee habilidades y conocimientos relacionados con la construcción y uso de equipos e instalaciones eléctricas y que ha recibido capacitación en seguridad sobre los riesgos posibles—NEC 2002 Handbook*

Seguridad personal

- Use siempre anteojos de seguridad y protección auditiva en un entorno industrial.
- Utilice una máscara protectora cuando trabaje cerca de aserrín.
- Utilice ropa adecuada y equipo de protección personal apropiado (por ejemplo, anteojos de seguridad y protección auditiva.) No use ropa suelta ni joyas. Si tiene el cabello largo, áteselo para atrás.
- Proceda con precaución cuando levante piezas o materiales pesados.

Instalación del equipo

- Siga las instrucciones de instalación al pie de la letra.

Procedimientos de Bloqueo/Etiquetado

- Antes de realizar el mantenimiento de los sistemas neumáticos o hidráulicos, purgue las líneas para eliminar la presión.
- Bloquee y etiquete todos los sistemas energizados antes de realizar tareas de mantenimiento en ellos. Refiérase a la sección *Pautas de bloqueo/etiquetado* en la página 22.

Cómo mantener un entorno seguro

- Mantenga alejados a los niños. Todos los visitantes deben mantenerse a una distancia segura del área de trabajo. Los riesgos pueden no ser evidentes a las personas no familiarizadas con la máquina.
- Mantenga las áreas de trabajo bien iluminadas.
- Mantenga el área de trabajo limpia y libre de cualquier riesgo de tropiezo o resbalamiento.
- No utilice el equipo en lugares húmedos o mojados y no lo exponga a la lluvia o a la nieve.

Uso y mantenimiento del equipo

- Asegúrese de que no haya personas, herramientas y objetos extraños en las zonas restringidas antes de utilizar este equipo. Las zonas restringidas se indican en la página 27.
- Realice pruebas de seguridad para verificar que todos los frenos de emergencia funcionen adecuadamente antes de utilizar el equipo por primera vez, después de realizar cualquier tarea de mantenimiento y según la frecuencia de mantenimiento establecida.
- En caso de que la máquina no funcione correctamente, deténgala inmediatamente utilizando un freno de emergencia e informe el problema a un supervisor.
- No deje nunca la máquina encendida si no está junto a ella. ¡Apáguela!. No abandone la máquina hasta que todas las piezas se detengan completamente y hasta que se haya apagado la alimentación eléctrica.
- Verifique periódicamente que no haya piezas gastadas o dañadas. Repárelas o cámbielas inmediatamente.
- Mantenga los sistemas hidráulicos, neumáticos y eléctricos en buen funcionamiento en todo momento. Repare las fugas y las conexiones sueltas inmediatamente. No exceda nunca la presión ni potencia eléctrica recomendadas.

- Verifique que todos los dispositivos de seguridad estén en buen funcionamiento al comienzo de cada turno. Todos los dispositivos protectores y de seguridad deben estar en su lugar antes y durante el uso de la máquina. No desconecte ni evite nunca ningún dispositivo de seguridad ni interbloqueo eléctrico.
- Inspeccione periódicamente la calidad del producto terminado.

Seguridad eléctrica

- No utilice líquidos en el interior de los gabinetes eléctricos.
- Cuando utilice disolventes sobre o alrededor de la máquina, desconecte la alimentación para eliminar las probabilidades de chispas, que pueden producir una explosión o incendio. Use un respirador aprobado para el uso con disolventes. Use ropa protectora, guantes y anteojos de seguridad.

Lockout/Tagout

Pautas de bloqueo/etiquetado

Deben cumplir con todas las pautas de bloqueo/etiquetado conforme a la norma OSHA 29 CFR 1910.147. El programa de control de energía de la compañía debe incluir un procedimiento específico. El objetivo de este manual no es reemplazar el procedimiento de desenergización o bloqueo/etiquetado requerido por la OSHA, sino proporcionar pautas orientativas generales.

El término "bloqueo", según se utiliza en este manual, se refiere a la colocación de un dispositivo de bloqueo en las fuentes de energía para asegurar que el dispositivo aislador de energía y el equipo controlado por éste no puedan reenergizarse o utilizarse hasta que se retire dicho dispositivo. Las fotos de la página siguiente muestran los lugares en los que se encuentran los interruptores de desconexión eléctrica de esta máquina.

- Las fuentes de energía incluyen energía eléctrica, mecánica, hidráulica, neumática, química, térmica y otras.
- En el caso de fuentes de energía eléctrica, la alimentación principal y la alimentación de control a la maquinaria deben apagarse y bloquearse físicamente en la posición "off" (apagado).
- Por lo general, como dispositivo de bloqueo se utiliza un candado con llave.
- Si hay más de una persona trabajando en una zona restringida, utilice un dispositivo de bloqueo grupal que permita a cada persona utilizar un candado que sólo pueda ser retirado por la persona que realiza el mantenimiento.

"Etiquetado" significa que debe colocarse una advertencia fácil de ver en un dispositivo aislador de energía que indique que el equipo no debe utilizarse.

Procedimientos de bloqueo/etiquetado eléctricos

Cuando trabaja en una máquina fuera del gabinete eléctrico principal de la máquina

Si trabaja en la línea de transmisión eléctrica a la máquina, siga el procedimiento de la página 25.

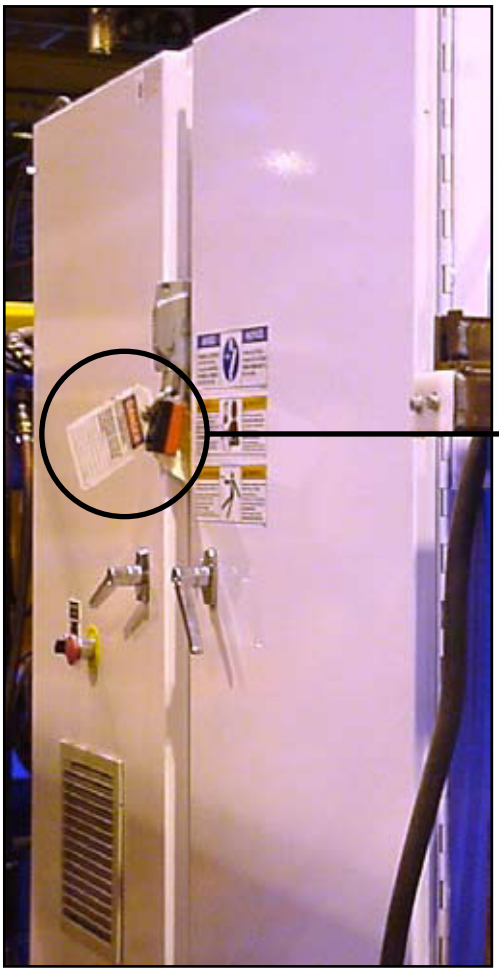
Antes de realizar el mantenimiento de cualquier máquina con alimentación eléctrica, bloquee y etiquete la máquina de forma adecuada. Cuando trabaje en una máquina fuera del gabinete eléctrico principal de la máquina, salvo en el caso de trabajos en la línea de transmisión eléctrica a la máquina, siga los procedimientos de bloqueo/etiquetado aprobados por la compañía, los cuales deberían incluir, entre otros, los pasos aquí indicados.

1. Coloque un freno de emergencia sobre la máquina.
2. Coloque el mango del interruptor con fusibles en la posición "apagado/apagada". Vea la figura 2-1.

	**RIESGO DE ELECTROCUCIÓN.** **Cuando el interruptor con fusibles está apagado, sigue habiendo energía dentro del gabinete del interruptor. ¡Apague siempre la alimentación en la fuente de alimentación del edificio antes de abrir este gabinete eléctrico!**

3. Coloque un candado y una etiqueta que cumplan con los requisitos de bloqueo/etiquetado de la OSHA.
4. Trabe o desenergice todos los componente neumáticos, componentes hidráulicos y otras piezas que tengan alimentación directa o almacenada.

Figura 7-1: Bloqueo/etiquetado en el gabinete eléctrico principall



Ejemplo de un candado y etiqueta fijados al gabinete eléctrico de una máquina

Cuando trabaje en una máquina dentro del gabinete eléctrico principal de la máquina o en la línea de transmisión eléctrica a la máquina

Antes de abrir el gabinete eléctrico principal o intentar reparar o reemplazar una línea de transmisión eléctrica a la máquina, bloquee y etiqueta la máquina en forma adecuada. Siga los procedimientos de bloqueo/etiquetado aprobados por la compañía, los cuales deberían incluir, entre otros, los pasos aquí indicados.

1. Coloque un freno de emergencia sobre la máquina.

2. Apague la alimentación a la máquina en la fuente de alimentación, que, por lo general, es un panel de entrada de suministro eléctrico que se encuentra en una pared de las instalaciones. En la figura 2-2 se muestra un ejemplo de panel de fuente de alimentación bloqueado.

3. Coloque un candado y una etiqueta que cumplan con los requisitos de bloqueo/etiquetado de la OSHA.

4. Abra la puerta del gabinete al que necesita acceder y usando un multímetro verifique que la alimentación esté apagada.

Figura 7-2: Bloqueo/Etiquetado del panel de fuente de alimentación

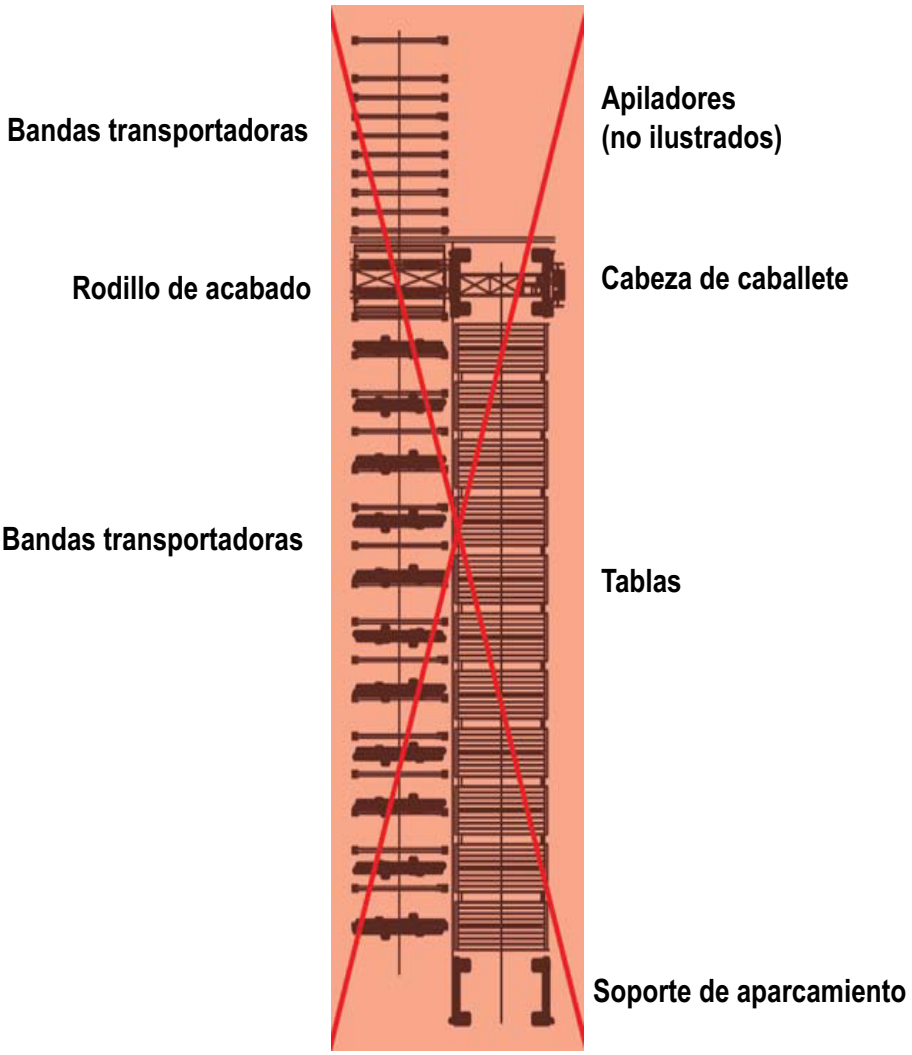
Solución de problemas con una máquina energizada

Sólo un electricista calificado que utilice el equipo de protección personal y siga los procedimientos recomendados en la norma NFPA 70E debe intentar realizar tareas de reparación o mantenimiento en un área o componente energizados de la máquina o en su proximidad.

Cada vez que se realizan tareas de mantenimiento mientras el equipo está eléctricamente energizado, existe un riesgo potencial de formación de un arco eléctrico. Consulte en la norma NFPA 70E el equipo de protección personal requerido para trabajar con componentes eléctricamente energizados. Los componentes neumáticos e hidráulicos pueden moverse de manera imprevista si no se desenergizan. Trabe físicamente cualquier componente que pueda moverse cuando deba trabajar en ellos o en su proximidad.

Zonas restringida

	Manténgase alejado de la zona restringida cuando el equipo esté en uso. Pueden producirse lesiones graves o incluso la muerte si el personal está en la zona restringida



General Information

Chapter 8

Purpose of Chapter

This chapter introduces you to this manual and provides an overview of your equipment and the means to identify it.

	DANGER
	**Read this manual completely before using this equipment!** **Do not operate this machine until you have a thorough understanding of all controls, safety devices, emergency stops, and operating procedures outlined in this manual.** **All warnings must be read and observed. Failure to do so may result in economic loss, property damage, personal injury and/or death.** **This manual must always be available to personnel operating and maintaining this equipment.**

Introduction to This Manual

Purpose of This Manual

This manual provides the information necessary to operate and maintain the stand-alone conveyor system and powering kit, which is designed to mechanically power the stand-alone conveyor.

In order for this manual to be useful, it must be kept with the machine so the operators and maintenance personnel have easy access to it. You can order the most recent revision of this manual by referring to the part number 001009. If you require a previous revision, talk to a Customer Service Technician.

Most questions that will arise about maintenance, troubleshooting, and part numbers are answered in this manual. If you cannot locate the answer or solution, contact the MiTek Machinery Division Customer Service Department using the contact information in Figure 8-1.

Figure 8-1: Contacting MiTek

MiTek Machinery Division
Customer Service Department
301 Fountain Lakes Industrial Drive
St. Charles, MO 63301

Parts Orders (with part number)
E-mail: mitekparts@mii.com

Technical Assistance
Phone: 800-523-3380
Fax: 636-328-9218
machinerysupport@mii.com

Web Site
www.mitek-us.com

Using This Manual

Review the table of contents to understand the organization and content of the chapters and appendices. The glossary and index are also valuable tools that will help you get the most out of your equipment.

Introduction to This Equipment

Purpose of the Equipment

The function of the stand-alone conveyor system is to transfer trusses to and from the Finish Roller press. The powering kit is designed to mechanically power the stand-alone conveyor.

Overview of the Equipment

The stand-alone conveyor system consists of rollers, support legs, and powering kits. The components of a stand-alone conveyor can be seen in Figure 8-2. Figure 8-3 shows the location of the powering kit system.

Figure 8-2: Stand-Alone Conveyor Main Components

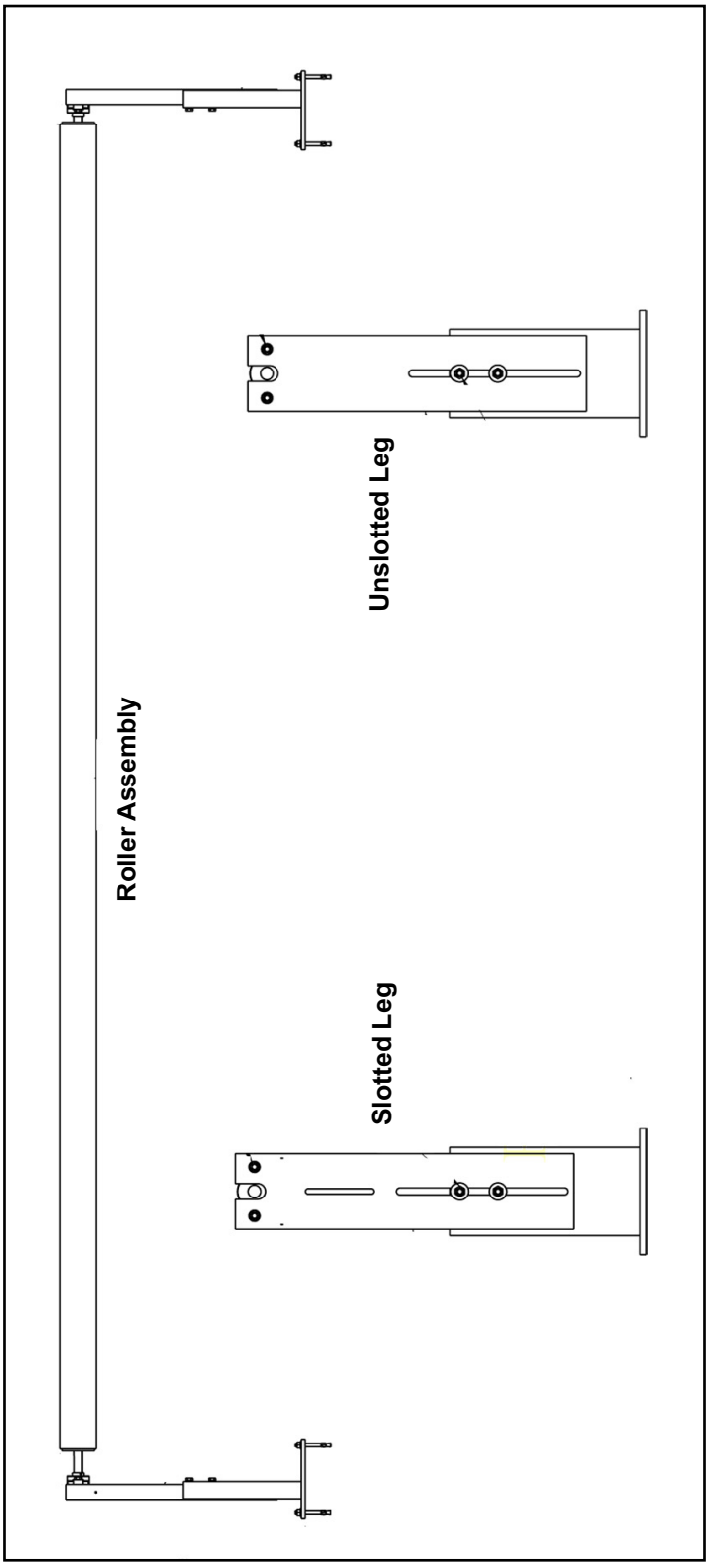
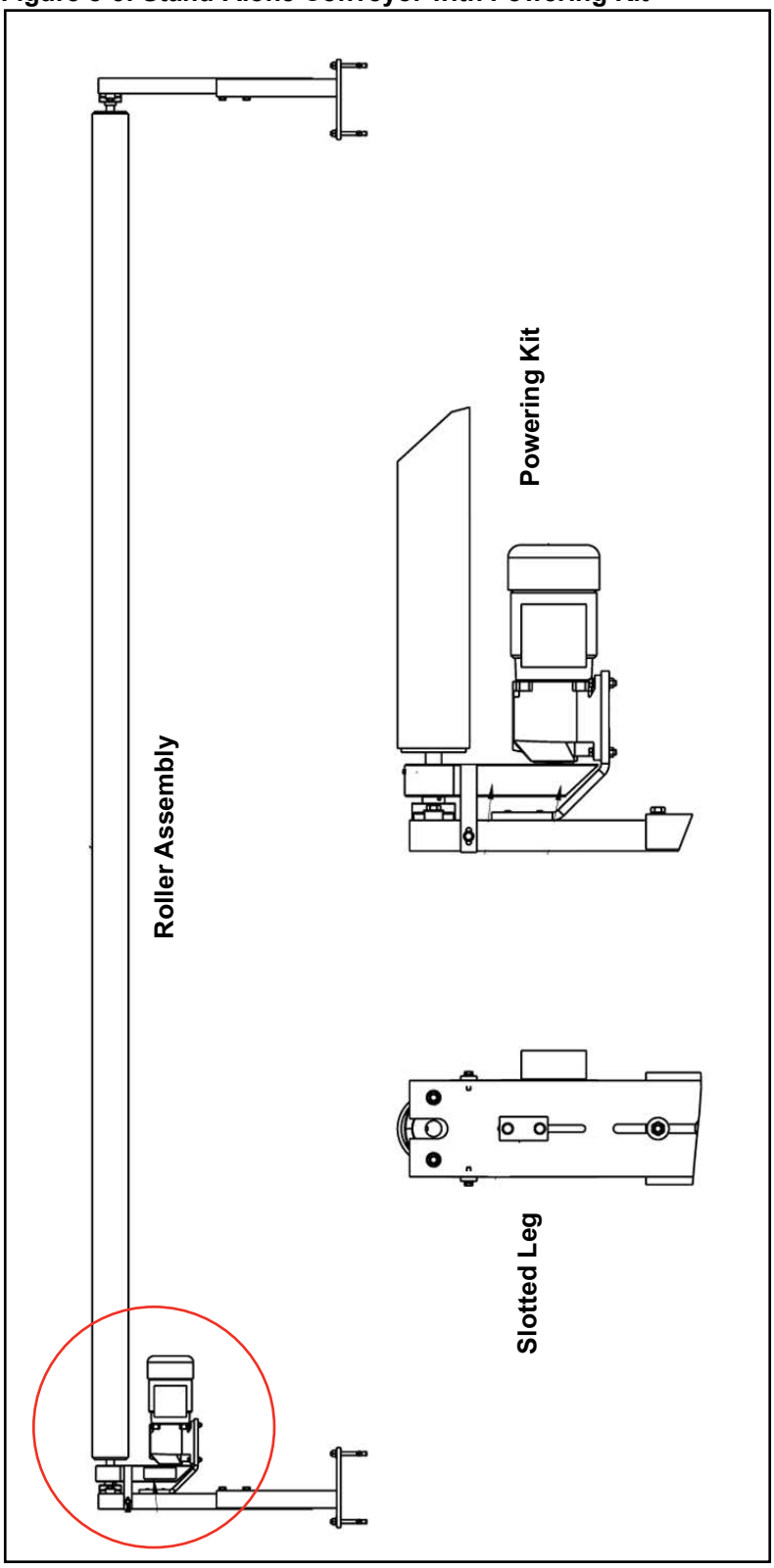


Figure 8-3: Stand-Alone Conveyor with Powering Kit



General Specifications

Table 8-1: Stand-Alone Conveyor General Specifications

Stand-Alone Conveyor Specifications	
Roller diameter	4-1/2" outside diameter
Distance between rollers	60" on center, standard - any option available
Standard conveyor setup	Every other roller is powered
Drive system	1/2 hp V-belt drive system - optional

Table 8-2: Powering Kit Specifications

Motors - Electric	
Horsepower rating	1/2 hp
Motor speed	1425 rpm
Starting switch	120V pushbutton, standard
Voltage	208/230/460 VAC
Motor FLA	2.4/2.2/1
Control amps	.5/.4/.3
Cycles	60 Hz
Phases	3
Frame	56C
Gearbox	
Ratio	20:1
Rpm input	1750
Rpm output	87
Torque output	325
Hp maximum	.51

Standard motors are furnished unless otherwise specified by customer. Nonstandard motors are subject to additional cost.

Prior to Installation

Chapter 9

Purpose of Chapter

This chapter covers what you must consider or complete before this equipment can be installed.

MiTek's Responsibilities

Prior to Installation

MiTek will provide the following items and information prior to the installation date:

1. A Prior to Installation package that:
   - Outlines this chapter and requests your signature of agreement.
   - Gives dates to expect shipment, delivery, and installation.
   - Explains the number of people required to help with installation.
   - Provides guidelines on providing an electrician, welder, and other specialists.
   - Describes payment information.
2. A layout of the equipment.

During Installation

A MiTek Customer Service Technician (CST) may be present to manage the installation of your equipment.

Customer's Responsibilities

Before the installation of your equipment, the items and procedures in this chapter must be arranged, purchased, or assembled. Table 9-1 provides an overview of these items. Each topic listed in the table is explained in detail in the text following the table.

If these requirements are not satisfied before the scheduled installation date, it may be necessary to reschedule the installation. Any additional cost may be the customer's responsibility.

Table 9-1: Summary of the Customer's Responsibility

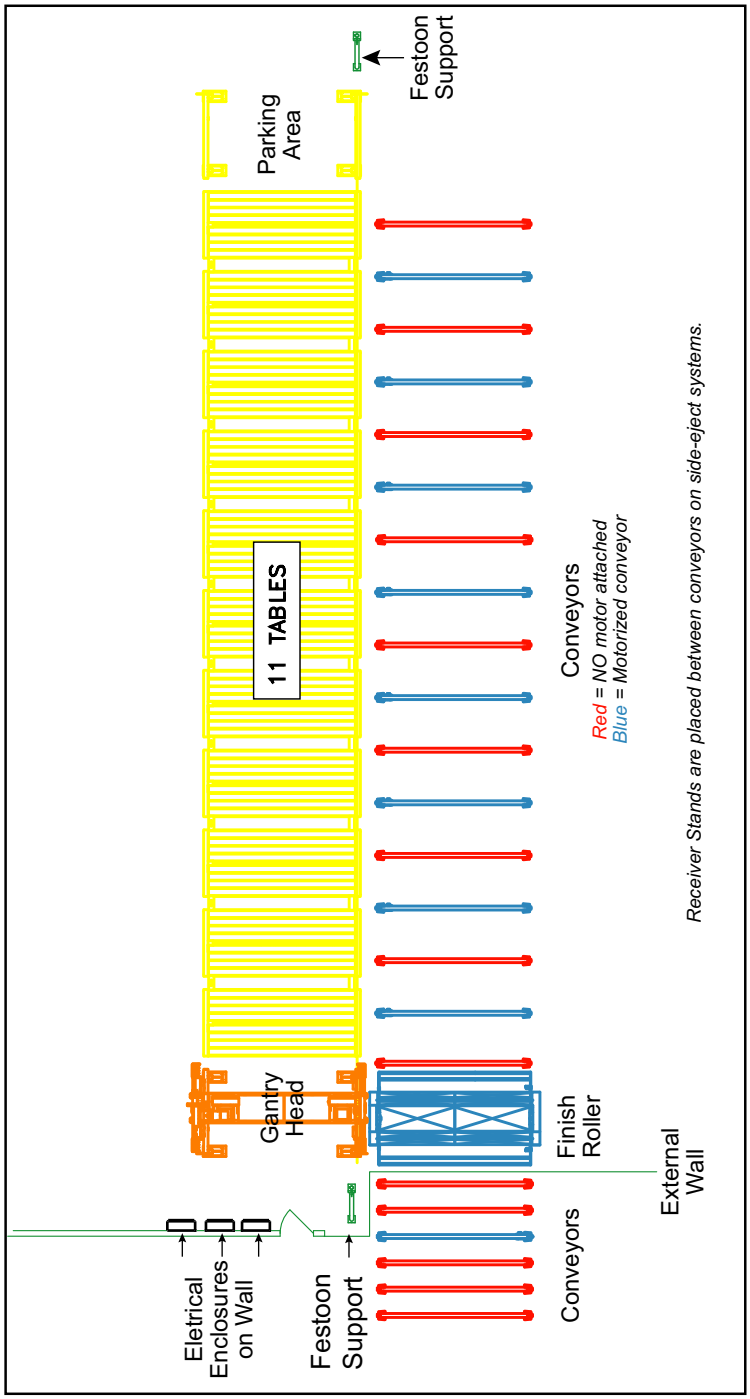
Space Requirements	This equipment requires enough space to allow for the machine dimensions listed on your layout, plus additional working space for operation and maintenance. Space should have adequate lighting.
Location Requirements	Concrete, a minimum of 6 in. thick 5000 psi, is required under the weight of the stand-alone conveyors. The equipment discussed in this manual must be used in dry conditions under a roofed area according to Type 1 electrical enclosure requirements.
Electrical Requirements	The standard electrical requirements are shown in Table 9-2. Contact your MiTek representative immediately if custom power specifications need to be arranged.
Shipping Weights	See Table 9-3.
Customer-Supplied Items Required	The customer is responsible for having the supplies listed in Table 9-4 available at the time of installation.

Careful attention to and execution of each item will prevent delays and ensure a proper installation.

Space Requirements

Refer to your individual layout when planning your space allocation. MiTek can provide help with plant layout and space utilization upon request.

Figure 9-1: Sample Layout for a Complete System



Space for the Equipment

It is the customer's responsibility to provide adequate space for the installation, operation, and protection of the equipment. The dimensions of a stand-alone conveyor are 9" x 178" (.75' x 14'-10").

Space for Operation and Maintenance

Additional space must be allocated for operation and maintenance (an additional 1 ft on all four sides of the stand-alone conveyor system). Operation space should provide safety, freedom of movement, free flow of finished materials, and ease in handling and shipping.

MiTek can provide help to the customer in plant layout and space utilization, if requested.

Location Requirements

Floor Structure

Concrete should be a minimum of 6 in. thick under the stand-alone conveyors and Finish Roller. Five thousand (5,000) psi concrete is recommended. Refer to your layout drawing.

A level and structurally proper concrete slab must be provided for the installation of the stand-alone conveyor. The conveyor footing can be a "sidewalk"-style footing 14" to 18" wide x 8" to 12" deep. This combination will allow easy conveyor centerline spacing at the time of installation and future modifications. For anchoring purposes, this slab should be designed and installed in accordance with local building code requirements and, if required, under supervision of a local professional engineer.

Consult your individual layout for exact dimensions of your system.

Environment

The press head, ejectors, receivers, and tables must be used in dry conditions under a roofed area according to Type 1 electrical enclosure requirements. The stand-alone conveyors may be used outdoors.

Lighting should be adequate for safe operation and maintenance.

Mechanical Requirements

The stand-alone conveyors will be supplied complete with all mechanical components. A stand-alone conveyor is an independent stand-alone unit that requires simple assembly and anchoring in place. All fasteners and anchor bolts will be supplied by MiTek.

Electrical Requirements

The standard electrical requirements are shown in Table 9-2. Each machine can be designed for any of the incoming voltages listed.

Table 9-2: Electrical Requirements Prior to Installation

Horsepower	Varies based on number of powered rollers.
Voltage	208/230/460 VAC
FLA Plus Control Amperage	Varies based on number of powered rollers.
Equipment Disconnect Protection	Varies based on number of powered rollers.
Cycles (Frequency)	60 Hz
Phases	3

Shipping Information

When the equipment arrives, you must have the proper transport and lifting equipment available to remove it from the truck and place it in your facility. Table 9-3 lists the weight of the individual components of a typical *s*ystem.

	DANGER
	**Transport and lifting equipment such as forklifts and cranes must be designed and rated for the load and application. The weight of each major component is given in Table 9-3.** **Inadequate transport equipment may result in property damage, personal injury, or death.**

Table 9-3: Shipping Information

Contents of Shipment	Approximate Weight
Conveyor roller	125 lb
Conveyor leg	50 lb each

Customer-Supplied Parts

The customer must supply the parts shown in Table 9-4. Some must be installed before installation occurs and some must be available for use at the time of installation.

Table 9-4: Customer-Supplied Parts

Item	Description	
Electrical Equipment	All electrical requirements to provide power to the disconnect enclosure on the conveyors are the customer's responsibility	
Transport Equipment	A heavy-duty forklift or truck wrecker is required to move the equipment during unloading and placement of the machine. All transport and lifting equipment must meet the requirements given in the *Shipping Information* section	
Tools That May Need to be Rented	Transit with measuring stick Industrial hammer-drill	Hydraulic jack Welding equipment and welder
General Tools	Standard socket set Ratchet 3/4" wrench 3/4" deep well socket	Allen wrench set Chalk line Steel tape measure Emery cloth

Training Provided

In the case where MiTek is overseeing the installation of your equipment, the MiTek representative will ensure that your operators and maintenance personnel understand how to operate and maintain this equipment. They will explain warranty information and ensure that the Operation and Maintenance Manual is present.

Purpose of Chapter

The purpose of the Installation chapter is to describe the entire installation process in detail. The instructions assume that the prior-to-installation requirements are satisfied.

Responsibilities During Installation

MiTek will provide installation supervision to ensure that the system is installed properly and operates correctly. We will also provide operating and maintenance training at the time the equipment is installed.The customer is responsible for providing all labor and equipment needed to complete the installation. These requirements are explained in the *Prior to Installation* chapter.

Delivery

Unloading

Refer to the *Prior to Installation* chapter for information regarding preparing for the delivery.

Even if a MiTek representative is present, it is the customer's responsibility to provide equipment and labor for:

- Unloading, unpacking, and placement of the stand-alone conveyors. Weight should be supported on the bottom of the roller. A small forklift will be required to move the conveyor.
- Unloading, unpacking, and installing the powering kit. Weight should be supported on the bottom of the drive base.

Exercise extreme caution to avoid damage or misalignment during unloading. Do not apply pressure on any moving parts or fittings.

Component weights are listed in Table 9-3 in the *Prior to Installation* chapter.

	DANGER
	**Transport and lifting equipment such as forklifts and cranes must be designed and rated for the load and application. The weight of each major component is given in Table 9-3.** **Lift the equipment only at the lift points indicated by MiTek!** **If the equipment is transported incorrectly, equipment damage, personal injury, or death may result.**

Unpacking

After successful unloading, remove the protective crating material from the pallets. Detach and set aside all loose parts. Move the equipment to the desired location using a forklift or crane appropriate to the weight of each unit. Lift the equipment to remove the pallet, and gently place each unit in its new location.

Assembly

Assembly and installation of the complete stand-alone conveyor and of the powering kit can be supervised by a skilled MiTek representative, who can supervise layout, dimensioning, aligning, leveling, connecting, assembling, and complete installation of the units. A MiTek representative can also make pre-operational checks and final adjustments as needed, and instruct personnel in the proper operation and maintenance of the equipment.

MiTek recognizes that this installation is disruptive of the customer's normal output schedule by the requisition of personnel and the normal curiosity of other employees that are not involved. For this reason, we request the most efficient people for this assignment. These people will do their work quickly, efficiently, and with the quality that the customer deserves. The end result is a fine system that will operate with a minimum of problems and yield the highest profit per hour of usage.

Forklift

One small forklift is required for moving the components/assemblies. An operator will be required for unloading and moving the components/ assemblies to the installation site.

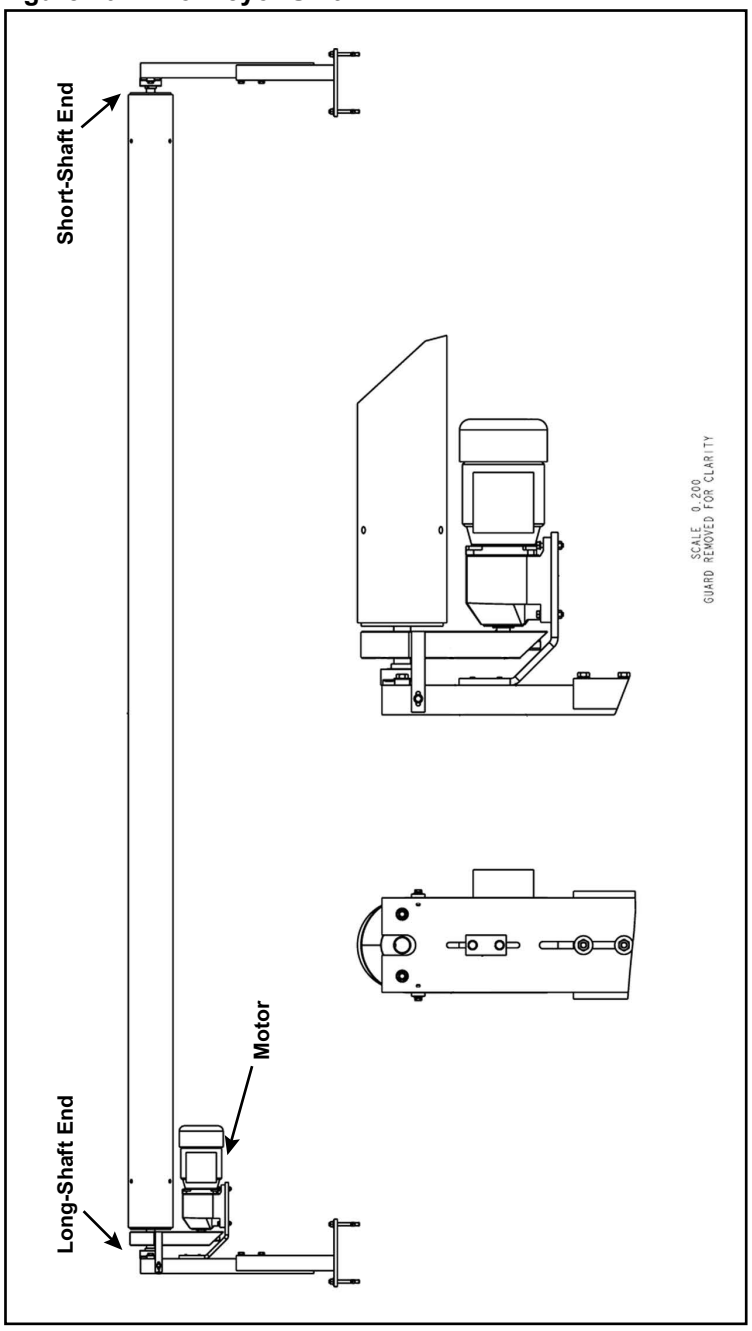
If there are any questions, please contact your MiTek sales representative.

Stand-Alone Conveyors

Place the Finish Roller and tables before placing the stand-alone conveyors.

One conveyor unit consists of a roller and two (2) legs. A motor is attached to every second conveyor unit. These pieces should be assembled according to the instructions in this section. Refer to Figure 10-1 for a general diagram of the assembly process. Notice the short-shaft and long-shaft ends are labeled.

Figure 10-1: Conveyor Unit



Conveyor Legs

Some conveyor legs have a lengthwise slot in the channel for mounting the motor, as shown in Figure 10-2. These legs are to be used on the long-shaft end of each conveyor roller.

Unslotted legs are to be used for the short-shaft end of each conveyor roller.

Assemble the top half and bottom half of each leg as shown in Figure 10-2.

Figure 10-2: Slotted

Assembling the Roller and Leg

Refer to...
Figure 10-3
Figure 10-4

(Long-Shaft End on Rollers WITH Motor)

1. Determine the number of rollers to be assembled with a motor by dividing the total number of conveyors by two (2). If the number does not divide evenly, round down because the first conveyor placed will not have a motor.

Figure 10-3: Long-Shaft End for Motor

Figure 10-4: Long-Shaft End for Motor, With Leg

2. Determine which end has the longer shaft extending from the roller. The motor will be attached to the long shaft on the roller of every second conveyor unit.

3. Slide a key into the keyway on the shaft. The keyway can be seen on the top of the shaft in Figure 10-3.

4. Place a motor belt so it is hanging freely on the longer shaft, as shown in Figure 10-3.

5. Place a pulley, hub side first, on the shaft and slide it toward the roller.

6. Slide the shaft through a leg bearing, using a slotted leg. The end of the shaft must be flush with the outside surface of the leg at the point of intersection. The leg brace should face the conveyor roller.

7. Position the pulley so it is 1/16 in. from the leg bearing.

8. Tighten the two (2) set screws on the bearing using a 1/8-in. Allen wrench.

9. Tighten the one set screw on the pulley using a 5/32-in. Allen wrench.

Assembling the Roller and Leg

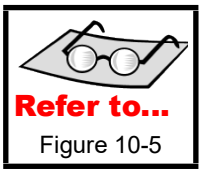
(Long-Shaft End on Rollers WITHOUT Motor)

1. Determine how many rollers will be assembled without a motor by dividing the total number of conveyors by two (2). If the number does not divide evenly, round up because the first conveyor placed will not have a motor.

2. Slide the long shaft through a leg bearing, using a slotted leg. The end of the shaft must be flush with the outside surface of the leg at the point of intersection. The leg brace should face the conveyor roller.

3. Tighten the bearing in two places using a 1/8-in. Allen wrench.

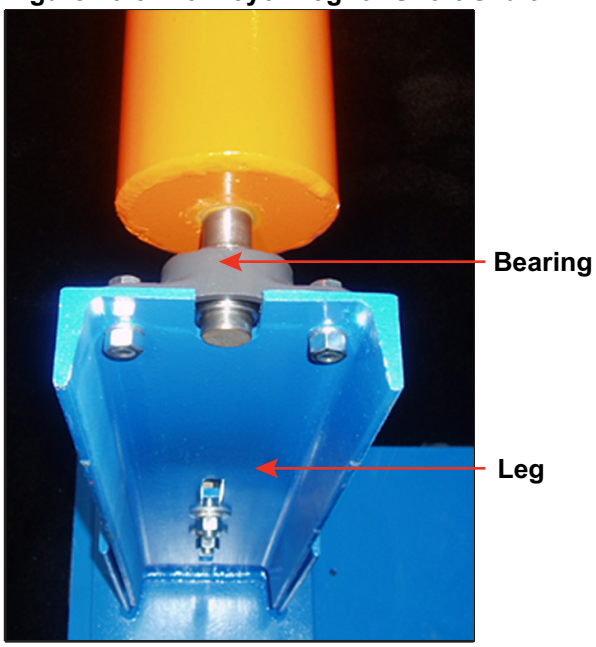
Assembling the Roller and Leg



(Short-Shaft End—Never a Motor)

1. Refer to Figure 10-5 during this procedure.
2. Locate an unslotted leg.
3. Place a roller on an elevated surface so the shafts are protruding freely.
4. Place the appropriate leg onto the roller shaft by inserting the shaft into the bearing.

Figure 10-5: Conveyor Leg for Short-Shaft



5. Slide the leg forward until the shaft is flush with the outside surface of the leg (where the shaft is showing).
6. Tighten the two (2) fittings.

Placing the Conveyors

Follow the procedure below to determine the location of each table system component. Refer to your individual layout.

1. Place the Finish Roller. Refer to your Finish Roller manual for more information.
2. Mark the location of the of the stand-alone conveyors' end, closest to the tables.
    a) Use a chalk line to mark the location of the support legs on the short-shaft end of the conveyor roller for the complete length of the conveyor line.
    b) The outside edge of the support leg (on the short-shaft end only) is 90-1/2 in. from the center of the Finish Roller, assuming the end of the shaft is flush with the channel. The edge of the roller on the conveyor should be even with the edge of the rollers on the Finish Roller.
3. Place the conveyor units starting with the one closest to the Finish Roller.

Motors

The first conveyor unit does NOT have a motor.

The second conveyor unit HAS a motor, and every second unit after it HAS a motor.

Aligning the Conveyors

Align the outside edge of the conveyor leg with the chalk line marked earlier (90-1/2 in. from the center of the Finish Roller). This position will also align the edge of the conveyor roller with the edge of the rollers in the Finish Roller.

Either end of the conveyor roller can be aligned with the chalk line, depending on where you want the electrical connection to the motors. Maintenance is made easier by putting the motors (long-shaft end) on the outside edge of the conveyors and aligning the short-shaft end of the conveyor roller with the chalk line.

1. Place the first three (3) rollers.
    a) The first roller should be as close as possible to the Finish Roller without touching its safety bar when the conveyor is set at the correct height.The safety bar must be able to work properly with the conveyors in position.

b) Ensure that the entire conveyor roller is parallel to the Finish Roller.

c) Set each roller according to the layout—the standard is 5 ft apart center-to-center. You may want the rollers closest to the Finish Roller set closer that 5 ft apart if they will be used for small trusses built off-line from the *RoofTracker* tables.

Figure 10-6: Squaring the Conveyors

2. Set three (3) rollers, then check the diagonal dimensions to ensure they are square. See Figure 10-6. Square them with the Finish Roller before anchoring them.

3. Anchor the stand-alone conveyors to the floor.

   a) Once square, secure the conveyor rollers in place with the same type of anchor bolts, washer, and nuts that were used for the table anchor plates.

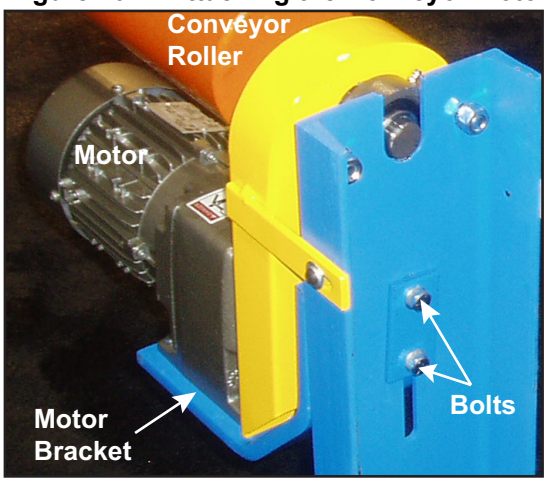
   b) There are four (4) holes in each leg support. Only two (2) anchors are needed, as long as they are located diagonally from each other. All four holes can be used, but you will need to purchase additional anchors.

4. Once all rollers are anchored, adjust the height by loosening the two (2) bolts on each leg support with a 9/16-in. hex head socket, adjusting the height, and tightening the bolts. Make certain that the top half of the leg is flush and square with the rest of the leg when you tighten it and that the top of the roller is level with the top of the roller in the Finish Roller.

Attaching the Motor

Attach a motor to every second conveyor unit, starting with the second unit from the Finish Roller. You can mount the motors before or after the conveyor units are placed and anchored.

Figure 10-7: Attaching the Conveyor Motor



1. Place the belt that is hanging on the roller shaft into the groove on the pulley on the roller shaft. Place the other end of the belt around the pulley on the motor. See Figure 10-7.
2. Let the weight of the motor sufficiently tighten the belt and determine the vertical location of the motor.
3. A bracket is attached to the motor. Place two (2) supplied bolts through the slot in the conveyor stand leg to attach the motor to every second conveyor stand.
4. All electrical work must be done or arranged for by the customer. See the *Electrical* section in this chapter for details on supplying power to the conveyor motors.

Installing the Powering Kit

Install the powering kit (gearbox, motor, drive base, sheaves, V-belt, and guard) on the stand-alone conveyor as follows:

To the existing (installed) stand-alone conveyor:

1. Block up the roller.

	CAUTION
	**PERSONAL INJURY HAZARD.** **The roller and leg assembly weighs approximately 225 lb. Use appropriate personnel and lifting techniques when lifting of moving the stand-alone conveyors.**

a) Loosen the set screws holding the bearing to the roller shaft.

b) Loosen the two bolts connecting the leg to the base.

c) Remove the leg and bearing assembly from the roller.

Ensure that the roller shaft and keyway are clean. Lubricate lightly for assembly.

2. Install the key and sheave on the roller shaft.
3. Install the V-belt on the sheave on the roller.
4. Place the leg and bearing assembly on the roller shaft.
5. Reconnect the leg to the base and tighten the mounting bolts.
6. Ensure that the roller is level, then:

   a) Tighten two bolts on leg and stand.

   b) Tighten set screw on bearing and roller shaft.

7. Install the drive base on the conveyor leg with two 3/8" nuts, washers, lock washers, and bolts.
8. Install the V-belt on the motor sheave.
9. Align motor and roller sheaves and tighten set screws on keys as required.
10. Adjust V-belt tension by exerting a downward force on the drive assembly until the V-belt is tight (1/8" deflection side to side).
11. Tighten the bolts on the motor base and leg.
12. Bolt the drive guard to the stand-alone conveyor leg.

	WARNING
	**CRUSH/PINCH HAZARD** **Guards must be in place and functional during machine operation.**

	WARNING
	**ELECTROCUTION HAZARD.** **All electrical work must be performed by a qualified electrician.** **Follow approved lockout/tagout procedures (OSHA 29 CFR 1910.147).**

13. Connect the electrical power to the motor.

Equipment Layout

Each component must be located in specific locations. Refer to your own layout during installation. Upon request, your MiTek representative can provide you with a layout before the equipment is installed.

Electrical System

	WARNING
	**ELECTROCUTION HAZARD.** **All electrical work must be performed by a qualified electrician.** **Follow approved lockout/tagout procedures (OSHA 29 CFR 1910.147).**

Checking Existing Wiring

Heavy gauge wire can work loose during shipping and handling. Before power is connected to the machine, conduct a pull test on all pre-wired connections inside the electrical enclosures.

Connecting Power to the Equipment

All electrical work is the customer's responsibility and must be performed by a qualified electrician. The machine design addresses electrical components starting with the disconnect enclosure. Installation and maintenance of all electrical requirements up to the disconnect enclosure are the responsibility of the customer. Your MiTek representative can provide guidance regarding when the electrical will need to be available during the installation.

The disconnect enclosure is usually placed on the wall next to the Finish Roller.

Purpose of Chapter

This chapter describes the operating mechanisms on this equipment and the procedure to operate it in most circumstances.

Things to Know Before You Begin

	DANGER
	**Read this manual completely before using this equipment!** **Do not operate this machine until you have a thorough understanding of all controls, safety devices, emergency stops, and operating procedures outlined in this manual.** **All warnings must be read and observed. Failure to do so may result in economic loss, property damage, personal injury and/or death.** **This manual must always be available to personnel operating and maintaining this equipment.**

	WARNING
	**CRUSH, PINCH, AND PERSONAL INJURY HAZARD.** **Before turning on the equipment, make sure that all personnel and equipment are clear.** **Failure to exercise caution may result in severe injury or death.**

Stopping the Machine

Emergency Stop (E-Stop) Pushbuttons

A typical E-stop pushbutton is shown in Figure 11-1. The E-stop for the Stand-Alone Conveyors is located on the electrical enclosure.

Push one of the red emergency stop (E-stop) buttons to cease power transmitting to the control circuit. To release the E-stop, pull straight out on the pushbutton. It will return to its extended position and the machine will operate again.

Figure 11-1: E-Stop

Disconnect Switch

The disconnect switch controls the power supplied from that switch to the rest of the machine. Turning the disconnect handle to the ON position supplies electrical power to the entire machine. To remove power to the machine, turn the disconnect handle to the OFF position. The disconnect handle should always be turned off when the machine is not in use.

When the disconnect switch is OFF, there is still live power up to the disconnect switch's enclosure. Always turn off power at the main power source before opening this enclosure!

Starting the Machine

Refer to the *Procedure Under Normal Conditions* section on page 55 for the operating procedure.

Operator Control Interface

Figure 11-2: Overview of Control Mechanisms

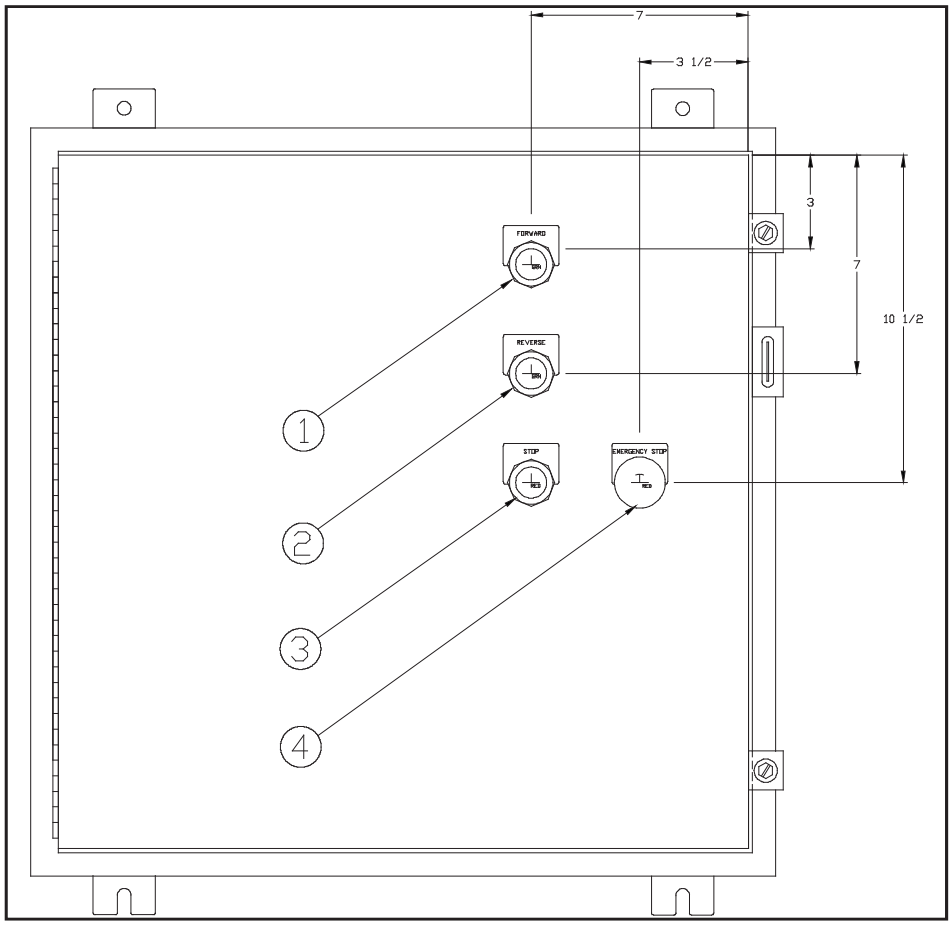


Table 11-1: Functions of Control Mechanisms

Control Mechanism	Function
1 Forward Pushbutton	Moves the rollers forward
2 Reverse Pushbutton	Moves the rollers in reverse
3 Emergency Stop Button	Stops all motion of the machine
4 Stop Pushbutton	Stops the forward/reverse motion of the rollers

Operating Procedure

Procedure Under Normal Conditions

	WARNING
	**CRUSH/PINCH HAZARD.** **Before turning on the equipment, make sure that all personnel and equipment are clear.**

1. Turn the disconnect ON.
2. Press the FORWARD or REVERSE pushbuttons to move the rollers in the required direction.
3. Press the STOP pushbutton to stop the forward/reverse motion.

NOTICE
When an EMERGENCY STOP (E-stop) is pressed, it will stop all motion by removing power to the motor. This is accomplished by disengaging the master control relay.

Safety

The powering kit is equipped with emergency stop controls. The operator must become familiar with the location and operation of these devices.

	WARNING
	**CRUSH, CUT, ELECTROCUTION AND PERSONAL INJURY HAZARD.** **Never operate the conveyor without all guards in place and operational.** **Never disconnect or bypass any safety device or electrical interlock.** **Never remove or paint over warning note labels that become deteriorated or damaged. Request new ones through our Customer Service Department.**

Purpose of Chapter

This chapter provides step-by-step instructions as well as information to help you understand how your equipment works to enable you to make repairs and perform preventive maintenance.

Introduction to Maintaining Your Equipment

This manual contains sufficient information for proper operation and maintenance under most conditions. Certain operating environments may necessitate preventive maintenance at more frequent intervals. Because consistent preventive maintenance is so important for keeping mechanical equipment in good operating condition, MiTek recommends that you stock certain replacement parts to minimize downtime.

Review the Table of Contents and utilize the Index to locate the information you need. The following appendices will also assist in maintaining and repairing your equipment:

- Troubleshooting
- Parts List
- Maintenance Checklists
- Drawing Set

	DANGER
	**Read this manual completely before using this equipment!** **Do not operate this machine until you have a thorough understanding of all controls, safety devices, emergency stops, and operating procedures outlined in this manual.** **All warnings must be read and observed. Failure to do so may result in economic loss, property damage, and/or personal injury.** **This manual must always be available to personnel operating and maintaining this equipment.**

	WARNING
	**PERSONAL INJURY HAZARD.** **Only qualified personnel should attempt to perform installation, repair, and/or maintenance. Follow approved lockout/tagout procedures.**

Proper maintenance is essential to dependable performance of the stand-alone conveyor system and the powering kit. Although the stand-alone conveyor system and the powering kit require a minimum of maintenance, it is important that all checks, adjustments and lubrication procedures and schedules be strictly adhered to.

The following minimum preventive maintenance guides are listed. Certain operating environments or conditions (e.g., hot or dusty environments) may necessitate additional maintenance at more frequent intervals.

Lubrication

General

Proper oil levels must be maintained at all times, and parts requiring greasing are to be serviced as shown on lubrication charts. Service life and efficiency of gears, bearings, etc., are affected by the type of lubrication used, frequency of application, oxidation and contamination of lubricant. Improved performance will be obtained by periodic lubrication in accordance with this manual's recommendation. Lubrication guidelines are given in this chapter for each part or system that requires lubrication. The information is also in the *Maintenance Checklist* appendix.

More bearing failures are caused by dirt introduced during greasing than from insufficient grease. Before beginning oiling or greasing, remove all dirt and old lubricant from area around filler plugs and grease fittings. Filler plugs should not be removed or grease fitting connections made until cleaning is finished. After lubrication is completed, surplus oil and grease may be removed with the use of a grease solvent.

Bearing Lubrication

Lubricate the flange bearing every 200 working hours. Inadequate or ineffective lubrication will result in accelerated wear. A clean lubricant film between moving parts will minimize wear and maximize efficiency.

CAUTION
Excess grease may rupture seals. Do not over-grease.

Movement of grease through bearings can be checked visually by the appearance of grease at the ends of the bearings. Old grease is usually forced out with shot of new grease.

Gear Oil Specifications

Use AGMA Oil Grade 4 or 3 for temperatures from +50°F to 125°F. For temperatures from 15°F to 60°F use AGMA Oil Grade 2 or 3.

The typical oils shown in Table 6-2 meet AGMA recommendations. Check with your local supplier for equivalent oils that may be used below 15°F.

The vent plug indicates the proper fill level.

Table 12-1: AGMA Oil Grade

Manufacturer	2	3	4	5
Amoco	American Indus. #31	American Indus. #51	American Indus. #75	American Indus. #75
Arco	Duro S-315	Duro S-465	Duro S-700	Duro S-1000
Chevron	GST Oil 68	GST Oil 100	AW Mach. Oil EP Grade 150	AW Mach. Oil EP Grade 220
Citgo	Pacemaker 30	Pacemaker 60	Pacemaker 80	———
Exxon	Teresstic 68	Teresstic 100	Teresstic 150	Nuto 220
Gulf	Harmony 68	Harmony 90	Harmony 150d	Harmony 220
Keystone	543	49 Light	432	1790
Mobil	DTE Heavy Medium	DTE Heavy	DTE Extra Heavy	DTE BB
Shell	Turbo 33	Turbo 41	Turbo 69	Tellus 71
Sunoco	Sunvis 31	Sunvis 51	Sunvis 75	Sunvis 99
Texaco	Regal RO-68	Regal RO-100	Regal RO-150	Regal RO-220

Electric Motor

Periodically inspect your electric motor for excessive dirt, friction or vibration. Dust may be blown from inaccessible locations using compressed air. Keep the ventilator openings clear to allow free passage of air.

Replacing the V-belt

To Remove

1. Be sure the motor is turned off.
2. Remove the guard.
3. Move the accessory to minimum adjustment.
4. Remove the belt from the drive sheave.
5. Unbolt the drive base from the stand-alone conveyor leg, and sit the drive base assembly on the ground.
6. Remove the stand-alone conveyor leg from the base assembly and slide the V-belt off the sheave and over the bearing and leg.

To Install

1. Install the new belt over the stand-alone conveyor leg and bearing and onto the roller sheave.
2. Bolt the leg back onto the base assembly.
3. Mount the drive base assembly back onto the leg.
4. Install the V-belt onto the drive sheave.
5. Tighten the belt by exerting a downward force on the drive assembly until the V-belt is tight (1/8" deflection, side to side); then run the motor 3 to 5 minutes to seat the belt.
6. After seating the belt, reset the tension to 1/8" deflection along its longest span.
7. Install the drive guard.

Reasons for Replacing the V-belt

Problem with V-belt	Reason to Replace
Cracks or splits on the underside	Can cause a break at any time
Grease buildup	Can cause a belt to soften, rot, and fail
Peeling of inner core	Causes uneven surfaces
	Belt runs rough and soon may fail
Glazed belt with slick, hard sides can slip	Causes overheating

Powering Kit System Lubrication

Bearings

Using No. 2 consistency lithium base grease on the bearings. The bearings should be purged every three months to flush out contaminants.

When greasing bearing, wipe the fittings clean. More bearing failures are caused by dirt introduced during greasing than from insufficient grease.

Gearbox

Upon delivery of unit, do not start without checking the oil level in the gearbox.

Drain fluid and refill unit after first 150 hours of operation. Thereafter, change fluid every six months (spring and fall), observing seasonal viscosity.

Never remove breather plug or oil level plug while drive is in operation.

Use oil recommended by manufacturer in the mechanical drive section.

Lubrication Chart

Table 12-2: Stand-Alone Conveyor Powering Kit System Lubrication Chart

Areas to Be Lubricated	Lubricant	Mfr's Number and Grade	Hours of Operation					
			8	16	40	200	500	1,000
Electric Motor	(*See* Note)	Impact Grease		(See Note)				X
Gearbox	Oil							X

Note: The motor is equipped with double-shield ball bearings with sufficient grease for normal operation. Where the motor is used regularly in a dirty, wet, or corrosive atmosphere, it is advisable to add 1/4 ounce of grease per bearing every 1,000 hours of operation.

	CAUTION
	**Excess grease may rupture seals. Do not over-grease.**

Movement of grease through bearings can be checked visually by the appearance of grease at the ends of the bearings. Old grease is usually forced out with shot of new grease.

Troubleshooting

In the course of operating any machine, malfunctions do occur. In order to quickly determine some of the probable causes of the malfunction and possible solutions, we have prepared the following troubleshooting guide.

Table 13-1: Stand-Alone Conveyor Not Operating Correctly

Problem	Possible Cause	Possible Solution
Conveyor rollers will not turn	Load on roller too heavy	Remove the load
	Failed bearing	Replace the bearing
	Overload in conveyor control panel	Eliminate control panel overload
	Loose belt on powering kit	Tighten powering kit belt
Reducer/gearbox overheating	Improper lubrication	
	Insufficient oil	Check oil level
	Heat generated by fluid friction of oil is causing a churning effect	Flush and refill to proper oil level with grade specified on reducer name plate
	Wrong grade of oil	
Noise and vibration in reducer/gearbox	Loose mounting bolts	Check mounting bolts and lock washers and tighten
	Insufficient oil	Check oil level
	Failed bearings/wear of bearings can be caused by dirt in oil	Flush and clean reducer and replace oil
	Loose parts	Replace reducer or worn bearings
		Inspect reducer for broken parts, loose bolts, nuts
		Check keys for proper fit
Oil leaking	Excessive oil	Check oil level and drain to proper level

Reports and Research

To benefit fully from maintenance experience, a good system of reports and records is essential. These reports and records, if analyzed frequently, will indicate areas that require special attention as well as recurring troubles that may be corrected before breakdown occurs. Records should include:

- The date detected and description of the symptoms
- A description of the preliminary investigation and the conclusions drawn
- The date of and the corrective action taken, replacement parts required, and length of downtime
- A record of when fluid is added or changed, filters replaced, or strainer cleaned.

Appendix 14

Navigating the Parts List

Table B-1 lists mechanical replacement parts for the stand-alone conveyor. The far right column indicates if the part should be kept in stock to minimize downtime.

Table 14-1: Mechanical Replacement Parts

Part Description	Quantity	Part Number	Keep in Stock
1/2-13 hex head cap screw, 1-1/2	4	327365	
1/2-13 hex nut	4	361609	
1/2" lock washer	4	364050	
1/2 flat washer	4	365123	
Bearing, flange	2	419133	4
Roller, 14'	1	66322	
Leg (idler side) assembly	1	66441	
Leg (powered side) assembly	1	66443	
Belt for 14' powered roller	1	529002	1

Appendix 15

Checklists for Preventive Maintenance

Use the checklists in this appendix to schedule preventive maintenance. The checklists will guide you through all preventive maintenance tasks required to keep this equipment in top working condition.

These pages are supplied with the intent that you will photocopy them and document the date that maintenance is done, leaving the original in the manual for future use.

Stand-Alone Conveyor

Stand-Alone Conveyor

Weekly Checklist

Year: _____ Month: _____

Preventive Maintenance Action (write dates at top of column)	1	2	3	4	5
Blow dust from electric motor using compressed air					
Vacuum dirt and debris from electrical enclosures					
Check E-stop lights					
Check to make sure all warning labels and operation labels are intact and easily read					

Notes	Date

Stand-Alone Conveyor

Monthly Checklist

Year: _____

MONTH (first half of year)		JAN	FEB	MAR	APRIL	MAY	JUNE
Check motor starter forward and reverse lights	1 month						
Check wiring and conduit to electrical enclosures for damage	1 month						
Check conveyor legs for damage	1 month						
Flush and replace grease on bearings	3 months						
Wipe bearing fittings clean	3 months						

MONTH (second half of year)		JULY	AUG	SEPT	OCT	NOV	DEC
Check motor starter forward and reverse lights	1 month						
Check wiring and conduit to electrical enclosures for damage	1 month						
Check conveyor legs for damage	1 month						
Flush and replace grease on bearings	3 months						
Wipe bearing fittings clean	3 months						

Stand-Alone Conveyor

Checklist by Working Hours

Year: _____

Preventive Maintenance Action	Working Hours	Sign and Date When Action is Performed
Lubricate the flange bearing	200 working hours	
Replace gearbox oil	1,000 working hours	
Lubricate electric motor	1,000 working hours	

Stand-Alone Conveyor

Periodic Checklist

Year: _____

Preventive Maintenance Action		Sign and Date When Action is Performed
Check the bolts that attach the conveyor legs to the floor for tightness	1 year	
Check the level of the conveyors and receiver stands	1 year	
Check belts	1 year	

Notes	Date

Document Evaluation

Appendix 16

A form is included in this appendix so you can provide MiTek with feedback on the usefulness of this manual. We make an ongoing effort to improve the value of our documentation, and your views are important to us.

Please follow the instructions on the form to provide us with comments or suggestions that will help us improve the quality of our documentation services.

Document Evaluation Form

We appreciate your comments on how we can make this document more useful.

Document Identification:

Stand-Alone Conveyor	Operation and Maintenance Manual	001009

General Ratings:

	Poor	Fair	Good	Excellent
Content	❑	❑	❑	❑
Organization	❑	❑	❑	❑
Accuracy	❑	❑	❑	❑
Clarity	❑	❑	❑	❑
Completeness	❑	❑	❑	❑
Examples/Illustrations	❑	❑	❑	❑
Readability	❑	❑	❑	❑

Compared to other truss machinery manufacturers' documentation, how would you rate this document?

❑ Poor ❑ Fair ❑ Good ❑ Excellent

Rate the quality of service you were given on the following topics:

	Poor	Fair	Good	Excellent
Delivered on time	❑	❑	❑	❑
Installation process	❑	❑	❑	❑
Service technician	❑	❑	❑	❑
Does the machine work as promised?	❑	❑	❑	❑
Does it handle the production load?	❑	❑	❑	❑

General Comments:

Document Evaluation Form (cont'd)

Instructions	***Identification Information***
Please provide as much information as possible. Identify the page and paragraph, and include a proposed rewrite if possible. Attach extra sheets as needed.	Stand-Alone Conveyor
	Operation and Maintenance Manual
	001009
Recommendation	
Reason for Recommendation	
Your Name:	Date:
Company Name:	Address:
Phone:	Email:
Please mail this form to: MiTek Machinery Operations 301 Fountain Lakes Industrial Drive St. Charles, MO 63301 Attn: Engineering Manager	***Or fax this form to:*** 636-328-9218 Attn: Engineering Manager

If you do not receive a reply within 45 days, please call our Customer Service Department and ask for the Documentation Specialist or Engineering Manager: 800-523-3380.

This appendix provides general information that will help you better understand how this equipment works.

Understanding Overloads

Purpose and Scope

The information below has been collected to help you understand the role of an overload, how an overload works, and how to calculate the overload setting to protect the motor.

The Importance of Protecting Your Motor

The following statement describes the importance of protecting electric motors and is a good illustration of why we need overloads.

Proper Motor Protection Safeguards Your Investments

> With electric motors driving the majority of today's manufacturing processes, proper motor protection is critical. Not surprisingly, a significant amount of effort and resources have recently been invested in motor protection technology, resulting in cost-effective solutions to many of today's common motor problems.
>
> Motors fail for a number of reasons—moisture and contamination, short circuits, mechanical problems and old age—but the primary reason is excessive heat, caused by excess current (greater than normal motor full load current), high ambient temperatures, and poor ventilation of the motor. If a motor is continuously overheated by only 10 degrees, its life can be reduced by as much as 50%.
>
> Steve Zimmerman
> Control Engineering
> December 1, 1997

What is an Overload?

So, what is an overload? The term literally means that too much load (what the motor is driving) has been placed on the motor. A motor is designed to run at a certain speed, called its synchronous speed. If the load on the motor increases, the motor draws more current to continue running at its synchronous speed.

It is quite possible to put so much load on a motor that it will draw more and more current without being able to reach synchronous speed. If this happens for a long enough period of time, the motor can melt its insulation and burn out, resulting in damage to the motor windings. This excessive load condition is called an overload.

In fact, the motor could stop turning altogether (called a locked rotor) under a large enough load. This is another example of an overload condition. Even though the motor shaft is unable to turn, the motor continues to draw current, attempting to reach its synchronous speed.

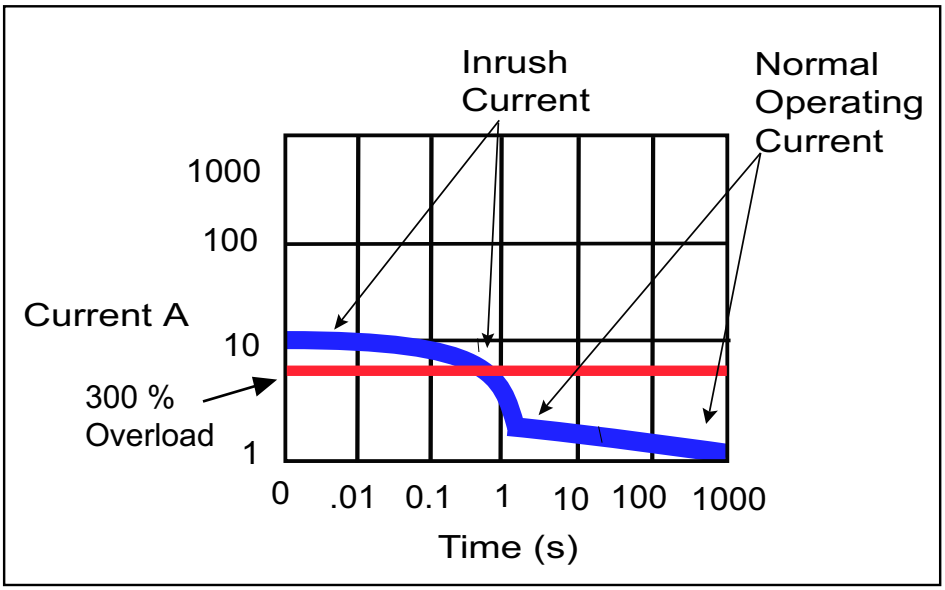
Although the running motor may not draw enough current to blow the fuses or trip circuit breakers, it can produce sufficient heat to burn up the motor. This heat, generated by excessive current in the windings, causes the insulation to fail and the motor to burn out. We use the term “locked rotor amps” to describe when the motor is in this state and is drawing the maximum amount of current.

Due to the possibility of excessive current draw, an overload protection device is required that does not open the circuit while the motor is starting, but opens the circuit if the motor gets overloaded.

Starting Current

When a motor is started, it must perform work to overcome the inertia of the rotating portion of the motor and the attached load. The starting current measured on the incoming line is typically 600% of full-load current when rated voltage and frequency is first applied to a NEMA B motor. The stationary portion of the motor current decreases to its rated value as the rotor comes up to speed.

Figure 17-1: Motor Inrush Curve



An overload condition will occur when the rotor has difficulty turning and draws more current than it normally would need to keep it turning. When an overload occurs the current being drawn is usually between 2 to 6 times the normal operating current.

For example if a conveyor belt becomes jammed and does not allow the rotor to turn, the motor will draw about as much amperage as it would on startup to try to get the rotor to turn. As long as the rotor does not turn, this increased current will continue to flow. The key thing to remember in an overload condition is that the current flows through the normal circuit path. Continued overload current will cause excess heating in the motor and the motor circuit. If the over current protective device does not operate in a timely manner, the motor could short out a winding, or cause insulation damage to a winding which could lead to a short circuit later.

Overload Relays

The overload relay is the device used in starters for motor overload protection. It limits the amount of current drawn to protect the motor from overheating.

An overload relay consists of:

- A current sensing unit (connected in the circuit to the motor)
- A mechanism to break the circuit, either directly or indirectly

Overload relays have the following features:

- A time delay which ignores harmless temporary overloads caused by normal motor starting, without breaking the circuit
- A means of resetting the circuit once the overload is removed

- A design that meets the special protective needs of motor control circuits
- Allow harmless temporary overloads, such as motor starting, without disrupting the circuit
- Will trip and open a circuit if current is high enough to cause motor damage over a period of time
- Can be reset once the overload is removed

Bimetallic Overload Relays

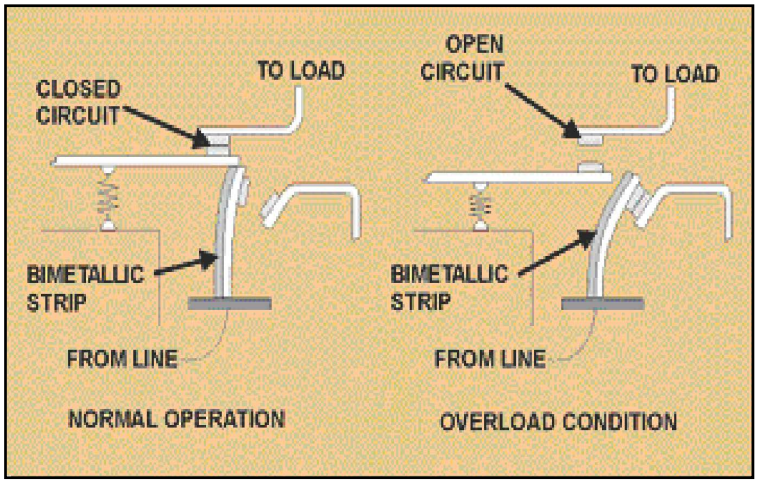
Overload protection is accomplished with the use of a bimetallic strip. This component consists of a small heater element wired in series with the motor and a bimetallic strip that can be used as a trip lever. A bimetallic strip is made of two dissimilar metals bonded together. The two metals have different thermal expansion characteristics, so the bimetallic bends at a given rate when heated.

Under normal operating conditions the heat generated by the heater element will be insufficient to cause the bimetallic strip to bend enough to trip the overload relay.

As current rises, heat also rises. The hotter the bimetallic becomes, the more it bends. In an overload condition the heat generated from the heater will cause the bimetallic strip to bend until the mechanism is tripped, stopping the motor.

If heat begins to rise, the strip bends, and the spring pulls the contacts apart, breaking the circuit, as shown in Figure 17-2.

Figure 17-2: The Warping Effect of the Bimetallic Strip



Once the tripping action has taken place, the bimetallic strip cools and reshapes itself, automatically resetting the circuit. The motor can be restarted even when the overload

condition has not been cleared, and will trip and reset itself again and again. (This assumes an automatic reset and can also be equipped with a manual reset.)

Electronic Overload Relay

Electronic overload relays are another option for motor protection. The features and benefits of electronic overload relays vary but there are a few common traits. One advantage offered by electronic overload relays is heater-less design. This reduces installation cost and the need to stock a variety of heaters to match motor ratings. Electronic overload relays can detect a phase loss and disconnect the motor from the power source. This feature is not available on mechanical types of overload relays.

Overload Classifications

Overload relays also have an assigned trip class. The trip class is the maximum time in seconds at which the overload relay will trip when the carrying current is at 600% of its current rating. Bimetallic overload relays can be rated as Class 10, meaning that they can be counted on to break the circuit no more than ten seconds after a locked rotor condition begins. Melting alloy overload relays are generally *Class 20*.

American industry has standardized on Class 20 overload protection.The Europeans have standardized on Class 10.

Class 20 will give a nominal 590-second trip (9.83 minutes) at an overload of 125% of full load amps, a 29-second trip at a 500% overload, and a 20-second trip at a 600% overload. Thus, a motor that is stalled and drawing locked rotor amperage will be taken off-line in 20 to 29 seconds. However, a motor that draws a continuous locked rotor current can be expected to burn out before 20 seconds.

Class 10 will give a nominal 230-second trip (3.83 minutes) at 125% overload, 15 seconds at 500% overload, and 10 seconds at 600% overload.

Class 30 has a longer time delay to be used on high inertia loads that require a long acceleration or have shock loading that causes repetitive motor inrush.

The overload class that MiTek normally specifies for equipment is a Class 10. Since it is possible to burn out a motor in less than 20 seconds, we have chosen to protect the motor with the highest degree of protection.

Codes And Standards

NFPA 79—Electrical Standard for Industrial Machinery, 2002

7.3.1.1 Motors. Motor overload protection shall be provided to each motor in accordance with Article 430, Part III, of NFPA 70, *National Electrical Code*.

NEC 2002—National Electrical Code

430.32 (A) (1) Separate Overload Device. A separate overload device that is responsive to motor current. This device shall be rated at no more than the percentages shown in Table 17-1.

Table 17-1: Full Load Current Tolerances

Nameplate Full Load Current Rating	% Allowed Above Full Load Current Rating
Service Factor of 1.15	125%
Motors with a marked temperature rise of 40°C or less	125%
All other motors	115%

Example 1

15 hp, 208V, 3 phase, induction motor, 40°C rise, *design B*, *FLA* 48 amps. Overload Protection = 48 amps times 125% = 60 amps

Example 2

25 hp, 208V, 3 phase, induction motor, 1.15 s.f., *design C*, *FLA* 72A. Overload Protection = 72 amps times 125% = 90 amps

Example 3

40 hp, 208V, 3 phase, wound rotor motor, FLA 118 amps. Overload Protection = 118 amps times 115%=136 amps

The motor overloads must be calculated using the nameplate current and not from Tables 430-148 or 430-150 of the National Electrical Code.

In Example 1, the motor has a 40°C rise, the O.L. unit is sized at 125% of the full load motor current.

In Example 2, the motor has a s.f. (service factor) of 1.15. The O.L. unit is sized at 125% of the full load motor current.

In Example 3, where neither of the two conditions exists, it is sized at 115%.

Glossary of Overload Terms

Full Load Amps (FLA)

This is the current flow required by a motor during normal operation under normal loading to produce its designated horsepower. Motors having nothing attached to their shaft will draw less than the FLA current.

Insulation Class

The National Electrical Manufacturers Association (NEMA) has established insulation classes to meet motor temperature requirements found in different operating environments. The four insulation classes are A, B, F, and H. Class F is commonly used. Class A is seldom used. Before a motor is started, its windings are at the temperature of the surrounding air. This is known as ambient temperature. NEMA has standardized on an ambient temperature of 104°F, or 40°C for all motor classes.

Temperature rises in the motor as soon as it is started. The combination of ambient temperature and allowed temperature rise equals the maximum winding temperature in a motor. A motor with Class F insulation, for example, has a maximum temperature rise of 221°F (105°C). The maximum winding temperature is 293°F (145°C) [104°F (40°C) ambient plus 221°F (105°C) rise]. A margin is allowed for a point at the center of the motor's windings where the temperature is higher. This is referred to as the motor's hot spot.

The operating temperature of a motor is important to efficient operation and long life. Operating a motor above the limits of the insulation class reduces the motor life expectancy. A 50°F (10°C) increase in the operating temperature can decrease the life expectancy of a motor by as much as 50%.

Table 17-2: Motor Operating Temperature

	Class A	Class B	Class F	Class H
Rise	176°F (80°C)	176°F (80°C)	320°F (160°C)	176°F (80°C)
Hot Spot	41°F (5°C)	50°F (10°C)	50°F (10°C)	59°F (15°C)

Locked Rotor Amps

Also known as inrush current, locked rotor amps is the amount of current the motor can be expected to draw under starting conditions when full voltage is applied. This is the current taken from the supply line at rated voltage and frequency with the rotor at rest.

Motor Load

A motor provides the conversion of electrical energy to mechanical energy that enables a machine to do work. The energy that a machine requires from a motor is known as the motor load. The motor load “seen” by a motor is dependant upon how the load is connected to the motor, the dimensions of the load, and the weight of the load.

A load connected to a motor by a gearbox reduces the load by the square of the gear ratio. If a load is attached to a motor through a 3:1 gear ratio, the load is 1/9 of the load the motor would see if the load were attached directly to the motor.

A round object attached to the motor shaft has a load related to the square of the radius of the object. If a 16" saw blade is a load of weight multiplied by the radius squared, the load is 8^2 x weight = 64 x weight. A 20" saw blade is a load of 10^2 x weight = 100 x weight. The 20" saw blade is 56% more load than the 16" saw blade due to the dimensions.

A motor load is directly related to the weight of an object. A 16" blade weighs 9.28 pounds. A 20" blade weighs 14.61 pounds, or 5.33 pounds more. The 20" blade is 56% more load than the 16" blade due to weight. Remember, weight is the volume of an object times its density, so weight is also related to the dimensions.

In the example of the saw blades, the combined effect of the longer radius, and longer weight means the 20" saw blade is approximately 125% more load on a motor than a 16" saw blade, which partially explains why motors on quads 1 and 4 are more likely to burn out or trip an overload.

NEMA Design Ratings

NEMA ratings refer to the torque ratings. The following ratings apply to motors:

NEMA B

The NEMA B motor's percentage of slip ranges from 2 to 4%. It has medium values for starting or locked rotor torque, and a high value of breakdown torque.

NEMA A

The NEMA A motor is similar in many ways to the NEMA B motor. It typically has a higher value of locked rotor torque and its slip can be higher.

NEMA C

The NEMA C motors are well suited to starting high-inertia loads. This is because they have high locked rotor torque capability. Their slip is around 5%, and their starting current requirement is average.

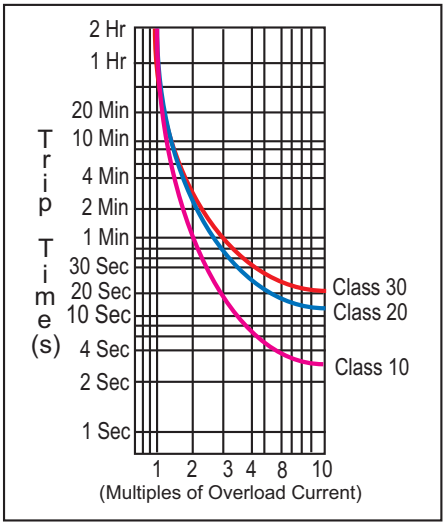
NEMA D

The NEMA D motor is found in heavy duty, high-inertia applications. It has high values of slip (up to 8%), and very high locked rotor torque capability.

Service Factor (s.f.)

A motor designed to operate at its nameplate horsepower rating has a service factor of 1.0. Some applications may require a motor to exceed the rated horsepower. In these cases a motor with a service factor of 1.15 can be specified. The service factor is a multiplier that may be applied to the rated power. A 1.15 service factor motor can be operated 15% higher than the motor's nameplate horsepower.

Figure 17-3: Trip Times for Trip



Trip Class

Overload relays are rated by a trip class, which defines the length of time it will take for the relay to trip in an overload condition. The most common trip classes are Class 10,

Class 20, and Class 30. Class 10, for example, has to trip the motor off-line in 10 seconds or less at 600% of the full load amps. This is usually sufficient time for the motor to reach full speed.

Appendix 18

Drawings are inserted at the back of the manual.

Table 18-1: Attached Drawings

Description	Drawing Number
Stand-Alone Conveyor Roller	66225
Conveyor Leg, Unpowered	66441-501
Conveyor Leg, Powered	66443-501
Layout, 5-Table System	66550
Powering Kit	83887-501
Interlock, Horizontal Stacker	N/A
Interlock, E-Stop, Horizontal Stacker	N/A
Interlock, Tandem Peak-Up Stacker	N/A

Glossary

actuate	to activate, put into action
aisle pad	a type of jigging used when a connector plate needs to be embedded where the table surface gives way to a walk-through aisle
amperage	the strength of an electric current, expressed in amperes
anchor plate	a steel plate that holds the tables in place; it is anchored to the concrete floor and the tables are welded to it
auto-eject	a pneumatic system that raises the truss off the tables and automatically places the truss on the stand-alone conveyors with the use of a transfer roller
bumper	a safety device on each corner of the gantry head (for a total of 4); when the bumper is depressed, the gantry head motion stops
bus bar	an electrical device that allows multiple gantry heads to be used simultaneously
connector plate	the nail-plate that is embedded into the ends of the tie
cushion	an attribute of a hydraulic cylinder that allows adjustment of the pressure in each cylinder
directional buttons	the 2 black buttons on the pendant control station that tell the gantry head which direction to move
end-eject	a pneumatic system that raises the truss off the tables and allows the truss to be manually pushed or pulled off the end of the tables; this system requires that the gantry head rolls back over the truss or a device must be installed to raise the gantry head when it is parked
gantry head	the entire traveling weldment that houses the Roller to embed the connector plates
hour-meter	a gauge on the gantry head on a 1-enclosure system that tells the amount of time the motor is actually turning and the gantry head is moving; 2-enclosure systems do not have an hour-meter

Glossary

inner side	refers to the end of the gantry head housing; the side closest to the tables; both ends have an inner side—one can see the inner side of both ends when standing on or between the tables
jigging	any of several devices used to hold the truss in place on the tables
joystick	an option that replaces the pendant control station to control movement of the gantry head
layout	a scaled diagram of the location of components and the space that they occupy
leveling screws	large cap head screws that thread into the table legs and allow the table height to be adjusted and leveled
light bar	the perimeter access guarding device that uses multiple light beams to detect when something is in the way of the gantry head and stops the machine to prevent injury or damage; the RoofTracker uses a set of 3-beam light bars on both sides of the gantry head
limit switch	an electro-mechanical device that consists of an actuator mechanically linked to a set of contacts; when an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection
lockout/tagout	a means of isolating a piece of equipment from its energy source so maintenance can safely occur; guidelines provided in OSHA 29 CFR 1910.147
lubricator	a device that allows controlled amounts of lubricants into the pneumatic system
motor end	used to indicate which end of the gantry head is being discussed; the end of the gantry head that houses the motor
outer side	refers to the end of the gantry head housing; the side farthest from the tables; both ends have an outer side—one can see the outer side of the one end when standing at the pendant control station

Glossary

pendant control station	where the operator stands to use the pendant that controls movement of the gantry head
pilot valve	a pneumatic valve that operates the setup valve to control the release or cessation of air in each setup; it is located on the bottom-chord end of one table in each setup
plate	see *connector plate*
PLC	Programmable Logic Controller; a solid-state control device that can be programmed to control process or machine operations. It consists of five basic components: processor, memory, input/output module, the power supply, and the programming device.
port	a connection point for a peripheral device
proximity switch	a switch that uses an electromagnetic field to detect when an object is near, there is no physical contact between the object and the switch; inductive proximity switches detect only metal objects, capacitive proximity switches can sense both metallic and non-metallic objects
puck	a type of jigging that is small and round
qualified person	a person or persons who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training, or experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work—ANSI B30.2-1983; one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved—NEC2002 Handbook
receiver bar	the light bar that receives the signal from the transmitter bar; every light bar set consists of a receiver bar and a transmitter bar
regulator	a component of the pneumatic system that connects to the main air source and regulates the air pressure allowed into the system

Glossary

Roller	the large roller inside the gantry head that innately embeds the plates into the truss
setup valve	a component of the pneumatic system that control the flow of air to the rest of the setup
side-eject	a pneumatic system that raises the truss off the tables and allows the truss to be manually pushed or pulled off the side of the table and onto the stand-alone conveyors
slider pad	a type of jigging used when a connector plate needs to be embedded where the table surface gives way to a slot for the Ejector
solenoid	an assembly used as a switch consisting of a coil and a metal core free to slide along the coil axis under the influence of the magnetic field
stand-alone conveyor	the conveyor system that carries the truss from the tables to the Finish Roller and out to the stacker
stop	a type of jigging that is long and straight
take-up bearing	adjusts the height of the roller
torque	a turning or twisting force
transfer roller	a motorized roller sitting perpendicular to the tables on an auto-eject system; it automatically transfers the truss from the Ejectors to the stand-alone conveyors
transmitter bar	the light bar that transmits the signal to the receiver bar; every light bar set consists of a receiver bar and a transmitter bar
VFD	Variable Frequency Device; controls the speed of the cycle
voltage	Equal to the difference of electric potential between two point on a conducting wire carrying a constant current of one ampere when the power between the points is one watt

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