CLASSIFIER MILL INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

MODEL:_____

SERIAL NO:_____

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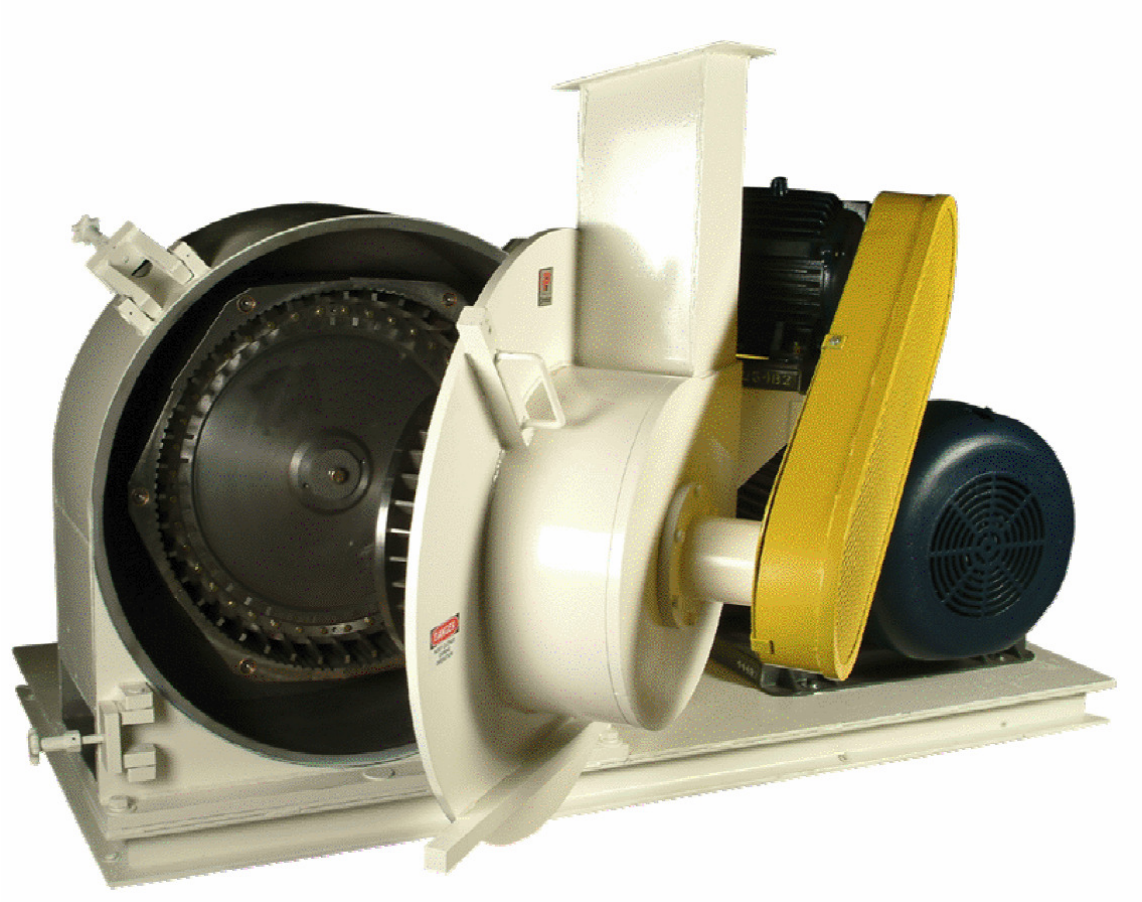

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Section 1

Section 1: Safety Rules

1.1 Safety Rules

Safety must be considered through all facets of operation and maintenance on any mechanical device. Using proper tools and methods will help prevent accidents and serious injury to you and your fellow workers.

Proper operating procedures and safety precautions are listed throughout this manual. Study them carefully and follow instructions; insist that those working with you do the same. Most accidents are caused by someone's carelessness or negligence.

Examples of the four types of safety notices (Danger, Warning, Caution and Notices) in this manual are listed below:

⚠ DANGER	**DANGER: INDICATES AN IMMINENTLY HAZARDOUS SITUATION IN WHICH PERSONAL INJURY OR DEATH MAY OCCUR.**
⚠ WARNING	**WARNING: INDICATES A POTENTIALLY HAZARDOUS SITUATION IN WHICH PERSONAL INJURY OR DEATH MAY OCCUR.**
CAUTION	**CAUTION: INDICATES A SITUATION WHERE DAMAGE TO THE EQUIPMENT COULD RESULT.**
NOTICE	**PROVIDES HELPFUL INFORMATION FOR PROPER OPERATION OF THE CLASSIFIER MILL.**

1.2 Safety Precautions

OPERATORS MUST BE INSTRUCTED NOT TO PUT HANDS, FINGERS OR OTHER FOREIGN OBJECTS IN THE MACHINE, AND NOT TO REMOVE ANY COVER, DOOR, HATCH OR OTHER PROTECTIVE DEVICES PLACED ON THIS MACHINE FOR THE SAFETY OF THE OPERATOR. ANY ATTEMPT TO DEFEAT THESE DEVICES COULD RESULT IN SERIOUS INJURY.

ELECTRICAL SERVICE TO THE MACHINE MUST BE LOCKED OUT WHILE ANY REPAIRS OR ADJUSTMENTS ARE BEING MADE OR WHILE ANY COVER, DOOR, HATCH OR OTHER PROTECTIVE DEVICE IS NOT IN PLACE.

WHEN PROCESSING MATERIALS THAT MAY REACT TO A SPARK CAUSED BY METAL HITTING METAL OR STONES, ETC., THE USE OF A MILL DUST COLLECTOR EQUIPPED WITH AN EXPLOSION VENT IS STRONGLY RECOMMENDED. SEE APPENDIX G FOR MORE INFORMATION ABOUT EXPLOSION VENTING.

The precautions listed in this manual may not be all inclusive and others might exist, that are specific to your operation or industry. In addition, nearly all employers are now subject to the Federal Occupational Safety and Health Act of 1970, as amended, which require that an employer be kept abreast of regulations, which will continue to be issued under its authority.

The Classifier Mill must always be operated in accordance with the instructions and precautions in this manual and on the caution plates attached to the equipment. Only workers completely familiar with the instructions and precautions in this manual should be permitted to operate the unit. The operators should thoroughly understand these instructions and precautions before attempting to operate this equipment.

Illustration 1-1 is a checklist of safety precautions and proper operating procedures. Failure to observe and follow the precautions may result in serious personal injury or property damage.

Safety Checklist

ALWAYS operate Classifier Mill in accordance with the instructions in this manual.

DO NOT open inspection doors while unit is in motion.

NEVER work on unit and related components unless electric power and motor drive have been locked out and tagged. The National Electrical Code requires a manually operable disconnect switch located within sight of the motor, or a controller disconnecting means capable of being locked if not within sight of the motor.

DO NOT use the Classifier Mill for processing of material other than the specific application for which it was designed.

AVOID poking or prodding into unit openings with bar or stick.

ALWAYS have a clear view of unit loading and unloading points and all safety devices.

KEEP area around unit, drive and control station free of debris and obstacles.

NEVER operate unit without guards and all safety devices in position and functioning.

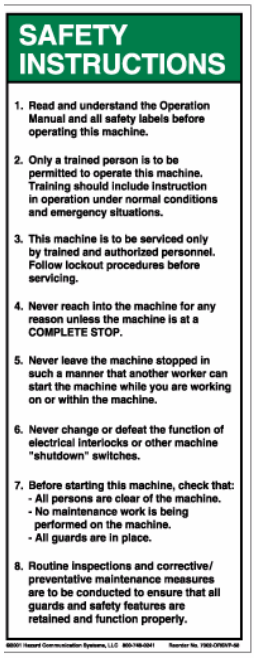
ALWAYS allow unit to stop naturally. DO NOT attempt to artificially brake or slow motion of unit.

NEVER put your hand near or in the inlet or outlet of the Classifier Mill while it is operating or stalled.

Illustration 1-1: Prater Classifier Mill Safety Check List

1.3 Classifier Mill Safety Labels

Illustration 1-2 shows the safety labels used on the Classifier Mill. These labels are important for worker information and must not be removed from the unit.



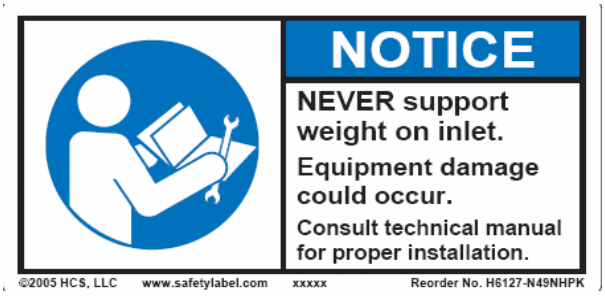


Illustration 1-2: Prater Classifier Mill Safety Labels

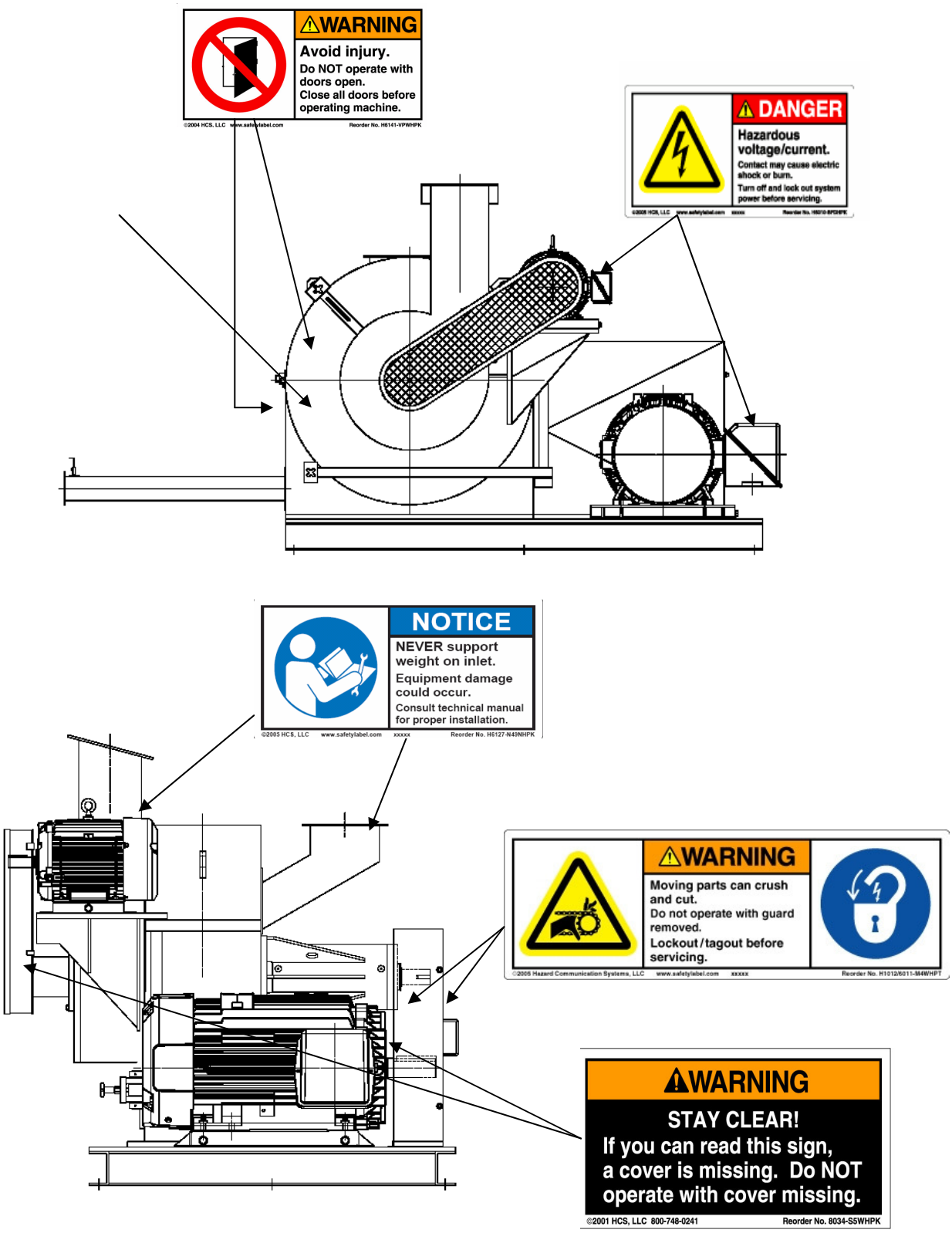
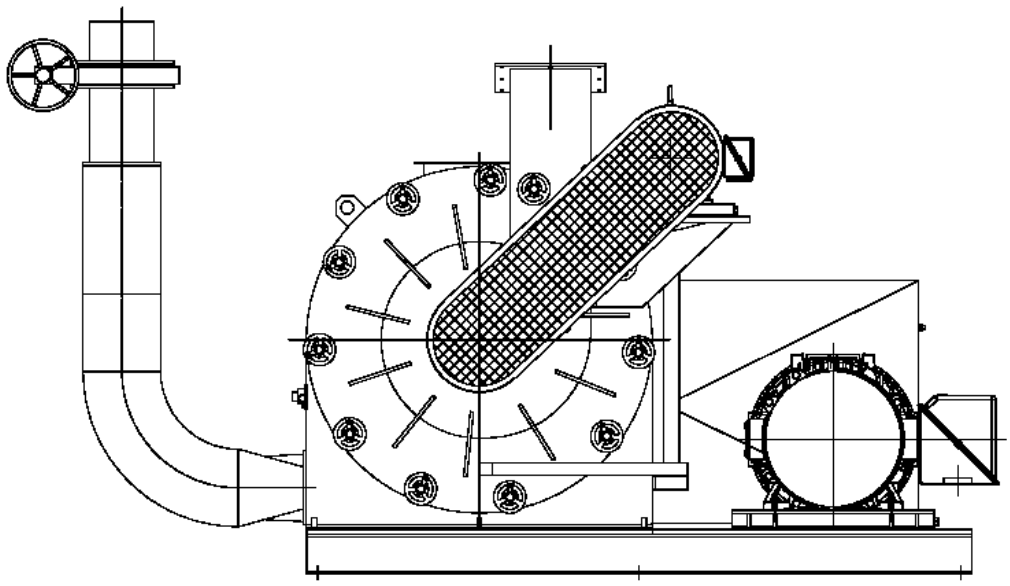


Illustration 1-3: Prater Classifier Mill Safety Label Placement



EXPLOSION PRESSURE
SHOCK-RESISTANT -
AT A MAXIMUM INITIAL PRESSURE
OF 1.1 BAR ABSOLUTE

YEAR BUILT: ___
VOLUME: ___

DANGER

BOLTING ON THIS COVER MUST BE
LUBRICATED AND TORQUED TO
___ FT-LB
TO SECURELY FASTEN COVER TO PREVENT
DUST AND FLAME ESCAPING DURING AN
INTERNAL DUST EXPLOSION

FAILURE TO FASTEN COVERS SECURELY
CAN RESULT IN SECONDARY EXPLOSIONS
AND FLYING DEBRIS RESULTING IN SERIOUS
INJURY OR DEATH

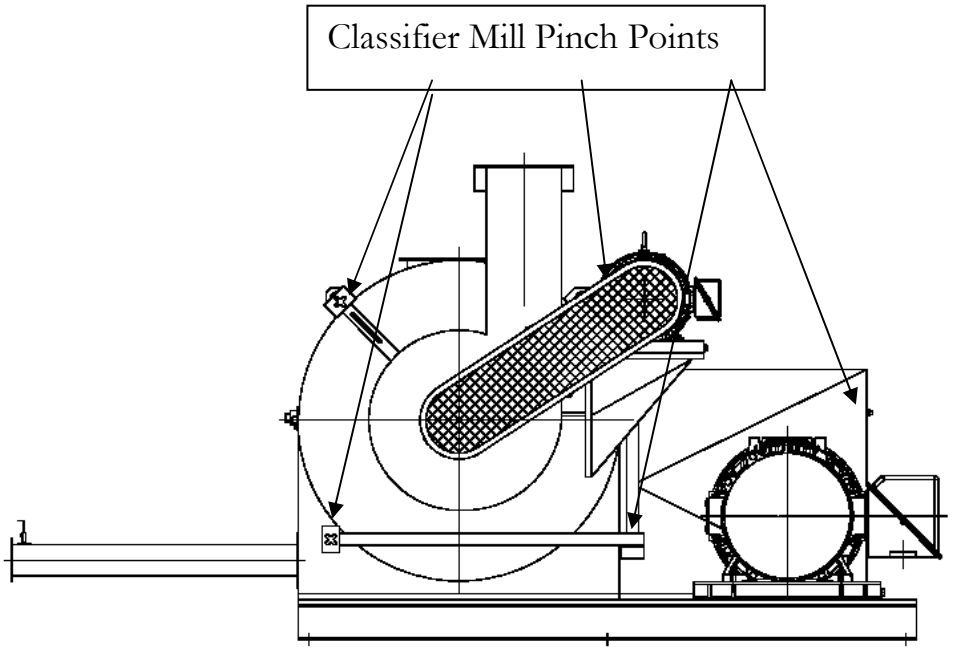
DANGER

BOLTING ON THIS COVER MUST BE
ASTM A193 GRADE B7 WITH THIS MARKING:

B7

Illustration 1-4: Prater Explosion Proof Classifier Mill Front View and Additional Labels

1.4 Classifier Mill Pinch Points



⚠WARNING

The Classifier Mill contains several points where care is needed to avoid bodily injury when opening or closing access doors. Always make sure care is used when opening or closing Classifier Mill doors, access hatches and guards. Failure to do so may result in serious injury.

Illustration 1-5: Prater Classifier Mill Pinch Points

Section

2

Section 2: Introduction

2.1 Manual Overview

This manual describes the installation requirements, procedures, and routine maintenance of **Prater's** Classifier Mill, Model #'s CLM – 36, CLM – 51, CLM – 76, and CLM - 101. Refer to this manual before beginning and during installation. Keep this manual available for future reference. Cross section and exploded views are located in the rear of the manual. The procedures throughout this manual refer to these drawings. Locate the view for your Model Classifier Mill and refer to the view for clarification.

Reliable operation, personnel safety, and long service life of this equipment depend on three important considerations:

- The care exercised during installation.
- The frequency/quality of maintenance and periodic inspections.
- A common sense approach to the Classifier Mills operation.

To keep operating costs down and profits up, carefully follow the instructions listed for installation, operation, safety, and maintenance.

2.2 Receiving The Unit

When your shipment arrives, thoroughly inspect the Classifier Mill and all related equipment. In the event of shipping damage, note the problem on the bill of lading or freight bill and make sure you obtain the driver's signature for a possible claim against the delivering carrier.

The Classifier Mill is always supplied with the mill pulley (Figure 6.5 - 19) and classifier pulley (if applicable) mounted and the motor pulley and V-belts supplied loose (except when motor and base are factory supplied).

The rotor's are supplied loose and must be properly installed before operating the unit. Inspect the grinder rotor and locate the serial number, which is stamped along with the letter F or FRONT on one side of the rotor on the center hub or near the bore for the shaft. Rotor installation procedures are covered later in this manual.

⚠WARNING

IN SOME SITUATIONS, THE CLASSIFIER HOUSING (FIGURE 6.5 & 6.7 - 1) IS SHIPPED LOOSE FROM THE CLASSIFIER BASE (FIGURE 6.5 & 6.7 - 9). IN THESE SITUATIONS, DO NOT OPEN THE CLASSIFIER DOOR (FIGURE 6.5 & 6.7 - 6) BEFORE PROPERLY INSTALLING THE CLASSIFIER HOUSING ONTO THE BASE. THERE IS A POTENTIAL FOR THE UNIT TO TIP AND CAUSE PERSONAL INJURY OR DEATH AS WELL AS SEVERE DAMAGE TO THE UNIT.

NOTICE

The RECEIVER is responsible for Inspection and filing claims against the CARRIER for any damage to the Classifier Mill in transit.

2.3 Before Installation

Be sure the installation crew or millwrights are aware of installation requirements. If they have any questions or are unsure of proper procedures, clarify the matter to avoid improper installation. Section 3 of this manual covers important steps to ensure safe, vibration-free installation. Personnel responsible for installation should be familiar with these procedures.

In preparing for installation, make sure you provide for all appropriate safety devices. **Prater** provides a door interlock lock as standard on all classifier mills, unless specifically instructed by the customer, in writing not to supply this device because the customer will use his own protective system. Prater Industries, Inc. does not install your machine. It is your responsibility to provide lockout switches, guards, and other safety devices and safety procedures to protect the machine operator or maintenance personnel.

NOTICE

If the mill is to be installed in an enclosed room it is important to allow adequate venting to provide proper air volume to the Classifier Mill. Inadequate air volume will severely restrict throughput of the system and may cause other problems.

2.4 Before Operation

Make sure operating personnel are well trained in procedures for operating and maintaining the Classifier Mill. In particular, make sure they understand the essential safety precautions described in Section 1 of this manual.

2.5 Classifier Mill Applications

The Prater Classifier Mill can be used for a wide range of applications in the field of fine and very fine particle size reduction. Typical applications for the Prater Classifier Mill include processing chemicals, pharmaceuticals, natural products, foodstuffs, cereal grains, powder coatings, organic and inorganic pigments, and resins. Its design provides efficient utilization of applied horsepower.

2.6 Unit Design

NOTICE

THIS PARAGRAPH REFERS TO FIGURES 6.4, 6.6 AND 6.8 IN THE REAR OF THE MANUAL.

Body assembly (Figure 6.5 & 6.7 - 1) is a rigid welded construction, with a bolted on bearing assembly (Figure 6.5 & 6.7 - 2), which can be exchanged in one piece. The mill shaft runs on ball bearings and carries the rotor assembly (Figure 6.5 & 6.7 - 3).

The rotor assembly is designed symmetrically. A single disc rotor (Figure 6.9 - 1) has wear resistant blades (Figure 6.9 - 3) positioned in grooves. Retaining rings (Figure 6.9 - 2) hold the blades in the grooves.

The screen assembly (Figure 6.5 & 6.7 - 4) is arranged around the rotor assembly, and is either bolted to the back wall of the mill (CLM 36, 51) or is supported by pins threaded into the rear wall (CLM 76, 101). The rotor (Figure 6.5 & 6.7 - 3) and the screen assembly (Figure 6.5 & 6.7 - 4) are carefully machined to maintain an accurate gap between the rotor assembly and the screen assembly to maximize grinding efficiency. The classifier rotor (Figure 6.5 & 6.7 - 5) allows fine material to pass and recirculates oversize material back to the grinding chamber for further reduction. By controlling the speed of the classifier rotor, very precise control of the particle size is achieved. The large door (Figure 6.5 & 6.7, 6) provides easy and sufficient access to all internal parts for inspection and maintenance.

2.7 Operating Principle

NOTICE

THIS PARAGRAPH REFERS TO FIGURE 6.16 IN THE REAR OF THE MANUAL.

Prater Classifier Mills operate on a high-speed impact principle. Material together with the necessary amount of air is fed through the product inlet, either by gravity or within a conveying air stream, into the rear of the Classifier Mill.

Prater highly recommends that the user install a magnet in the feed inlet to capture most ferrous materials. Unless other arrangements have been made Prater does not normally supply this magnet. In addition to the feed inlet magnet, for maximum production security, it is strongly recommended that magnetic separation be incorporated into the system prior to the Classifier Mill as well. If other foreign materials, such as stainless steel, aluminum, rock, etc may be contained in the product, additional separation or screening should be used to maintain suitable screen and rotor life.

The rotor blades in the first stage grinding section act as a fan and generate an air stream through the Classifier Mill. Particles move outward, impacting on each other, and then exit the first stage section thru the screens or the center opening in the screenless assembly. After first stage grinding the ground material is pulled toward the classifier rotor for classification. A secondary air stream is used to aid in classification. Particles small enough to pass through the rotor are discharged with the air stream for collection in the system dust collector. Oversize particles are rejected by the classifier and returned to the second stage grinding section for further size reduction. Increasing or decreasing the classifier speed can adjust the finished particle size.

The secondary air inlet allows air to be introduced between the primary grinding stage and the classification zone. This ensures that a consistent airflow is maintained in the classification zone irrespective of the air being generated by the grinding action. Because of this unique feature, feeds that already contain significant quantities of in specification material can be fed into the secondary air inlet. This allows removal of this material and lightens the load of the grinder to achieve higher capacities or reduced energy consumption.

The classifier rotor is either direct motor driven (CLM 36, 51 with no bearing housing assembly) or belt driven (CLM 76, 101 with bearing housing assembly). The speed of the classifier is VFD controlled allowing instant changes to the speed and cut point of the classifier.

Due to the secondary airflow and the rotation of the classifier rotor, a spiraling air system is set up and classification of the material is possible. As the particles approach the rotor, they are subjected to a centrifugal force which can be several hundred gravities depending on the speed of the rotor.

On particles that are smaller than the cut point the centripetal drag force exerted on the particles by the air stream overcomes this force and these particles are carried through the classifier rotor and exit the mill with the air stream through the fines discharge. On particles that are larger than the cut point the centrifugal force predominates. These particles are pushed away from the rotor and reenter the milling chamber for second stage grinding.

2.8 Classifier Mill Specifications

2.8.1 Dimensions

Classifier Mill	CLM 36	CLM 51	CLM 76	CLM 101
Mill Rotor Diameter (In.)	13.8”	19.63"	29.63”	39.4”
Rotor Width (In.)	3.75”	5.3”	8.25”	11.0”
Mill Motor Size (HP)	20-40	30-60	75-125	125-250
Mill Motor (RPM)	3600	3600	1800	1800
Classifier Rotor Dia. (In.)	9.13”	11.8”	19.69”	27.11”
Classifier Rotor width (In.)	3.65”	5.48”	8”	10.34”
Class. Motor Size (HP)	3-5	5-7.5	10-15	15-25
Class. Motor RPM	3600	3600	1800	1800
~Weight (LBS)	552	1652	4100	8650
Min Air Volume (CFM)	750	1500	3000	6000
Max Air Volume (CFM)	1200	2400	4800	9600

Table 2-1: Classifier Mill Dimensions

2.8.2:

Classifier Mill Speeds

	Classifier Mill Grinder Rotor RPM			
	CLM-36	CLM-51	CLM-76	CLM-101
At 120 M/S	6538	4600	3045	2290
At 100 M/S	5450	3832	2540	1908
At 80 M/S	4360	3065	2031	1527
At 60 M/S	3270	2300	1523	1145
Class. Speed Range	400-6000	350-4600	325-3600	300-2250

Table 2-2: Classifier Mill Speeds

Section

3

Section 3: Installation

3 . 1 Introduction

Proper installation of Prater's Classifier Mill is critical for efficient and productive operation. The proper site preparation and placement of the Classifier Mill and related equipment will insure that the grinder operates safely and to its fullest capacity.

The following are important considerations in Classifier Mill installations:

3.1.1 Location

Make sure the operating location will provide strong, vibration-free base support and allow easy access to all parts of the Classifier Mill. See Section 3.2 & 3.3.

3.1.2 Leveling

The Classifier Mill must be mounted horizontally on a flat surface, which has sufficient strength to prevent deflections of more than 0.003" and be large enough to incorporate the full base of the Classifier Mill. Sections 2.3 and 2.4 explain how to check for proper leveling and prevention of vibration damage during operation.

3.1.3 Drive

The Classifier Mill is always supplied with the mill pulley (Figure 6.5, 19) mounted and the motor pulley (Figure 6.5, 17) and V-belts supplied loose (except when motor and base are factory supplied). On the CLM-76/101 the classifier pulley and V-belt drive are supplied mounted. Section 3.6 explains proper drive installation.

3.1.4 Grounding the Classifier Mill.

Effective July 1, 2007 all Classifier Mills will be shipped with grounding lugs installed to easily make a connection from the mill base to earth ground. Failure to properly connect the unit to earth ground can result in extensive damage to the mill bearings and rotor assemblies. Refer to **Appendix F** for more information on static electricity and the importance of properly grounding the unit.

3.2 Mill Base Foundation

The Classifier Mill must be supported in a vibration free location. The Classifier Mills CLM-36, and CLM-51 are bolted down with four bolts. The Classifier Mill CLM-76 and CLM-101 are bolted down with six bolts.

In most instances Prater Industries will supply the stand. If however the user desires to construct the stand the stand need only be designed for a dead weight loading. The Classifier Mill is balanced to very rigid specifications, eliminating any additional dynamic loading conditions.

The Classifier Mill must be mounted on a foundation that will not only support the weight of the mill but will provide a vibration free environment as well. The recommended foundation sizes for each model Classifier Mill can be found in Table 3-1 below.

Model	Mill Weight (with largest motor) (lbs)	Required Foundation Mass (lbs)	Foundation Dimensions Length x Width (ft x ft)	Min. Depth of Concrete (150 lb/ft^3 concrete) (inches)
CLM-36	1,425	4,275	7-1/2 x 5-1/2	8-1/2
CLM-51	3,000	9,000	8-1/2 x 6-1/2	13
CLM-76	5,500	16,500	12 x 7-1/2	15
CLM-101	11,250	33,750	14-1/2 x 8-1/2	22

TABLE 3-1 Classifier Foundation

In most cases mounting the mill to the floor will require some shimming of the mill base to accommodate irregularities in the floor. After proper support and leveling of the Classifier Mill the unit must be securely bolted to the floor. Prater recommends securing the mill with the fasteners in Table 3-2.

TABLE 3-2 Recommended Fasteners

MODEL	ANCHOR DIAMETER	ANCHOR LENGTH
CLM-36*	3/8”	6”
CLM-51	½”	8”
CLM-76	¾’	10”
CLM-101	7/8”	12”

Prater Classifier Mill bases can be equipped with optional vibration dampeners (SHIPPED IN A SEPARATE BOX), to minimize transmissions of high frequency noise and reduce vibration transmission to the Classifier Mill from other surrounding equipment.

*Note: The CLM 36 can be installed on a portable base with wheels, instead of a floor secured base.

3.3 Clearance

There should be sufficient open space in all directions around the Classifier Mill to allow access for changing screens and other maintenance operations. No excessive weight can be resting on or supported from the Classifier Mill.

3.4 Installing the Classifier Mill Rotors

⚠WARNING

Classifier Mill Rotors contain sharp edges, which may cause personal injury if not handled properly. Always use care when working with Classifier Mill Rotors. Classifier Mill Rotors can be very heavy. Always insure that proper methods and adequate support are used at all times.

CAUTION

Rolling the Classifier Mill Rotor on the rotor blades may seriously damage the rotor.

Depending on the size of the unit power/mechanical assistance installing the rotor may be necessary. Prater Industries manufactures many assistive tools designed specifically for rotor installation and removal. **Contact Customer Service for details and pricing information.** These instructions refer to Figures in Section 6 in the rear of the manual.

CAUTION

NEVER BLOCK THE ROTOR USING THE ROTOR BLADES TO PREVENT ROTATION DURING TIGHTENING OF THE BOLTS.

3.4.1 Grinding Rotor Installation

1. For the CLM 36, and CLM 51 remove the entire screen frame assembly (Figure 6.5, 4) by removing the hex head cap screws securing the frame to the rear of the mill housing.

2. For the CLM 76, and CLM 101 remove the baffle plate (Figure 6.11, 3) to allow clearance for the rotor.

3. Locate the serial number and the F or Front, which should be stamped on the rotor and face the door after installation (Figure 6.9).

4. Slide rotor (Figure: 6.5 & 6.7, 3) onto shaft assembly (Figure 6.5 & 6.7, 2).

5. Align key ways and insert key.

6. The rotor and key should slide smoothly and seat against the shaft shoulder.

7. Install end cap, lock washer, and bolt (Figure 6.1 - 9, 19, 20) and using Table 3-1, tighten to the recommended torque.

8. Re-install screen frame assembly or baffle plate.

3.4.2 Classifier Rotor Installation

1. For the CLM-36: Insert the rotor spacer and key (Figure 6.10 - 11, 14) into the hub assembly (Figure 6.10 - 1). Align the keyways and insert the classifier rotor onto the motor shaft (Figure 6.4 - 5, 10). Install washer and bolt (Figure 6.10 - 12,13) and tighten to recommended torque.

2. For the CLM-51/76/101: Locate the keyway on the shaft and rotate to the 12 o'clock position and insert the key (Figure 6.4 - 18). With the keyway at the 12 o'clock position slide the classifier rotor onto the shaft. It may be necessary to rotate slightly to align the keyways. insert end cap, cap screw and washer (Figure 6.11 - 3, 14, 20) into recess of classifier rotor and tighten to recommended torque listed in Table 3-1.

Table 3-1: Recommended bolt torque

Mill	Mill Bolt Size	Class. Bolt Size	Torque (in -lb)
CLM 36	3/8" - 16	Grade 8	525
CLM 51	5/8" - 11	Grade 8	2550
CLM 76	¾" - 10	Grade 8	4500
CLM 101	7/8"- 9	Grade 8	7275

3.5 Vibration

The Prater Classifier Mill is constructed to run without noticeable vibration. Vibration indicates a problem that must be found and corrected immediately. If left uncorrected, vibration will cause: Classifier Mill damage, Structural damage. There are several conditions that cause vibration, including:

- Uneven base (See Section 3.2)
- Loose motor fasteners
- Defective motor or Classifier Mill bearings (See Section 5)
- Other equipment transferring vibration thru contact with the Classifier Mill.
- Worn, missing or broken rotor blades (Figure 6.9 - 3)
- Material buildup on rotor disk or blades.

3.6 Drive

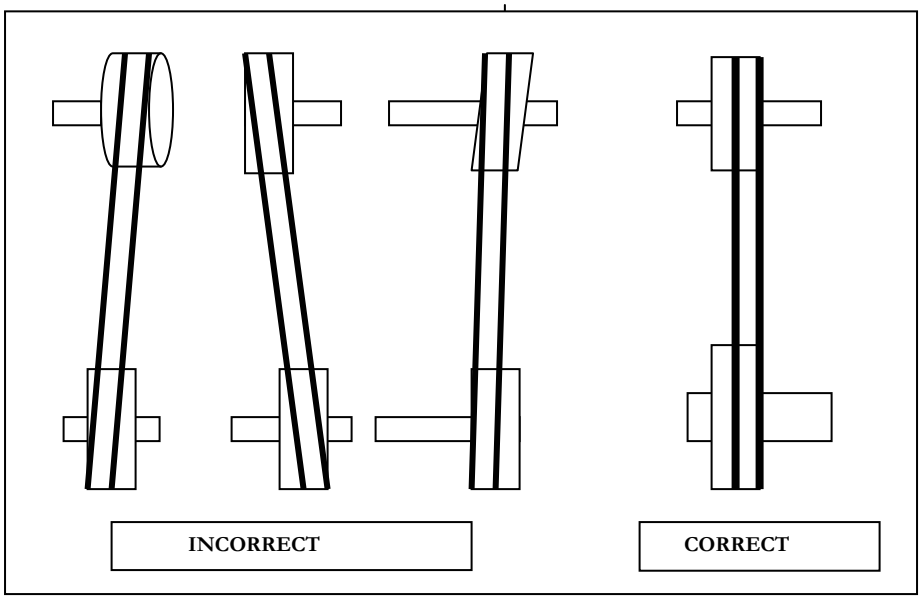
The Classifier Mill has been supplied with the proper size pulley, balanced and properly mounted. In case it's necessary to change the speed, always change only the pulley on mill shaft (Figure 6.7 - 20).

A maximum tip or circumferential speed however, of 120 meters per second (23, 616 FPM) should never be exceeded. The motor pulley is also standard, and is properly balanced and sized to provide the proper tip speed.

Alignment of pulleys after motor installation is very important because of the high rotational speeds. Improper alignment causes rapid bearing failure on motor and/or Classifier Mill (Illustration 3-2). Proper belt tensioning is very important. The belts are a matched set and require sufficient tension to prevent slippage under full motor load. New units are shipped with the pulleys laser aligned with a preset centerline distance to insure proper tensioning. The belts should be inspected frequently during the first few days of operation and then periodically thereafter. The new belts have a tendency to stretch, causing them to loosen up and squeal. (See any standard belt manufacturer's catalogue for tensioning specifications).

A V-belt guard will be provided with all Classifier Mills, unless the customer requests, in writing, that the guard need not be provided. The guard is built to rigid specifications to our standard center distances and locations. "OSHA" requirements mandate guarding all drives; therefore the customer MUST supply an approved design guard if they request **Prater** Companies not to supply one. Exposed V-belts are a HAZARDOUS condition.

Illustration 3-2 Pulley Alignment



3.7 Bearing Assembly Air Purge

Units shipped after December 31, 2001 will incorporate a front bearing cover/air purge assembly as an integral part of the mill bearing assembly. **Prater Industries, Inc.** strongly recommends that

customers utilize the air purge. The purge is installed to protect the mill bearings from product contamination due to dusty conditions and water during any cleaning of the mill and support equipment. **To be effective the air purge must operate at all times.** As received the mill bearing assembly incorporates a 1/8" NPT tapped hole, which is plugged at the factory. This port is located in the front bearing cover, which incorporates a lantern ring or an air assisted Inpro seal to operate the air purge assembly. The air supply to the purge must be clean dry compressed air at 2 – 4 psi. The air volume requirements will be 4 – 10 ACFM depending on the size of the mill.

3.8 Feeding

NOTICE

The capacity and/or fineness listed will only be achieved if the density, particle size, shape, moisture content, and chemical make up of the feed material is consistent and IDENTICAL to that which we tested or specified, and is fed evenly and uniformly in a controlled manner to the PRATER unit(s) shown.

After the Classifier Mill is mounted in place, the product inlet (Figure 6.7 - 8) must be connected to a device capable of providing a uniform controlled feed rate to the mill. **Prater Industries, Inc.** recommends that feeding devices be operated with a Variable Frequency Drive to allow for adjustments due to changes in the feed material characteristics.

IT IS ESSENTIAL THAT THE FEED BE CONTROLLED in order to prevent overfeed, or uncontrolled pulsations which can overload the Classifier Mill. Any device, such as a slide gate, rotary feeder, vibrating trap feeder, screw conveyor, etc., may be used, as long as it provides a uniform controlled feed. The feeding device should be supported from the building or other static structure. **DO NOT** support the feeder on the mill feed inlet (Figure 6.7 - 8).

Establishing feed rate by averaging total feed over a period of time may allow non-uniform feed. There are no guarantees that short feeding cycles may not be too high or provide erratic feed during the run.

3.8.1 Protecting the Mill from Tramp Material Damage

The **Prater** Classifier Mill must be protected from damage by tramp material. One way to provide this protection is to provide an in-line magnet in the incoming product stream **immediately** before the Mill inlet. It is the user's responsibility to provide this protection. Damage caused to the Mill because it lacks such protection will not be covered by the **Prater** warranty.

3.9 Required Air Flow

Table 3-3 lists the Classifier Mill models matched with the required airflow volumes in cubic feet per minute.

TABLE 3-3 RECOMMENDED AIRFLOW RANGES

MODEL	CFM
CLM-36	750 - 1200
CLM-51	1500 - 2400
CLM-76	3000 - 4800
CLM-101	6000 –9600

NOTICE

The airflow for each system has been calculated based on the testing performed. If you are not sure what the proper setting is for your Classifier Mill contact Prater Customer Service.

3.10 Electrical Requirements

Install connections to meet all national and local electrical codes. Consult with your local power company before installation.

NOTICE

THE NATIONAL ELECTRICAL CODE REQUIRES A MANUALLY OPERABLE DISCONNECT SWITCH LOCATED WITHIN SIGHT OF THE MOTOR, OR A CONTROLLER DISCONNECTING MEANS CAPABLE OF BEING LOCKED IF NOT WITHIN SIGHT OF THE MOTOR.

Effective October 31, 1989, OSHA requires that all energy disconnect devices be capable of accepting a lock-out/tag-out device. This requirement is mandatory for any new equipment being installed or for replacement, repair, or modification of older equipment. The employer must:

- Produce a written program explaining the procedure.
- Conduct an annual inspection to verify compliance.
- Provide documented employee training in these procedures.

The **Prater** Classifier Mill may be started “across the line” if such a procedure is acceptable to your local power company. In order to limit overload on the power supply, CLM-76 and CLM-101 models may require reduced voltage compensating starters to “soft start” motors in many areas.

3.10.1 Electrical Interlocking

As a general guide, the last piece of process equipment is started first with subsequent starts working up the line to the feeder, which is the last item started.

NOTICE	**A TIME DELAY IS ALWAYS REQUIRED BETWEEN START-UP OF THE CLASSIFIER MILL AND START UP OF THE FEEDER, TO ALLOW THE CLASSIFIER MILL TO REACH FULL OPERATING SPEED BEFORE PRODUCT IS INTRODUCED.**
NOTICE	**ON SHUT DOWN, A TIME DELAY IS REQUIRED TO ASSURE THAT ALL OF THE PRODUCT HAS CLEARED THE CLASSIFIER MILL.**

3.11 Unit Check

After installation is complete, carefully inspect all work before the installation crew leaves to see that all instructions have been properly followed.

3.12 Adjustments

To achieve the most efficient performance with the Classifier Mill through all possible adjustments it is important to remember how particle size reduction is achieved through impact and acceleration.

The following adjustments will influence the grinding results.

3.12.1 SPEED - Changing the pulley on the mill shaft.

Larger: slows tip speed – coarser product.
Smaller: raises tip speed – fine product.

3.12.2 CLASSIFIER SPEED – Changing the frequency of the classifier VFD ouput

Higher Frequency: Increases classifier speed and produces a finer product.
Lower Frequency: Decreases classifier speed and produces a coarser product.

3.12.3 SCREEN - Different screen hole sizes give different particle sizing.

Larger holes – coarser product.
Smaller holes – finer product.

3.12.4 JAWS - Adds to impact – finer product

3.12.5 AIRFLOW – Higher - airflow leads generally to coarser grind and higher capacity.
Lower - airflow usually gives finer grind and lower capacity.

3.12.6 FEED – In some cases a finer pregrind will increase capacity.

Uniform feed – smooth, uniform amperage draw, efficient operation, high capacity
Non-uniform feed – pulsating amperage draw, inefficient operation, low capacity

The more non-uniform the feed rate the greater the amperage pulsating and the higher the reduction in capacity. In the case of rotary valve type feeders Prater requires a minimum of 15 RPM to insure a uniform feed. Speeds less than 15 RPM will result in larger amperage pulsations, inconsistent finished product particle distribution and inefficient electrical use.

Section

4

Section 4: Operation

4.1 Introduction

Pre-run inspections and safety checks throughout this section insure that the Classifier Mill is in proper operating condition. Other aspects of operation covered in this section include: start-up and shut down sequences.

4.2 Pre-Run Inspection

Before attempting to run the Classifier Mill even to check rotation, perform the following inspection:

⚠DANGER

ELECTRICAL SERVICE TO THE MACHINE MUST BE LOCKED OUT WHILE ANY REPAIRS OR ADJUSTMENTS ARE BEING MADE OR WHILE ANY COVER, DOOR, HATCH OR OTHER PROTECTIVE DEVICE IS NOT IN PLACE.

1. Open access door (Figure 6.5 & 6.7 - 6).
2. For the CLM 36 remove the screen frame assembly (Figure 6.5 - 4), for CLM 51, 76, and 101 remove the baffle plate (Figure 6.13 & 6-14 - 1). Remove any loose material or foreign matter lying in the Classifier Mill.
3. Reinstall the screen assembly, or baffle plate.
3. Turn the rotor assembly by hand to see that it turns freely.
4. Close and lock door.
5. Inspect the mill drive for proper sheave alignment and belt tensioning

4.3 Safety Check-Up

Before starting the Classifier Mill check the following:

- ✓ The inside of the Classifier Mill for foreign material, i.e., nuts, bolts, wire.
- ✓ That screen assembly is properly installed.
- ✓ That the rotor assembly moves freely and is not hitting surrounding parts.
- ✓ That all guards are mounted and secure.
- ✓ That all inspection doors are closed and locked.

- ✓ That all electrical starting equipment, meters, disconnect switches, and other control devices are clearly visible readily accessible to the operator.

4.4 Rotor Rotation

The rotors in the classifier mill both rotate counter clockwise when visualized by looking at the door of the classifier mill.

⚠WARNING

CLASSIFIER MILL GRINDING SYSTEMS CAN GENERATE NOISE LEVELS THAT MAY SEVERELY DAMAGE HEARING. IF THE CLASSIFIER MILL IS OPERATING IN AN ENCLOSED AREA EAR PROTECTION MUST BE WORN AT ALL TIMES WHEN THE SYSTEM IS RUNNING. PRATER INDUSTRIES CAN PROVIDE MUFFLING DEVICES TO REDUCE THIS NOISE UPON REQUEST.

4.5 Start-Up Sequence

This start-up sequence is intended as a general guide. The start-up sequence you use will depend on your specific operation and any unique characteristics of your installation.

As a general guide to electrical interlocking, you turn on equipment in reverse order from product flow. The final piece of equipment to be started should be the product feeder.

NOTICE

A TIME DELAY IS ALWAYS REQUIRED BETWEEN START-UP OF THE CLASSIFIER MILL AND START UP OF THE FEEDER, TO ALLOW CLASSIFIER MILL TO REACH FULL OPERATING SPEED BEFORE PRODUCT IS INTRODUCED. ON SHUT DOWN, A TIME DELAY IS REQUIRED TO ASSURE THAT ALL OF THE PRODUCT HAS CLEARED THE CLASSIFIER MILL

4.6 Running the Classifier Mill For The First Time

Insure that all equipment has been “bumped” to insure proper rotation
If the system is being controlled by a PLC, discuss the start and shut down sequence with the programmer. In a standard Classifier Mill installation the sequence is as follows:

1. Start the system chiller, dryer, etc. if installed.
2. Start the finished product, discharge equipment and any post milling equipment, i.e. sifters, mixers, etc.
3. Start the system fan, pulse and the classifier motor.
4. Start the mill.
5. The first time the mill is started perform the following:
   A. Feel the bearing assembly to determine if there is any excessive vibration.
   B. By feel, determine if any vibration exists between the bearing housing front plate and the mill rear wall.
   C. Check the mill floor mounts by feel to determine if there is any vibration between the mill footpads and the floor mount.
   D. If the vibration feels excessive and correcting items B-D does not alleviate the problem follow this procedure:
      A. If the grinder rotor was unmarked reverse the rotor and repeat item 3a above.
      B. If the rotor is marked and properly installed, recheck the rotor for loose blades.
      C. Next tighten all the fasteners for the mill housing, motor, motor base, bearing housing, and feed inlet.
      D. Restart the mill and keep it running until bearing temperature is stable / falling or the unit reaches 200 degrees F.
      E. If the bearing housing temperature reaches 200 degrees F stop the unit and call **Prater** for consultation.
6. If the vibration initially feels normal, then while the bearing temperature rise is being monitored set the system dampers and perform the system airflow readings.
7. The normal arrangement for the dampers should be an approximate 40/60 split between the feed inlet and the secondary air inlet. If readings are not available to make the split the Operator should set the dampers by feel.
8. Start the feed to the mill at about 50 percent of the rated capacity or 60 percent of the motor full load amps. Continue running at this setting until the system stabilizes. Stabilization occurs when the fluctuation in the mill motor current draw is between 5 and 10 percent of the FLA rating of the motor. This value is determined by voltage, hp and operator experience. There should only be light loading of the classifier motor at this point.
9. If stabilization does not occur at this setting it may still be possible to achieve stabilization at a higher feed rate. After a sample has been collected, analyzed, and any necessary changes to the mill have been completed the feed rate should be increased in increments.
10. Once the maximum sustainable feed rate has been achieved a sample should be collected for analysis. At this time a means of determining the feed rate should be found. Acceptable methods for attaining this are:
    a. Direct timing from the feed mechanism.
    b. Direct timing from the discharge of a cyclone.
    c. Shift timing in an operation where the mill is being continuously fed over a shift of at least eight hours.

Unacceptable methods for attaining this are:

a. Direct timing from the discharge of a new uncoated dust collector or one where the filters have recently been changed.
b. Shift timing in an operation where the feed is anything other than continuous.

4.7 Initial inspection after 2 days or 48 hours running time

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL BOTH ROTORS HAVE COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

After not more than 48 hours of operation the customer should open the mill up and inspect the mill internals.

- Inspect the rotor for any blade loosening and retighten as needed.
- Inspect all the internal parts for any wear or material buildup.
- Inspect the parts for impact damage from foreign material.

While inspecting the blades and securing the fasteners it is important to check each individual blade to insure there are no loose ones before the rotor is installed. After each eight hours of running the blades should be checked and retightened to see if any loose blades are identified. These checks should continue until two consecutive inspections reveal no loose blades.

The customer should inspect the mill monthly for materials that tend to be abrasive. For softer items, i.e. sugar the inspection interval should be quarterly. The customer should use these inspections to determine the life of the internal components and implement a Preventive Maintenance Program to insure continuous operation.

Section 5

Section 5: Maintenance

5.1 Introduction

The Classifier Mill is designed to operate with minimal maintenance. Routine inspections and regular maintenance will identify any worn or broken parts before they become a problem. Worn or broken parts are damaging to the Classifier Mill and its output. When operated without vibration or foreign materials entering the screen assembly, only those parts subject to the heaviest wear, i.e. drive belts, rotor blades, and screens will require maintenance.

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

5.2 Routine Inspection

High speed rotating equipment requires regular routine preventative maintenance procedures.

Regular inspection of the rotor blades (Figure 6.9 - 3) should be carried out particularly where abrasive materials are being processed. The wear pattern on the rotor blades (Figure 6.9 - 3) will vary depending upon operating conditions. Visual inspection will show the necessity for change.

Prater Classifier Mill blades are manufactured from a special alloy steel designed to give them strength and durability. The blades are inspected for cracks or defects prior to being installed at the factory or shipped as replacement parts. The service life of the blades is dependent on several factors such as: abrasiveness of material being ground in the mill; contact with foreign material in the feed (i.e. metal, stones, etc.); excessive vibration over a period of time, foreign material entering the mill, and unintentional damage prior to being installed in the rotor such as being dropped on the floor or miss-handled during shipping.

To help prevent the problems mentioned above, **Prater** recommends the following:

1. Install components in the process before the mill to remove foreign material and break-up or remove large product agglomerations.

2. **Prater** recommends inspecting the blades every 30 days for wear or damage.
3. When inspection indicates that damage has occurred (bending, gouging, pitting, discoloration, etc.), replace all blades in the mill with new ones. The old undamaged blades can be magnetic particle tested, and possibly reused.
4. Install vibration detection equipment to help detect a problem before a blade breaks.
5. Instruct maintenance personnel in regard to proper handling of the blades during installation.

The blade-retaining ring (Figure 6.9 - 2) should be inspected for sign of wear and replaced if necessary and the screens (Figure 6.12, 6.13, 6.14 - 4) should not be allowed to wear so thin as to break up.

The rotors (Figures 6.5 & 6.7 - 3, 5) are statically and dynamically balanced to a high standard to ensure smooth, vibration-free running. Should increased vibration develop, immediately stop the machine.

5.3 Screens

The screens (Figure 6.12, 6.13, 6.14 - 4) help control the particle size of the final product. Inspect the screens frequently to maintain the desired output and clean as necessary. The screens may require replacement if they are showing signs of wear.

5.3.1 Screen Replacement

⚠DANGER

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL BOTH ROTORS HAVE COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

5.3.2 CLM-36 and CLM-51 Screen Replacement

1. Turn off the Classifier Mill and allow the rotors (Figures 6.5 - 3, 5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.5 - 6) and remove the screen frame assembly (Figure 6.5 - 4) by removing bolts (Figure 6.12 - 7) from the back of the mill housing.
4. Remove Socket Head Cap Screws (Figure 6.12 - 8) this will allow removal of the baffle plate and the grinding ring.
5. Remove screens (Figure 6.12 - 4).
6. Clean all slots in housing, rear ring, front grinding ring, and grinding jaws.
7. Slide new screens into position, making certain that they are flush with the groove in the rear ring.

8. To replace grinding jaw (Figure 6.12 - 3), remove flat head screws (Figure 6.12 - 8) and install new grinding jaws as needed.
9. Replace full grinding ring and baffle plate, and secure with screws removed in step 4.
10. Reinstall screen frame assembly and secure with bolts removed in step 3.
11. Rotate the mill rotor by hand to check for any interference between the rotor and grinding jaws.
12. Close door and secure

5.3.3 CLM-76 and CLM-101 Screen Replacement

1. Turn off the Classifier Mill and allow the rotors (Figure 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.7 - 6).
4. Remove bolt and lock washer (Figure 6.14 - 7) and remove baffle plate (Figure 6.14 - 1).
5. Remove front grinding ring (Figure 6.14 - 2) by sliding the segmented parts off of the support pins.
6. Slide out screens (Figure 6.14 - 4)
7. Clean all slots in the full grinding ring, segments, rear ring, and the housing.
8. At this point you can also replace the rear grinding jaws by sliding them off the support pins and replacing as necessary.
9. Slide new screens into position, making certain that they are flush with the housing groove.
10. Replace grinding ring segments removed in step 5.
11. Replace baffle plate removed in step 3.
12. Rotate the mill rotor by hand to check for any interference between the rotor and grinding jaws.
13. Close door and secure.

5.3.4 Replacing the Screenless Frame Rings

1. Turn off the Classifier Mill and allow the rotors (Figure 6.5 & 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill and open the door.
3. Remove lockwasher and nut assembly (Figure 6.15 - 1) and remove the baffle plate (Figure 6.15 - 2).
4. Remove the front grinding ring (Figure 6.15 - 3) by sliding it forward off the guide pins (Figure 6.15 - 6)
5. Remove the spacers (Figure 6.15 - 4) from the guide pins.
6. Slide the rear-grinding ring (Figure 6.15 - 5) off the guide pins.

NOTICE

If you are replacing the guide pins (Figure 6.14 - 6), the pins in the CLM 36, and CLM 51 are removed from the back of the mill housing. For the CLM 76, and CLM 101 the pins are removed from the door side of the housing, and don't incorporate a lockwasher.

7. Slide the new rear-grinding ring onto the new or thoroughly cleaned old guide pins.
8. Install spacers removed in step 6.
9. Slide the new front grinding ring onto the guide pins.
10. Reinstall the baffle plate and secure with lockwasher and nut assembly removed in step 4.
11. Close door and secure.

5.4 Mill Grinder Rotor Blade Replacement

⚠DANGER

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

NOTICE

THE ROTOR (Figure 6.5 & 6.7 - 3) DOES NOT HAVE TO BE REMOVED FROM MILL BEARING HOUSING SHAFT (FIGURE 6.5 & 6.7 - 2), HOWEVER PRATER INDUSTRIES, INC. RECOMMENDS REMOVAL OF THE ROTOR TO INSURE THAT BOTH RETAINING RINGS ARE PROPERLY TIGHTENED.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.5 & 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.5 & 6.7 - 6).
4. For the CLM 36 and CLM 51 follow the procedure in section 5.3.2 to remove the entire screen frame assembly.
5. For the CLM 76, and CLM 101 remove bolt and lock washer (Figure 6.14 - 7) and remove baffle plate (Figure 6.14 - 1).
6. Remove fasteners (Figure 6.9 - 5) that secure the retaining ring (Figure 6.9 - 2).
7. Mark the position of the retaining ring to ensure it is reinstalled in the same position. Use the tapped holes in the retaining ring to unseat the ring.
8. Remove the worn/broken blades.

NOTICE

WHEN REPLACING DAMAGED OR WORN BLADES WITH NEW BLADES, IT IS NECESSARY TO ALSO REPLACE THE BLADE DIRECTLY OPPOSITE THE WORN BLADE. IF THE BLADES ARE PROPERLY MATCHED THIS SHOULD KEEP THE ROTOR IN BALANCE.

CAUTION

IF ONE BLADE IS CRACKED, IT IS RECOMMENDED THAT ALL BLADES BE MAGNETIC PARTICLE TESTED TO DETECT ANY UNSEEN HAIRLINE CRACKS. BLADES WITH THESE IMPERFECTIONS WILL PROBABLY BREAK AND CAUSE ADDITIONAL BLADE FAILURES AND OTHER EQUIPMENT DAMAGE. USED BLADES, WHICH SHOW NO CRACKS OR IMPERFECTIONS AFTER MAGNETIC PARTICLE TESTING ARE NORMALLY SAFE TO REINSTALL. IF IN DOUBT OR IF YOU HAVE ANY QUESTIONS CONTACT PRATER INDUSTRIES FOR HELP AND/OR RETURN OF THE ROTOR FOR FURTHER INSPECTION AND TESTING.

Proper installation of the rotor blades is critical to insure continued vibration free operation and unnecessary downtime due to excessive vibration. Rotor blades purchased from Prater Industries, Inc. are shipped as a matched set. A matched set of blades is a set of blades where the deviation between the heaviest and lightest blades are within Prater tolerances, and does not mean the blades are all the same weight. Prater Industries, Inc. recommends that customers weigh the individual blades to insure uniform weight distribution around the rotor.

9. If the full set of blades is to be replaced refer to Appendix H.
10. Install the new blades.
11. Position the retaining ring and align with the markings from step 7.
12. Install the fasteners removed in step 6.

CAUTION

IT IS IMPORTANT TO STAGGER THE BOLTS ON EITHER SIDE OF THE ROTOR WHEN REINSTALLING THE RETAINING RINGS (FIGURE 6.9 - 2) TO ENSURE PROPER TIGHTENING OF ROTOR BLADES. NEVER USE THE SAME HOLE FOR TWO BOLTS!

13. Check each blade to make sure there is no movement in any direction.
14. Reinstall the baffle plate or screen frame.
15. Close and secure the door.

After each eight hours of running the blades should be checked and retightened to see if any loose blades are identified. These checks should continue until two consecutive inspections reveal no loose blades.

5.5 Classifier Top Fan Blade Replacement

The purpose of the classifier top fan blades is to prevent coarse material from passing over the top of the classifier rotor and discharging into the fines collector. When these blades begin to wear excessively the classifier speed must be increased to keep product in specification. This results in heavier loading of the grinder and reduced capacity. Rounding of the outside corner of the top fan blades indicates worn blades.

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL BOTH ROTORS HAVE COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.5 & 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.5 & 6.7 - 6).
4. Remove bolt(s) securing the classifier rotor to the shaft and slide the rotor off the shaft.
5. Remove socket head cap screws and lock washers (Figure 6.11 - 17, 13) to remove fan blades (Figure 6.11 - 4).
6. Install new fan blades and tighten Socket Head Cap Screw (SHCS) and lock washers (Figure 6.11 - 17, 13) until the blades are firmly held in place.
7. Using the procedure in Section 3.4 reinstall the classifier rotor.
8. Manually rotate the rotor to insure there is no contact between the newly installed blades and the discharge housing.
9. Check the clearance between the fan blades and the housing to insure it is less than 0.060”.
10. Close and secure door.

5.6 Classifier Rotor Blade Replacement

The rotor blades of the classifier are manufactured from hardened tool steel to provide abrasion resistance and long life. If inspection of the rotor indicates thinning of the blades toward the center, it is time to replace the blades.

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL BOTH ROTORS HAVE COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.5 & 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.5 & 6.7 - 6).
4. Remove bolt(s) securing the classifier rotor to the shaft and slide the rotor off the shaft.
5. Lay the classifier on a worktable with the door side facing upward.
6. Loosen the Flat Head Cap Screw (FHCS) (Figure 6.11 - 9) enough to allow you to raise the top carrier ring 9/16"; use spacers to keep the ring separated 9/16".
7. Pivot the blade (Figure 6.11 - 8) outward and remove the blade from the slots in the carrier ring.
8. Install new blades.
9. Secure the top carrier ring by tightening the FHCS loosened in step 6.
10. Using the procedure in Section 3.4 reinstall the classifier rotor.
11. Close and secure door.

NOTICE

WHEN REPLACING DAMAGED OR WORN BLADES WITH NEW BLADES, IT IS NECESSARY TO ALSO REPLACE THE BLADE DIRECTLY OPPOSITE THE WORN BLADE. IF THE BLADES ARE PROPERLY MATCHED THIS SHOULD KEEP THE ROTOR IN BALANCE.

CAUTION

IF ONE BLADE IS CRACKED, IT IS RECOMMENDED THAT ALL BLADES BE MAGNETIC PARTICLE TESTED TO DETECT ANY UNSEEN HAIRLINE CRACKS. BLADES WITH THESE IMPERFECTIONS WILL PROBABLY BREAK AND CAUSE ADDITIONAL BLADE FAILURES AND OTHER EQUIPMENT DAMAGE. USED BLADES, WHICH SHOW NO CRACKS OR IMPERFECTIONS AFTER MAGNETIC PARTICLE TESTING ARE NORMALLY SAFE TO REINSTALL. IF IN DOUBT OR IF YOU HAVE ANY QUESTIONS CONTACT PRATER INDUSTRIES FOR HELP AND/OR RETURN OF THE ROTOR FOR FURTHER INSPECTION AND TESTING.

5.7 Greasing the Bearings

All Classifier Mill bearings are shielded bearings that are "greased for life." They require no additional lubrication for the life of the bearing. Replace bearings at normal maintenance intervals, or when the bearing is damaged or contaminated. Prater recommends that bearings be changed yearly or after 2,500 hours running time, whichever occurs first.

5.8 Bearing Disassembly and Reassembly

5.8.1 CLM-36 Mill Bearing Disassembly

⚠DANGER

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.5 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.5 - 6) and remove the screen frame (CLM 36)
4. Remove end cap, lock washer, and bolt (Figure 6.1 - 9, 19, 20).
5. Withdraw rotor (Figure 6.5 - 3) from bearing housing shaft (Figure 6.1 - 2).
6. Remove rotor key (Figure 6.1 - 7) from mill shaft (Figure 6.1 - 2).
7. Open the drive belts guard (Figure 6.5 - 9) and release belt tension until the drive belts can be removed from the pulleys without damage.
8. Remove mill pulley (Figure 6.5 - 19) from mill bearing shaft (Figure 6.1 - 2), and drive key (Figure 6.1 - 8).

NOTICE

THE BEARING ASSEMBLY CAN NOW BE REMOVED IN ONE PIECE BY REMOVING THE BOLTS AND WASHERS FASTENING IT TO THE MILL HOUSING.

9. Remove the HHCS to remove the front rotor side end cap assembly (Figure 6.1 - 3).
10. Mill shaft (Figure 6.1 - 2) is now ready for removal. Using a rubber mallet or similar device, displace shaft from the drive side of the bearing housing assembly, moving the shaft axially one to three inches towards the mill housing side of the bearing assembly.

CAUTION

Be careful not to damage the shaft seal during shaft removal.

11. Once the shaft is clear of the bearing seats, it can be pulled out from the bearing housing. Remove the drive bearing (Figure 6.1 - 13) by removing the locknut and lock washer (Figure 6.1 - 10, 11). Make sure to bend tab on lock washer so it is clear of the locknut.
12. Remove the inner shaft sleeve (Figure 6.1 - 16) to remove the rotor bearing (Figure 6.1 - 14).

5.8.2 CLM-51 Mill Bearing Disassembly

⚠DANGER

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.5 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.5 - 6) and remove the screen frame baffle plate (Figure 6.13 - 1)
4. Remove end cap, lock washer, and bolt (Figure 6.2 - 20, 21, 22).
5. Withdraw rotor (Figure 6.5 - 3) from bearing housing shaft (Figure 6.2 - 2).
6. Remove rotor key (Figure 6.2 - 10) from mill shaft (Figure 6.2 - 2).
7. Open the drive belts guard (Figure 6.5 - 9) and release belt tension until the drive belts can be removed from the pulleys without damage.
8. Remove mill pulley (Figure 6.5 - 19) from mill bearing shaft (Figure 6.2 - 2), and drive key (Figure 6.2 - 9).

NOTICE

THE BEARING ASSEMBLY CAN NOW BE REMOVED IN ONE PIECE BY REMOVING THE BOLTS AND WASHERS FASTENING IT TO THE MILL HOUSING.

9. Remove the HHCS to remove the front rotor side end cap assembly (Figure 6.2 - 7).
10. Mill shaft (Figure 6.2 - 2) is now ready for removal. Using a rubber mallet or similar device, displace shaft from the drive side of the bearing housing assembly, moving the shaft axially one to three inches towards the mill housing side of the bearing assembly.

CAUTION

Be careful not to damage the shaft seal during shaft removal.

11. Once the shaft is clear of the bearing seats, it can be pulled out from the bearing housing. Remove the drive bearing (Figure 6.2 - 6) by removing the locknut and lock washer (Figure 6.2 - 14, 15). Make sure to bend tab on lock washer so it is clear of the locknut.
12. Remove the rotor drive bearing (Figure 6.2 - 5) by removing the locknut and lock washer (Figure 6.2 - 16, 17). Make sure to bend tab on lock washer so it is clear of the locknut.

5.8.3 CLM-76/101 Mill Bearing Disassembly

⚠DANGER

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.7 - 6) and remove the screen frame baffle plate (Figure 6.14 - 1)
4. Remove end cap, lock washer, and bolt (Figure 6.3 - 20, 21, 22).
5. Withdraw rotor (Figure 6.7 - 3) from bearing housing shaft (Figure 6.3 - 3).
6. Remove rotor key (Figure 6.3 - 10) from mill shaft (Figure 6.3 - 3).
7. Open the drive belts guard (Figure 6.7 - 10) and release belt tension until the drive belts can be removed from the pulleys without damage.
8. Remove mill pulley (Figure 6.7 - 20) from mill bearing shaft (Figure 6.3 - 3), and drive key (Figure 6.3 - 11).

NOTICE

THE BEARING ASSEMBLY CAN NOW BE REMOVED IN ONE PIECE BY REMOVING THE BOLTS AND WASHERS FASTENING IT TO THE MILL HOUSING.

9. Remove the HHCS to remove the front rotor side end cap assembly (Figure 6.3 - 12).
10. Mill shaft (Figure 6.3 - 3) is now ready for removal. Using a rubber mallet or similar device, displace shaft from the drive side of the bearing housing assembly, moving the shaft axially one to three inches towards the mill housing side of the bearing assembly.

CAUTION

Be careful not to damage the shaft seal during shaft removal.

11. Once the shaft is clear of the bearing seats, it can be pulled out from the bearing housing. Remove the drive bearing (Figure 6.3 - 4) by removing the locknut and lock washer (Figure 6.3 - 5, 6). Make sure to bend tab on lock washer so it is clear of the locknut.
12. Remove the rotor drive bearing (Figure 6.3 - 7) by removing the locknut and lock washer (Figure 6.3 - 8, 9). Make sure to bend tab on lock washer so it is clear of the locknut.

5.8.4 CLM-36 Mill Bearing Reassembly

Assemble bearings (Figure 6.1 - 13, 14) on mill shaft (Figure 6.1 - 2) using the following procedure:

Before starting the assembly, inspect all parts to be sure they are clean of dirt, grease, burrs, etc. Lay all parts of the assembly on a clean, dry surface. Inspect the labels on the boxes containing the bearings to be assembled and be sure they have a green inspection sticker, which ensures **Prater** has inspected the critical dimensions. Be sure your hands are free of any grease, metal chips, dirt, etc. Remove the bearings from the box and verify that the bearings contain the 2Z, C3 and JEM designations. This is extremely important. Do not use a bearing that does not say 2Z and C3 in the part designation. Check both sides of the bearing to be sure the shields are not damaged. Once the bearing is out of the box, always lay it on a clean, dry, flat surface. Bearings have three external parts: the inner race, the shields and the outer race. When assembling a bearing housing, the shields on the bearings should never be touched by any tools or even squeezed between the fingers. This could cause undetected damage to the internal parts of the bearing, resulting in premature bearing failure. **Prater** recommends that the critical bearing dimensions (ID, OD, etc.) be measured to insure they are within the manufacturers tolerances if **Prater** did not supply the bearings.

Assembling without an Induction Heater

The pressure applied to the bearing must be on the inner race, and the inner race only. Never put pressure on the outer race to press a shaft into the inner race of a bearing. Be sure the tool being used to apply pressure to the inner race is only touching the inner race. Never apply pressure to one bearing while using the opposite bearing for resistance or as a stop. This will damage the opposite bearing. The assembly operation starts by pressing the rotor side bearing (Figure 6.1 - 14) onto the bearing housing shaft (Figure 6.1 - 2). Install inner shaft sleeve (Figure 6.1 - 16). Press the drive side bearing (Figure 6.1 - 13) onto the shaft (Figure 6.1 - 2). Replace lock washers and lock nuts (Figure 6.1 - 10, 11) so they are tight against the inner race. Make sure the tabs in the lock washers are bent down onto the lock nut.

Assembling with an Induction Heater

Using an induction heater, heat the rotor side bearing (Figure 6.1 - 14) and insert it on the shaft (Figure 6.1 - 2) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Slide the shaft sleeve (Figure 6.1 - 16) over the shaft (Figure 6.1 - 2). Heat the drive side bearing (Figure 6.1 - 13) and insert it on the shaft (Figure 6.1 - 2) and against the shaft sleeve shoulder (Figure 6.1 - 16) and let it cool. **MAXIMUM temperature is 230° F (110°C).** Replace lock washers and lock nuts (Figure 6.1 - 10, 11) so they are tight against the inner race. Make sure the tab in the lock washer is bent down onto the lock nut.

Once the bearings are pressed onto the shaft, the bearing and shaft assembly can be pressed into the housing. The first bearing into the housing is the one the resides closest to the pulley. Since

this bearing cannot be directly pushed into its seat in the housing, it is important to be sure it is inserted as straight and accurate as possible. A little care will go a long way.

Next the inner bearing, the one closest to the rotor, is then pushed into the housing by applying pressure to the outer race of this bearing. Be sure the tool being used to apply pressure to the outer race is only touching the outer race. Do not use excessive pressure to push this bearing into place. If the interference is too great, contact a **Prater** customer service representative for more information. Do not force the bearing into place with undue pressure. This will only damage the internal parts of the bearing and results in premature failure of the bearing.

Once the outer bearing is seated in place, install the wave spring so that it rests on the outer race of the drive side bearing. The bearing end caps are installed to lock the outer race of the bearings into the housing. Before installing the caps carefully inspect the inpro seals to ensure that they are not worn or damaged and replace if necessary. Install the bearing caps with the proper hardware. Reinstall bearing assembly into the mill body and reconnect the air purge lines.

CAUTION	Be careful not to damage the shaft seal during shaft replacement into the mill body.

Replace rotor (Figure 6.5 - 3) and install end cap, lock washer, and bolt (Figure 6.1 - 9, 19, 20). Check for smooth rotor rotation and zero endplay. Install and tension the drive belts then close and secure the drive belts guard.

5.8.5 CLM-51 Mill Bearing Reassembly

Assemble bearings (Figure 6.2 - 5, 6) on mill shaft (Figure 6.2 - 2) using the following procedure:

Before starting the assembly, inspect all parts to be sure they are clean of dirt, grease, burrs, etc. Lay all parts of the assembly on a clean, dry surface. Inspect the labels on the boxes containing the bearings to be assembled and be sure they have a green inspection sticker, which ensures **Prater** has inspected the critical dimensions. Be sure your hands are free of any grease, metal chips, dirt, etc. Remove the bearings from the box and verify that the bearings contain the 2Z, C3 and JEM designations. This is extremely important. Do not use a bearing that does not say 2Z and C3 in the part designation. Check both sides of the bearing to be sure the shields are not damaged. Once the bearing is out of the box, always lay it on a clean, dry, flat surface. Bearings have three external parts: the inner race, the shields and the outer race. When assembling a bearing housing, the shields on the bearings should never be touched by any tools or even squeezed between the fingers. This could cause undetected damage to the internal parts of the bearing, resulting in premature bearing failure. **Prater** recommends that the critical bearing dimensions (ID, OD, etc.) be measured to insure they are within the manufacturers tolerances if **Prater** did not supply the bearings.

Assembling without an Induction Heater

The pressure applied to the bearing must be on the inner race, and the inner race only. Never put pressure on the outer race to press a shaft into the inner race of a bearing. Be sure the tool being used to apply pressure to the inner race is only touching the inner race. Never apply pressure to one bearing while using the opposite bearing for resistance or as a stop. This will damage the opposite bearing. The assembly operation starts by pressing the rotor side bearing (Figure 6.2 - 5) onto the bearing housing shaft (Figure 6.2 - 2). Install the lock washer and lock nut (Figure 6.2 - 16, 17) so they are tight against the inner race. Press the drive side bearing (Figure 6.2 - 6) onto the shaft (Figure 6.2 - 2). Replace lock washers and lock nuts (Figure 6.2 - 14, 15) so they are tight against the inner race. Make sure the tabs in the lock washers are bent down onto the lock nut.

Assembling with an Induction Heater

Using an induction heater, heat the rotor side bearing (Figure 6.2 - 5) and insert it on the shaft (Figure 6.2 - 2) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Install the lock washer and lock nut (Figure 6.2 - 16, 17) so they are tight against the inner race. Heat the drive side bearing (Figure 6.2 - 6) and insert it on the shaft (Figure 6.2 - 2) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Replace lock washers and lock nuts (Figure 6.2 - 14, 15) so they are tight against the inner race. Make sure the tab in the lock washer is bent down onto the lock nut.

Once the bearings are pressed onto the shaft, the bearing and shaft assembly can be pressed into the housing. The first bearing into the housing is the one the resides closest to the pulley. Since this bearing cannot be directly pushed into its seat in the housing, it is important to be sure it is inserted as straight and accurate as possible. A little care will go a long way.

Next the inner bearing, the one closest to the rotor, is then pushed into the housing by applying pressure to the outer race of this bearing. Be sure the tool being used to apply pressure to the outer race is only touching the outer race. Do not use excessive pressure to push this bearing into place. If the interference is too great, contact a **Prater** customer service representative for more information. Do not force the bearing into place with undue pressure. This will only damage the internal parts of the bearing and results in premature failure of the bearing.

Once the outer bearing is seated in place, install the wave spring so that it rests on the outer race of the drive side bearing. The bearing end caps are installed to lock the outer race of the bearings into the housing. Before installing the caps carefully inspect the inpro seals to ensure that they are not worn or damaged and replace if necessary. Install the bearing caps with the proper hardware. Reinstall bearing assembly into the mill body and reconnect the air purge lines.

CAUTION	Be careful not to damage the shaft seal during shaft replacement into the mill body.

Replace rotor (Figure 6.5 - 3) and install end cap, lock washer, and bolt (Figure 6.2 - 20, 21, 22). Check for smooth rotor rotation and zero endplay. Install and tension the drive belts then close and secure the drive belts guard.

5.8.6 CLM-76/101 Mill Bearing Reassembly

Assemble bearings (Figure 6.3 - 4, 7)) on mill shaft (Figure 6.3 - 3) using the following procedure:

Before starting the assembly, inspect all parts to be sure they are clean of dirt, grease, burrs, etc. Lay all parts of the assembly on a clean, dry surface. Inspect the labels on the boxes containing the bearings to be assembled and be sure they have a green inspection sticker, which ensures **Prater** has inspected the critical dimensions. Be sure your hands are free of any grease, metal chips, dirt, etc. Remove the bearings from the box and verify that the bearings contain the 2Z, C3 and JEM designations. This is extremely important. Do not use a bearing that does not say 2Z and C3 in the part designation. Check both sides of the bearing to be sure the shields are not damaged. Once the bearing is out of the box, always lay it on a clean, dry, flat surface. Bearings have three external parts: the inner race, the shields and the outer race. When assembling a bearing housing, the shields on the bearings should never be touched by any tools or even squeezed between the fingers. This could cause undetected damage to the internal parts of the bearing, resulting in premature bearing failure. **Prater** recommends that the critical bearing dimensions (ID, OD, etc.) be measured to insure they are within the manufacturers tolerances if **Prater** did not supply the bearings.

Assembling without an Induction Heater

The pressure applied to the bearing must be on the inner race, and the inner race only. Never put pressure on the outer race to press a shaft into the inner race of a bearing. Be sure the tool being used to apply pressure to the inner race is only touching the inner race. Never apply pressure to one bearing while using the opposite bearing for resistance or as a stop. This will damage the opposite bearing. The assembly operation starts by pressing the rotor side bearing (Figure 6.3 - 7) onto the bearing housing shaft (Figure 6.3 - 3). Install the lock washer and lock nut (Figure 6.3 - 8, 9) so they are tight against the inner race. Press the drive side bearing (Figure 6.3 - 4) onto the shaft (Figure 6.3 - 3). Replace lock washers and lock nuts (Figure 6.3 - 5, 6) so they are tight against the inner race. Make sure the tabs in the lock washers are bent down onto the lock nut.

Assembling with an Induction Heater

Using an induction heater, heat the rotor side bearing (Figure 6.3 - 7) and insert it on the shaft (Figure 6.3 - 3) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Install the lock washer and lock nut (Figure 6.3 - 8, 9) so they are tight against the inner race. Heat the drive side bearing (Figure 6.3 - 4) and insert it on the shaft (Figure 6.3 - 3) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Replace

lock washers and lock nuts (Figure 6.3 - 5, 6) so they are tight against the inner race. Make sure the tab in the lock washer is bent down onto the lock nut.

Once the bearings are pressed onto the shaft, the bearing and shaft assembly can be pressed into the housing. The first bearing into the housing is the one the resides closest to the pulley. Since this bearing cannot be directly pushed into its seat in the housing, it is important to be sure it is inserted as straight and accurate as possible. A little care will go a long way.

Next the inner bearing, the one closest to the rotor, is then pushed into the housing by applying pressure to the outer race of this bearing. Be sure the tool being used to apply pressure to the outer race is only touching the outer race. Do not use excessive pressure to push this bearing into place. If the interference is too great, contact a **Prater** customer service representative for more information. Do not force the bearing into place with undue pressure. This will only damage the internal parts of the bearing and results in premature failure of the bearing.

Once the outer bearing is seated in place, install the wave spring so that it rests on the outer race of the drive side bearing. The bearing end caps are installed to lock the outer race of the bearings into the housing. Before installing the caps carefully inspect the inpro seals to ensure that they are not worn or damaged and replace if necessary. Install the bearing caps with the proper hardware. Reinstall bearing assembly into the mill body and reconnect the air purge lines.

CAUTION	Be careful not to damage the shaft seal during shaft replacement into the mill body.

Replace rotor (Figure 6.7 - 3) and install end cap, lock washer, and bolt (Figure 6.3 - 20, 21, 22). Check for smooth rotor rotation and zero endplay. Install and tension the drive belts then close and secure the drive belts guard.

5.8.7 CLM-76/ 101Classifier Bearing Dissassembly

⚠DANGER	DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

1. Turn off the Classifier Mill and allow the rotors (Figure 6.7 - 3,5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open door (Figure 6.7 - 6) and remove the lock washers, screws, and end cap (Figure 6.11 - 3, 14, 20) that attach the classifier rotor (Figure 6.7 - 5) to the classifier bearing assembly (Figure 6.7 - 7).

4. Withdraw the classifier rotor (Figure 6.7 - 5) from the bearing housing shaft (Figure 6.4 - 1).
5. Remove rotor key (Figure 6.4 - 18) from mill shaft (Figure 6.4 - 1).
6. Open the drive belts guard (Figure 6.7 - 11) and release belt tension by adjusting the classifier motor (Figure 6.7 - 16) until the drive belts can be removed from the pulleys without damage.
7. Remove the classifier drive pulley from the classifier bearing shaft (Figure 6.4 - 1) and remove the drive key (Figure 6.4 - 17).

NOTICE

THE BEARING ASSEMBLY CAN NOW BE REMOVED IN ONE PIECE BY REMOVING THE BOLTS AND WASHERS FASTENING IT TO THE MILL HOUSING.

8. Remove the HHCS to remove the front rotor side end cap assembly (Figure 6.4 - 9) and spacer (Figure 6.4 - 7) from the classifier bearing assembly.
9. The classifier bearing shaft (Figure 6.4 - 1) is now ready for removal. Using a rubber mallet or similar device, displace shaft from the drive side of the bearing housing assembly, moving the shaft axially one to three inches towards the mill housing side of the bearing assembly.

CAUTION

Be careful not to damage the shaft seal during shaft removal.

10. Once the shaft is clear of the bearing seats, it can be pulled out from the bearing housing. Remove the rotor drive bearing (Figure 6.4 - 4) from the shaft (Figure 6.4 - 1).
11. Remove the drive bearing (Figure 6.4 - 3) by removing the locknut and lock washer (Figure 6.4 - 5, 6). Make sure to bend tab on lock washer so it is clear of the locknut.

5.8.8 CLM-76/ 101 Classifier Bearing Reassembly

Assemble bearings (Figure 6.4 - 3, 4) on mill shaft (Figure 6.4 - 1) using the following procedure:

Before starting the assembly, inspect all parts to be sure they are clean of dirt, grease, burrs, etc. Lay all parts of the assembly on a clean, dry surface. Inspect the labels on the boxes containing the bearings to be assembled and be sure they have a green inspection sticker, which ensures **Prater** has inspected the critical dimensions. Be sure your hands are free of any grease, metal chips, dirt, etc. Remove the bearings from the box and verify that the bearings contain the 2Z, C3 and JEM designations. This is extremely important. Do not use a bearing that does not say 2Z and C3 in the part designation. Check both sides of the bearing to be sure the shields are not damaged. Once the bearing is out of the box, always lay it on a clean, dry, flat surface. Bearings have three external parts: the inner race, the shields and the outer race. When assembling a bearing housing, the shields on the bearings should never be touched by any tools or even squeezed between the

fingers. This could cause undetected damage to the internal parts of the bearing, resulting in premature bearing failure. **Prater** recommends that the critical bearing dimensions (ID, OD, etc.) be measured to insure they are within the manufacturers tolerances if **Prater** did not supply the bearings.

Assembling without an Induction Heater

The pressure applied to the bearing must be on the inner race, and the inner race only. Never put pressure on the outer race to press a shaft into the inner race of a bearing. Be sure the tool being used to apply pressure to the inner race is only touching the inner race. Never apply pressure to one bearing while using the opposite bearing for resistance or as a stop. This will damage the opposite bearing. The assembly operation starts by pressing the drive side bearing (Figure 6.4 - 3) onto the bearing housing shaft (Figure 6.4 - 1). Install the lock washer and lock nut (Figure 6.4 - 5, 6) so they are tight against the inner race. Press the rotor side bearing (Figure 6.4 - 4) onto the shaft (Figure 6.4 - 1). Replace the rotor side end cap and spacer (Figure 6.4 - 9, 7) and make sure the spacer is pressed firmly against the inner race of the classifier rotor bearing (Figure 6.4 - 4) before reinstalling the classifier rotor.

Assembling with an Induction Heater

Using an induction heater, heat the drive side bearing (Figure 6.4 - 3) and insert it on the shaft (Figure 6.4 - 1) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Install the lock washer and lock nut (Figure 6.4 - 5, 6) so they are tight against the inner race. Heat the rotor side bearing (Figure 6.4 - 4) and insert it on the shaft (Figure 6.4 - 1) and against the shaft shoulder and let it cool. **MAXIMUM temperature is 230° F (110°C).** Replace the rotor side end cap and spacer (Figure 6.4 - 9, 7) and make sure the spacer is pressed firmly against the inner race of the classifier rotor bearing (Figure 6.4 - 4) before reinstalling the classifier rotor.

Once the bearings are pressed onto the shaft, the bearing and shaft assembly can be pressed into the housing. The first bearing into the housing is the one the resides closest to the pulley. Since this bearing cannot be directly pushed into its seat in the housing, it is important to be sure it is inserted as straight and accurate as possible. A little care will go a long way.

Next the inner bearing, the one closest to the rotor, is then pushed into the housing by applying pressure to the outer race of this bearing. Be sure the tool being used to apply pressure to the outer race is only touching the outer race. Do not use excessive pressure to push this bearing into place. If the interference is too great, contact a **Prater** customer service representative for more information. Do not force the bearing into place with undue pressure. This will only damage the internal parts of the bearing and results in premature failure of the bearing.

Once the outer bearing is seated in place, install the wave spring so that it rests on the outer race of the drive side bearing. The bearing end caps are installed to lock the outer race of the bearings into the housing. Before installing the caps carefully inspect the inpro seals to ensure that they are not

worn or damaged and replace if necessary. Install the bearing caps with the proper hardware. Reinstall bearing assembly into the mill body and reconnect the air purge lines.

CAUTION	Be careful not to damage the shaft seal during shaft replacement into the mill body.

Replace the rotor key (Figure 6.4 - 18) onto the mill shaft (Figure 6.4 - 1) and reattach the classifier rotor (Figure 6.7 - 5) using the lock washers, screws, and end cap (Figure 6.11 - 3, 14, 20). Install and tension the drive belts then close and secure the drive belts guard.

5.8.9 New Bearing Run-In Procedure

Bearing Temperatures
Initial bearing running temperatures and stabilization time will bary depending upon the following factors:

1. Rotational speed (RPM)
2. Installed bearing internal clearance
3. Grease fill volume
4. Bearing size
5. Ambient temperature

It is recommended to start new bearings running at half speed, if a VFD is available, for about one hour. After an hour, increase to full speed and run until both bearing temperatures stabilize below 140° F. If VFD is not available, try an initial warm-up procedure of power-on, then power-off, the mill drive motor to achieve an average break-in speed of about half the normal running speed for the first 15 minutes of running time.

Bearings with less internal clearance will run warmer initially and take longer to stabilize. Generally, larger bearings will run warmer than smaller bearings, since the rolling elements must spin at a higher velocity.

It is not uncommon for a new bearing to reach 160° F during initial run-in, but in no case should a bearing temperature be allowed to exceed 180° F for an extended period of time. Grease may begin to bleed above 180° F. Grease life is best if the bearing temperature stabilizes below 140° F.

Depending upon the variables given above, bearing temperatures should reduce to a stabilized running temperature below 140° F within the first 24 hours of operation. The final stabilized temperature for a particular bearing will depend on the ambient temperature and bearing internal clearance.

5.9 Belt Tension

⚠DANGER

DO NOT OPEN THE CLASSIFIER MILL OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE CLASSIFIER MILL HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED IN THE OPEN POSITION.

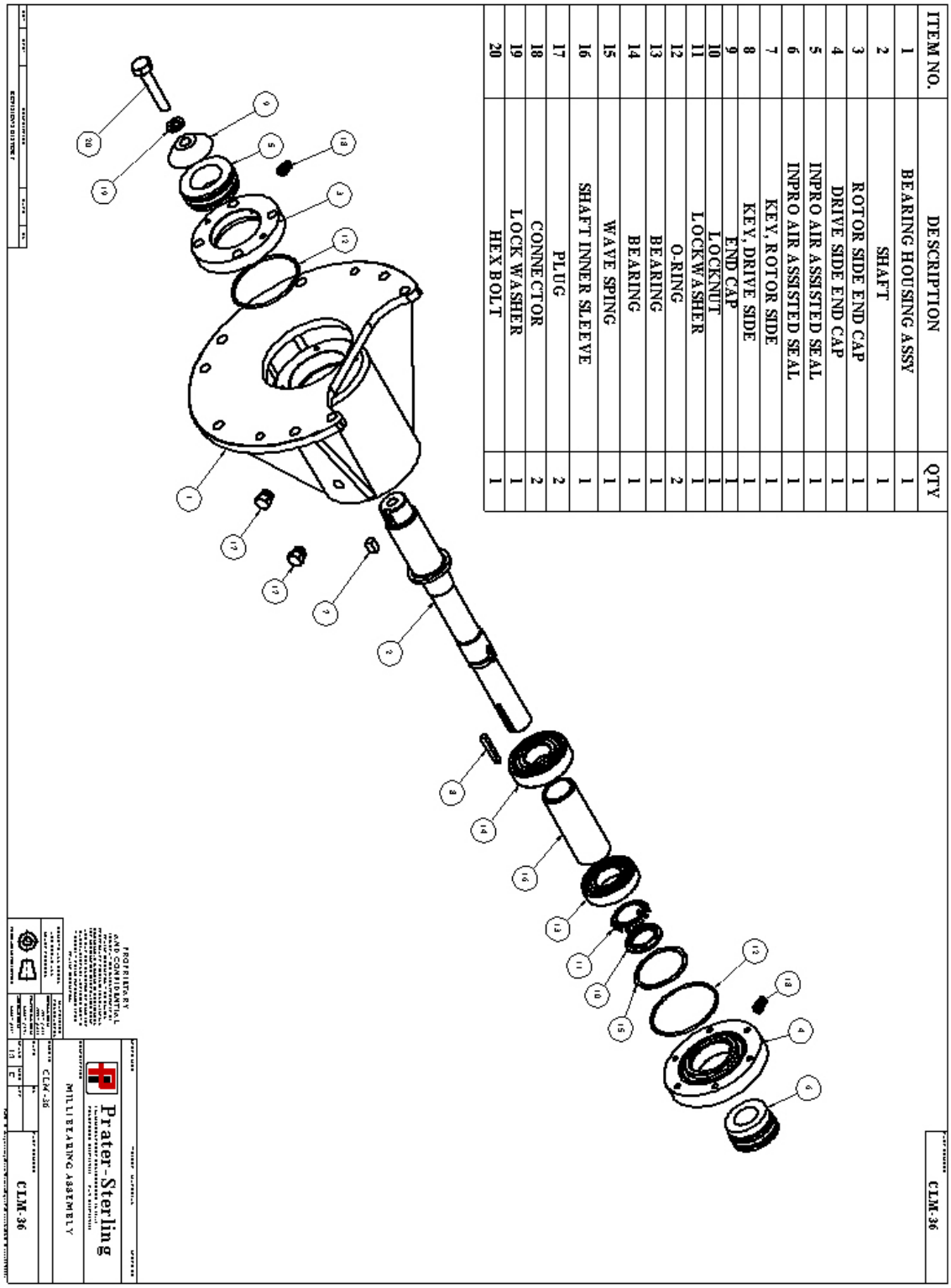
1. Turn off the Classifier Mill and allow the rotors (Figures 6.4 & 6.6 - 3, 5) to come to a complete stop.
2. **Lock out electrical power** to the Classifier Mill.
3. Open mill drive guard door by using a tool to remove fasteners that attach front guard face to the main guard body.
4. Press firmly on the mid-point of the belt and measure the belt deflection. Deflection should be 1/4" or less.
5. If deflection is more than 1/4", loosen the motor mounting bolts, tighten the belt and tighten the mounting bolts.
6. Reattach drive guard door.
7. Repeat above steps for classifier rotor drive.

Section

6

Section 6: Drawings and Parts List

The following figures and illustrations are provided to assist in the operation and maintenance of Prater Classifier Mills as well as a general reference for any spare or replacement parts for Prater Classifier Mills. For specific Classifier Mill questions please contact Prater Customer Service.



ITEM NO.	DESCRIPTION	QTY
1	BEARING HOUSING ASSY	1
2	SHAFT	1
3	ROTOR SIDE END CAP	1
4	DRIVE SIDE END CAP	1
5	INPRO AIR ASSISTED SEAL	1
6	INPRO AIR ASSISTED SEAL	1
7	KEY, ROTOR SIDE	1
8	KEY, DRIVE SIDE	1
9	END CAP	1
10	LOCKNUT	1
11	LOCKWASHER	1
12	O-RING	2
13	BEARING	1
14	BEARING	1
15	WAVE SPING	1
16	SHAFT INNER SLEEVE	1
17	PLUG	2
18	CONNECTOR	2
19	LOCK WASHER	1
20	HEX BOLT	1

Figure 6.1: CLM-36 Exploded Mill Bearing Assembly

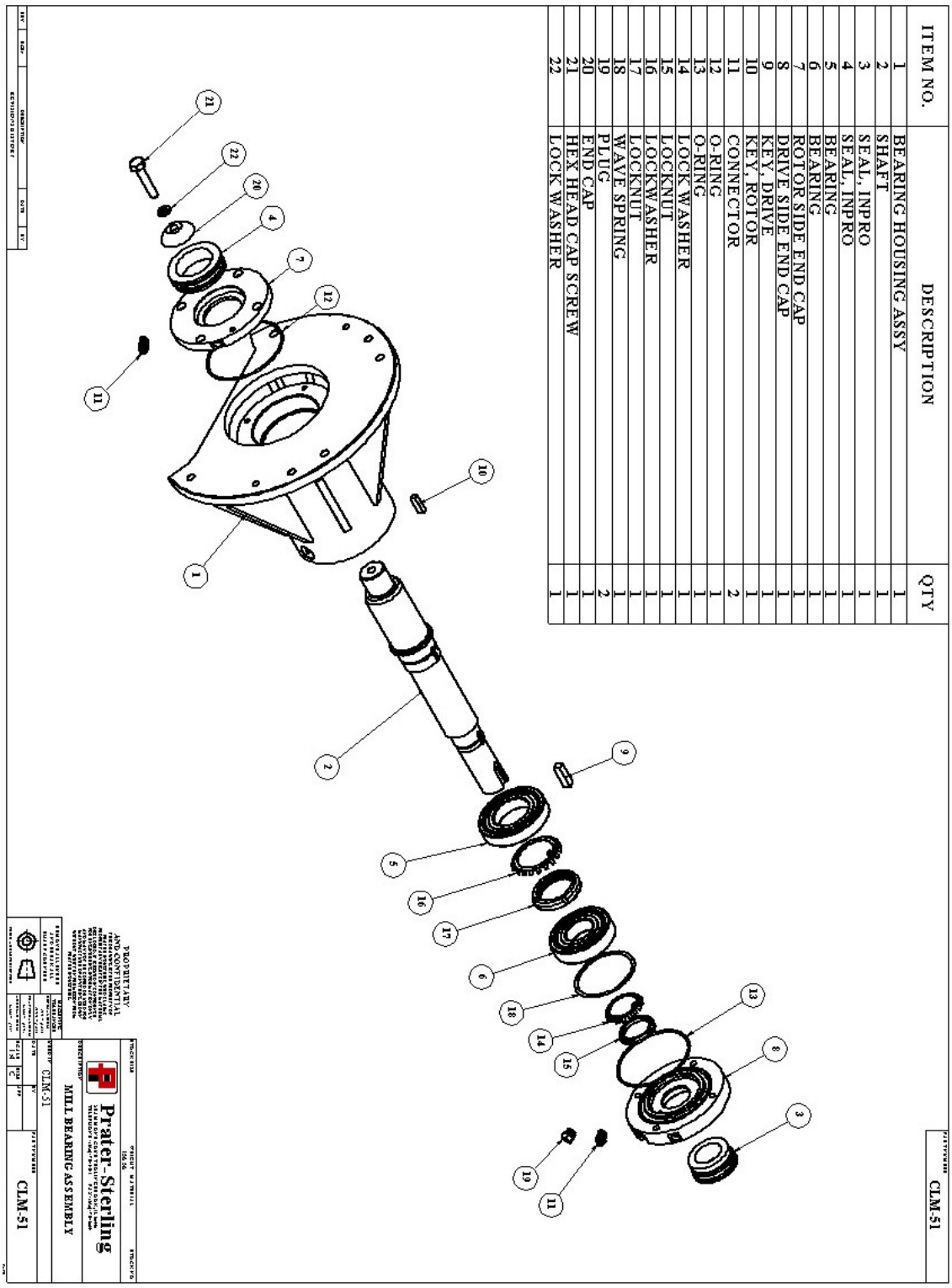


Figure 6.2: CLM-51 Exploded Mill Bearing Assembly

ITEM NO.	DESCRIPTION	QTY
1	BEARING HOUSING ASSEMBLY	1
2	DRIVE SIDE BEARING CAP	1
3	DRIVE SHAFT	1
4	BEARING	1
5	LOCK WASHER	1
6	LOCK NUT	1
7	BEARING	1
8	LOCK WASHER	1
9	LOCK NUT	1
10	ROTOR KEY	1
11	DRIVE KEY	1
12	ROTOR SIDE END CAP	1
13	INPRO SEAL	1
14	INPRO SEAL	1
15	TUBE CONNECTOR	2
16	WAVE SPRING	1
17	O-RING	1
18	O-RING	1
19	PLUG	2
20	RETAINING WASHER	1
21	LOCK WASHER	1
22	HEX BOLT	1

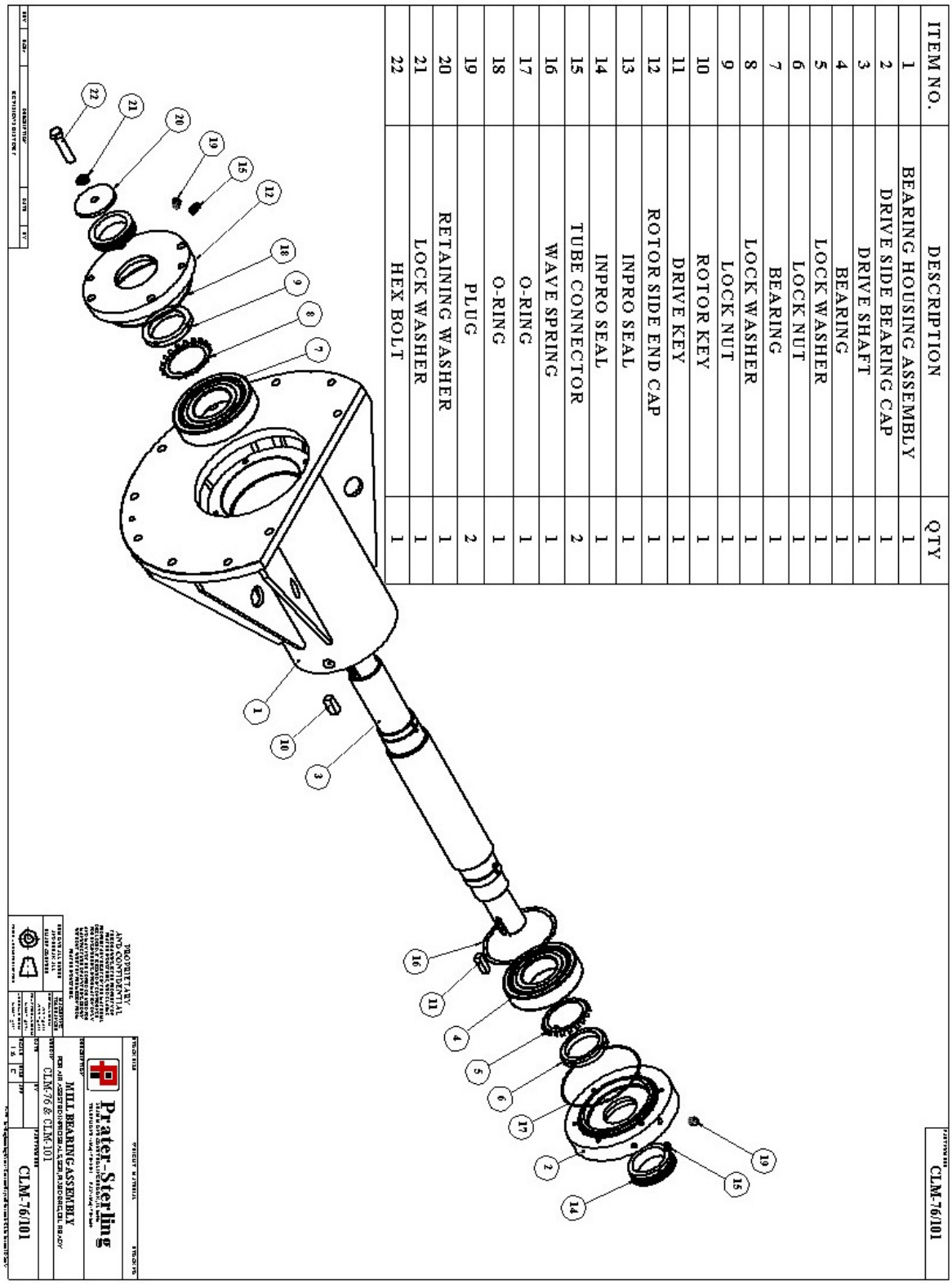
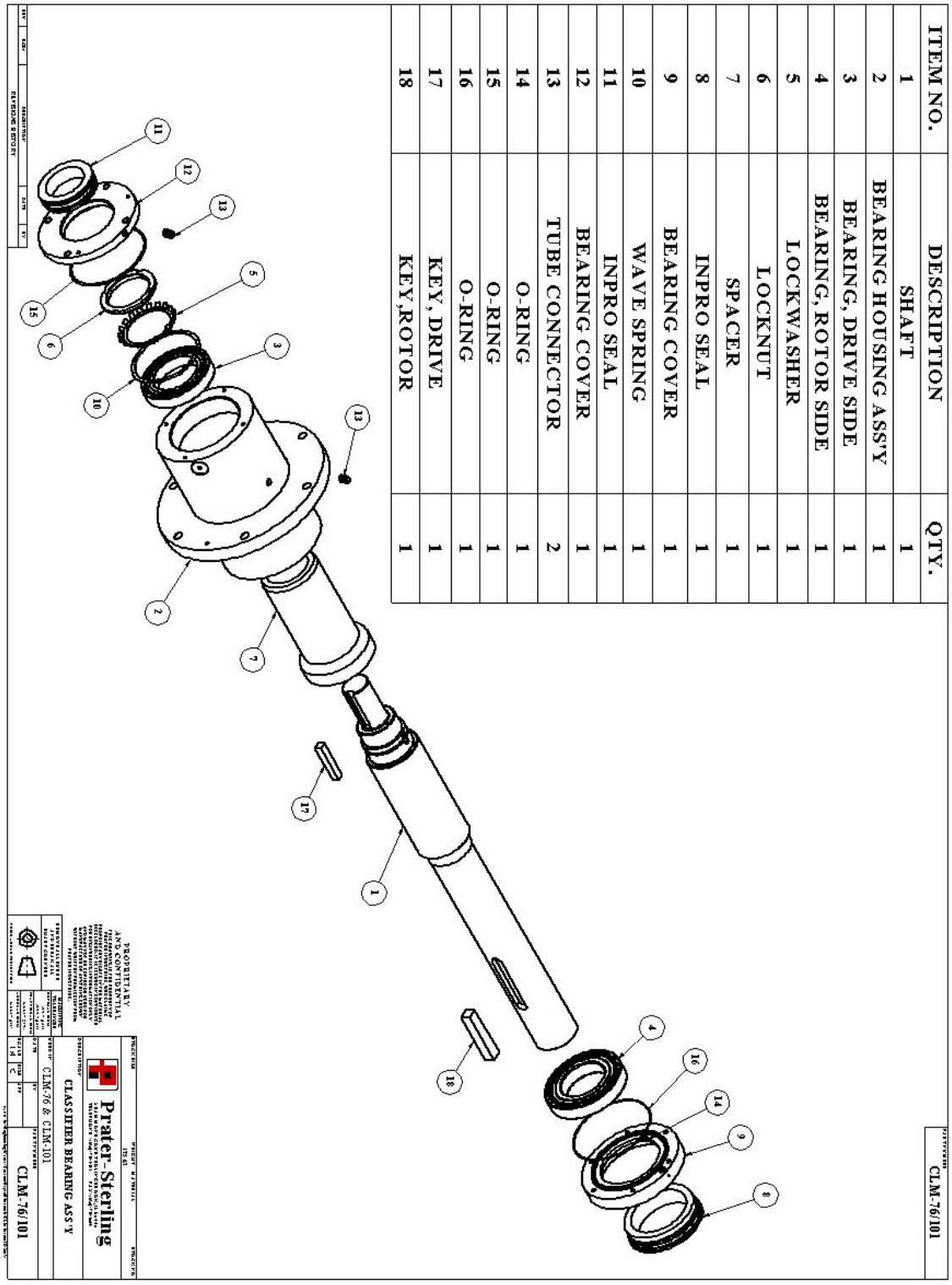


Figure 6.3: CLM-76 & CLM-101 Exploded Mill Bearing Assembly



ITEM NO.	DESCRIPTION	QTY.
1	SHAFT	1
2	BEARING HOUSING ASS'Y	1
3	BEARING, DRIVE SIDE	1
4	BEARING, ROTOR SIDE	1
5	LOCKWASHER	1
6	LOCKNUT	1
7	SPACER	1
8	INPRO SEAL	1
9	BEARING COVER	1
10	WAVE SPRING	1
11	INPRO SEAL	1
12	BEARING COVER	1
13	TUBE CONNECTOR	2
14	O-RING	1
15	O-RING	1
16	O-RING	1
17	KEY, DRIVE	1
18	KEY,ROTOR	1

Figure 6.4: CLM-76 & CLM-101 Exploded Classifier Bearing Assembly

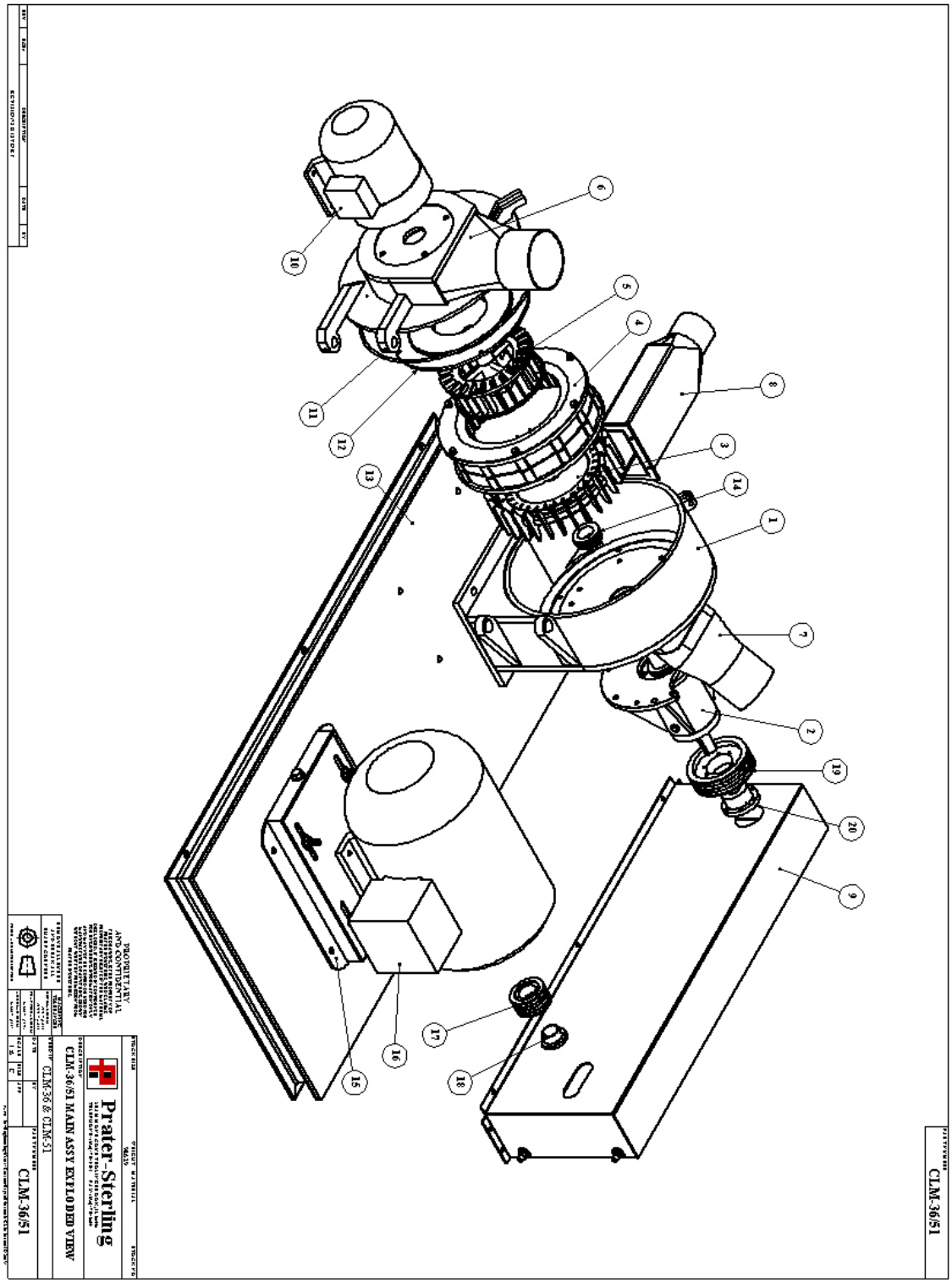


Figure 6.5: CLM-36 & CLM-51 Main Assembly Exploded View

CLM-36 & CLM-51 Main Assembly Parts List

Item No.	Description	Qty.
1	Housing Assembly	1
2	Mill Bearing Assembly	1
3	Mill Rotor Assembly	1
4	Screen Frame Assembly	1
5	Classifier Rotor Assembly	1
6	Door Assembly	1
7	Product Inlet	1
8	Secondary Air Inlet	1
9	Mill Drive Guard Assembly	1
10	Classifier Motor	1
11	Door Seal	1
12	Door Plate	1
13	Classifier Mill Base	1
14	Housing Body Seal	1
15	Mill Motor Base	1
16	Mill Motor	1
17	Motor Drive Pulley	1
18	Motor Drive Pulley Bushing	1
19	Rotor Drive Pulley	1
20	Rotor Drive Pulley Bushing	1

Table 6.6: CLM-36 & CLM-51 Main Assembly Parts List

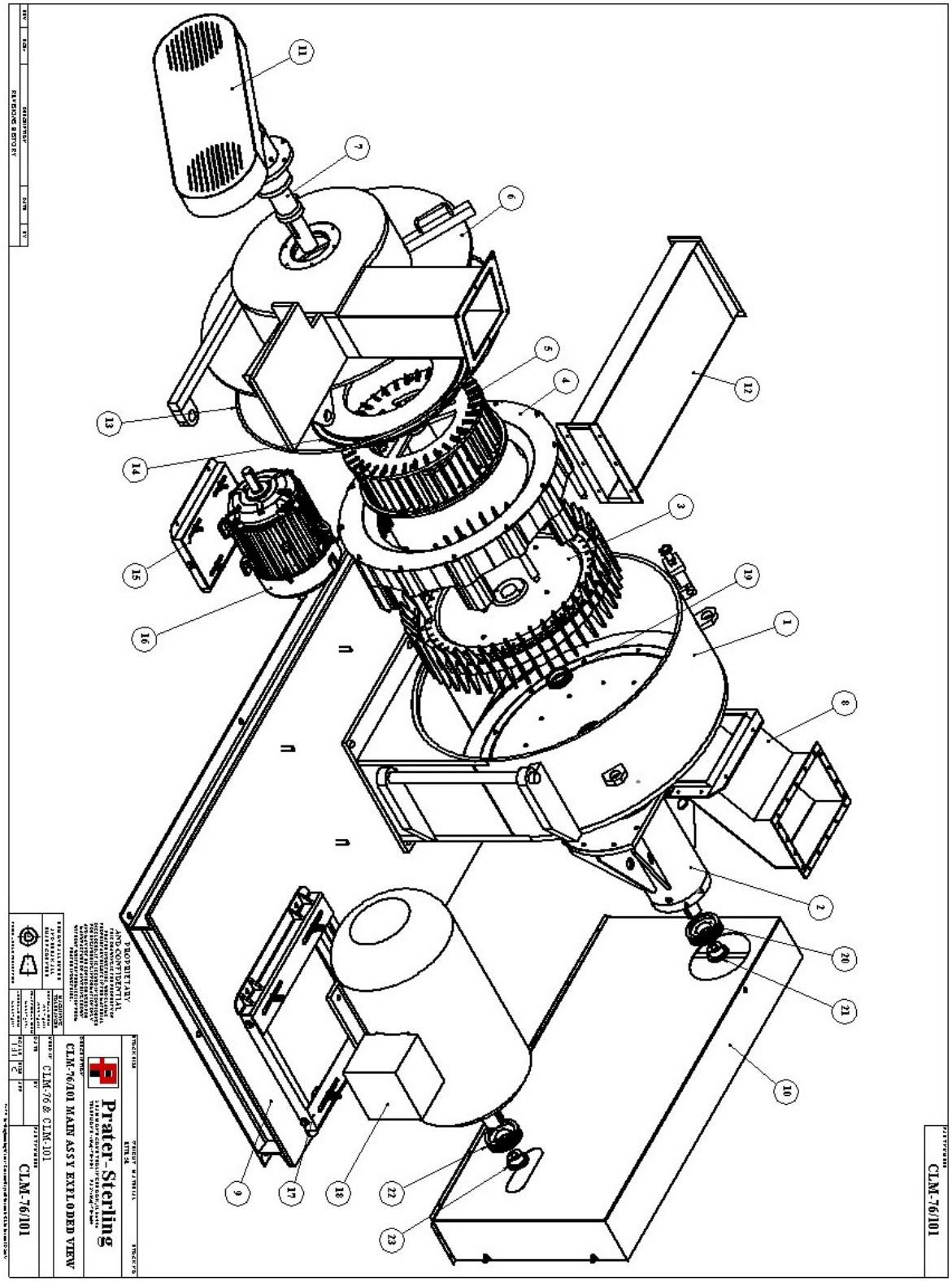


Figure 6.7: CLM-76 & CLM-101 Main Assembly Exploded View

CLM-76 & CLM-101 Main Assembly Parts List

Item No.	Description	Qty.
1	Housing Assembly	1
2	Mill Bearing Assembly	1
3	Mill Rotor Assembly	1
4	Screen Frame Assembly	1
5	Classifier Rotor Assembly	1
6	Door Assembly	1
7	Classifier Bearing Assembly	1
8	Product Inlet	1
9	Classifier Mill Base	1
10	Mill Drive Guard Assembly	1
11	Classifier Drive Guard Assembly	1
12	Secondary Air Inlet	1
13	Door Seal	1
14	Door Plate	1
15	Classifier Motor Base	1
16	Classifier Motor	1
17	Mill Motor Base	1
18	Mill Motor	1
19	Housing Body Seal	1
20	Rotor Drive Pulley	1
21	Rotor Drive Pulley Bushing	1
22	Motor Drive Pulley	1
23	Motor Drive Pulley Bushing	1

Table 6.8: CLM-76 & CLM-101 Main Assembly Parts List

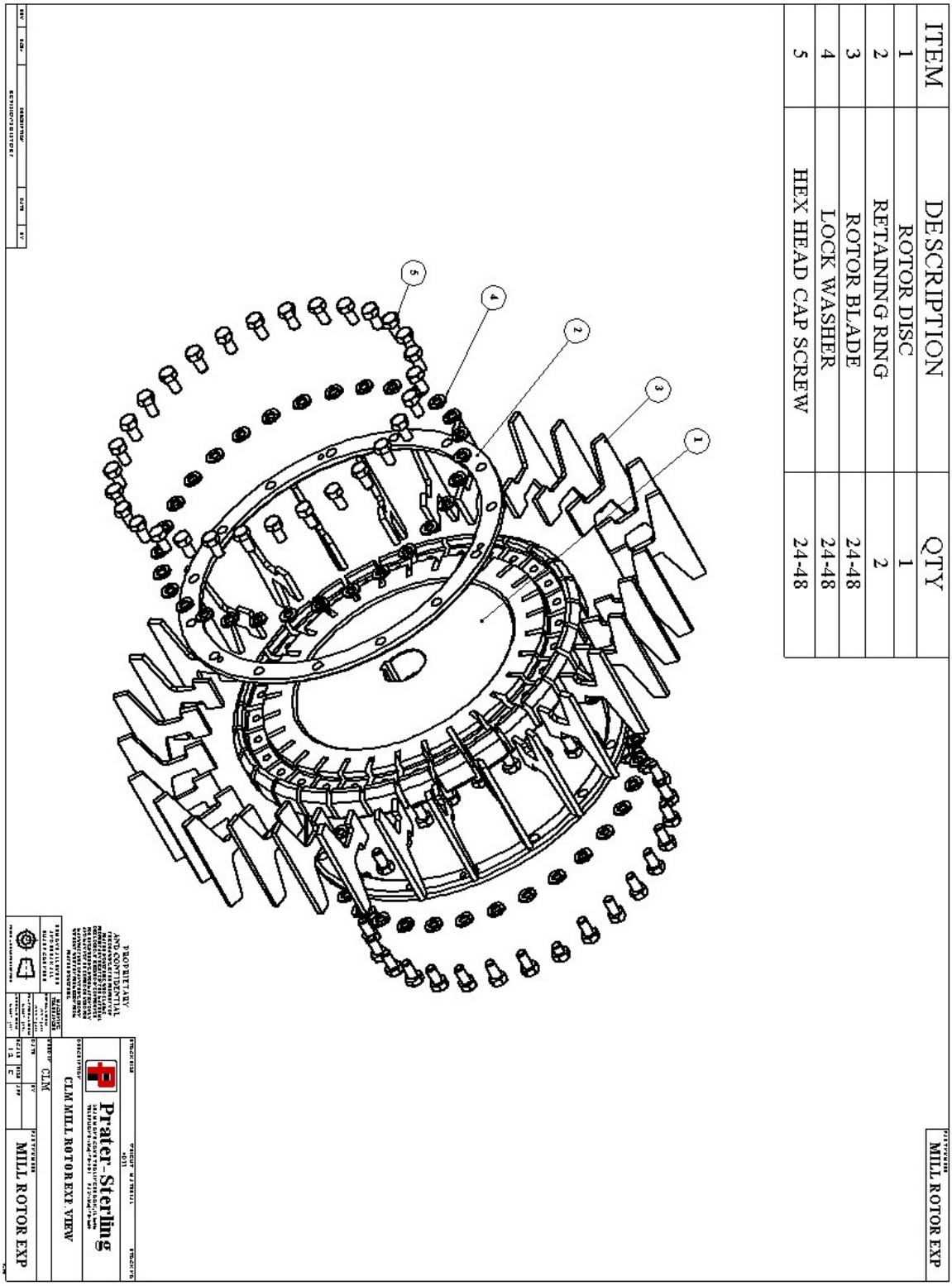


Figure 6.9: CLM Mill Rotor Assembly Exploded View and Parts List

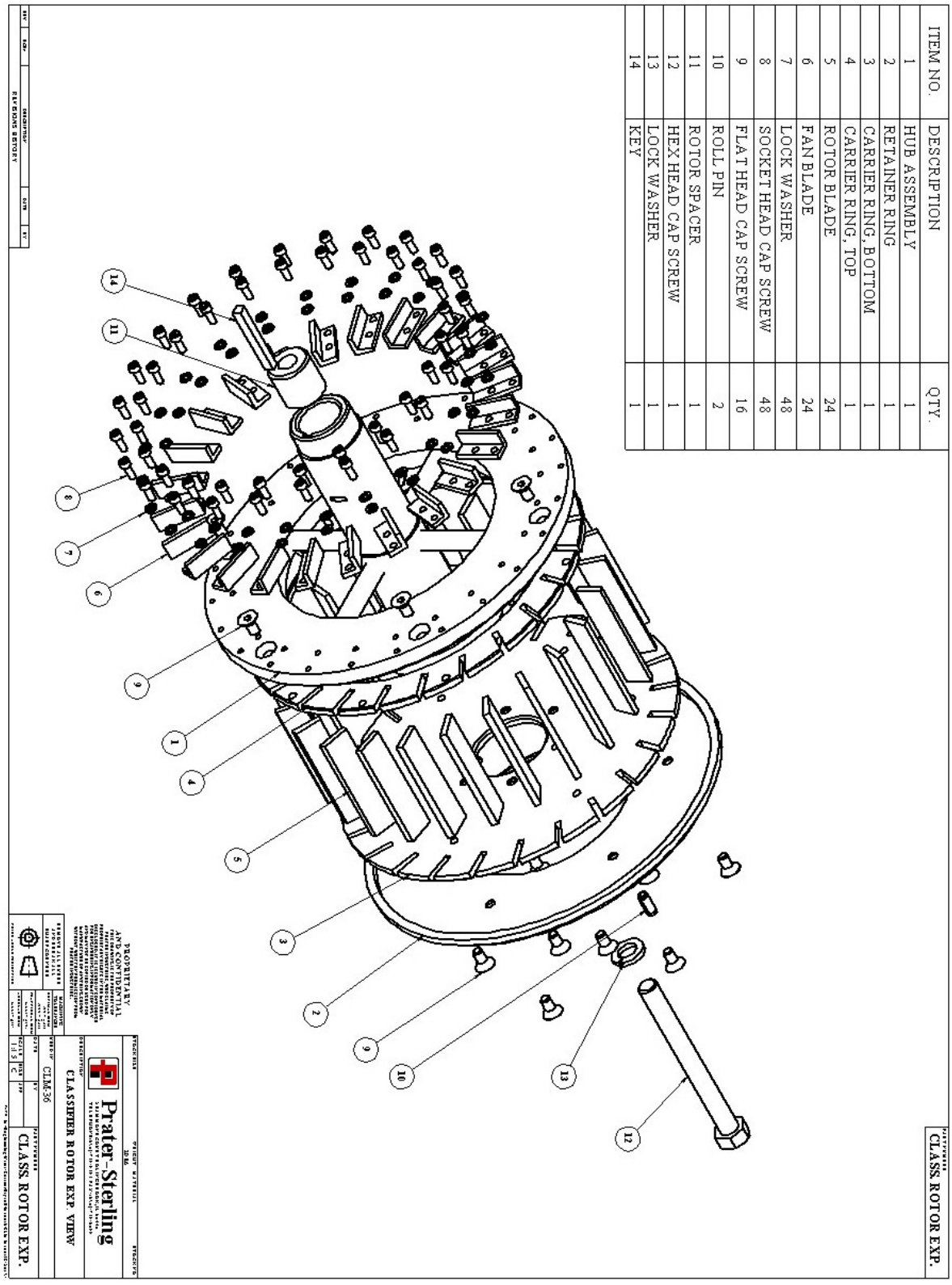
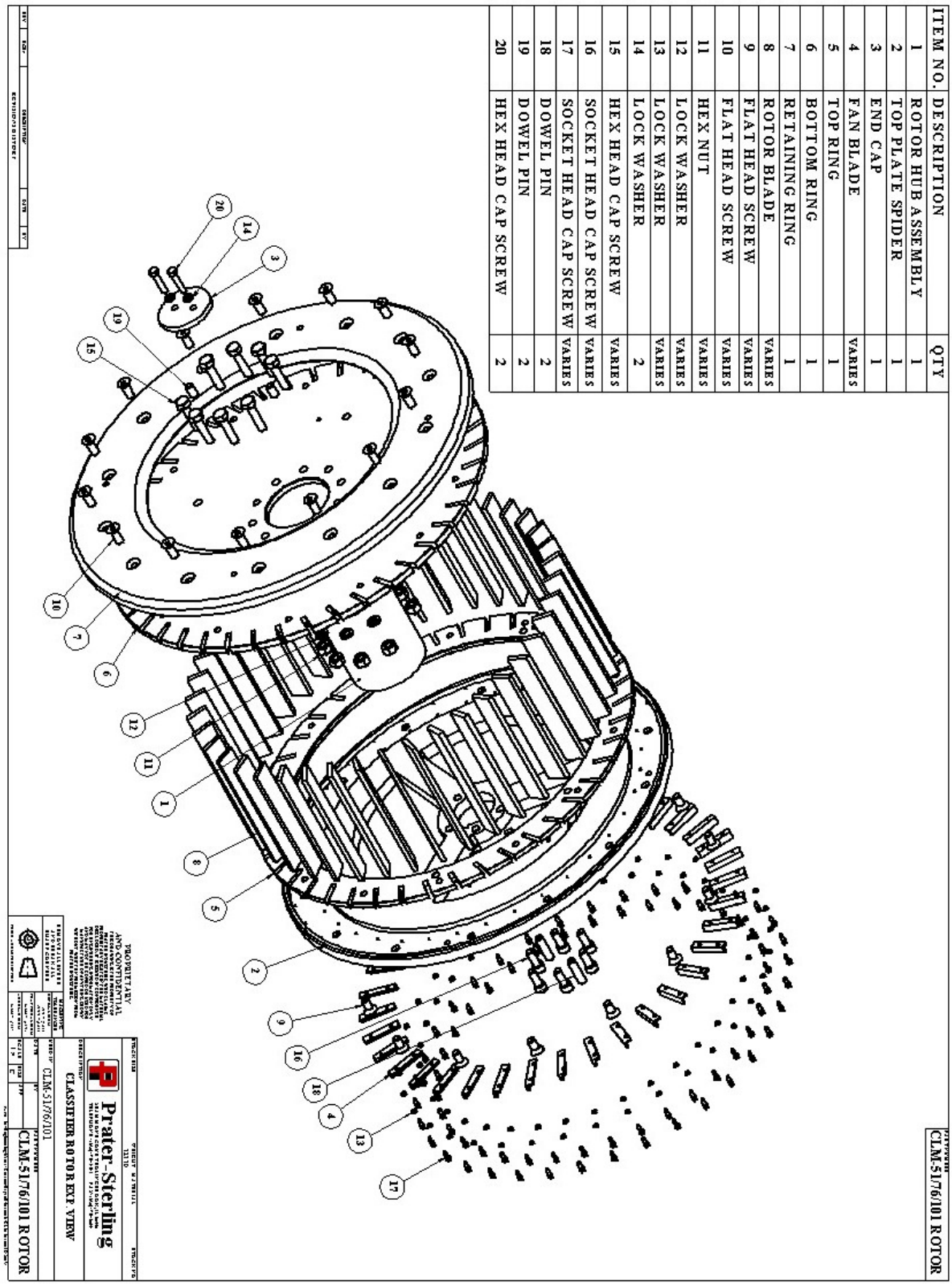


Figure 6.10: CLM-36 Classifier Rotor Assembly Exploded View and Parts List



ITEM NO.	DESCRIPTION	QTY
1	ROTOR HUB ASSEMBLY	1
2	TOP PLATE SPIDER	1
3	END CAP	1
4	FAN BLADE	VARIES
5	TOP RING	1
6	BOTTOM RING	1
7	RETAINING RING	1
8	ROTOR BLADE	VARIES
9	FLAT HEAD SCREW	VARIES
10	FLAT HEAD SCREW	VARIES
11	HEX NUT	VARIES
12	LOCK WASHER	VARIES
13	LOCK WASHER	VARIES
14	LOCK WASHER	2
15	HEX HEAD CAP SCREW	VARIES
16	SOCKET HEAD CAP SCREW	VARIES
17	SOCKET HEAD CAP SCREW	VARIES
18	DOWEL PIN	2
19	DOWEL PIN	2
20	HEX HEAD CAP SCREW	2

CLM-51/76/101 ROTOR

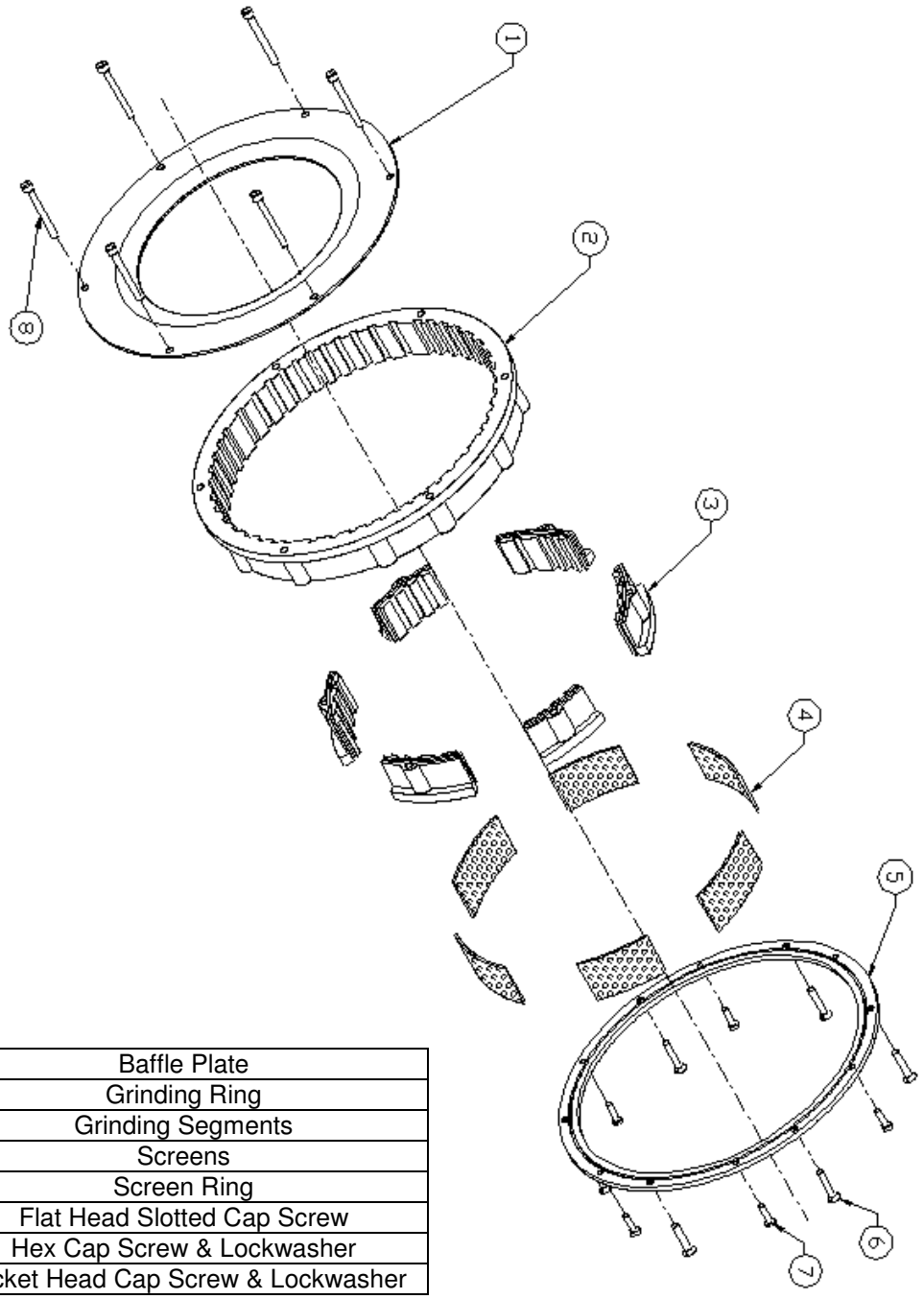
Prater-Sterling

CLASSIFIER ROTOR EXP. VIEW

CLM-51/76/101

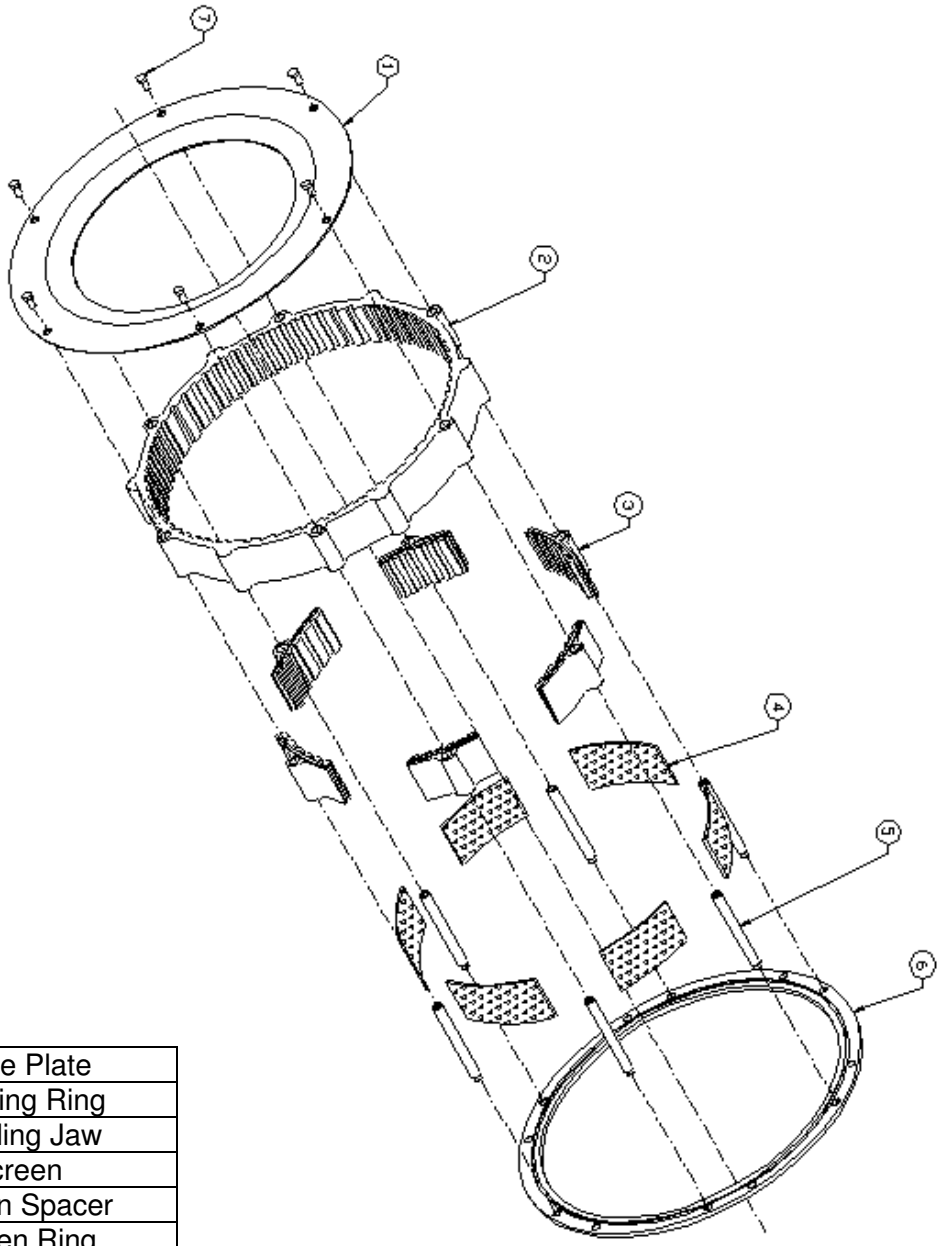
CLM-51/76/101 ROTOR

Figure 6.11: CLM-51/76/101 Classifier Rotor Assembly Exploded View and Parts List



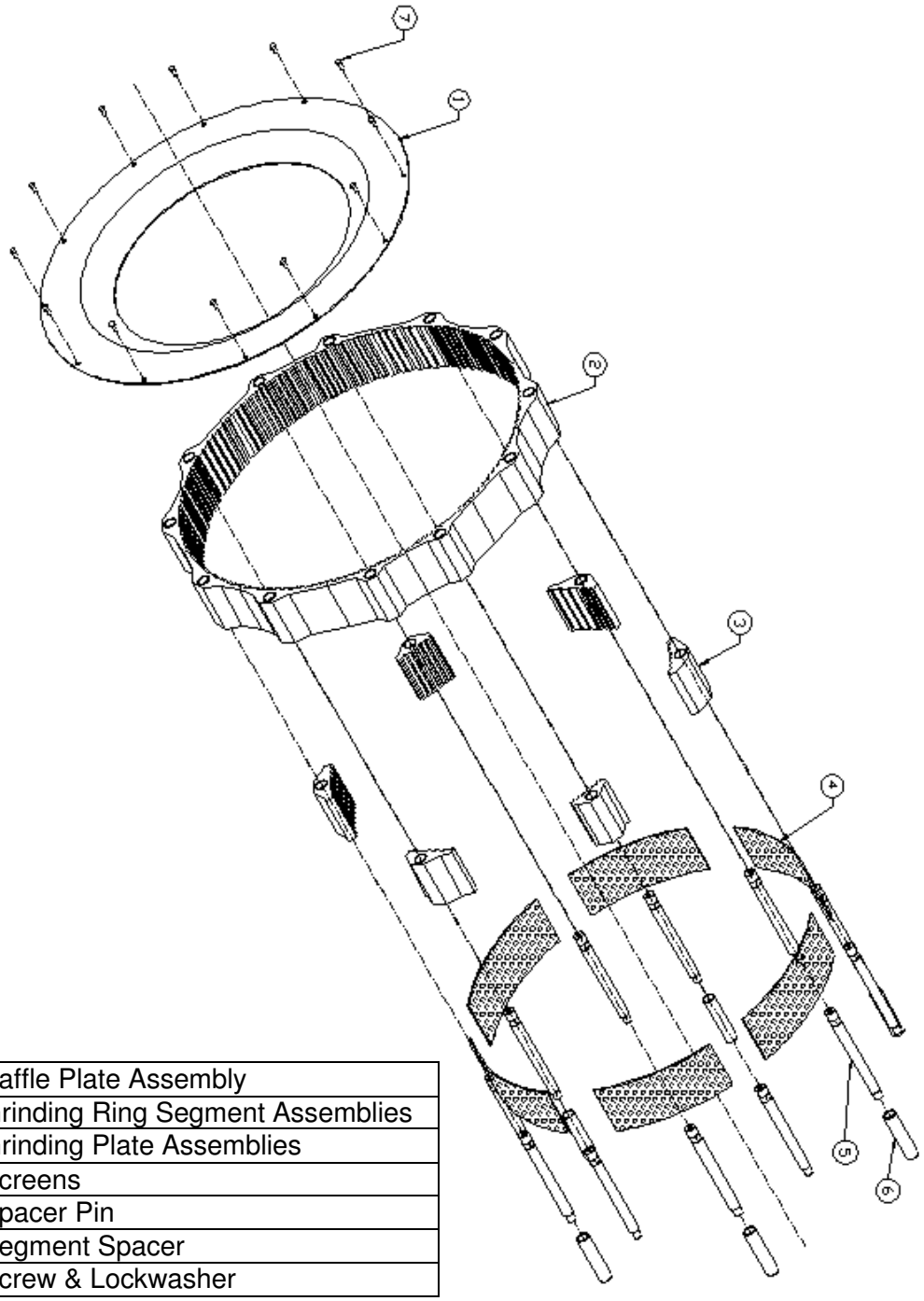
1	Baffle Plate
2	Grinding Ring
3	Grinding Segments
4	Screens
5	Screen Ring
6	Flat Head Slotted Cap Screw
7	Hex Cap Screw & Lockwasher
8	Socket Head Cap Screw & Lockwasher

Figure 6.12: CLM-36 Screen Frame Assembly Exploded View and Parts List



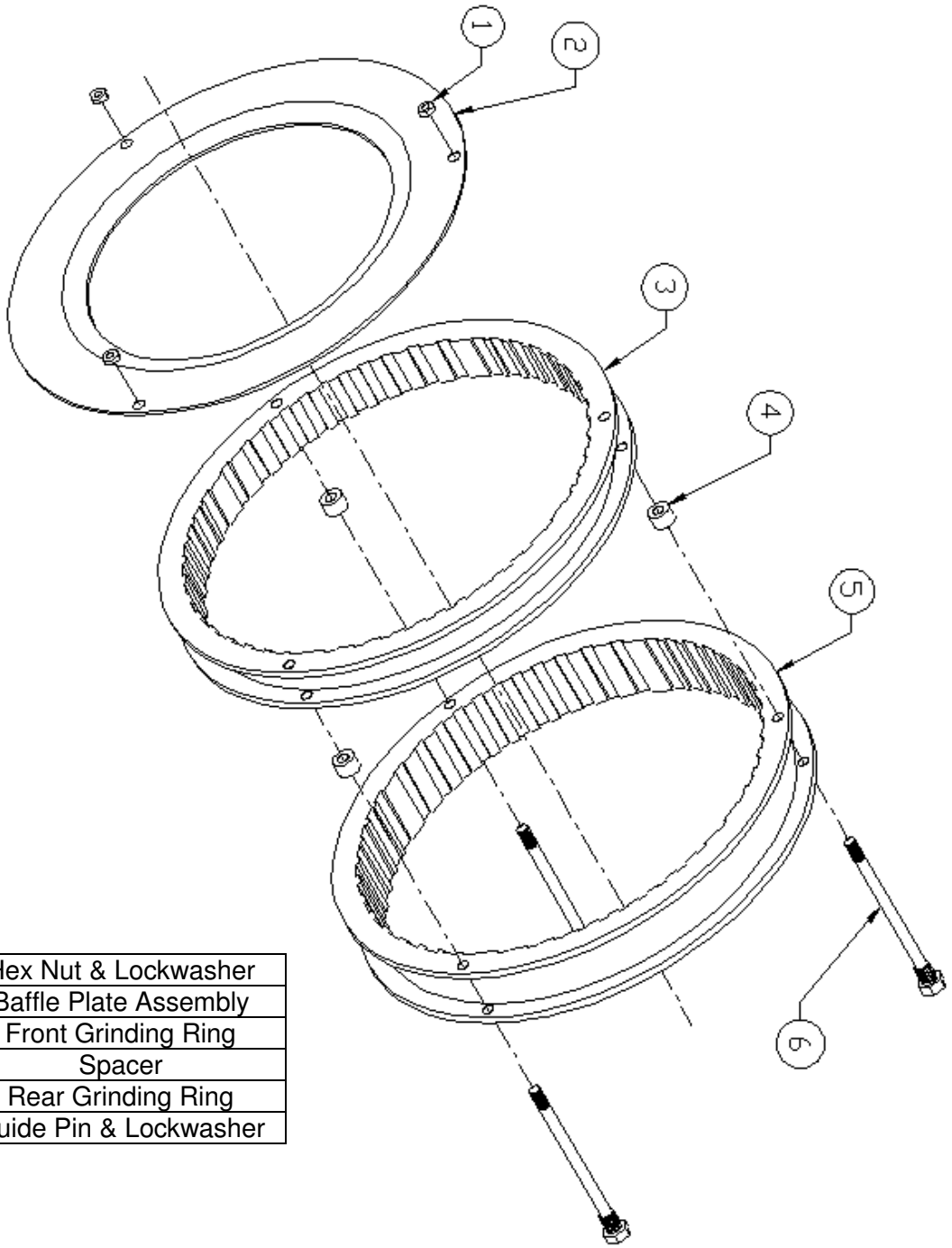
1	Baffle Plate
2	Grinding Ring
3	Grinding Jaw
4	Screen
5	Screen Spacer
6	Screen Ring
7	HHCS & Lockwasher

Figure 6.13: CLM-51 Screen Frame Assembly Exploded View and Parts List



1	Baffle Plate Assembly
2	Grinding Ring Segment Assemblies
3	Grinding Plate Assemblies
4	Screens
5	Spacer Pin
6	Segment Spacer
7	Screw & Lockwasher

Figure 6.14: CLM-76/101 Screen Frame Assembly Exploded View and Parts List



1	Hex Nut & Lockwasher
2	Baffle Plate Assembly
3	Front Grinding Ring
4	Spacer
5	Rear Grinding Ring
6	Guide Pin & Lockwasher

Figure 6.15: CLM Screenless Screen Frame Assembly Exploded View and Parts List

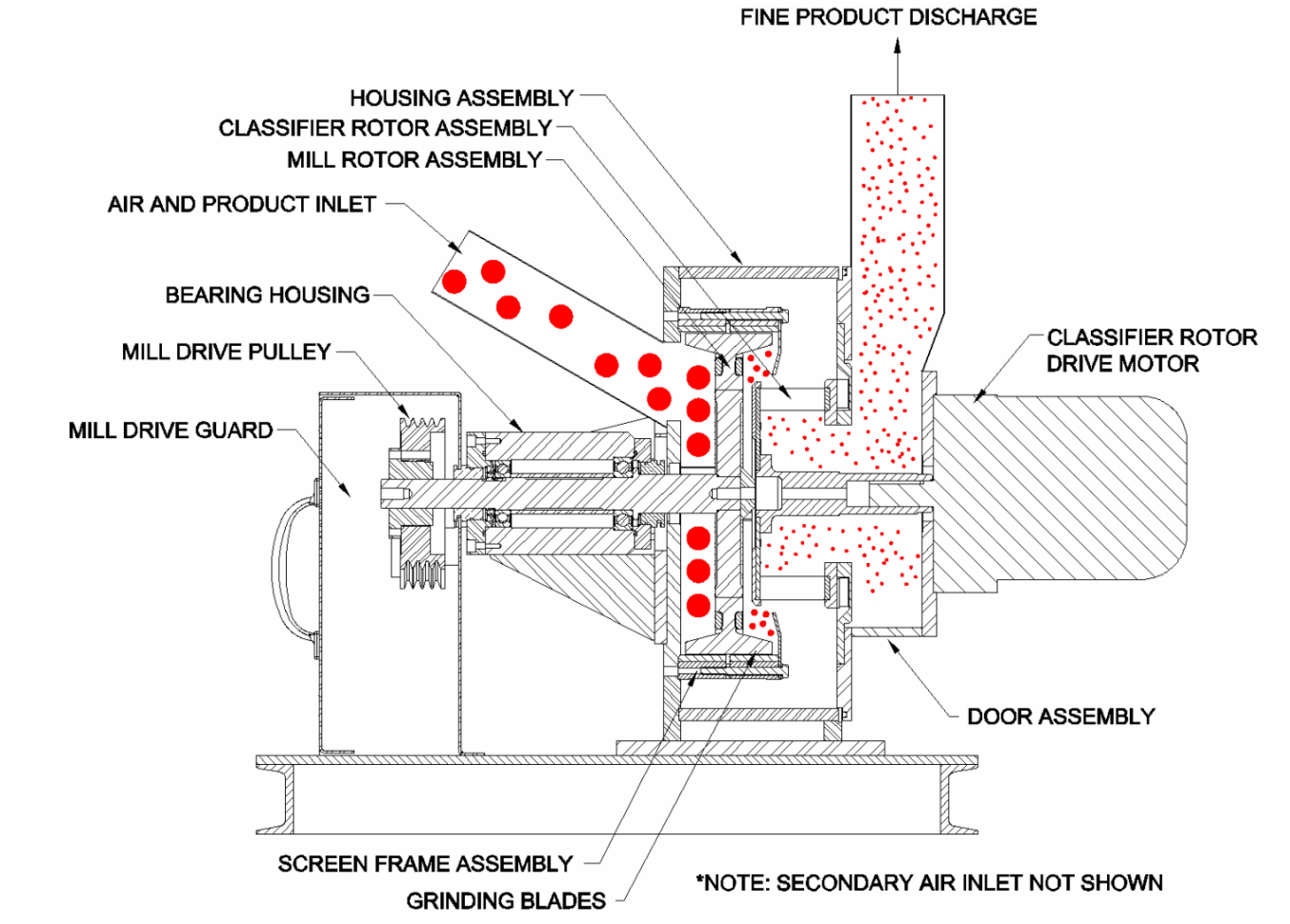


Figure 6.16: CLM Operating Principle

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1.	Mill Pulley	25.	Lockwasher
2.	Body Assembly/Housing	26.	Drive Bearing
3.	Sensor Disc	27.	Bearing Housing
4.	Collar	28.	Key
5.	Yoke Pin	29.	Mill Shaft
6.	Collar	30.	Key
7.	Yoke Door Latch	31.	Grease Retainer
8.	Threaded Rod	32.	Rotor Bearing
9.	Latch Knob	33.	Gasket
10.	Door Seal	34.	Bearing Cover
11.	Door Seal	35.	Lockwasher
12.	Classifier	35A.	Locknut
13.	Screw	36.	Screw
14.	Main Ring	37.	Labyrinth
15.	Grinding Jaw	38.	Rotor Spacer
16.	Screen	39.	End Cap
17.	Grinding Ring	40.	Lockwasher
18.	Screw	41.	Screw
18A.	Baffle Ring/Plate	43.	Rotor Blade
19.	Screw	44.	Screw
20.	Lockwasher	45.	Retainer Ring
21.	Snap Ring	46.	Rotor Disc
22.	Rear Bearing Cap	47.	Screw
23.	Seal	48.	Lockwasher
24.	Locknut		

Table 6.17: CLM-36, CLM-51, and CLM-101 Assembly Parts List

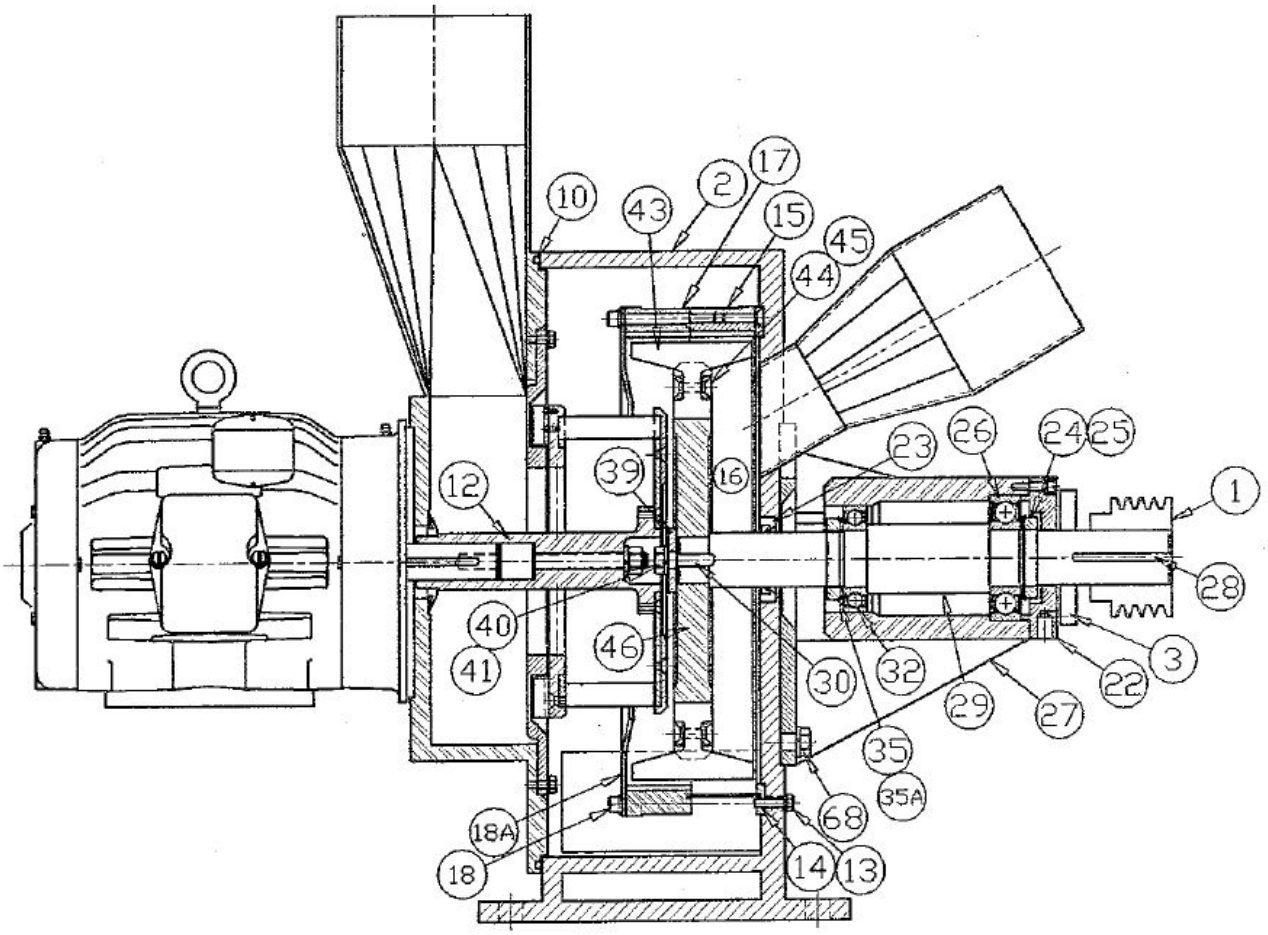


Figure 6.18: CLM-36 Components

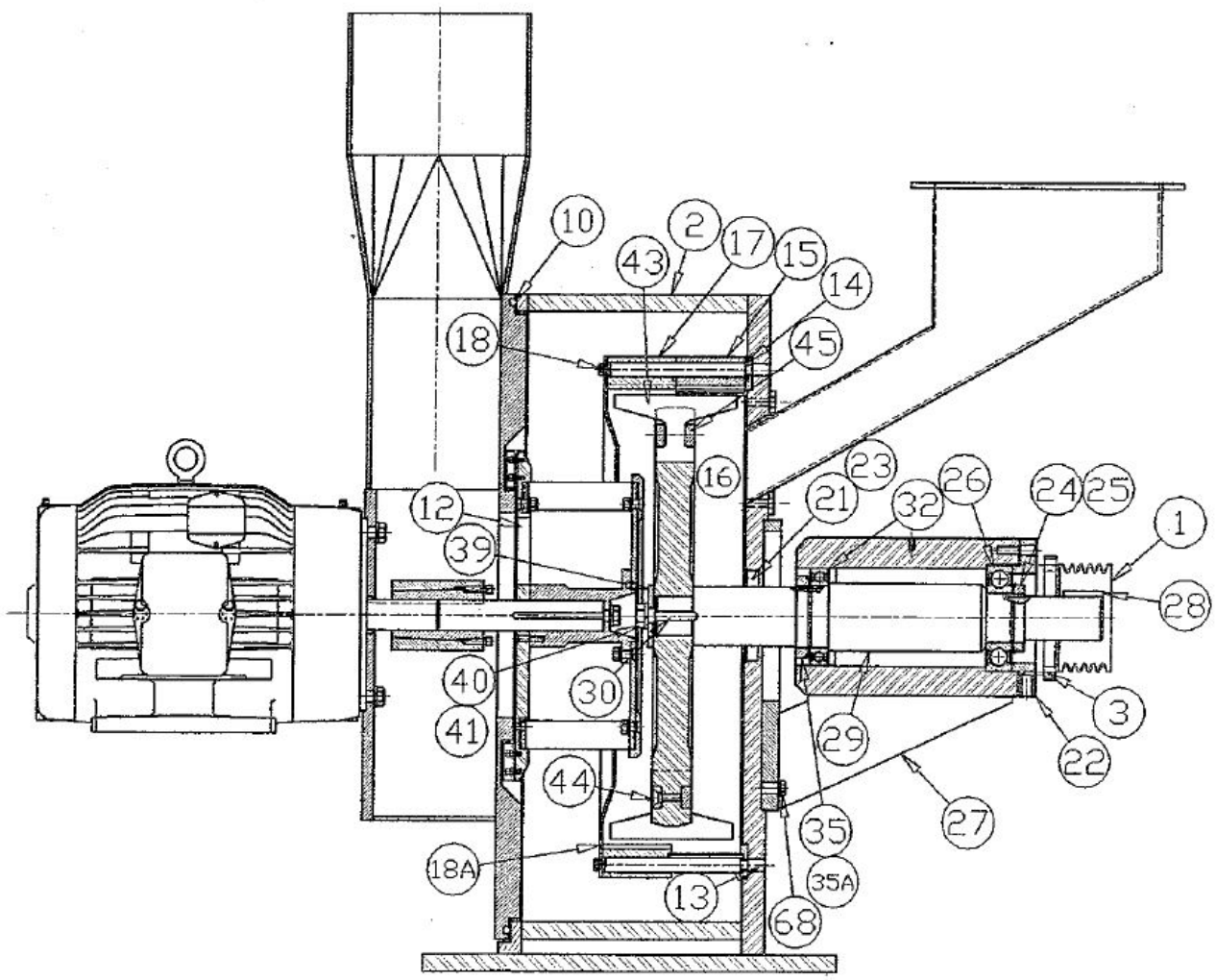


Figure 6.19: CLM-51 Components

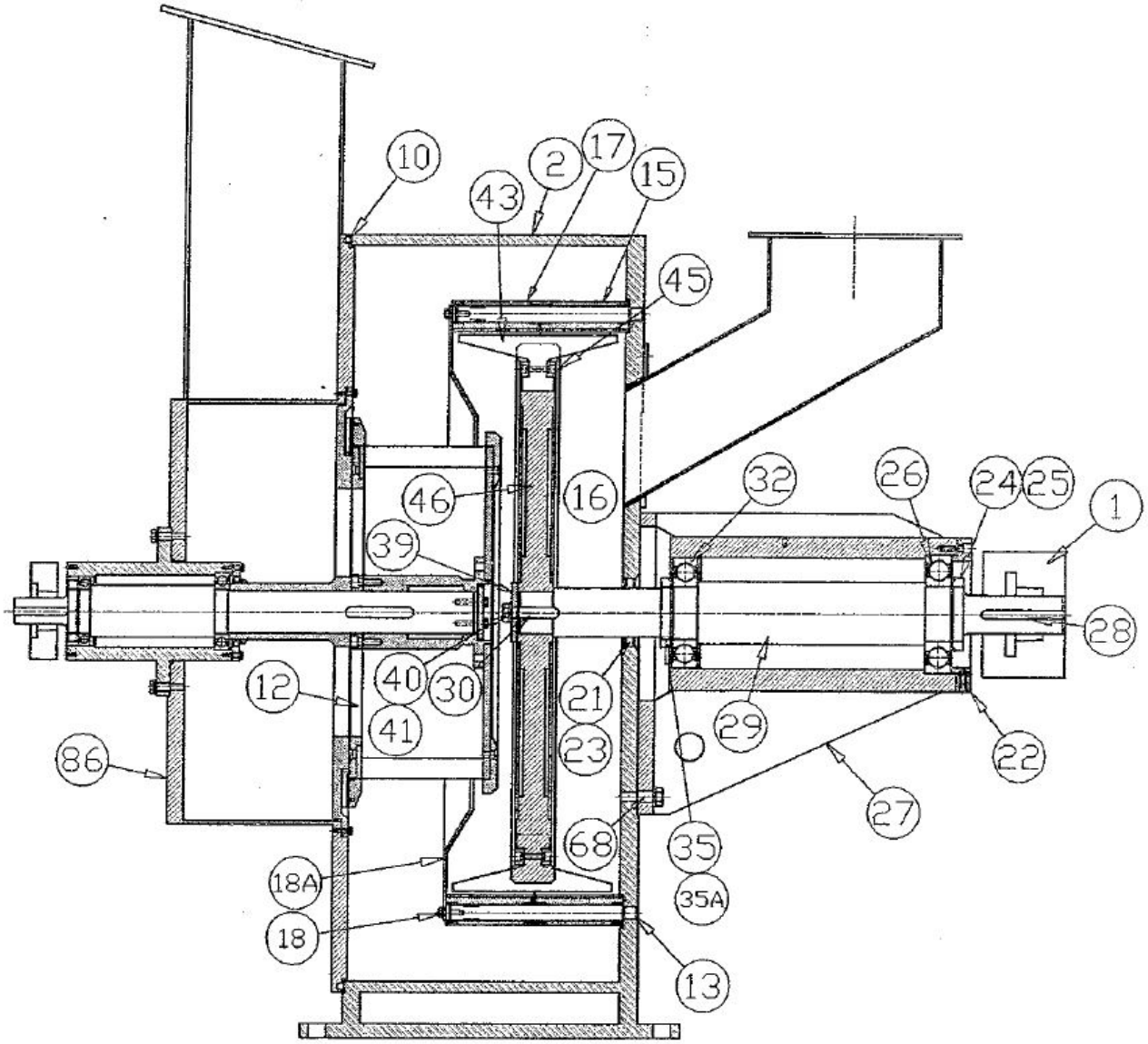


Figure 6.20: CLM-101 Components

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
47.	Screw	70.	Ball Bearing
48.	Lockwasher	71.	Washer
49.	Screw	72.	Bearing Housing
50.	Screw	73.	Top Retainer
51.	Retaining	74.	Bearing
52.	Bottom Carrier Ring	75.	Lockwasher
53.	Rotor Blade	76.	Locknut
54.	Hub	77.	Flinger
55.	Retaining Ring	78.	Rear Bearing Cap
56.	Spider Ring	79.	Washer
57.	Screw	80.	Screw
58.	Spacer	81.	Pulley
59.	Seal	82.	Screw
60.	Fan Blade	83.	Belt
61.	Washer	84.	Pulley
62.	Screw	85.	Drive Guard
63.	Spacer	86.	Door
64.	Key	87.	Door Plate
65.	Rotor Shaft	88.	Lockwasher
65A.	Spacer	89.	Washer
66.	Labyrinth	90.	Screw
67.	Screw	91.	Motor
68.	Screw	92.	Taperlock Bushing
69.	Bearing Cover	93.	Taperlock Sheave

Table 6.21: CLM-36, CLM-51, and CLM-101 Classifier Parts List

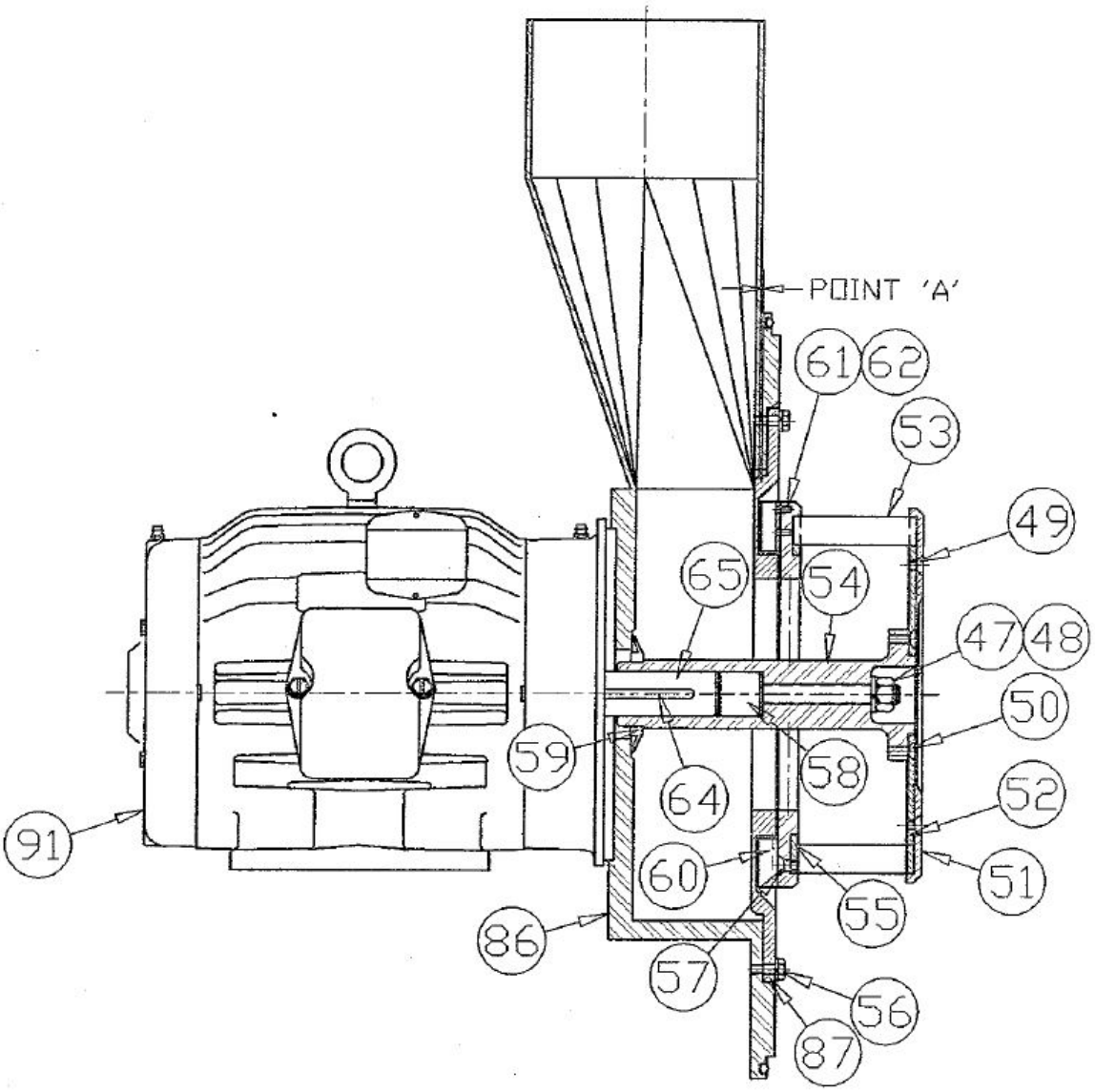


Figure 6.22: CLM-36 Classifier Components

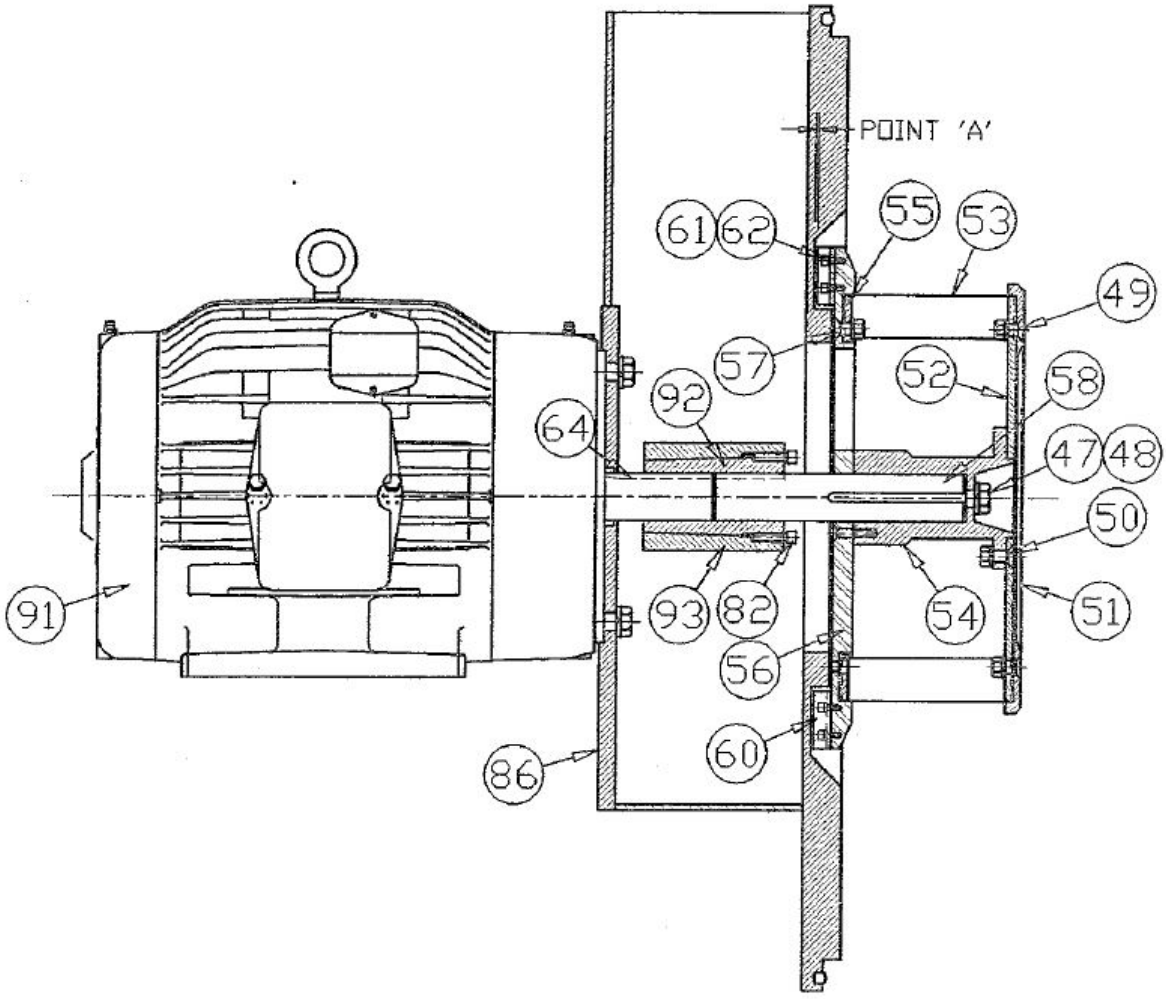


Figure 6.23: CLM-51 Classifier Components

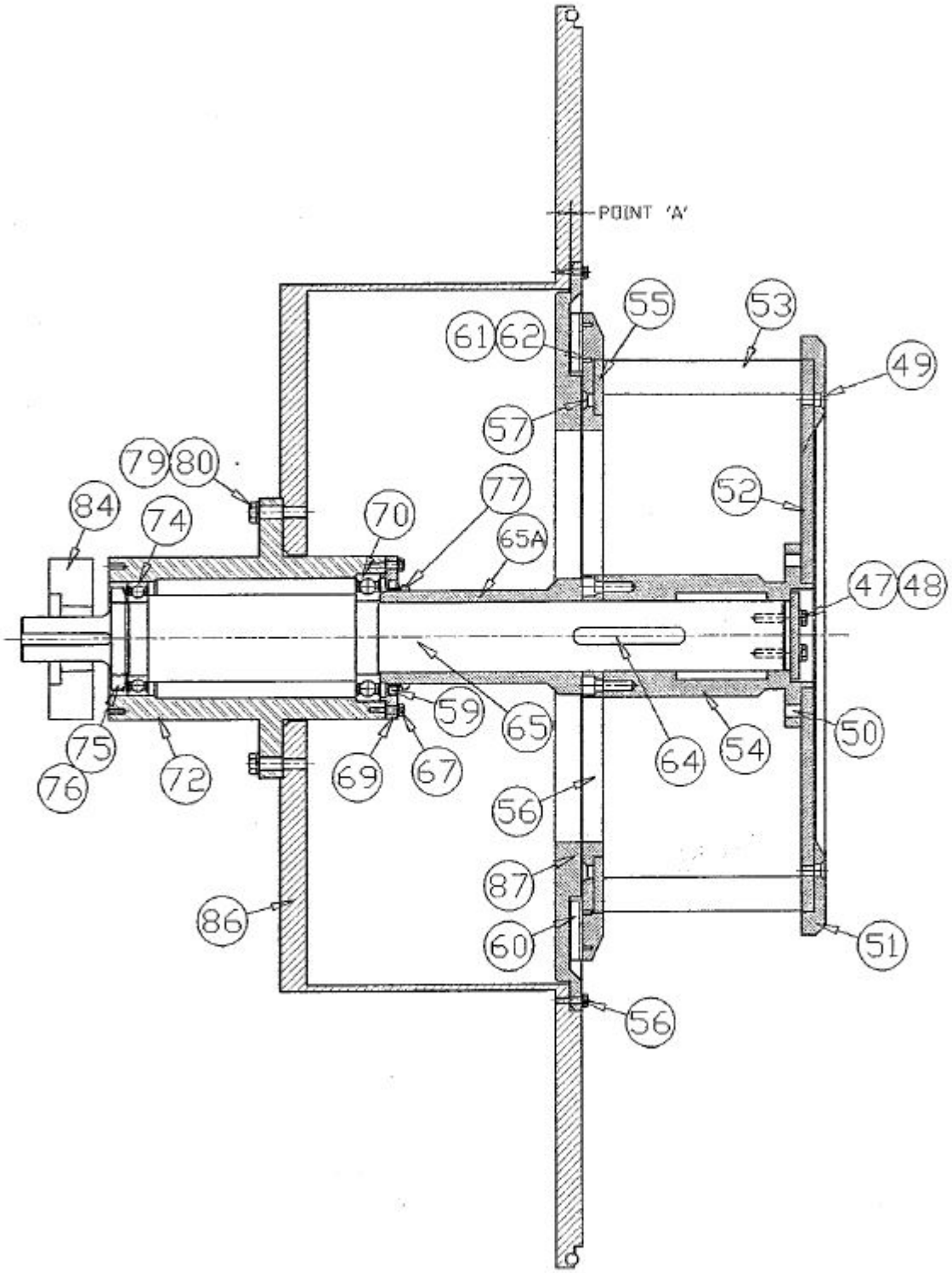
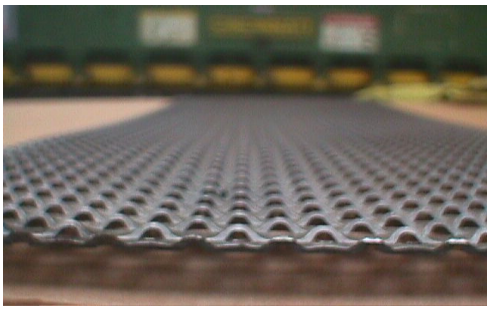


Figure 6.24: CLM-101 Classifier Components

APPENDIX A: PROPER INSTALLATION AND ORIENTATION OF TRIANGULAR SCREENS

Prater's triangle screens are directional and must be installed in the forward direction to achieve proper airflow and grind. Proper installation is achieved when the forward direction of the screen(s) match the direction of rotation of the grinder. Below are pictures that show how to determine the forward direction of these screens.



The picture at the left shows a view looking down the forward direction of the screen. In this direction, the hole openings are visible to the eye. When these holes face the direction of rotation of the grinder rotor, the screen is installed in the "forward" direction. In this manner, proper air and product flow is maintained.

The picture at the left shows a view looking down the reverse direction of the screen (opposite direction of the top left photo). In this direction, the hole openings are not visible to the eye. When installed so that the rotation of the mill rotor sweeps the screen in this direction, air and product flow are restricted. This is considered the backward direction and is not usually the correct way to install the screen.

The picture at the left shows a side profile view of the screen. As you can see, the stamping process for this screen creates a form very similar to a cheese grater. These screens would be installed in the forward direction when the direction of rotation of the grinding rotor sweeps left (relative to the picture shown).

<<<<<Direction of rotation for forward direction.

This last picture shows the screen as viewed from the backside. As you can see, the stamping process creates a "triangular" shaped hole. The direction in which these triangles point also indicates the forward direction of the screen. In this case, the forward direction is pointing to the top of the page. When the screen is rolled to its final shape and installed in the mill, the triangles will point in the direction of rotation when installed "forward" and against the direction of rotation when installed "backward."

APPENDIX B: CLASSIFIER MILL START WORKSHEET

Customer: _____ Date: _____

Contact: _____ Title: _____

Equipment: CLM-_____ S/N: _____

Section 1 Mill Inspection

Motor Pulley Diameter: _____ Rotor Pulley Diameter: _____

Motor RPM: _____ Drive Ratio: _____ Calculated Rotor RPM: _____

Pulley Alignment: _____Belt Tension: _____ Mill Monitor: _____

Installation: _____Floor _____Steel Platform _____ Structural Steel

Vibration Pads Installed ? (Y/N): _____ Mill Level ? (Y/N): _____

Mounting Hardware Size: _____

Section 2 System Inspection

Chiller Installed (Y/N): _____Dryer Installed (Y/N): _____

Feed Inlet Filter (Y/N): _____APUB Filter (Y/N): _____

System Piping Dia: Feed Inlet: _____ APUB: _____ Mill – DC: _____

Dust Collector Type: _____ Cloth Area: _____Sq/Ft

Fan Manufacturer: _____ Type: _____

Model: _____ Horsepower: _____ RPM: _____

Fan Rating: _____CFM @ _____" Static Pressure Damper Installed (Y/N): ___

Pulse timing set to _____ seconds off and _____ seconds on @ _____ PSI

Feeder Type: _____ Manufacturer: _____ Size: _____

APPENDIX C: AIRFLOW ABSTRACT

Proper airflow is essential for efficient production. This discussion outlines methods for measuring airflow in an operating system.

Air Flow and Air Pressure Relationships

We must first review some basic principles of airflow and pressure, and then show how to obtain the required value of Velocity Pressure. In the illustrations that follow, we show a simple U-shaped glass tube connected to an air duct with flexible tubing. The U-tube holds water and has marked graduations showing inched of water column on both legs of the tube.
In determining static pressure, one end of the U-tube is open to atmospheric pressure and the other end is connected to a port at the side of the air duct.

The total pressure measurement differs from static pressure in that a rigid elbow extends into the duct to gage the force of the moving air stream as shown in Figure C-1.
The velocity pressure measurement connects both ends of the U-tube to the air duct; one to the side and the other in the air stream with a rigid elbow as shown in Figure C-1.
The three types of pressures are related in the manner:
Ptot = Pvel + Pst
Pvel = Ptot - Pst

Sample Calculation

The following example shows how to calculate airflow in cubic feet per minute.
If using the U-tube as shown in Figure C-1, you measure:
Pst at 14.0” W.C. (inches water column)
Ptot at -12.5” W.C. (inches water column)
And you know
The duct diameter to be 10”
Then, you can use the formula:
Ptot = Pvel + Pst
To calculate the correct airflow in cubic feet per minute as follows:
-12.5 = Pvel + (-14.0)
Pvel = 14 - 12.5 = 1.5
Using Table C-1, locate the intersecting columns for Pvel at 1.5, and Duct Diameter at 10".
The Air Flow for this example is 2565 CFM.
Velocity Pressure can also be measured with a pitot tube in a configuration such as shown in Figure C-1. The determination shown has the advantages of simplicity and of providing a direct reading of Velocity Pressure in inches of water column.
Velocity Pressure and Air Volume
With a value for Pvel obtained by any appropriate method, Table C-1 allows a direct reading of airflow in cubic feet per minute. The table covers duct diameters 4 to 18 inches and Velocity Pressures up to 2-1/2 inches of water column.

The examples shown describe the Negative air systems. In Positive systems the total pressure would be higher than the static pressure.

Duct OD (Inches)		4	5	6	8	10	12	14	16	18
Duct ID (Inches)		3.83	4.83	5.83	7.79	9.79	11.79	13.79	15.79	17.74
Duct Area (SQ. FT)		.081	.128	.187	.331	.523	.758	1.037	1.360	1.716
Velocity Pressure (Inches WC)	**Air Speed** (fpm)	**Air Flow CFM (Cubic Feet per Minute)**								
.10	1266	103	162	237	419	662	960	1313	1722	2172
.20	1791	145	229	335	593	937	1358	1857	2436	3073
.30	2194	178	281	410	726	1147	1663	2275	2984	3765
.40	2533	205	324	474	838	1325	1920	2627	3445	4347
.50	2832	229	362	530	937	1481	2147	2937	3852	4860
.60	3102	251	397	580	1027	1622	2351	3217	4219	5323
.70	3351	271	429	627	1109	1753	2540	3475	4557	5750
.80	3582	290	458	670	1186	1873	2715	3715	4872	6147
.90	3799	308	486	710	1257	1987	2880	3940	5167	6519
1.00	4005	324	513	749	1326	2095	3036	4153	5447	6873
1.10	4200	340	538	785	1390	2197	3184	4355	5712	7207
1.20	4387	355	562	820	1452	2294	3325	4549	5966	7528
1.30	4566	370	584	854	1511	2388	3461	4735	6210	7835
1.40	4739	384	607	886	1569	2478	3592	4914	6445	8132
1.50	4905	397	628	917	1624	2565	3718	5086	6671	8417
1.60	5066	410	648	947	1677	2650	3840	5253	6890	8693
1.70	5222	423	668	977	1728	2731	3958	5415	7102	8961
1.80	5373	435	688	1005	1778	2810	4073	5572	7307	9220
1.90	5521	447	707	1032	1827	2887	4185	5725	7509	9474
2.0	5664	459	725	1059	1875	2962	4293	5874	7703	9719
2.10	5804	470	743	1085	1921	3035	4399	6019	7893	9960
2.20	5940	481	760	1111	1966	3107	4503	6160	8078	10193
2.30	6074	492	777	1136	2010	3177	4604	6299	8261	10423
2.40	6205	503	794	1160	2054	3245	4703	6435	8439	10648

Table C-1
Air Volume Measurements

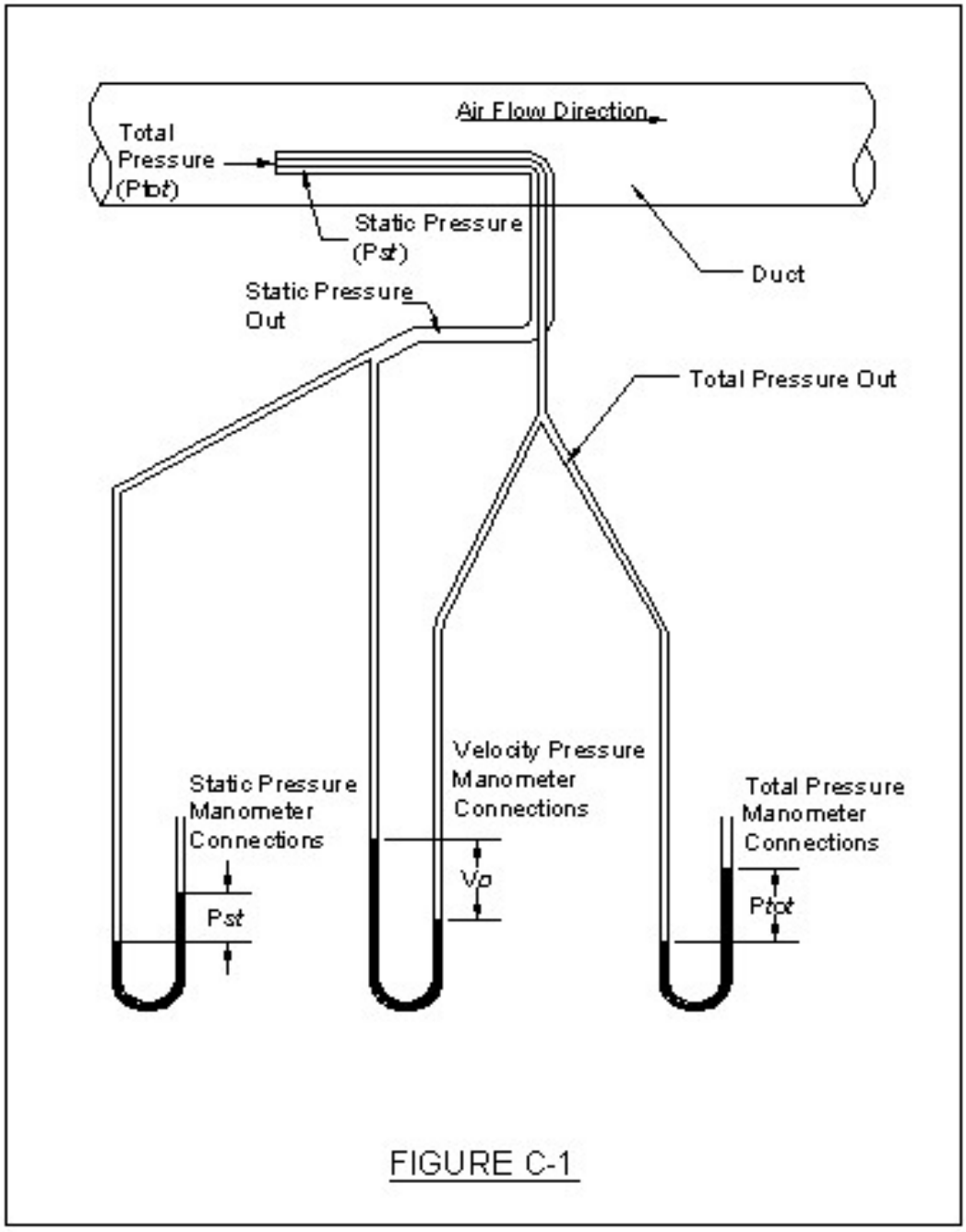

Air Flow Direction
Total Pressure (Ptot)
Static Pressure (Pst)
Duct
Static Pressure Out
Total Pressure Out
Static Pressure Manometer Connections
Velocity Pressure Manometer Connections
Total Pressure Manometer Connections
Pst
Vp
Ptot

FIGURE C-1

APPENDIX D: TROUBLESHOOTING GUIDE

This section covers some common operating problems that might be encountered with the Prater Industries, Inc. Classifier Mill. This is offered as a general guide to analyzing and correcting common problems with the Classifier Mill. This is not intended as a guide to every problem you might encounter with the milling system. If after reviewing this section and making any necessary adjustments you have not identified the specific cause of the problem contact Prater Industries, Inc. Customer Service for further assistance.

Ground Product Too Coarse

1. Obtain a sample of the feed material and perform an evaluation of the sample for particle size, moisture, and oil content. If any of these parameters have changed an adjustment to the mill speed or screen frame may be necessary. Prater recommends contacting Prater Industries, Inc. Customer Service for further guidance.
2. Check to ensure the proper screen size and screen frame configuration is being used.
3. Check for wear on the rotor blades, grinding jaws, and screens.
4. Check the speed of the mill using a tachometer to determine if the speed has changed due to electrical or belt slippage problems.
5. Check to ensure the mill is being fed the proper rate, and does not have large variations in the current draw due to pulsing of the feed.
6. Check to ensure proper air volume entering the mill with the feed.

Ground Product Too Fine

1. Obtain a sample of the feed material and perform an evaluation of the sample for particle size, moisture, and oil content. If any of these parameters gave changed an adjustment to the mill speed or screen frame may be necessary. Prater recommends contacting Prater Industries, Inc. Customer Service for further guidance.
2. Check to ensure the proper screen size and screen frame configuration is being used.
3. Check the speed of the mill using a tachometer to determine if the speed has changed due to electrical or belt slippage problems.
4. Ensure proper air volume thru mill feed inlet. Check for obstructions in piping or buildup on the dust collector filters, check the system fan.

Low Capacity

1. Obtain a sample of the feed material and perform an evaluation of the sample for particle size, moisture, and oil content. If any of these parameters gave changed an adjustment to the mill speed or screen frame may be necessary. Prater recommends contacting Prater Industries, Inc. Customer Service for further guidance.
2. Check to ensure the proper screen size and screen frame configuration is being used.

3. Check the speed of the mill using a tachometer to determine if the speed has changed due to electrical or belt slippage problems.
4. Ensure proper air volume thru mill feed inlet. Check for obstructions in piping or buildup on the dust collector filters, check the system fan.
5. Check for wear on the rotor blades, grinding jaws, and screens.
6. Check to ensure the mill is being fed properly, and does not have large variations in the current draw due to pulsing of the feed.

Excessive Vibration/High Bearing Temperature

If you are running the Classifier Mill for the first time refer to sections 2 and 3 in the manual to insure proper installation requirements have been met. Section 3.6: Running the Classifier Mill for the first time contains a comprehensive procedure to assist in diagnosing vibration problems on new and old units. If the Classifier Mill has been in service for some time and vibration suddenly increases, this is an indication of a serious problem. Review the items in Sections 2 and if everything seems to be in order the following procedure should be used to assist in diagnosing the problem:

1. Stop the Classifier Mill and allow the rotor to come to a complete stop. Lock out power to the Classifier Mill.
2. Open the mill access door and visually inspect the rotor for bent, or broken blades.
3. Visually inspect the screen frame assembly for damaged grinding jaws or screens.
4. Manually rotate the rotor to determine if there is any contact between the moving and stationary components. If contact occurs proceed with the following:
    a. Contact between moving and stationary parts indicates a serious problem.
    b. After the rotor returns to a complete stop, remove the screen frame assembly.
    c. Firmly grasp each individual rotor blade and by feel determine if there is any looseness of any blades in any direction. If looseness exists refer to section 5.4 Rotor Blade Replacement.
    d. If no loose blades are identified and no visual damage to the rotor has been identified, remove the rotor assembly and the drive belts.
    e. Manually rotate the shaft and determine if by feel any roughness exists in the assembly.
    f. If the assembly feels smooth, determine by feel if there is any play or looseness in the assembly.
    g. If items e and/or f fail the inspection, replace the bearings.
    h. Attach a Dial Indicator to the rear wall of the mill and determine deflection of the bearing assembly, this should be less than 0.002".
    i. Remove the shaft/bearing assembly from the housing and visually inspect the bearing housing for wear. If the housing shows visible wear, contact Prater Industries, Inc. for further instructions.
    j. If all of the above steps do not reveal the problem contact Prater Industries, Inc. for further instructions.
5. If no contact occurs proceed with the following:

a. Firmly grasp each individual rotor blade and by feel determine if there is any looseness of any blades in any direction. If looseness exists refer to section 5.4 Rotor Blade Replacement.
b. If no loose blades are identified and no visual damage to the rotor has been identified, remove the rotor assembly and the drive belts.
c. Manually rotate the shaft and determine if by feel any roughness exists in the assembly.
d. If the assembly feels smooth, determine by feel if there is any play or looseness in the assembly.
e. If items C and/or D fail the inspection, replace the bearings.
f. If all of the above steps do not reveal the problem contact Prater Industries, Inc. for further instructions.

Rotor Blade Breakage

A broken rotor blade usually indicates a serious problem in the system and Prater Industries, Inc. highly recommends a service call by a Prater Industries, Inc. Technician to assist in evaluating the cause and extent of the damage. If you choose not to have Prater Industries, Inc. Technicians assist in the evaluation and rebuild, the following procedure must be used to evaluate the potential damage caused by the breakage.

1. Remove bearing assembly from the housing.
2. Visually and by feel inspect the housing looking for grooving of the bearing seat.
3. If grooving is present, the housing will need to be replaced
4. Remove bearings from shaft and discard.
5. Inspect shaft for bending, deflection of more than 0.002” is over tolerance and the shaft will need to be replaced.
6. Mark the position of the rotor retaining rings in the rotor disk and remove both rings.
7. Remove all the blades and discard the broken blades.
8. Inspect the remaining blades and discard any bent, chipped, and scarred blades.
9. Have the remaining blades magna-fluxed.
10. Inspect the retaining rings where the blades failed for grooves cut into the rings when the blade(s) broke. If the blade(s) cut a groove in the rings they will need to be replaced.
11. Inspect the rotor disk and determine if any corruption of the slots has occurred.
12. If it is determined that one or more slots have been corrupted, it is recommended to return the disk to Prater for inspection.
13. If this is not possible, leave the corrupted slots and the 180-degree opposite slots empty. This is not recommended if more than 10 percent of the slots are corrupted.
14. If all the parts are inspected and are within tolerances, reassemble the bearing assembly using new bearings.
15. Reinstall both retaining rings into the disk and install the rotor less blades.
16. Run the rotor (less blades) and determine if vibration level is within tolerance.
17. If vibration is within tolerance it is then necessary to weigh all the blades and install the blades following the procedure in the manual.

18. If all of the above is done and the mill still vibrates a service call must be scheduled or the rotor, bearing and screen frame assemblies will need to be sent to Prater for further inspection and repair.

APPENDIX E: VIBRATION STANDARDS

The following table lists the vibration standards for the Prater-Sterling Classifier Mills. The vibration in mils listed is the recommended maximum vibration allowable for safe trouble free operation of the mill.

New Vibration Standards for M - CLM Series, Fine Grinders and Classifier Mills										
Effective September 20, 2000										
MILL MODEL										
M19	M21	M36	M51	M76	M101	CLM18	CLM36	CLM51	CLM76	CLM101
Standards for tip speeds at 60 m/s										
6684 rpm	5307 rpm	3923 rpm	2596 rpm	1702 rpm	1219 rpm	6472 rpm	3328 rpm	2337 rpm	1491 rpm	1146 rpm
< .35 mils	< .50 mils	< .68 mils	< 0.9 mils	< 1.0 mils	< 1.0 mils	< .35 mils	< .78 mils	< 0.9 mils	< 1.0 mils	<1.0 mils
Standards for tip speeds at 80 m/s										
8912 rpm	7077 rpm	5230 rpm	3462 rpm	2270 rpm	1626 rpm	8489 rpm	4365 rpm	3065 rpm	1989 rpm	1528 rpm
< .27 mils	< .37 mils	< .49 mils	< .75 mils	< 1.0 mils	< 1.0 mils	< .25 mils	< .57 mils	< .85 mils	< 1.0 mils	< 1.0 mils
Standards for tip speeds at 100 m/s										
10026 rpm	8846 rpm	6538 rpm	4327 rpm	2837 rpm	2032 rpm	10611 rpm	5456 rpm	3831 rpm	2486 rpm	1910 rpm
< .20 mils	< .27 mils	< .38 mils	< .58 mils	< 0.9 mils	< 0.9 mils	< .17 mils	< .44 mils	< .66 mils	< 0.9 mils	< 0.95 mils
Standards for tip speeds at 110 m/s										
11254 rpm	9730 rpm	7192 rpm	4760 rpm	3121 rpm	2235 rpm	11672 rpm	6002 rpm	4215 rpm	2734 rpm	2100 rpm
< .18 mils	< .20 mils	< .34 mils	< .52 mils	< .85 mils	< 0.8 mils	< 0.15 mils	< .39 mils	< .59 mils	< 0.85 mils	< 0.9 mils
Standards for tip speeds at 120 m/s										
13368 rpm	10615 rpm	7846 rpm	5193 rpm	3405 rpm	2439 rpm	12733 rpm	6547 rpm	4598 rpm	2958 rpm	2272 rpm
< .15 mils	< .18 mils	< .28 mils	< .47 mils	< .75 mils	< 0.7 mils	< .13 mils	< .35 mils	< .53 mils	< .70 mils	< .80 mils

APPENDIX F: PROTECTING THE CLASSIFIER MILL FROM STATIC ELECTRICITY

Bearing Failures from Static Electricity

In many applications the processing of certain materials may generate static electricity inside the Classifier Mill. Another source of static electricity is the friction that develops between the belts and the drive sheaves. Without proper grounding of the mill rotor shaft this static may build to a point where the voltage is great enough to overcome the resistance of the thin film of oil in the bearings. Once this occurs the static buildup will discharge to ground typically through the mill housing causing fusion craters in the bearings. Over a short period of time these craters increase in size and number resulting in frosting, pitting, fluting, and eventually bearing failure. If there is no condition monitoring installed on the mill this will likely lead to a catastrophic rotor failure if the mill is not stopped immediately after the bearing failure

Rotor Blade Failures from Static Electricity

In some applications, particularly where the feed material is pneumatically conveyed into the mill, static buildup may discharge inside the grinding chamber. This discharge may occur between the rotor blades and the rotor disk, the rotor blades and the retaining rings, and the rotor blades and the screen frame assembly. This may result in catastrophic rotor failure, which causes extensive and expensive damage to the mill internal components. As in bearing failures, if there is no condition monitoring installed on the mill this failure may result in a bearing failure as well.

Protecting the Classifier Mill from Static Electricity

NOTICE

Effective July 1, 2007 all Prater Classifier Mills will be equipped with a grounded bearing assembly and a lug on the frame for connection to earth ground.

Prater recommends that all Classifier Mills be equipped with a microfiber brush. Grounding brushes provides a direct route to earth ground for any static buildup in the grinding chamber that allows the charge to reach ground without going thru the bearings. Additionally this will protect the bearings from any static generated by friction between the belts and the sheaves.

In any application where the feed material is pneumatically conveyed into the mill, the feed inlet must incorporate a ground probe just prior to the entrance of the mill. The ground probe should be connected to earth ground to allow any static buildup from conveying to discharge outside the mill.

APPENDIX G: DUST COLLECTOR EXPLOSION VENTING

This guide applies to the design, location, installation, maintenance, and use of devices and systems that vent the combustion gases and pressures resulting from a deflagration within an enclosure so that structural and mechanical damage is minimized. A deflagration can result from the ignition of a flammable gas, mist, or combustible dust. 1.1.2 This guide should be used as a companion document to NFPA 69, Standard on Explosion Prevention Systems, which covers explosion prevention measures and can be used in place of, or in conjunction with, NFPA 68. The choice of the most effective and reliable means for explosion control should be based on an evaluation that includes the specific conditions of the hazard and the objectives of protection. Venting of deflagrations only minimizes the damage that results from combustion. 1.1.3. This guide does not apply to detonations, bulk autoignition of gases, or unconfined deflagrations, such as open-air or vapor cloud explosions. 1.1.4* This guide does not apply to devices that are designed to protect storage vessels against excess internal pressure due to external fire exposure or to exposure to other heat sources. 1.1.5 This guide does not apply to emergency vents for runaway exothermic reactions or self-decomposition reactions. 1.1.6 This guide does not apply to pressure relief devices on equipment such as oil-insulated transformers. It also does not apply to pressure relief valves on tanks, pressure vessels, or domestic (residential) appliances.

Dust Explosion Venting

NFPA 68, Venting of Deflagrations, applies to equipment or enclosures needing to withstand more than 1.5 psig pressure. Most dust collectors need additional reinforcement for that capability. The maximum pressure that will be reached during an explosion will always be greater than the pressure at which the vent device releases. NFPA 68 calls for a pressure differential of at least 50 lbs./ft2 or 0.35 psi between the vent release pressure and the resistive pressure of the dust collector (enclosure). This NFPA guide lists the following basic principles that are common to the venting of deflagrations. You should become familiar with these principles so that you can correctly specify the conditions the dust collector and explosion vent must satisfy.

1. The vent design must be sufficient to prevent deflagration pressure inside the dust collector from exceeding two-thirds of the ultimate strength of the weakest part of the dust collector, which must not fail. This criterion does anticipate that the dust collector may deform. So do expect some downtime with the dust control system after an explosion.

2. Snow, ice, sticky materials or similar interferences must not affect dust vent explosion operation.

3. Dust explosion vent closures must have a low mass per unit area to reduce opening time. NFPA recommends a maximum total mass divided by the area of the vent opening of 2.5 lbs./ft2.

4. Dust explosion vent closures should not become projectiles as a result of their operation. The closure should be properly restrained without affecting its function.

5. Vent closures must not be affected by the process conditions, which it protects, or by conditions on the non-process side.

6. Explosion vent closures must release at overpressures close to their design release pressures. Magnetic or spring-loaded closures will satisfy this criterion when properly designed.

7. Explosion vent closures must reliably withstand fluctuating pressure differentials that are below the design release pressure.

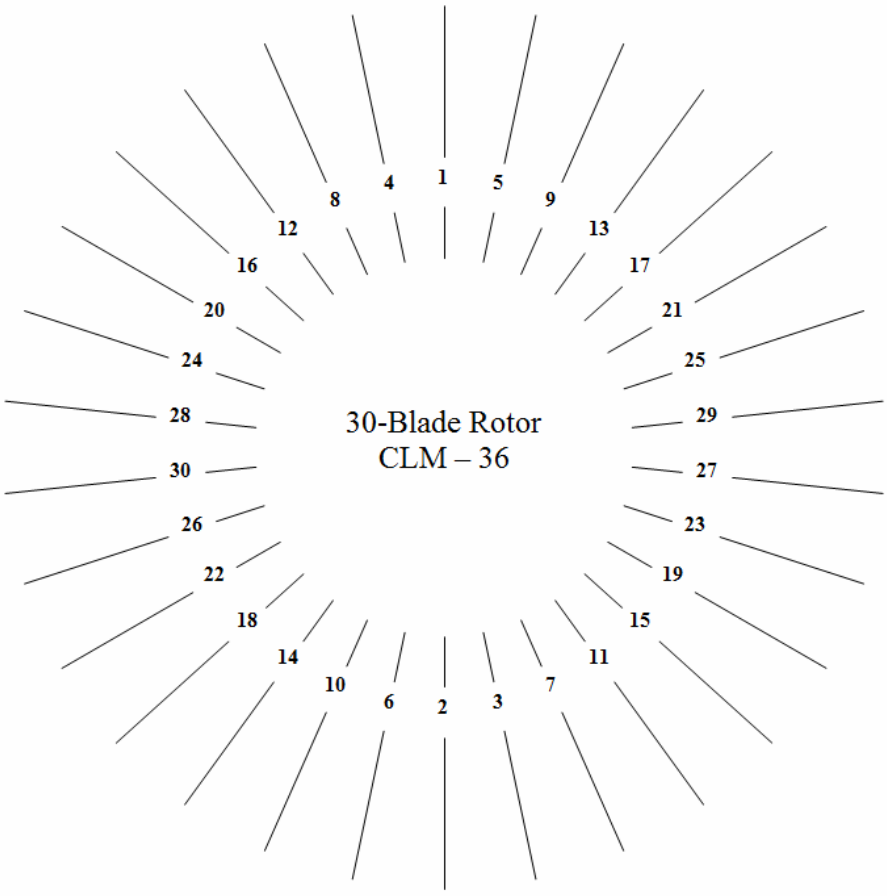
8. Dust explosion vent closures must be inspected and properly maintained in order to ensure dependable operation. In some cases, this may mean replacing the vent closure at suitable time intervals.

9. The supporting structure for the dust collector must be strong enough to withstand any reaction forces developed as a result of operation of the dust explosion vent.

10. Industrial exhaust system ductwork connected to the dust collector may also require explosion venting.

APPENDIX H: ROTOR BLADE PLACEMENT PROCEDURES

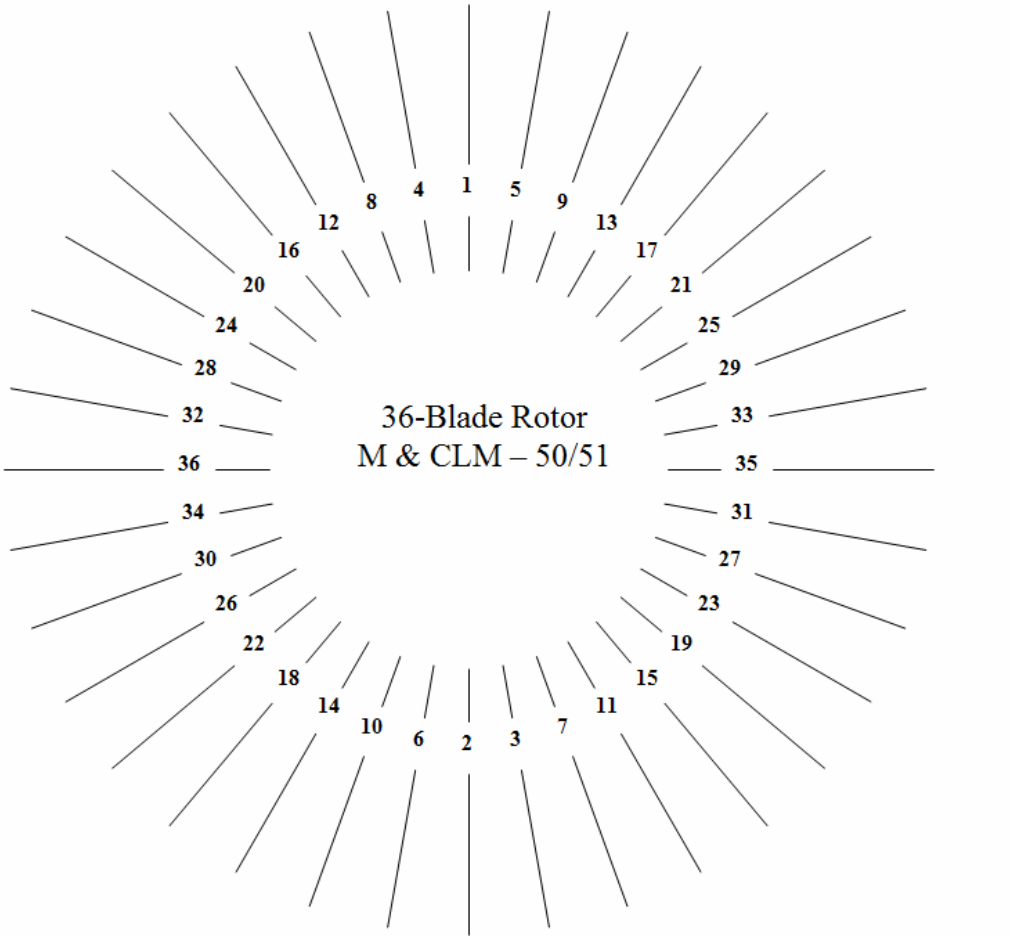
BLADE INSTALLATION Serial Number:_____
Customer:_____ Date:_____
Model:_____ Name:_____



CLM – 35/36 Rotor Blade Installation Procedures

Weigh all blades using a scale with 0.1 gram resolution and arrange them in ascending order by weight. The lightest blade will be #1 and the heaviest #30. Thoroughly clean the blade slots and the seat for the retaining ring before beginning the blade placement. Using the weight that was added to the bare rotor as reference, install blade number one, into slot number one next to the weight. Continue to install blades into corresponding slots on the diagram as shown. Write down weights of blades on diagram for reference.

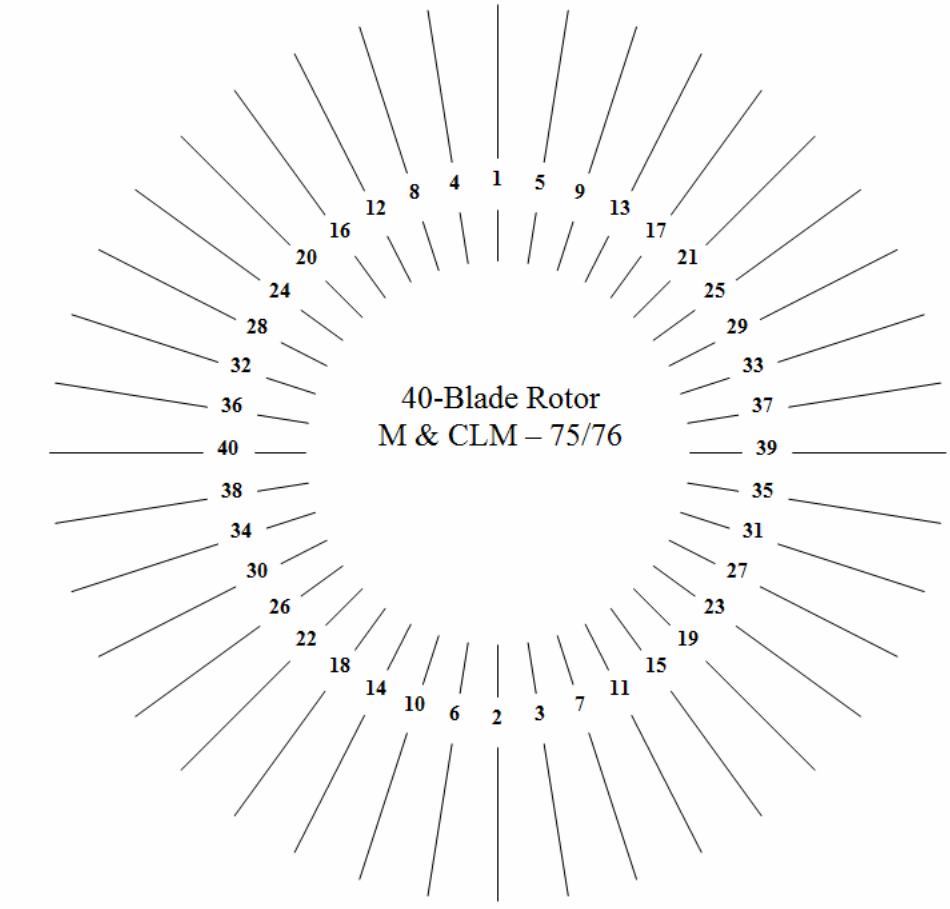
BLADE INSTALLATION Serial Number:_____
Customer:_____ Date:_____
Model:_____ Name:_____



CLM – 50/51 Rotor Blade Installation Procedure

Weigh all blades using a scale with 0.1 gram resolution and arrange them in ascending order by weight. The lightest blade will be #1 and the heaviest #36. Thoroughly clean the blade slots and the seat for the retaining ring before beginning the blade placement. Using the weight that was added to the bare rotor as reference, install blade number one, into slot number one next to the weight. Continue to install blades into corresponding slots on the diagram as shown. Write down weights of blades on diagram for reference.

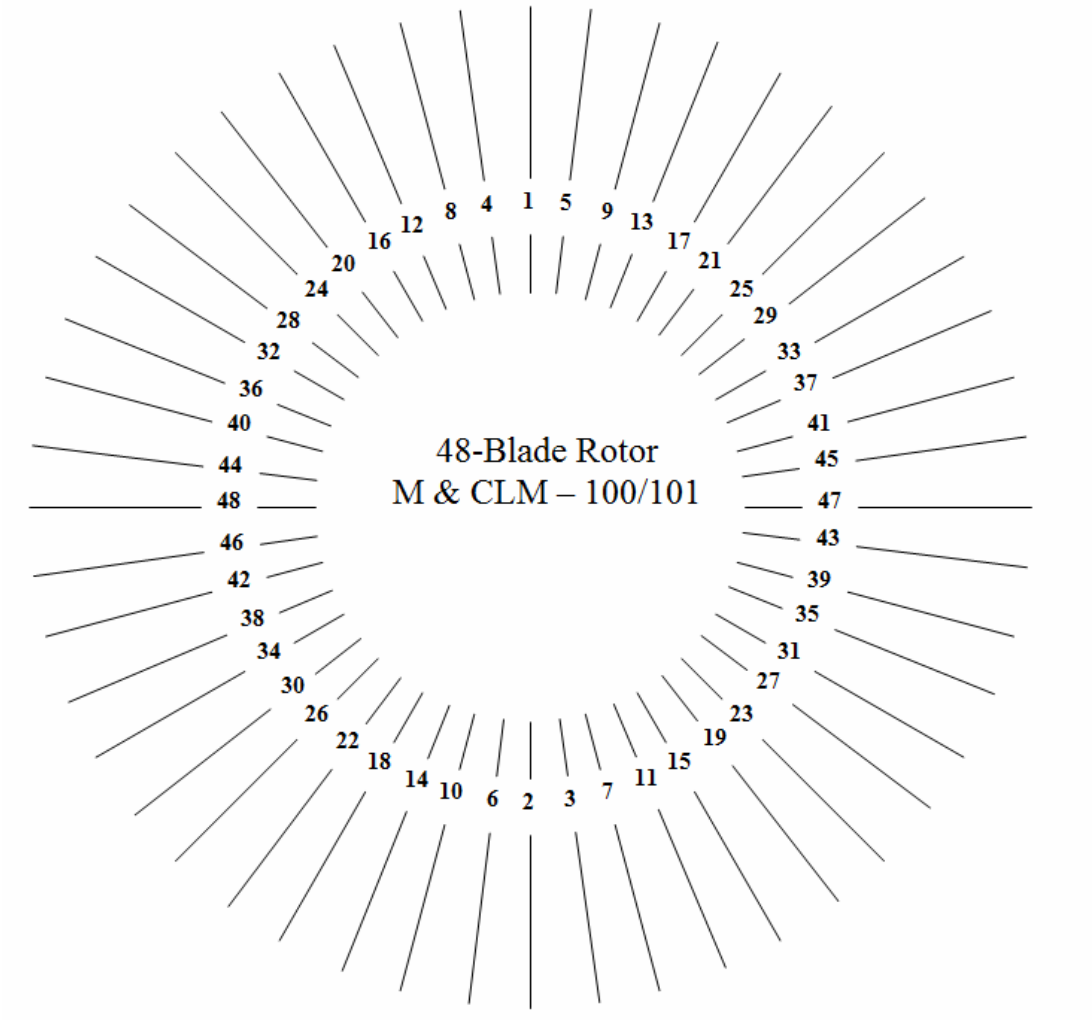
BLADE INSTALLATION Serial Number:_____
Customer:_____ Date:_____
Model:_____ Name:_____



CLM – 75/76 Rotor Blade Installation Procedures

Weigh all blades using a scale with 0.1 gram resolution and arrange them in ascending order by weight. The lightest blade will be #1 and the heaviest #40. Thoroughly clean the blade slots and the seat for the retaining ring before beginning the blade placement. Using the weight that was added to the bare rotor as reference, install blade number one, into slot number one next to the weight. Continue to install blades into corresponding slots on the diagram as shown. Write down weights of blades on diagram for reference.

BLADE INSTALLATION Serial Number:_____
Customer:_____ Date:_____
Model:_____ Name:_____



CLM-100/101 Rotor Blade Installation Procedure

Weigh all blades using a scale with 0.1 gram resolution and arrange them in ascending order by weight. The lightest blade will be #1 and the heaviest #48. Thoroughly clean the blade slots and the seat for the retaining ring before beginning the blade placement. Using the weight that was added to the bare rotor as reference, install blade number one, into slot number one next to the weight. Continue to install blades into corresponding slots on the diagram as shown. Write down weights of blades on diagram for reference.