

# TABLE OF CONTENTS

<b><u>CONTENTS</u></b>	<b><u>PAGE(S)</u></b>
WARRANTY	2
SAFETY TIPS	3-5
FORWARD	6
PARTS ORDERING INFORMATION	7
ROLLING CAPACITIES	8
MILL INSTALLATION	9
MILL OPERATION	10-11
ROLL TENSION SPRING ADJUSTMENT	12-13
TRAM ADJUSTMENT	14
TROUBLE SHOOTING	15-16
REPAIR AND MAINTENANCE	
LUBRICATION	17-19
WHEN TO RE-CORRUGATE ROLLS	17
ROLL REMOVAL	20-21
INSTALLING ROLLS	21
INSTRUCTIONS ON CLEANING THE MAGNET	22
PRINTS AND ILLUSTRATIONS	23

# WARRANTY

## The A. T. Ferrell Company, Inc. Manufacturer's Warranty for the following product lines:

### FERRELL-ROSS

Roller Mills, Flaking Mills, Cereal Mills, Industrial Mills, Flake and Pellet Coolers, Crumblers, Grain Cleaners, Steam Chests, Roll Feeders, Vibratory Feeders and Conveyers, Loss in Weight Feeders, Mixers and Blenders.

(“FERRELL-ROSS” IS A REGISTERED TRADEMARK OF THE A. T. FERRELL COMPANY, INC.)

The A. T. Ferrell Company, Inc. warrants each new product of its manufacture when purchased from an authorized representative for a period of one year from the date of shipment. This warranty shall apply to all parts and workmanship (except products or components not manufactured by The A. T. Ferrell Company, Inc.), which shall appear to A. T. Ferrell Company to have been defective in manufacture. The A. T. Ferrell Company's sole and entire obligation under such warranty shall be satisfied by shipment to the Purchaser-User, without charge, (except for transportation costs, which shall be paid by the Purchaser-User) of the part or parts returned for inspection and parts intended to replace those acknowledged by The A. T. Ferrell Company, Inc. to be defective.

This warranty shall not apply and shall be void under the following conditions:

1. If the product is transported from original installation site.
2. If any part of the product has been altered, modified, or changed, except at The A. T. Ferrell Company, Inc. factory or is authorized in by The A. T. Ferrell Company, Inc. in writing.
3. If attachments or devices unsuitable to the product have been used on or in conjunction with the product.
4. If the product has not been installed, used, operated, handled, or serviced in accordance with the appropriate instruction manual.

The A. T. Ferrell Company, Inc. reserves the right to make changes in design or improvements in its products without obligation whatsoever to prior Purchaser-User of such products.

The A. T. Ferrell Company, Inc. will pass on to a Purchaser-User only such warranty as it shall receive on products or components not of its manufactured from the manufacturer or supplier thereof.

We will not be liable for any consequential damages, loss or expenses arising in connection with the use or inability to use the product for any purpose whatever. Our maximum liability shall not in any case exceed the cost of replacing defective parts if returned to us within one year from date of shipment. No salesman, manufacturer's representative or other person may make or has the authority to make any guarantees or warranties expressed or implied on behalf of A. T. Ferrell Company, Inc. which are inconsistent with these terms and conditions or any catalogue or other publication of A. T. Ferrell Company, Inc.

Claims for warranty should be directed to our sales department, 1440 South Adams Street, Bluffton, IN 46714 or phone (260) 824-3400. The machine serial number and description of the type of failure is required to file a claim.

Contact our sales department before returning warranty items for a RMO (Returned Material Order) which must accompany all returned items. All returned items are to be shipped freight pre-paid and credit will be issued after inspection and acknowledgement of warranty defect. A. T. Ferrell Company, Inc. will pass on to the purchaser/user only such warranty as it shall receive on products or components not of its manufacture from the manufacturer or supplier thereof.

# BE A SAFE OPERATOR

## AVOID ACCIDENTS



This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows. Regardless, of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient machine operation. A careful operator is the best insurance against an accident.



Carefully read and understand the operator's manual before operating the machine. Do not attempt to install, connect power to, operate or service machine without proper instruction and until you have been thoroughly trained in its use by your employer.



Keep children, visitors and all untrained personnel away from machine while in operation.



Make certain all electric motors and control panels are properly grounded.



Danger – Do not attempt to work on, clean or service this equipment or open or remove any protective cover, guard, or grate until power has been turned off and mechanically locked out and the machine has come to a complete stop.



Danger – Keep hands, feet and clothing clear from rotating belts, pulleys, rolls and gears when machine is operating. Failure to do so will cause severe injury or death.



Danger – Never operate machine without protective covers, guards, or grates properly installed.



Do not obscure or remove safety decals from the equipment. Replacement decals are available from the manufacturer.



This equipment was manufactured in compliance with existing OSHA regulations. It is the responsibility of the owner/user to maintain OSHA compliance when operating the equipment.



When performing work on the hydraulic system, check all hoses, ensure that they are in good condition and all connections are tight.



Never use your bare hands to locate a hydraulic leak. Use a small piece of wood or cardboard. Hydraulic fluid escaping under pressure can penetrate the skin. Openings in the skin and minor cuts are susceptible to infection from hydraulic fluid.



If injured by escaping fluid, see a doctor at once.



Replace all guards and shields after servicing and before starting up the machine.



Do not clean, lubricate or adjust equipment while it is in operation.



After servicing, make sure all tools, parts and service equipment are removed from the machine.



Do not start the machine until you are sure that everyone is clear.

# TYPICAL SAFETY DECALS

<b>⚠️ AVERTISSEMENT</b>		<b>⚠️ WARNING</b>
<p>Débrancher le système d'alimentation principal avant l'entretien!</p> <p>Le commutateur d'alimentation de chaque section contrôle uniquement cette section!</p>		<p><b>Disconnect main power before servicing!</b></p> <p>Each section's power switch controls that section only!</p>
<small>©Clarion Safety Systems, LLC clarionsafety.com xxxxx</small>		<small>B0206506 Reorder No. C18603-15</small>

<b>⚠️ DANGER</b>
<p><b>Drawing-in and crush hazard.</b></p> <p><b>Lockout power before removing guard, cover or inspection door.</b></p>
<b>⚠️ DANGER</b>
<p><b>Danger d'entraînement et d'écrasement.</b></p> <p><b>Verrouiller l'alimentation avant de déposer le dispositif de protection, le couvercle ou la porte d'inspection.</b></p>
<small>©Clarion xxxxx 80069646 C19409-12</small>

	<b>⚠️ DANGER</b>	
	<p><b>Avoid injury.</b></p> <p>Moving parts can crush and cut.</p> <p>Keep hands and fingers clear of moving parts.</p> <p>Do not operate with guard removed.</p>	
<small>©Clarion Safety Systems, LLC clarionsafety.com xxxxx</small>		<small>Reorder No. H1018/1012-M61DHPT</small>

<b>⚠️ AVERTISSEMENT</b>		<b>⚠️ WARNING</b>
<p>Une installation, un réglage, un entretien ou une maintenance inappropriés peuvent causer des dommages matériels, des blessures corporelles ou la mort.</p> <p>Lire attentivement les instructions d'installation, d'utilisation et d'entretien avant d'installer ou d'effectuer l'entretien de cet équipement.</p>		<p>Improper installation, adjustment, service or maintenance can cause property damage, injury or death.</p> <p>Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.</p>
<small>©Clarion Safety Systems, LLC clarionsafety.com xxxxx</small>		<small>F8030358 Reorder No. C18603-05</small>

<b>⚠️ DANGER</b>		<b>⚠️ DANGER</b>
<p><b>Faire attention de ne pas se blesser.</b></p> <p><b>Les pièces mobiles peuvent écraser et couper.</b></p> <p>Garder les mains et les doigts à l'écart des pièces mobiles.</p> <p>Ne pas utiliser si le dispositif de protection a été retiré.</p>		<p><b>Avoid injury.</b></p> <p>Moving parts can crush and cut.</p> <p>Keep hands and fingers clear of moving parts.</p> <p>Do not operate with guard removed.</p>
<small>©Clarion Safety Systems, LLC clarionsafety.com xxxxx</small>		<small>B0206509 Reorder No. C18603-16</small>

## **FORWARD**

Your new roller mill has been designed and manufactured to give years of dependable service. Before installing and operating your new mill, please read and understand the operator's manual we prepared for you.

Every mill is thoroughly tested and inspected at the factory before shipment. However, it will be necessary to make minor adjustments to your mill after it has been installed to get the performance you desire.

If a commercial carrier shipped your mill, ensure that you check all parts carefully to see if there is any damage in the shipping. If damage is found, make a notation of such and make certain that your local agent makes a similar note on your freight bill, before you accept shipment. This is necessary to support your claim.

Do not hesitate to accept damaged equipment after the agent has made the notation on the freight bill. You will be reimbursed when you present your claim.

We assume no responsibility for loss or damages after the equipment leaves our dock, but we will gladly render our services to assist you in adjusting your claim.

Determine the parts you require, submit an order to us and we will prepare an invoice. Upon receiving our invoice you will be in a position to file a claim against the shipping company.

There are drawings and parts lists in the back of this booklet to assist you in ordering spare parts. When you order spare parts specify the mill serial number, mill size, part number, description and quantity to assure prompt and correct replacements.

A.T. Ferrell Co., Inc.

**1440 S. Adams Street**

**Bluffton, IN 46714 U.S.A.**

**Phone: (260) 824-3400 (800) 248-8318**

**Fax: (260) 824-5463**

**E-Mail: [info@atferrell.com](mailto:info@atferrell.com)**

**Website: [www.Ferrell-Ross.com](http://www.Ferrell-Ross.com)**

Division of A. T. Ferrell Company, Inc.

## PARTS ORDERING INFORMATION

1. Order replacements parts through your local sales representative or direct from Ferrell Ross.

A. T. Ferrell Company, Inc.  
1440 S. Adams St.  
Bluffton, IN 46714  
Phone: (260) 824-3400 (800) 248-8318  
Fax: (260) 824-5463  
Website: [www.Ferrell-Ross.com](http://www.Ferrell-Ross.com)  
E-Mail: [info@atferrell.com](mailto:info@atferrell.com)

2. To expedite the order process, please have your machine description, model number, and serial number available.
3. Use the part numbers and descriptions furnished in this manual.

## RECOMMENDED SPARE PARTS

It can be very costly to have a roller mill idle for several days because no repair parts were on hand. It's best to stock vital parts to help avoid downtime as much as possible. The following parts are recommended to be stocked:

Motor Drive and Differential Drive V-Belts – one set

Roll Flange and Pillow Block Bearings – one of each

Agitator Shaft Bearings – minimum of one

Saddle Blocks – one set

The remaining parts seldom need replacement and normally do not need to be stocked. Rolls can usually be re-corrugated until they are less than 9.5 inches in diameter. If the rolls require re corrugation every 18 months or less, it is advisable to stock an extra pair (with bearings).

## Rolling Capacities

		DRY CORN		MILO		WHEAT		OATS		BARLEY	
ROLL	CORRUG	(56#/BU)		(56#/BU)		(60#/BU)		(37#/BU)		(50#/BU)	
SIZE	PER IN.	BU/HR #/MIN		BU/HR #/MIN		BU/HR #/MIN		BU/HR #/MIN		BU/HR #/MIN	
10 X 6	5a	330	310								
	10b	130	120	130	120	70	70	70	40	70	50
	13c	90	80	90	80	50	50	50	30	50	40
10 X 12	5a	660	620								
	10b	260	250	260	250	130	130	140	90	130	110
	13c	180	160	180	160	100	100	90	60	100	80
10 X 18	5a	1000	930								
	10b	400	370	400	370	200	200	210	130	200	160
	13c	260	250	260	250	140	140	140	90	140	120
10 X 24	5a	1330	1240								
	10b	530	500	530	500	260	260	280	170	260	220
	13c	350	330	440	410	190	190	190	120	190	160
10 X 30	5a	1660	1550								
	10b	660	620	660	620	330	330	210	130	330	280
	13c	440	410	550	520	240	240	150	90	240	200
10 X 36	5a	2000	1860								
	10b	800	740	800	740	400	400	410	250	400	330
	13c	530	490	530	490	290	290	290	180	290	240

\*All projected capacities listed are only estimates. The capacity of any roller mill or flaker will vary depending on quality of the grain, roll spacing (gap), horsepower, differential roll speed and the general operation of the mill.

\*a - 5 groove per inch corrugations are normally used for coarse cracking of corn

\*b - 10 groove per inch corrugations are normally used for processing a combination of grains on a single pair roller mill.

\*c - 13 groove per inch corrugations are normally used for processing small grains on a single pair machine and/or double reduction on a two pair high machine.

## INSTALLATION

The mill should be located so that an adequate gravity flow of material is available. A strong magnet (s) should be placed in the spouting (with access to it) directly ahead of the mill (for mills not equipped with magnets) so that all material entering the mill must pass over the magnet (s).



Stones often cause the most wear and damage to the rolls. The most effective way to prevent stone damage is to keep them out of the incoming material to the mill. Installation of a shaker screen ahead of the mill will help to remove most stones.

Allow sufficient space around the mill for making adjustments, repairs, roll removal, etc. (A minimum of 24 inches is recommended). The mill location should also insure that the rolls will be level for optimum performance.

Bolt the mill to the floor using shims to compensate for any unevenness of the floor. Do not over tighten nuts. Lock nuts are recommended to prevent mounting hardware from loosening. Rubber belting should be utilized between the floor and mill to dampen vibration, especially when mounting to concrete floors.

If the drive motor was not supplied with the mill, remove the drive guard wrapper and mount your motor to the adjustable motor base with the motor shaft extending through the drive guard back plate. Install the motor drive sheave and align with roller mill drive sheave. Install the drive V-Belt (s). Belts must not be too tight or too loose. New belts may stretch considerably during the first 24 hours of operation. The belt tension should be checked periodically and adjusted if necessary.



Proper V-Belt tensioning is essential for long belt life. Over tightened belts may cause premature belt, motor shaft and roll shaft-bearing failures. Slack belts will cause slippage, shortened belt life and possibly create a fire hazard.



A qualified electrician should install electrical controls and wiring. The motors disconnect switches and conductor cable should comply with the National Electrical Code and any Local codes that may apply. Motor starting control stations should be located so that the operator can see that all personnel are clear of the mill when starting.

## MILL OPERATION

### PRE-START INSTRUCTIONS



Carefully read and understand the operator manual before operating the mill. Do not attempt to install, connect power to, operate or service the mill without proper instruction and until you have been thoroughly trained in its use by your employer.

#### Inspect Daily To See That:

1. Trash and stones are removed from the hopper.
2. Tramp metal is removed from magnet(s).
3. V-Belts and chains are properly tightened.
4. All mill doors and guarding are in place.

#### Inspect Periodically To See That:

1. Excessive dust accumulations are removed from mill, motor, starter, and operator control station.
2. Roll wear is not excessive.
3. Material build-up inside the mill is removed.
4. All fasteners are tight.
5. Roll end-to-end adjustment is correct.
6. Belts and chains are properly adjusted.

### START-UP INSTRUCTIONS

1. Open the rolls fully to avoid overloading the motor during starting.
2. Close the slide gate to prevent grain from entering the roll chamber.



Check to see that everyone is clear of moving parts before starting the mill.

3. Start the motor and bring the adjustable roll to operating position with the adjustment handle.
4. Open slide gate slowly until 90% of full-load motor amperage is reached or product begins to “bridge” over roll nip-point.
5. Insert the product sampler through the hole provided in the front of the mill to examine the condition of rolled product. Adjust the roll clearance to give desired product. Grain in the in-feed hopper should cover the agitator during mill operation to insure proper distribution over the length of rolls.



Never operate the mill without protecting covers, guards or grates properly installed.

## MILL OPERATION (CONTINUED)

### SHUT-DOWN INSTRUCTIONS

1. Completely close the in-feed hopper slide gate.
2. Open the rolls fully.
3. When all material has cleared the rolls, shut-off motor.

Should an emergency shutdown or motor overload shutdown occur, mechanically lockout the power to the mill, close the slide gate and open the rolls fully. It may be necessary to remove the bolted roll access door and rotate the rolls by hand by completely clear the rolls of grain.



Be sure all mill doors and guards are replaced before restoring power to the mill.

## ROLL TENSION SPRING ADJUSTMENT

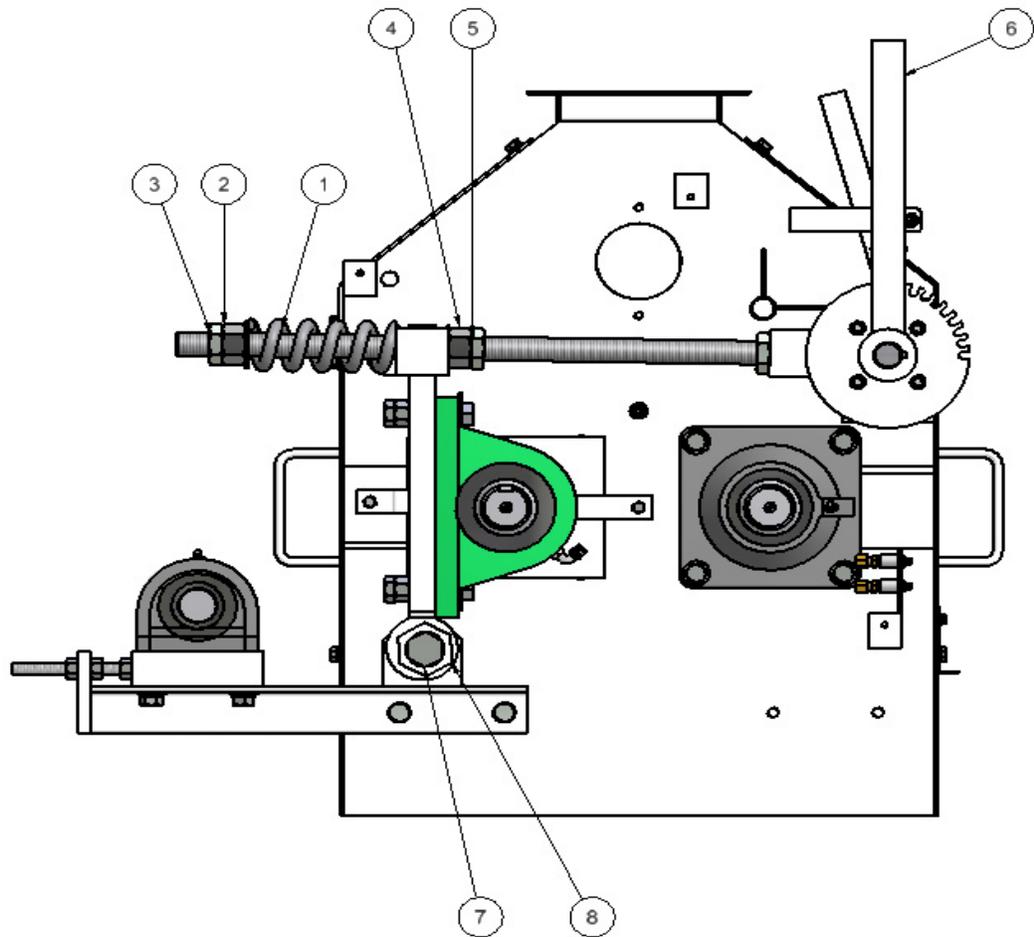


FIGURE 1

The roll tension springs (see **item 1**, Figure 1) should never exceed a pre-load (difference between spring free length and compressed length) greater than one inch and must be adjusted equally on each end of the rolls. Operating with a minimum of spring pre-load will increase the roll life. To adjust the spring pre-load loosen the locknut, (**item 3**) and rotate the adjusting nut, (**item 2**) clockwise to increase spring pre-load (compress spring) or counterclockwise to decrease spring pre-load (lengthen spring). Retighten locknut when adjustment is completed.

## **ROLL ADJUSTMENTS**

(Refer to Figure 1)

The roll adjustment handle, (item 6) is factory set so when it is positioned in the first notch of the roll release quadrant the roll clearance is between .003" and .005". The mill should never be started when the adjustment handle is in this minimum roll clearance position. Always open rolls fully (adjusting handle moved to horizontal position) before starting mill motor, then slowly move adjusting handle to desired operating position. Finer gap adjustments can be obtained with the micro-handwheel if this option is included on your mill.



**The following roll adjustments must never be made while the mill is operating. Please shutdown the mill and mechanically lockout the power to the mill before proceeding.**

To decrease the roll clearance as rolls wear down, position the adjusting handle to the fully closed position and remove the top bolted on mill panels. Remove the internal roll baffle plates to gain access to the roll saddles bolted to the mill sides at each end of the rolls at the roll nip-point. Loosen and move the roll saddles up out of the roll nip-point. Loosen the locknut, (item 5) on the tension rod and rotate the roll adjustment nut, (item 4) to achieve the desired minimum roll gap. NOTE-adjustment must be equal on both ends of rolls. Check the end-to-end roll adjustment (distance between rolls at each end) by placing a long feeler gauge through the nip-point at each end of the rolls. If the feeler gauges are not available, a thin piece of cardboard, such as a shipping tag can be used by placement through the nip-point at each end of the rolls while turning the rolls by hand. Compare the depth of the creases on each tag and continue adjustments until the creases are equal in depth. NOTE-maintain the same spring tension on each end of rolls while making the end-to-end adjustments.

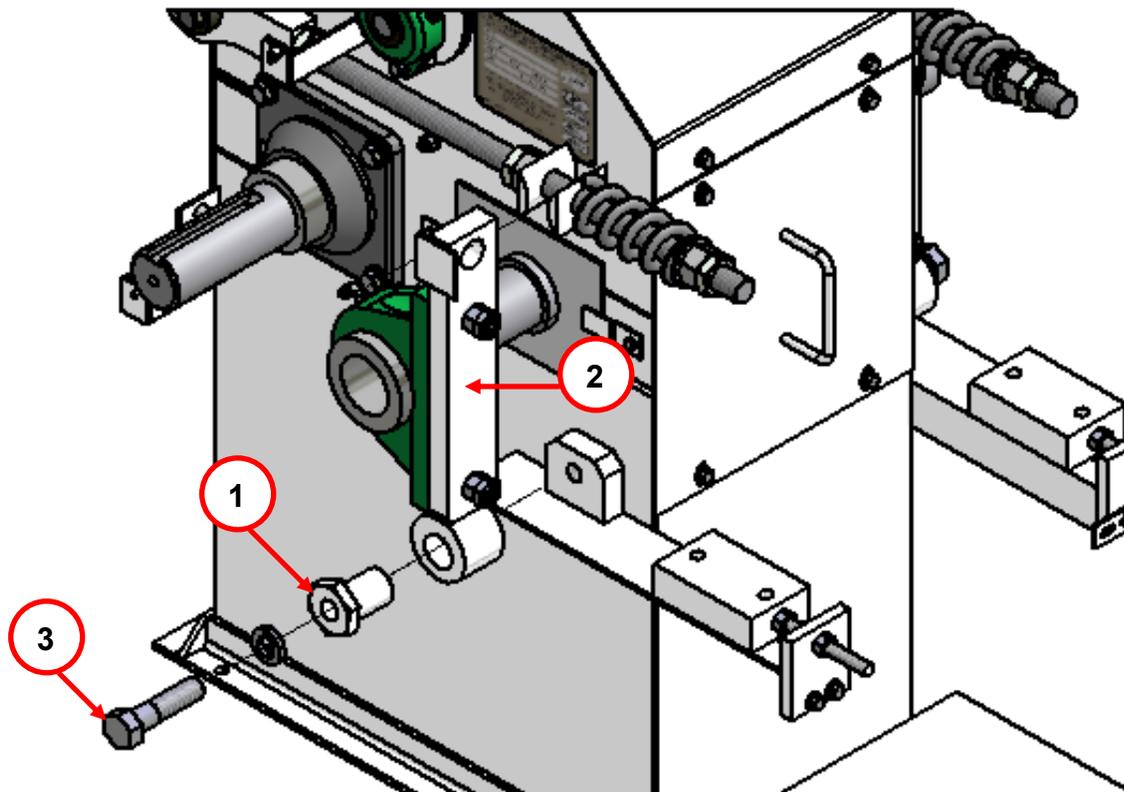
Reposition the roll saddles into the roll nip-point so they just touch the rolls and replace the internal baffles adjusting them to within 1/8 inch of the roll surfaces. Replace the top mill panels when adjustments are complete.

## TRAM ADJUSTMENT

This term refers to the relative position of one roll to another in the parallel or level position. Stated another way, the longitudinal centerline (axis) of each roll shaft must be parallel to each other and lie in the same plane to be in-tram.

When the rolls are out-of-tram it is impossible to get a uniform product rolled throughout the entire length of the rolls. This condition can exist even though the end-to-end adjustments are correct. Out-of-tram rolls wear excessively and unevenly causing premature bearing failures.

The tram is factory adjusted. The vertical position of the pivot roll can be adjusted by rotating the eccentric bushing (item 1) located at the base of the pivot arm (item 2) on each side of the mill. Loosen the hex head bolt (item 3) and rotate the eccentric (item 1) to achieve the desired vertical position. Repeat the procedure for the opposite side of the mill. When the longitudinal centerlines of both rolls are parallel, tighten the hex head bolts (item 3) to 380 ft/lbs.



**Item # 3**

Part # 67027046  
Grade 5 Hex Head Cap Screw  
7/8-9x3 1/2

FIGURE 2

## TROUBLE SHOOTING

<u>PROBLEM</u>		<u>POSSIBLE CAUSE</u>		<u>SUGGESTED REMEDY</u>
<b>Mill won't start</b>		Grain or other foreign Object stuck between rolls		Open rolls fully and check nip-point of rolls for lodged material(s).
		Loose V-Belts		Adjust belt tension
		Incorrect wiring between motor and controls		Check control and motor wiring.
<b>No output from mill</b>		Foreign material lodged in hopper or grain bridging		Check in-feed hopper and gravity main shute
<b>Motor doesn't reach full speed</b>		Incorrect motor wiring for supply voltage		Check supply voltage and wiring requirements
		Motor under-sized for application		Check HP requirements for mill
<b>Pounding &amp; vibration</b>		Worn bearing(s)		Replace bearing
		Material build-up on rolls		Clean rolls. Some materials such as grains preconditioned with molasses should be avoided
				Warm-up rolls with dry grain before rolling high moisture grains

## TROUBLE SHOOTING (CONTINUED)

<b><u>PROBLEM</u></b>		<b><u>POSSIBLE CAUSE</u></b>		<b><u>SUGGESTED REMEDY</u></b>
<b>Excessive fines in finished product</b>		Very dry grain		“Temper” incoming grain with steam or water prior to rolling.
		New rolls		New rolls may need to be “run-in” to remove rough edges
		Old rolls		Rolls may need re-corrugated
		Frozen grain		Decrease rate of feed through rolls
<b>Whole grain in finished product</b>		Roll misalignment		Check roll end-to-end adjustment and adjust if necessary
		Saddle blocks at roll ends worn out or out of position		Replace or adjust saddle blocks
		In-feed hopper baffle plates improperly adjusted		Adjust baffles to within 1/8” of roll surfaces
		Overfeeding		Decrease feed rate to prevent grain build-up above roll nip-point

## **REPAIR AND MAINTENANCE**



Do not attempt to work on, clean or service this equipment or open or remove any protective cover, guard, or grate until power has been turned off and mechanically locked out and the mill has come to a complete stop.

### **LUBRICATION**



**CAUTION!** To prevent possible personal injury, never lubricate the mill while it is operating.

Roll shaft bearings should be lubricated every 80 hours after the 160 hours of operation with one shot of Chevron Delo EP NLGI2 or equivalent grease. Do not over grease. Excess grease should be wiped off to prevent it from getting onto V-Belts.

Chevron Delo Grease Specification Sheet to follow on next page.

### **WHEN TO RE-CORRUGATE ROLLS**

Eventually, the rolls will require re-corrugation. This normally is not necessary until the machine has processed many thousands of bushels of grain, but will vary with the type of corrugations and the grain condition. The following guidelines will assist you to determine when re-corrugation is required:

1. There is a noticeable drop in mill capacity.

NOTE: Make sure that foreign material is not impairing the flow of material to or through the mill.

2. There is an increase in fines from rolls used in cracking corn or milo.
3. A visual inspection reveals smooth or rounded corrugations. Fine-grooved rolls may be completely smooth in small areas, while coarse-grooved rolls will have very rounded corrugations, instead of being sharp.

NOTE: We have two locations in the United States to re-corrugate your rolls. Please contact us for your roll re-corrugation requirements.



# CHEVRON DELO<sup>®</sup> GREASES EP

## NLGI 00, 0, 1, 2

### CUSTOMER BENEFITS

Chevron Delo Greases EP deliver value through:

- **Extreme pressure high load carrying capacity**
- **Excellent corrosion and wear protection**
- **Excellent water resistance**
- **Excellent high temperature stability**
- **Outstanding low temperature pumpability**

### FEATURES

Chevron Delo Greases EP are technically advanced, extreme pressure greases for a wide variety of on- and off-road applications.

They are formulated with ISOSYN<sup>®</sup> base stocks, a lithium complex thickener, rust and oxidation inhibitors, and extreme pressure and tackiness additives. They are blue in color with a tacky texture.

They are engineered to minimize friction and wear with a thick, velvety coating for excellent load carrying protection.

Chevron Delo Greases EP are specially formulated for extreme pressure wheel bearing and chassis applications including the steering drag links, king pins, transmission cross shaft spring pins, shackle pins, brake cam shafts, and fifth wheel faceplates and pivots operating under high and low temperature conditions.

The high viscosity index base oil makes these products perfect for the centralized lubrication systems found on today's mobile equipment.

These products are formulated to perform in unusually demanding conditions of high and low temperatures. The lithium complex thickener in Chevron Delo Greases EP elevates the dropping point to approximately 266°C (510°F). This high dropping point equates to excellent high temperature stability up to 177°C (350°F).

Chevron Delo Greases EP have the proper base oil viscosity to meet NLGI GC-LB requirements for low temperature operation. **NLGI 1** and **2** are recommended for applications operating in the temperature range of -18°C to 177°C (0°F to 350°F).

**NLGI 00** and **0** can be used at temperatures as low as -34°C (-30°F).

Chevron Delo Greases EP exceed the requirements of NLGI GC-LB for EP protection and rust protection, making them well suited for the most severe applications.



### APPLICATIONS

Chevron Delo Greases EP are designed for extreme duty in a wide variety of on- and off-highway vehicle and equipment applications.

**On-highway heavy duty trucks** — These lubricants are perfect for a wide variety of Class 8 trucks in all chassis and wheel bearing applications ranging from automatic centralized greasing systems to wheel bearings operating near the high temperatures of disc brakes. This product is for all applications, from owner/operators to fleets (especially those considering extended service intervals).

**Off-highway vehicles** — Whether the application is in construction, logging, mining, agriculture or utilities, these greases will perform. Use them in haul trucks, loaders, tractors, cherry pickers or any of a number of other off-highway vehicles.

**Medium- and light-duty trucks and buses** — As with their heavy duty counterparts, the Class 7 and Class 6 vehicles and buses require an extreme duty grease. Chevron Delo Greases EP will provide that performance.

**Automobiles** — Chevron Delo Greases EP are exceptional lubricants for high temperature wheel bearings and other high performance automotive applications.

**NLGI 1** and **2** are approved for the NLGI Certification Mark GC-LB.

Chevron Delo Greases EP meet the requirements of the Mack MG-C grease specification.



**TYPICAL TEST DATA**

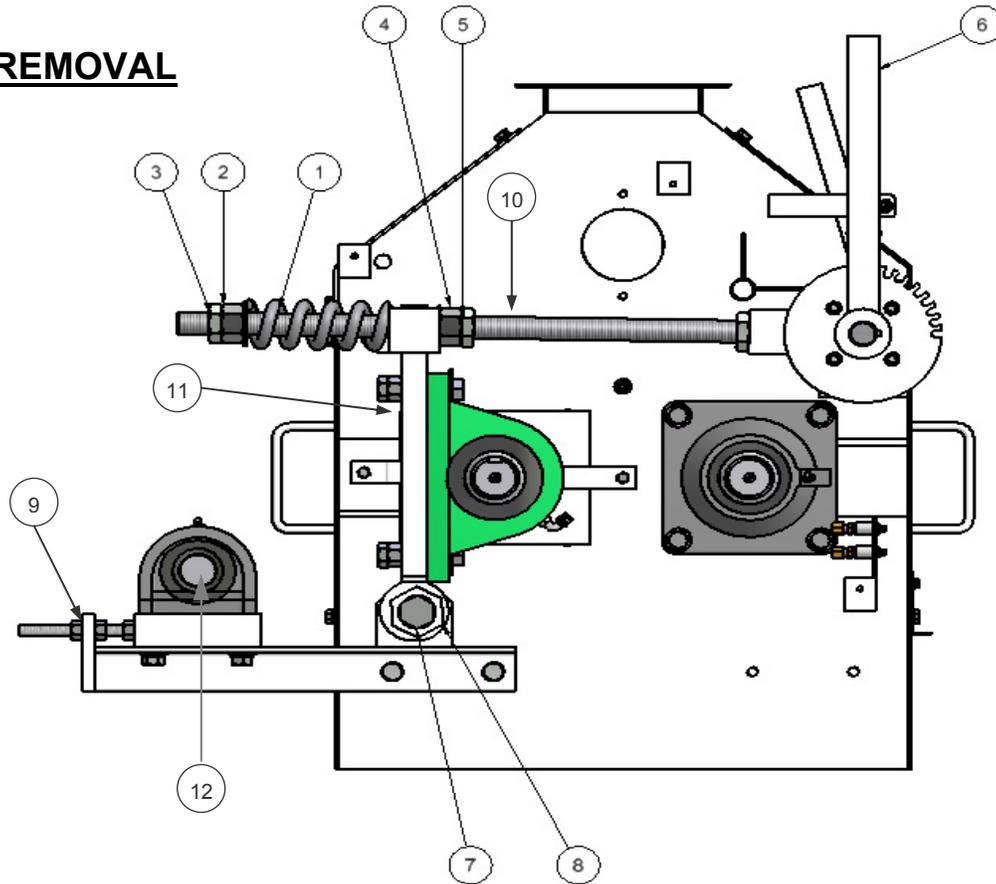
<b>NLGI Grade</b>	<b>00</b>	<b>0</b>	<b>1</b>	<b>2</b>
<i>Product Number</i>	235212	235211	235209	235208
<i>MSDS Number</i>	6818	6818	6818	6818
Operating Temperature, °C(°F) Minimum <sup>1</sup> Maximum <sup>2</sup>	-40(-40) 132(270)	-40(-40) 132(270)	-40(-40) 177(350)	-40(-40) 177(350)
Penetration (Worked 60 Strokes), at 25°C (77°F)	415	370	325	280
Dropping Point, °C(°F)	n/a	235(455)	255(491)	265(509)
Four Ball Weld Point, kg	400	400	400	400
Four Ball Wear Scar, mm	0.45	0.45	0.45	0.45
Timken OK Load, lb	60	60	70	70
Water Washout, wt%	n/a	15	10	5
Water Spray-off, wt%	n/a	n/a	30	20
Lincoln Ventmeter, psig at 30 s, at 75°F 30°F 0°F -22°F	— 50 50 100	— 100 150 450	— 200 450 1250	— 250 700 1400
Copper Corrosion	1b	1b	1b	1b
Bearing Rust, 5% Synthetic Sea Water	Pass	Pass	Pass	Pass
Thickener, % Type	4.0 Lithium Complex	5.8 Lithium Complex	8.0 Lithium Complex	11.0 Lithium Complex
ISO Viscosity Grade Base Oil Equivalent	220	220	220	220
Viscosity, Kinematic* cSt at 40°C cSt at 100°C	189 17.5	189 17.5	189 17.5	189 17.5
Viscosity, Saybolt* SUS at 100°F SUS at 210°F	992 90	992 90	992 90	992 90
Viscosity Index	100	100	100	100
Flash Point, °C(°F)*	274(525)	274(525)	274(525)	274(525)
Oil Separation, wt%	n/a	5	4	2
Texture	Tacky	Tacky	Tacky	Tacky
Color	Blue	Blue	Blue	Blue

Typical test data are average values only. Minor variations which do not affect product performance are to be expected in normal manufacturing.

- <sup>1</sup> Minimum operating temperature is the lowest temperature at which a grease, already in place, could be expected to provide lubrication. Most greases cannot be pumped at these minimum temperatures.
- <sup>2</sup> Maximum operating temperature is the highest temperature at which the grease could be used with frequent (daily) relubrication.
- \* Determined on mineral oil extracted by vacuum filtration.

## REPAIR AND MAINTENANCE

### ROLL REMOVAL



**FIGURE 3**

- Step 1. When mill has been shut-down and power mechanically locked-out, remove the belt guard wrappers from the mill.
- Step 2. Loosen motor drive V-Belt(s) and remove belt(s) and drive sheave(s).
- Step 3. Loosen the differential idler arm tension nut (item 9) and remove the differential drive V-Belt(s) and sheaves. (Chain drive sprocket also on horizontal discharge models).
- Step 4. Remove the idler shaft (item 12) (bearings may remain on shaft) and bearings from the mounting brackets.

## **ROLL REMOVAL** (cont.)

Step 5. Remove the agitator drive pulley and agitator idler pulley (not shown for clarity).

Step 6. Unbolt the drive and differential guard back plates and dismount.

Step 7. Remove the roll tension spring nuts (**items 2 & 3**) and springs (**item 1**) from the roll tension rod (**item 10**). Unbolt and remove the roll access doors (front and back).

Step 8. Remove the bolts that secure the pillow block bearing to the pivot arm (**item 11**) and the adjustable roll is ready to be removed from the mill.



**CAUTION!** Rolls are heavy, use extreme caution when handling.

Approximate weights are:

10 X 6 – 150 lbs.

10 X 12 – 300 lbs.

10 X 18 – 450 lbs.

10 X 24 – 600 lbs.

10 X 30 – 750 lbs.

10 X 36 – 900 lbs.

Step 9. Unbolt the stationary roll flange bearings and remove the stationary and adjustable rolls from the mill. The shaft bearings may be removed when the rolls are resting on the floor.

## **INSTALLING ROLLS**

To install rolls, reverse the steps taken to remove rolls. It is recommended to install the stationary roll first and align the pivot roll to it. See adjustment instructions in the Mill Operation section of this manual.

## **Instructions for Cleaning of Magnet**

For Model "M" Mills that have been equipped with an internally mounted magnet. It is very important to follow the all safety and procedural guidelines.

1. Shut off the power supply to the mill and follow standard power lock out tag out procedure.
2. To access the magnet a ½" wrench, or socket should be used to remove the hex head cap screws from the upper portion of the rear housing cover.
3. Grasp the handles on the hinged upper rear housing cover and pull to open.
4. Remove the magnet slide with magnet from the mill before cleaning magnet.
5. To avoid injury from sharp metal, bare hands should not be use for wiping tramp metal from the magnet.
6. To reinstall reverse procedures number 4, 3, and 2.
7. Before restarting mill please follow standard safety guidelines.
8. Daily cleaning of the magnet is recommended.

## TENSIONING V-BELT DRIVES

Without exception, the most important factor in the successful operation of a V-belt drive is proper belt-tensioning. To achieve the long, trouble-free service associated with V-belt drives, belt tension must be sufficient to overcome slipping under maximum peak load. This could be either at start or during the work cycle. The amount of peak load will vary depending upon the character of the driven machine or drive system. To increase total tension, merely increase the center distance. Before attempting to tension any drive it is imperative that the sheaves be properly installed and aligned. If a V-belt slips it is too loose. Add to the tension by increasing the center distance. Never apply belt dressing as this will damage the belt and cause early failure.

It is common for belts to stretch over time especially during the initial week or two of operation. Be sure to check and adjust the belt tension during the first week and again the first couple months of operation.

### GENERAL METHOD

The general method for tensioning V-belts should satisfy most drive requirements.

Step 1: Reduce the center distance so that the belts may be replaced over the sheaves and in the grooves without forcing them over the sides of the grooves. Arrange the belts so that both the top and bottom spans have about the same sag. Apply tension to the belts by increasing the center distance until the belts are snug.

See figure 1

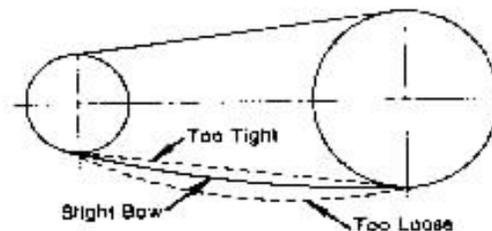


Figure 1

Step 2: Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive under its highest load condition (usually starting). A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If the belts squeal as the motor comes on or at some subsequent peak load, they are not tight enough to deliver the torque demanded by the drive machine. The drive should be stopped and the belts tightened.

Step 3: Check the tension on a new drive frequently during the first day by observing the slack side span. After a few days' operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust so that the drive again shows a slight bow in the slack side.

## FORCE DEFLECTION METHOD

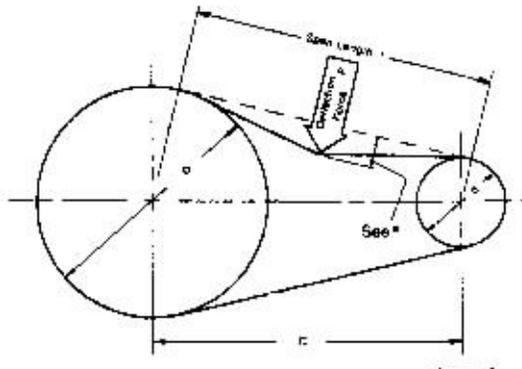
This method should be used only for tensioning drives on which the grade of belt, rated belt capacity, service factor, design horsepower, etc. are known. If the drive has been designed in strict accordance with the procedures, instructions, and horsepower ratings in Wood's current catalog, the force deflection values are valid. However, if the drive was designed from editions dated prior to 1980 or using information other than that contained in these catalogs, excessive loads on bearings or excessive shaft deflections may result.

Step 1: Install belts per Step 1 of General Method above. Measure span length (t) in inches as shown in figure 2, or calculate using formula.

Step 2: From figure 2 the deflection height (h) is always  $\frac{1}{64}$ " per inch of span length (t). For example, a 32" span length would require a deflection of  $\frac{32}{64}$ " or  $\frac{1}{2}$ ".

Step 3: Determine the minimum, maximum, and initial recommended pounds force using table 1 or calculate based on the required Static Strand Tension (T). Note: The initial recommended force is used only for installing new belts which have not seated themselves into the sheave grooves and where initial belt stretch has not taken place.

## TENSIONING V-BELT DRIVES



$$t = \sqrt{C^2 - \left(\frac{D-d}{2}\right)^2}$$

$$h = \frac{t}{64}$$

where t = Span length inches  
 C = Center distance inches  
 D = Larger sheave diameter, inches  
 d = Smaller sheave diameter, inches

\* Deflection height h =  $\frac{1}{64}$  per inch of span

Step 4: Using a spring scale, apply a perpendicular force to any ONE of the belts at the midpoint of the span as shown in figure 2. Compare this deflection force with the values found in Step 3.

- a. If the deflection force is below the minimum, the belts are too loose and the tension should be increased by increasing the center distance.
- b. If the deflection force is higher than the maximum, the belts are too tight and the tension should be decreased.

When new V-belts are installed on a drive the INITIAL tension will drop rapidly during the first few hours. Check tension during the first 24 hours of operation. Subsequent re-tensioning should fall between the minimum and maximum force.

To determine the deflection distance from normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple-belt drives an adjacent un-deflected belt can be used as a reference.

Minimum deflection force values shown in table 1 are based on assumed average static tensions for drives having multiple belts or more than one V-band, thus eliminating calculations. (For drives using only one belt or one V-band, deflection force must be determined by use of engineering formulas.)

Find the minimum recommended deflection force for the belt section and type based upon the small sheave diameter, speed and drive ratio. For intermediate sheave diameters and/or drive ratio combinations the minimum deflection force may be interpolated.

MAXIMUM Deflection Force = Minimum times 1.5

INITIAL Deflection Force = Minimum times 2.0

For Ultra-V Band, Premium V-Band and Torque-Flex banded belts multiply the minimum deflection force from table 1 by the number of belts in the band. Where larger values make use of the Force Deflection Method impractical, use the elongation Method to tension V-bands.

**Table 1 Recommended Minimum Force Per Belt**

Belt Section		Small Sheave		Drive Ratio			
		Speed Range	Dia.	1.0	1.5	2.0	4.0 & over
Sure-Grip Premium	AP	1800-3600	3.0	2.0	2.3	2.4	2.6
		1800-3600	4.0	2.6	2.8	3.0	3.3
		1800-3600	5.0	3.0	3.3	3.4	3.7
		1800-3600	3.5	3.5	3.7	3.8	4.3
	BP	1200-1800	4.6	3.7	4.3	4.5	5.0
		1200-1800	5.0	4.1	4.6	4.8	5.6
		1200-1800	6.0	1.8	5.3	5.5	6.3
		1200-1800	8.0	5.7	6.2	6.4	7.2
	CP	900-1800	7.0	6.5	7.0	8.0	9.0
		900-1800	9.0	8.0	9.0	10.0	11.0
		900-1800	12.0	10.0	11.0	12.0	13.0
		700-1500	16.0	12.0	13.0	13.0	14.0
	DP	900-1500	12.0	13.0	15.0	16.0	17.0
		900-1500	15.0	16.0	18.0	19.0	21.0
		700-1200	18.0	19.0	21.0	22.0	24.0
		700-1200	22.0	22.0	23.0	24.0	26.0
Torque-Flex	AX	1800-3600	3.0	2.5	2.8	3.0	3.3
		1800-3600	4.0	3.3	3.6	3.8	4.2
		1800-3600	5.0	3.7	4.1	4.3	4.6
		1800-3600	7.0	4.3	4.6	4.8	5.3
	BX	1200-1800	4.6	5.2	5.8	6.0	6.9
		1200-1800	5.0	5.4	6.0	6.3	7.0
		1200-1800	6.0	6.0	6.4	6.7	7.7
		1200-1800	8.0	6.6	7.1	7.5	8.2
	CX	900-1800	7.0	10.0	11.0	12.0	13.0
		900-1800	9.0	11.0	12.0	13.0	14.0
		900-1800	12.0	12.0	13.0	13.0	14.0
		700-1500	16.0	13.0	14.0	14.0	15.0
	DX	900-1500	12.0	16.0	18.0	19.0	20.0
		900-1500	15.0	19.0	21.0	22.0	24.0
		700-1200	18.0	22.0	24.0	25.0	27.0
		700-1200	22.0	25.0	27.0	28.0	30.0

**PRINTS**

**AND**

**ILLUSTRATIONS**