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07/07/14	Overhaul of structure, format, content and correction of bearing type
05/16/16	Removal of inter roll comment in startup section Addition of belt tensioner assembly drawing and instruction
04/27/18	Added break in for new rolls comment under operation

# 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 U.S.A. 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 safe-guarded 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.

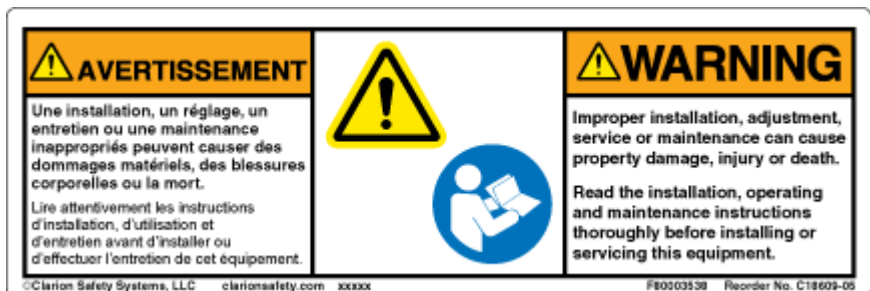
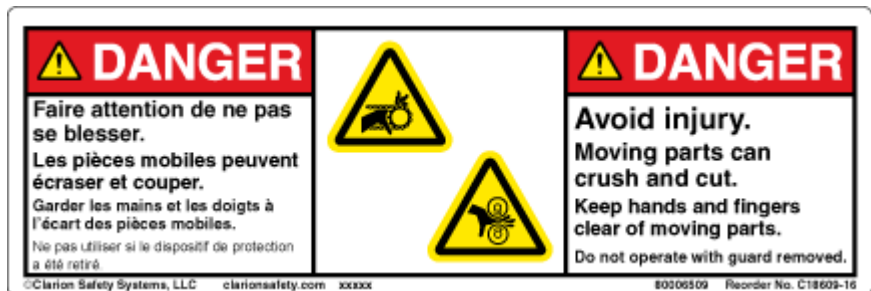
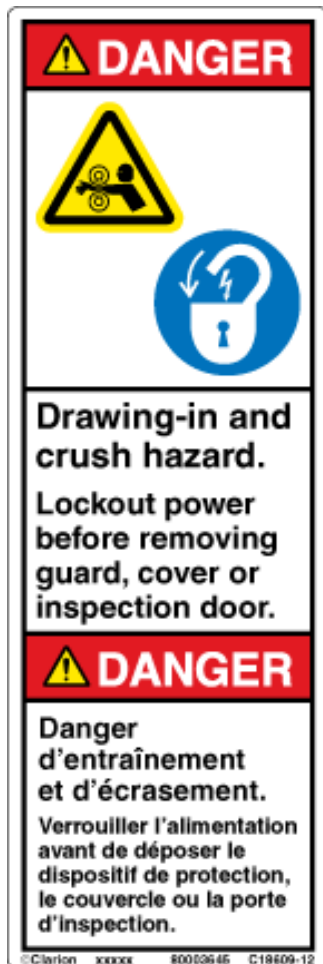
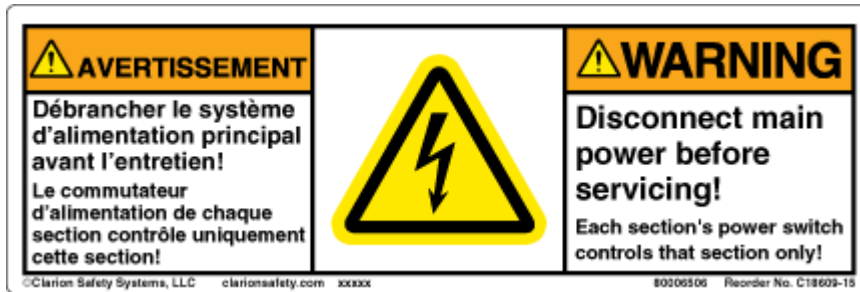


After servicing, make sure all tools, parts and service equipment are removed from the machine.



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

# TYPICAL SAFETY DECALS



## **FORWARD**

Many years of experience and engineering background have gone into the design of your extremely rugged FERRELL-ROSS flaking mill. Each FERRELL-ROSS mill is a precision built machine, constructed from durable materials to close tolerance specifications. There is not another roller mill in the milling industry that compares with the outstanding features, workmanship, or durability that is built into each FERRELL-ROSS mill.

We prepared this booklet for our 18x36 XHD Dual Drive Flaking Mill to help you install, operate and maintain your mill to the highest standard and to obtain the greatest efficiency.

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)

# Ferrell-Ross

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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.ATFerrell.com/Ferrell-Ross](http://www.ATFerrell.com/Ferrell-Ross)  
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.



# SECTION 1 - GENERAL INFORMATION

## 1.1 INTRODUCTION

The “Roller” mill achieves particle reduction by passing material through counter-rotating corrugated rolls to grind and cut a product to a specific particle size. While “Flaking/Crimping” mills are roller mills, they acquire their name because of a similar process but, instead of grinding and cutting, these mills flatten or “FLAKE” the product. The primary difference between flaking and crimping is the degree of thickness or (thinness) of the end product.

Size reduction in a “roller” mill, depends on the material, the roll speed differential, the corrugation type, the roll gap setting, the volume of material fed to the rolls, and the number of stages of reduction. In a Flaking mill these conditions are also present as well as a combination of the following, either singularly or in combination:

1. Plumpness of the kernel, “shape”.
2. Toughness of the seed coat, “hull”.
3. Moisture content of the seed.
4. Amount of conditioning, when steam is used.
5. Thinness of flake or crimped grain desired.
6. The amount of foreign material in the grain, “FM”. (Particularly rocks)

The capacity can be increased somewhat if the quality of the final product is not critical, but refer to the individual flaking charts for each type of product to find a general guide line for product qualities and conditioning requirements.

The gap setting for flaking mills are variable depending on the desired flake thinness and this too will affect the mills capacity. As a general rule of thumb, the rolls are set farther apart when rolling corn because of the larger kernel size and closer together for small grains. You will need to fine-tune this adjustment after achieving proper conditioning of the product and then adjust the mills spring and hydraulic pressures to maintain the gap setting desired.

**NOTE:** Do not allow the rolls to run together when making adjustments. Damage to the rolls may result.

# **SECTION 2**

# **OPERATION**

## SECTION 2 - OPERATIONS

### 2.1 INSTALLATION AND INITIAL CHECKS

#### GENERAL ARRANGEMENT

See the general dimension drawing for inlet, outlet, and overall dimensions. The model specifications on diagram K000-00184-I provides equipment weights.

As shipped, the mill has a feeder installed at the mill inlet. For the best mill operation, the user must provide a uniform flow of material across the width of the mill. A spout with a minimum of restrictions will be necessary to provide adequate material flow. Direct the feed stream as near as possible to the center of the mill inlet to assure uniform end to end material flow through the mill. Poor mill performance and irregular roll wear results from improper feeding of the rolls.

Provide adequate access space for mill maintenance and main drive motor adjustment and service. Allow a minimum of 24" on the sides and rear of the mill and additional space in front of the mill for roll removal.

Provide some means to lift the front panel, the rolls, the sheaves and the roll housing. Because the mill parts are heavy, use adequately rated hoists and trolleys for servicing the rolls.

#### RECEIVING INSPECTIONS

When the mill arrives, carefully inspect all items for damage or loss that occurred in transit. Notify the carrier immediately and file a claim WITH THE CARRIER for any loss or damage. Please note, A. T. Ferrell is not responsible for damage or loss incurred in shipping. Contact A. T. Ferrell for assistance with any claim settlement for damage or loss incurred in shipping.

**Please complete these checks before continuing:**

- \_\_\_ Make visual inspection of all painted and stainless steel surfaces for signs of damage. Report this information to the carrier.
- \_\_\_ Make visual inspection of the hydraulic system including hoses and tubing for signs of damage or coming loose.
- \_\_\_ Check motors and junction boxes for any signs of damage.
- \_\_\_ Check that all hardware is tight and has not loosened in shipping.

## 2.2 MILL AND MAIN DRIVE INSTALLATION

1. Install the mill on a flat, level foundation or base suitable for the weight of the equipment, the weight of the inlet spouting, and possibly the weight of the feed material.
2. Secure the mill to its base using the bolt holes provided in the frame. Use bolts to match the size and number of holes in the frame. Where needed, install a vibration damping pad under the mill to seal the outlet connection and minimize noise and vibration.
3. Mount the hydraulic power pack conveniently close to the mill, but not on the mill. Connect an air supply of 60 - 150 psi (4.5 CFM) to the air filter on the power unit. Use the 2 3/8" hydraulic hoses provided with the mill to connect the power unit to the mill. Hydraulic connections on the unit are labeled "A CYL". Hydraulic connections on the mill are located at the mill base.
4. Close the rolls.
5. Before making any electrical connections, inspect the interior of the mill for loose parts and foreign materials.
6. The discharged flaked grain is hot and moist when a steamer is used. The moisture in the grain is very corrosive; therefore, proper conveyor selection is very important. If the grain is to be stored, proper cooling before storage is required.
7. The connection of electrical utilities should only be performed by a qualified electrician. A lockout switch should be installed with the mill in series with the mill motor control circuit. The lockout switch should be located within reach of the mill. NOTE: Each mill contains 3 motors. One for each roll and one for the feeder.
8. Protect the mill inlet and discharge opening to prevent accidental entry by personnel.
9. Install all guards. Make sure that belt guards are in place and securely fastened.
10. When wiring is complete, check for correct motor rotation. Make sure the lockout switch and maintenance cover interlock switch are adjusted and function correctly. The rolls always turn inward, or toward the center.
11. Install supply and finished product take-away system interlock switches to prevent equipment damage or material backups in the event any component stops functioning.

## 2.3 OPERATION GUIDELINES

Careful operation assures optimum machine performance and roll life. Use the following general rules to operate this equipment.

- Always start the mill with the rolls clear. If in doubt, open rolls completely to allow any material in the nip to pass.
- Adjust the rolls carefully. Check the roll stop adjustment regularly to insure positive protection against roll contact.
- Maintain a full hopper in the feeder when operating to insure uniform feeding across the rolls.
- Increase the feed rate carefully. Ease up to full motor load rather than engaging the feeder at high rates. **DO NOT EXCEED FULL MOTOR AMPS.**
- Check the product coming from the mill by sampling through the bottom sample door provided. For a thinner product, adjust the rolls closer; for a coarser product, open the rolls slightly. It normally takes an adjustment of .005”\1.27mm or more to change the appearance of the product.
- To make a more exact measurement of the flake, use a micrometer to measure the thickness. Make your roll adjustment course to begin with and finer as you approach the desired flake quality.
- Check the roll alignment by examining product samples from both ends of the rolls. Different product sizing at opposite roll ends indicates a roll alignment problem or excessive feeding towards one end of the rolls. Use the roll adjustment procedure described in section 3.6 for roll alignment.
- Visually check through the feeder sight door to make sure the feed material is passing directly through the rolls. Do not allow materials to back up in the roll nip. Processing materials directly through the rolls gives the optimum machine capacity, efficiency, and roll life.
- **NEVER** attempt to start the machine with material in the roll nip.
- **NEVER** allow the rolls to grind together; rapid wear of the corrugations will result.
- **NEVER** operate at amperage loads greater than full rated motor load or damage to drive components may result.
- **NEVER** operate at more than 100% motor load.
- **NEVER** allow feed materials to back up in the roll nip; excessive roll wear and reduced capacity will result.

**Break in period for new flaking rolls.** Some suggest a break in period for new flaking rolls to reduce the generation of fines. Typical settings on flaked grain for animal feed would be about a 31 to 32 pound flake per bushel for a few days and then start closing the gap a bit each day until reaching your goal. Normally ending at about a 27 to 28 pound flake after a week or two.

## 2.4 START-UP SEQUENCE

1. If a steamer is used, follow the steamer instructions and start the steamer.
  - 1A If used, the roll preheat system should be started simultaneously with the steam chest. Suggested roll preheat start up sequence.
2. Start the product take-away system.
3. Clear the rolls (open to .500" \13.2mm) by moving the hydraulic valve to the open position (moves rolls apart).
4. Start the mill motor.
  - a. Clear the rolls.
  - b. Start the mill motor.
  - c. Slowly open the roll preheat steam valve or valves to the desired setting.
  - d. Close the preheat steam valve or valves approximately two to five minutes before introducing product to the rolls.
5. When the mill roll comes up to speed, turn on the feeder and adjust the feed rate to desired setting by adjusting the feed gate.
6. Carefully adjust the rolls to their normal operating position, by moving the hydraulic valve to close position (moves rolls together). The beginning hydraulic pressure should be approximately 800 psi \56 sq cm, adjustment for this is done with the pressure control valve on the power unit.
7. Bring the feed rate up slowly by opening the feed gate on the feeder. The feed rate of the mill is adjusted using the SCR speed controlled motor on the feeder. Do not exceed the mill motor's rated amperage.
8. As the feed rate increases, inspect the product thickness. In order to reach full mill capacity it will be necessary to increase the hydraulic pressure to compensate for roll separation due to increased feed rate. (We recommend that you do not exceed 1800 psi \126.56 kg/sq cm. The conditioning of the product, (refer to capacity charts, product conditioning specification, and steamer control for proper adjustments) will have a direct effect upon the quality of the flake produced. Inadequate product retention time in the steam chest will affect gelatinization and grain firmness, resulting in damage or shortened mill life.
9. Check samples from the rolls by inserting a sample scoop through the sample door provided at the front of the mill below the rolls. Examine samples at each end of the mill and in the center to determine mill performance. Adjust the rolls as necessary to obtain the desired results.

10. To adjust the roll gap setting use the following procedure (see K100-00212: Roll tension assembly, two of two.)
  - a. Close the feed gate on the feeder and turn off the feeder motor.
  - b. Lock out power to all mill motors and any conveyor equipment that may cause injury.
  - c. The rolls must be stopped, not moving, before checking the roll gap measurement. Once the rolls have stopped, close the rolls until they reach the hydraulic cylinder stops (see parts diagram), and with a feeler gauge measure the gap between the rolls in the operational setting. If the roll gap needs to be adjusted:
    1. Loosen adjusting jam nut (K201-05369) which locks the cylinder stop.
    2. With a cylinder wrench, turn the adjusting nut (K201-05371) toward the bearing housing to increase roll clearance, or turn the nut away from the bearing housing to decrease roll clearance.

CAUTION: the factory has preset the spring compression at 1.0" \25.4mm measurement, if the compression has changed, loosen the lock nut on the spring end and adjust accordingly. Observe the initial beginning position as a reference, you should not have to adjust this nut any further than necessary to allow for take up when the cylinder closes.
    3. Once you have completed your adjustments, measure your roll gap setting at both ends of the rolls to ensure proper alignment for even flaking and to prevent possible roll damage, and lock all nuts securely. (See torque specification)

### **WARNING**

**DO NOT INSERT HANDS OR ANY OBJECT INTO THE ROLL AREA AS PERSONAL INJURY OR DEATH MAY RESULT.**

11. Check the feeder operation through the feeder inspection door. Visually verify that the feed stream is uniform the entire length of the rolls and material is not backing up in the roll nip.

## **2.5 SHUTDOWN SEQUENCE**

1. Shutdown feeder motor at motor control. This will prevent material from being fed into mill, but will not affect material being fed into the feeder above it.
2. Close feed gate on mill.
3. Shutdown mill drive motors. Allow rolls to completely stop.
4. Shutdown product take-away system.
5. Open the rolls.
6. Shut off steam.

## 2.6 SCRAPER KNIFE ASSEMBLY ADJUSTMENT

**Note: Please refer to Drawing K100-00781 for Detail**

1. It is necessary to make initial adjustment of the knife assembly prior to operation to ensure contact of the knife to the roll. Adjustment of each knife is made by adjustment knobs found at the base of the mill opposite the motors. The top two knobs is for the scraper on the front roll, the bottom two knobs is for the scraper on the back roll.
2. With the rolls stopped, you can push and pull on each knob to bounce the scraper on that side against the roll. Turning the adjustment knob will allow a slight contact to be made with the roll. Giving another  $\frac{1}{4}$  turn will allow the spring tension to maintain that slight contact.

Note: Do not over tighten as this excessive contact will create excessive wear on the scraper blades and excessive noise during operation.

3. Equally adjust the knife holder so that the knife contacts the entire roll surface.
4. Scraper wear is to be expected especially after initial start-up as the square edge wears to match the roll.
5. Buildup of material on the roll will occur if the scrapers are not adjusted correctly



# **SECTION 3**

# **MAINTENANCE**

## **SECTION -3 MAINTENANCE**

### **3.1 LUBRICATION**

Satisfactory long-term performance of a mill requires proper maintenance and lubrication. The factory filled all gearboxes with the appropriate lubricants, and greased all bearings before shipping the mill.

Use the following lubrication recommendations for proper maintenance of the mill working components.

Use high quality multipurpose grease, such as Sunoco Prestige, Philube 1B & RB, Mobilux 2, or Gold Pillow Lube. As some additives may not be compatible, do not mix different grease types. When changing grease types; completely flush the unit to prevent cross contamination between the different grease types.

Use care to clean fittings off before applying the grease gun to prevent contamination of the bearings. Use a hand-operated grease gun rather than an air powered unit to reduce the possibility of blown grease lines and seals.

The mill design allows lubrication of all bearings while the mill is in operation. Follow the lubrication schedule, but do not over grease as excess lubricant can get into the belts and cause premature belt failure.

Several of the bearings on the mill employ remote grease fittings and poly grease lines to ease lubrication on the go. Periodically check these lines for integrity to verify that grease is being supplied to the bearings.

Follow the motor manufacturer's specifications for the lubrication of all motors. Motors require less frequent lubrication than other mill components.

On mills with inter-roll drive shaft mounted gear reducers, the use of Mobil SHC 629 synthetic oil is recommended.

#### **NOTE**

**DO NOT SUBSTITUTE ANY PETROLEUM BASED LUBRICANTS FOR THE SYNTHETIC OIL LISTED.**

Follow the lubrication schedule for the shaft mounted reducers.

Flush the gear boxes with kerosene and drain completely before refilling. Do not over fill the gearbox. Over filling will result in oil being discharged through the vent plug.

Drain and refill the roll feeder drive with SAE 80W-90 gear lube.

## LUBRICATION CHART

The following lubricants have been recommended for use with the various parts of your roller mill. You should check with your local lubricant supplier to find suitable alternatives.

### FEEDER BEARINGS ROLL/PIN - ROLL ECCENTRICS/ADJ. SCREW - FEED GATE

LUBRICANT	SUPPLIER
Phillube 1B & RP	Phillips Petroleum Co.
Andok 280	Imperial Oil Co.
Amolith #1	Standard Oil Co.
Sunoco 844-X	Sun Oil Co.
F-925	New York & New Jersey Oil
Keystone 44-h	Keystone Lubricating
Lubriko M-21	Masters Lubricant Co.
Nerita 2	Shell Oil Co.
Andok B	Standard Oil (NJ)
Mobilux 2	Mobile Oil Co.
Atlantic 54	Atlantic Refining Co.

These bearings have been greased at the factory; no additional grease should be required to start the machine. Lubricate at intervals suggested on the Lubrication Chart. Grease should be added slowly with shaft rotating if possible, until grease can be seen coming out through the pressure relief hole in the grease fitting. Use caution when using a high-pressure, high volume grease gun.

### ROLL CHILL BEARINGS

LUBRICANT	SUPPLIER
Philube L #1	Phillips Petroleum Co.
Atlantic 62	Atlantic Refining
Amolith #1	Standard Oil Co.
Molibux #1	Mobile Oil Co.
Lubriko M-3 Spec.	Masters Lubricants
Andok 28	Imperial Oil
Sunoco 844-X	Sun Oil Co.

These bearings have been packed with grease before completion of assembly. Re-lubricate according to the Lubrication Chart time interval. Greasing is accomplished through the grease zerk found on the bearing plate cover.

### IDLER BEARING FOR DIFFERENTIAL DRIVE V-BELT

For normal operating conditions a grease should be used which conforms to NLGI No. 2 consistency and is free of any contaminants.

These bearings have been greased before completing of assembly, re-lubricate according to the Lubrication Chart time interval. Grease should be pumped in slowly. The maximum grease capacity of the bearing is 5/8 ounces.

## LUBRICANT CHART

Ambient Conditions		Operating Conditions		Bearing Operating Temperature		Suggested Greasing Interval**	Use these greases or equivalent
Dirt	Moisture	Load	Speed	Low	High		
Clean	Dry	Light to Medium	Slow to Medium	0	120	2-6 months	High quality NLGI #1 or 2 Multi-purpose bearing greases are generally Satisfactory. Consultation with a reputable lubricant supplier is recommended.
				120	200	1-12 months	
Moderate to Dirty	Dry	Light to Medium	Slow to Medium	0	200	1-4 weeks	
				120	200	1-7 days	
Extreme Dirt	Dry	Light to medium	Slow to Medium	120	200	Daily flushing out dirt	
	High humidity Direct water splash	Light to Heavy	Slow to medium	32	300	1-4 weeks grease at shutdowns	Mobil Oil Co., Mobilux EP2 Texaco Inc., RB2 Shell Oil Co., Alvania EP2
		Heavy to very heavy	Slow	0	200	1-8 weeks	Shell Oil Co., Alvania EP2
				-20	120	1-8 weeks	Shell Oil Co. Alvania EP-RO
		Light	High Speed	100	200	1-8 weeks	Imperial Oil & Grease Co., Molub-Alloy # 2 Gulf Oil Corp., Gulfcrown #2 Texaco Inc. Molytex # 2
	Possible frost	Light to heavy	Slow to medium	-65	250	1-4 weeks grease at shutdown	Esso, Beacon 325 Texaco Ubc,m 2346EP Low Temp Shell Oil Co., Aeroshell 7A
Clean to moderate	Dry	Light to medium	Slow to medium	80	250	1-8 weeks	Union Oil Co., Unoba EP2 Texaco Inc., 1999 Hi Temp
Clean to dirty	Dry	Light	Slow	80	300	1-4 weeks	Dow Chemical Co., DC44 Keystone Lubricants Co., No 89

\*\*Suggested starting interval for maintenance program. Check grease condition or oiliness and dirt and adjust greasing frequency accordingly. Watch operating temperatures. Sudden rises may show need for grease or indicate over lubrication on higher speed applications.



# CHEVRON DELO® 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® 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.



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20 December 2005  
GR-35

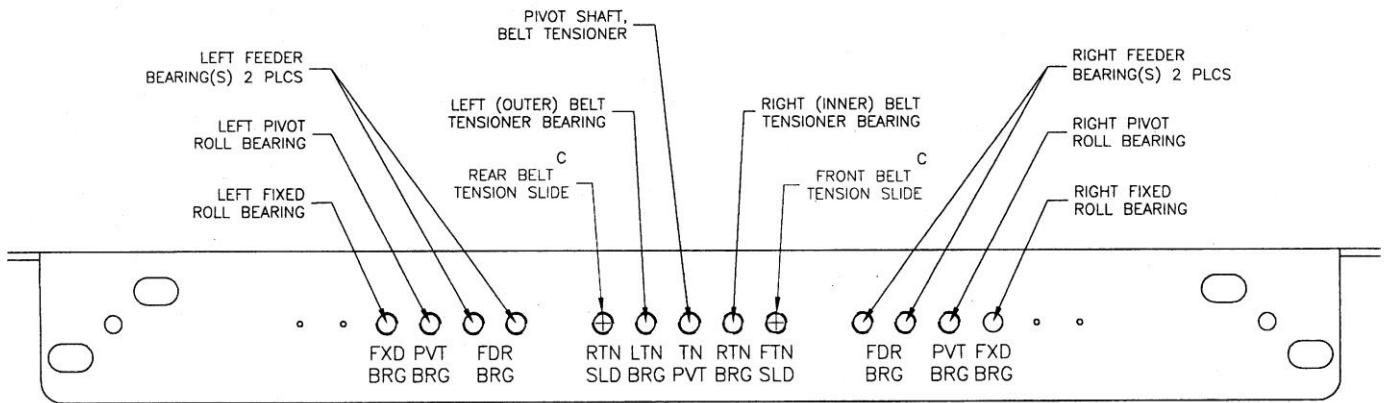
**TYPICAL TEST DATA**

<b>NLGI Grade</b>	<b>00</b>	<b>0</b>	<b>1</b>	<b>2</b>
Product Number	235212	235211	235209	235208
MSDS Number	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.






NOTES:

- 1: DO NOT SCALE FROM DRAWING.
- 2: ONE PIECE REQUIRED PER K100-00260: FRAME WLDMT, 18X36" XHD, LH.
- 3: ONE PIECE REQUIRED PER K100-00261: FRAME WLDMT, 18X36" XHD, RH.
- 4: ONE PIECE REQUIRED PER K100-00265: FRAME WLDMT, 18X36" XHD CEREAL, RH.
- 5: ONE PIECE REQUIRED PER K100-03031: FRAME WLDMT, 18X36" XHD GARNET, RH.
- 6: ONE PIECE REQUIRED PER K100-03053: FRAME WLDMT, 18X36" XHD DUAL DRIVE.

REV	ECN/NPR NO	DATE	DESCRIPTION OF CHANGE	DRAWN
C	K040034	6/29/04	ADDED FRONT & REAR BELT TENSION SLIDE HOLES	DJ
B	K010132	4/14/02	ADD 11 1/4"-18 NPT HOLES & LETTERS 0.72 & 2.22 MORE 1.13 & 2.56	DJ
A	K000073	8/21/00	CHANGE FRACTIONAL TOLERANCE BLOCK ELIMINATE 3 PLC DIM., ADD NOTE #5	TF
--	K000086	7/6/00	UNIVERSAL REDESIGN, OBS K300-00221 XXXXX	DJ

--		20412443	15.257	SHT. 7 GA HRPO CQ 48 X 120 (.1793)	
ITEM	PART NO.	QTY.	DESCRIPTION		
CAD NO MANUAL CHANGES					
TOLERANCES (EXCEPT AS NOTED)					
DECIMAL: .XXX ± .005 .XX ± .030	FINISH: NONE	SCALE: 1/2	DRAWN BY: DJ	APPROVED BY: X.X.X.	
FRACTIONAL: ± 1/16	DRAWING TITLE: LETTER DETAIL, PLATE, FRONT STEP 18/20X36" XHD				
ANGULAR: ± 1/2°	DATE: 11/12/02	SIZE: B	DRAWING NO.: K200-00220	SHEET: 2 of 2	

### TABLE 1 - BOLT TORQUE SPECIFICATIONS

Use the following guide for torque specifications of sheave bushing screws.

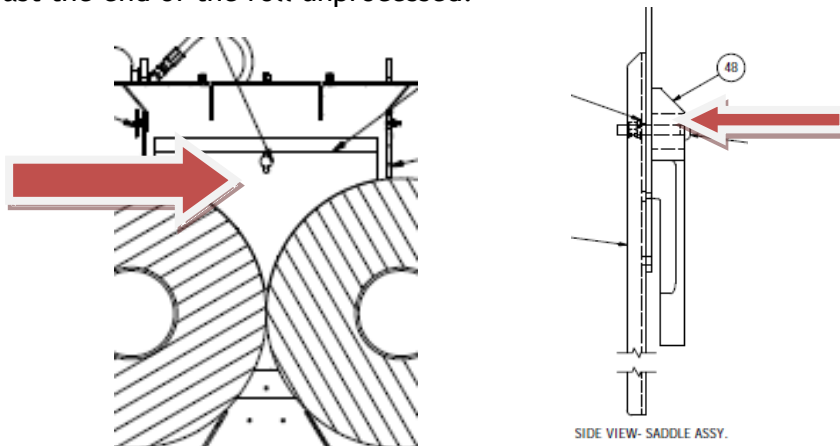
SCREW	TORQUE (IN-LB)	(FT-LB)
5/16-18	120-180	10-15
3/8-16	240-360	20-30
½-20	480	40
½-13	720	60
9/16-12	600-900	50-75
5/8-11	1080-1620	90-135
¾-12	1800	150
¾-10	2700	225
7/8-9	2400-3600	200-300
1-8	3600-5400	300-450



## ROLL SADDLES

### 3.2 ROLL END BLOCKS (SADDLES)

The roll ends are chamfered during corrugation and remaining chamfer leaves a small opening where material could pass without being crushed. The roll end block effectively seals this opening to prevent anything from getting past the end of the roll unprocessed.



The roll end blocks or saddles are “V” shaped blocks made from aluminum or UHMW polyethylene. These are relatively soft materials and prevent damage to the roll ends should contact take place.

The roll end blocks will require periodic maintenance, as the point of the “V” will wear with use. The roll end blocks are usually serviced when the rolls are corrugated. If wear dictates, service the roll end blocks prior to roll removal.

Use the following procedure to service the roll end blocks.

#### CAUTION

**MAKE SURE THE POWER IS SHUT OFF AND LOCKED OUT BEFORE SERVICING THE ROLL END BLOCKS.**

Please refer to drawing K000-02456. Access the roll end blocks on the flaking models by removing the maintenance cover at the front of the mill from above the rolls being serviced. Remove the roll drive covers to gain access to the roll end block bolts on the differential and drive end of the mill.

To adjust the roll end blocks, move the rolls to their fully closed position. Loosen the nut on the roll end block bolt and hold the roll end block directly in the nip as the nut is tightened.

To replace the roll end block, remove the nut from the roll end block bolt and pull the roll end block out. Insert the new roll end block and bolt through the holes in the roll end plate and through the slot in the mill frame. Replace the nut and tighten it.

### 3.3 BELT DRIVE ADJUSTMENT

The mills have two motors, one per roll. Each motor has one belt that drives a roll. The belts need to be correctly installed and tensioned at installation. However belts need to be checked periodically for proper tightness. It is not uncommon for belts to loosen after the first few days of operation. This section discusses the proper method of adjusting the drive belts to the proper tightness.

#### CAUTION

**MAKE SURE THE POWER IS SHUT OFF AND LOCKED OUT BEFORE PERFORMING ANY MAINTENANCE OR SERVICE ON THE FLAKING MILL DRIVES. THIS MUST BE DONE PRIOR TO REMOVAL OF THE DRIVE GUARDS THAT GIVE ACCESS TO THE DRIVE BELTS.**

#### CAUTION

**NEVER "ROLL" A BELT OVER A SHEAVE OR DAMAGE TO THE CORDS IN THE BELT COULD RESULT IN POOR BELT PERFORMANCE AND SHORT LIFE**

Drive belt tension is set by the position of the motor base for that drive. After setting the correct tension, re-install the main drive guard covers.

### TENSIONING BELT DRIVES

Without exception, the most important factor in the successful operation of a belt drive is proper belt-tensioning. 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. 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 month of operation.

### BELT INSTALLATION CHECKLIST

- |  |  |
|--|--|
| <input type="checkbox"/> 1) Lock out power source                                  | <input type="checkbox"/> 10) Inspect sheave grooves for wear. Replace if necessary |
| <input type="checkbox"/> 2) Observe all safety procedures                          | <input type="checkbox"/> 11) Check sheave alignment (1 <sup>st</sup> check)        |
| <input type="checkbox"/> 3) Follow manufacturer guidelines                         | <input type="checkbox"/> 12) Verify replacement belts                              |
| <input type="checkbox"/> 4) Remove belt guard                                      | <input type="checkbox"/> 13) Install new belts                                     |
| <input type="checkbox"/> 5) Loosen belt by adjusting the motor base for that drive | <input type="checkbox"/> 14) Tension belts   |
| <input type="checkbox"/> 6) Shorten center distance                                | <input type="checkbox"/> 15) Check sheave alignment (2 <sup>nd</sup> check)        |
| <input type="checkbox"/> 7) Remove old belts                                       | <input type="checkbox"/> 16) Replace guard   |
| <input type="checkbox"/> 8) Inspect belts for wear patterns.                       | <input type="checkbox"/> 17) Start drive (look & listen)                           |
| <input type="checkbox"/> 9) Inspect and clean drive components                     | <input type="checkbox"/> 18) Re-tension after 24 hours                             |

## 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. Refer to drawing K00-00184 for detail of the illustrations below.

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.

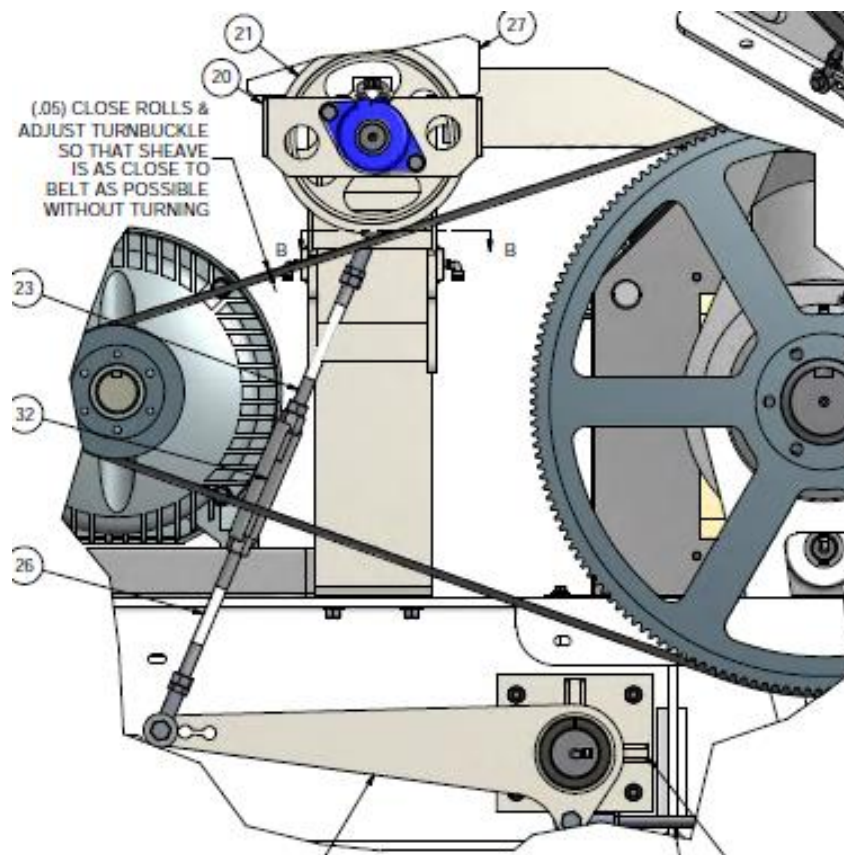
Step 4: Using a spring scale, apply a perpendicular force to any ONE of the belts at the midpoint of the span as shown in figure 2. Compare this deflection force with the values found in Step 3.

- 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.

## BELT TENSIONER ASSEMBLY ADJUSTMENT

The belt tensioner assembly is used on the pivot roll drive to keep the belt tensioned when the pivot roll is opened. Under normal operating conditions when the rolls are closed and the mill is in operation the belt tension is set by adjustment of the position of the motor base from the pivot roll. As the pivot roll in the mill is opened it moves toward the motor it would normally create slack in the belt. The belt tensioner assembly sheave maintains proper belt tension by moving down against the belt as the roll is opened, pressing against the belt and taking up this slack. The position of the belt tensioner assembly is pre-set from the factory. With the rolls closed the belt tensioner wheel should be as close as possible to the belt without turning. Adjustment of the turnbuckle arm is used to set this distance.



### 3.4 ROLL ADJUSTMENT PROCEDURE

Use the following procedure to set the parallel alignment of the rolls.

1. Shut off power to the mill and lock out all motors.
2. Back off the roll stop nuts on the roll adjust rod, cylinder stop or fixator, whichever is used.
3. Bring the rolls together until they just touch.
4. After the rolls touch, check the roll alignment end to end. If the rolls are more than 0.05" out of parallel, adjust the rolls to parallel as follows:

Loosen the jam nut on the cylinder, adjusting rod, or fixator, depending on the mill type. Depending on which end needs moved, turn either the eccentric rod or cylinder adjusting nut or fixator, adjust bolt until the rolls are parallel within the 0.005" end to end clearance. With the roll stop adjusted, check to make sure the pivot roll housing is centered vertically. If not, loosen foot piece bolts and center the roll housing. Repeat the above procedure until there is less than 0.005" difference in roll clearance end to end and roll housings are vertical.

5. Adjust the minimum roll gap setting as follows:

With the rolls touching and parallel, back off the rolls. Use a 0.010 feeler gauge, shim stock, or wire gauge to check the roll difference. This is the minimum roll gap setting recommended for set up and initial operation. The final minimum roll gap setting may need to be less than 0.005", but should never allow roll to roll contact. To keep the rolls parallel while making the adjustment, we recommend that you alternate the turns on the adjusting nuts from one side of the mill to the other and make the same amount of rotation on the nuts with each adjustment.

6. Tighten the roll stop adjust nuts. After tightening the roll stop nuts, check the roll alignment for end to end parallel adjustment.

### 3.5 ROLL RE-CORRUGATION

Roll wear depends on the material being processed, the tons processed, the material reduction achieved, the accuracy of the roll adjustment, and any impurities in the material stream. Maintaining a uniform flow of clean material across the width of the rolls assures maximum roll life.

The rolls have a hardened chill depth of approximately 5/8" to 3/4". The corrugations are cut into this hardened area of the roll. Re-corrugating extends the useful life of the rolls. With each re-corrugation, a reduction in roll diameter and hardened chill thickness occurs. Depending on the number of re-corrugation and the corrugation contractors' equipment, rolls usually can be re-corrugated 4-8 times before they are too small or soft for rework.

When returning the rolls to Ferrell Ross for re-corrugation, the bearings do not have to be removed from the rolls. If the user has spare replacement rolls, fitting the spare rolls with bearings and housings rather than trying to change bearings back and forth assures minimum mill downtime.

Make sure the return shipping container is suitable for the weight and the handling the rolls will receive while in transit.

**SECTION 4**

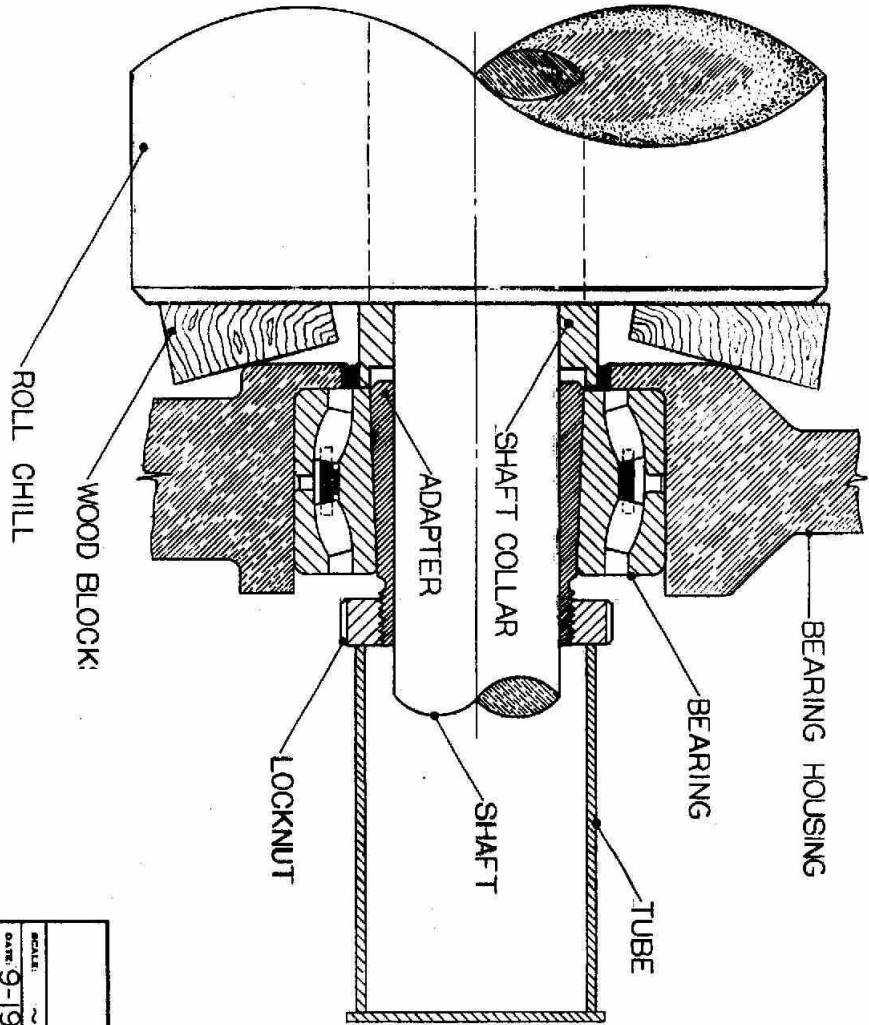
**ROLL CHILL  
REMOVAL  
&  
INSTALLATION**

## SECTION 4 - REMOVAL OF ROLL CHILL BEARINGS AND ADAPTERS

### 4.1 MAINTENANCE

**CAUTION:** Do not use a standard bearing pull because this will force the bearing on the journal tighter.

1. Remove the bearing housing cover plate.
2. The tangs of the lock washer will have to be bent clear off the lock slots so the nut may be loosened.
3. The nut is loosened in the following manner:
  - a. The nut has right hand threads so it must be loosened in a counter clockwise direction.
  - b. A soft steel bar or a spanner wrench is placed in one of the nut slots.
  - c. Strike the bar or a spanner wrench several sharp blows with a hammer.
  - d. Loosen the nut until approximately three-fourths (3/4) of the threads are still in contact with the adapter.
  - e. Use a piece of pipe that has a block of metal welded to the end.
  - f. Strike the piece of pipe on the end squarely and this will force the bearing adapter inside the shaft collar.
  - g. The bearing housing, bearing and adapter will slip very easily off the journal.



<b>FERRELL-ROSS</b>		OKLAHOMA CITY, OKLAHOMA	
DESIGNED BY	APPROVED BY:	DATE	REVISION
		9-19-79	
<b>ROLL CHILL BEARING AND ADAPTER</b>			
<b>REMOVAL</b>			
		DRAWING NUMBER 070-00051	



## Dismounting

Bearing type: Explorer spherical roller bearing

Selected bearing: SKF 22228 CCK/W33

Dismounting from adapter sleeve  
Mechanical

Carefully read the complete instructions prior to starting work, the instructions may contain alternative tools and measuring methods.

Illustrations are not always proportional and are not always showing the exact design.

The instructions are valid for SKF bearings only.

Where tool recommendations are made, please check the actual dimensions against the bearing and any other components, which may interfere with the use of the tool.

! The mounting and dismounting of rolling bearings involve the handling of sometimes-heavy weights; the use of tools and other devices and in some cases the use of high-pressure oil. In order to avoid accidents, injuries or damage to property please follow carefully the prescribed methods.

---

### Precautions

Arrange for a clean working place.

An undamaged bearing should be remounted in the same shaft position and orientation. Mark each bearing's relative position, i.e. which section of the bearing is up, which is in front etc.

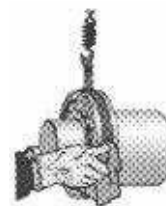
In case of bearing damage it might be necessary to analyze the bearing components to find the cause and to take corrective actions, so dismount with care.

Review the actual drawing and study the bearing arrangement.

Make sure that shaft or housing is properly supported during dismounting.

Use lifting equipment to facilitate the handling of the bearing.

! Make sure that the lifting equipment is secure so that the bearing will not be dropped. Check that no one is under the bearing.



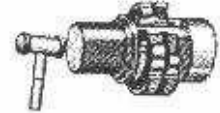
## Dismounting procedure

Dismounting can be achieved by hammer blows applied directly to a sleeve abutting the lock nut or the inner ring.

Mark the adapter sleeve's position on the shaft so that it can be remounted in the same position.  
Disengage the tab of the locking washer.

Loosen the nut a few turns but leave it on the sleeve.

Use a hammer and a sleeve abutting the lock nut or the adapter sleeve.

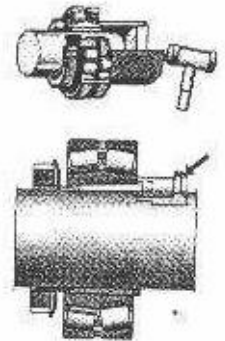


A suitable dismounting sleeve, such as those provided by SKF in the fitting tool kit, should have a cover so that hammer blows will be dampened.

Give the sleeve a couple of sharp blows so that the bearing comes loose.

Use a dead blow hammer and strike firmly in the center.

Place the sleeve against the bearing inner ring if the nut is located inward.



Bearings mounted so that it is impossible to use a hammer and sleeve can be dismounted with a special segmental drift. Only a few hammer blows to the inner ring face are required.

Do not use a sharp-formed drift, since the bearing or adapter sleeve may be easily damaged.

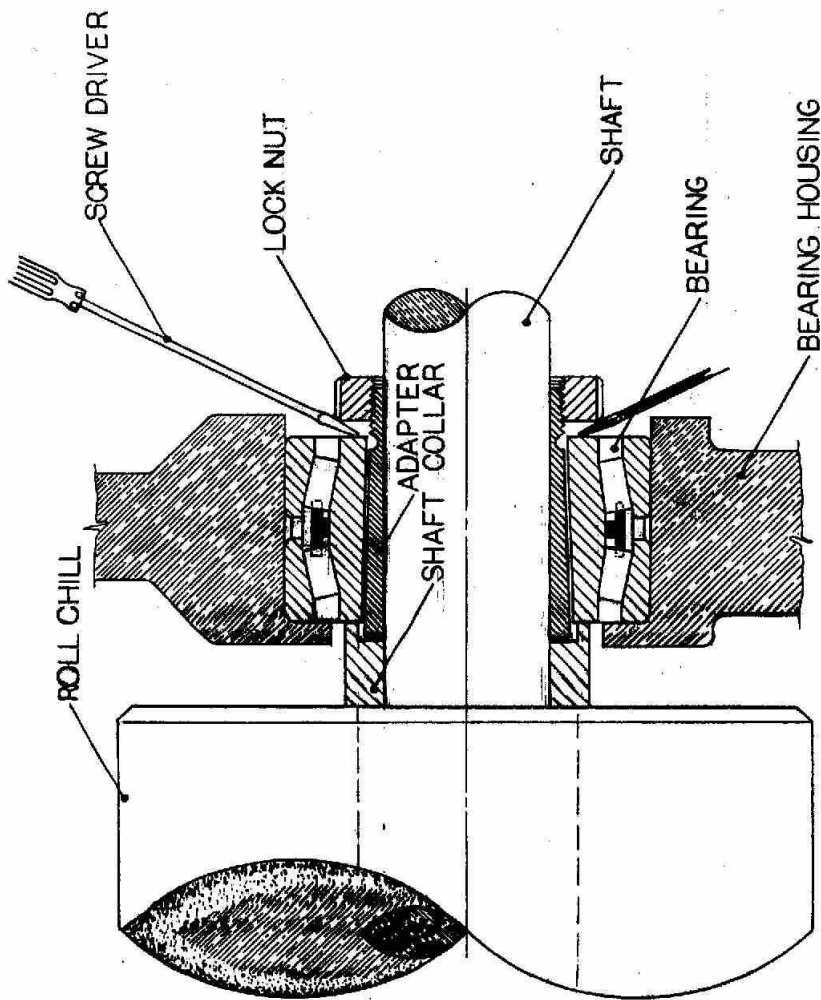
## 4.2 INSTALLATION OF RECORRUGATED ROLLS

NOTE: Use two (2) 15” long two-by-fours to support the bearing housings while installing bearings.

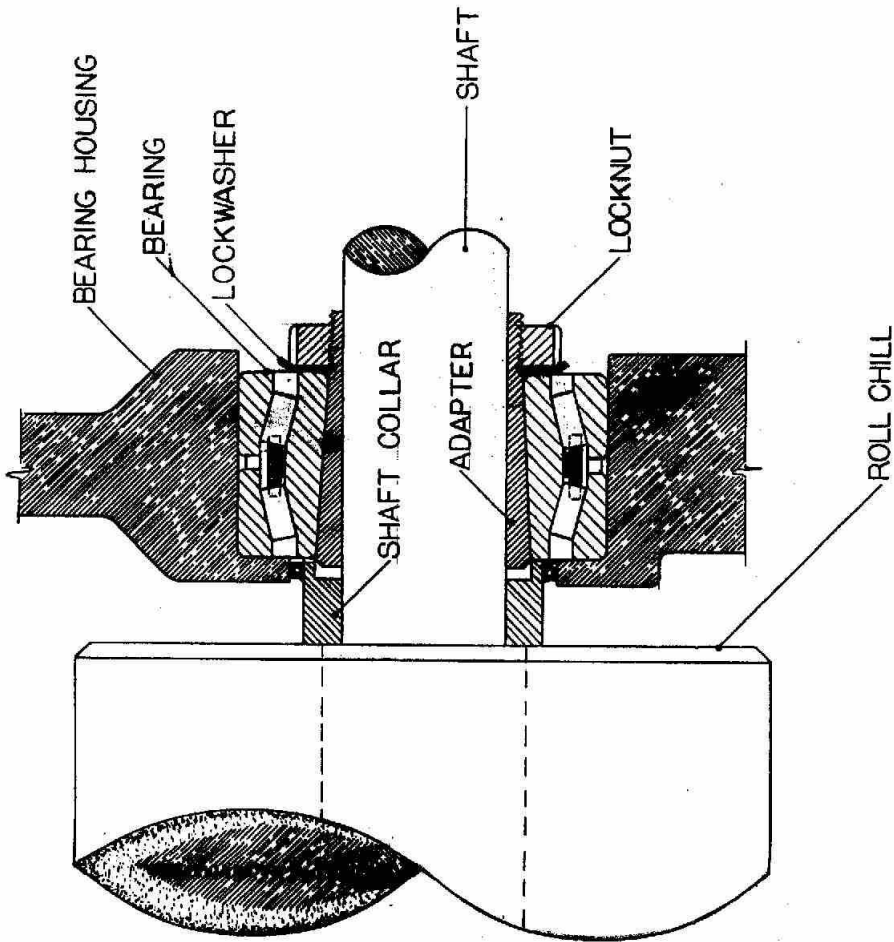
1. Install bearing in bearing housing with large end of tapered toward backside of bearing housing.
2. To ensure proper clearance for the installation of the bearing cap, and to prevent bearing from falling out of bearing housing, a lug is bolted to the cap end of the bearing housing.
3. Turn bearing housing facedown and use a grease gun to force grease between the rollers on the backside of the bearing.
4. Install the grease seal on back side of bearing housing.
5. Clean journal, making sure the shaft collar is well cleaned and install dust seal. Install bearing adapter on journal with slotted nut and lock washer removed.
6. Slip bearing and bearing housing over bearing adapter making certain adapter is under the shaft collar. Slip on lock washer then screw on nut snugly, but not tight. (NOTE: The other three journals will be prepared up to this point.)
7. Hoist rolls into base of the mill and secure with bolts. Do not tighten bolts at this point.
8. After both rolls are in place, install roll release connecting rod with tension rods. (This assures alignment of rear bearing housings.)
9. After tension rods and roll release connecting rod are installed, tighten front and rear bearing housing bolts.
10. Install tension springs and pull rods together evenly from end to end.
11. Center the rolls inside the base of mill and then wedge boards on each side of roll to keep them from slipping during the next step.
12. Loosen adapter nuts the distance of three or four threads. Place two screw drivers or 18” nails bars behind the lock rings and pry the adapters out as far as possible. This causes the bearing to be drawn snugly into position and pulls adapter from under the shaft collars. ***\*CAUTION should be exercised at this stage to prevent distortion of the threads on the adapter by the prying tools.***
13. Use a spanner wrench and hammer to tighten slotted nuts, then bend tang of lock washer in lock nut.

## INSTALLATION OF RECORRUGATED ROLLS (CONT.)

14. Remove lugs installed in step 2.
15. Pack front side of bearing.
16. Install grease seal in bearing cap and fill concave portion of bearing cap with grease and bolt in place.
17. Remove connecting rod couplings and connecting rod then install front and back roll housing.
18. Install connecting rod couplings and connecting rod.



FERRELL-ROSS OKLAHOMA CITY, OKLAHOMA		DATE: 9-20-79	APPROVED BY: <i>[Signature]</i>
SCALE: ~	DATE: 9-20-79	DRAWING NUMBER: 070-00052	
ROLL CHILL BEARING AND ADAPTER INSTALLATION			REVISED



<b>FERRELL-ROSS</b> OKLAHOMA CITY, OKLAHOMA		DRAWN BY: <i>[Signature]</i> REVISED:
SCALE:	DATE: 10-2-79	APPROVED BY: <i>[Signature]</i>
<b>ROLL CHILL BEARING AND ADAPTER</b>		QUANTITY ORDERED: 070-00053
<b>INSTALLED</b>		

## Mounting

Bearing type: Explorer spherical roller bearing

Selected bearing: SKF 22228 CCK/W33  
Mounting on adapter sleeve  
Mechanical mounting

Carefully read the complete instructions prior to starting work, the instructions may contain alternative tools and measuring methods.

Illustrations are not always proportional and are not always showing the exact design.

The instructions are valid SKF bearings only.

Where tool recommendations are made, please check the actual dimensions against the bearing and any other components which may interfere with the use of the tool.

! The mounting and dismounting of rolling bearings involve the handling of sometimes heavy weights, the use of tools and other devices, and in some cases the use of high pressure oil. In order to avoid accidents, injuries or damage to property please follow carefully the prescribed methods.

---

### Precautions

Mount the bearing in a clean environment. Housings, shafts and other components of the bearing arrangement should be checked to see that they are clean.

The bearings should be left in their original packages until immediately before mounting so that they do not become dirty.



The dimensional and form accuracy of all components which will be in contact with the bearing should be checked.



The diameter of cylindrical shaft seating's is usually checked using a micrometer at four positions in three planes. The measurement form available here or similar should be used in the measuring process and for future follow-up.



Use lifting equipment to facilitate the handling of the bearing. Spring suspension can simplify bearing positioning.

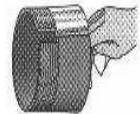
! Make sure that the lifting equipment is secure so that the bearing will not be dropped. Have no personnel standing under the bearing.

### Mounting procedure

Wipe the preservative from the bore and outside diameter of the bearing.

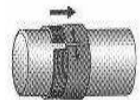
If the bearing is to be grease lubricated and used at very high or very low temperatures, or if the grease is not compatible with the preservative it is necessary to wash and carefully dry the bearing.

Wipe the preservative from the surface of the sleeve.



Lightly oil the bore of the bearing with a thin mineral oil.

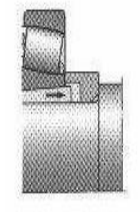
Open the adapter sleeve by inserting a screwdriver or other suitable tool in the slit and slide the sleeve along the shaft to the correct position.



Place the bearing on the sleeve.



Using adapter sleeve when the bearing is mounted against an abutment requires a spacer sleeve. The spacer sleeve must be designed in such a way that the adapter sleeve can move under the spacer to allow the bearing to contact the spacer sleeve. The dismounting distance required is greater than the drive-up distance.





Screw on the nut with its chamfer facing the bearing but do not mount the locking washer.

Use impact spanner SKF TMFN to tighten the nut



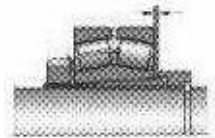
Tighten the nut until the bearing is driven up to the correct position. To determine the correct position see below.

Measuring the axial drive-up using shims

If mounting against an abutment and there is and there is sufficient space between the bearing and the spacer sleeve, two shims can be used and to be positioned 180° to each other. These should each have a thickness equal to the required axial drive-up **0.0433 inch**.

The drive-up value is valid for solid steel shafts only.

Insert the adapter sleeve under the spacer sleeve, press the shims against the spacer sleeve and push the bearing on to the adapter sleeve until it makes contact with the shims.



Tighten the lock nut, but not more than it is still possible to remove the shims. Remove the shims and drive the bearing up until it contacts the spacer sleeve by tightening the nut using the spanner.

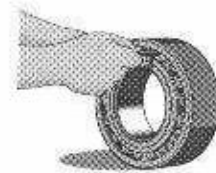
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### Measuring residual clearance using feeler gauges

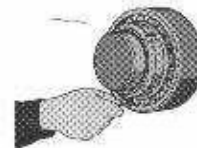
The initial clearance before mounting must be measured and the clearance must also be measured as the bearing is driven up on its seating until the prescribed clearance reduction has been achieved.

The reduction in radial internal clearance should be minimum **0.0026 inch** and maximum **0.0035 inch**.

The clearance should always be measured between the outer ring and an unloaded roller, either the uppermost...



.....or the lowest one when the bearing is on the shaft.



Before measuring, the bearing should be rotated a few times to ensure that the rollers have assumed their correct position.

During the measurement, the roller at the measuring point should be lightly pressed against the guide ring between the two roller rows and the feeler gauge blade be inserted to the middle of the roller. The measured internal clearance must be the same for both rows of rollers.

The residual radial clearance should be minimum:

**0.0022 inch** for Normal clearance bearing.

**0.0032 inch** for C3 clearance bearing.

**0.0043 inch** for C4 clearance bearing.

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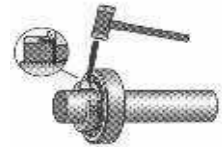
Unscrew the nut. The bearing will not come loose.

Place the locking washer in position.



Tighten the lock nut firmly but make sure that the bearing is not driven any further up the sleeve.

Lock the nut by bending one of the locking washer tabs down into one of the slots in the nut. Do not bend it to the bottom of the slot.



Check that the shaft or outer ring can be rotated without any disturbances.

If the bearing is to be oil lubricated take care that the right quantity of the right oil used.

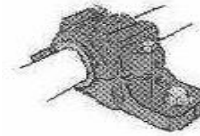
If the bearing is to be grease lubricated, now is the time to put in the grease.

Normally the bearing should be filled completely with grease unless it is to operate at high speeds. The free space in the housing should only be partly filled (between 30 and 50%).

The grease meter SKF *LAGM 1000* is a helpful tool for keeping track of the supplied quantity.

For “normal” operating conditions the grease SKF *LGMT 2* may be used. For selection of suitable grease considering the actual operating conditions see SKF *Quick grease selection guide*.

If the bearing is to be fitted in a plumber block housing, see *instructions* for mounting the housing.



Re-lubrication intervals for SKF 22228 CCK/W33

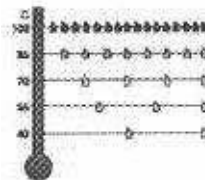
Re-lubrication interval in operating hours for the bearing when it is grease lubricated, operating temperature is below 70°C (158°F) and operating conditions are “normal”. In many cases the re-lubrication interval may be longer than stated here. For more detailed information, see the *SKF Interactive Engineering Catalogue* or contact your SKF representative.

Speed rating for grease lubrication: **1700 r/min**

Rotational speed, r/min	Re-lubrication interval, operating hours
340 (20 % of speed rating)	<b>6400</b>
850 (50 % speed rating)	<b>1900</b>
1360 (80 % of speed rating)	<b>810</b>

Grease quantity to be used when re-lubricating: **3 ounce**

At bearing temperatures over 70°C (158°F), the re-lubricating interval should be reduced by half for each 15°C (27°F) increase in temperature. Intervals may be extended for temperatures less than 70°C (158°F).



It is necessary to lubricate more frequently in applications where there is a risk of heavy contamination. The same applies to bearings in wet environments. For bearing on vertical shafts the intervals should be halved.



The *SYSTEM 24* automatic grease dispenser secures the supply of lubricant to the bearing and is especially suitable in locations that are difficult to access.



**SECTION 5**

**PARTS**

**AND**

**ASSEMBLY**

## PRINTS IN THIS MANUAL

### 18x36 Dual Drive Flakemaster

K000-00184-I (3pgs)	Installation, 18x36 Flakemaster
K000-00184 (2pgs)	Roller Mill Assy, 18x36 Flakemaster
K100-00212 (2pgs)	Roll Tension Assy, 18" XHD HYD
K100-00416	Door Assy, Sample 18/20"
K100-00723	Hydraulic Assy, RH 18x36
K100-00781	Scraper Assy, Install, SS DD
K100-03050 (2pgs)	Roll & Brg Hsg, Assy, Pivot
K100-00524	Bearing Housing Assy, Pivot 228
K100-03051 (2pgs)	Roll & Brg Hsg, Assy, Fixed
K100-03052 (2pgs)	Center Sect. Asy, Dual Drv 18x36"
K100-03054	Guard Assy, Fixed, Dual Drive 18"
K100-03055	Guard Assy, Pivot, Dual Drive 18"
K100-03056 (2pgs)	Pin Feeder Assy, Reducer Drive
K100-03062	Belt Tension Assy, Dual Drive