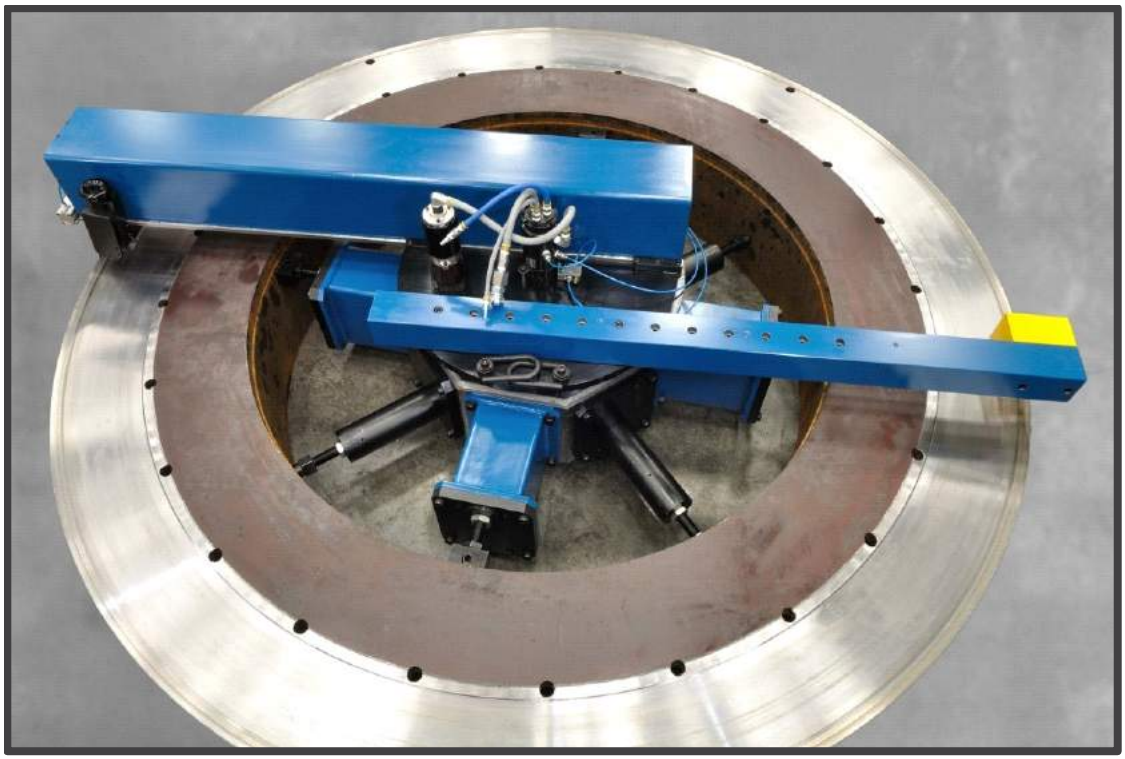
CE

FF8200

FLANGE FACER

OPERATING MANUAL

ORIGINAL INSTRUCTIONS



CLIMAX

Portable Machining & Welding Systems

P/N 59130
March 2019
Revision 9

CLIMAX | BORTECH CALDER H&S TOOL

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- Your name
- Shipping address
- Telephone number
- Machine model
- Serial number (if applicable)
- Date of purchase

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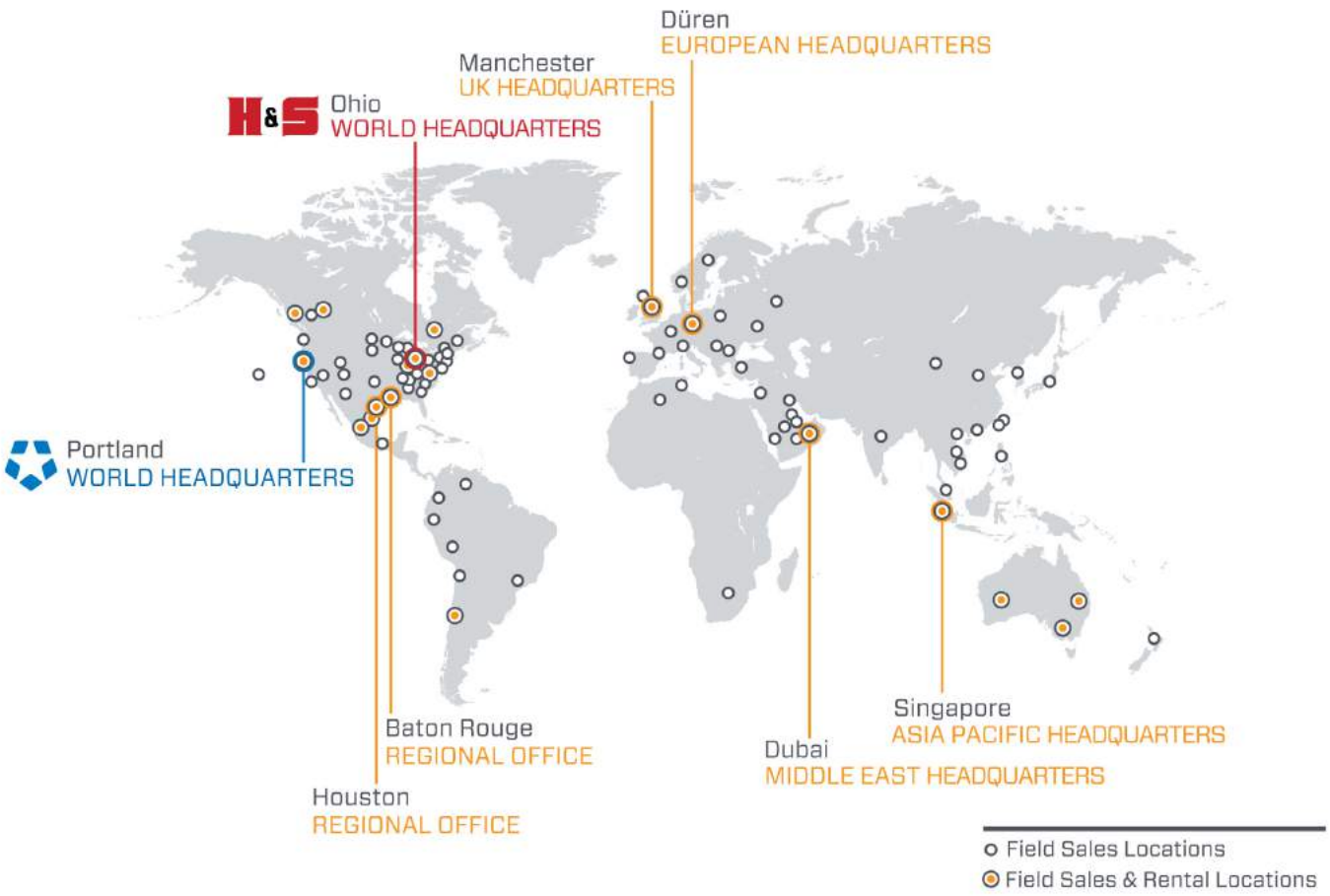

CE DOCUMENTATION

Climax Portable Machine Tools, Inc. Effective Date: April 1, 2011

Declaration of Conformity

CE

CLIMAX®
Portable Machine Tools, Inc.

Manufacturer Address:	EC Authorized Representative:
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Climax GmbH is authorized to compile a technical file for this product.

We hereby declare that the machinery described:

Make:	Flange Facer
Models:	FF3000, FF4000, FF5000, FF6000, FF6100, FF6200, FF7200, FF8000, FF8200
Serial Numbers:	11016661 - 15128700

Is in compliance with the following directives:

2006/42/EC - Machinery, 2004/108/EC - EMC

Compliance with the relevant EHSR of the above directives is by application of the following referenced harmonized standards:

EN 349, EN 982 + A1, EN 983 + A1, EN 3744, EN 11201, EN 12100-1, EN 12100-2, EN 12840, EN 13732-1, EN 13849-1, EN 14121-1

(Original Signed)
VP - Engineering
Climax Portable Machine Tools, Inc.
2712 E. Second St., Newberg, Oregon
USA 97132-8210

Signed in Newberg, Oregon 97132-8210 USA on: (Original Dated)
DATE

LIMITED WARRANTY

CLIMAX Portable Machine Tools, Inc. (hereafter referred to as “CLIMAX”) warrants that all new machines are free from defects in materials and workmanship. This warranty is available to the original purchaser for a period of one year after delivery. If the original purchaser finds any defect in materials or workmanship within the warranty period, the original purchaser should contact its factory representative and return the entire machine, shipping prepaid, to the factory. CLIMAX will, at its option, either repair or replace the defective machine at no charge and will return the machine with shipping prepaid.

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- Damage after the date of shipment not caused by defects in materials or workmanship
- Damage caused by improper or inadequate machine maintenance
- Damage caused by unauthorized machine modification or repair
- Damage caused by machine abuse
- Damage caused by using the machine beyond its rated capacity

All other warranties, express or implied, including without limitation the warranties of merchantability and fitness for a particular purpose are disclaimed and excluded.

Terms of sale

Be sure to review the terms of sale which appear on the reverse side of your invoice. These terms control and limit your rights with respect to the goods purchased from CLIMAX.

About this manual

CLIMAX provides the contents of this manual in good faith as a guideline to the operator. CLIMAX cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.

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1 INTRODUCTION

IN THIS CHAPTER:

1.1 How to use this manual

This manual describes information necessary for the setup, operation, maintenance, storage, shipping, and decommissioning of the FF8200.

The first page of each chapter includes a summary of the chapter contents to help you locate specific information. The appendices contain supplemental product information to aid in setup, operation, and maintenance tasks.

Read this entire manual to familiarize yourself with the FF8200 before attempting to set it up or operate it.

1.2 Safety alerts

Pay careful attention to the safety alerts printed throughout this manual. Safety alerts will call your attention to specific hazardous situations that may be encountered when operating this machine.

Examples of safety alerts used in this manual are defined here[1]:

⚠ DANGER

indicates a hazardous situation which, if not avoided, ***WILL*** result in death or severe injury.

⚠ WARNING

indicates a hazardous situation which, if not avoided, ***COULD*** result in death or severe injury.

1. For more information on safety alerts, refer to *ANSI/NEMA Z535.6-2011, Product safety Information in Product Manuals, Instructions, and Other Collateral Materials*.

⚠ CAUTION

indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

indicates a hazardous situation which, if not avoided, could result in property damage, equipment failure, or undesired work results.

1.3 GENERAL SAFETY PRECAUTIONS

CLIMAX leads the way in promoting the safe use of portable machine tools and valve testers. Safety is a joint effort. You, the end user, must do your part by being aware of your work environment and closely following the operating procedures and safety precautions contained in this manual, as well as your employer's safety guidelines.

Observe the following safety precautions when operating or working around the machine.

Training – Before operating this or any machine tool, you should receive instruction from a qualified trainer. Contact CLIMAX for machine-specific training information.

Risk assessment – Working with and around this machine poses risks to your safety. You, the end user, are responsible for conducting a risk assessment of each job site before setting up and operating this machine.

Intended use – Use this machine in accordance with the instructions and precautions in this manual. Do not use this machine for any purpose other than its intended use as described in this manual.

Personal protective equipment – Always wear appropriate personal protective gear when operating this or any other machine tool. Flame-resistant clothing with long sleeves and legs is recommended when operating the machine. Hot chips from the workpiece may burn or cut bare skin.

Work area – Keep the work area around the machine clear of clutter. Restrain cords and hoses connected to the machine. Keep other cords and hoses away from the work area.

Lifting – Many CLIMAX machine components are very heavy. Whenever possible, lift the machine or its components using proper hoisting equipment and rigging. Always use designated lifting points on the machine. Follow lifting instructions in the setup procedures of this manual.

Lock-out/tag-out – Lock-out and tag-out the machine before performing maintenance.

Moving parts – CLIMAX machines have numerous exposed moving parts

and interfaces that can cause severe impact, pinching, cutting, and other injuries. Except for stationary operating controls, avoid contact with moving parts by hands or tools during machine operation. Remove gloves and secure hair, clothing, jewelry, and pocket items to prevent them from becoming entangled in moving parts.

Sharp edges – Cutting tools and workpieces have sharp edges that can easily cut skin. Wear protective gloves and exercise caution when handling a cutting tool or workpiece.

Hot surfaces – During operation, motors, pumps, hydraulic power units (HPUs), and cutting tools can generate enough heat to cause severe burns. Pay attention to hot surface labels, and avoid contact with bare skin until the machine has cooled.

1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS

Eye hazard – This machine produces metal chips during operation. Always wear eye protection when operating the machine.

Sound level – This machine produces potentially harmful sound levels. Hearing protection is required when operating this machine or working around it.

Hazardous environments – Do not operate the machine in environments where potentially explosive materials, toxic chemicals, or radiation may be present.

Machine mounting – Do not operate the machine unless mounted to a workpiece in accordance with this manual. If mounting the machine in an overhead or vertical position, do not remove hoist rigging until the machine is mounted to the workpiece in accordance with this manual.

1.5 RISK ASSESSMENT AND HAZARD MITIGATION

Machine Tools are specifically designed to perform precise material-removal operations.

Stationary Machine Tools include lathes and milling machines and are typically found in a machine shop. They are mounted in a fixed location during operation and are considered to be a complete, self-contained machine. Stationary Machine Tools achieve the rigidity needed to accomplish material-removal operations from the structure that is an integral part of the machine tool.

In contrast, Portable Machine Tools are designed for on-site machining applications. They typically attach directly to the workpiece itself, or to an adjacent structure, and achieve their rigidity from the structure to which it is attached. The design intent is that the Portable Machine Tool and the structure to which it is attached become one complete machine during the material-removal process.

To achieve the intended results and to promote safety, the operator must understand and follow the design intent, set-up, and operation practices that are unique to Portable Machine Tools.

The operator must perform an overall review and on-site risk assessment of the intended application. Due to the unique nature of portable machining applications, identifying one or more hazards that must be addressed is typical.

When performing the on-site risk assessment, it is important to consider the Portable Machine Tool and the workpiece as a whole.

1.6 RISK ASSESSMENT CHECKLIST

The following checklist is not intended to be an all inclusive list of things to watch out for when setting up and operating this Portable Machine Tool. However, these checklists are typical of the types of risks the assembler and operator should consider. Use these checklists as part of your risk assessment:

TABLE 1-1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

	Before set-up
☐	I took note of all the warning labels on the machine.
☐	I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
☐	I considered the need for personnel safety guarding and installed any necessary guards.
☐	I read the machine assembly instructions (Section 3).
☐	I created a lift plan, including identifying the proper rigging, for each of the setup lifts required during the setup of the support structure and machine.
☐	I located the fall paths involved in lifting and rigging operations. I have taken precautions to keep workers away from the identified fall path.
☐	I considered how this machine operates and identified the best placement for the controls, cabling, and the operator.
☐	I evaluated and mitigated any other potential risks specific to my work area.

TABLE 1-2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

	After set-up
☐	I checked that the machine is safely installed (according to Section 3) and the potential fall path is clear. If the machine is installed at an elevated position, I checked that the machine is safeguarded against falling.
☐	I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel.
☐	I planned for containment of any chips or swarf produced by the machine.
☐	I followed the required maintenance checklist (Section 5) with the recommended lubricants (Section 5.2).
☐	I checked that all affected personnel have the recommended personal protective equipment, as well as any site-required or regulatory equipment.
☐	I checked that all affected personnel understand and are clear of the danger zone.
☐	I evaluated and mitigated any other potential risks specific to my work area.

1.7 LABELS

The following warning and identification labels should be on your machine. If any are defaced or missing, contact CLIMAX immediately for replacements.

TABLE 1-3. FF8200 LABELS

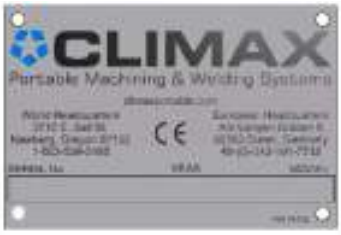
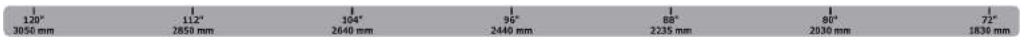
	P/N 27462 Warning hazards		P/N 29154 CE serial plate
	P/N 41425 Lift point identification		P/N 46902 Warning label: heat hazard
	P/N 59037 Warning label: hearing protection required		P/N 59039 Warning label: lift point
	P/N 59039 Warning label: hand danger/ moving parts		P/N 60537 Warning label: torque screw specification
	P/N 61457 Warning label: OD mount		

TABLE 1-3. FF8200 LABELS

<table>
<tr><td colspan="3"> 
</td><td>P/N 61540
Counterweight position label</td></tr>
<tr><td> 
</td><td>P/N 62883
Warning label: crush hazard</td><td> 
</td><td>P/N 62884
Warning label: impact hazard</td></tr>
<tr><td> 
</td><td>P/N 62888
Warning label: lift point only</td><td> 
</td><td>P/N 66070
Warning label: do not operate with-out guards</td></tr>
<tr><td> 
</td><td>P/N 70229
CLIMAX label</td><td> 
</td><td>P/N 91217
Mass plate</td></tr>
</table>

For identification of label locations, see the exploded views in Appendix A.

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2 OVERVIEW

IN THIS CHAPTER:

2.1 Features and components

The FF8200 is a flange facer with an infinitely variable feed rate from 0.002–0.035"/revolution (0.051–0.889 mm/revolution), providing operational flexibility and the ability to provide phonographic finishes with off/on capabilities.

The use of large, heavy-duty, construction-grade bearings provides powerful, rigid performance throughout the entire machine facing range, even machining over bolt hole patterns.

Principle components include:

Tool head–This feature can be rotated a full 360°, providing the ability to create a variety of chamfers, o-ring grooves, lens rings and other angular surfaces as needed.

Oversized ring gear–This feature provides steady rotation for difficult machining challenges.

Unique chucking system–This feature minimizes parts and greatly simplifies machine set-up and tear down. It can be removed to allow customers to face mount the flange facer for applications like machining heat exchanger flanges.

Machining arm–Also called the turning, milling, or tool arm, this feature can be infinitely positioned to reduce rotating swing clearance as needed for close quarter applications.

Feed box–This feature can be mounted to provide either radial or axial feed.

Remote control feed rate adjustment–This feature allows the machine operator to safely adjust the feed rate without reaching into the rotating machine. This also allows for feed adjustment while machining.

Figure 2-1 shows components.

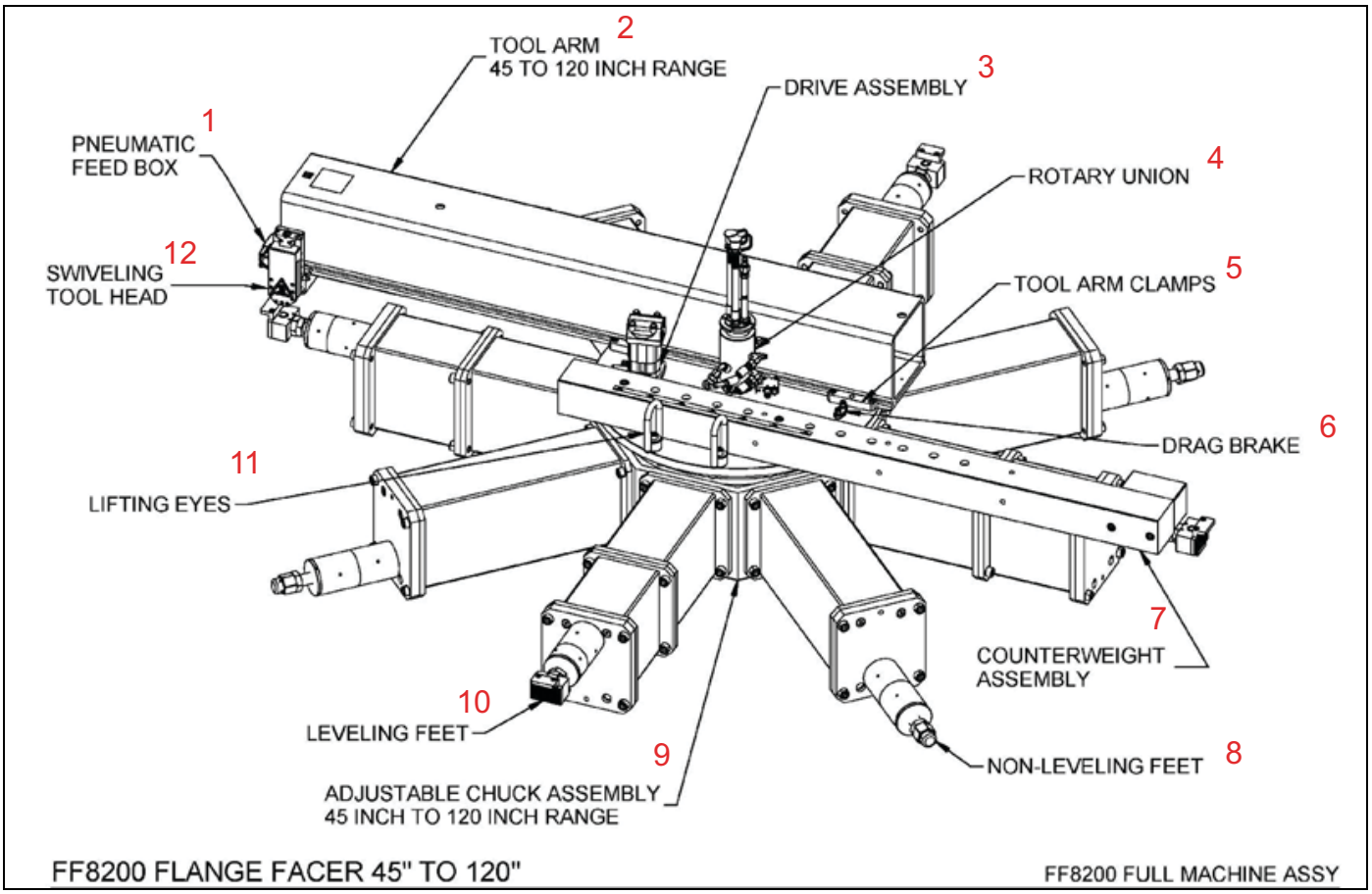


FIGURE 2-1. COMPONENTS

TABLE 2-1. COMPONENT IDENTIFICATION

Number	Component
1	Pneumatic feed box
2	Tool arm 40–120” (1,016–3,048 mm) range
3	Drive assembly
4	Rotary union
5	Tool arm clamps
6	Drag brake
7	Counterweight assembly
8	Non-leveling feet
9	Adjustable chuck assembly 45–120” (1,143–3,048 mm) range
10	Leveling feet
11	Lifting eyes
12	Swiveling tool head

2.2 CONTROLS

The pneumatic conditioning unit (PCU) controls are described in Section 4.3 on page 70 and the hydraulic power unit (HPU) controls are described in Section 4.4 on page 73.

⚠ WARNING

Always stop the machine and lock-out/tag-out the PCU or HPU before making adjustments to controls or machine components. Failure to follow this safety precaution may result in severe injury.

Emergency shutdown

To stop machine operation immediately, press the EMERGENCY STOP button on the PCU.

Before restarting the FF8200, check the following:

1. Close the speed adjustment valve.
2. Pull the EMERGENCY STOP button up.
3. Press the START button (repeat step 1 if necessary).

2.3 DIMENSIONS

Figure 2-2 on page 12 and Figure 2-3 on page 13 show the machine and operating dimensions.

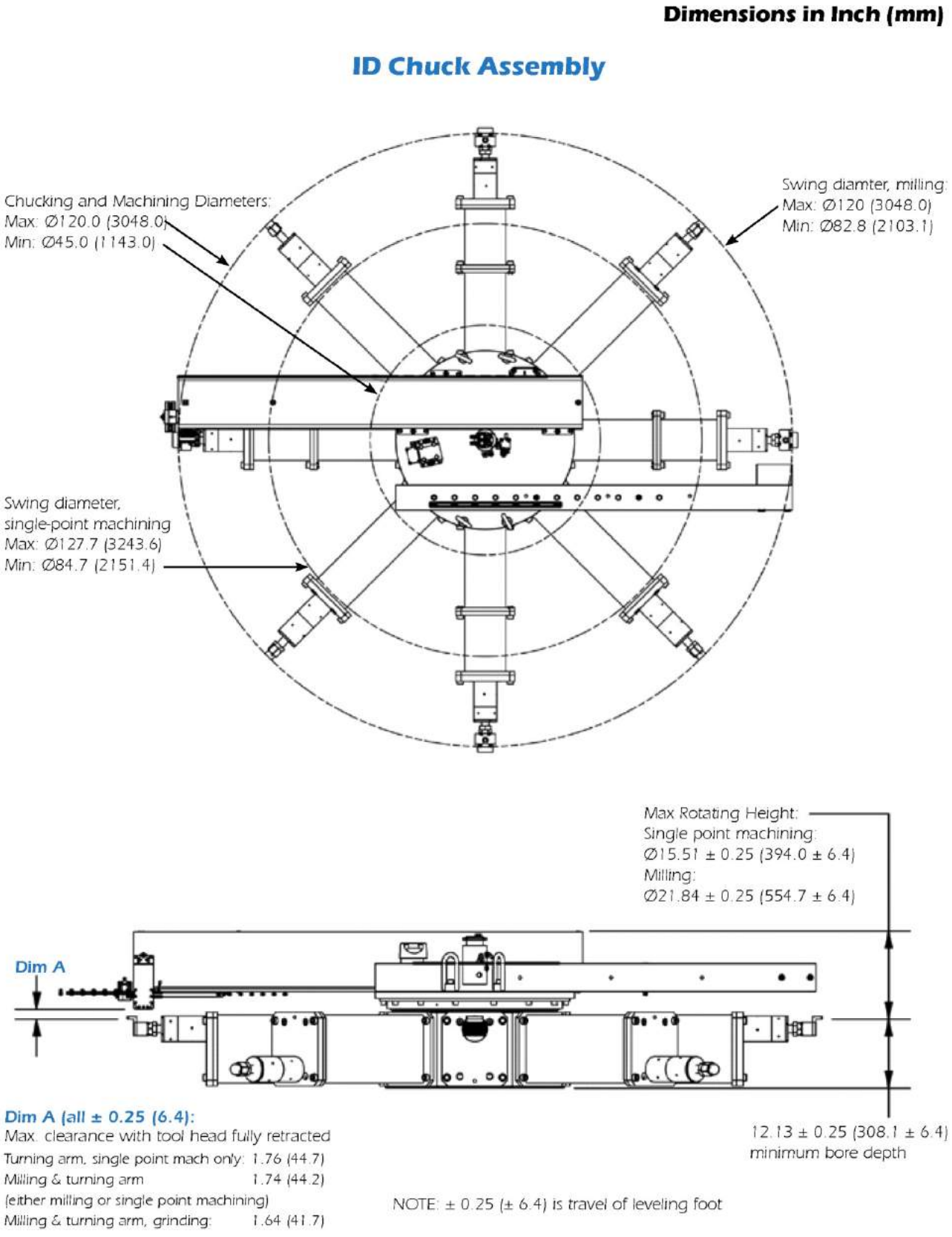
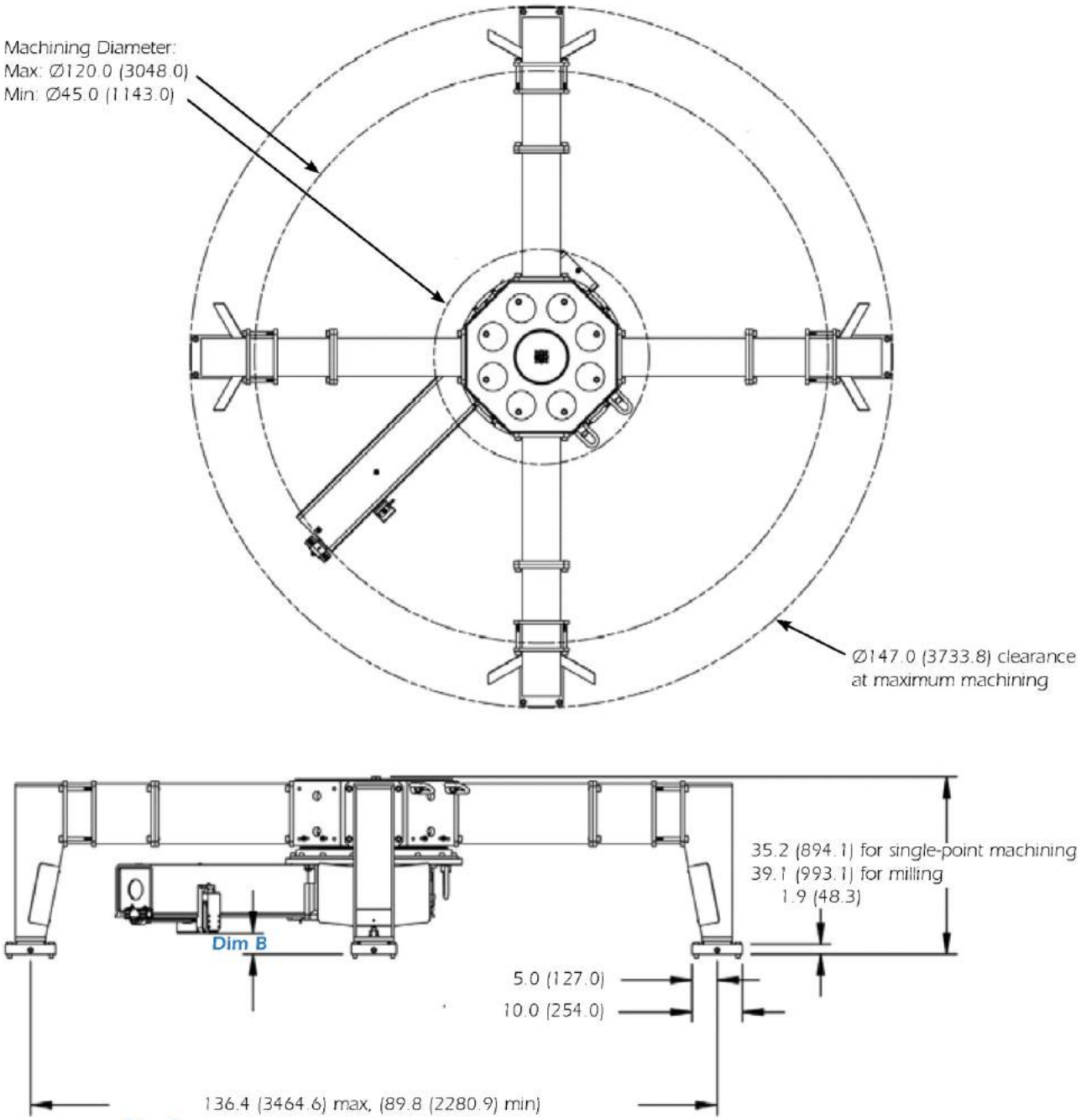


FIGURE 2-2. ID CHUCK DIMENSIONS

Dimensions in Inch (mm)

OD Chuck Assembly



Dim B:
With tool head fully retracted

Turning arm, single point mach only:	4.2 (106.7)
Milling & turning arm:	4.2 (106.7)
(either milling or single point machining)	
Milling & turning arm, grinding:	4.1 (104.1)

FIGURE 2-3. OD CHUCK DIMENSIONS

2.4 SPECIFICATIONS

Specifications

		US	Metric
Machine Performance Ranges			
ID:	Mounting range	45 - 120 inches	1143.0 - 3048.0 mm
	Facing diameter range	45 - 120 inches	1143.0 - 3048.0 mm
	Milling diameter range	45 - 120 inches	1143.0 - 3048.0 mm
	Grinding diameter range	45 - 120 inches	1143.0 - 3048.0 mm
	Swing diameter @ minimum with feedbox on end of arm	84.7 inches	2151.4 mm
	Radial tool slide travel	12 inches	304.8 mm
	Axial tool head travel	4 inches	101.6 mm
	Depth required inside bore for ID chuck	12.13 ± 0.25 inches	308.1 ± 6.4 mm
	(± 0.25 inches (± 6.4 mm) is travel of leveling foot)		
	Feed Rate	0.002 - 0.040 in/rev	0.051 - 1.016 mm/rev
OD:	Mounting range *	89.8 - 136.4 inches	2280.9 - 3464.6 mm
	Facing diameter range	45 - 120 inches	1143.0 - 3048.0 mm
	Milling diameter range	45 - 113.5 inches	1143.0 - 2882.9 mm
	Grinding diameter range (w/ feed box)	45 - 118 inches	1143.0 - 2997.2 mm
	Grinding diameter range (w/o feed box)	45 - 120 inches	1143.0 - 3048.0 mm
	Depth required inside bore for chuck	0 inches	0 mm
	Refer to ID for specifications not listed		
Milling Option:			
	Vertical Stroke, milling head	8 inches	203.2 mm
Rotational Drive System			
Drive type		Pneumatic or hydraulic drive with pinion and internal ring gear	
Pinion gear to ring gear reduction		7.429:1	
Single point turning speed range:			
	Pneumatic	5 - 29 RPM	
	Hydraulic (based on motor choice)	1.8 - 18 RPM	
Milling & grinding speed ranges (with reducer):			
	Pneumatic	0.004 - 0.173 RPM	
	(rapid only, not in cut)	(58 ipm @ 72 inch dia.)	(1473.2 mm/min @ 1828.8 mm dia.)
	Hydraulic (based on motor choice)	0.002 - 0.374 RPM	
Power input requirements			
	Pneumatic - 3.5 Hp (2.6 kW)	50 ft³/min @ 90 psi	1.42 m³/min @ 620 kPa
	Hydraulic	10 gpm@1200 psi	37.9 L/min @ 8273 kPa
Measures			
For machine dimensions, please refer to dimensional drawings			
ID machine weight, approximate		4000 lb	1814.4 kg
ID machine weight with mill, approximate		4150 lbs	1882.4 kg
OD machine weight, approximate		3775 lb	1712.3 kg
ID machine weight with mill, approximate		3925 lbs	1780.4 kg
Chuck crate dimensions, (for ID and OD machines) (WxDxH)			
	Wood, approx.	93 x 40.5 x 40 in	2362 x 1029 x 1016 mm
	Metal, approx.	90.2 x 40.2 x 36.2 in	2291 x 1021 x 920 mm
Leg crate dimensions (for ID and OD machines) (WxDxH)			
	Wood, approx.	94 x 43.5 x 19 in	2388 x 1105 x 483 mm
	Metal, approx.	94.2 x 42.7 x 19.2 in	2393 x 1085 x 488 mm
OD mount hardware crate dimensions (for OD machine only) (WxDxH)			
	Wood, approx.	94 x 43.5 x 19 in	2388 x 1105 x 483 mm
	Metal, approx.	94.2 x 42.7 x 19.2 in	2393 x 1085 x 488 mm

* OD mount minimum arm swing is 84.7 inches (2151.4 mm) diameter. An additional customer supplied structure will be required to chuck below the minimum swing diameter

All dimensions should be considered reference. Contact your Cimax Representative for precision dimensions. Specifications are subject to change without notice. There are no systems or components on this machine that are capable of producing hazardous EMF, UV or other radiation hazards. The machine does not use lasers nor does it create hazardous materials such as gases or dust.

3 SETUP

IN THIS CHAPTER:

This section describes the setup and assembly procedures for the FF8200 flange facer.

3.1 RECEIPT AND INSPECTION

Your CLIMAX product was inspected and tested prior to shipment, and packaged for normal shipment conditions. CLIMAX does not guarantee the condition of your machine upon delivery.

When you receive your CLIMAX product, perform the following receipt checks:

1. Inspect the shipping containers for damage.
2. When unpacking the machine, place machine on 4" (102 mm) high blocks to prevent damaging the components.
3. Check the contents of the shipping containers against the included invoice to make sure that all components have been shipped.
4. Inspect all components for damage.

Contact CLIMAX immediately to report damaged or missing components.

NOTICE

Keep the shipping container and all packing materials for future storage and shipping of the machine.

The machine ships from CLIMAX with a heavy coating of LPS 3. The recommended cleaner is LPS PreSolve Orange Degreaser. All parts must be cleaned before use.

3.2 PREPARING THE MACHINE FOR USE

3.2.1 Pre-setup checks

The FF8200 can be set up and mounted in many ways. Before setting up the flange facer, check the following:

- The machine assemblies are positioned correctly.
- There is enough room to position the entire machine on or near the work piece.
- All connections are correctly attached.

3.2.2 Assessing the work area

The FF8200 often is used in dangerous locations (in elevated positions, near other operating equipment, overhead, etc.). CLIMAX cannot foresee where this machine will be used; therefore, you must perform a site specific risk assessment (see Table 1-1 on page 5) for each job before starting work.

The FF8200 has remote operation features that enable you to choose the optimum location from which to work. See the pneumatic conditioning unit (PCU) controls

described in Section 4.3 on page 70 and the hydraulic power unit (HPU) controls described in Section 4.4 on page 73.

WARNING

Always follow safe work practices, including site-specific safety requirements. It is your responsibility to perform a risk assessment before you set up the machine and each time before you operate the machine.

3.3 LIFTING AND RIGGING

DANGER

The FF8200 can weigh 4,970 lbs (2,250 kg) when fully assembled in the inner diameter (ID) configuration, and 5,190 lbs (2,360 kg) in the outer diameter (OD) configuration.

Use caution and follow all site rigging procedures such as a lift plan and never allowing anyone under the load. Falling or uncontrolled swinging of machinery can cause serious injury or death.

The FF8200 has lifting points for individual sub-assemblies and for the completely assembled machine. The lifting points are labeled with the label shown in Figure 3-1.

FIGURE 3-1. LIFTING POINT IDENTIFICATION LABEL

CAUTION

Lift the machine only by the hoist rings marked by the label in Figure 3-1.

The sub-assemblies can be disassembled and individually lifted by the labeled lifting eyes on each sub-assembly.

DANGER

Do not lift the assembled machine by the lifting eyes or hoist rings on the counterweight or the machining arm.

Only lift the assembled machine by the four hoist rings. Lifting the assembled machine by other lifting points can cause the machine to fall from the rigging.

There are four hoist rings locations on the top of the rotary table. Depending on the application orientation, secure the supplied hoist rings in the necessary locations and torque to the spec marked on the hoist rings. When lifting the machine, pay

special attention to the location of the center of gravity. Always make sure that all machine parts are tightened to prevent hazards.

Lifting the counterweight

When using the swivel plate milling head attachment, the counterweight arm must be removed for certain facing diameters. See the setup section for more information on when the adapter plate is necessary. To lift the counterweight and the counterweight adapter:

1. First attach the counterweight to the adapter plate.
2. Lift the counterweight assembly by the lifting eye on the adapter plate.

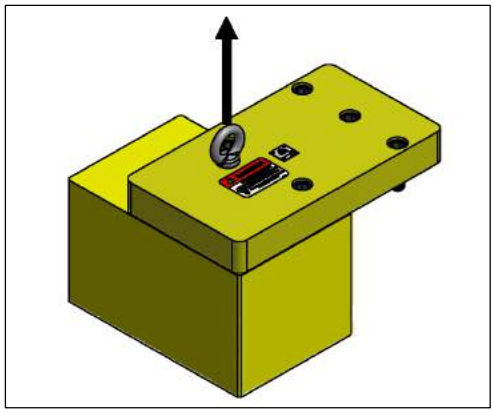


FIGURE 3-2. LIFTING COUNTERWEIGHT ADAPTER ASSEMBLY

⚠ DANGER

The lifting eye on the adapter is rated for the adapter plate and the counterweight.

Only use it to lift the counterweight assembly. Do not lift the machine assembly using the counterweight adapter plate lifting eye.

Using the lifting eye to raise the machine will result in falling machinery that can cause serious injury or be fatal to the operator and bystanders.

3.4 INSTALLATION HAZARDS

The installation stage can be dangerous, as it relies on the operator and other personnel following the recommended safety precautions. Consider the following warnings carefully before undertaking the assembly process.

⚠ WARNING

Swinging or falling machinery could cause serious injury or death to personnel. Secure all components to the machine before lifting. Use supplemental rigging during setup.

We recommend installing safety weld plates immediately after lifting the machine into place, before the rigging is removed, and before leveling or centering the machine. This will prevent accidental machine fallout.

There are two of these safety weld plates included with your machine. If you would like to order more, please contact CLIMAX.

FIGURE 3-3. SAFETY WELD PLATES

The following safety methods are also provided:

Safety weld plates: These two plates must be thoroughly welded onto the workpiece (with a fillet weld the length of each end and a couple short fillets across the front) with the machine in place, and bolted onto the adjustable leveling jacking bolt.

Setup fingers: see the instructions in Section 3.15 on page 37.

⚠ WARNING

If not properly secured, this machine can fall and cause fatal injuries to personnel. Pay special attention to vertical flange installations.
• Chucking feet must be secured to the workpiece.
• Setup fingers and finger clamps should be utilized when possible.

To avoid the risk of a falling machine, secure the machine by using clamps bolted to the underside of the leveling feet (included with the machine).

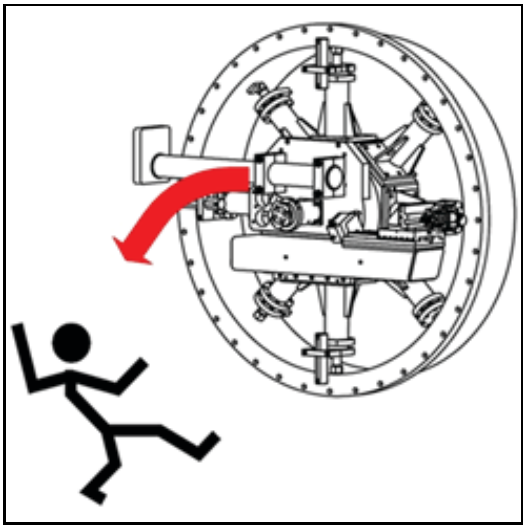


FIGURE 3-4. VERTICAL INSTALLATION HAZARD

⚠ WARNING

Do not remove the crane until at least one of the securing methods is in place and the jacking bolts are tightened to the following specified torques: for milling, 175 ft-lb (237 Nm); for single-point, 85 ft-lbs (115 Nm).

NOTICE

If the torque value cannot be achieved without acceptable workpiece deformation, the operator must apply their own secondary support and restraint devices.

WARNING

Do not extend the chucking feet past the full-extension groove in the threaded screw. If needed, add additional leg sections to minimize the length of the threaded jacking screw that is exposed.

3.5 EIGHT-STEP INSTALLATION INSTRUCTIONS

A Fast Eight-Step Process

This model is so fast and easy to set up that an experienced operator can usually mount the machine into the flange bore, align it, and start cutting in less than an hour.

1 Measure the bore diameter. This will be used to determine the leg length.

2 Select the appropriate leg length and foot.

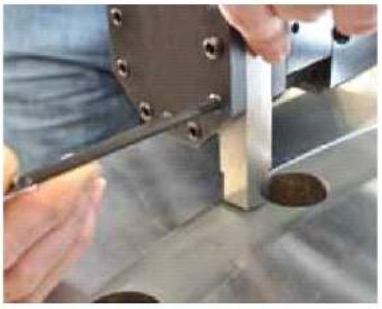
3 Install setup fingers.

4 Tighten Legs

5 Set machine onto flange using setup fingers. Lightly tighten leveling

6 Extend feet into flange. Indicate, level and tighten leveling feet and stationary feet.

7 Install tool bit, and connect to power.



8 You are ready to begin machining!

3.6 OVERVIEW OF SETUP

Inspect and perform necessary maintenance on the machine before mounting on a workpiece. The following steps are an overview of the processes involved with setting up the FF8200 in the ID mounting configuration. The OD mount setup is listed in Section 3.20 on page 50.

Do the following to mount the machine to the workpiece:

1. Check that power sources are disconnected.
2. Measure the surface for mounting and select proper parts for machining, attaching (customer-supplied) scab plates or other mounting surfaces as needed (Figure 3-5).
3. Before inserting the flange facer into the work piece, confirm the legs are securely attached to the machine.
    - For ID mounting: Confirm that the ID mounting legs are set to a diameter smaller than the internal mounting diameter.
    - For OD: Confirm that the OD mounting legs are set to a diameter larger than the flange diameter. Refer to Section 3.14 on page 35 for the complete procedure for chuck leg setup.

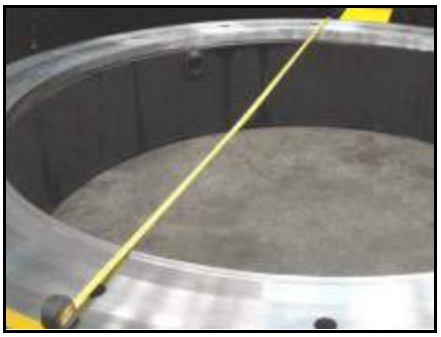


FIGURE 3-5. MEASURE THE WORKPIECE

NOTICE

If mounting the FF8200 in the vertical orientation, then the machining arm and counterweight should be attached to the rotary table (step 5) before mounting the machine to the workpiece (step 8). This will reduce the possibility of an unintentional rotational shift during the installation process.

4. Position the counterweight and machining arm in location slots that are equal distance from the center of the machine, the same location number, in order to balance the machine.
5. Secure the machining arm and counterweight to the rotary table. Torque the machining arm mounting bolts to 45 ft-lbs (61 Nm), and torque the counterweight arm mounting bolts to 55 ft-lbs (75 Nm).

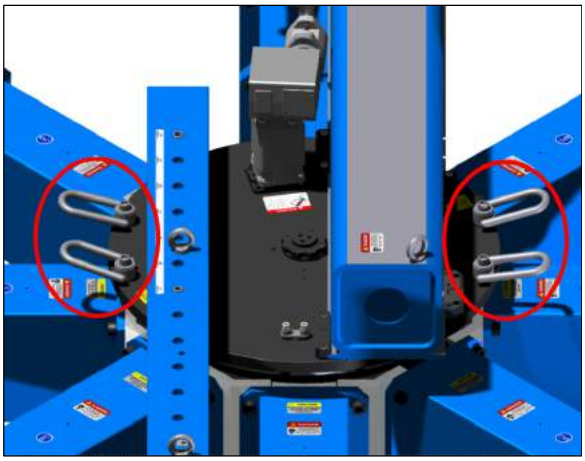


FIGURE 3-6. ASSEMBLED MACHINE LIFTING POINTS

6. Attach the crane slings to the hoist rings on the rotary table of the FF8200, depending on the machine orientation, vertical or horizontal.

WARNING

Only use individual slings for each hoist rings and be sure that they are of appropriate and equal length, and rated for the machine weight, and sling angle.

7. Lift the machine slowly and carefully. If it is out of balance, lower the machine to the ground. Make adjustments before attempting to lift and maneuver it again.
8. Mount the machine to the workpiece using setup fingers (Figure 3-7).
9. Connect any control cables that may be necessary (depending on configuration).
10. Check that the machine is centered and leveled before performing any machining operations.

FIGURE 3-7. SETUP FINGER

The counterweight lifting eyes can be positioned in many locations depending on the configuration and orientation of the machine. Only use these lifting eyes to lift the counterweight.

3.7 ID MOUNT LEG ASSEMBLY

The highlighted items in Figure 3-8 are 4"-4UN triple lead threaded.

The leveling jaws include clamps for internal flanges up to 8" (210 mm).

TABLE 3-1. LOCKING NUT AND LEVELING JAW IDENTIFICATION

Number	Component
1	New internal locking nut
2	Leveling jaw

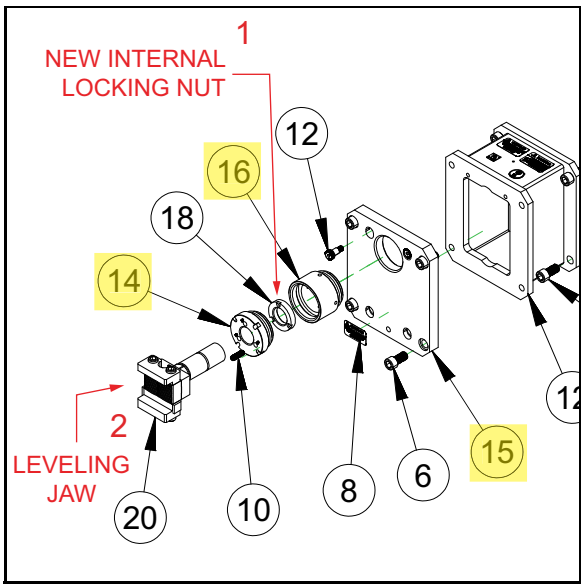


FIGURE 3-8. LOCKING NUT AND LEVELING JAW

On the end cap, the highlighted lock symbols are for the jacking screw locking system (see Figure 3-9.

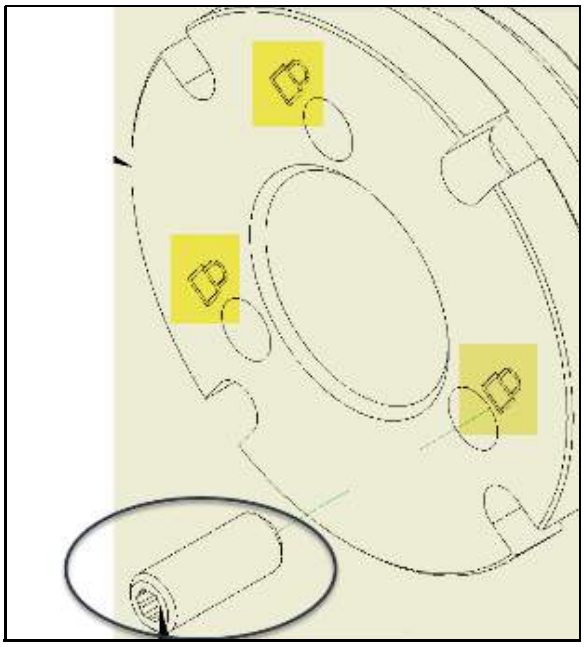


FIGURE 3-9. LOCKING SYMBOLS ON END CAP

NOTICE

After the final adjustments are complete on the jacking feet, tighten one of the three socket head set screw (P/N 74499) M12 x 40mm long to 29 ft –lbs (40 Nm) (shown circled in Figure 3-9) to lock the jacking screw position. Loosen this screw before making additional jacking adjustments—or removing the machine from the flange.

⚠ WARNING

Use supplemental rigging, such as setup fingers, when mounting the machine.

TIP:

The FF8200 ID mount can be configured in either double plane (that is, the leveling feet are offset from the non-leveling feet) or single plane (that is, the leveling feet are on the same plane as the non-leveling feet).

Double-plane mounting is typically more rigid than single-plane mounting. Most windmill towers require single-plane mounting because of the narrow internal flange thickness.

Do the following to set up the rotary table mounting feet:

1. Measure the workpiece bore.
2. Select the appropriate parts for assembly.
3. Apply anti-seize (provided in the tool kit) to the following locations:
   - The threads and contacting faces of each chuck extension leg section, as shown in Appendix 3-10.

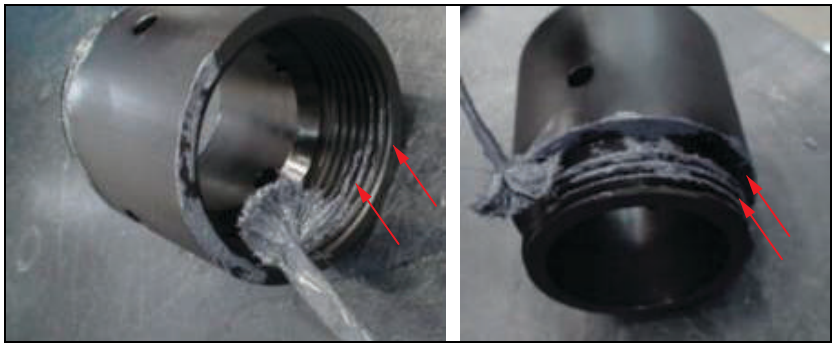


FIGURE 3-10. LOCATIONS TO APPLY ANTI-SEIZE

   - The jacking bolt threads, to prevent thread galling (Figure 3-11.)

FIGURE 3-11. JACKING BOLT

4. Refer to Figure A-10 on page 94 and Table 3-4 when assembling the chuck legs.
5. Secure the chuck arms to the hub with the bolts supplied.
6. After attaching the end cap to the chuck extensions leg, install the leveling and non-leveling chuck feet assemblies in an alternative arrangement.

⚠ WARNING

Do not extend the jacking feet past the full-extension groove in the threaded screw. If needed, add additional leg sections to minimize the length of the threaded jacking screw that is exposed.

FIGURE 3-12. JACKING SCREW GROOVE

7. Adjust the jacking screws equally until they are approximately 3/8" (10 mm) less than the work-piece inside diameter.
8. Install the setup fingers onto the leveling blocks. Adjust the fingers so they will rest on the work piece flange.

⚠ CAUTION

Before putting the chuck onto the workpiece, check that the jacking screws are roughly equally retracted and equipped with the set-up fingers.

Before installing the FF8200 on the workpiece, check for the following:

- The workpiece surface area that will contact the FF8200 leveling and non-leveling chuck feet is dry and completely free of oil, grease, or other lubricant.

⚠ WARNING

Moisture, oil, or lubricants on the chucking foot contact areas of the workpiece may result in insufficient jacking friction force and allow the machine to shift or fall out of the workpiece.

- The chuck feet threads are coated with anti-seize lubricant.

⚠ WARNING

Failure to apply anti-seize lubricant to the chuck feet threads may result in lower-than-anticipated chuck feet clamping force, which may allow the machine to shift or fall out of the workpiece.

NOTICE

If an application does not allow use of any of the securing methods listed above during setup and machining, contact CLIMAX to determine a custom solution.

3.8 ADJUSTING THE TOOL HEAD GIB SCREWS

The six M6 screws (see Figure 3-13) are used to adjust the tool head gib. Adjustment should only be necessary after many hours of use and should only be adjusted if the machine is no longer producing a good finish.

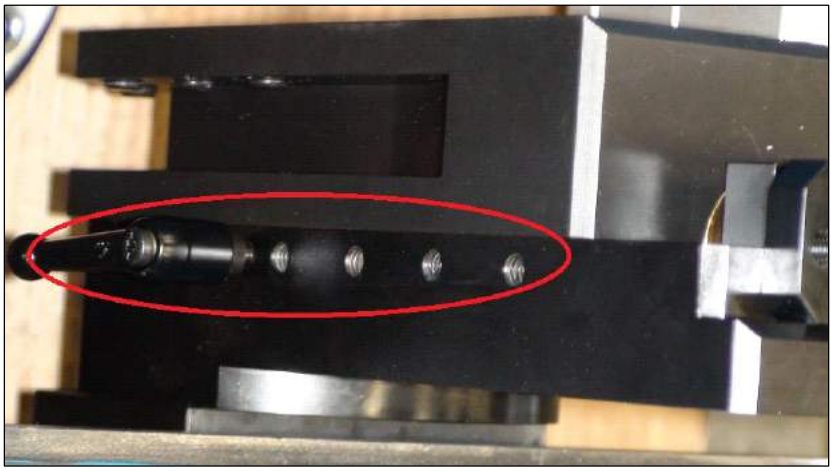


FIGURE 3-13. SIX M6 SCREWS

If a slide is visibly loose and causing machining problems, tighten the six screws by small increments until a slight drag is felt as the tool is traveling.

3.9 ROTATING THE TOOL HEAD

The tool head can be rotated by loosening the single draw bolt coming from the back of the tool head, positioning the tool head, and tightening the draw bolt.

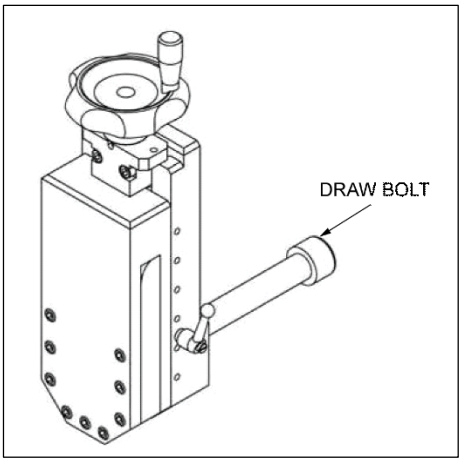


FIGURE 3-14. DRAW BOLT

⚠ CAUTION

Do not loosen the tool head rapidly. Keep your hand on the tool head for stability. Quick disengagement of tool head can cause it to swing unexpectedly, and may result in personnel injury or machine damage.

NOTICE

The FF8200 is designed to trail the cutting tool behind the machining arm. The machining arm moves in a clockwise direction. Keep these characteristics in mind when installing a new tool in the machine.

3.10 ADJUSTING THE RADIAL SLIDE ANTI-BACKLASH LEAD NUT

The radial slide lead nut is adjustable to provide near zero backlash. The lead nut is adjusted using one M4 set screw on each of the two lead nuts (see Figure 3-15).

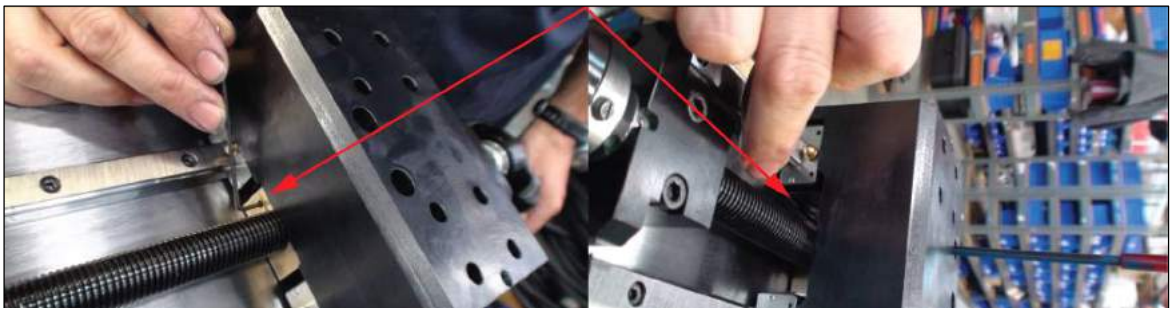


FIGURE 3-15. M4 SET SCREW LOCATIONS

Adjustment should only be necessary after many hours of use and should only be adjusted if the machine is no longer producing a good finish.

If the slide is visibly loose and causing machining problems, tighten the two set screws by small increments until less than 0.001" (0.025 mm) of the backlash can be measured.

After adjustment, check the travel over the full length of the lead screw for tight spots.

3.11 POSITIONING THE MACHINING ARM

The machining arm is infinitely adjustable for versatile positioning and to clear obstructions.

Do the following to reposition the arm:

1. Loosen the screws holding the four clamps.
2. Hold the safety stop pin open.
3. Slide the arm to the desired position.
4. Release the safety stop pin.
5. Re-tighten the clamps and the counterweight.

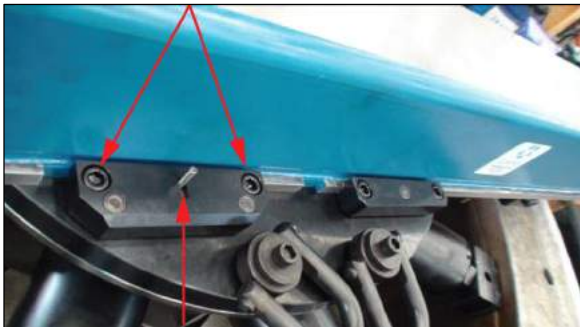


FIGURE 3-16. SCREWS AND SAFETY STOP PIN LOCATION

WARNING

Tighten the clamp bolts to 45 ft-lbs (61 Nm) to prevent unexpected movement that could cause serious injury or death.

WARNING

Position the machining arm so that the safety stop pin engages the retention notch in the machining arm.

Do not disable the safety stop pin. The safety stop pin is intended to prevent unwanted shifting of the machining arm, which could result in serious injury or death.

FIGURE 3-17. SAFETY STOP PIN RETENTION NOTCHES

⚠ CAUTION

After adjusting the machining arm, check that the counterweight is set to the corresponding bolt location increment.

For precise machining and to avoid damaging the machine, the counterweight and machining arm should always be equally spaced from the center of the machine.

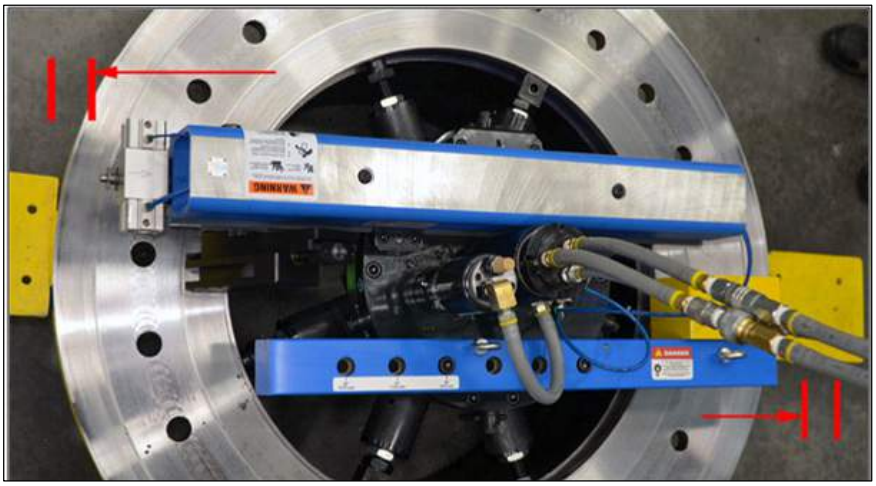


FIGURE 3-18. COUNTERWEIGHT AND MACHINING ARM AT EQUIDISTANCE

The machining arm is fitted with a half-rule with both inch and centimeter markings to assist in setting the counterweight to balance the machine.

FIGURE 3-19. MACHINING ARM RULER

Because the arm is moved radially from center, the half-rule shows inches and centimeters in half-increments and is measured from the safety stop pin, as shown in Figure 3-20.

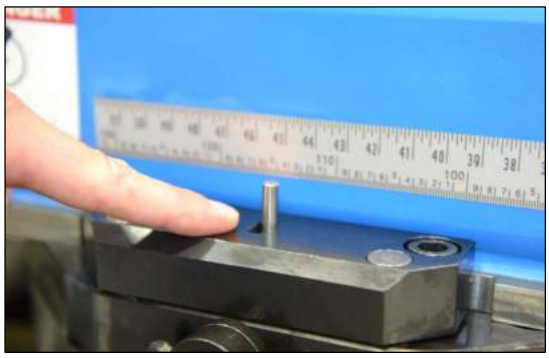


FIGURE 3-20. STOP PIN

After repositioning the arm, adjust the counterweight to match the reading on the half-rule at the safety stop pin of the machine. The counterweight fasteners, shown in Figure 3-21, are marked with ranges that match the approximate setting on the machining arm.

FIGURE 3-21. COUNTERWEIGHT FASTENERS

3.12 POSITIONING THE COUNTERWEIGHT

NOTICE

The counterweight must be installed when the machine is used in a vertical machining application. CLIMAX recommends that you always use the counterweight as it improves the performance of the machine and produces a flatter surface.

The counterweight arm may be positioned at various distances from the center of the machine to balance the machine. The counterweight arm was designed to approximate the weight of the machining arm, and the counterweight is approximately the same weight as the tool head.

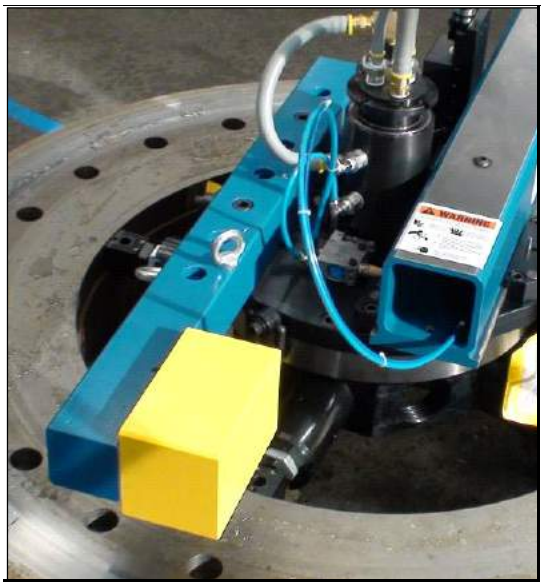


FIGURE 3-22. COUNTERWEIGHT ARM

⚠ WARNING

Tighten the counterweight arm mounting bolts to 55 ft-lbs (75 Nm) to prevent unexpected movement that could cause serious injury or death.

Check that all mounting hardware is secure. A loose counterweight can fall off during operation, seriously injuring the operator or bystanders.

⚠ CAUTION

For precise machining and to avoid damage to the machine, the counterweight and machining arm should always be equally spaced from the center of the machine. The location numbers should be the same.

The machine may be configured with different counterweight masses, tool heads, and counterweight arm options. Refer to Figure 3-23 on page 33 to select the correct combination based on the operation specifications.

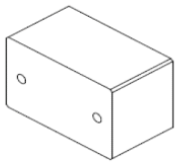
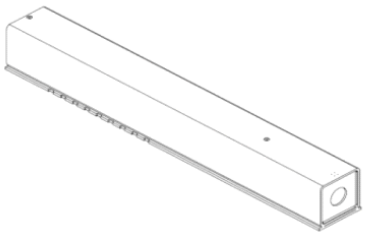
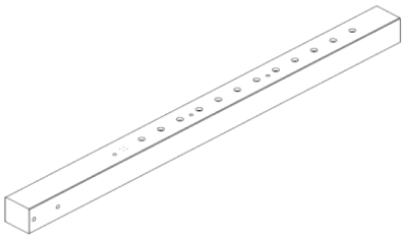
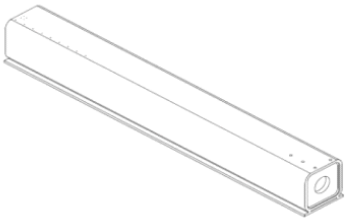
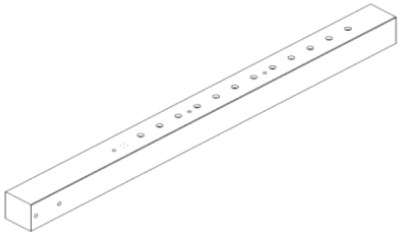
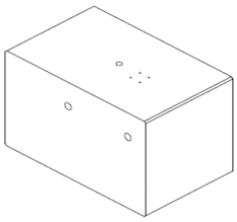
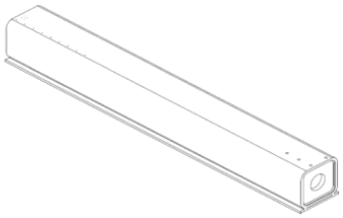
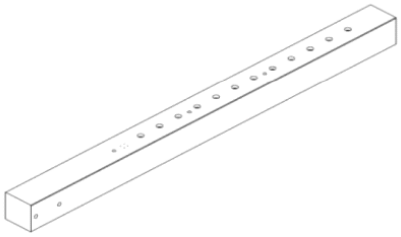
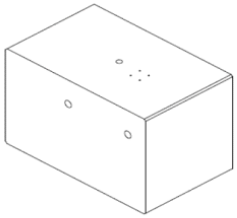
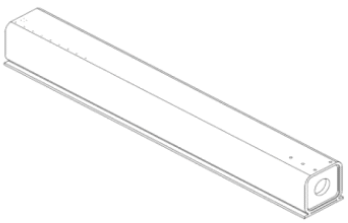
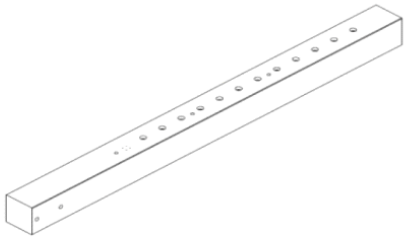
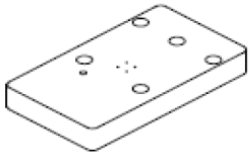
Single Point Flange Facing or Grinding **No Swivel Plate**	Counterweight, Single Point 36 lbm [16 kg]  P/N 58056	Tool Arm, Single Point 1/2" Wall Tube  P/N 58097	Counterweight Arm, Single Point Dimensions: 5" x 5" x 77.5"  P/N 58065	
		Tool Arm, Milling or Single Point 5/8" Wall Tube  P/N 60818	Counterweight Arm, Milling or Single Point Dimensions: 5.5" x 5.5" x 77.5"  P/N 62403	
Milling **No Swivel Plate**	Counterweight, Milling 190 lbm [86 kg]  P/N 62394	Tool Arm, Milling or Single Point 5/8" Wall Tube  P/N 60818	Counterweight Arm, Milling Dimensions: 5.5" x 5.5" x 77.5"  P/N 62403	
Milling **With Swivel Plate**	Counterweight, Milling 190 lbm [86 kg] 	Tool Arm, Milling or Single Point 5/8" Wall Tube 	Counterweight Arm, Milling Dimensions: 5.5" x 5.5" x 77.5"  P/N 62403 Counterweight Adapter, Swivel Plate 	77-120" Dia. 67-77" Dia. 45-67" Dia.

FIGURE 3-23. COUNTERWEIGHT COMPONENT CHART

3.13 COUNTERWEIGHT ADAPTER PLATE

When using the swivel plate milling head attachment and machining at certain diameters, the machine can be balanced with the counterweight attached to the counterweight arm, as described in Section 3.12 on page 31, or to the machining arm.

TABLE 3-2. COUNTERWEIGHT ADAPTER PLATE IDENTIFICATION

Component
Swivel plate (P/N 63250)
Counterweight adaptor plate (P/N 83095)

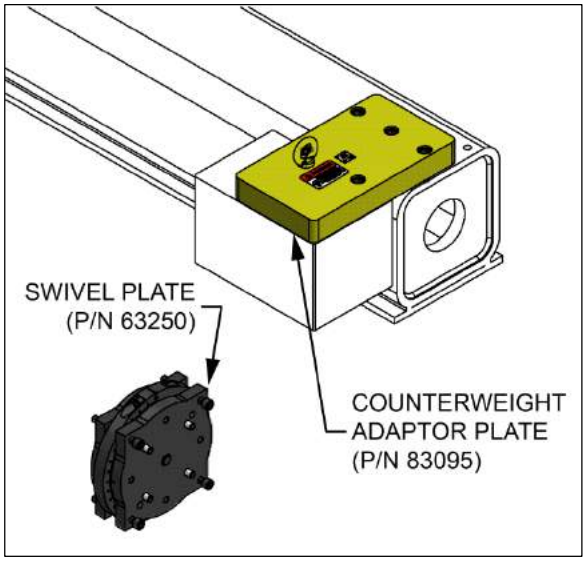


FIGURE 3-24. COUNTERWEIGHT ADAPTER PLATE FOR USE WITH THE SWIVEL HEAD

The location of the counterweight depends on the machining diameter range, because smaller ranges will cause interference between the milling head and the counterweight arm.

Refer to Figure 3-23 on page 33 and Figure 3-25 on page 35 to select the correct component arrangement according to the machining operation and range. Figure 3-25 on page 35 is only for machining operations with the swivel plate adapter.

For operations without the swivel plate, the counterweight should be attached to the counterweight arm.

To attach the counterweight assembly to the machining arm, three tapped holes must be on the machining arm at the end opposite the tool head. Machining arms that have not been configured for the counterweight adapter plate may be retrofitted (contact CLIMAX for document P/N 83143).

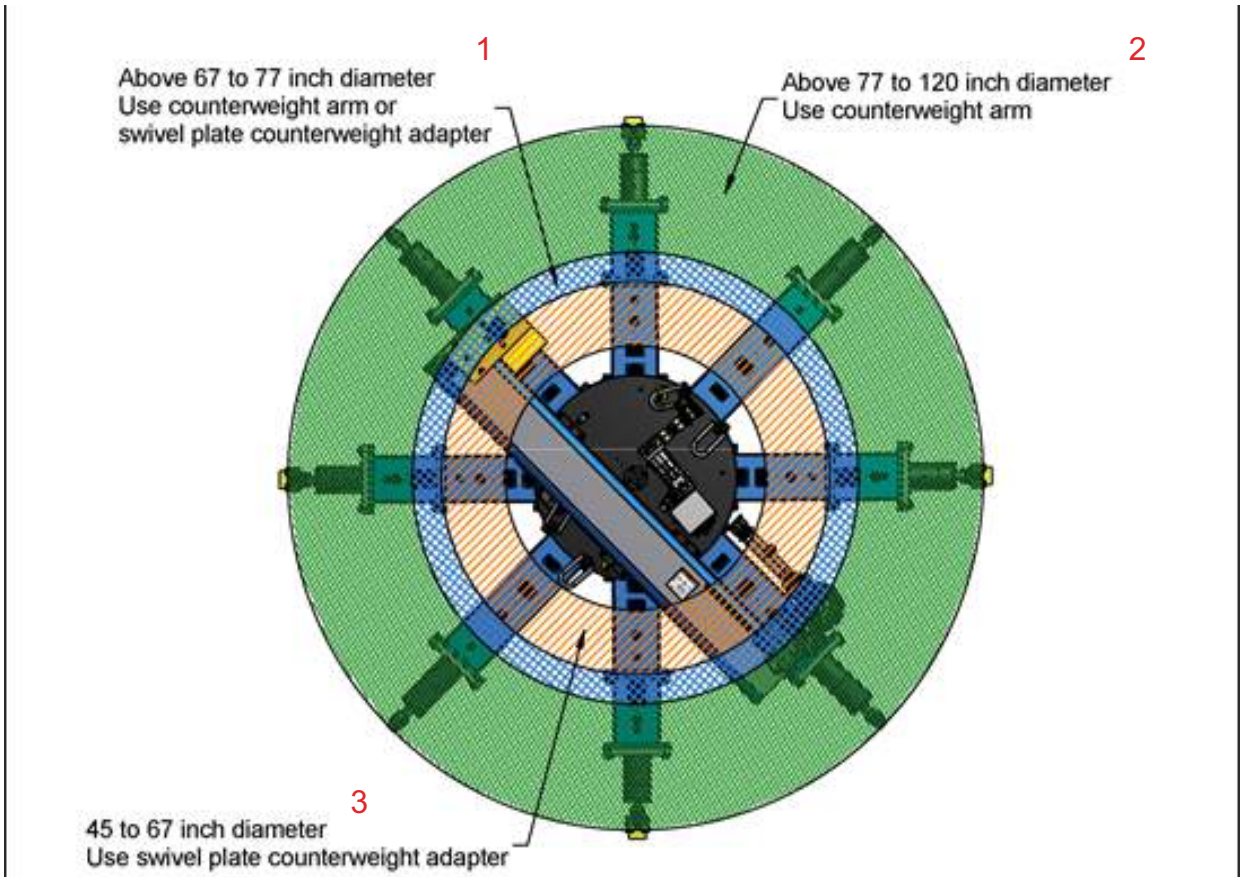


FIGURE 3-25. FACING RANGES FOR COUNTERWEIGHT COMPONENT SELECTION WITH SWIVEL PLATE ADAPTER

TABLE 3-3. COUNTERWEIGHT RANGE IDENTIFICATION

Number	Component
1	More than 67–77” (1,702–1,956 mm) diameter: use the counterweight arm or swivel plate counterweight adapter
2	More than 77–120” (1,956–3,048 mm) diameter: use the counterweight arm
3	45–67" (1,143–1,702 mm) diameter: use the swivel plate counterweight adapter

3.14 CHUCK MOUNTING

Table 3-4 and Table 3-5 shows the recommended ID mounting setup.

TABLE 3-4. LEVELING CHUCKING LEG CHART

Diameters	12.5" stand off	17.5" stand off	27.5" stand off	2.5" leg	5" leg	End plate
45–50" (1,143–1,270 mm)	0	0	0	0	0	1
50–55" (1,270–1,397 mm)	0	0	0	1	0	1

TABLE 3-4. LEVELING CHUCKING LEG CHART

Diameters	12.5" stand off	17.5" stand off	27.5" stand off	2.5" leg	5" leg	End plate
55–60" (1,397– 1,524 mm)	0	0	0	0	1	1
60–65" (1,524–1,651 mm)	0	0	0	1	1	1
65–70" (1,651–1,778 mm)	0	0	0	0	2	1
70–75" (1,778–1,905 mm)	1	0	0	0	0	1
75–80" (1,905–2,032 mm)	1	0	0	1	0	1
80–85" (2,032–2,159 mm)	0	1	0	0	0	1
85–90" (2,159–2,286 mm)	0	1	0	1	0	1
90–95" (2,286–2,413 mm)	0	1	0	0	1	1
95–100" (2,413–2,540 mm)	0	1	0	1	1	1
100–105" (2,540–2,667 mm)	0	0	1	0	0	1
105–110" (2,667–2,794 mm)	1	1	0	0	0	1
110–115" (2,794–2,921 mm)	1	1	0	1	0	1
115–120" (2,921–3,048 mm)	1	1	0	0	1	1

TABLE 3-5. NON-LEVELING CHUCKING LEG CHART

Diameters	12.5" stand off	17.5" stand off	27.5" stand off	2.5" leg	5" leg	End plate
45–50" (1,143–1,270 mm)	0	0	0	0	0	1
50–55" (1,270–1,397 mm)	0	0	0	1	0	1
55–60" (1,397– 1,524 mm)	0	0	0	0	1	1
60–65" (1,524–1,651 mm)	0	0	0	1	1	1
65–70" (1,651–1,778 mm)	0	0	0	2	1	1
70–75" (1,778–1,905 mm)	0	0	0	1	2	1
75–80" (1,905–2,032 mm)	0	0	0	0	3	1
80–85" (2,032–2,159 mm)	1	0	0	0	1	1
85–90" (2,159–2,286 mm)	1	0	0	1	1	1
90–95" (2,286–2,413 mm)	1	0	0	0	2	1
95–100" (2,413–2,540 mm)	1	0	0	1	2	1
100–105" (2,540–2,667 mm)	0	1	0	0	2	1
105–110" (2,667–2,794 mm)	0	0	1	1	0	1
110–115" (2,794–2,921 mm)	0	0	1	0	1	1
115–120" (2,921–3,048 mm)	0	0	1	1	1	1

The machine ships with the main body mounted to the chuck.

3.15 MOUNTING AND ALIGNING THE MACHINE

See the Section 3.4 on page 18 for a full list of installation hazards.

WARNING

Use supplemental rigging when mounting the machine, in case it falls out or through the chucking diameter.

Do the following to mount and align the chuck:

1. Measure the bore diameter of the work piece.
2. Select the proper leg extensions and screw actuators.
   a) Apply Never-Seez (provided in the tool kit) or any other anti-seize compound to the threads and contacting faces of each leg section before screwing them together (see Figure 3-26).

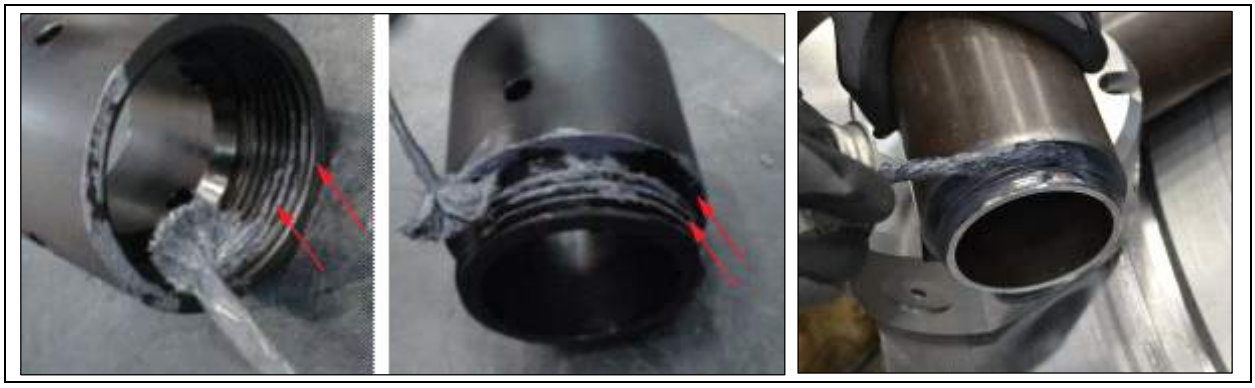


FIGURE 3-26. LOCATIONS TO APPLY ANTI-SEIZE

3. Before putting the chuck onto the work piece, make sure the jacking screws are roughly retracted equally and equipped with the setup fingers.

TABLE 3-6. SETUP FINGER AND LEVELING FOOT IDENTIFICATION

Number	Component
1	Setup finger
2	Leveling foot

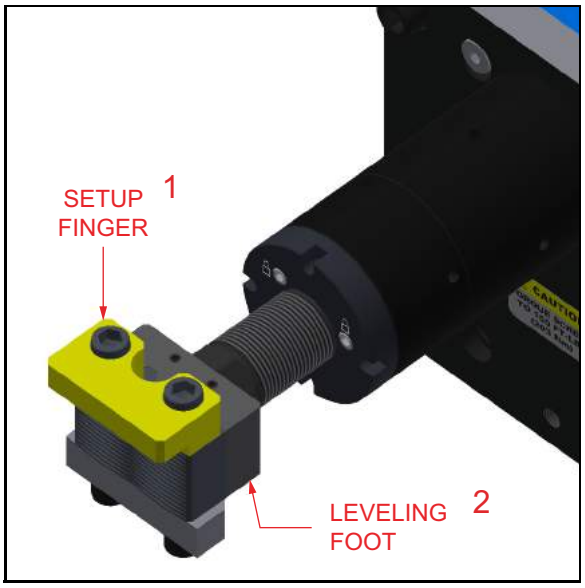


FIGURE 3-27. LEVELING FOOT AND SETUP FINGER

4. Use a simple scale to center the jacking screws. No more than 0.1" (2.54 mm) clearance is needed to allow comfortable insertion of the chuck.
5. Place the mounting chuck into the bore of the flange and tighten the leveling feet evenly with the wrench provided in the toolkit. Make sure that the setup fingers are seated evenly.
6. Adjust the jacking screws to center the machine. Set a dial indicator or other tool to the bore if the exact center is required.
7. After **securely attaching** the machine to the flange, mount a dial indicator on the machining arm and indicate the surface of the flange by manually rotating the machine.
8. Level the machine by turning the jacking screws in each of the leveling feet.
9. Tighten the leveling feet and stationary feet by torquing to the following specifications: for milling, 175 ft-lb (237 Nm); for single-point, 85 ft-lbs (115 Nm).
10. Check the machine for level once again.
11. Repeat this procedure until the machine is aligned.

FIGURE 3-28. DIAL INDICATOR LOCATION

12. Secure the chuck by tightening the three locking socket head set screws.
13. Check the machine for level once again.
14. Repeat this procedure until the machine is aligned.
15. Make sure that the machine is secure in the fixture.

16. Remove the setup fingers.

⚠ CAUTION

Use only the small wrench on the jam nuts. Do not use excess force by using a larger wrench, which could damage the machine.

3.16 FEED SYSTEM AND FEED BOX

The feed system includes a flow control at the 3-way control valve that is set at the factory at 5 scfm.

NOTICE

CLIMAX recommends that you do not adjust this valve.

FIGURE 3-29. FLOW CONTROL

The machines are fitted with a remote feed box adjustment at the air shut-off valve. All adjustments to the feed rate are done from this point. The air supply lines to the feed box are supplied in two sizes: 1/4" (6.35 mm) and 1/8" (3.2 mm). This prevents accidentally swapping hoses.

The feed box only feeds in one direction, without a setup change.

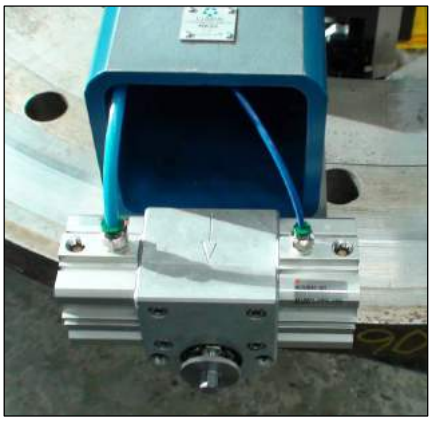


FIGURE 3-30. FEED BOX AIR SUPPLY LINES

To reverse the direction, it is not necessary to disconnect the hoses. Do the following:

1. Remove the feed shaft and two bolts connecting it to the arm.

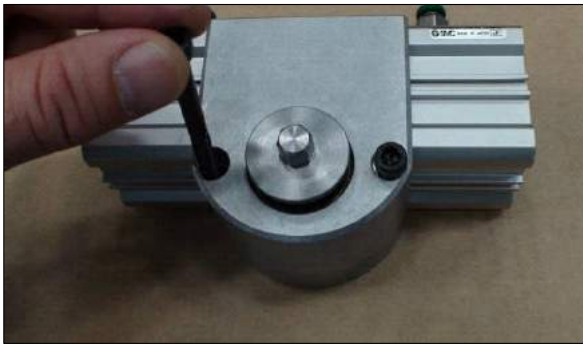


FIGURE 3-31. DETAIL OF FEED SHAFT BOLTS

2. Rotate the feed box until the arrow points in the desired feed direction.
3. Reinstall the bolts and feed shaft.

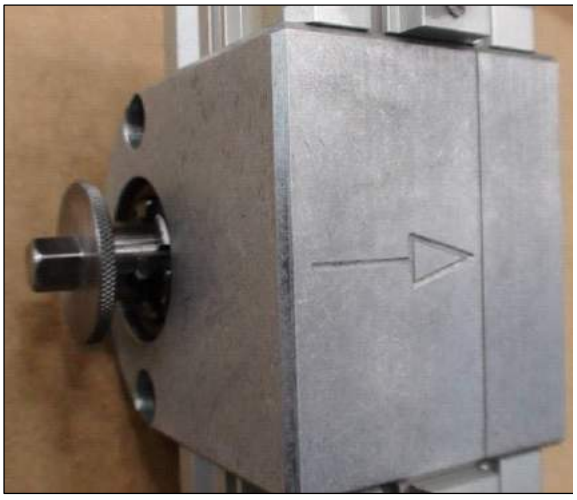


FIGURE 3-32. DETAIL OF FEED DIRECTION

This feed box has two positions: engaged (shown on the right in Figure 3-33) and disengaged/neutral (shown on the left in Figure 3-33).

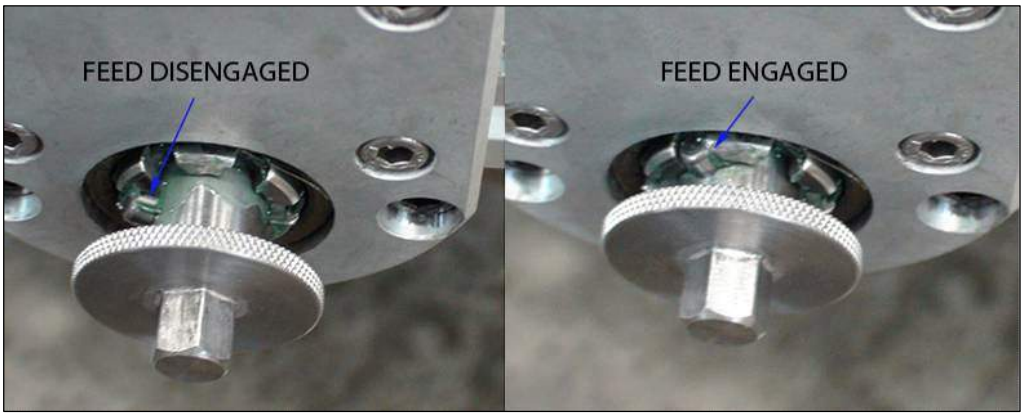


FIGURE 3-33. FEED BOX POSITIONS

In neutral, the tool may be manually fed in either direction. Hoses connected to the feed box should have approximately 12" (305 mm) of extra length coiled inside the arm to allow the arm to move and still keep the hoses clear of snag hazards.

To disconnect the feed hoses, press down on the collar around the hose and pull the hose out.

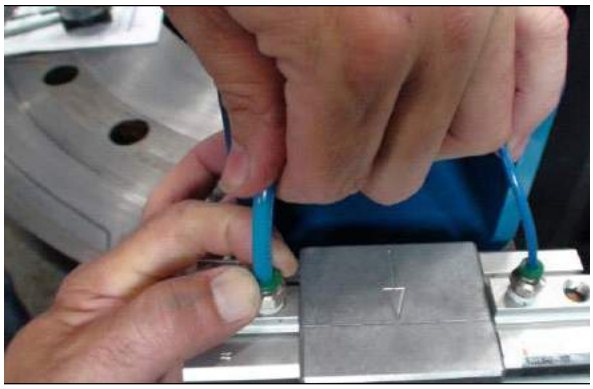


FIGURE 3-34. DISCONNECTING FEED HOSES

3.17 SINGLE POINT TURNING WITH THE MILLING ARM OPTION

Use the supplied ratchet box wrench (P/N 48854 3/8" / 7/16") to operate the feed box in this configuration.

⚠ CAUTION

When single point turning with the milling arm, use the supplied ratchet box wrench for the feed box not the hand wheel. This will prevent the creation of a pinch point.

3.18 SURFACE MOUNTING (OPTIONAL EQUIPMENT)

The surface mount kit provides the ability to use the FF8200 in situations where the regular inside diameter mount cannot be used, or where the outside diameter chuck would be cumbersome and not as rigid as a surface mount. The surface mount kit can also be used in back facing applications, or where there is a need to machine up to or past the outside dimension and there is no way to mount the FF8200.

The surface mount kit (P/N 79540) does not change the operation of the FF8200.

The FF8200 machine is very heavy. Use the appropriate lifting equipment when lifting the machine. Only lift the machine by all the lifting points for stability. The machine can be broken down into smaller sections for easier lifting. Do not lift the machine by the drive motors, pneumatic lines, controls, machining arm, back face attachment, machining arm, or counterweight lifting points.

WARNING

Falling or uncontrolled swinging of machinery can cause serious injury or be fatal to the operator and bystanders. Lift the machine by the lifting eyes.

For face mounting the machine during single point machining, it is important to use the counterweight arm to balance the machine load.

Do not remove any machine parts while the machine is vertical, unless you are sure the parts and the machine are secured.

WARNING

Do not remove the drive motor while the machine is vertical. This will release the machine and it will settle to the heaviest point of gravity very quickly. Uncontrolled rotation of the machine can damage the machine or cause severe personnel injury or death.

Table 3-7 identifies the text in Figure 3-35 on page 43.

TABLE 3-7. SURFACE MOUNT DIMENSIONS IDENTIFICATION

Number	Component
1	Tool arm assembly 45–120" (1,143–3,048 mm) range
2	Rotary table
3	Counterweight assembly
4	Surface mount
5	Clearance with tool head fully retracted 1.38" (35.05 mm) with turning arm, single point only 1.36" (34.54 mm) with milling arm with milling head or single-point head 1.25" (31.75 mm) with milling arm or turning arm and grinder
6	36.0" (914 mm) minimum mounting diameter

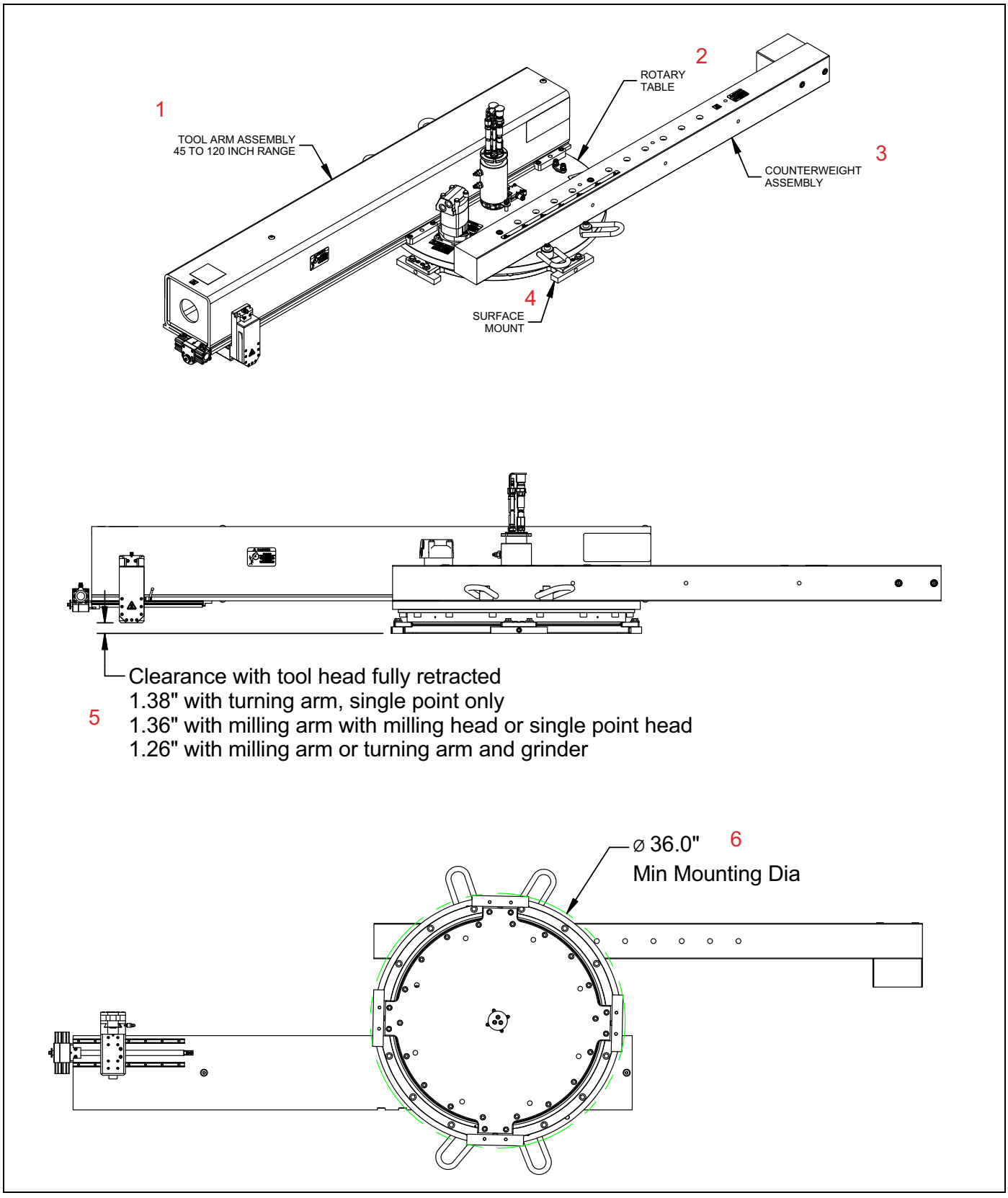


FIGURE 3-35. SURFACE MOUNT SINGLE-POINT DIMENSIONS

3.18.1 Surface mount kit setup

Complete the following procedure to assemble the machine for surface mounted facing:

1. Remove the legs and mounting feet from the chuck.
2. Lift the machine by two of the hoist rings and invert the machine so that the bolts connecting the chuck to the rotary table are accessible.
3. Place the inverted rotary table on block so that the counterweight arm and machining arm are beneath the rotary table.

⚠ DANGER

Follow all company lifting procedures and use caution when lifting and inverting the machine to avoid dropping or damaging the machine components.

Check that the rotary union will not be damaged when the machine is placed on supports. Falling machinery may result in serious injury or death.

4. Remove the eight fasteners that secure the chuck to the rotary table (see Figure 3-36). There are M16 bolts for the FF7200 and M20 bolts for the FF8200.
5. Remove the chuck from the bottom of the FF8200.

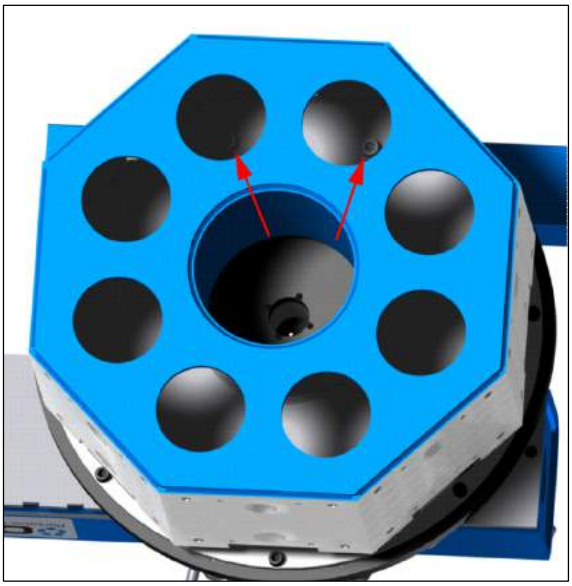


FIGURE 3-36. REMOVING BOLTS FROM CHUCK

6. Attach the plate extensions to the bottom plate, as shown in Figure 3-37.

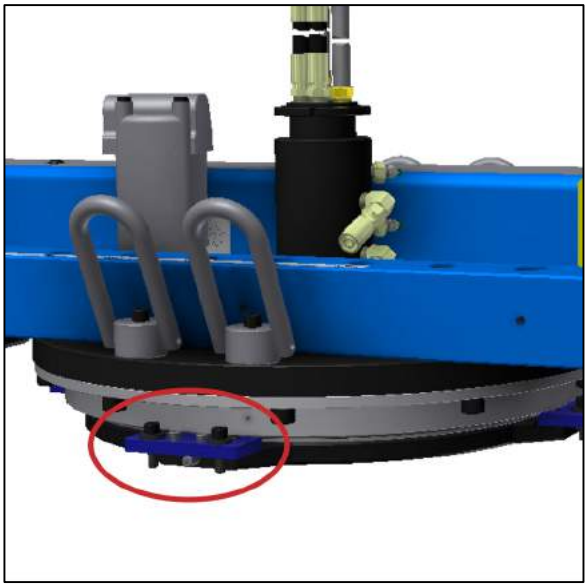


FIGURE 3-37. ATTACHING EXTENSION PLATES

7. Attach the tack weld plates to the plate extensions using the supplied bolts, as shown in Figure 3-38 and Figure 3-39 on page 46.
8. Center the machine on the workpiece so that it is within ± 0.200" (5 mm).
9. Attach the tack weld plates to the workpiece by either tack welding, clamping, or bolting.

FIGURE 3-38. ATTACHING TACK WELD PLATE

The tack weld plates may be modified as required to secure the machine to the surface of the workpiece.

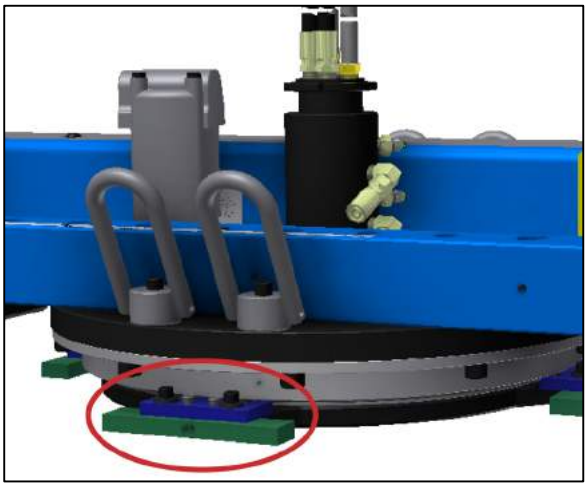


FIGURE 3-39. SURFACE MOUNT KIT ASSEMBLY

⚠ WARNING

Use a minimum of 2" (50 mm) or 1/4" (6 mm) weld on every tack weld plate.

Confirm the weld correctly attaches the rotary table to the workpiece before removing the machine from the rigging.

Do not weld over the centering setscrew hole in the tack weld plate.

3.18.2 Centering and leveling the machine

The surface mount kit (P/N 79540) has two leveling setscrews and one centering setscrew per plate extension/tack weld plate combination, as shown in Figure 3-40.

TABLE 3-8. LEVELING AND CENTERING SET SCREW IDENTIFICATION

Number	Component
1	Leveling set screws
2	Centering set screws

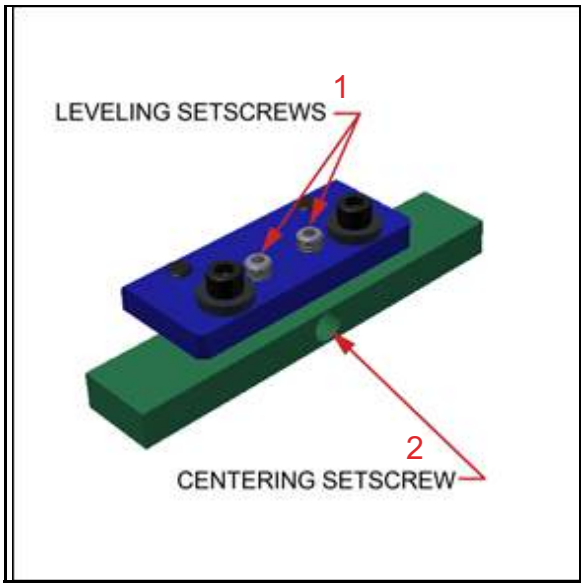


FIGURE 3-40. LOCATION OF LEVELING AND CENTERING SET SCREWS

Do the following:

1. Use the set screws to make the final leveling adjustments.
2. Level the machine using the eight leveling setscrews.

3.19 BACK FACE ATTACHMENT SETUP (OPTIONAL EQUIPMENT)

The back face attachment consists of the back face attachment and screws to mount the attachment to the machining arm.

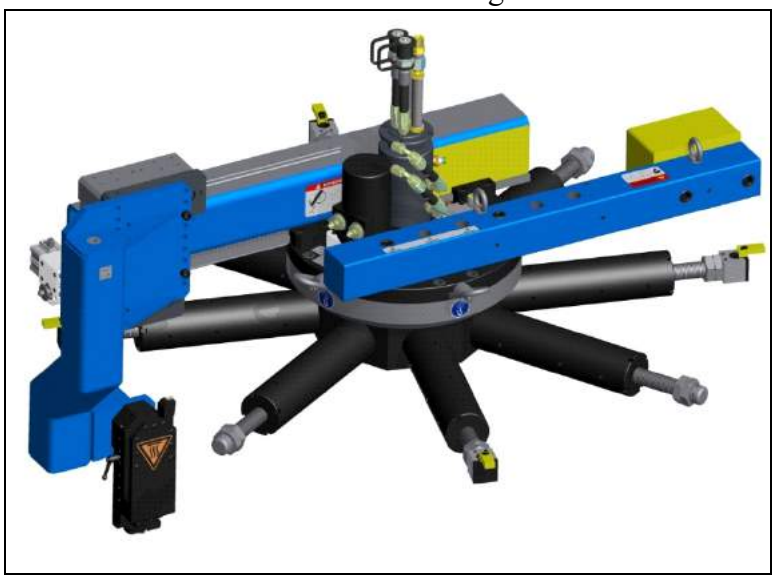


FIGURE 3-41. BACK FACING ATTACHMENT

⚠ CAUTION

Always use the counterweight arm with the back face attachment. The heavy back face attachment alone will unbalance the machine and may result in poor machined surface quality.

3.19.1 Back face attachment assembly

Do the following procedure to assemble the back face attachment.

1. Remove the five dowel pins from the milling arm plate before installing the back face attachment.

2. Attach the back face attachment to the milling arm using the four M10 socket head cap screws as shown in Figure 3-42. Tighten the cap screws to 42 ft-lb (58 Nm). The height of the back face attachment can be adjusted by using the provided mounting holes, position back face attachment based on the flange thickness.

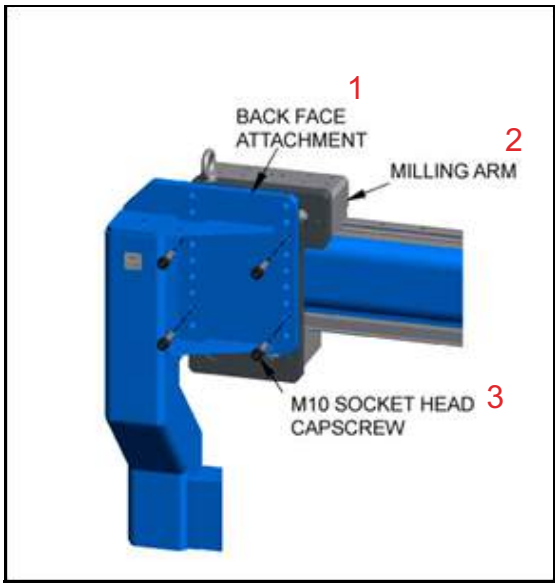


FIGURE 3-42. DETAIL OF ASSEMBLY OF BACK FACING ATTACHMENT

TABLE 3-9. BACKFACING ATTACHMENT ASSEMBLY IDENTIFICATION

Number	Component
1	Back face attachment
2	Milling arm
	M10 socket head capscrew

3. Position the machining arm based on the workpiece flange diameter (see Figure 3-43).

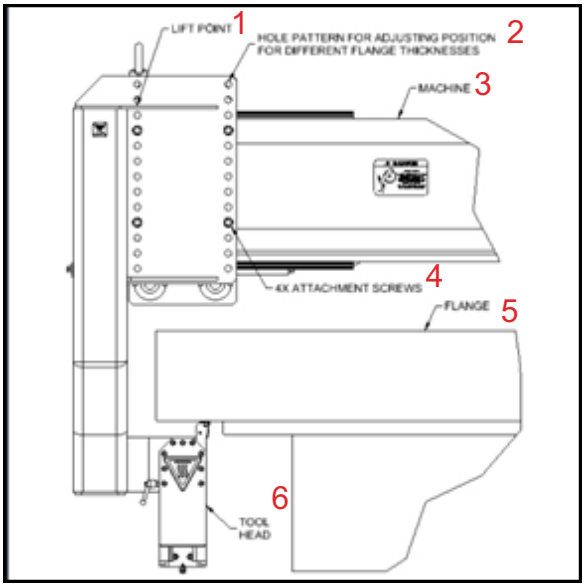


FIGURE 3-43. BACK FACING ATTACHMENT ON FLANGE

TABLE 3-10. BACKFACING ATTACHMENT ON FLANGE IDENTIFICATION

Number	Component
1	Lift point
2	Hole pattern for adjusting the position for different flange thicknesses
3	Machine
4	Four attachment screws
5	Flange
6	Tool head

4. Position the counterweight arm based on the machining arm location.

3.19.2 Tool head assembly

Attach the tooling head to the back face attachment using the M20 socket head cap screw and flat washer used to attach the tool head to the radial arm (see Figure 3-44). Tighten the cap screw to 135 ft-lb (185 Nm).

Place the cutting tool into the tool head.

NOTICE

The FF8200 is designed to trail the cutting tool behind the machining arm. The machining arm moves in a clockwise direction. Keep these characteristics in mind when installing a new tool in the machine.

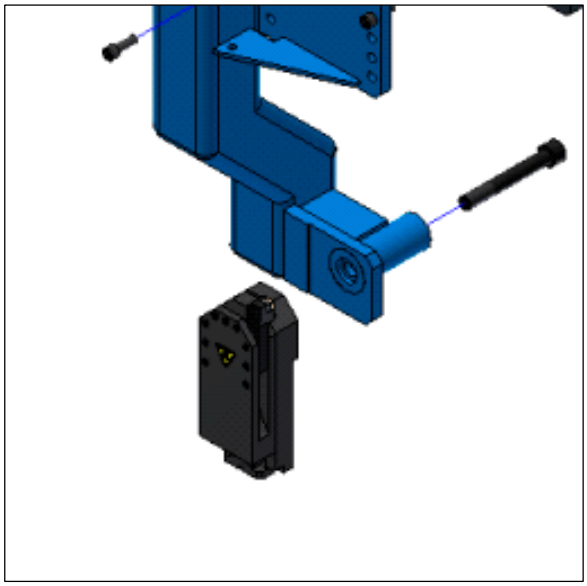


FIGURE 3-44. TOOL HEAD ASSEMBLY

3.19.3 Counterweight assembly

The counterweight should be moved out the same distance as the machining arm as described in the counterweight section. Figure 3-45 shows the arrangement when using the facing attachment.

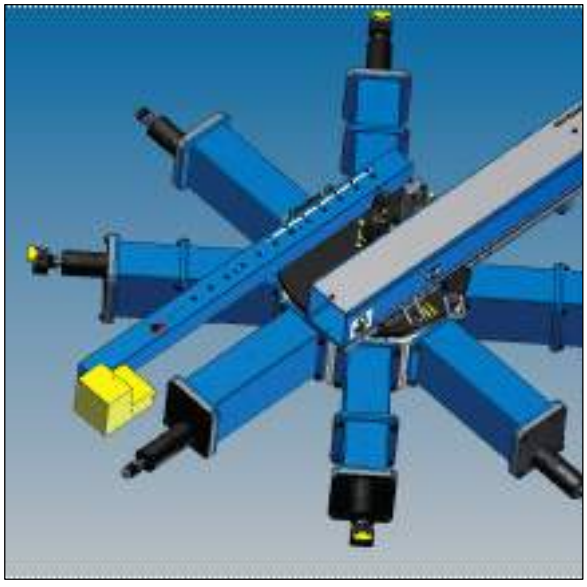


FIGURE 3-45. COUNTERWEIGHT POSITION

3.20 OD MOUNT (OPTIONAL EQUIPMENT)

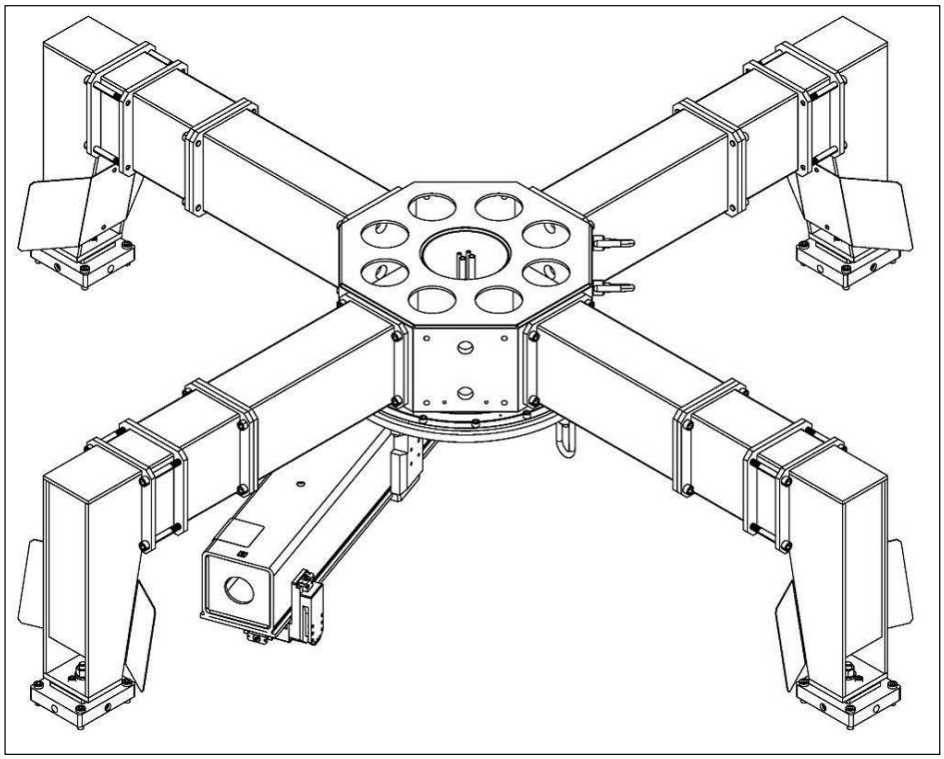


FIGURE 3-46. OD MACHINE

3.20.1 Preparation

If the machine is not setup for OD machining, then the main body or chuck of the flange facer must be rotated in order to use the OD mount.

Before rotating, the legs must be removed and the rotary union must be attached in the proper direction using the kit accessories.

⚠ WARNING

Do not reach into rotating machine during operation. Severe crushing hazard and potential for entanglement can cause serious injury or death.

Remove the tooling arm and re-attach using the OD mounts.

See Figure A-11 on page 92 and Figure A-12 on page 93 for details.

FIGURE 3-47. OD MOUNT SETUP

3.20.2 Recommended OD mounting setup for FF8200

TABLE 3-11. CHUCKING LEG SPECIFICATIONS

Maximum single point diameter	Maximum milling diameter[a]	Mounting diameter[b]	12.5" (318 mm) stand off	17.5" (445 mm) stand off	27.5" (699 mm) stand off	5" (127 mm) spacer
85" (2,159 mm)	78.5" (1,994 mm)	101.4" (2,576 mm)			1	
90" (2,286 mm)	83.5" (2,121 mm)	111.4" (2,830 mm)			1	1
100" (2,540 mm)	93.5" (2,375 mm)	116.4" (2,957 mm)	1	1		1
110" (2,794 mm)	103.5" (2,629 mm)	126.4" (3,211 mm)	1		1	
120" (3,048 mm)	113.5" (2,883 mm)	136.4" (3,465 mm)	1		1	1

a. Denotes diameter to center of milling spindle. Add diameter of cutter to get full milling reach.

b. Diameter denotes location of center of clearance hole in setup foot. Can be adjusted slightly to fit need. Scab plates are required to mount to diameters smaller than listed to allow for minimum swing clearance. The sizes of these scab plates are unique to each application and are not supplied by CLIMAX.

Do the following while referring to Figure 3-48:

1. Remove the four arm clamps from the rotary table.
2. Remove the rotary union.
3. Install the clamp risers onto the top plate, making sure to note the location of the safety clamp risers.
4. Install the cam feed OD mount onto the rotary union.
5. Install one 1/2 NPT coupler onto each pipe.

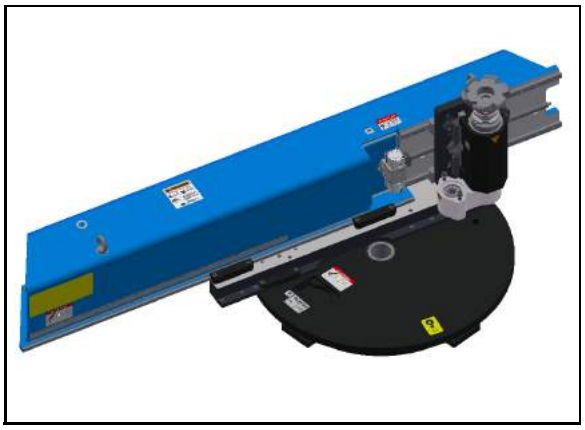


FIGURE 3-48. OD MOUNT ROTARY TABLE AND ARM ASSEMBLY

6. Install hoses on to each coupler.
7. Install the 2 x 12" (51 x 305 mm) pipe into the rotary union so that they are not in adjacent holes but across from each other.
8. Install the 2 x 14" (51 x 356 mm) pipe into the rotary union using the remaining two holes.
9. Pass the hoses and pipe through the center of the rotary table and install the rotary union to the rotary table.
10. Install the circular post.
11. Turn the arm over.
12. Reassemble the clamps on the risers, attach torque restraint sheet metal and install shoulder screw.

Complete the following steps while referring to Figure 3-26 on page 37:

1. Determine the workpiece diameter.
2. Assemble long ID chuck sections and vertical leg components using the M20 screws.
3. Apply Never-Seez (provided in the tool kit) or any other anti-seize compound to the threads and contacting faces of each leg section before screwing them together (see Figure 3-26 on page 37).
4. Check that the area is clear and carefully rotate the machine onto the opposite using a strap around a chuck leg.

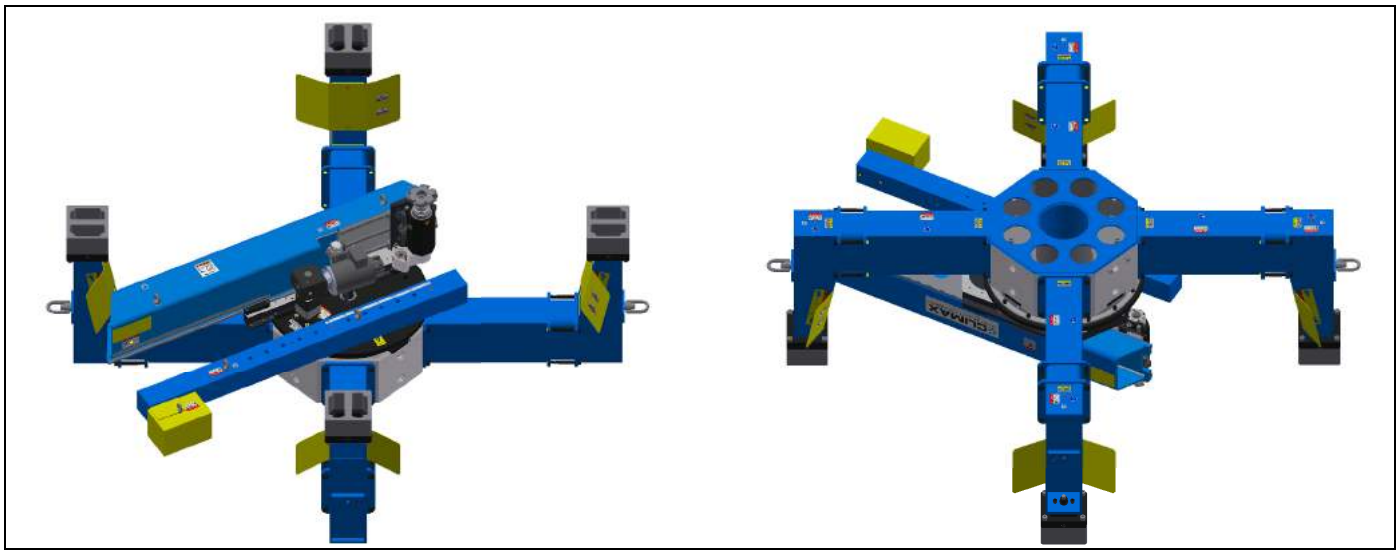


FIGURE 3-49. BLOCK RISER AND LEG ASSEMBLY

5. Weld on tack weld plates to quadrants of the fixture on the underside or flush to the top surface (2x9x18 minimum dimensions).

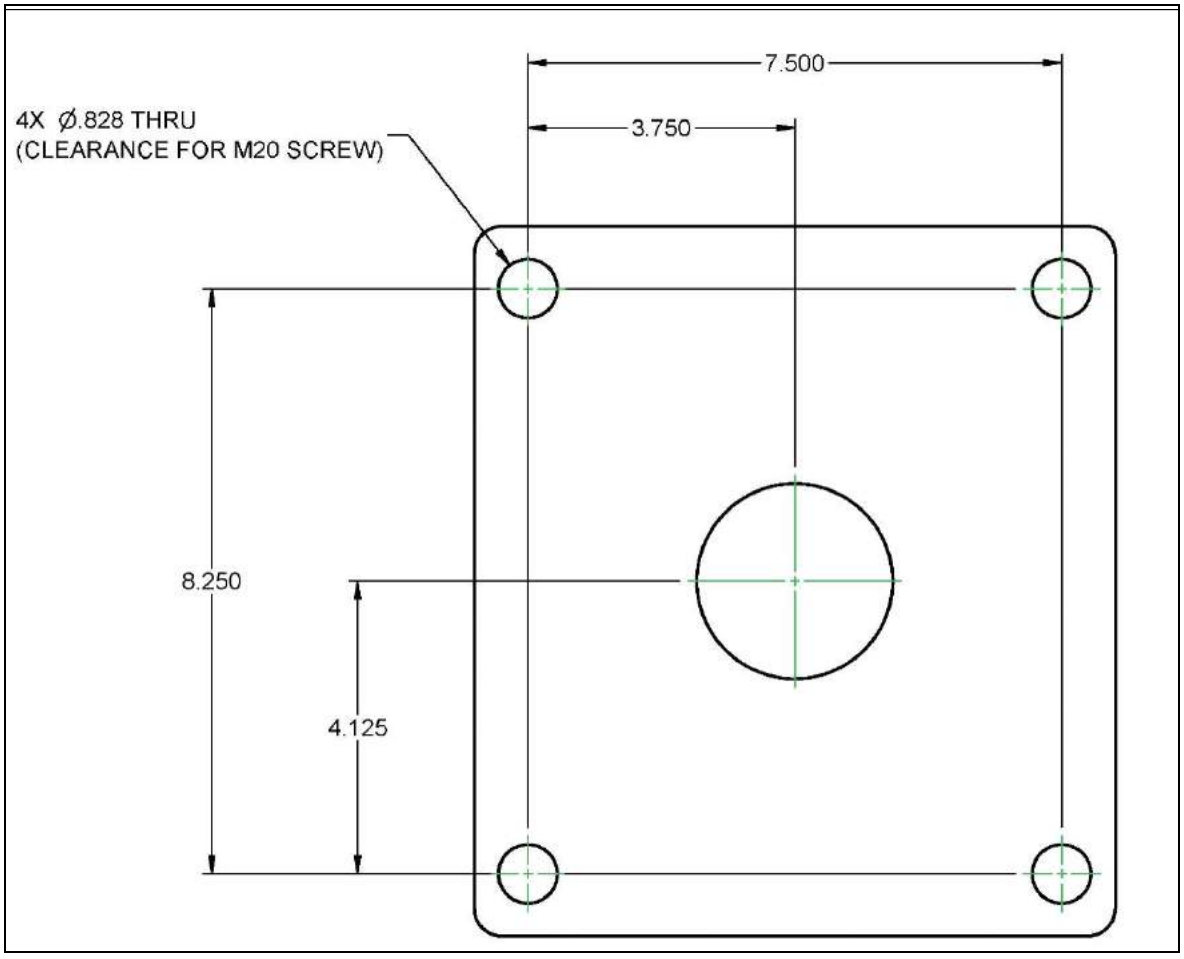


FIGURE 3-50. DIMENSIONS OF TACK WELD PLATES

6. Match drill and tap mounting hole pattern M20 x 2.5. (Inside hole dimension is 93.5").

⚠ WARNING

Do not remove the support rigging until the machine is completely secured by all fixed and adjustable legs.

7. Install the proper foot sections.
8. Leave leveling and centering fasteners loose for later setup steps.
9. Lift the assembly using the legs or holes in the chuck hub.
10. Carefully lower the machine on the studs.
11. Adjust the feet as necessary.
12. Adjust the machine parallel to the work piece. Measure from the tool head to the workpiece using a dial indicator.
13. Zero the indicators positioned over one set of legs, and then rotate 180º. While monitoring the indicators you may adjust the machine using the leveling legs. Check that they are both moving in the appropriate direction evenly. Move to the leg that is 90º from the first leg.
14. Repeat this process until you have achieved the desired alignment.
15. After all machine legs have been tightened, check alignment before you operate the machine. Check alignment periodically during machine operation.

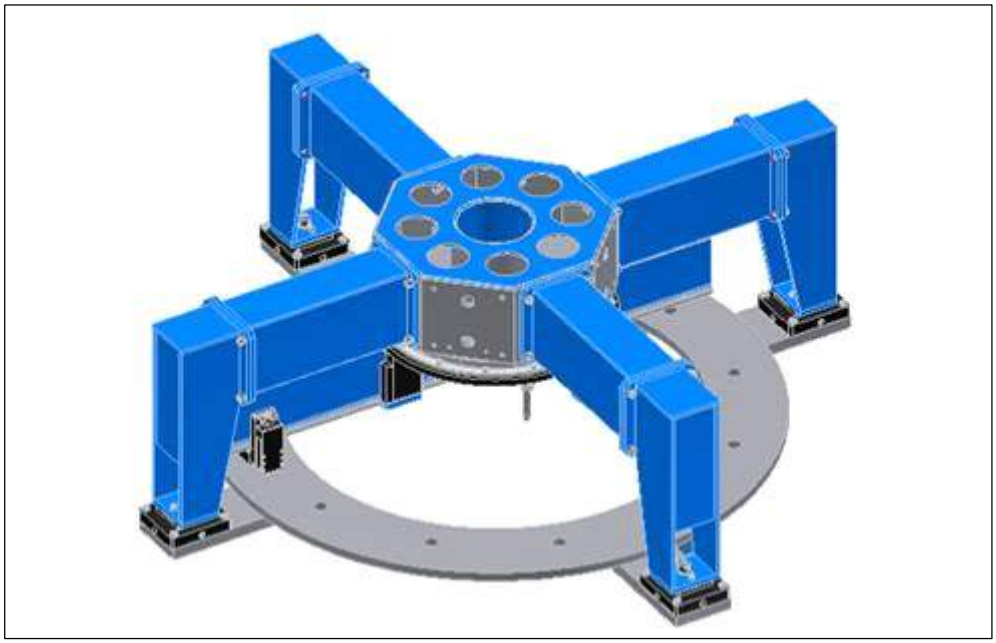


FIGURE 3-51. FIXTURE AND VERTICAL ASSEMBLY

16. Check that all fasteners are tight.

3.21 MILLING HEAD (OPTIONAL EQUIPMENT)

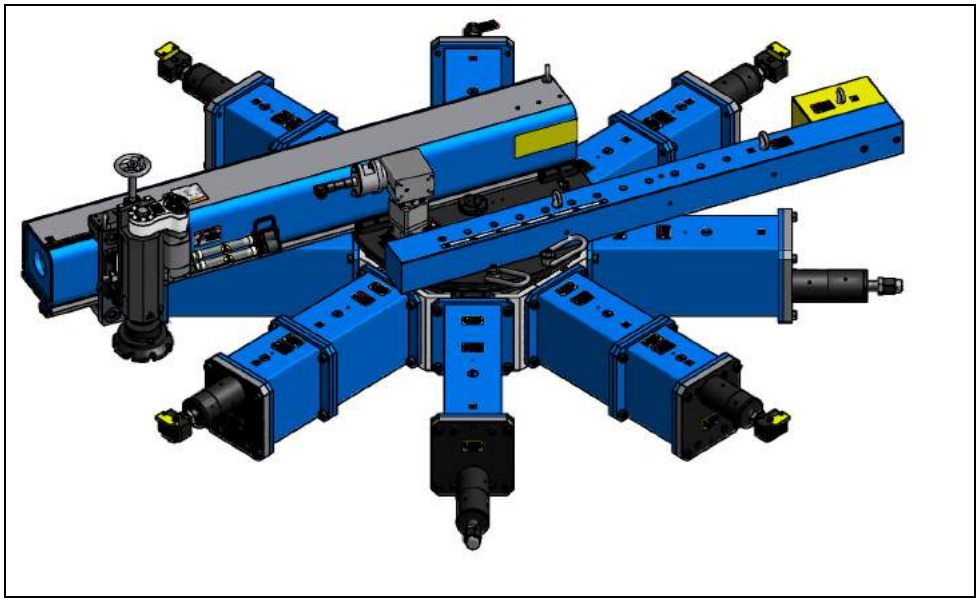


FIGURE 3-52. FF8200 WITH ID MOUNT

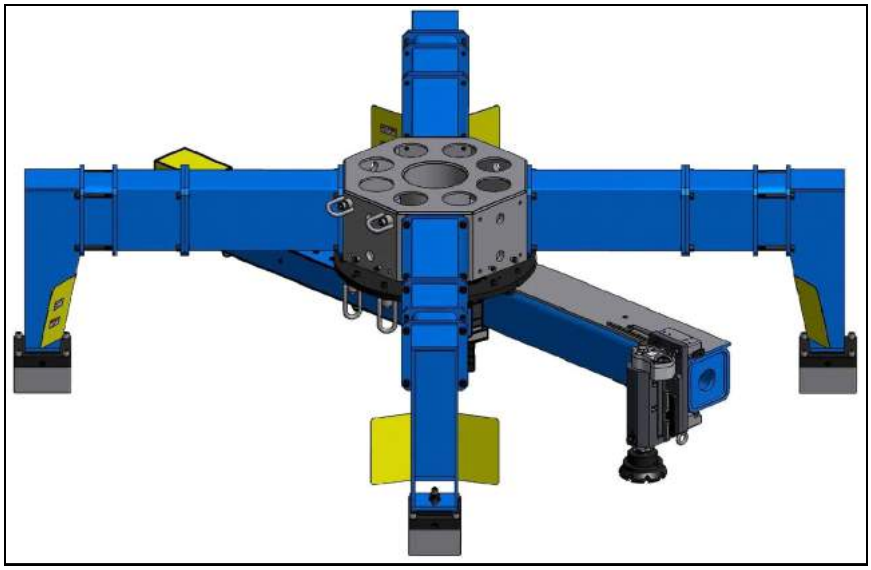


FIGURE 3-53. FF8200 WITH OD MOUNT

For some milling applications of the FF8200, the gearbox may interfere with other components. The gearbox can be rotated to the positions shown in Figure 3-54 to prevent collisions between components.

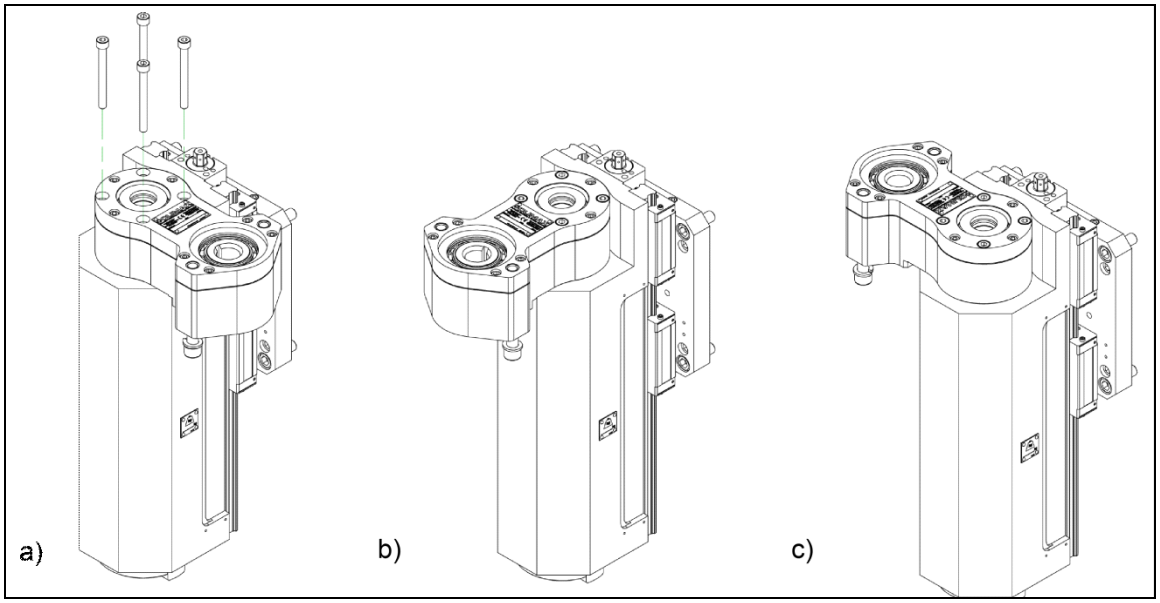


FIGURE 3-54. GEAR BOX ROTATION

Do the following to rotate the gear box:

1. Clean off any chips or debris around the gearbox.
2. Remove the four screws from the locations shown in Figure 3-54-a.
3. Rotate the gearbox 90 or 180 degrees to the necessary position, shown in Figure 3-54 b or c.

NOTICE

Do not lift the gearbox off of the milling head when rotating. This will prevent any contaminant from entering the gear box and milling head that would damage the internal components.

4. Reinstall the four screws.

3.21.1 Quick setup

3.21.1.1 Milling attachment setup

Do the following to set up the milling attachment:

1. Install the milling head assembly to the machine.
2. Install the machine into the work piece (hydraulic/hydraulic machines must be operated using a dual pump 25 hp HPU).
3. Attach all hoses.

4. Adjust the drag brake as necessary.

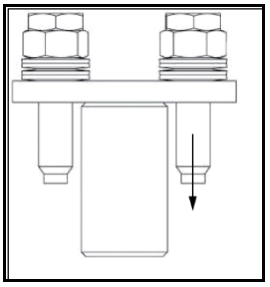


FIGURE 3-55. DRAG BRAKE

NOTICE

The drag brake should be adjusted so that the machine does not rotate under load. This is done by tightening the two bolts that press down on the cylinder.

⚠ CAUTION

Before operation, make sure all guards are in place and all fasteners are tight.

3.21.1.2 Operating

Do the following to operate the milling attachment:

1. Extend the spindle to touch the surface.
2. Take a skim cut to test the settings.
3. Check the finish.
4. Adjust as necessary.

3.21.2 Installing the milling head cutter

Do the following to install the milling head cutter:

1. Check that the cutter is sharp and free of nicks.
2. Check that the spindle is completely stopped and machine power is locked out.
3. Clean dirt and chips from the spindle surface.
4. Insert the cutter into the spindle. Be sure the cutter is engaged.
5. Fasten securely.

3.21.2.1 Tool setup

The milling head has four tramming screws adjacent to the mounting screws of the housing. This allows the milling head to be jacked away from the adapter plate to tram the vertical orientation of the spindle. On top of the plate there are also two additional screws for adjusting the tilt of the milling head.

Since the milling head is mounted on a center pivot, the angle of the milling head must be aligned before machining can begin. This adjustment is made using the adjustment screws in the blocks mounted either below or above the housing. The rotational adjustment screws allow the housing to be rotated slightly to achieve vertical or horizontal orientation relative to the machining arm.

Adjusting the milling head and spindle

To adjust the milling head and spindle, do the following:

1. Loosen the lock.
2. Adjust the milling head and spindle.
3. Use the DRO to position the milling head.
4. Tighten the lock before machining.

Tramming the spindle to the table

Spindle tramming is the process of orienting the spindle.

NOTICE

The spindle must be oriented perpendicular to the machine tool itself rather than to the workpiece, which is not a reliable reference point.

Do the following to tram the spindle:

1. If the spindle drive motor is installed, remove it from the spindle gearbox to allow easy hand-rotation of the spindle.
2. Install a magnetic-base dial indicator to the body of the face milling cutter.

TIP:

A right-angle fixture oriented from the linear slide rail can serve as a reference point that is perpendicular to the milling arm.

FIGURE 3-56. DIAL INDICATOR INSTALLED

3. Extend the indicator out to make contact with the bottom of the machine ram surface.
4. With the stylus of the indicator touching the ram surface, set the dial of the indicator to zero.

FIGURE 3-57. CONTACT BETWEEN INDICATOR AND MACHINE RAM SURFACE

5. Rotate the spindle 180° to the machine ram surface.

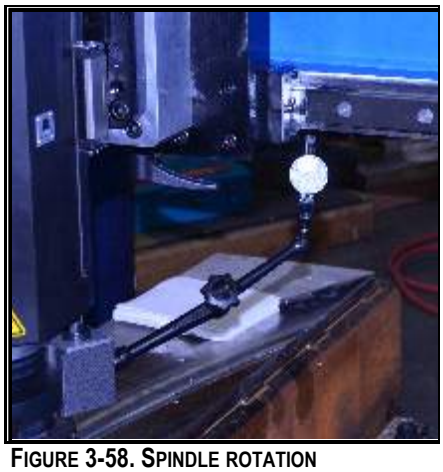


FIGURE 3-58. SPINDLE ROTATION

TIP:

With the standard spindle, the angle is limited to ±1°. If a greater angle is needed, a swivel head adapter will be needed. For further information, contact CLIMAX.

6. Note the dial reading. If it is more than 0.001" (0.03 mm) out of tramming tolerance, do the following:
   a) Loosen the four cap screws so that they are just slightly snug (between 1–3 ft-lb ([1–4 Nm]), as shown in Figure 3-40 on page 46, so that the tramming setscrews can adjust the plate.

NOTICE

There are two cap screws on each side of the milling head, which is mounted in the center of the tramming plate shown in Figure 3-59.

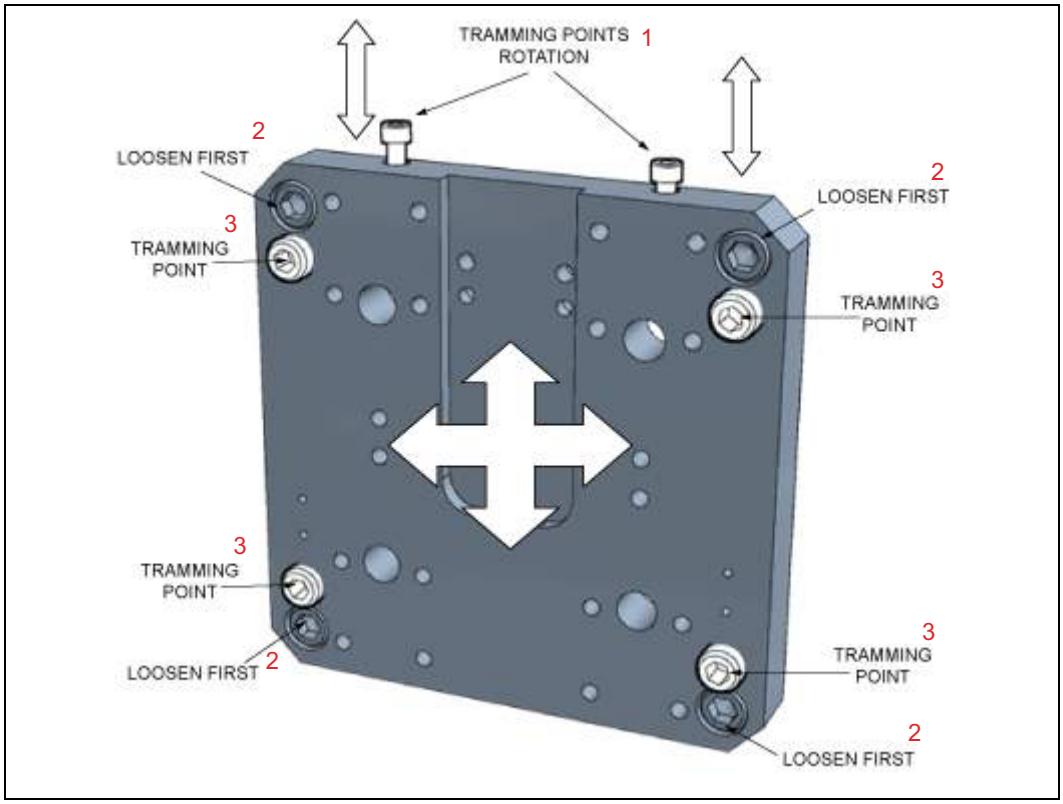


FIGURE 3-59. TRAMMING DIAGRAM

TABLE 3-12. TRAMMING IDENTIFICATION

Number	Component
1	Tramming points rotation
2	Loosen first
3	Tramming point

b) Adjust the Y-axis screws until the indicator reads within 0.001" (0.03 mm). See Figure 3-60.

FIGURE 3-60. Y-AXIS SCREW ADJUSTMENT

c) Adjust the X-axis screws (where shown in Figure 3-61) until the indicator reads within 0.001” (0.03 mm).

7. Repeat the process of sweeping the indicator at the 0° and 180° locations and adjusting the spindle orientation until the same reading is achieved at both locations.
8. Once both axes are within tolerance, tighten the mounting bolts to 45 ft-lbs (61 Nm).

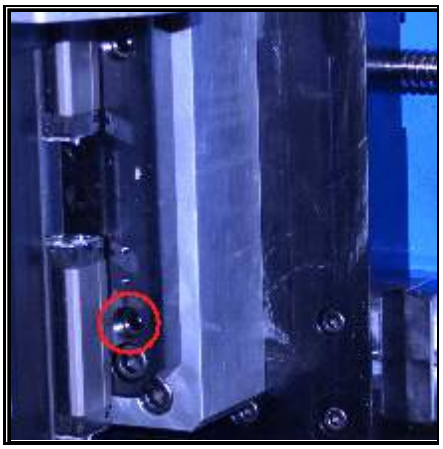


FIGURE 3-61. X-AXIS SCREW LOCATION

TIP:

Keep the dial indicator installed during the final tightening of the mounting screws, so you can recheck that the housing does not move during tensioning.

9. Reinstall the spindle drive motor (if necessary).

When ready to operate the machine, note the machined surface after the first pass.

A crosshatched pattern is the optimal result, as shown in the right of Figure 3-62.

If the results are heel-edged, as shown in the left of Figure 3-62, adjust the X-axis screws according to step c.

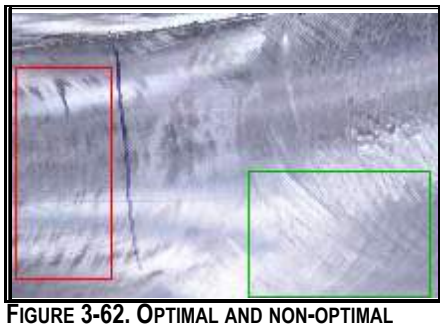


FIGURE 3-62. OPTIMAL AND NON-OPTIMAL RESULTS

3.21.2.2 Machining

For vertical applications, install the counterweight arm and balance the machine before lifting it into the vertical position.

1. Complete the risk assessment checklist in Table 1-2 on page 5.
2. Connect electrical power to the hydraulic power unit.
3. Check that the system reset button is released.
4. Turn on the main power.
5. Turn the feed to minimum.
6. Before putting the cutter near the work piece, test the travel direction of all axes to make sure that the settings match the direction you want to machine.
7. Turn on the spindle and check the rotation direction of the cutter. If it is rotating the incorrect direction, do the following:
    a) Turn off the spindle.
    b) Press the E-Stop button.
    c) Lock out the HPU.
    d) Switch hydraulic hoses either at the motor end or at the HPU to correct the rotation.
    e) Restart the spindle and verify the correct rotation direction of the cutter.
8. Move the machine axes to the desired starting location.
9. Advance the cutter to the desire cutting depth. Lock in place.
10. Turn on the spindle and adjust the speed to the desired cutting rate.
11. Turn the feed to minimum.
12. Engage the feed and adjust the feed speed for the desired cut.
13. Adjusting the machine when the cut is complete.

3.21.2.3 Adjusting the machine when the cut is complete

NOTICE

During milling operations, keep chips clear of moving parts.

Do not step on hoses or cables. Metal chips can be forced through the cable jacket and damage cabling causing machine malfunction and downtime.

When the cut is complete, do the following:

1. Reduce the feed speed to minimum and stop the feed.
2. Adjust the machine direction or depth of cut as needed.
3. Start the feed again and resume cutting until the desired milling area is completed.

When the milling is complete, do the following:

1. Stop the feed.
2. Retract from the work piece.
3. Stop the spindle
4. Press the E-stop.

⚠ CAUTION

Lock out the HPU before removing the cutter or replacing inserts. Stopping the spindle while the feed is running causes broken inserts.

3.22 SWIVEL HEAD AND COUNTERWEIGHT ADAPTER PLATE (OPTIONAL EQUIPMENT)

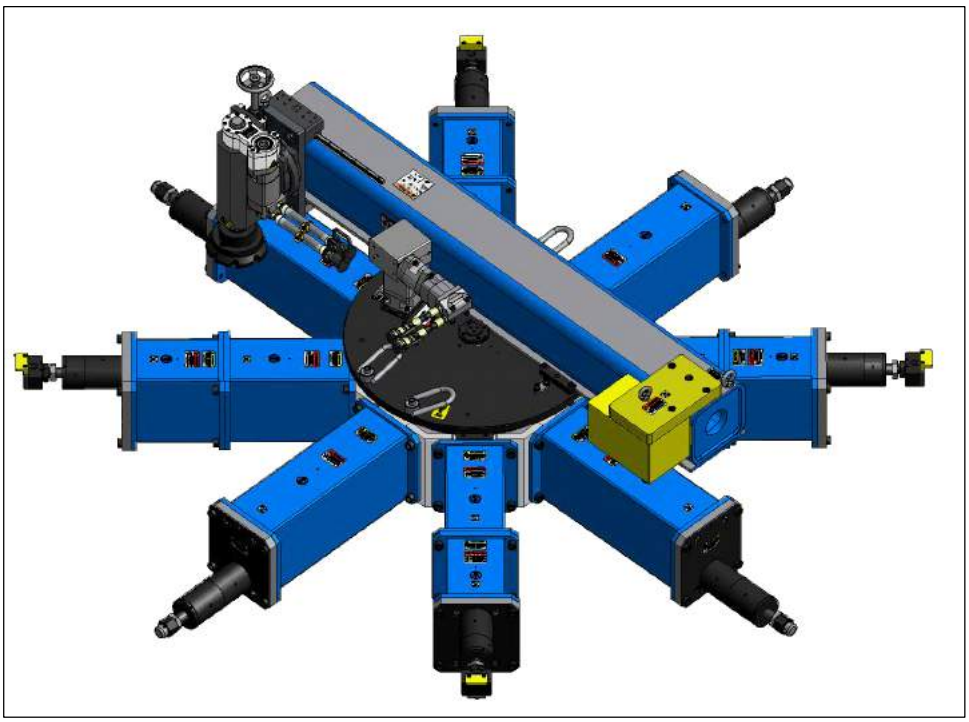


FIGURE 3-63. ID MOUNT WITH SWIVEL HEAD COUNTERWEIGHT ADAPTER PLATE

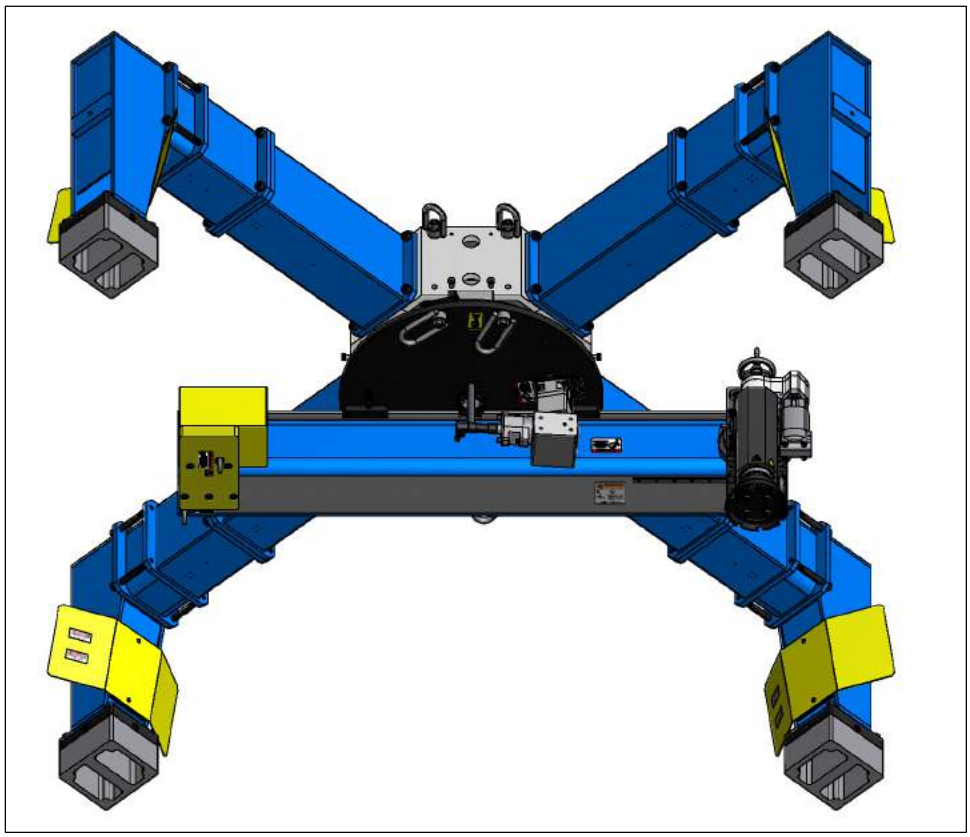


FIGURE 3-64. OD MOUNT WITH SWIVEL HEAD COUNTERWEIGHT ADAPTER PLATE

Optional swivel head

P/N 83125 is an optional swivel head kit for use with the tool head (see Figure 3-65). A counterweight adapter plate is included to move the counterweight to the milling arm when the machining certain diameters.

TABLE 3-13. COUNTERWEIGHT ADAPTER PLATE IDENTIFICATION

Component
Swivel plate (P/N 63250)
Counterweight adaptor plate (P/N 83095)

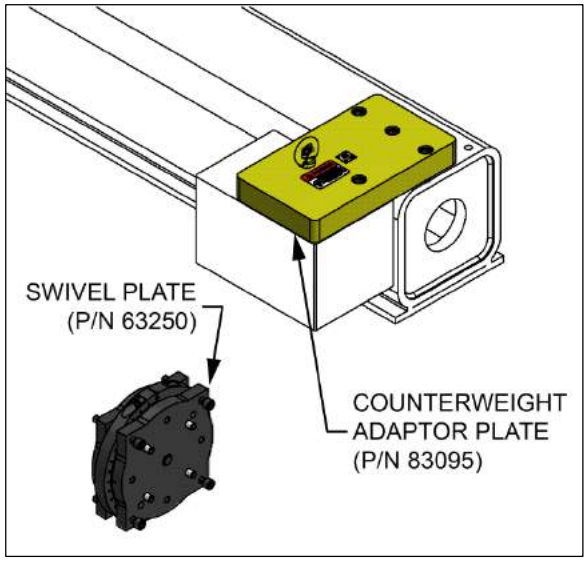


FIGURE 3-65. SWIVEL HEAD AND COUNTERWEIGHT ADAPTER PLATE

See Section 3.11 on page 29 for more information.

3.23 GRINDING HEAD (OPTIONAL EQUIPMENT)

The grinding head is attached to the single-point tool head. The single-point tool head may be mounted to the milling tool arm as well as the single-point tool arm. See Figure A-9 on page 90, Figure A-10 on page 91, and Figure 3-35 on page 43 for detail on the single-point tool head and grinder attachment.

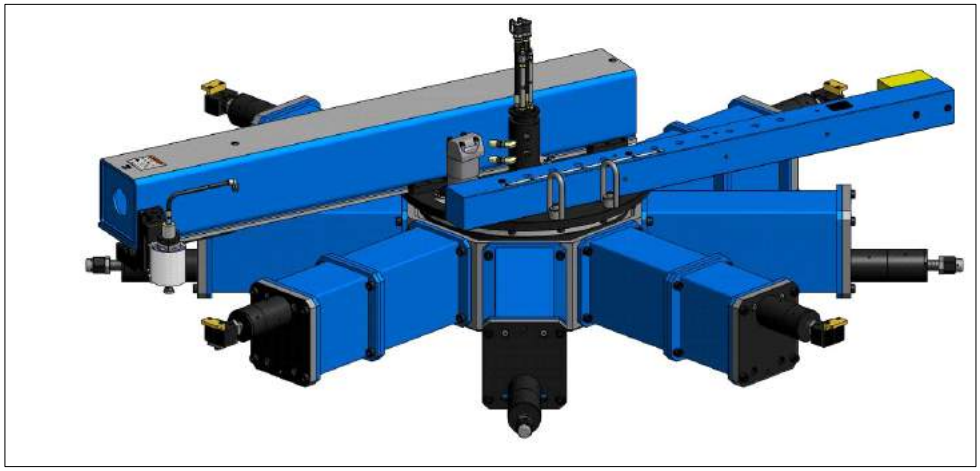


FIGURE 3-66. ID MOUNT FLANGE FACER WITH GRINDING HEAD

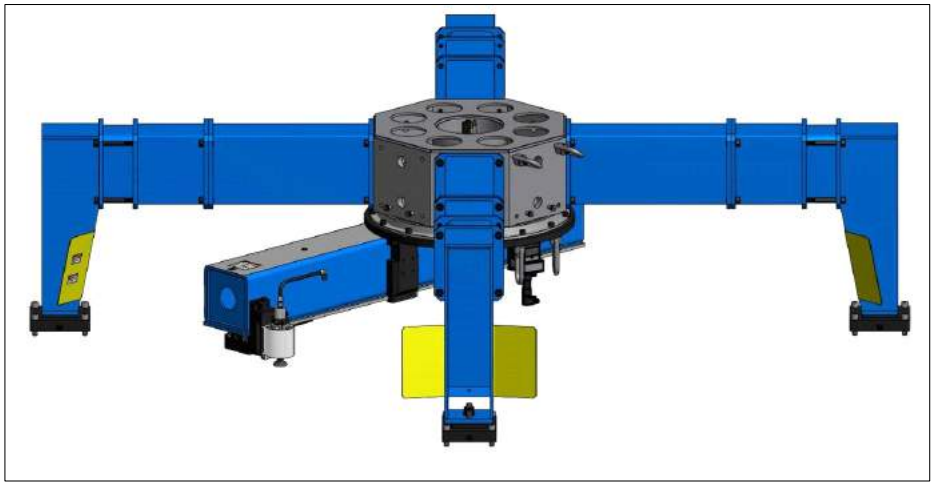


FIGURE 3-67. OD MOUNT FLANGE FACER WITH GRINDING HEAD

⚠ CAUTION

Stay clear of the grinder and wear proper respiratory protection during operation, to avoid breathing in grinding residue.

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4 OPERATION

IN THIS CHAPTER:

Do not operate this machine without adequate training to fully understand the safe setup, operation, and maintenance procedures.

⚠ WARNING

To avoid serious personal injury, keep clear of moving machinery during operation. Always be aware of the location of all personnel near the machine.

4.1 PRE-OPERATION CHECKS

⚠ WARNING

Rotating machinery can seriously injure the operator. Turn off and lock out the machine before making the pre-start checks.

Before operating the machine, complete the risk assessment checklist in Table 1-2 on page 5 and always check for the following items:

- All energy supplies are off and the system reset button is released.
- The machine control/observation area will not be in the path of hot flying chips during machine operation.
- Lines are properly connected.
- The machine is securely mounted to the workpiece and leveled or aligned to the job's requirements.
- The milling head is properly set up, according to the instructions in Section 3.21 on page 55.

- The milling cutter is securely mounted, according to the instructions in Section 3.21.2 on page 57.
- All machine parts, including the tool head, tool holder, tool bit, chucks, and clamps are secure.
- The tool head is set at the desired angle.
- The tool condition and sharpness are adequate.
- The feed direction and rate are set correctly.
- The machining arm and counterweight arm are secured to the turntable.

⚠ CAUTION

Make sure that the machine (including the spindle and all movable parts) can rotate without collisions.

- The turning and counterweight arm mounting bolts are tight.
- All the jacking screws are tight (for milling, 175 ft-lb (237 Nm); for single-point, 85 ft-lbs (115 Nm).
- The turning and counterweight arm mounting bolts are tight. Torque the machining arm mounting bolts to 45 ft-lbs (61 Nm), and torque the counterweight arm mounting bolts to 55 ft-lbs (75 Nm).
- The rigging has been removed from the machine. Do not remove the lifting eyes.
- All handles and tools are removed from the machine.
- The machine is clean of all metal chips and other debris, which could damage the machine and degrade performance.
- The work area is clear of non-essential personnel and equipment.
- Cables and hoses are secured away from the path of moving machine parts.

FIGURE 4-1. EXAMPLE OF SECURED HOSES

⚠ CAUTION

Metal chips and other debris can damage the machine and degrade its performance. Check that all metal chips and other debris are removed from the machine before and after each use.

4.2 SAFE OPERATING RANGES

Table 4-1 shows the milling cutter surface feet per minute (sfpm) and standard meters per minute (smpm) for a given tool or cutter diameter and hydraulic motor size at 20 gallons per minute (gpm) or 75.7 liters per minute (lpm).

⚠ CAUTION

Do not pick a motor and tool combination that is less than 150 sfpm at 20 gpm (75.7 lpm). The resulting peak force at the cutter could damage the machine. It is acceptable to run a tool at less than 150 sfpm as long as at 20 gpm (75.7 lpm) it is greater than 150 sfpm.

If the operator chooses to run the machine beyond the design limitations, they do so at their own risk.

TABLE 4-1. MAXIMUM MILLING CUTTER SFPM CAPABLE FROM THE HYDRAULIC MOTOR AT 20 GPM

Tooling diameter	Optional hydraulic motor sizes							
	6.2 cu-in (101.6 cu-cm)	8.0 cu-in (131 cu-cm)	9.6 cu-in (157.3 cu-cm)	11.9 cu-in (195.0 cu-cm)	14.9 cu-in (244.17 cu-cm)	18.7 cu-in (244.2 cu-cm)	24.0 cu-in (393.3 cu-cm)	29.8 cu-in (488.3 cu-cm)
1" (25 mm)	194 sfpm (59.13 smpm)	151 sfpm (46.02 smpm)	125 sfpm (38.10 smpm)	101 sfpm (30.78 smpm)	81 sfpm (24.69 smpm)	64 sfpm (24.69 smpm)	50 sfpm (15.24 smpm)	40 sfpm (12.19 smpm)
2" (51 mm)	389 sfpm (118.57 smpm)	302 sfpm (92.05 smpm)	250 sfpm (76.20 smpm)	202 sfpm (61.57 smpm)	161 sfpm (49.07 smpm)	129 sfpm (39.32 smpm)	100 sfpm (30.48 smpm)	80 sfpm (24.38 smpm)
4" (102 mm)	777 sfpm (236.83 smpm)	603 sfpm (183.79 smpm)	500 sfpm (152.40 smpm)	403 sfpm (122.83 smpm)	323 sfpm (98.45 smpm)	258 sfpm (78.64 smpm)	200 sfpm (60.96 smpm)	160 sfpm (48.77 smpm)
5" (127 mm)	971 sfpm (295.96 smpm)	754 sfpm (229.82 smpm)	624 sfpm (190.20 smpm)	504 sfpm (153.62)	403 sfpm (122.83 smpm)	322 sfpm (98.15 smpm)	250 sfpm (76.20 smpm)	200 sfpm (60.96 smpm)
6" (152 mm)	1,166 sfpm (355.40 smpm)	905 sfpm (275.84 smpm)	749 sfpm (228.30 smpm)	605 sfpm (184.40 smpm)	484 sfpm (147.52 smpm)	386 sfpm (117.65 smpm)	300 sfpm (91.44 smpm)	240 sfpm (73.15 smpm)
8" (203 mm)	1,554 sfpm (473.66 smpm)	1,206 sfpm (367.59 smpm)	905 sfpm (275.84 smpm)	806 sfpm (245.67 smpm)	645 sfpm (196.60 smpm)	515 sfpm (156.97 smpm)	400 sfpm (121.92 smpm)	320 sfpm (97.54 smpm)
10" (254 mm)	1,943 sfpm (592.23 smpm)	1,508 sfpm (459.64 smpm)	1,206 sfpm (367.59 smpm)	1,008 sfpm (307.24 smpm)	806 sfpm (245.67 smpm)	644 sfpm (196.29 smpm)	500 sfpm (152.40 smpm)	401 sfpm (122.22 smpm)

The colors shown are defined in Table 4-2.

TABLE 4-2. OPERATING RANGE COLOR DEFINITIONS

SFPM	Definition
<150 sfpm (45.72 smpm)	Do not operate
150–250 sfpm (45.72–76.20 smpm)	Okay to operate

TABLE 4-2. OPERATING RANGE COLOR DEFINITIONS

SFPM	Definition
250–500 sfpm (76.20–152.40 smpm)	Optimal operating range
>500 sfpm (152.40 smpm)	Okay to operate

4.3 PNEUMATIC CONDITIONING UNIT

⚠ WARNING

For machines with air motors, if the machine stops moving unexpectedly, lock out the pneumatic safety valve located at the filter lubricator assembly before performing any troubleshooting.

This section explains the pneumatic conditioning unit (PCU) controls and machining instructions. Figure 4-2 shows different pneumatic configurations, depending on machine type.

FIGURE 4-2. PCU CONFIGURATIONS (OPTION 1 ON THE LEFT; OPTION 2 ON THE RIGHT)

4.3.1 Controls

4.3.1.1 Option 1

The PCU controls (P/N 59636, see Figure 4-3 and Figure A-19 on page 100) include:

FIGURE 4-3. PCU CONTROLS (P/N 59636)

1. **START button** (system reset): resets the low pressure drop out.
2. **Emergency stop button**: isolates the supply air and vents the downstream air. Press down to stop the machine; pull up to reset.
3. **Lock out/Tag out valve:** isolates air pressure from the machine and provides the ability to lock the valve closed so that you can perform maintenance.
4. **Oiler adjustment knob:** controls the air lubricator drip rate. For more information, see Section 5 on page 77.

4.3.1.2 Option 2

Figure 4-4 shows the PCU controls (P/N 59245, also shown in Figure A-22 on page 103).

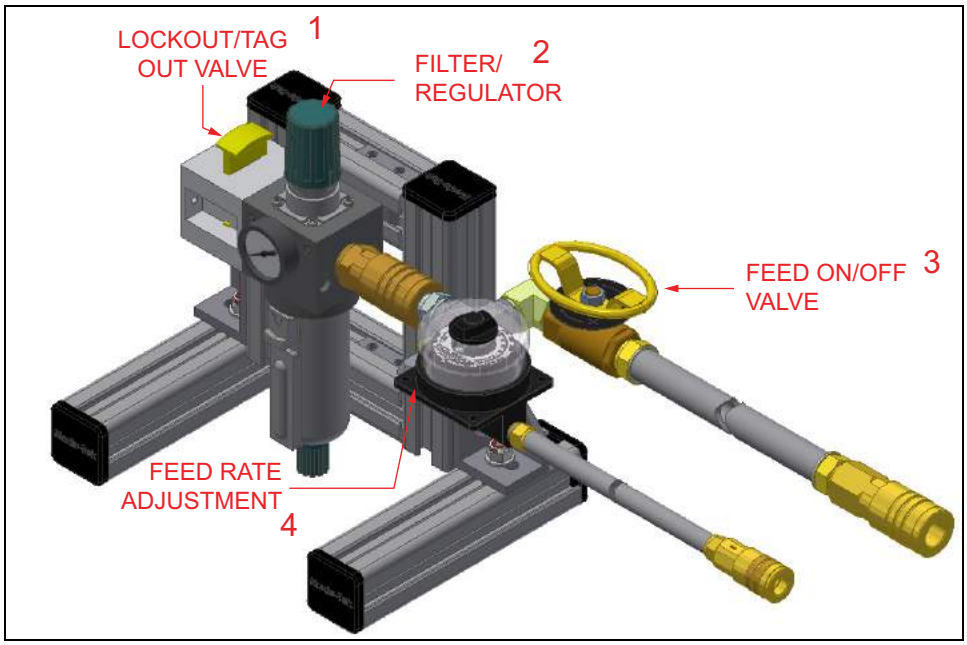


FIGURE 4-4. PCU CONTROLS (P/N 59245)

TABLE 4-3. PCU CONTROL IDENTIFICATION

Number	Component
1	Lockout/tag out valve
2	Filter/regulator
3	Feed on/off valve
4	Feed rate adjustment

The lock out/tag out valve isolates air pressure from the machine and provides the ability to lock the valve closed so that you can perform maintenance.

4.3.2 Machining

4.3.2.1 Option 1

Do the following to operate the PCU:

1. Connect the energy sources.
2. Turn the feed rate adjustment dial to the minimum feed or to the desired setting, if known.
3. Turn on the feed and adjust the feed rate for the desired cut.
4. When the cut is complete, first stop the feed and then stop the machine rotation.

4.3.2.2 Option 2

Do the following to operate the PCU:

1. Connect the energy sources.
2. Push the START button on the PCU.

TABLE 4-4. PCU KNOB IDENTIFICATION

Number	Component
1	Feed on/off valve
2	Speed adjustment valve
3	Feed rate adjustment

3. Use the speed adjustment valve to turn on the drive motor.

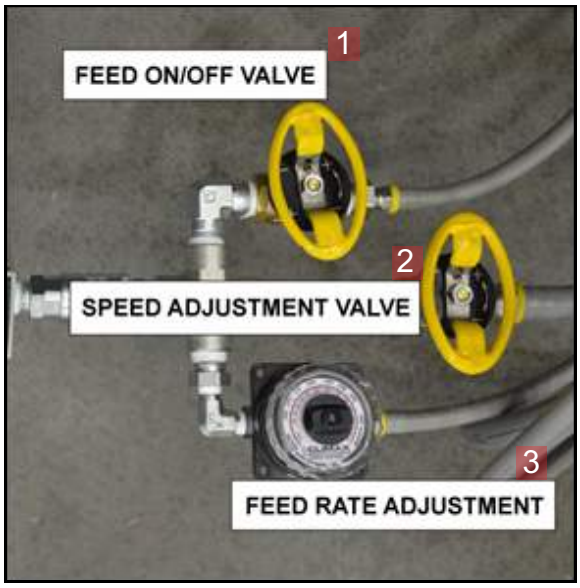


FIGURE 4-5. PCU MACHINING KNOBS

4. Turn the feed rate adjustment dial to the minimum feed or to the desired setting, if known.
5. Turn on the feed and adjust the feed rate for the desired cut.
6. Use the speed adjustment valve to adjust the drive motor to achieve the desired cut.
7. When the cut is complete, first stop the feed and then stop the machine rotation.

4.4 HYDRAULIC POWER UNIT

4.4.1 Controls

Figure 4-6 shows the hydraulic power unit (HPU) controls, which are defined in Table 4-5.

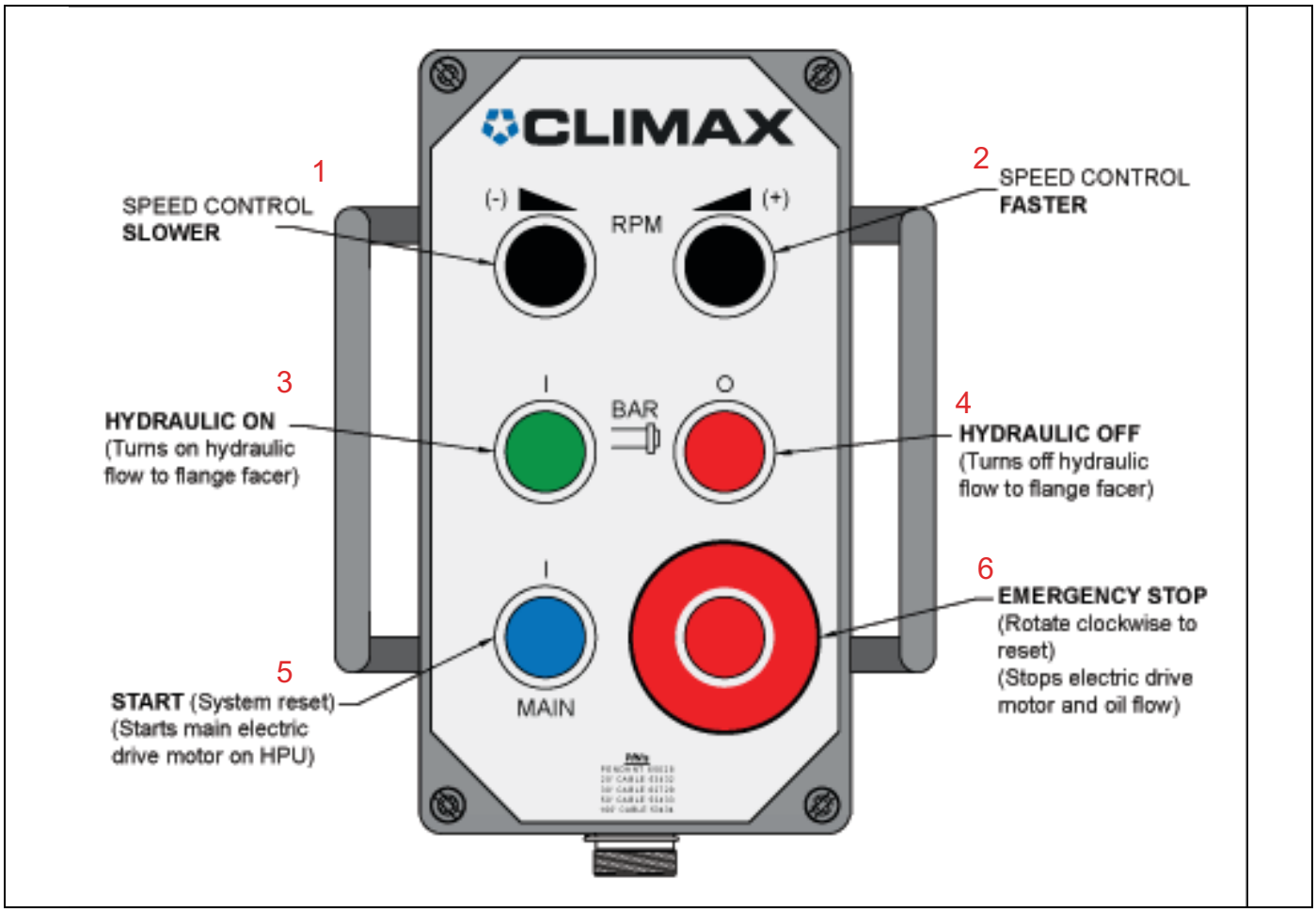


FIGURE 4-6. HPU CONTROLS

TABLE 4-5. HPU CONTROLS

Number	Button	Function
1	Speed control slower	Controls the machine's rate of rotation. Press to slow down machine rotation.
2	Speed control faster	Controls the machine's rate of rotation. Press to increase machine rotation.
3	Hydraulic on	Controls the hydraulic flow to the flange facer. Press to start machine rotation.
4	Hydraulic off	Controls the hydraulic flow to the flange facer. Press to stop machine rotation.
5	Start	Turns on the electric drive motor on the HPU. Press to start the HPU.
6	Emergency stop	Cuts power to the HPU. Press to stop the machine. Rotate clockwise to reset.

4.4.2 Machining

⚠ DANGER

To avoid serious injury to hands or arms, do not reach inside the swing of the machining arm during operation.

This type of machine has a hydraulic powered rotation with a pneumatic feed.

⚠ CAUTION

Using a different HPU than the one specified in this manual will require a separate evaluation.

Do the following to operate the HPU:

1. Connect the energy sources.
2. On the HPU controller, turn the EMERGENCY STOP button clockwise to reset the emergency stop.
3. Press the START button to start the HPU motor.
4. Press the SPEED CONTROL SLOWER button until it is at the minimum.
5. Press the HYDRAULIC ON button.
6. Press the SPEED CONTROL FASTER button to reach the desired speed.
7. Turn the feed rate adjustment dial to the minimum feed or to the desired setting, if known.

8. Turn on the feed and adjust the feed rate for the desired cut.
9. Use the speed control buttons to adjust the drive motor to achieve the desired cut.
10. When the cut is complete, first stop the feed and then stop the machine rotation.

⚠ CAUTION

Recheck the chuck torque at intervals, including after environmental changes (such as between night and day) in case of thermal growth.

4.5 ADJUSTING THE MACHINE WHEN THE CUT IS COMPLETED

⚠ CAUTION

The cutting tools can get hot during machining. Wear gloves or other protective personal protective equipment and be careful of hot surfaces to avoid burns.

When the cut is completed, stop the feed and the machine and do the following:

1. Check that all power sources to the machine drive are isolated and locked out.
2. Adjust the machine direction, depth of cut, or tool position as needed.
3. Start the machine and feed again to start a new cut.
4. Repeat until the desired surface is achieved.

4.6 DISASSEMBLY

⚠ WARNING

If not properly secured, this machine can fall and cause fatal injuries to personnel. Pay special attention to vertical flange installations.

The machine must be properly rigged and attached to a crane or other suitable lifting apparatus before beginning any disassembly steps.

Do the following to disassemble the machine:

1. Retract the tool from the work piece.
2. Remove the tool bit.
3. Remove the hoses.
4. Attach the lifting equipment to the machine using the supplied hoist rings.
5. Install setup fingers to each leveling foot.

6. Loosen and retract the leveling and stationary feet.
7. Remove the machine from the workpiece.

5 MAINTENANCE

5.1 MAINTENANCE CHECKLIST

Table 5-1 lists maintenance intervals and tasks.

TABLE 5-1. MAINTENANCE INTERVALS AND TASKS

Interval	Task	Reference
During use	Clean the ball screws and ACME lead screws frequently to prevent thread damage to nut and lead screw.	Section 5.3.2 on page 78
Before and after each use	Remove debris, oil, and moisture from machine surfaces.	--
After each use	Lightly lubricate the lead screws, dovetails, and linear rails with 10W30 weight oil after cleaning.	Section 5.3.1 on page 78
Periodically	Add a small amount of grease to the drive gear and bearing after every 500 hours of use.	Section 5.3.1 on page 78
	Lightly oil the lead screws.	Section 5.3.2 on page 78

5.2 APPROVED LUBRICANTS

CLIMAX recommends using the following lubricants at the locations indicated. Failure to use the appropriate lubricants can result in damage and premature machine wear.

⚠ CAUTION

Avoid damage, premature machine wear, and protect your warranty by using only approved lubricants.

TABLE 5-2. APPROVED LUBRICANTS

Application Area	Lubricant
Tool bits, work piece	Guardol QLT Motor Oil
Square ways – acme screws, dovetail and linear rails	Way oil (10W30 weight motor oil)
Pneumatic conditioning unit	10W30 weight motor oil

TABLE 5-2. APPROVED LUBRICANTS

Application Area	Lubricant
Unpainted surfaces	LPS1 or LPS2
Gearboxes	CONOCO PolyTac EP 2

5.3 MAINTENANCE TASKS

Maintenance tasks are described in the following sections.

5.3.1 Lubricating the machine

Follow these guidelines for lubrication:

- Lightly lubricate the lead screws, dovetails, and linear rails with 10W30 weight oil after cleaning. This should be done after each work session. This will keep the machine from oxidizing.
- Add a small amount of grease to the drive gear and bearing after every 500 hours of use.

TIP:

The more oil is used to lubricate the lead screw and nuts, the longer they will last.

5.3.2 Lead screw maintenance

During operation, clean the ball screws and ACME lead screws frequently to prevent thread damage to nut and lead screw.

Lightly oil the lead screws periodically.

NOTICE

Do not grease the ball screws.

5.3.3 Milling head

Change gearbox grease after the first 10 hours of use, then every 50 hours thereafter.

6 STORAGE AND SHIPPING

IN THIS CHAPTER:

6.1 Storage

Proper storage of the flange facer will extend its usefulness and prevent undue damage.

Before storing, do the following:

1. Clean the machine with solvent to remove grease, metal chips, and moisture.
2. Drain all liquids from the pneumatic conditioning unit (PCU).

Store the flange facer in its original shipping container. Keep all packing materials for repackaging the machine.

6.1.1 Short-term storage

Do the following for short-term storage (three months or less):

1. Retract the tool head from the workpiece.
2. Remove the tooling.
3. Remove hoses.
4. Remove the machine from the workpiece.
5. Clean the machine to remove dirt, grease, metal chips, and moisture.
6. Spray all unpainted surfaces with LPS-2 to prevent corrosion.
7. Store the flange facer in its original shipping box.

6.1.2 Long-term storage

Do the following for long-term storage (longer than three months):

1. Follow the short-term storage instructions, but use LPS-3 instead of LPS-2.
2. Add a desiccant pouch to the shipping container. Replace according to manufacturer instructions.
3. Store the shipping container in an environment out of direct sunlight with temperature < 70ºF (21ºC) and humidity < 50%.

6.2 SHIPPING

The flange facer can be shipped in its original shipping container.

6.3 DECOMMISSIONING

To decommission the flange facer prior to disposal, remove the drive assembly from the RDU and dispose of the drive assembly separately from the rest of the machine components. Refer to Appendix A for component assembly information.

APPENDIX A ASSEMBLY DRAWINGS

Drawing list

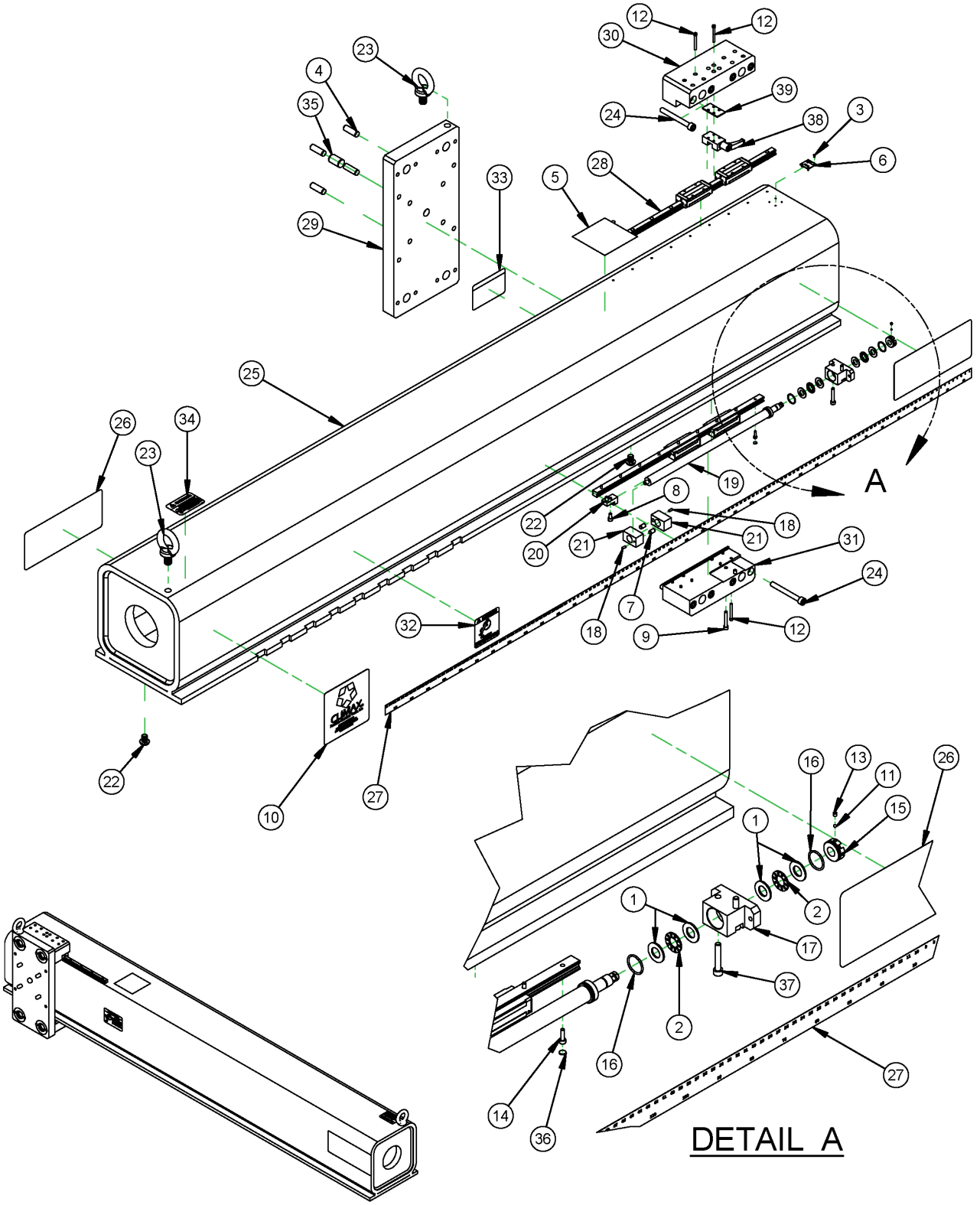
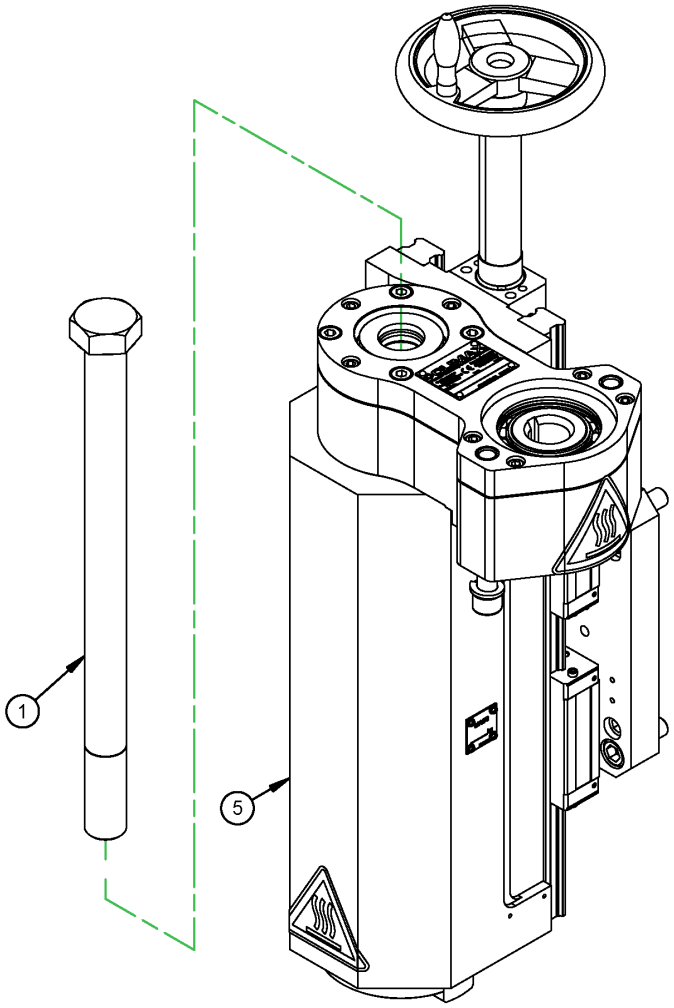


FIGURE A-1. MILLING ARM ASSEMBLY (P/N 72698)

PARTS LIST		
ITEM	PART No.	DESCRIPTION
1	10436	WASHER THRUST .500 ID X .937 OD X .060
2	10437	BRG THRUST .500 ID X .937 OD X .0781
3	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
4	11832	PIN DOWEL 1/2 DIA X 1-1/2
5	27462	LABEL WARNING STICKER SINGLE POINT MACHINES
6	29152	PLATE MASS CE
7	31592	PIN DOWEL 5/16 x 1/2
37	35504	SCREW M6 X 1.0 X 35mm SHCS
8	36051	SCREW M6 x 1 x 12 SHCS
9	36125	SCREW M6 X 1.0 X 40mm SHCS
10	37830	LABEL CLIMAX LOGO 5-1/2 X 5-1/2
11	43489	BALL NYLON 1/8 DIA
12	45209	SCREW M4 X 0.7 X 40mm SHCS
13	53365	SCREW M4 X 0.7 X 4 mm SSSFP
14	55050	SCREW M4 X 0.7 X 14MM SHCS
15	57214	BRG RETAINING NUT AXIAL FEED LEADSCREW
16	57320	RING O 1/16 X 13/16 ID X 15/16 OD
17	57793	BEARING BLOCK LEADSCREW
18	57854	SCREW M4 X 0.7 X 10 mm SSSFPPL
19	57895	LEAD SCREW AXIAL FEED FF LINE
20	57898	TAIL SUPPORT LEADSCREW RADIAL FEED FF LINE
21	57915	ACME NUT LEADSCREW FF LINE
22	58107	SCREW M12 X 1.75 X 16 BHSC
23	59627	BOLT EYE M16 X 2.0 X 27MM LG
24	60031	SCREW M10 X 1.5 X 90MM SHCS
25	60818	TOOL ARM FF8200 MILLING
26	61457	LABEL WARNING OD MOUNT FEDERAL SAFETY YELLOW
27	61560	RULE ADHESIVE BACKED 1 X 72 R-L HALF SCALE INCH AND MM GRAD
28	62454	SLIDE RAIL THK SHS15 520MM LG PRELOADED METAL SCRAPERS 2 BLOCKS
29	62539	PLATE MOUNTING MILL FF8200
31	62563	BLOCK RAIL LOWER FF7200 FF8200
32	62883	LABEL FLANGE FACERS CRUSH HAZARD
33	62884	LABEL FLANGE FACERS IMPACT HAZARD
34	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3
35	63557	PIN DOWEL 3/4 DIA X 1-1/4
36	68500	CAP RAIL 15MM METAL THK SHS
38	72636	ZIMMER BRAKE 15MM RAIL
39	72637	ZIMMER ADAPTER 15MM RAIL
30	72692	BLOCK RAIL UPPER

FIGURE A-2. MILLING ARM ASSEMBLY PARTS LIST (P/N 72698)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	62330	SCREW 1-8 X 14.5 HEX BOLT GRADE 5 (62282 ONLY)
2	1	62845	SCREW 1-8 X 15.5 HEX BOLT GRADE 5 (62734 ONLY)
3	1	62331	DRAWBOLT MILLING HEAD 2-29/32 BRG 50 TAPER METRIC NMTB (62644 ONLY)
4	1	62846	DRAWBOLT MILLING HEAD 2-29/32 BRG 50 TAPER METRIC V-FLANGE (62735 ONLY)
5	1	72277	MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER

MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER INCH NMTB	62282
MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER INCH V-FLANGE	62734
MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER METRIC NMTB	62644
MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER METRIC V-FLANGE	62735

FIGURE A-3. MILLING HEAD ASSEMBLIES

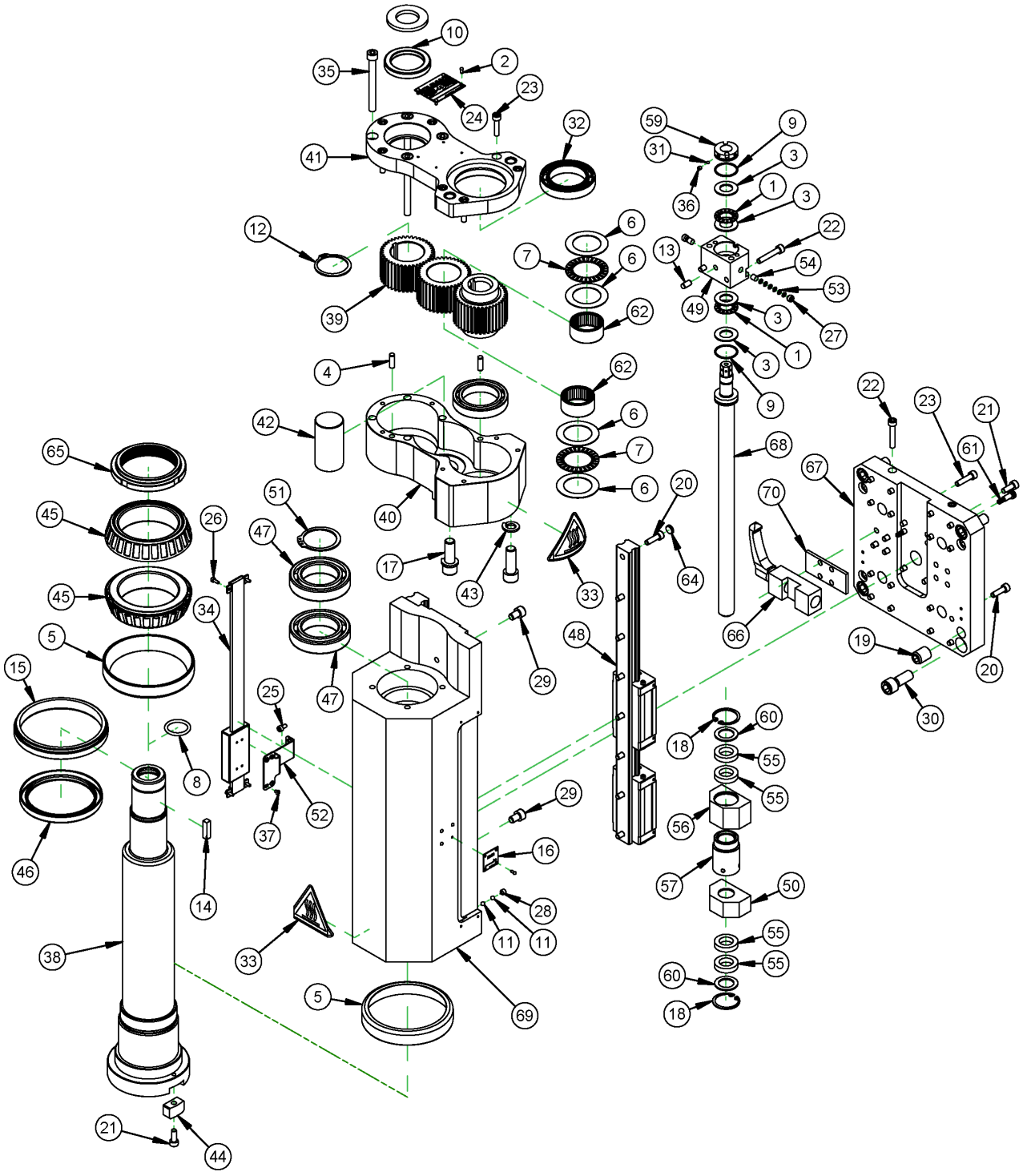


FIGURE A-4. MILLING HEAD ASSEMBLY (P/N 72277)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10538	BRG THRUST .625 ID X 1.125 OD X .0781
2	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
3	4	11165	WASHER THRUST .625 ID X 1.125 OD X .060
4	2	11729	PIN DOWEL 1/4 DIA X 3/4
5	2	11821	BRG CUP 4.4375 OD X .750 WIDE
6	4	15326	WASHER THRUST 1.375 ID X 2.062 OD X .030
7	2	15327	BRG THRUST 1-375 ID X 2.062 OD X .0781
8	1	15509	RING O 1/8 X 1 ID X 1-1/4 OD
9	2	15731	RING O 1/16 X 1 ID X 1-1/8 OD
10	1	15768	SEAL 1.625 ID X 2.250 OD X .313
11	4	16594	BALL NYLON 3/16 DIA
12	1	19505	RING SNAP 1-5/8 OD .062 WIDE
13	1	20166	PIN DOWEL 1/4 DIA X 1/2
14	1	20273	KEY 1/4 SQ X 1.00 SQ BOTH ENDS
15	1	28219	NUT MAIN BRG PRELOAD
16	1	29152	PLATE MASS CE
17	2	30207	SCREW M12 X 1.75 X 35mm SHCS
18	2	33777	RING SNAP 1-3/16 ID (30MM)
19	4	34643	SCREW M16 X 1.5 X 20mm SSSFP
20	32	35009	SCREW M6 X 1.0 X 20 SHCS
21	6	35014	SCREW M6 X 1.0 X 16mm SHCS
22	4	35504	SCREW M6 X 1.0 X 35mm SHCS
23	11	35652	SCREW M6 X 1.0 X 25 SHCS
24	1	35828	PLATE SERIAL YEAR MODEL CE 1.5 X 2.0
25	2	35910	SCREW M4 X 0.7 X 8MM SHCS
26	4	35994	SCREW M3 X 0.5 X 8mm SHCS
27	2	36087	SCREW M8 X 1.25 X 6MM SSSFP
28	2	36150	SCREW M6 X 1.0 X 6mm SSSCP
29	2	36545	SCREW M8 X 1.25 X 12mm
30	4	40697	SCREW M12 X 1.75 X 30mm SHCS
31	2	43489	BALL NYLON 1/8 DIA
32	2	46352	BRG BALL 1.7717 ID X 2.6772 OD X .4724 W/ 2 SEALS
33	2	46902	LABEL WARNING HOT SURFACE GRAPHIC 2.25 TRI
34	1	51859	SCALE DIGITAL 8 INCH VERTICAL MOUNT
35	4	52936	SCREW M8 X 1.25 X 80MM SHCS

FIGURE A-5. MILLING HEAD ASSEMBLY PARTS LIST 1 (P/N 72277)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
36	2	53365	SCREW M4 X 0.7 X 4 mm SSSFP
37	4	54024	SCREW M3 X 0.5 X 4MM BHSCS
38	1	60462	SPINDLE BLOCK 2.75 BRG 8 STROKE #50 TAPER
39	1	60467	GEAR SET 40T 16DP 2.5PD THREE GEARS BLOCK SPINDLE 2.75 BRG
40	1	60468	HOUSING GEARBOX BLOCK SPINDLE 2.75 BRG
41	1	60469	COVER GEARBOX BLOCK SPINDLE 2.75 BRG
42	1	60470	SHAFT GEAR BLOCK SPINDLE 2.75 BRG
43	2	60702	WASHER SPLIT LOCK M12
44	2	60704	LUG DRIVE #50 TAPER BLOCK SPINDLE
45	2	60705	BRG CONE 2.75 ID X 1.00 WIDE
46	1	60706	SEAL 3.25 ID X 4.000 OD X .375
47	2	60793	BRG BALL 1.7717 ID X 2.9528 OD X .6299
48	2	62255	SLIDE RAIL THK SHS25 442MM LG PRELOADED METAL SCRAPERS 2 BLOCKS
49	1	62281	BEARING BLOCK BALLSCREW 20MM
50	1	62321	HOLDER FELT WIPER MILLING HEAD
51	1	62322	RING SNAP 1.771 OD (45MM)
52	1	62324	BRACKET DRO BLOCK SPINDLE 2.75 BRG
53	12	62376	WASHER SPRING BELLEVILLE 1/8 ID X 1/4 OD X .013 THK
54	2	62378	ROD POLYURETHANE 1/4 DIA X 1/4 LENGTH 95 SHORE A
55	4	62379	SEAL FELT 16MM BALL SCREW 1.015 OD MILLING HEAD
56	1	62423	MOUNT BALL NUT MILLING HEAD
57	1	62426	BALL SCREW NUT 20MM X 5MM LEAD 33 MM OD EICHENBERGER ROUND
58	1	62696	WASHER 1 FLTW ASTM F436
59	1	62898	BRG RETAINING NUT 5/8-18 O-RING SEAL SETSCREW LOCK
60	2	62903	WASHER SHIM .75 ID 1.125 OD .062 THICK STEEL
61	2	62909	SCREW 6MM DIA X 12MM X M5 X 0.8 SHLDCS
62	2	63437	BRG NEEDLE 1-3/8 ID X 1-5/8 OD X .750 OPEN
63	1	63927	HANDWHEEL ASSY Z-AXIS (NOT SHOWN)
64	16	68501	CAP RAIL 25MM METAL THK SHS
65	1	68623	NUT LOCKING MODIFIED 2.751-18 FLEXIBLE INSERT LOCKING
66	1	72262	ZIMMER BRAKE 25mm RAIL
67	1	72279	PLATE MOUNTING BLOCK SPINDLE 2.75 BRG
68	1	72283	BALL SCREW MILLING HEAD 2.75 BRG 8" STROKE
69	1	72652	HOUSING SPINDLE 2.9062 BRG 8 STROKE
70	1	72869	ADAPTER BRAKE 25mm RAIL 4mm THICK

FIGURE A-6. MILLING HEAD ASSEMBLY PARTS LIST 2 (P/N 72277)

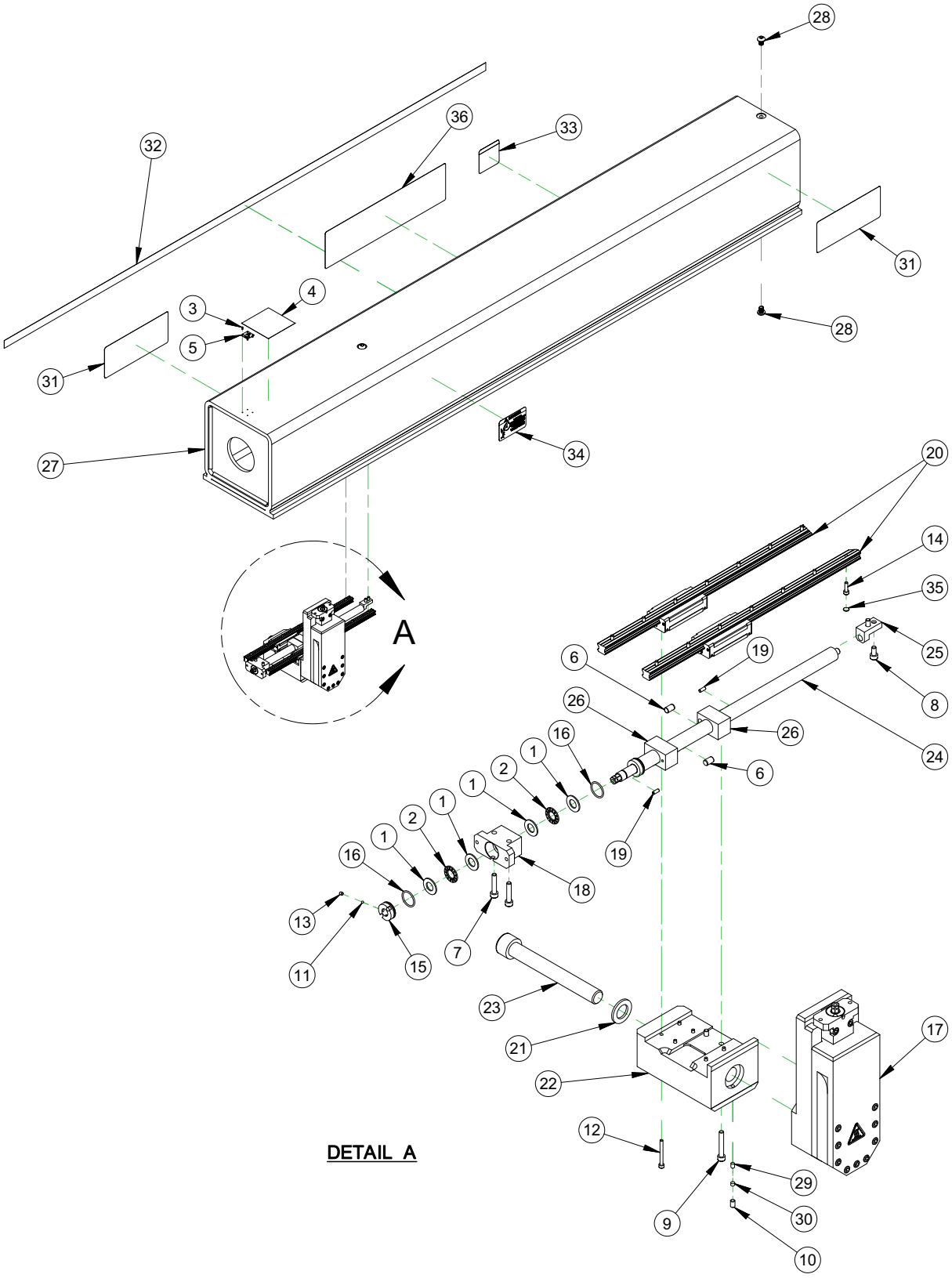
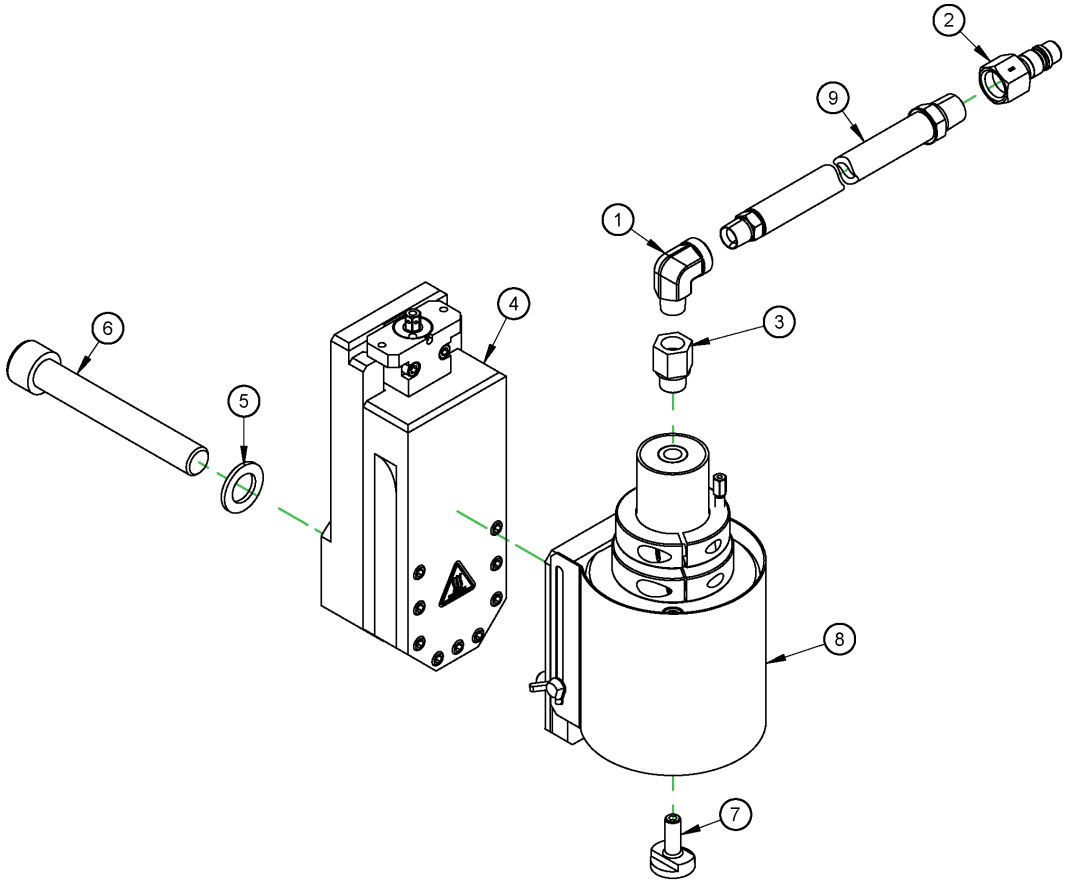


FIGURE A-7. MACHINING ARM ASSEMBLY (P/N 57872)

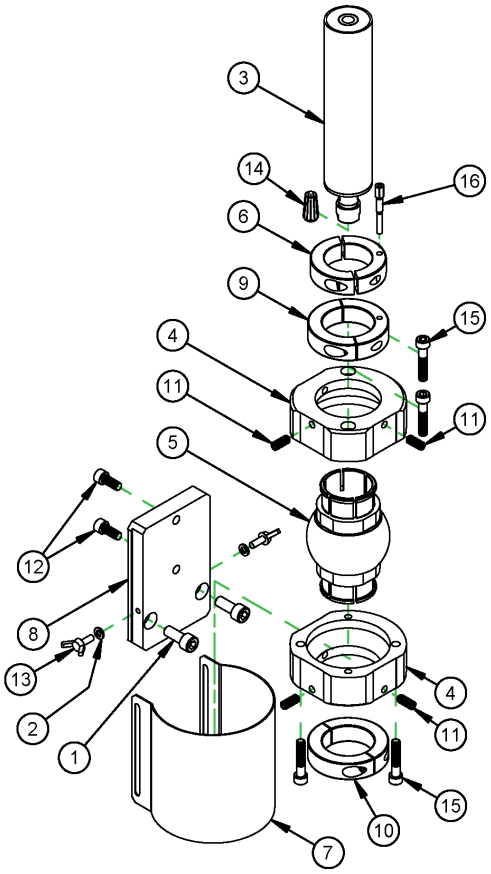
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10436	WASHER THRUST .500 ID X .937 OD X .060
2	2	10437	BRG THRUST .500 ID X .937 OD X .0781
3	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
4	1	27462	LABEL WARNING STICKER SINGLE POINT MACHINES
5	1	29152	PLATE MASS CE
6	2	31592	PIN DOWEL 5/16 x 1/2
7	2	35505	SCREW M6 X 1.0 X 30 SHCS
8	2	36051	SCREW M6 x 1 x 12 SHCS
9	2	36125	SCREW M6 X 1.0 X 40mm SHCS
10	1	43272	SCREW M6 X 1.0 X 10mm SSSFP
11	2	43489	BALL NYLON 1/8 DIA
12	8	45209	SCREW M4 X 0.7 X 40mm SHCS
13	2	53365	SCREW M4 X 0.7 X 4 mm SSSFP
14	14	55050	SCREW M4 X 0.7 X 14MM SHCS
15	1	57214	BRG RETAINING NUT AXIAL FEED LEADSCREW
16	2	57320	RING O 1/16 X 13/16 ID X 15/16 OD
17	1	57781	TOOL HEAD ASSY FF LINE
18	1	57793	BEARING BLOCK LEADSCREW
19	2	57854	SCREW M4 X 0.7 X 10 mm SSSFPPL
20	2	57886	SLIDE RAIL THK SHS15 400MM LG PRELOADED METAL SCRAPERS
21	1	57888	WASHER FIXTURING 21MM ID X 35MM OD X 3MM CASE HARDENED
22	1	57889	PLATE MOUNTING TOOLHEAD FFLINE
23	1	57891	SCREW M20 X 1.5 X 160 mm SHCS GRADE 12.9
24	1	57895	LEAD SCREW AXIAL FEED FF LINE
25	1	57898	TAIL SUPPORT LEADSCREW RADIAL FEED FF LINE
26	2	57915	ACME NUT LEADSCREW FF LINE
27	1	58097	TOOL ARM FF8200
28	4	58107	SCREW M12 X 1.75 X 16 BHSC
29	1	59637	INSERT BRASS TOOL HEAD DRAG
30	1	59638	INSERT SPRING ELASTOMER TOOL HEAD DRAG
31	2	61457	LABEL WARNING OD MOUNT FEDERAL SAFETY YELLOW
32	1	61560	RULE ADHESIVE BACKED 1 X 72 R-L HALF SCALE INCH AND MM GRAD
33	1	62883	LABEL FLANGE FACERS CRUSH HAZARD
34	1	62884	LABEL FLANGE FACERS IMPACT HAZARD
35	14	68500	CAP RAIL 15MM METAL THK SHS
36	1	70229	LABEL CLIMAX LOGO 4.75 X 18

FIGURE A-8. MACHINING ARM ASSEMBLY (P/N 57872)



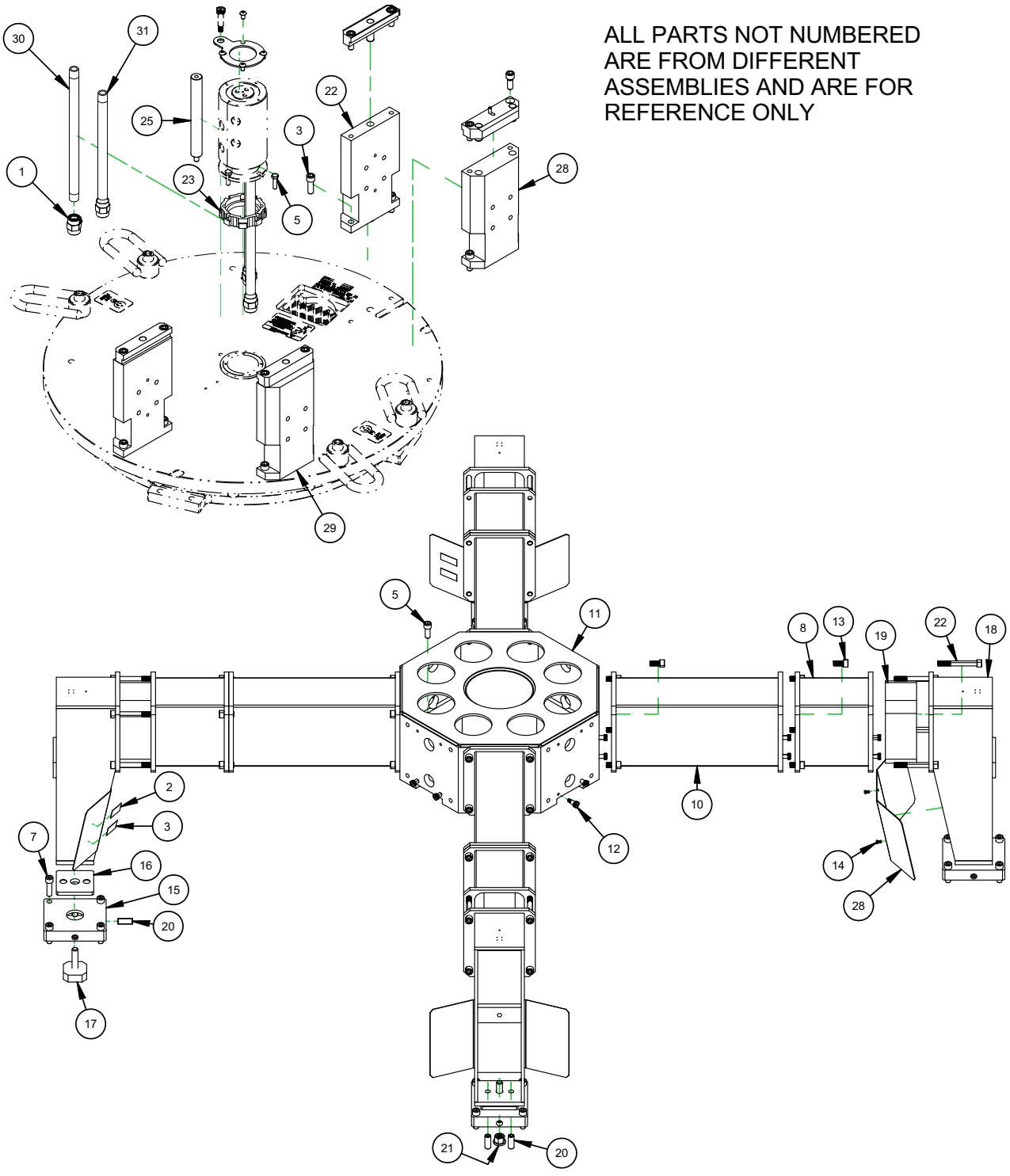
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	11132	FTG ELBOW 3/8 NPTM X 3/8 NPTF STREET 90 DEG
2	1	24851	FTG QUICK COUPLER 1/2B 1/2 NPTF MALE AIR
3	1	52734	FTG ADPTER 3/8 BSPP MALE X 3/8 NPTF
4	1	57781	TOOL HEAD ASSY FF LINE
5	1	57888	WASHER FIXTURING 21MM ID X 35MM OD X 3MM CASE HARDENED
6	1	60790	SCREW M20 X 1.5 X 140MM SHCS
7	1	62624	ARBOR GRINDING WHEEL CBN 10MM SHANK M8 THREAD
8	1	63063	ASSY GRINDING ATTACHMENT
9	1	63223	HOSE ASSY 801 1/2 X 3/8 NPTM X 1/2 NPTM X 60

FIGURE A-9. GRINDING ASSEMBLY (P/N 62948)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	35339	SCREW M10 X 1.5 X 25mm SHCS
2	2	35891	WASHER M6 FLTW DIN 12.5
3	1	57150	SPINDLE GRINDING ES 170 ER
4	2	60553	HOUSING GRINDING ATTACHMENT
5	1	60554	COLLET SPHERICAL GRINDING ATTACHMENT
6	1	60555	COLLAR CLAMP MOTOR GRINDING ATTACHMENT
7	1	60556	GUARD GRINDING ATTACHMENT
8	1	60558	PLATE MOUNTING GRINDING ATTACHMENT
9	1	60560	COLLAR CLAMP COLLET UPPER GRINDING ATTACHMENT
10	1	60566	COLLAR CLAMP 50MM ID
11	4	60940	SCREW M8 X 1.0 X 20MM SSSFP
12	2	60941	SCREW M8 X 1.0 X 20MM SHCS
13	2	60942	SCREW M6 X 1.0 X 16MM WING THUMB ZINC
14	1	61114	COLLET 10MM MANNESMANN ES170 GRINDING SPINDLE
15	4	61225	SCREW M8 X 1.25 X 40MM SHCS
16	1	61228	SCREW FINE ADJUST 1/4-28 AND M6 X 1.0

FIGURE A-10. GRINDING ATTACHMENT ASSEMBLY (P/N 63063)



KIT CONVERSION OD MOUNT FF8200 61368

ASSY CHUCK OD ONLY FF8200 61372

FIGURE A-11. OD MOUNT CONVERSION KIT (P/N 61368 AND OD ONLY CHUCK ASSEMBLY (P/N 61372)

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	4	10319	FTG COUPLING 1/2 NPTF STEEL ZINC PLATED
2	4	25979	LABEL WARNING PINCH POINT
3	4	26151	LABEL WARNING WATCH YOUR HANDS AND FINGERS
4	8	30207	SCREW M12 X 1.75 X 35mm SHCS
5	8	40459	SCREW M20 X 2.5 X 50 mm SHCS (61372 ONLY)
6	4	55799	SCREW M8 X 1.25 X 30MM HHCS
7	16	56192	SCREW M20 X 2.5 X 70 MM SHCS
8	4	57724	WELDMENT STANDOFF 12.5 FF8200 (61372 ONLY)
9	4	57851	WELDMENT STANDOFF 17.5 FF8200 (61372 ONLY)
10	4	57852	WELDMENT STANDOFF 27.5 FF8200 (61372 ONLY)
11	1	58101	HUB CHUCK MACHINED FF8200 (61372 ONLY)
12	16	58202	SCREW 16MM DIA X 20MM X M12 X 1.75 SHLDCS (61372 ONLY)
13	50	58203	SCREW M20 X 2.5 X 40MM SHCS (61372 ONLY)
14	8	59827	SCREW M8 X 1.25 X 16MM BHSCS
15	4	60751	PLATE CENTERING OD MOUNT FF8200
16	4	60752	PLATE WASHER OD MOUNT FF8200
17	4	60753	STUD HOLD DOWN M24 OD MOUNT FF8200
18	4	60754	LEG VERTICAL SUPPORT OD MOUNT FF8200
19	4	60755	STANDOFF 5 INCH OD MOUNT FF8200
20	24	60756	SCREW M24 X 3.0 X 60MM SSSFP
21	4	60757	NUT M24 X 3.0 FLANGED
22	16	60760	SCREW M20 X 2.5 X 160MM SHCS
23	2	60810	RISER CLAMP OD MOUNT FF8200
24	1	60831	CAM FEED OD MOUNT
25	2	61334	LIFTING EYE M20 X 2.5 2200KG LOAD (NOT SHOWN)
26	1	61395	POST CIRCULAR 212MM TALL X M10 MALE TO FEMALE
27	1	61431	KIT TOOL OD MOUNT FF8200 (NOT SHOWN)
28	4	61433	SHIELD OD MOUNT FF8200
29	1	72504	RISER CLAMP SAFETY OD MOUNT FF8200
30	1	72505	RISER CLAMP OD MOUNT FF8200
31	2	85242	FTG NIPPLE 1/2 NPTM X 12 SEAMLESS BLACK PIPE SCHED 80
32	2	85243	FTG NIPPLE 1/2 NPTM X 14 SEAMLESS BLACK PIPE SCHED 80

FIGURE A-12. OD MOUNT CONVERSION KIT (P/N 61368 AND OD ONLY CHUCK ASSEMBLY PARTS LIST (P/N 61372)

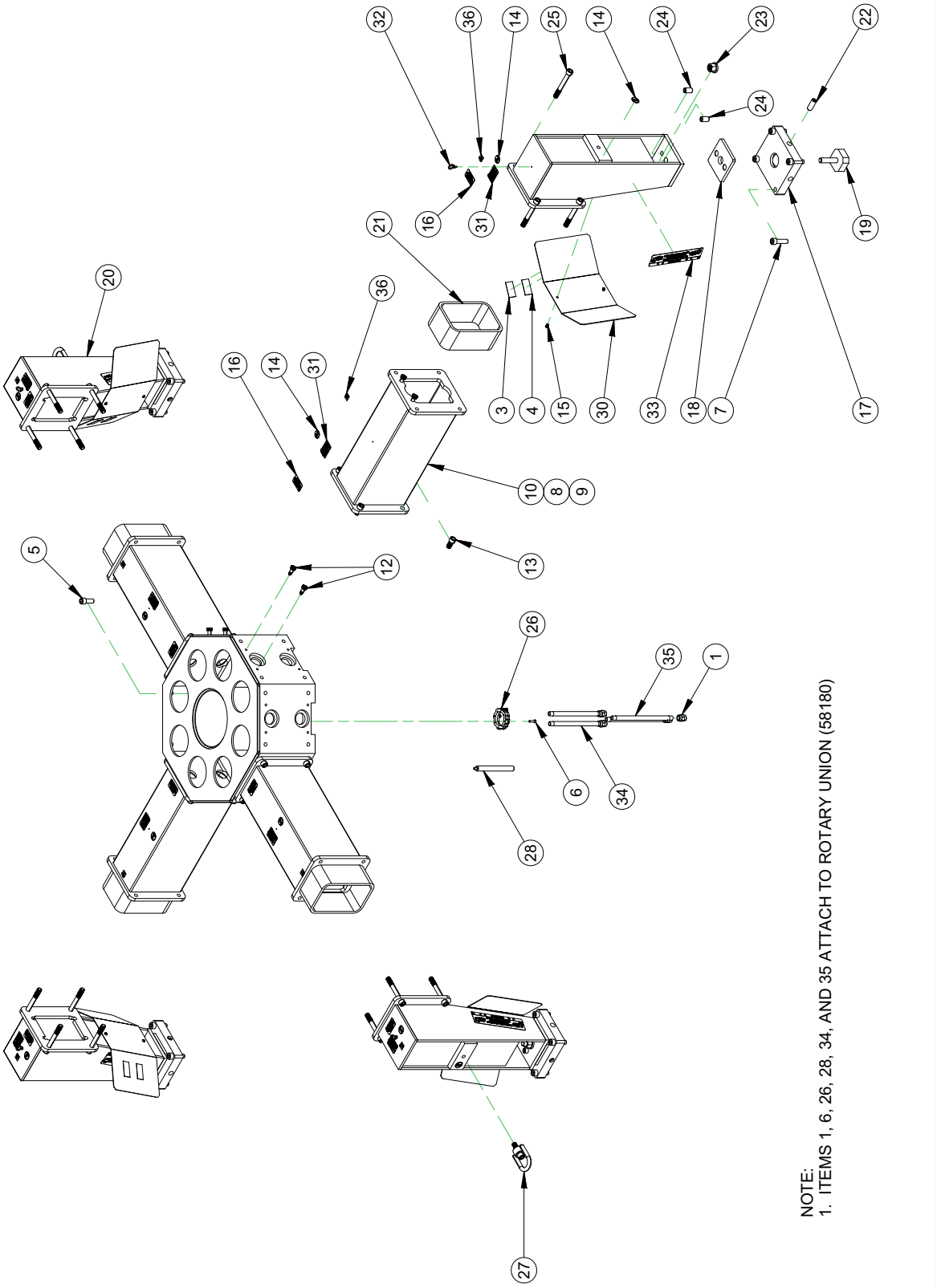
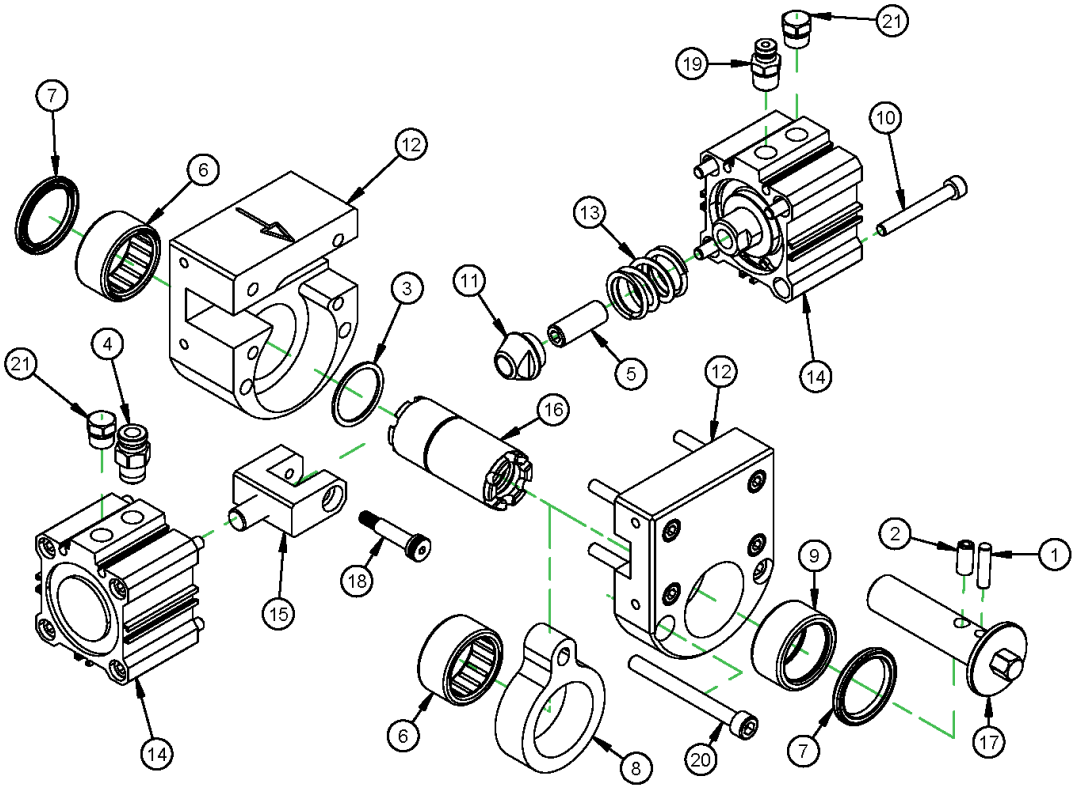


FIGURE A-13. ID/OD CHUCK 45–120" FOR TURNING WITH MILLING ARM ASSEMBLY (P/N 62666)

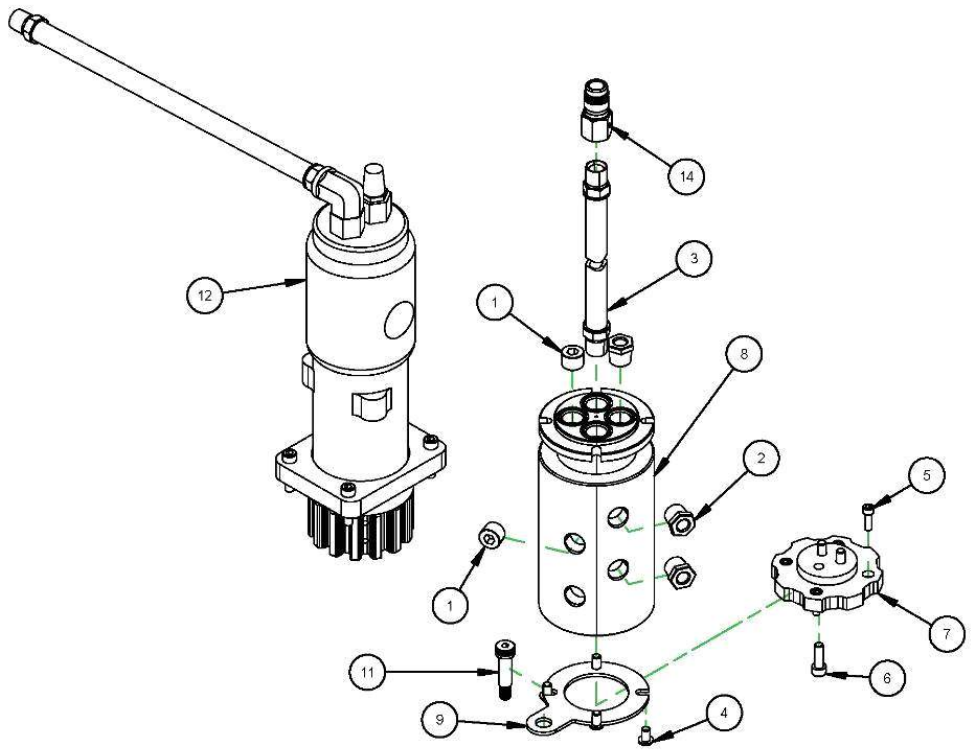
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10319	FTG COUPLING 1/2 NPTF X 1/2 NPTF STEEL ZINC PLATED
2	1	19700	(NOT SHOWN) CONTAINER SHIPPING FLAT ROOF 20 X 8.75 X 10.5
3	4	25979	LABEL WARNING PINCH POINT
4	4	26151	LABEL WARNING WATCH YOUR HANDS AND FINGERS
5	8	40459	SCREW M20 X 2.5 X 50 mm SHCS
6	4	55799	SCREW M8 X 1.25 X 30MM HHCS
7	16	56192	SCREW M20 X 2.5 X 70 MM SHCS
8	4	57724	WELDMENT STANDOFF 12.5 FF8200
9	4	57851	WELDMENT STANDOFF 12.5 FF8200
10	4	57852	WELDMENT STANDOFF 27.5 FF8200
11	1	58101	HUB CHUCK MACHINED FF8200
12	16	58202	SCREW 16MM DIA X 20MM X M12 X 1.75 SHLDCS
13	50	58203	SCREW M20 X 2.5 X 40MM SHCS
14	20	59039	LABEL WARNING LIFT POINT ROUND 1.5"
15	8	59827	SCREW M8 X 1.25 X 16MM BHSCS
16	16	60537	LABEL TORQUE SCREWS 150 FT-LBS
17	4	60751	PLATE CENTERING OD MOUNT FF8200
18	4	60752	PLATE WASHER OD MOUNT FF8200
19	4	60753	STUD HOLD DOWN M24 OD MOUNT FF8200
20	4	60754	LEG VERTICAL SUPPORT OD MOUNT FF8200
21	4	60755	STANDOFF 5 INCH OD MOUNT FF8200
22	16	60756	SCREW M24 X 3.0 X 60MM SSSFP
23	4	60757	NUT M24 X 3.0 FLANGED
24	8	60758	SCREW M24 X 3.0 X 40MM SSSFP
25	16	60760	SCREW M20 X 2.5 X 160MM SHCS
26	1	60831	CAM FEED OD MOUNT
27	2	61334	HOIST RING M20 X 2.5 2200KG LOAD
28	1	61395	POST CIRCULAR 212MM TALL X M10 MALE TO FEMALE
29	1	61431	(NOT SHOWN) KIT TOOL OD MOUNT FF8200
30	4	61433	SHIELD OD MOUNT FF8200
31	16	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3
32	4	63954	LIFTING EYE M6 X 1 X 12 THREAD 19 ID 460 LBS 210 KG
33	8	66070	LABEL WARNING-DO NOT OPERATE WITHOUT GUARDS
34	2	85242	FTG NIPPLE 1/2 NPTM X 12 SEAMLESS BLACK PIPE SCHED 80
35	2	85243	FTG NIPPLE 1/2 NPTM X 14 SEAMLESS BLACK PIPE SCHED 80
36	16	91217	PLATE MASS CE 1.0 X 1.0 KG ADHESIVE BACKED

FIGURE A-14. ID/OD CHUCK 45–120" FOR TURNING WITH MILLING ARM ASSEMBLY PARTS LIST (P/N 62666)



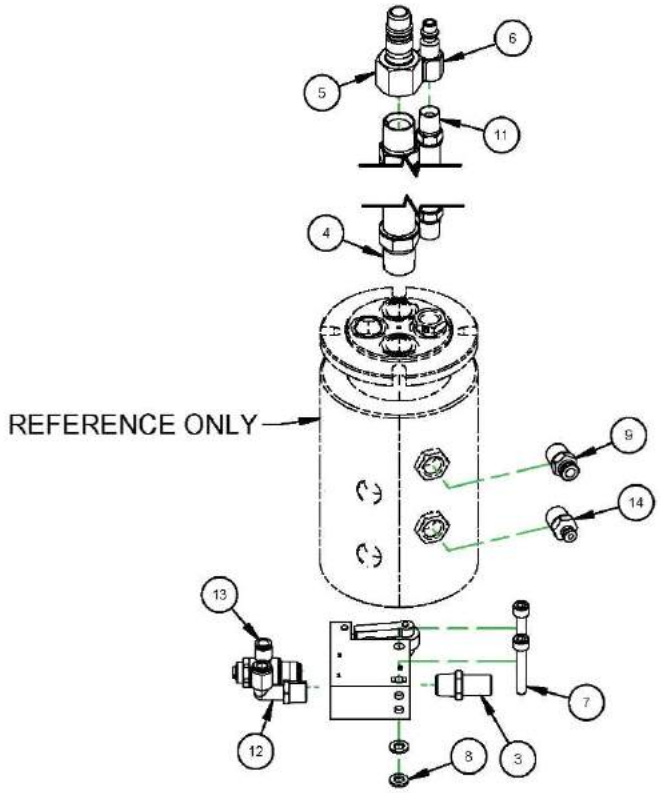
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	11763	PIN DOWEL 3/16 x 3/4
2	1	13061	DETENT PLUNGER BALL 1/4-20 X .531
3	1	14241	RING SNAP 1 OD SPIRAL HEAVY DUTY
4	1	18439	FTG ADAPTER 1/8 NPTM X 1/4 TUBE F PRESTOLOCK NICKEL PLATED
5	1	19630	SCREW 3/8-24 X 1 SSSFP
6	2	25957	BRG ROLLER CLUTCH 1 X 1.312 X .625
7	2	25959	SEAL 1.000 ID X 1.312 OD X .125 HM14 LIP
8	1	57491	ARM RATCHET
9	1	57530	BRG NEEDLE 1.0 X 1-5/16 X .625
10	8	57541	SCREW M5 X .8 X 40mm SHCS
11	1	58434	RETAINER SPRING PNEUMATIC FEEDBOX REMOTE ADJUST
12	1	58435	HOUSING PNEUMATIC FEED BOX REMOTE ADJUSTABLE
13	1	58440	SPRING COMP .845 OD X .100 WIRE X 1.00 LONG
14	2	58446	CYLINDER AIR 40MM DIA 10MM STROKE SINGLE ACTING SPRING EXTEND INCH
15	1	58450	CLEVIS DOUBLE 6MM PIN 3/8-24 SHAFT
16	1	58451	BUSHING DRIVE DOUBLE ENDED
17	1	58519	SHAFT FEED
18	1	58588	SCREW 6MM DIA X 20MM X M5 X 0.8 SHLDCS
19	1	59154	FTG ADAPTER 1/8 TUBE F PRESTOLOCK X 1/8 NPTM NICKEL PLATED
20	2	59156	SCREW M6 X 1.0 X 60mm SHCS
21	2	82880	FTG MUFFLER 1/8 NPTM BRONZE AND STEEL

FIGURE A-15. FEED BOX ASSEMBLY (P/N 58671)



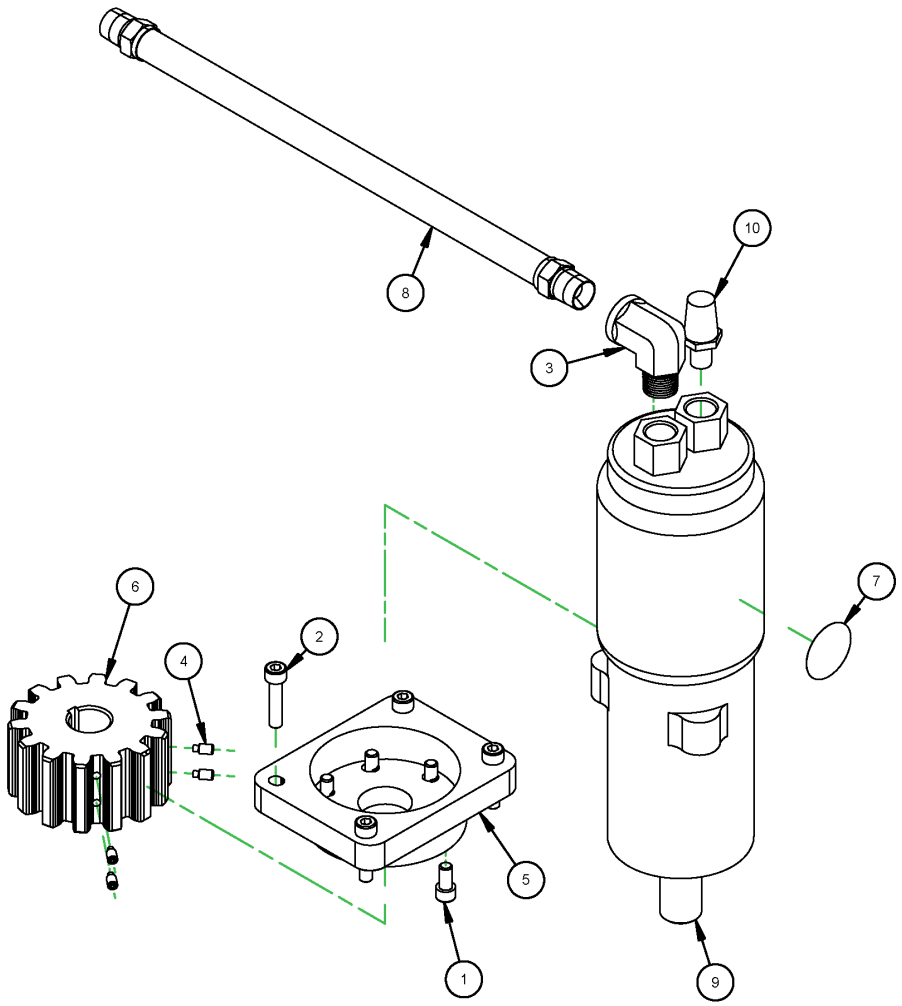
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	2	12579	FTG PLUG 1/2 NPTM SOCKET
2	3	12920	FTG REDUCER BUSHING 1/2 NPTM X 1/4 NPTF
3	1	15625	HOSE ASSY 801 1/2 X 1/2 NPTMS ENDS X 12
4	4	21769	5/16-18 X 1/2 BHSCS
5	4	35009	SCREW M6 X 1.0 X 20 SHCS
6	3	42494	SCREW M8 X 1.25 X 25mm SHCS
7	1	58039	CAM FEED
8	1	58751	UNION ROTARY HYDRAULIC 4 CHANNEL 1/2 NPTF PORTS MOD
9	1	58902	PLATE TORQUE ROTARY UNION
10	1	59244	PLUMBING PNEUMATIC FEED ASSY (NOT SHOWN)
11	1	59328	SCREW 12MM DIA X 35MM X M10 X 1.5 SHLDCS
12	1	59632	ASSY DRIVE PNEUMATIC FF7200 AND FF8200
13	1	59636	AIR CONTROL ASSY FOR PNEUMATIC FEED AND 1" DRIVE SUPPLY (NOT SHOWN)
14	1	59692	FTG QUICK COUPLER 3/4B 1/2 NPTF MALE AIR

FIGURE A-16. AIR MOTOR DRIVE ASSEMBLY (P/N 58186)



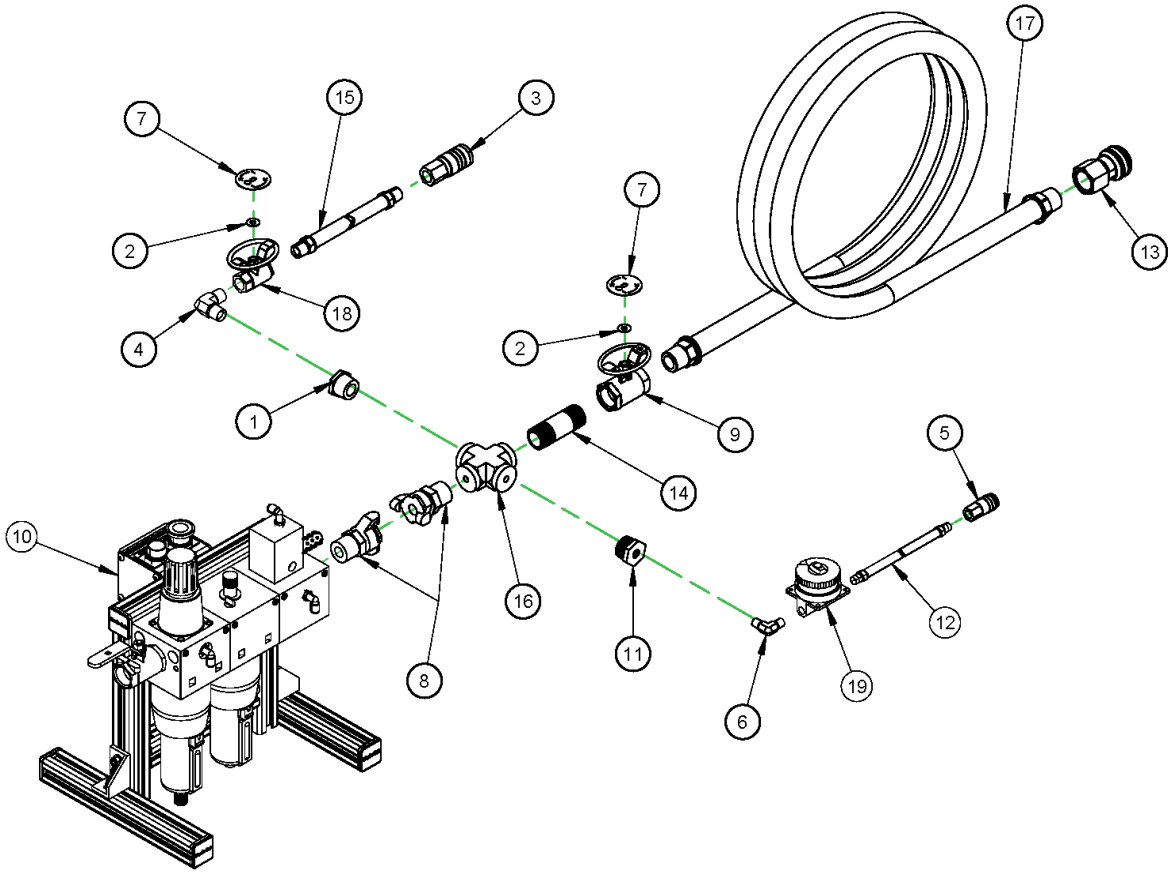
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	130	50985	TUBING 1/4 OD X .040 WALL DOT 1200 PSI NYLON BLUE (NOT SHOWN)
2	130	59151	TUBING 1/8 OD X .023 WALL DOT 1000 PSI NYLON BLUE (NOT SHOWN)
3	1	13641	FTG MUFFLER 1/4 NPTM
4	1	15625	HOSE ASSY 801 1/2 X 1/2 NPTMS ENDS X 12
5	1	24851	FTG QUICK COUPLER 1/2B 1/2 NPTF MALE AIR
6	1	28493	QUICK COUPLER 1/4B MALE 1/4 NPTF
7	2	35504	SCREW M6 X 1.0 X 35mm SHCS
8	2	35891	WASHER M6 FLTW DIN 12.5
9	1	51263	FTG ADAPTER 1/4 NPTM X 1/4 TUBE F PRESTOLOCK NICKEL PLATED
10	1	59318	VALVE 2-POSITION 3-WAY NORMALLY OPEN
11	1	59341	HOSE ASSY 801 1/4 X 1/4 NPTM ENDS X 12
12	1	59342	FTG ELBOW 1/4 NPTMS X 1/4 TUBE F PRESTOLOCK NICKEL PLATED
13	1	60669	VALVE 1/4 NPTM X 1/4 TUBE F PRESTOLOCK FLOW CONTROL RIGHT ANGLE FLOW METERED OUT SET AT 5 SCFM
14	1	63083	FTG ADAPTER 1/8 TUBE F PRESTOLOCK X 1/4 NPTM STRAIGHT

FIGURE A-17. PLUMBING PNEUMATIC FEED ASSEMBLY (P/N 59244)



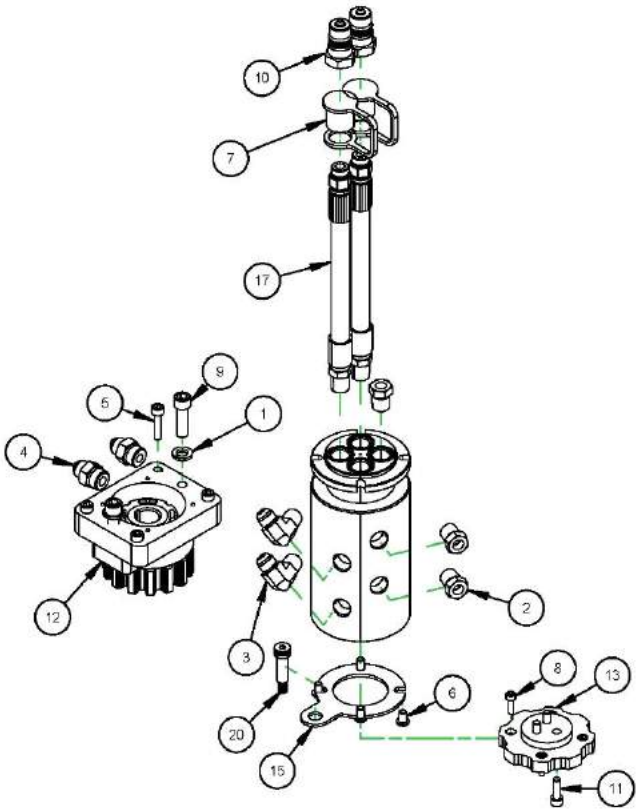
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	6	12432	SCREW 5/16-18 X 5/8 SHCS
2	4	18215	SCREW M8 X 1.25 X 35 mm SHCS
3	1	35692	FTG ELBOW 1/2 NPTM X 1/2 NPTF ST 90 DEG BRASS
4	4	45034	SCREW M6 X 1.0 X 12MM SSSDPPL
5	1	58309	PLATE MOTOR PNEUMATIC FF7200 FF8200
6	1	58310	GEAR SPUR 4DP 14T 20PA STEEL MOD
7	1	59037	LABEL WARNING - WEAR EAR PROTECTION
8	1	59634	HOSE ASSY 801 1/2 X 1/2 NPTMS ENDS X 16
9	1	60887	MOTOR AIR 3.5HP 185 RPM FS 97 RPM MAX 265TQ REVERSE ROTATION
10	1	61033	MUFFLER 1/2 INCH SINTERED BRASS

FIGURE A-18. PNEUMATIC DRIVE ASSEMBLY (P/N 59632)



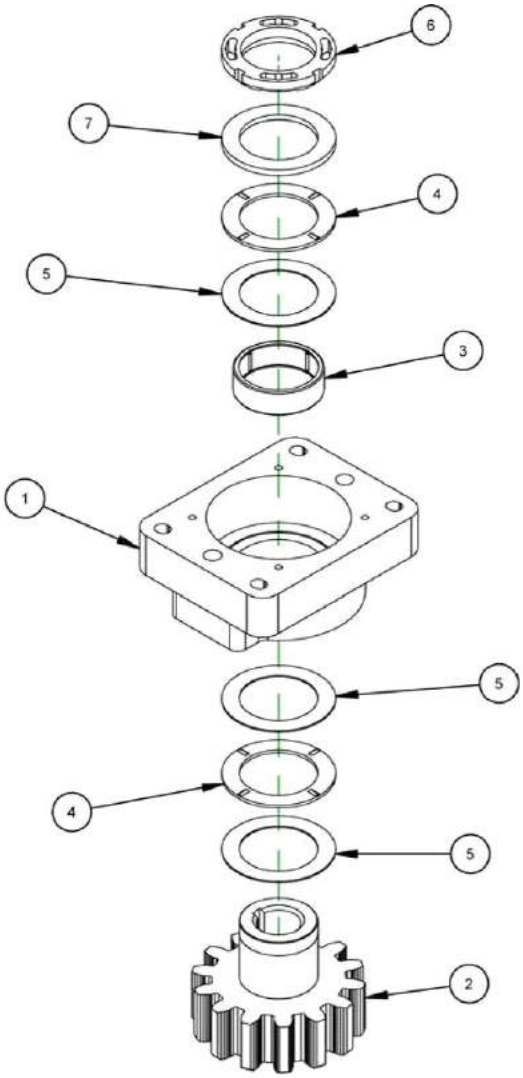
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10321	FTG REDUCER BUSHING 1 NPTM X 1/2NPTF
2	2	10770	WASHER THRUST .75 OD X .312 ID X .03
3	1	13208	FTG QUICK COUPLER 1/2B 1/2NPTF FEMALE AIR
4	1	13828	FTG ELBOW 1/2 NPTM X 1/2 NPTM 90°
5	1	28494	FTG QUICK COUPLER 1/4B 1/4 NPTF FEMALE AIR
6	1	30502	FTG ELBOW 1/4 NPTM X 1/4 NPTM 90 DEG
7	2	35772	LABEL DIRECTION OVAL HANDLE BALL VALVE
8	2	58380	FTG QUICK COUPLER UNIVERSAL 1 NPTM
9	1	58382	VALVE BALL 1 NPTF OVAL HANDLE
10	1	59248	PNEUMATIC CONDITIONING UNIT 1 IN W/ L.P. DROP OUT AND E-STOP CE
11	1	59286	FTG BUSHING 1 NPTM X 1/4 NPTF
12	1	59330	HOSE ASSY 801 1/4 X 1/4 NPTMS ENDS X 180
13	1	59369	FTG QUICK COUPLER 3/4B 1 NPTF FEMALE AIR
14	1	59370	FTG NIPPLE 1 NPTM X 3" BRASS
15	1	59376	HOSE ASSY 801 1/2 X 1/2 NPTMS ENDS X 180
16	1	59380	FTG CROSS 1 NPTF
17	1	59693	HOSE ASSY 801 1 X 1 NPTM ENDS X 180
18	1	63175	VALVE BALL 1/2 NPTF X 1/2 NPTF VENTED OVAL HANDLE
19	1	71317	REGULATOR PNUE. 2-40 PSI DIAL SET SEMI-PRECISION 1/4 NPTF X 1/4 NPTF

FIGURE A-19. AIR CONTROL ASSEMBLY FOR PNEUMATIC FEED (P/N 59636)



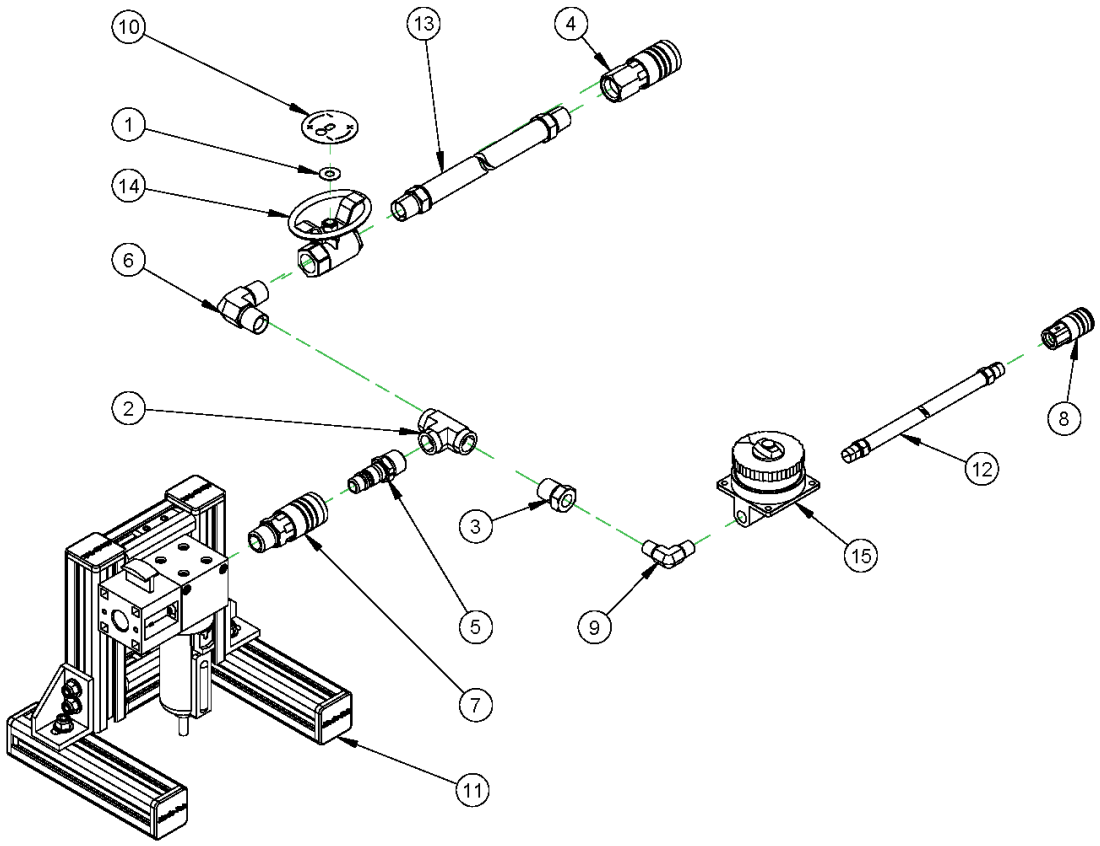
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	2	11238	WASHER LOCK 1/2
2	3	12920	FTG REDUCER BUSHING 1/2 NPTM X 1/4 NPTF STEEL
3	2	12974	FTG ELBOW 1/2 NPTM X JIC-8 MALE 90 DEG
4	2	16047	FTG ADAPTER SAE-10M X JIC-8M STRAIGHT
5	4	18215	SCREW M8 X 1.25 X 35 mm SHCS
6	4	21769	5/16-18 X 1/2 BHSCS
7	2	27978	FTG DUST CAP 1/2 MALE QUICK COUPLING
8	4	35009	SCREW M6 X 1.0 X 20 SHCS
9	2	35215	SCREW M12 X 1.75 X 40mm SHCS
10	2	40614	FTG QUICK COUPLER 1/2 MB X SAE-10F
11	3	42494	SCREW M8 X 1.25 X 25mm SHCS
12	1	57819	ASSY DRIVE GEAR HYD FF7200 FF8200
13	1	58039	CAM FEED
14	1	58751	UNION ROTARY HYDRAULIC 4 CHANNEL 1/2 NPTF PORTS MOD
15	1	58902	PLATE TORQUE ROTARY UNION
16	2	59233	HOSE ASSY 451 1/2 X JIC-8 FEMALE ENDS X 23 STRAIGHT END AND 90° END (NOT SHOWN)
17	2	59240	HOSE ASSY 451 1/2 X SAE-10M TO 1/2 NPTM X 12 STRAIGHT FITTINGS
18	1	59244	PLUMBING PNEUMATIC FEED ASSY (NOT SHOWN)
21	1	59245	AIR CONTROL ASSY FOR PNEUMATIC FEED (NOT SHOWN)
20	1	59328	SCREW 12MM DIA X 35MM X M10 X 1.5 SHLDCS

FIGURE A-20. HYDRAULIC DRIVE ASSEMBLY (P/N 58180)



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	57816	PLATE MOTOR HYDRAULIC FF7200 FF8200
2	1	57817	GEAR PINION 4DP 14T MODIFIED
3	1	59407	BRG NEEDLE 45MM ID X 52MM OD X 16MM OPEN
4	2	59408	BRG THRUST 45MM ID X 65MM OD X 3MM
5	3	59409	WASHER THRUST 45MM ID X 65MM OD X 1MM
6	1	59411	NUT LOCKING TLNKM-09 FACE LOCKING PILOTED
7	1	59424	WASHER THRUST 45MM ID X 65MM OD X 4MM

FIGURE A-21. HYDRAULIC GEAR DRIVE ASSEMBLY (P/N 57819)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10770	WASHER THRUST .75 OD X .312 ID X .03
2	1	12917	FTG TEE 1/2 NPTF (3)
3	1	12920	FTG REDUCER BUSHING 1/2 NPTM X 1/4 NPTF STEEL
4	1	13208	FTG QD COUPLER 1/2B 1/2 NPTF PNEUMATIC
5	1	13209	FTG QD NIPPLE 1/2B 1/2 NPTM PNEUMATIC
6	1	13828	FTG ELBOW 1/2 NPTM X 1/2 NPTM 90°
7	1	16610	FTG QUICK COUPLER 1/2B 1/2 NPTM FEMALE AIR
8	1	28494	FTG QUICK COUPLER 1/4B 1/4 NPTF FEMALE AIR INDUSTRIAL STYLE
9	1	30502	FTG ELBOW 1/4 NPTM X 1/4 NPTM 90 DEG
10	1	35772	LABEL DIRECTION OVAL HANDLE BALL VALVE
11	1	59329	ASSY PNEUMATIC FILTER & VALVE WITH STAND
12	1	59330	HOSE ASSY 801 1/4 X 1/4 NPTMS ENDS X 180
13	1	59376	HOSE ASSY 801 1/2 X 1/2 NPTMS ENDS X 180
14	1	63175	VALVE BALL 1/2 NPTF X 1/2 NPTF VENTED OVAL HANDLE
15	1	71317	REGULATOR PNUE. 2-40 PSI DIAL SET SEMI-PRECISION 1/4 NPTF X 1/4 NPTF

FIGURE A-22. AIR CONTROL ASSEMBLY FOR PNEUMATIC FEED (P/N 59245)

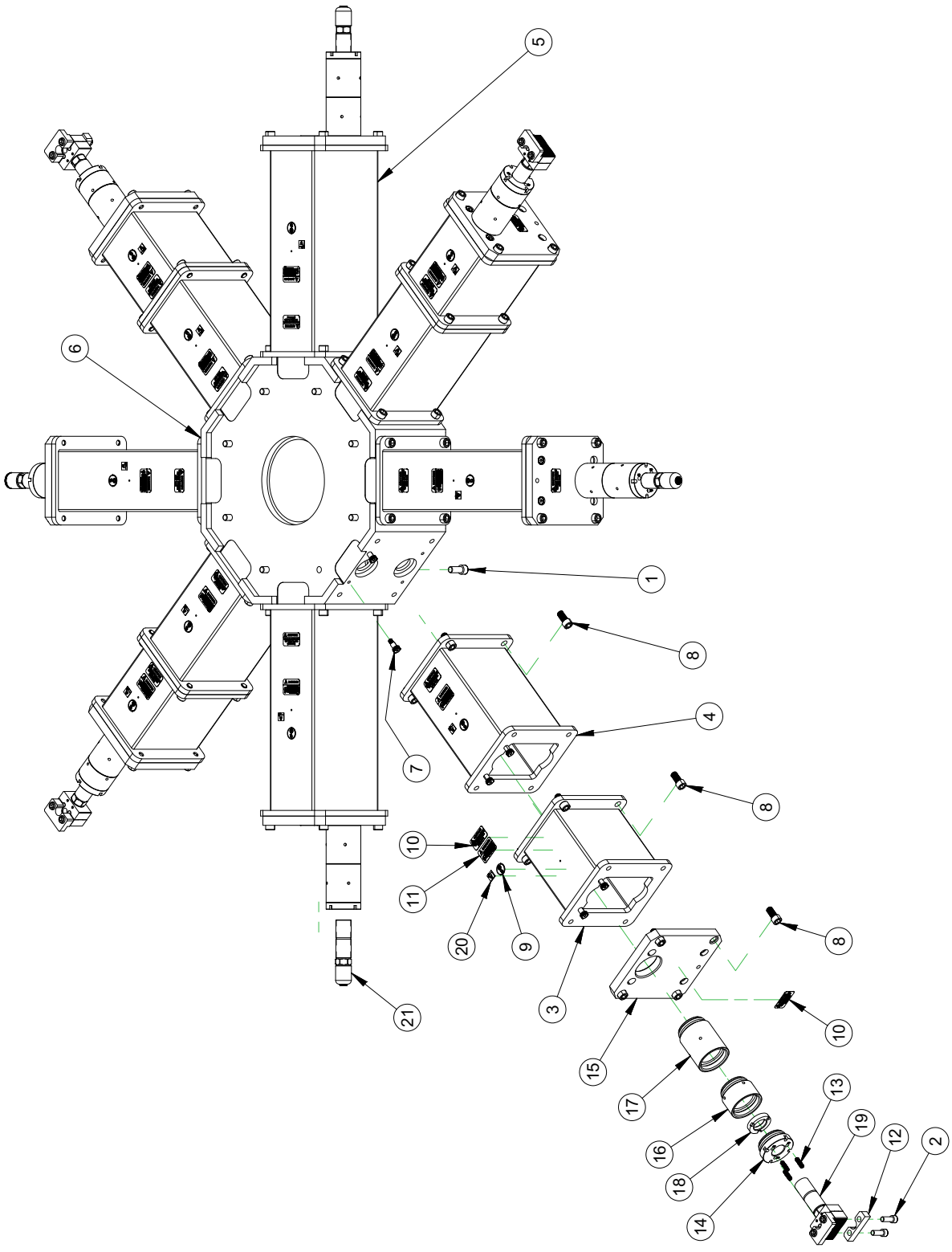
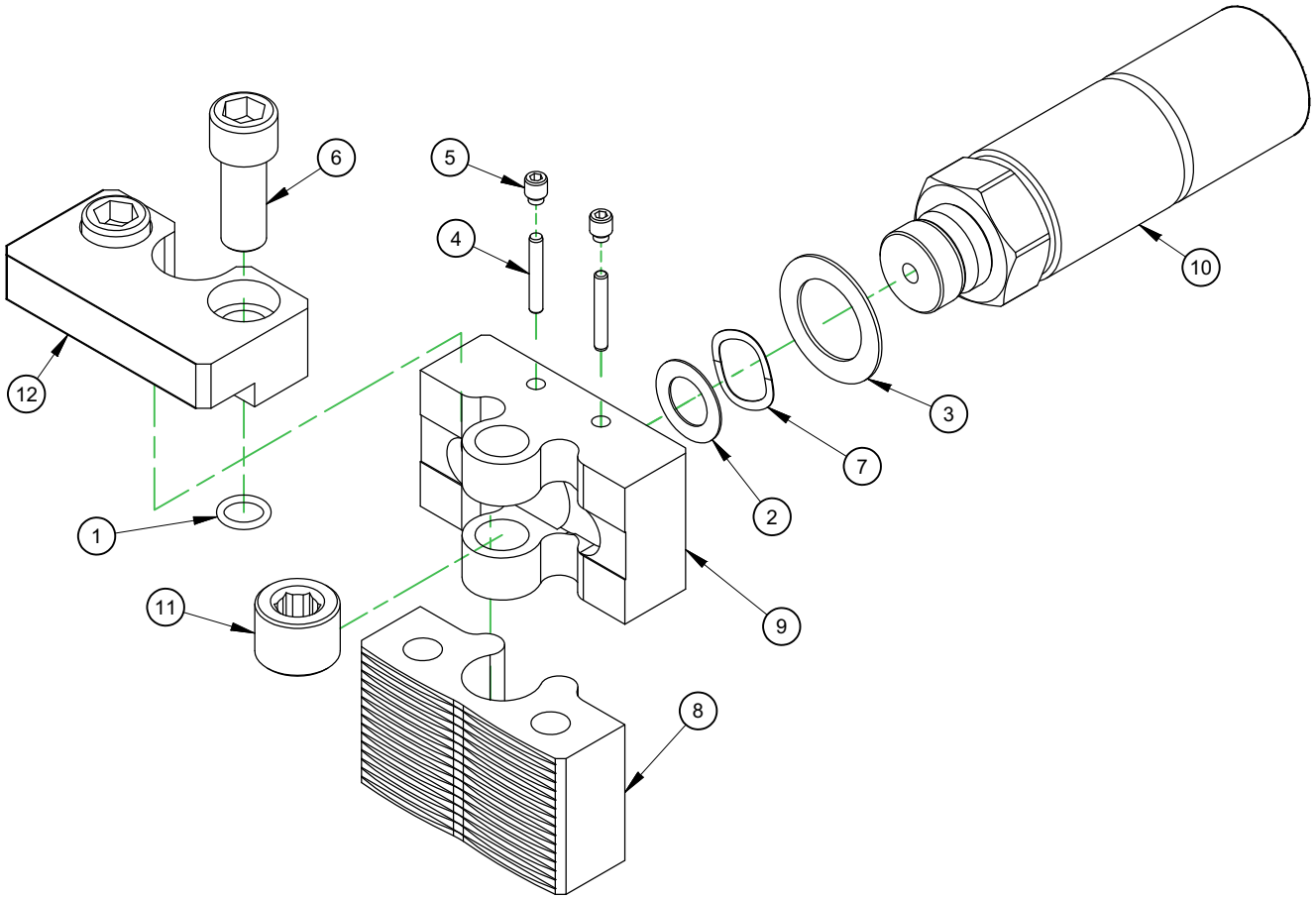


FIGURE A-23. ID CHUCK ASSEMBLY (P/N 57881)

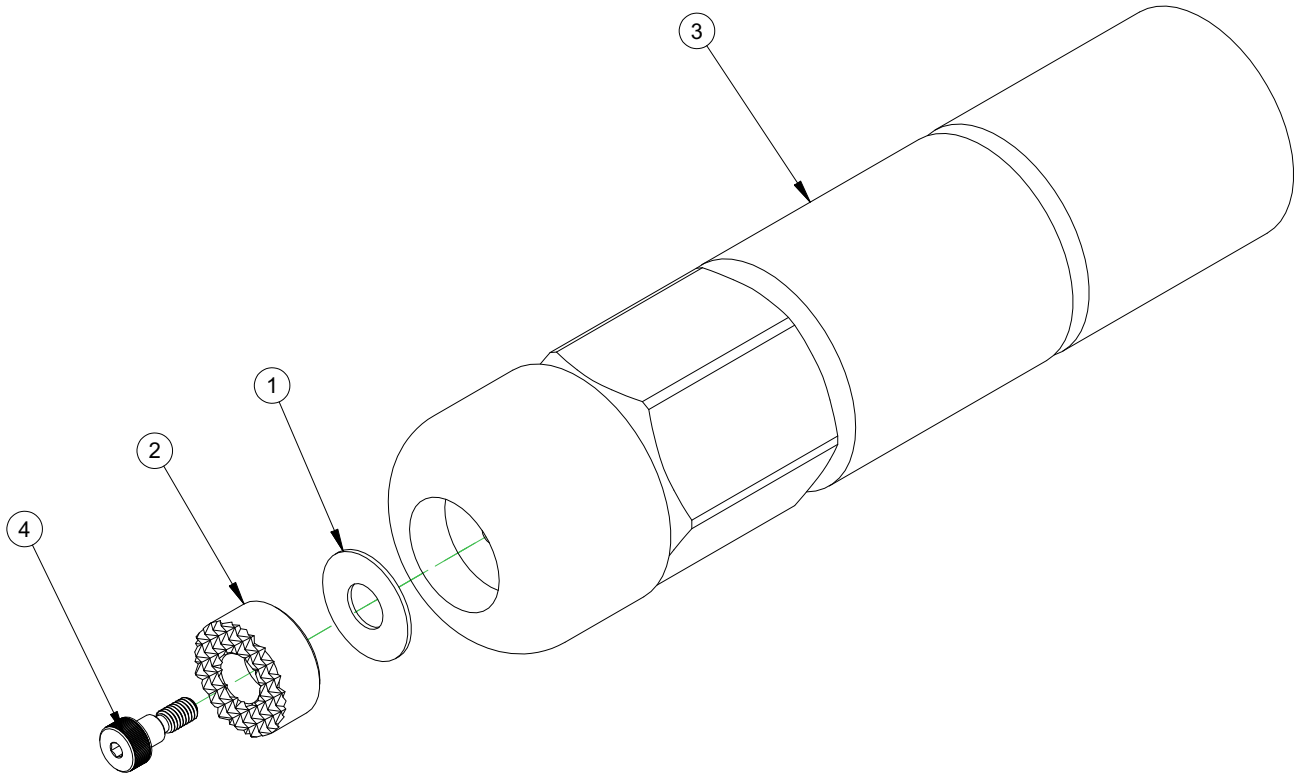
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	40459	SCREW M20 X 2.5 X 50 mm SHCS
2	4	46222	SCREW M16 X 2.0 X 55mm SHCS
3	4	57724	WELDMENT STANDOFF 12.5 FF8200
4	4	57851	WELDMENT STANDOFF 17.5 FF8200
5	4	57852	WELDMENT STANDOFF 27.5 FF8200
6	1	58101	HUB CHUCK MACHINED FF8200
7	16	58202	SCREW 16MM DIA X 20MM X M12 X 1.75 SHLDCS
8	80	58203	SCREW M20 X 2.5 X 40MM SHCS
9	12	59039	LABEL WARNING LIFT POINT ROUND 1.5"
10	20	60537	LABEL TORQUE SCREWS 150 FT-LBS
11	12	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3
12	2	63842	RESTRAINT SAFETY WELD PLATE CM6200
13	24	74499	SCREW M12 X 1.75 X 40mm SSSFP
14	8	89717	CAP END 4.50 DIA 4-4 OD THREAD 2-8 ID THREAD
15	8	89718	PLATE BASE CHUCK
16	8	89720	LEG CHUCK TUBE 4.5 OD X 2.5 THREADED
17	12	89721	LEG CHUCK TUBE 4.5 OD X 5.0 THREADED
18	8	89726	NUT JACKING LOCK 2-8
19	4	90836	ASSY FOOT CHUCK ADJUSTABLE
20	12	91217	PLATE MASS CE 1.0 X 1.0 KG ADHESIVE BACKED
21	4	91232	ASSY FOOT NON LEVELING GRIPPER LARGE FF LINE

FIGURE A-24. ID CHUCK ASSEMBLY PARTS LIST (P/N 57881)



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	2	10611	RING O 3/32 X 9/16 ID X 3/4 OD
2	1	11739	WASHER THRUST .750 ID X 1.250 OD X .0312
3	1	16666	WASHER THRUST 1.250 ID X 1.937 OD X .060
4	2	19735	PIN DOWEL 3/16 DIA X 1-1/4
5	2	44257	SCREW M8 X 1.25 X 10mm SSSDP
6	4	44905	SCREW M16 X 2.0 X 40mm SHCS
7	1	58244	WASHER SPRING WAVE 1.235 OD X .961 ID X .014
8	1	63582	JAW ADJUSTER CM6200
9	1	63583	BASE ADJUSTER CM6200
10	1	63584	JAW SCREW CM6200
11	1	63585	SCREW M30 X 1.5 X .875 HOLLOW LOCK MOD
12	1	63586	FINGER SETUP EXTENSION CM6200

FIGURE A-25. ADJUSTABLE CHUCK FOOT ASSEMBLY (P/N 90836)

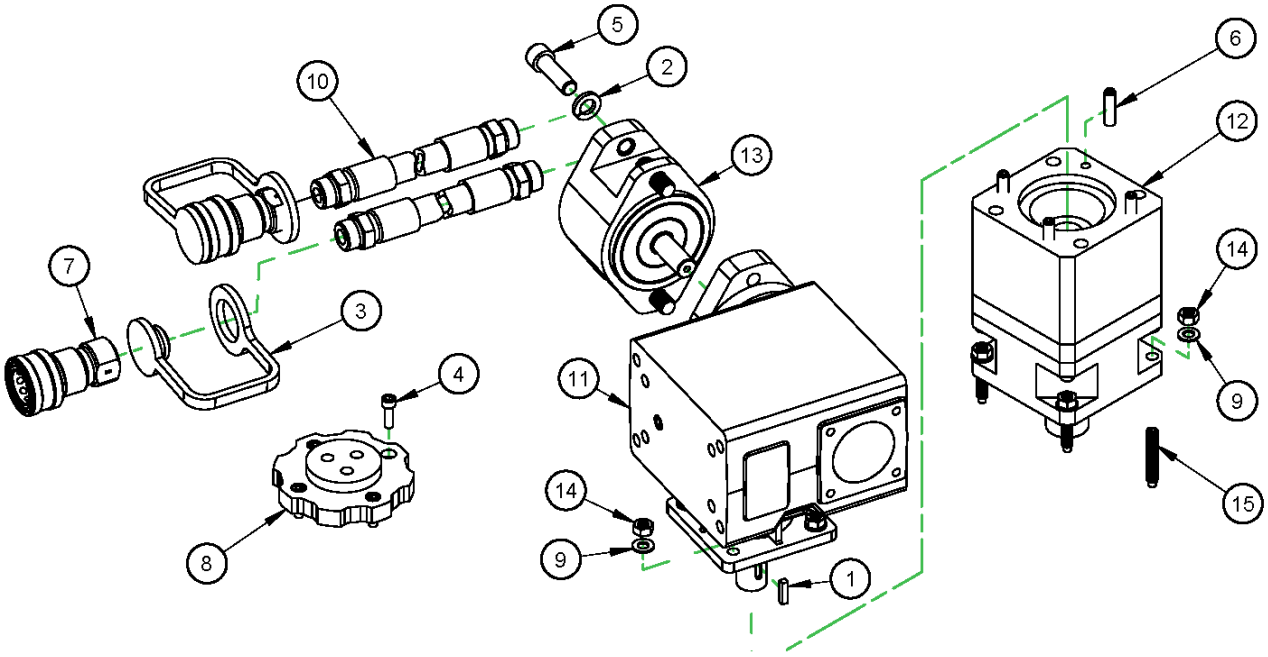


NOTE:

1. NON-MARRING 91259 GRIPPER PAD IS INCLUDED IN TOOL KIT.

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	84463	WASHER THRUST 10mm ID X 24mm OD X 1mm
2	1	91228	GRIPPER SERRATED HSS 25MM DIAM X M6 CBORED
3	1	91230	FOOT NON LEVELING GRIPPER LARGE FF LINE
4	1	91263	SCREW 6MM DIA X 6MM X M5 X 0.8 SHLDCS

FIGURE A-26. NON-LEVELING FOOT ASSEMBLY (P/N 91232)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10217	KEY 3/16 SQ X .75 SQ BOTH ENDS
2	2	11238	WASHER LOCK 1/2
3	2	27977	FTG DUST PLUG 1/2 QD COUPLER
4	4	35009	SCREW M6 X 1.0 X 20 SHCS
5	2	35215	SCREW M12 X 1.75 X 40mm SHCS
6	4	36240	SCREW M8-1.25 X 30mm SSSFP
7	2	40615	FTG QUICK COUPLER FEMALE 60 SERIES 1/2B X SAE-10F
8	1	58039	CAM FEED
9	8	59432	WASHER M8 FLTW 16MM OD 1.6MM THICK
10	2	60117	ASSY HYD HOSE 100R17 1/2 X 12 SAE-10M BOTH ENDS
11	1	67219	GEARBOX 30:1 WORM .625 INPUT .875 OUTPUT
12	1	67258	GEARBOX 5:1 PLANETARY .875 INPUT 1.25 OUTPUT
13	1	67347	ASSY TORQUE LIMITER 2 BOLT SAE A 1.25 INPUT .625 OUTPUT
14	8	67546	NUT M8 X 1.25 STDN ZINC PLATED
15	4	67573	SCREW M8 X 1.25 X 50MM SSSHDP

FIGURE A-27. CONVERSION KIT HYDRAULIC DRIVE MOTOR (P/N 64336)

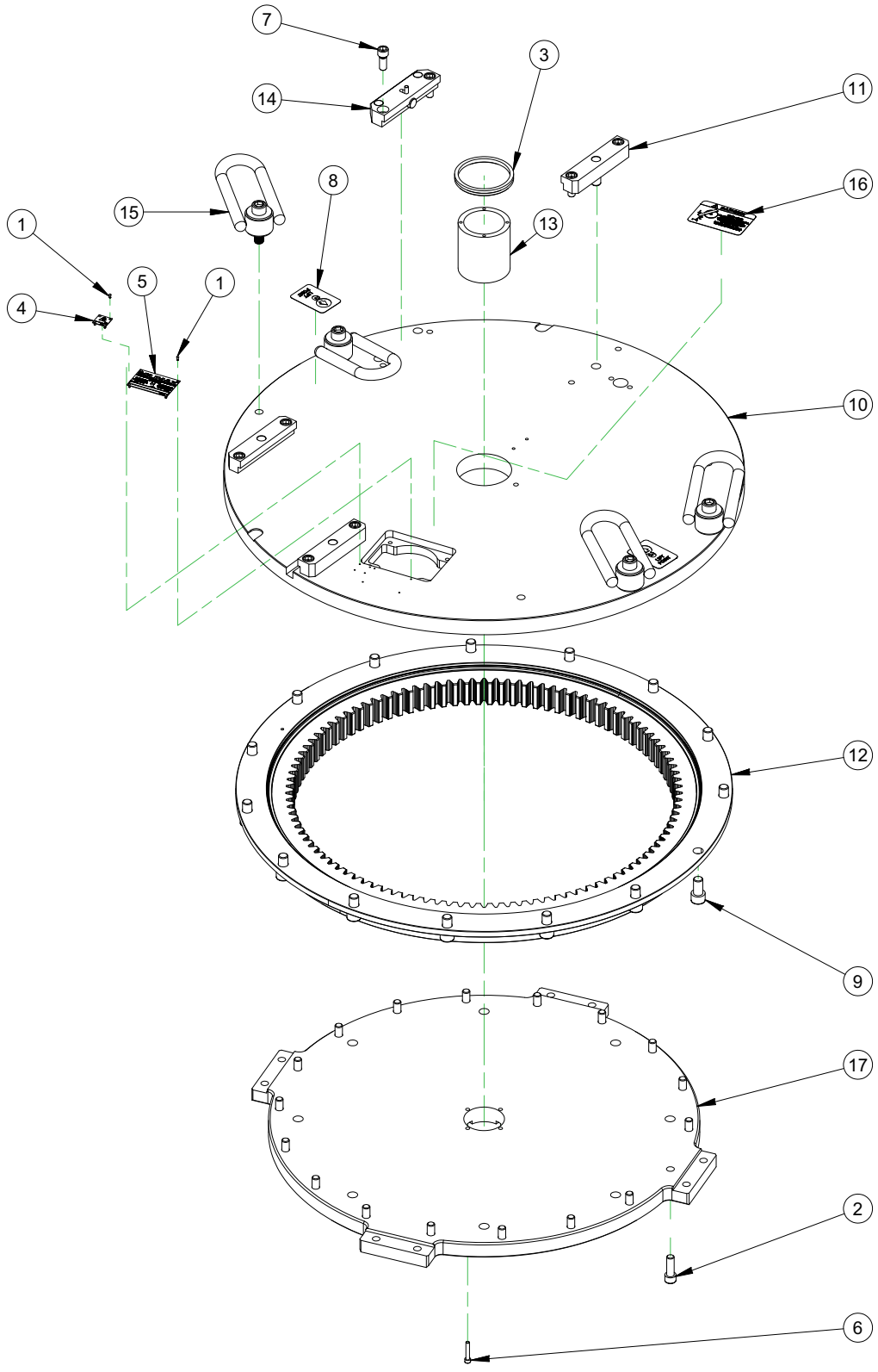
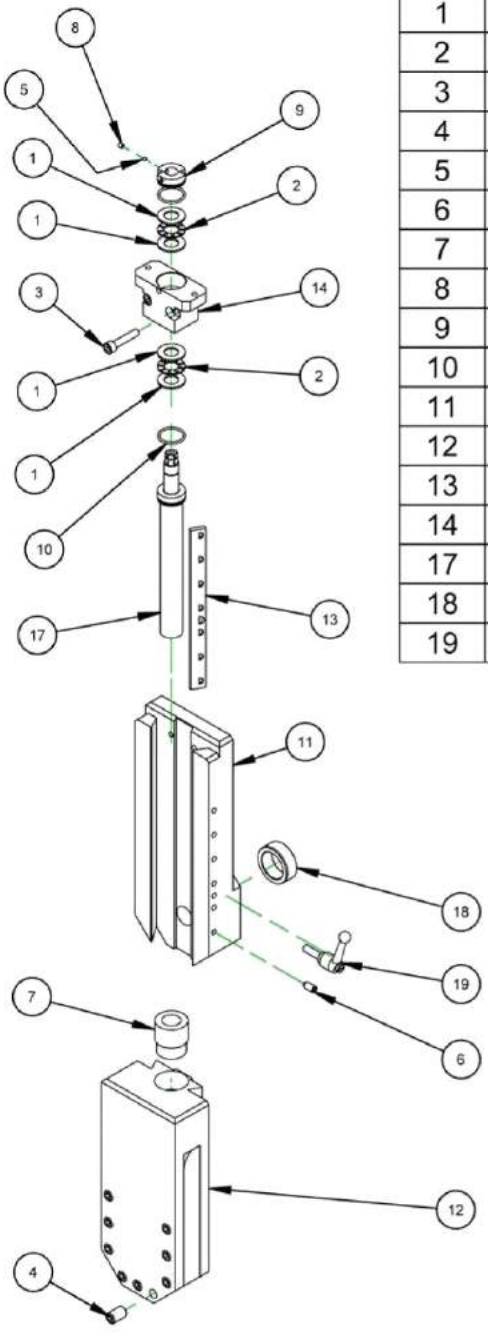


FIGURE A-28. ROTARY TABLE ASSEMBLY (P/N 58061)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	18	11691	SCREW 1/2-13 X 1-1/2 SHCS
3	1	18136	SEAL 3.500 ID FORSHEDA V-RING
4	1	29152	PLATE MASS CE
5	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
6	4	35504	SCREW M6 X 1.0 X 35mm SHCS
7	8	40697	SCREW M12 X 1.75 X 30mm SHCS
8	2	41425	LABEL LIFT POINT 2 X 3
9	15	41738	SCREW M16 X 2.0 X 30MM SHCS
10	1	57785	PLATE TOP FF8200
11	3	57815	CLAMP ARM PINNED
12	1	58046	ASSY BRG AND GEAR KAYDON 33.5 OD
13	1	58050	SHAFT CENTER FF7200 AND FF8200
14	1	58128	CLAMP SAFETY STOP ASSY
15	4	58154	RING HOIST M16 X 2.0 X 175MM 1900kg (4180lbs)
16	1	62884	LABEL FLANGE FACERS IMPACT HAZARD
17	1	79543	PLATE BOTTOM SURFACE MOUNT FF8200

FIGURE A-29. ROTARY TABLE ASSEMBLY PARTS LIST (P/N 58061)

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	4	10436	WASHER THRUST .500 ID X .937 OD X .060
2	2	10437	BRG THRUST .500 ID X .937 OD X .0781
3	2	35505	SCREW M6 X 1.0 X 30 SHCS
4	9	42969	SCREW M10 X 1.5 X 12MM SSSFP
5	2	43489	BALL NYLON 1/8 DIA
6	7	45034	SCREW M6 X 1.0 X 12MM SSSDPPL
7	1	48526	LEAD NUT3/4-10 BRONZE
8	2	53365	SCREW M4 X 0.7 X 4 mm SSSFP
9	1	57214	NUT BRG RETAINING AXIAL
10	2	57320	RING O 1/16 X 13/16 ID X 15/16 OD
11	1	57782	BOTTOM SLIDE TOOL HEAD FF LINE
12	1	57783	TOP SLIDE TOOL HEAD FF LINE
13	1	57784	GIB TOOL HEAD FF LINE
14	1	57793	BEARING BLOCK LEADSCREW
17	1	57912	LEAD SCREW AXIAL FEED FF LINE
18	1	57963	BUSHING DRILL 1-3/8 OD X 1 ID X 1/2 LG
19	1	58133	HANDLE ADJUSTABLE M6 X 1 X 20MM



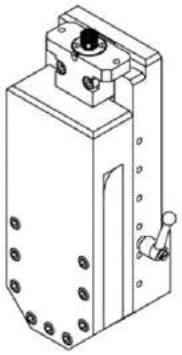
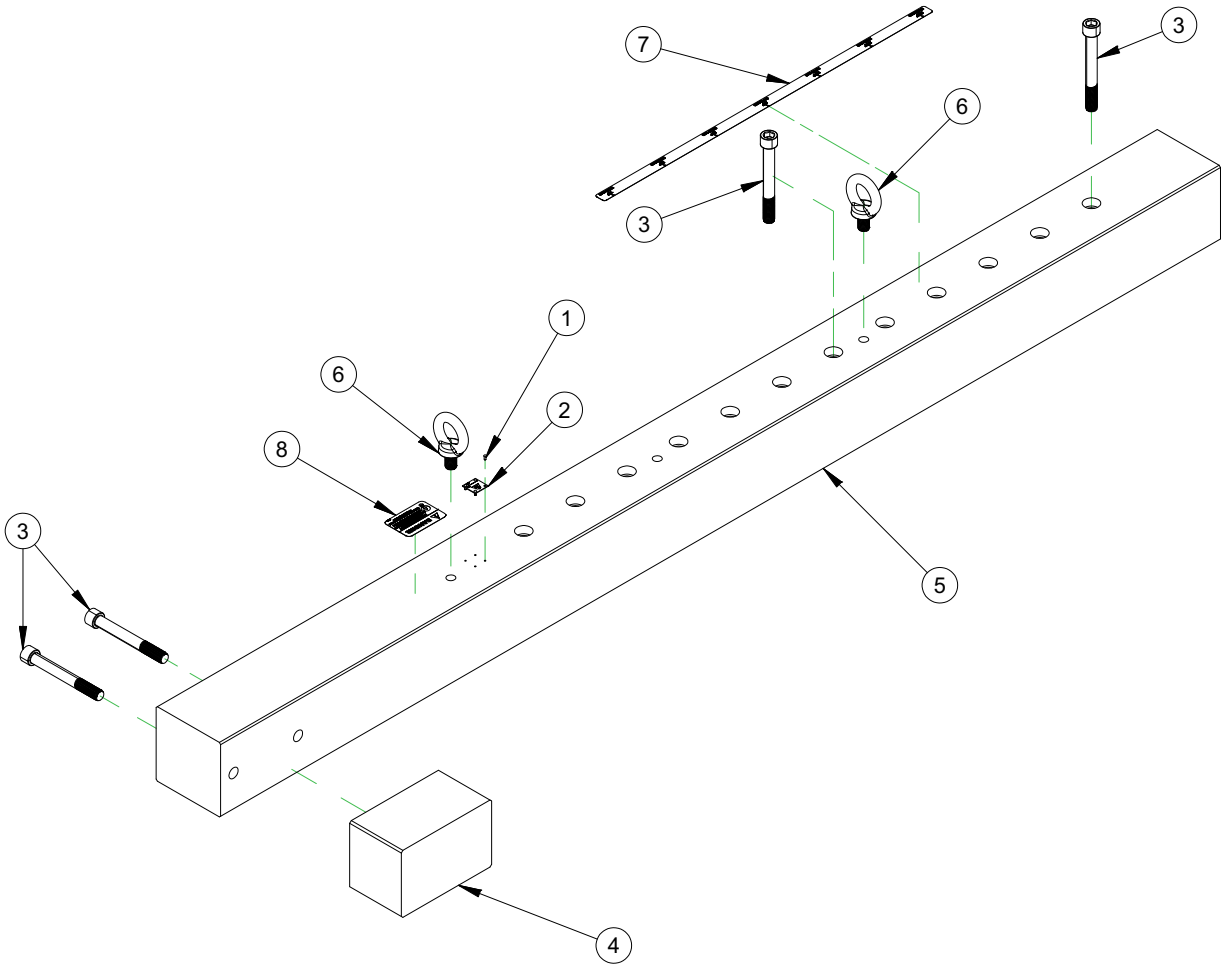
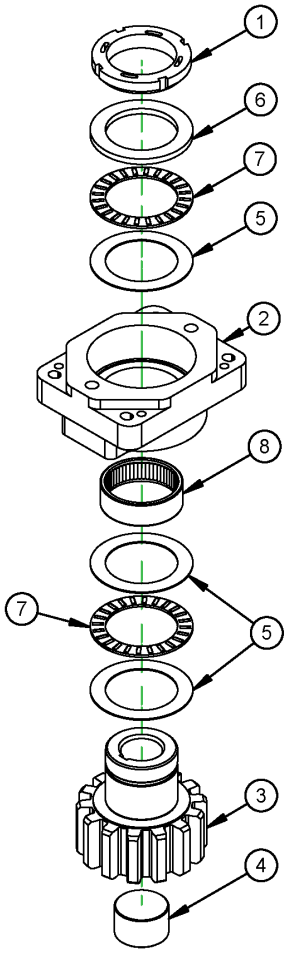


FIGURE A-30. TOOL HEAD ASSEMBLY (P/N 57781)

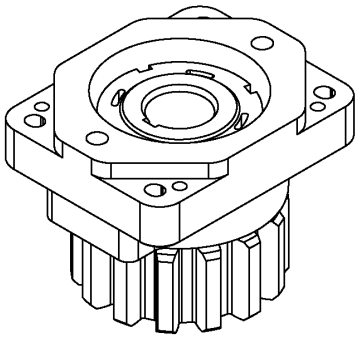


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	1	29152	PLATE MASS CE
3	4	44229	SCREW M16 X 2.0 X 130mm SHCS
4	1	58056	COUNTERWEIGHT
5	1	58065	ARM COUNTERWEIGHT FF8200
6	2	59627	BOLT EYE M16 X 2.0 X 27MM LG
7	1	61540	LABEL COUNTERWEIGHT ARM FF8200
8	1	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3

FIGURE A-31. COUNTERWEIGHT ASSEMBLY (P/N 58066)



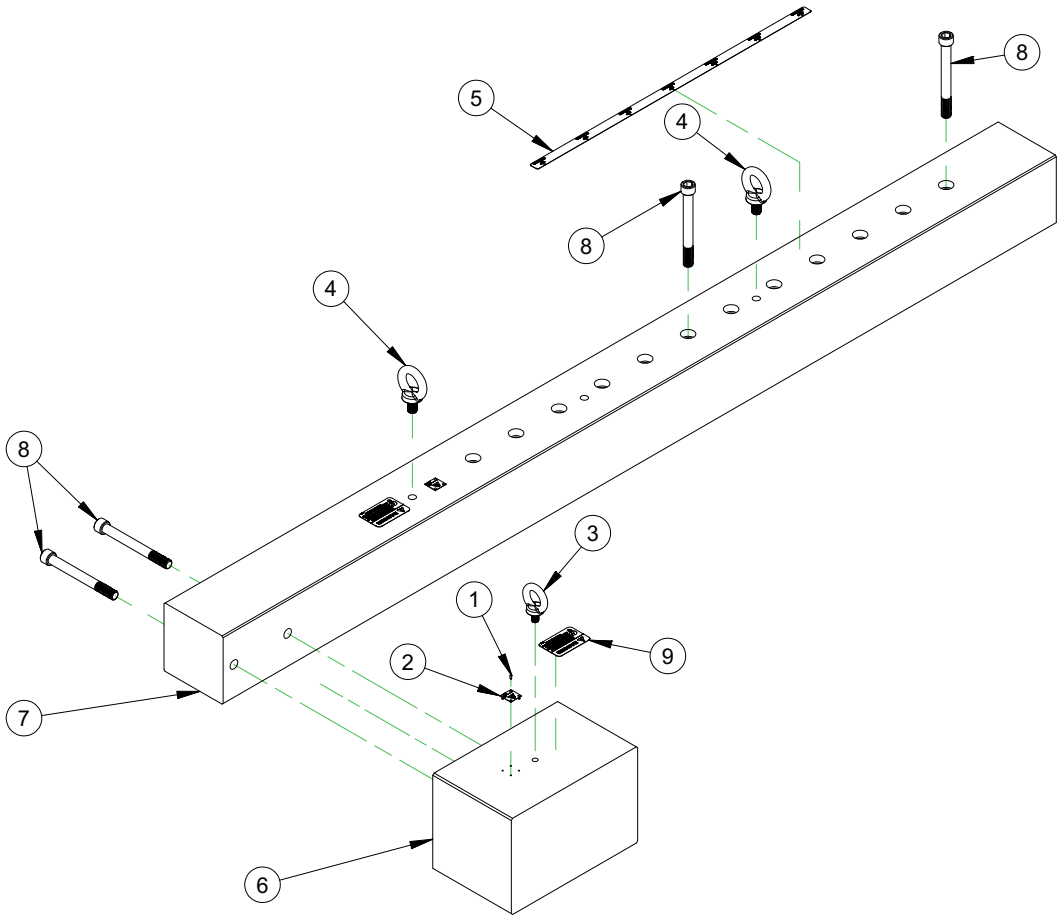
EXPLODED
SCALE 1 : 5



ASSEMBLED
SCALE 1 : 3

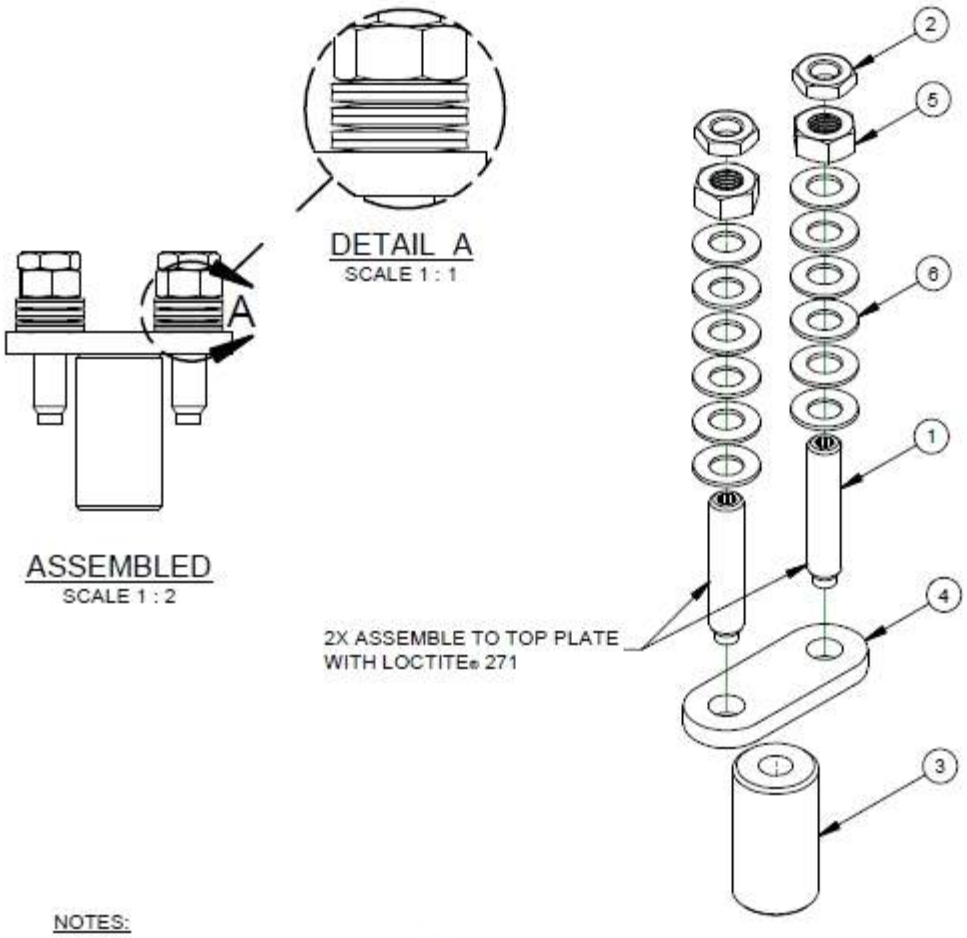
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	57443	NUT LOCKING TLN-11 FACE LOCKING
2	1	67067	PLATE MOTOR HYDRAULIC 1-1/4 DRIVE SHAFT FF7200 FF8200
3	1	67068	GEAR PINION 4DP 14T 20PA STEEL
4	1	67439	PLUG 1-5/8 DIA 1 LONG CLASS L
5	3	67515	WASHER THRUST 55MM ID X 78MM OD X 5MM
6	1	67526	WASHER THRUST 55MM ID X 78MM OD X 5MM
7	2	67528	BRG THRUST 55MM ID X 78MM OD X 3MM
8	1	67535	BRG NEEDLE 55MM ID X 63MM OD X 20MM OPEN

FIGURE A-32. HYDRAULIC GEAR DRIVE ASSEMBLY (P/N 67328)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	2	29152	PLATE MASS CE
3	1	59626	BOLT EYE M12 X 1.75 X 20.5MM LG
4	2	59627	BOLT EYE M16 X 2.0 X 27MM LG
5	1	61540	LABEL COUNTERWEIGHT ARM FF8200
6	1	62394	COUNTERWEIGHT MILL OPTION
7	1	62403	ARM COUNTERWEIGHT FF8200 MILLING
8	4	62412	SCREW M16 X 2.0 X 150 MM SHCS
9	2	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3

FIGURE A-33. COUNTERWEIGHT ARM ASSEMBLY (P/N 62415)

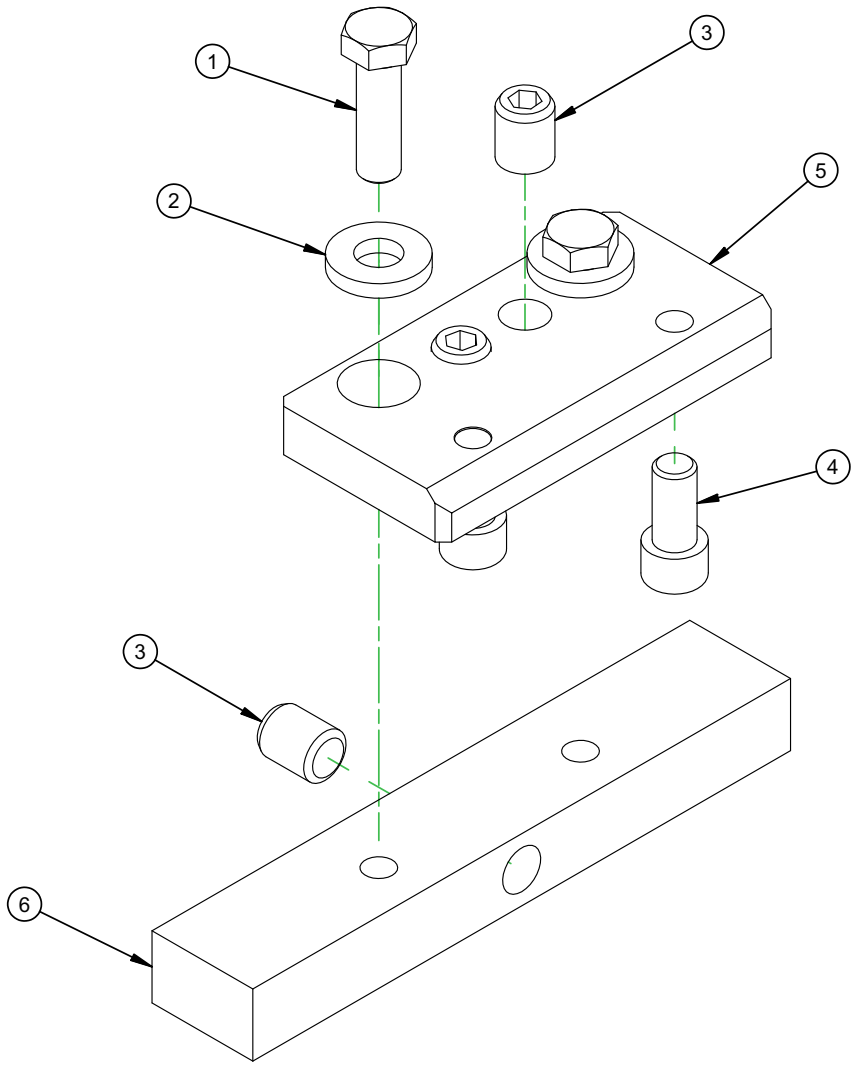


NOTES:

1. TO SET DRAG, TIGHTEN NUTS UNTIL BELLEVILLES ARE FLAT, THEN BACK OFF 1/2 TURN

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	44406	SCREW M10 X 1.5 X 50mm SSSHDP
2	2	44407	NUT M10 X 1.50 JAMN ZINC PLATED
3	1	60885	SHOE DRAG BRAKE 1IN DIA BRONZE
4	1	60889	PLATE CLAMP DRAG BRAKE
5	2	60922	NUT M10 X 1.50 STDN ZINC PLATED
6	12	60923	WASHER SPRING BELLEVILLE 10MM X 20MM X 1.25MM

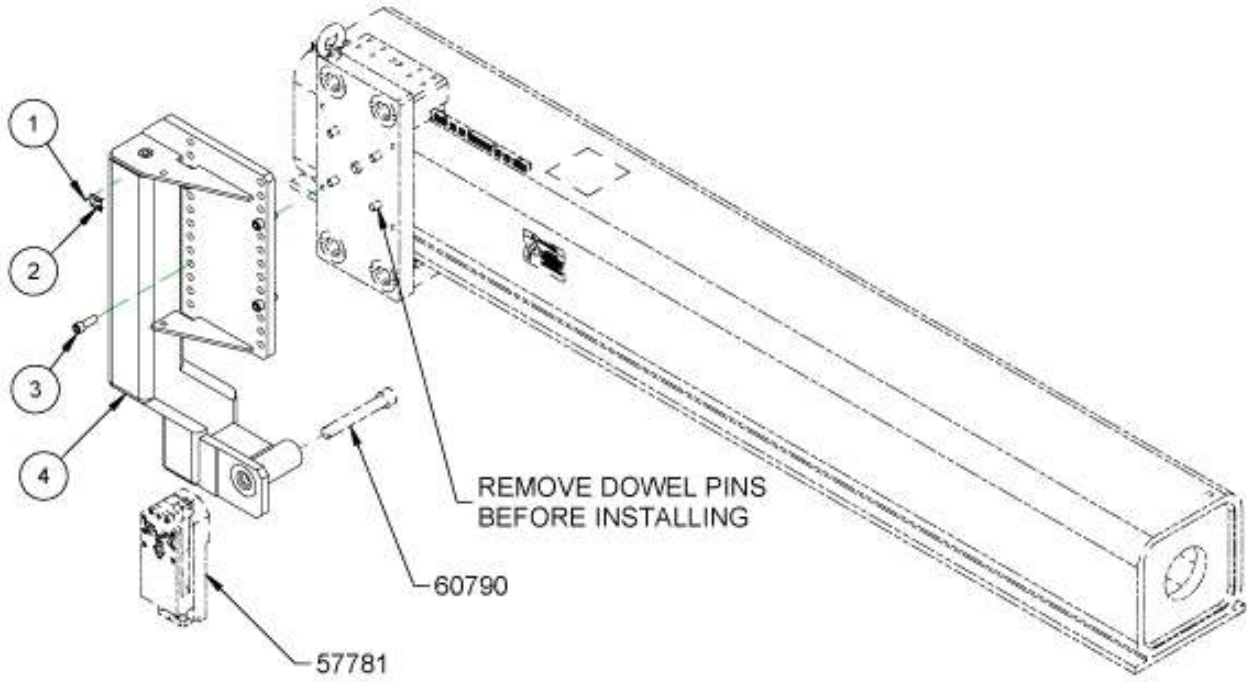
FIGURE A-34. DRAG BRAKE ASSEMBLY (P/N 62535)



79540 INCLUDES ONE FULL SET. QTY'S SHOWN IN PARTS LIST SHOW ONLY ONE SURFACE MOUNT ASSY, QTY'S ARE ACTUALLYL FOUR TIMES THAT.

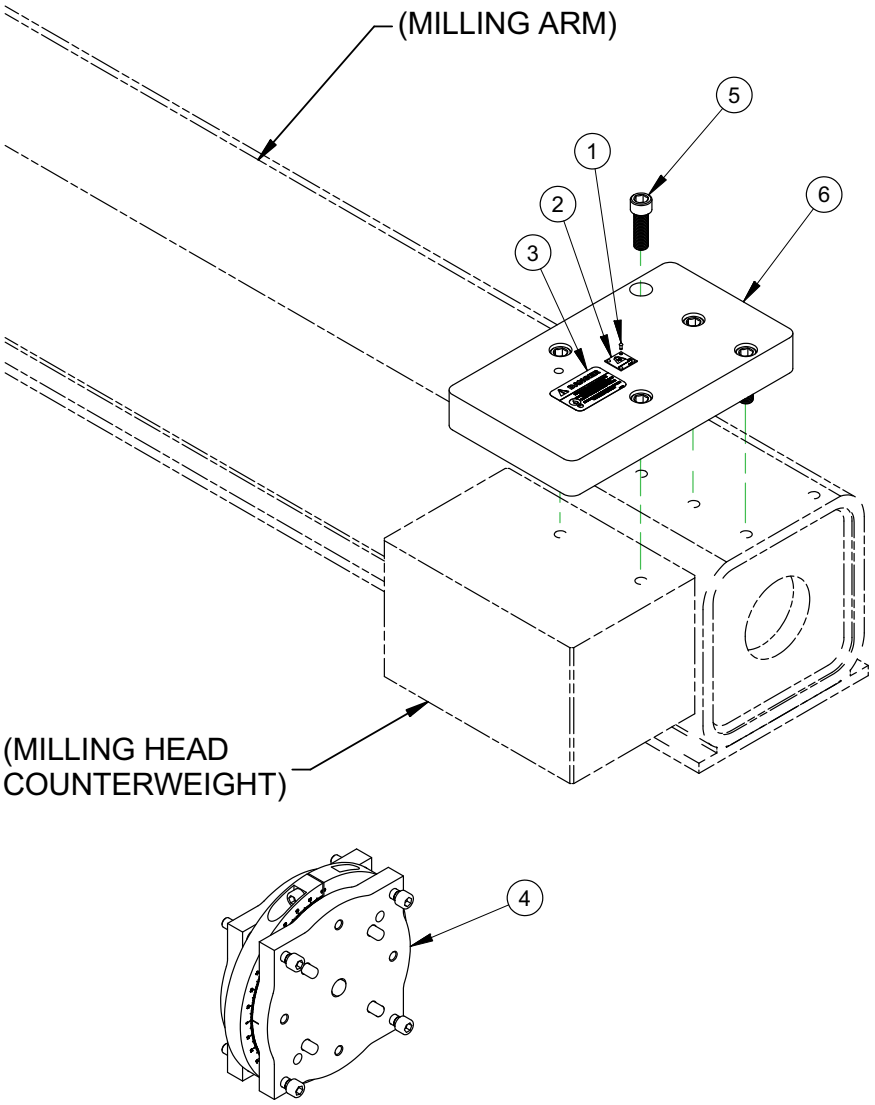
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	13789	SCREW M12 X 1.75 X 40mm HHCS
2	2	17145	WASHER 1/2 FLTW HARDENED 1-1/8 OD X 3/16 THK
3	3	34643	SCREW M16 X 1.5 X 20mm SSSFP
4	2	42094	SCREW M12 X 1.75 X 25mm SHCS
5	1	79541	PLATE EXTENSION
6	1	79542	BLOCK TACK WELD

FIGURE A-35. SURFACE MOUNT ASSEMBLY (P/N 79540)



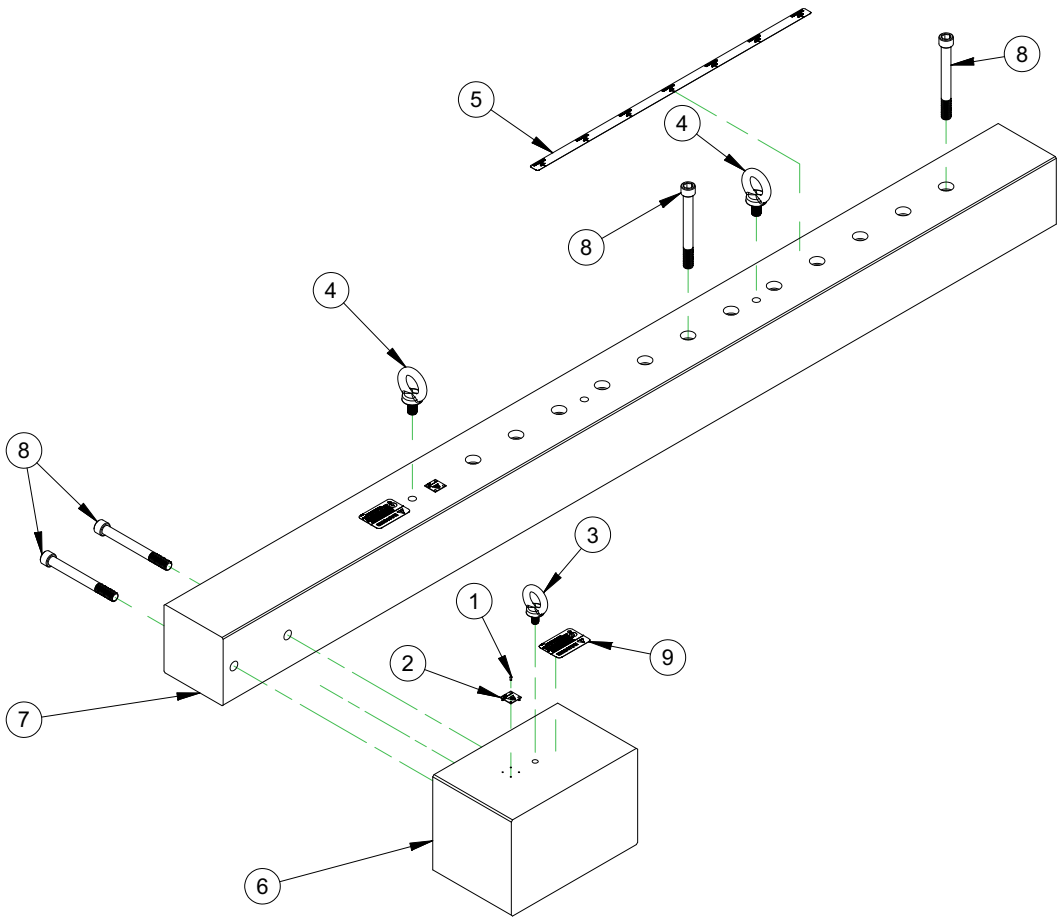
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	1	29152	PLATE MASS CE
3	4	30207	SCREW M12 X 1.75 X 35mm SHCS
4	1	69673	BACK FACE ATTACHMENT FF7200 FF8200

FIGURE A-36. BACKFACE ASSEMBLY (P/N 69711)



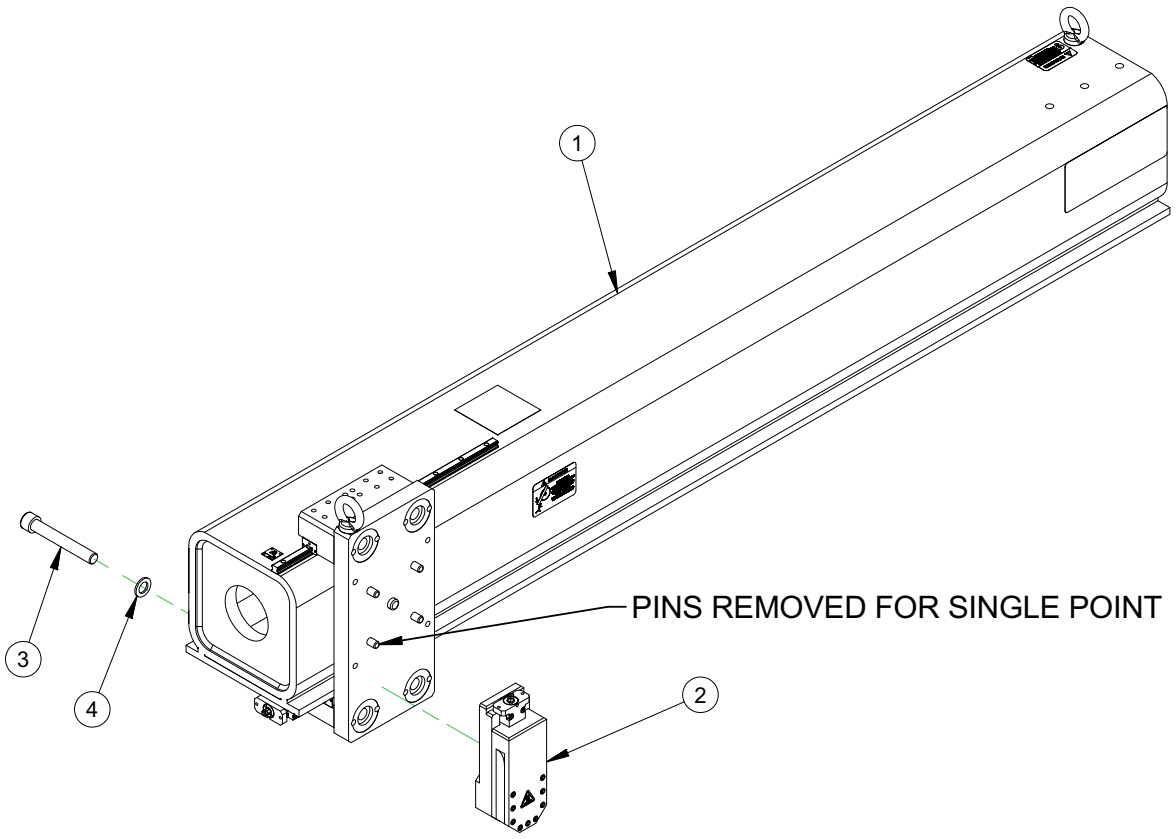
7	1	83143	(NOT SHOWN) INSTRUCTIONS RETROFIT SWIVEL PLATE COUNTERWEIGHT FF8200
6	1	83095	ADAPTER SWIVEL PLATE COUNTERWEIGHT
5	5	64518	SCREW M16 X 2.0 X 50MM SHCS
4	1	63250	ASSY SWIVEL PLATE MILLING HEAD METRIC
3	1	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3
2	1	29152	PLATE MASS CE
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
ITEM	QTY	PART No.	DESCRIPTION

FIGURE A-37. SWIVEL PLATE AND COUNTERWEIGHT ADAPTER ASSEMBLY (P/N 83125)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	2	29152	PLATE MASS CE
3	1	59626	BOLT EYE M12 X 1.75 X 20.5MM LG
4	2	59627	BOLT EYE M16 X 2.0 X 27MM LG
5	1	61540	LABEL COUNTERWEIGHT ARM FF8200
6	1	62394	COUNTERWEIGHT MILL OPTION
7	1	62403	ARM COUNTERWEIGHT FF8200 MILLING
8	4	62412	SCREW M16 X 2.0 X 150 MM SHCS
9	2	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3

FIGURE A-38. MILLING ARM ASSEMBLY (P/N 83125)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	72698	ASSY ARM MILLING FF8200
2	1	57781	TOOL HEAD ASSY FF LINE
3	1	60790	SCREW M20 X 1.5 X 140MM SHCS
4	1	57888	WASHER FIXTURING 21MM ID X 35MM OD X 3MM CASE HARDENED

FIGURE A-39. MILLING ARM WITH SINGLE-POINT TOOL HEAD ASSEMBLY (P/N 62578)

TABLE A-1. SPARE PARTS KIT

Component	Part number	Description	Quantity
Rotary table (P/N 58061)	58128	CLAMP ARM ASSY SAFETY STOP	1
	57815	CLAMP ARM LARGE FF7200 AND FF8200	3
	58154	HOIST RING LONGBAR M16 X 2 X 25MM 50 ID 88 OD 200 OAL 4180 LBS 1900 KG SWIVEL	4
	40697	SCREW M12 X 1.75 X 30MM SHCS	8
Arm system (P/N 90680, 57781, 62578, 57872)	57898	TAIL SUPPORT LEADSCREW RADIAL FEED FF LINE (KB)	1
	57895	LEADSCREW RADIAL FEED FF LINE	1
	57886	SLIDE RAIL THK SHS15 400MM LG PRELOADED METAL SCRAPERS (VMI)	2
	68500	CAP RAIL 15MM METAL THK SHS	14
	58133	HANDLE ADJUSTABLE M6 X 1 X 20MM	1
	42969	SCREW M10 X 1.5 X 12 SSSFP	9
	59627	LIFTING EYE M16 X 2.0 X 27 35 ID 63 OD 89 OAL 1543 LBS 700 KG	2
Feed System (P/N 58671, 59244)	58671	FEED BOX PNEUMATIC REMOTE FEED ADJUST	1
	50985	TUBING 1/4 OD X .040 WALL DOT 1200 PSI NYLON BLUE	180
	59151	TUBING 1/8 OD X .023 WALL DOT 1000 PSI NYLON BLUE	180
	59318	VALVE 2-POSITION 3-WAY NORMALLY OPEN	1
	58519	SHAFT FEED REMOVABLE FEEDBOX SHAFT	1
	58446	CYLINDER AIR 40MM DIA 10MM STROKE SINGLE ACTING SPRING EXTEND INCH	2
	57530	BRG NEEDLE 1 ID X 1-5/16 OD X .625 OPEN	1
	25957	BRG ROLLER CLUTCH 1 ID X 1.312 OD X .625	2
	25959	SEAL 1.000 ID X 1.312 OD X .125	2
	59156	SCREW M6 X 1.0 X 60MM SHCS	2
Chuck system (P/N 57881)	63586	FINGER SETUP EXTENSION CM6200	4
	44905	SCREW M16 X 2.0 X 40MM SHCS	8
	90836	ASSY FOOT CHUCK ADJUSTABLE NON-CLAMP	4
	87901	PLATE SADDLE RADIAL AXIS	1
	89717	CAP END 4.50 DIA 4-4 OD 3 LEAD THREAD 2-8 ID	8
	89720	LEG CHUCK TUBE 4.5 OD X 2.5 THREADED	8
	89721	LEG CHUCK TUBE 4.5 OD X 5.0 THREADED	12

TABLE A-1. SPARE PARTS KIT

Component	Part number	Description	Quantity
Drive System (P/N 58180, 59245)	42494	SCREW M8 X 1.25 X 25MM SHCS	3
	71317	REGULATOR PNUEMATIC 2-40 PSI DIAL SET SEMI-PRECISION 1/4 NPTF X 1/4 NPTF	1
	59245	AIR CONTROL ASSY FOR PNEUMATIC FEED ONLY 15 FT HOSES	1
	60887	MOTOR AIR 3.5HP REVERSIBLE	1
	35215	SCREW M12 X 1.75 X 40MM SHCS	2
	11238	WASHER 1/2 LOCW	2
	18215	SCREW M8 X 1.25 X 35MM SHCS	4
	59329	PNEUMATIC CONDITIONING UNIT VALVE, FILTER, AND STAND ONLY	1
	69213	MOTOR HYD 4.9 CU IN 1-1/4 INCH KEYED SHAFT SAE O-RING 2000	1
	69217	MOTOR HYD 18.7 CU IN 1-1/4 INCH KEYED SHAFT SAE O-RING 2000	1
	69219	MOTOR HYD 29.8 CU IN 1-1/4 INCH KEYED SHAFT SAE O-RING 2000	1
	59240	HOSE ASSY 451 1/2 X SAE-10M TO 1/2 NPTM X 12 STRAIGHT FITTINGS	2
	59233	HOSE ASSY 451 1/2 X JIC-8 FEMALE ENDS X 23 STRAIGHT END AND 90° END	2

TABLE A-2. TOOL KIT P/N 58188

Part number	Description	Quantity
14735	WRENCH EXTENSION 1/2 DRIVE X 10	1
14818	WRENCH RATCHET 1/2 DRIVE	1
29066	BIT TOOL HSS 3/4 X 5.0 LH FINISH SINGLE SC	1
29067	BIT TOOL HSS 3/4 X 5.0 RH FINISH SINGLE SC	1
33999	SET HEX WRENCH .050 - 3/8 BONDHUS BALL END	1
34866	OIL AIRTOOL COMPLETE	1
35516	HAMMER DEAD BLOW 1-3/4 DIA HEAD	1
38678	WRENCH HEX SET 1.5 - 10MM BONDHUS BALL END	1
46249	WRENCH HEX BIT SOCKET 14MM X 1/2	1
46250	WRENCH HEX BIT SOCKET 10MM X 1/2	1
46252	WRENCH HEX BIT SOCKET 17MM X 1/2	1

TABLE A-2. TOOL KIT P/N 58188

Part number	Description	Quantity
48854	WRENCH RATCHET BOX 3/8 X 7/16	1
50985	TUBING 1/4 OD X .040 WALL DOT 150 PSI NYLON BLUE	180
58353	WRENCH END 55mm X 9-1/2 LONG TIGHT ACCESS	2
58368	INDICATOR ELECTRONIC .500 TRAVEL 2-1/4 DIA FACE .0005" INC	1
58375	WRENCH HEX BIT SOCKET 19MM X 1/2	1
59151	TUBING 1/8 OD X .023 WALL DOT 1000 PSI NYLON BLUE	180
60033	HOLDER INSERT 3/4 SQ SHANK LEFT HAND W/ 10 INSERTS SECO TRIGON	1
60034	HOLDER INSERT 3/4 SQ SHANK RIGHT HAND W/ 10 INSERTS SECO TRIGON	1
63678	HANDWHEEL 3.0 IN MODIFIED 3/8 HEX	1
64370	HOLDER INDICATOR ARTICULATED ARM W/ MAG BASE 282MM REACH NOGA	1
65183	LUBRICANT ANTI SEIZE MOLY GRAPHITE EXTREME PRESSURE 10 OZ CAN	1
65188	WRENCH SPANNER 110MM TO 115MM (4-1/2) DIA .300 DIA PIN	2
90684	TOOL BOX METAL 30 X 8 X 9H RED	2

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APPENDIX B SDS

Safety Data Sheet list

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SAFETY DATA SHEET

Section 1. Identification

Product name Castrol GTX 10W-30

SDS # 459835

Code 459835-US12 US13 US81

Relevant identified uses of the substance or mixture and uses advised against

Product use Engine Oils.
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Manufacturer

BP Lubricants USA Inc.
1500 Valley Road
Wayne, NJ 07470
Telephone: (973) 633-2200
Telecopier: (973) 633-7475

EMERGENCY HEALTH INFORMATION: 1 (800) 447-8735

Outside the US: +1 703-527-3887 (CHEMTREC)

EMERGENCY SPILL INFORMATION: 1 (800) 424-9300
CHEMTREC (USA)

OTHER PRODUCT INFORMATION 1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

Section 2. Hazards identification

OSHA/HCS status This material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture Not classified.

GHS label elements

Signal word No signal word.

Hazard statements No known significant effects or critical hazards.

Precautionary statements

General Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention Not applicable.

Response Not applicable.

Storage Not applicable.

Disposal Not applicable.

Hazards not otherwise classified Defatting to the skin.
USED ENGINE OILS
Used engine oil may contain hazardous components which have the potential to cause skin cancer.
See Toxicological Information, section 11 of this Safety Data Sheet.

Section 3. Composition/information on ingredients

Highly refined base oil (IP 346 DMSO extract < 3%). Proprietary performance additives.

Substance/mixture Mixture

Ingredient name	CAS number	%
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	80-85

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Check for and remove any contact lenses. Get medical attention.

Skin contact Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if symptoms occur.

Inhalation If inhaled, remove to fresh air. Get medical attention if symptoms occur.

Ingestion Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.

Protection of first-aiders No action shall be taken involving any personal risk or without suitable training.

Most important symptoms/effects, acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician Treatment should in general be symptomatic and directed to relieving any effects.

Specific treatments No specific treatment.

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media In case of fire, use foam, dry chemical or carbon dioxide extinguisher or spray.

Unsuitable extinguishing media Do not use water jet.

Specific hazards arising from the chemical In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous combustion products Combustion products may include the following:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel
No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment. Floors may be slippery; use care to avoid falling.

For emergency responders
If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions
Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill
Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill
Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Dispose of via a licensed waste disposal contractor.

Section 7. Handling and storage

Precautions for safe handling

Protective measures
Put on appropriate personal protective equipment (see Section 8).

Advice on general occupational hygiene
Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash thoroughly after handling. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities
Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Store and use only in equipment/containers designed for use with this product. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Not suitable
Prolonged exposure to elevated temperature

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Distillates (petroleum), hydrotreated heavy paraffinic	**ACGIH TLV (United States).** TWA: 5 mg/m³ 8 hours. Issued/Revised: 11/2009 Form: Inhalable fraction **NIOSH REL (United States).** TWA: 5 mg/m³ 10 hours. Issued/Revised: 6/1994 Form: Mist STEL: 10 mg/m³ 15 minutes. Issued/Revised: 6/1994 Form: Mist **OSHA PEL (United States).** TWA: 5 mg/m³ 8 hours. Issued/Revised: 6/1993

Section 8. Exposure controls/personal protection

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Appropriate engineering controls

All activities involving chemicals should be assessed for their risks to health, to ensure exposures are adequately controlled. Personal protective equipment should only be considered after other forms of control measures (e.g. engineering controls) have been suitably evaluated. Personal protective equipment should conform to appropriate standards, be suitable for use, be kept in good condition and properly maintained.
Your supplier of personal protective equipment should be consulted for advice on selection and appropriate standards. For further information contact your national organisation for standards.
Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.
The final choice of protective equipment will depend upon a risk assessment. It is important to ensure that all items of personal protective equipment are compatible.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.
Appropriate techniques should be used to remove potentially contaminated clothing.
Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Safety glasses with side shields.

Skin protection

Hand protection

Wear protective gloves if prolonged or repeated contact is likely. Wear chemical resistant gloves. Recommended: Nitrile gloves. The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/ manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

Body protection

Use of protective clothing is good industrial practice. Cotton or polyester/cotton overalls will only provide protection against light superficial contamination that will not soak through to the skin. Overalls should be laundered on a regular basis. When the risk of skin exposure is high (e.g. when cleaning up spillages or if there is a risk of splashing) then chemical resistant aprons and/or impervious chemical suits and boots will be required. Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment.
The correct choice of respiratory protection depends upon the chemicals being handled, the conditions of work and use, and the condition of the respiratory equipment. Safety procedures should be developed for each intended application. Respiratory protection equipment should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Section 9. Physical and chemical properties

Appearance

Physical state	Liquid.
Color	Brown.
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point	Not available.
Boiling point	Not available.
Flash point	Closed cup: >200°C (>392°F) [Pensky-Martens.]
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable. Based on - Physical state
Lower and upper explosive (flammable) limits	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Density	Not available.
Relative density	0.88
Solubility	insoluble in water.
Solubility	Insoluble in the following materials: cold water.
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Kinematic: 79.01 mm^2/s (79.01 cSt) at 40°C Kinematic: 11.62 mm^2/s (11.62 cSt) at 100°C

Section 10. Stability and reactivity

Reactivity	No specific test data available for this product. Refer to Conditions to avoid and Incompatible materials for additional information.
Chemical stability	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur. Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	Avoid all possible sources of ignition (spark or flame).
Incompatible materials	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Aspiration hazard

Name	Result
Distillates (petroleum), hydrotreated heavy paraffinic	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure	Routes of entry anticipated: Dermal, Inhalation.

Section 11. Toxicological information

Potential acute health effects

Eye contact No known significant effects or critical hazards.

Skin contact No known significant effects or critical hazards.

Inhalation Vapor inhalation under ambient conditions is not normally a problem due to low vapor pressure.

Ingestion No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact No specific data.

Skin contact Adverse symptoms may include the following:
irritation
dryness
cracking

Inhalation No specific data.

Ingestion No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects Not available.

Potential delayed effects Not available.

Long term exposure

Potential immediate effects Not available.

Potential delayed effects Not available.

Potential chronic health effects

General USED ENGINE OILS
Combustion products resulting from the operation of internal combustion engines contaminate engine oils during use. Used engine oil may contain hazardous components which have the potential to cause skin cancer. Frequent or prolonged contact with all types and makes of used engine oil must therefore be avoided and a high standard of personal hygiene maintained.

Carcinogenicity No known significant effects or critical hazards.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects No known significant effects or critical hazards.

Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

No testing has been performed by the manufacturer.

Persistence and degradability

Expected to be biodegradable.

Bioaccumulative potential

Section 12. Ecological information

This product is not expected to bioaccumulate through food chains in the environment.

Mobility in soil

Soil/water partition coefficient (K_{OC}) Not available.

Mobility Spillages may penetrate the soil causing ground water contamination.

Other adverse effects No known significant effects or critical hazards.

Other ecological information Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

Section 13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.
Additional information	-	-	-	-

Special precautions for user Not available.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not available.

Section 15. Regulatory information

U.S. Federal regulations

United States inventory (TSCA 8b) All components are listed or exempted.

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 311/312

Classification Immediate (acute) health hazard

SARA 313

Form R - Reporting requirements This product does not contain any hazardous ingredients at or above regulated thresholds.

Supplier notification This product does not contain any hazardous ingredients at or above regulated thresholds.

State regulations

Massachusetts None of the components are listed.

New Jersey The following components are listed: MINERAL OIL (UNTREATED and MILDLY TREATED); MINERAL OIL (UNTREATED and MILDLY TREATED)

Pennsylvania None of the components are listed.

California Prop. 65 **WARNING:** This product contains a chemical known to the State of California to cause cancer.
white mineral oil

Other regulations

Australia inventory (AICS) All components are listed or exempted.

Canada inventory All components are listed or exempted.

China inventory (IECSC) At least one component is not listed.

Japan inventory (ENCS) At least one component is not listed.

Korea inventory (KECI) All components are listed or exempted.

Philippines inventory (PICCS) All components are listed or exempted.

REACH Status For the REACH status of this product please consult your company contact, as identified in Section 1.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	1
Physical hazards	0
Personal protection	X

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

National Fire Protection Association (U.S.A.)

History

03/28/2014.

Section 16. Other information

Date of issue/Date of revision

Date of previous issue No previous validation.

Key to abbreviations

ACGIH = American Conference of Industrial Hygienists
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
CAS Number = Chemical Abstracts Service Registry Number
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
OEL = Occupational Exposure Limit
SDS = Safety Data Sheet
STEL = Short term exposure limit
TWA = Time weighted average
UN = United Nations
UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

SECTION 1: Identification

Product Identifier: **Guardol QLT® Motor Oil**

Other means of identification: 76 Guardol QLT® Motor Oil 10W-30
76 Guardol QLT® Motor Oil 15W-40

SDS Number: **720210**

Relevant identified uses: Heavy Duty Diesel Engine Oil

Uses Advised Against: All others

24 Hour Emergency Phone Number: CHEMTREC 800-424-9300 (24 Hours)
CANUTEC 613-996-6666
CHEMTREC Mexico 01-800-681-9531

Manufacturer/Supplier:
Phillips 66 Lubricants
P.O. Box 4428
Houston, TX 77210

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

Customer Service:
U.S.: 800-368-7128 or International: 1-832-765-2500
Technical Information: 1-877-445-9198

SECTION 2: Hazard identification

Classified Hazards
H412 -- Hazardous to the aquatic environment, chronic toxicity -- Category 3

Other Hazards
None Known

Label Elements

Harmful to aquatic life with long lasting effects

Avoid release to the environment; Dispose of contents/ container to an approved waste disposal plant

SECTION 3: Composition/information on ingredients

Chemical Name	CASRN	Concentration[1]
Distillates, petroleum, hydrotreated heavy paraffinic	64742-54-7	>85
Non-Hazardous Materials	VARIOUS	<15
Phenol, (tetrapropenyl) derivatives	74499-35-7	0.5 - 1.0

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Inhalation of oil mists or vapors generated at elevated temperatures may cause respiratory irritation. Accidental ingestion can result in minor irritation of the digestive tract, nausea and diarrhea. Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

SECTION 5: Firefighting measures

NFPA 704 Hazard Class

Health: 0 **Flammability:** 1 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

Special protective actions for firefighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

SECTION 7: Handling and storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Spills will produce very slippery surfaces. Used motor oils have been shown to cause skin cancer in mice after repeated application to the skin without washing. Brief or intermittent skin contact with used motor oil is not expected to cause harm if the oil is thoroughly removed by washing with soap and water. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: Exposure controls/personal protection

Chemical Name	ACGIH	OSHA	Other
Distillates, petroleum, hydrotreated heavy paraffinic	TWA: 5mg/m³ STEL: 10 mg/m³ as Oil Mist, if Generated	TWA: 5mg/m³ as Oil Mist, if Generated	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: Amber, Transparent
Physical Form: Liquid
Odor: Petroleum
Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data
Evaporation Rate (nBuAc=1): <1

Flash Point: > 392 °F / > 200 °C
Test Method: Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Initial Boiling Point/Range: No data
Vapor Pressure: <1 mm Hg
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: No data
Auto-ignition Temperature: No data
Decomposition Temperature: No data
Specific Gravity (water=1): 0.876 - 0.885 @ 60ºF (15.6ºC)

Particle Size: Not applicable
Percent Volatile: Negligible
Flammability (solid, gas): Not applicable
Solubility in Water: Negligible

Bulk Density: 7.31 - 7.38 lbs/gal
Viscosity: 11.8 - 15.3 cSt @ 100°C; 77 - 112 cSt @ 40°C
Pour Point: -36 °F / -38 °C

SECTION 10: Stability and reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition. Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use, During use in engines, contamination of oil with low levels of hazardous fuel combustion by-products (e.g. polycyclic aromatic hydrocarbons) may occur.

SECTION 11: Toxicological information

Information on Toxicological Effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5 mg/L (mist, estimated)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated)
Oral	Unlikely to be harmful		> 5 g/kg (estimated)

Aspiration Hazard:

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Distillates, petroleum, hydrotreated heavy paraffinic

Carcinogenicity: This oil has been highly refined by a variety of processes to reduce aromatics and improve performance characteristics. It meets the IP-346 criteria of less than 3 percent PAH's and is not considered a carcinogen by the International Agency for Research on Cancer.

Phenol, (tetrapropenyl) derivatives

Reproductive Toxicity: This product contains low levels of phenol, (tetrapropenyl) derivatives. Rats given high, repeated daily doses of phenol, (tetrapropenyl) derivatives by oral intubation experienced adverse reproductive effects. Pregnant rats given high, repeated daily doses of phenol, (tetrapropenyl) derivatives by oral intubation gave birth to pups with cleft palate and skeletal malformations at dose levels that caused maternal toxicity. Follow-up studies of phenol, (tetrapropenyl) derivatives in finished lubricating fluids demonstrated a no-observed effect level of 1.78 wt%.

SECTION 12: Ecological information

GHS Classification:
H412 -- Hazardous to the aquatic environment, chronic toxicity -- Category 3
Harmful to aquatic life with long lasting effects.

Toxicity: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material are greater than 5.3, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of the hydrocarbon constituents in soil and sediment.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle used oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

SECTION 14: Transport information

U.S. Department of Transportation (DOT)

Shipping Description: *Not regulated*
Note: *If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)*

International Maritime Dangerous Goods (IMDG)

Shipping Description: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.*

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:
Not applicable

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: *Not regulated*

Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health Hazard: No
Chronic Health Hazard: No
Fire Hazard: No
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Chemical Name	Concentration[1]	de minimis
Zinc Compound(s)	1.2 - 1.5	1.0%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

WHMIS Hazard Class:
none

International Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

SECTION 16: Other information

Date of Issue:	Previous Issue Date:	SDS Number:	Status:
19-Feb-2015	01-Aug-2013	720210	FINAL

Revised Sections or Basis for Revision:
Identified Hazards (Section 2); Precautionary Statement(s) (Section 2); Composition (Section 3); Toxicological (Section 11); Environmental hazards (Section 12)

Precautionary Statements:
P273 - Avoid release to the environment
P501 - Dispose of contents/ container to an approved waste disposal plant

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

SAFETY DATA SHEET

1. Identification

Product identifier **LPS® 1 (Aerosol)**

Other means of identification

Part Number 00116

Recommended use An industrial lubricant designed to displace moisture from mechanical and electrical equipment, provide light-duty lubrication and short-term rust prevention.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Manufacturer

Company name ITW Pro Brands

Address 4647 Hugh Howell Rd.
Tucker, GA 30084

Country (U.S.A.)
Tel: +1 770-243-8800

In Case of Emergency 1-800-424-9300 (inside U.S.)
+001 703-527-3887 (outside U.S.)

Website www.lpslabs.com

E-mail lpssds@itwprobrands.com

2. Hazard(s) identification

Physical hazards	Flammable aerosols	Category 1
	Gases under pressure	Compressed gas
Health hazards	Not classified.	
Environmental hazards	Not classified.	
OSHA defined hazards	Not classified.	

Label elements

Signal word Danger

Hazard statement Extremely flammable aerosol. Contains gas under pressure; may explode if heated.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use.

Response Wash hands after handling.

Storage Protect from sunlight. Store in a well-ventilated place. Do not expose to temperatures exceeding 50°C/122°F.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) Combustible.

Supplemental information Repeated exposure may cause skin dryness or cracking.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Distillates Petroleum Hydrotreated Light		64742-47-8	70 - 80
Distillates Petroleum Hydrotreated Med		64742-46-7	10 - 20
Carbon Dioxide		124-38-9	1 - 5
Sorbitan trioleate		26266-58-0	1 - 3
Calcium Sulfonate		61789-86-4	0.1 - 1

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact No adverse effects due to skin contact are expected.

Eye contact No specific first aid measures noted.

Ingestion Not likely, due to the form of the product.

Most important symptoms/effects, acute and delayed Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Water fog. Alcohol resistant foam. Dry chemical powder. Dry chemicals. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical Contents under pressure. Pressurized container may explode when exposed to heat or flame. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

Fire fighting equipment/instructions In case of fire: Stop leak if safe to do so. Do not move cargo or vehicle if cargo has been exposed to heat. Move containers from fire area if you can do so without risk. Cool containers exposed to heat with water spray and remove container, if no risk is involved. Containers should be cooled with water to prevent vapor pressure build up. For massive fire in cargo area, use unmanned hose holder or monitor nozzles, if possible. If not, withdraw and let fire burn out.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials. Move containers from fire area if you can do so without risk. In the event of fire and/or explosion do not breathe fumes.

General fire hazards Extremely flammable aerosol. Contents under pressure. Pressurized container may explode when exposed to heat or flame. Combustible.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Wear appropriate protective equipment and clothing during clean-up. Emergency personnel need self-contained breathing equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. Use personal protection recommended in Section 8 of the SDS.

Methods and materials for containment and cleaning up Refer to attached safety data sheets and/or instructions for use. Stop leak if you can do so without risk. Use water spray to reduce vapors or divert vapor cloud drift. Isolate area until gas has dispersed. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Pressurized container: Do not pierce or burn, even after use. Do not use if spray button is missing or defective. Do not spray on a naked flame or any other incandescent material. Do not smoke while using or until sprayed surface is thoroughly dry. Do not cut, weld, solder, drill, grind, or expose containers to heat, flame, sparks, or other sources of ignition. All equipment used when handling the product must be grounded. Do not re-use empty containers. Avoid prolonged or repeated contact with skin. Avoid prolonged exposure. Use only in well-ventilated areas. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Level 1 Aerosol.

Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50°C/122 °F. Do not puncture, incinerate or crush. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. Store in a well-ventilated place. Stored containers should be periodically checked for general condition and leakage. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

U.S. - OSHA

Components	Type	Value	Form
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)	PEL	5 mg/m3	Oil mist

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Carbon Dioxide (CAS 124-38-9)	PEL	9000 mg/m3
		5000 ppm

ACGIH

Components	Type	Value	Form
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)	TWA	5 mg/m3	Oil mist

US. ACGIH Threshold Limit Values

Components	Type	Value
Carbon Dioxide (CAS 124-38-9)	STEL	30000 ppm
	TWA	5000 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Carbon Dioxide (CAS 124-38-9)	STEL	54000 mg/m3
		30000 ppm
	TWA	9000 mg/m3
		5000 ppm

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection

Wear appropriate chemical resistant gloves.

Other

Wear suitable protective clothing.

Respiratory protection	If permissible levels are exceeded use NIOSH mechanical filter / organic vapor cartridge or an air-supplied respirator.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using do not smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Gas.
Form	Aerosol.
Color	Amber.
Odor	Characteristic.
Odor threshold	Not available.
pH	Not applicable
Melting point/freezing point	< -58 °F (< -50 °C)
Initial boiling point and boiling range	415.4 °F (213 °C)
Flash point	174.2 °F (79.0 °C) Tag Closed Cup (dispensed liquid)
Evaporation rate	< 0.1 (BuAc = 1)
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	0.6 %
Flammability limit - upper (%)	7 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	< 0.05 mm Hg @ 20°C
Vapor density	> 1 (air = 1)
Relative density	0.79 - 0.81 @ 20°C
Solubility(ies)	
Solubility (water)	Not soluble
Partition coefficient (n-octanol/water)	< 1
Auto-ignition temperature	> 442.4 °F (> 228 °C)
Decomposition temperature	Not established
Viscosity	< 3.8 cSt @ 25°C
Other information	
Explosive properties	Not explosive.
Heat of combustion	Not established
Oxidizing properties	Not oxidizing.
Percent volatile	95 - 96 %
VOC	0.4 % per US State & Federal Consumer Product Regulations

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.

Hazardous decomposition products Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation Prolonged inhalation may be harmful.

Skin contact Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.

Eye contact Direct contact with eyes may cause temporary irritation.

Ingestion Expected to be a low ingestion hazard.

Symptoms related to the physical, chemical and toxicological characteristics Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity Contains a potential skin sensitizer.

Components	Species	Test Results
Calcium Sulfonate (CAS 61789-86-4)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg, 24 Hours
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
Inhalation		
Vapor		
LC50	Rat	> 4.5 mg/l, 4 Hours
Distillates Petroleum Hydrotreated Med (CAS 64742-46-7)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg, 24 Hours

Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not likely, due to the form of the product.

Chronic effects Prolonged inhalation may be harmful.

Further information None known.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	2.9 mg/l, 96 hours

Persistence and degradability

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)

LPS® 1 (Aerosol)	< 1

Mobility in soil No data available.

Other adverse effects None known.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Contents under pressure. Do not puncture, incinerate or crush. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

D003: Waste Reactive material

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

14. Transport information

DOT

UN number UN1950
UN proper shipping name Aerosols, flammable
Transport hazard class(es)
Class 2.1
Subsidiary risk -
Label(s) 2.1
Packing group Not available.
Environmental hazards
Marine pollutant No
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions N82
Packaging exceptions 306
Packaging non bulk None
Packaging bulk None

IATA

UN number UN1950
UN proper shipping name Aerosols, flammable
Transport hazard class(es)
Class 2.1
Subsidiary risk -
Packing group Not available.
Environmental hazards No
ERG Code 10L
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Other information

Passenger and cargo aircraft	Allowed with restrictions.
Cargo aircraft only	Allowed with restrictions.

IMDG

UN number	UN1950
UN proper shipping name	AEROSOLS, Flammable
Transport hazard class(es)	
Class	2.1
Subsidiary risk	-
Label(s)	2.1
Packing group	Not available.
Environmental hazards	
Marine pollutant	No
EmS	F-D, S-U
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

DOT

IATA; IMDG

General information Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: Ensure that containers are firmly secured. Ensure cylinder valve is closed and not leaking. Ensure valve outlet cap nut or plug (where provided) is correctly fitted. Ensure valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - Yes
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Distillates Petroleum Hydrotreated Med (CAS 64742-46-7)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 11-01-2016

Revision date 09-19-2017

Version # 03

Disclaimer ITW Pro Brands cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision information This document has undergone significant changes and should be reviewed in its entirety.

SAFETY DATA SHEET

1. Identification

Product identifier **LPS® 2 (Aerosol)**

Other means of identification

Part Number 00216

Recommended use An industrial lubricant designed to displace moisture from equipment, provide heavy-duty lubrication and rust prevention.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Manufacturer

Company name ITW Pro Brands

Address 4647 Hugh Howell Rd.
Tucker, GA 30084

Country (U.S.A.)
Tel: +1 770-243-8800

In Case of Emergency 1-800-424-9300 (inside U.S.)
+001 703-527-3887 (outside U.S.)

Website www.lpslabs.com

E-mail lpssds@itwprobrands.com

2. Hazard(s) identification

Physical hazards	Flammable aerosols	Category 1
	Gases under pressure	Compressed gas
Health hazards	Not classified.	
Environmental hazards	Not classified.	
OSHA defined hazards	Not classified.	

Label elements

Signal word Danger

Hazard statement Extremely flammable aerosol. Contains gas under pressure; may explode if heated.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use.

Response Wash hands after handling.

Storage Protect from sunlight. Store in a well-ventilated place. Do not expose to temperatures exceeding 50°C/122°F.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) Combustible.

Supplemental information None known.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Distillates Petroleum Hydrotreated Light		64742-47-8	70 - 80
Petroleum Oil		64742-52-5	10 - 20
Carbon Dioxide		124-38-9	1 - 5

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact No adverse effects due to skin contact are expected.

Eye contact No specific first aid measures noted.

Ingestion Not likely, due to the form of the product.

Most important symptoms/effects, acute and delayed Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Water fog. Alcohol resistant foam. Dry chemical powder. Dry chemicals. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical Contents under pressure. Pressurized container may explode when exposed to heat or flame. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

Fire fighting equipment/instructions In case of fire: Stop leak if safe to do so. Do not move cargo or vehicle if cargo has been exposed to heat. Move containers from fire area if you can do so without risk. Cool containers exposed to heat with water spray and remove container, if no risk is involved. Containers should be cooled with water to prevent vapor pressure build up. For massive fire in cargo area, use unmanned hose holder or monitor nozzles, if possible. If not, withdraw and let fire burn out.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials. Move containers from fire area if you can do so without risk. In the event of fire and/or explosion do not breathe fumes.

General fire hazards Extremely flammable aerosol. Contents under pressure. Pressurized container may explode when exposed to heat or flame. Combustible.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Wear appropriate protective equipment and clothing during clean-up. Emergency personnel need self-contained breathing equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. Use personal protection recommended in Section 8 of the SDS.

Methods and materials for containment and cleaning up Refer to attached safety data sheets and/or instructions for use. Stop leak if you can do so without risk. Use water spray to reduce vapors or divert vapor cloud drift. Isolate area until gas has dispersed. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling Pressurized container: Do not pierce or burn, even after use. Do not use if spray button is missing or defective. Do not spray on a naked flame or any other incandescent material. Do not smoke while using or until sprayed surface is thoroughly dry. Do not cut, weld, solder, drill, grind, or expose containers to heat, flame, sparks, or other sources of ignition. All equipment used when handling the product must be grounded. Do not re-use empty containers. Avoid prolonged or repeated contact with skin. Avoid prolonged exposure. Use only in well-ventilated areas. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Level 3 Aerosol.

Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50°C/122 °F. Do not puncture, incinerate or crush. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. Store in a well-ventilated place. Stored containers should be periodically checked for general condition and leakage. Store away from incompatible materials (see Section 10 of the SDS). Level 3 Aerosol.

8. Exposure controls/personal protection

Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

U.S. - OSHA

Components	Type	Value	Form
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)	PEL	5 mg/m3	Oil mist
Petroleum Oil (CAS 64742-52-5)	PEL	5 mg/m3	Oil mist
White Mineral Oil (CAS 8042-47-5)	TWA	5 mg/m3	Oil mist.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Carbon Dioxide (CAS 124-38-9)	PEL	9000 mg/m3
		5000 ppm

ACGIH

Components	Type	Value	Form
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)	TWA	5 mg/m3	Oil mist
Petroleum Oil (CAS 64742-52-5)	TWA	5 mg/m3	Oil mist
White Mineral Oil (CAS 8042-47-5)	TWA	5 mg/m3	Respirable fraction.

US. ACGIH Threshold Limit Values

Components	Type	Value
2-Methyl Butyl Acetate (CAS 624-41-9)	STEL	100 ppm
	TWA	50 ppm
Carbon Dioxide (CAS 124-38-9)	STEL	30000 ppm
	TWA	5000 ppm

U.S. - NIOSH

Components	Type	Value	Form
White Mineral Oil (CAS 8042-47-5)	TWA	5 mg/m3	Mist.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Carbon Dioxide (CAS 124-38-9)	STEL	54000 mg/m3
		30000 ppm
	TWA	9000 mg/m3
		5000 ppm

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves.
Other	Wear suitable protective clothing.
Respiratory protection	If permissible levels are exceeded use NIOSH mechanical filter / organic vapor cartridge or an air-supplied respirator.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using do not smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Gas.
Form	Aerosol.
Color	Brown.
Odor	Slight petroleum odor. Cherry.
Odor threshold	Not established
pH	Not applicable
Melting point/freezing point	< -58 °F (< -50 °C)
Initial boiling point and boiling range	383 °F (195 °C) @ 101 kPa
Flash point	174.2 °F (79.0 °C) Tag Closed Cup (dispensed liquid)
Evaporation rate	< 0.1 BuAc
Flammability (solid, gas)	Flammable gas.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	0.6 %
Flammability limit - upper (%)	7 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	< 0.05 mm Hg @ 20ºC (dispensed liquid)
Vapor density	4.7 (air = 1)
Relative density	Not available.
Solubility(ies)	
Solubility (water)	< 3 %
Partition coefficient (n-octanol/water)	< 1
Auto-ignition temperature	> 442.4 °F (> 228 °C)
Decomposition temperature	Not established
Viscosity	< 7 cSt
Viscosity temperature	77 °F (25 °C)
Other information	
Explosive properties	Not explosive.
Heat of combustion	> 30 kJ/g
Oxidizing properties	Not oxidizing.
Percent volatile	92 - 95 %
Specific gravity	0.82 - 0.86 @ 20°C

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity Not expected to be acutely toxic.

Components	Species	Test Results
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
Inhalation		
Vapor		
LC50	Rat	> 4.5 mg/l, 4 Hours
Petroleum Oil (CAS 64742-52-5)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
Inhalation		
LC50	Rat	> 3.9 mg/l, 4 Hours
Oral		
LD50	Rat	> 2000 mg/kg
White Mineral Oil (CAS 8042-47-5)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg, 24 Hours
Inhalation		
LC50	Rat	2.18 mg/l, 4 Hours

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not likely, due to the form of the product.
Chronic effects	Prolonged inhalation may be harmful.
Further information	None known.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Distillates Petroleum Hydrotreated Light (CAS 64742-47-8)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	2.9 mg/l, 96 hours

Persistence and degradability

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)

LPS® 2 (Aerosol)	< 1

Mobility in soil	No data available.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Contents under pressure. Do not puncture, incinerate or crush. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company. D003: Waste Reactive material
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

14. Transport information

DOT

UN number	UN1950
UN proper shipping name	Aerosols, flammable
Transport hazard class(es)	
Class	2.1
Subsidiary risk	-
Label(s)	2.1
Packing group	Not available.
Environmental hazards	
Marine pollutant	No
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Packaging exceptions	306

Packaging non bulk	None
Packaging bulk	None

IATA

UN number	UN1950
UN proper shipping name	Aerosols, flammable
Transport hazard class(es)	
Class	2.1
Subsidiary risk	-
Label(s)	2.1
Packing group	Not available.
Environmental hazards	No.
ERG Code	10L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed with restrictions.
Cargo aircraft only	Allowed with restrictions.

IMDG

UN number	UN1950
UN proper shipping name	AEROSOLS, flammable
Transport hazard class(es)	
Class	2.1
Subsidiary risk	-
Label(s)	2.1
Packing group	Not available.
Environmental hazards	
Marine pollutant	No
EmS	Not available.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

DOT

IATA; IMDG

General information Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: Ensure that containers are firmly secured. Ensure cylinder valve is closed and not leaking. Ensure valve outlet cap nut or plug (where provided) is correctly fitted. Ensure valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - Yes
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Petroleum Oil (CAS 64742-52-5)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 11-01-2016

Revision date	09-20-2017
Version #	02
Disclaimer	ITW Pro Brands cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Revision information	This document has undergone significant changes and should be reviewed in its entirety.

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200), Health Canada HPR (SOR/2015-17), and Mexico NOM-018-STPS-2015

SECTION 1: Identification

Product Identifier	**Polytac® EP**
Other means of identification	Phillips 66® Polytac® EP #2
Code	**831644**
Issue date	30-Aug-2018
Relevant identified uses	Lubricating Grease
Uses advised against	All others
24 Hour Emergency Phone Number	CHEMTREC: 1-800-424-9300 CHEMTREC México 01-800-681-9531 CHEMTREC Global +1 703 527 3887

Manufacturer/Supplier
Phillips 66 Lubricants
P.O. Box 4428
Houston, TX 77210

SDS Information
URL: www.phillips66.com/SDS
Phone: 800-762-0942
Email: SDS@P66.com

Customer Service
U.S.: 800-368-7128 or International: 1-832-765-2500
Technical Information
1-877-445-9198

SECTION 2: Hazard identification

Classified Hazards

H412 -- Hazardous to the aquatic environment, chronic toxicity -- Category 3

Hazards Not Otherwise Classified (HNOC)

PHNOC: None known

HHNOC: None known

Label elements

Harmful to aquatic life with long lasting effects

Avoid release to the environment; Dispose of contents/container to an approved waste disposal plant

SECTION 3: Composition/information on ingredients

Chemical Name	CASRN	Concentration
Distillates, petroleum, hydrotreated heavy naphthenic	64742-52-5	<50
Lubricant Base Oil (Petroleum)	VARIOUS	<30
1H-Imidazole-1-ethanol, 4,5-dihydro-, 2-nortall-oil alkyl derivatives	61791-39-7	0.5
N-1-naphthylaniline	90-30-2	0.5

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician. (see Note to Physician)

Inhalation: First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion: First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Inhalation of oil mists or vapors generated at elevated temperatures may cause respiratory irritation. Accidental ingestion can result in minor irritation of the digestive tract, nausea and diarrhea. Prolonged or repeated contact may dry skin and cause irritation.

Notes to Physician: When using high-pressure equipment, injection of product under the skin can occur. In this case, the casualty should be sent immediately to the hospital. Do not wait for symptoms to develop. High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. These injuries often require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury. Early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

SECTION 5: Firefighting measures

NFPA 704: National Fire Protection Association

Health: 0 **Flammability:** 1 **Instability:** 0

0 = minimal hazard
1 = slight hazard
2 = moderate hazard
3 = severe hazard
4 = extreme hazard

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

Special protective actions for fire-fighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers,

storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

SECTION 7: Handling and storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Spills will produce very slippery surfaces. High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: Exposure controls/personal protection

Occupational exposure limits
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

Chemical Name	ACGIH	OSHA	Mexico	Phillips 66
Distillates, petroleum, hydrotreated heavy naphthenic	TWA: 5mg/m³ STEL: 10 mg/m³ as Oil Mist, if Generated	---	---	---
Lubricant Base Oil (Petroleum)	TWA: 5mg/m³ STEL: 10 mg/m³ as Oil Mist, if Generated	---	---	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Biological occupational exposure limits
Note: None

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye/face protection is not normally required; however, good industrial hygiene practice suggests the use of eye protection that meets or exceeds ANSI Z.87.1 whenever working with chemicals.

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practice suggests the

use of gloves or other appropriate skin protection whenever working with chemicals. Suggested protective materials: Nitrile rubber

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used. A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: Green
Physical Form: Semi-Solid
Odor: Petroleum
Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data
Evaporation Rate (nBuAc=1): <1
Particle Size: Not applicable
Percent Volatile: No data
Flammability (solid, gas): Not applicable
Solubility in Water: Insoluble

Flash Point: No data
Test Method: Not applicable
Initial Boiling Point/Range: No data
Vapor Pressure: No data
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: No data
Auto-ignition Temperature: No data
Decomposition Temperature: No data
Specific Gravity (water=1): 0.9 @ 60ºF (15.6ºC)
Bulk Density: 7.5 lbs/gal
Viscosity: No data
Pour Point: No data

SECTION 10: Stability and reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition. Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

Information on Toxicological Effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5 mg/L (mist, estimated)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated)
Oral	Unlikely to be harmful		> 5 g/kg (estimated)

Likely Routes of Exposure: Inhalation, eye contact, skin contact

Aspiration Hazard: Not expected to be an aspiration hazard

Skin Corrosion/Irritation: Not expected to be irritating. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Not expected to be irritating.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Lubricant Base Oil (Petroleum)

Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including severe hydrocracking/hydroprocessing to reduce aromatics and improve performance characteristics. All of the oils meet the IP-346 criteria of less than 3 percent PAH's and are not considered carcinogens by NTP, IARC, or OSHA.

SECTION 12: Ecological information

GHS Classification:
H412 -- Hazardous to the aquatic environment, chronic toxicity -- Category 3
Harmful to aquatic life with long lasting effects.

Toxicity: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material are greater than 5.3, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of the hydrocarbon constituents in soil and sediment.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle used oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

SECTION 14: Transport information

UN Number: Not regulated
UN proper shipping name: None
Transport hazard class(es): None
Packing Group: None
Environmental Hazards: This product does not meet the DOT/UN/IMDG/IMO criteria of a marine pollutant
Special precautions for user: If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds)
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)
Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CERCLA/SARA - Section 313 and 40 CFR 372
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds)
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

SECTION 16: Other information

Issue date	Previous Issue Date:	SDS Number	Status:
30-Aug-2018	22-Aug-2018	831644	FINAL

Revised Sections or Basis for Revision:
Environmental hazards (Section 12)

Legend (pursuant to NOM-018-STPS-2015):
The information within is considered correct but is not exhaustive and will be used for guidance only, which is based on the current knowledge of the substance or mixture and is applicable to the appropriate safety precautions for the product. Legend (pursuant to NOM-018-STPS-2015):

Precautionary Statements:
P273 - Avoid release to the environment
P501 - Dispose of contents/ container to an approved waste disposal plant

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; HPR = Hazardous Products Regulations; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

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CLIMAX
BORTECH
CALDER
H&S TOOL