CE

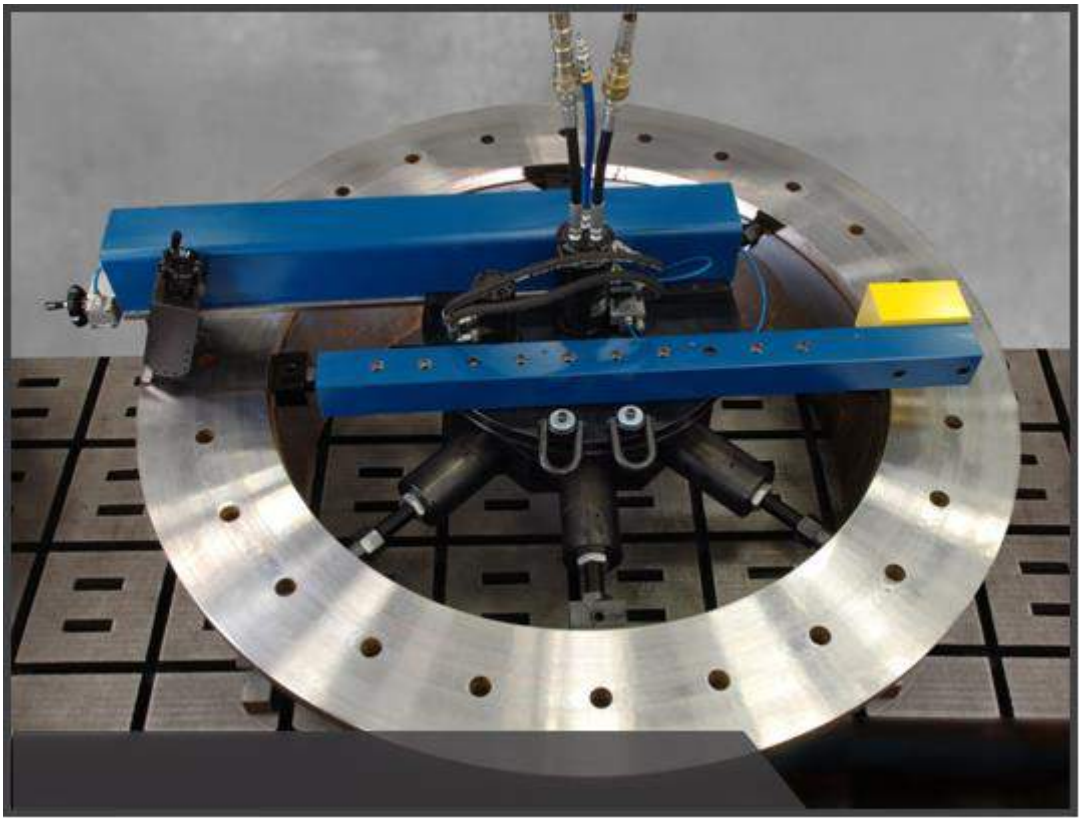
FF7200 Flange Facer Machine

OPERATING MANUAL

This manual is available in electronic format as P/N 59129

Original Instructions

Serial Number Range: 11017900 – 15121870



CLIMAX
Portable Machining & Welding Systems

PN: 59129 March 2019 Revision 9

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For comments or questions about CLIMAX products or services, please call CLIMAX or e-mail info@cpmt.com. For quick and accurate service, please provide your representative with the following:

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

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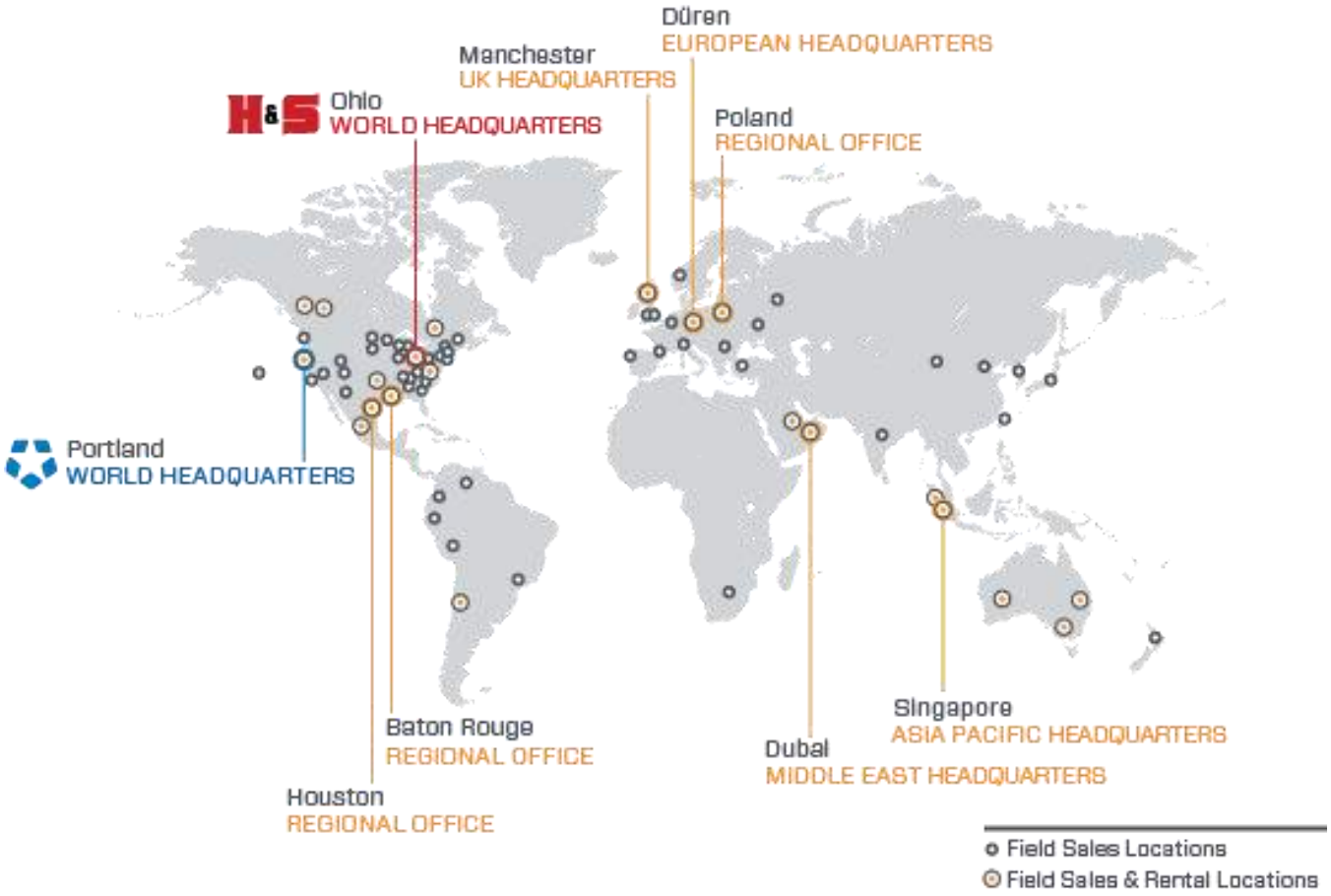
CLIMAX WORLDWIDE LOCATIONS



CE

Climax Portable Machine Tools, Inc. Effective Date: July 22, 2010

Declaration of Conformity

CE

CLIMAX®
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Manufacturer Address:
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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 - Pneumatic
Models:	FF7200
Serial Numbers:	10016661 - 10028700

Is in compliance with the following directives:

2006/42/EC - Machinery

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

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

VP - Engineering
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Signed in Newberg, Oregon 97132-8210 USA on: 7/22/10

DATE

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Introduction

About this Manual

CLIMAX machines are highly configurable with many options and accessories. This manual covers the use and operation of all of those possible options. The machine configuration purchased by a customer may not contain all of the options and accessories in this manual. If a specific machine application requires additional options or accessories, please contact CLIMAX for assistance in obtaining the needed components.

This manual describes the operation and maintenance of your flange facer. The machine is designed for facing, beveling and grooving operations. All parts meet CLIMAX's strict quality standards. For maximum safety and performance, you must read the entire manual before operating the machine.

Safety Guidelines

The primary safety challenge for most on-site maintenance is that repairs are often done under difficult conditions.

CLIMAX leads the way in promoting the safe use of portable machine tools. Safety is a joint effort. As the operator of this machine, you are expected to do your part by closely examining the job site and following the operating procedures outlined in this manual, your own company rules, and local regulations.

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 the appropriate personal protective gear when operating this or any other machine tool. Eye and ear protection are required when operating or working around the machine. Flame-resistant clothing with long sleeves and legs is recommended when operating the machine, as hot flying chips from the workpiece may burn or cut bare skin.

Work area – Keep the work area around the machine clear of clutter. Keep all cords and hoses away from the work area when operating the machine.

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 all lifting instructions in the setup procedures of this manual.

Lock out/tag out – Lock out and tag out the machine before doing maintenance.

Moving parts – CLIMAX machines have numerous exposed moving parts and interfaces that can cause severe impact, pinching, cutting, and other injuries. Except for operating controls, avoid contact with moving parts by hands or tools during machine operation. 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, some housings, and cutting tools can generate enough heat to cause severe burns. Pay attention to hot surface labels. Avoid contact with bare skin until the machine has cooled.

Eye protection is required.

Hearing protection is required.

The maximum temperature data (taken after 35 minutes of operating the machine in a continuous cut) is 129 ^{o} F (54^{o} C).

Labeling Guidelines

The purpose of product safety signs and labels is to increase the level of awareness to possible dangers.

Safety Alert Symbols indicate DANGER, WARNING or CAUTION. These symbols may be used in conjunction with other symbols or pictographs. Failure to obey safety warnings can result in serious injury. Always follow safety precautions to reduce the risk of hazards and serious injury.

	**DANGER** **Indicates a hazardous situation that could be fatal or cause serious injury.**
	**WARNING** **Indicates a potentially hazardous situation that could be fatal or cause serious injury.**
	**CAUTION** **Indicates a potentially hazardous situation that could result in minor to moderate injury, damage to the machine or interruption of an important process.**
	**IMPORTANT** **Provides critical information for the completion of a task. There is no associated hazard to people or the machine.**
	**TIP** **Provides important information regarding the machine.**

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 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.

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 attached to it 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.

Risk Assessment Checklist

Use these checklists as part of your risk assessment:

TABLE 1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

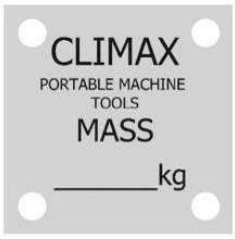
Before Set-up	
☐	I took note of all the warning labels on the machine (shown on page 6).
☐	I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
☐	I considered the need for personnel safety guarding and installed any necessary guards.
☐	I read the Setup section on page 13.
☐	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 the best placement for the controls, cabling, and the operator.
☐	I evaluated and mitigated any other potential risks specific to my work area.

TABLE 2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

After Set-up	
☐	I checked that the machine is safely installed (according to the Setup section) and the potential fall path is clear. If the machine is elevated, 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 Maintenance section with the recommended lubricants on page 60.
☐	I checked that all affected personnel have the recommended personal protective equipment, as well as any equipment required by the site or other regulations.
☐	I checked that all affected personnel understand the danger zone and are clear of it.
☐	I evaluated and mitigated any other potential risks specific to my work area.

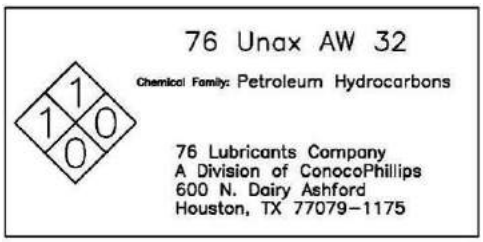
Labels

Part Number 29154 – CE Machine Nameplate

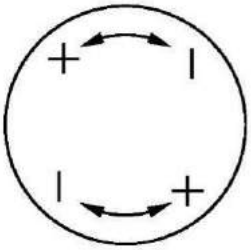


Part Number 29152 – Mass Tag displays the weight of a group of components or the assembly

Part Number 59039 – Designated Lift Point



Part Number 39546 – Chemical Designator



Part Number 35772 – Ball Valve Handle

Part Number 27462 – Warning Label

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Part Number 84019 – CLIMAX Logo

Part Number 59037 – Hearing Protection Required

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.

CLIMAX warrants that all parts are free from defects in materials and workmanship, and that all labor has been performed properly. This warranty is available to the customer purchasing parts or labor for a period of 90 days after delivery of the part or repaired machine or 180 days on used machines and components. If the customer purchasing parts or labor finds any defect in materials or workmanship within the warranty period, the purchaser should contact its factory representative and return the part or repaired machine, shipping pre- paid, to the factory. CLIMAX will, at its option, either repair or replace the defective part and/ or correct any defect in the labor performed, both at no charge, and return the part or repaired machine shipping prepaid.

These warranties do not apply to the following:

- 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.

General Information

- Use of large, heavy-duty, construction-grade bearings provides powerful, rigid performance throughout the entire machine facing range, even machining over bolt hole patterns.
- Infinitely variable feed rates from 0.002-0.035”/rev (0.051-0.889 mm/rev) provide operational flexibility and the ability to provide phonographic finishes with OFF/ON capabilities.
- The tool head may 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 provides steady rotation for difficult machining challenges.
- Unique chucking system minimizes parts and greatly simplifies machine set-up and tear down.
- Chucking system can be removed to allow customers to face mount the flange facer for applications like machining heat exchanger flanges.
- Turning arm can be infinitely positioned to reduce rotating swing clearance as needed for close quarter applications.
- Feed box can be mounted to provide either radial or axial feed.
- Features a remote control feed rate adjustment to allow the machine operator to safely adjust the feed rate without reaching into the rotating machine. This also allows for feed adjustment while machining.

Standard Components

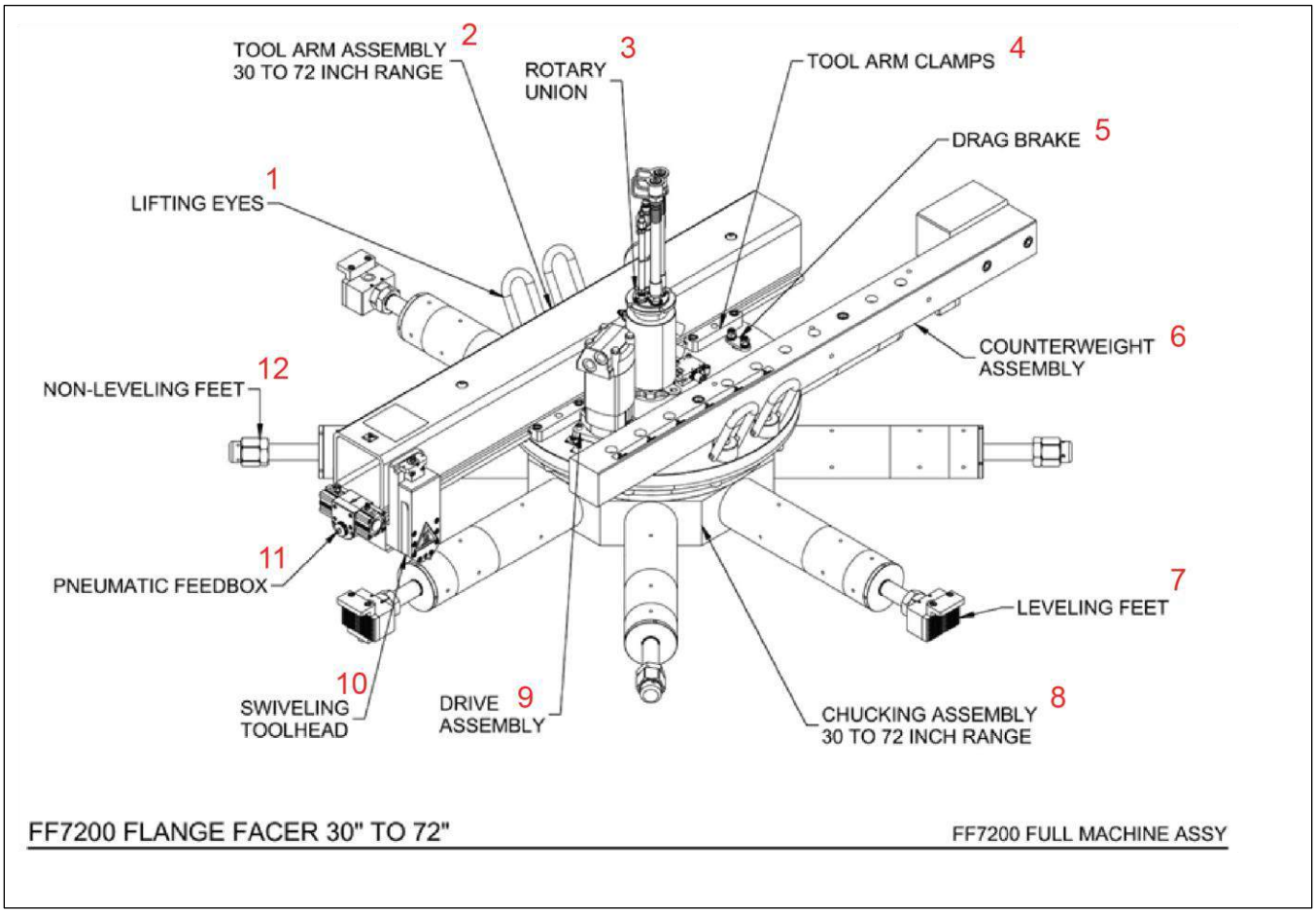


Figure 1. Components

Table 3. Components figure identification

Number	Description
1	Lifting eyes
2	Tool arm assembly (30–72" [762–1,829 mm] range)
3	Rotary union
4	Tool arm clamps
5	Drag brake
6	Counterweight assembly
7	Leveling feet
8	Chucking assembly (30–72" [762–1,829 mm] range)
9	Drive assembly

Number	Description
10	Swiveling tool head
11	Pneumatic feedbox
12	Non-leveling feet

Figure 2. Main machine in wood crate

Figure 3. Tool Kit

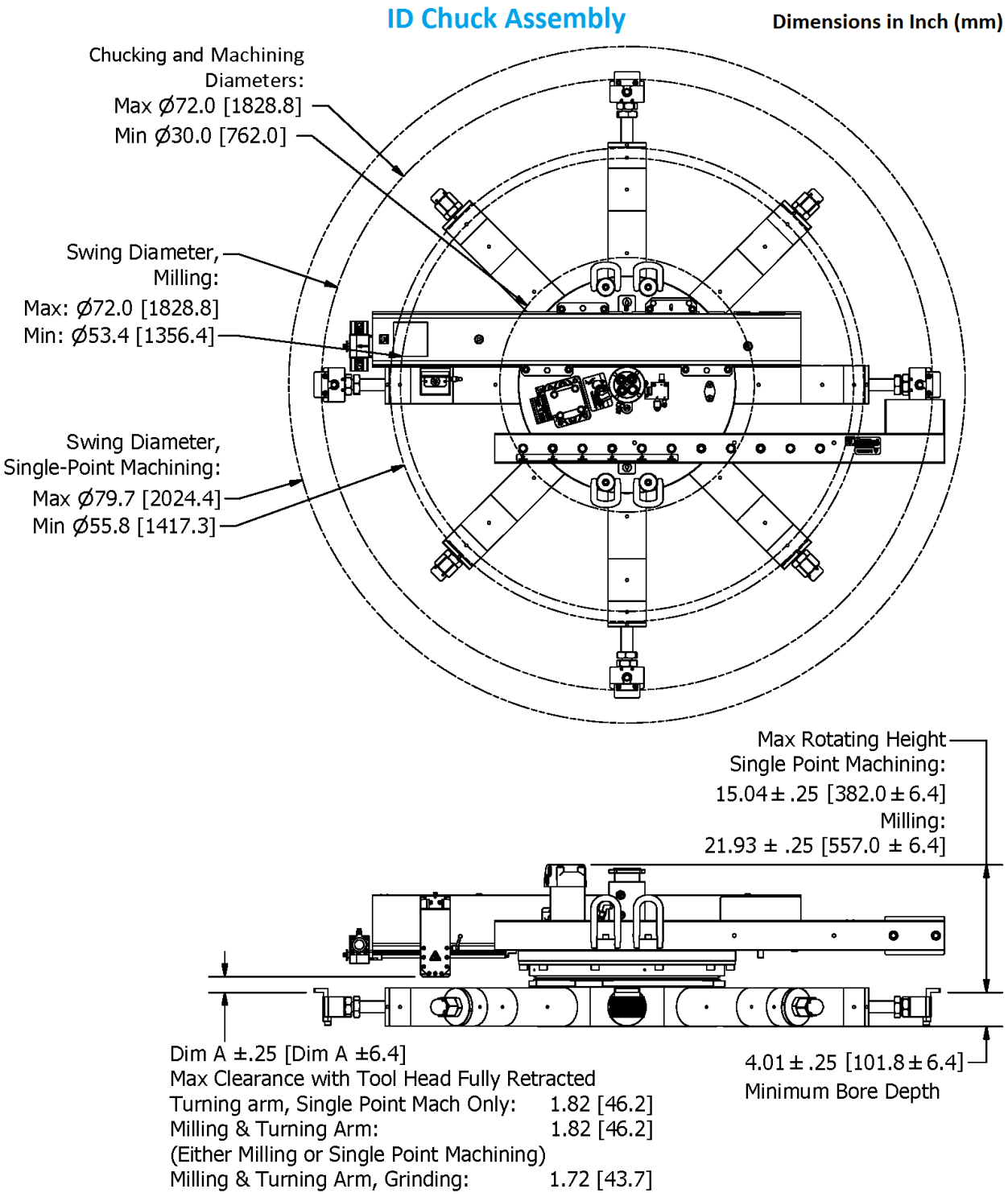
Main Machine Components

1 FF7200 Main Machine with counter weight and turning arm assembly
8 57701 Chuck Leg 2.5 Inch Long
8 57702 Chuck Leg 5.0 Inch Long
8 57703 Chuck Leg 8.0 Inch Long
8 57704 End Cap 4.5 Diameter
4 57637 Leveling Foot with #57556 M30 x 3.5 Jam Nut
4 57899 Non-leveling Foot with #57556 M30 x 3.5 Jam Nut
1 59329 Pneumatic Conditioning Unit w/Quick Coupler #55126
1 58185 Tool Kit Box (see contents below)
1 59245 Hose and Control Valve Assembly (feed unit controller)

Tool Box Contents

120” 50985Tubing 1/4 in OD x .040 Wall DOT 1200 psi Nylon
120” 59151 Tubing 1/8 in OD x .023 Wall DOT 1000 psi Nylon
1 59129 Operator Manual FF7200
1 35516 Dead Blow Hammer 1-3/4 Dia. Head
2 65188 WrenchSpanner110mm to 115mm (4-1/2) Dia. .300 Dia. Pin
2 58353 Open End Wrench 55mm x 9-1/2 Long
1 14818 Ratchet Wrench ½ Drive
1 46250 Hex Socket 10mm x ½ Drive
1 46249 Hex Socket 14mm x ½ Drive
1 46252 Hex Socket 17mm x ½ Drive
1 58354 Socket Wrench Extension ½ Drive x 5 Long
1 34866 Air Tool Oil- 4 oz. Bottle
1 33999 Hex Wrench Set- .050- 3/8 Inch Ball End
1 38678 Hex Wrench Set- 1.5- 10mm Ball End
1 63678 Knob Cast Iron
1 29066 Tool Bit HSS ¾ x 5 LH Finish Single SC
1 29067 Tool Bit HSS ¾ x 5 RH Finish Single SC
10 61820 Carbide Insert- Saco WNMP 431-MF1 TM4000
1 39633 Torx Wrench T-15
1 60034 Holder Insert ¾ Sq. Shank RH
1 60033 Holder Insert ¾ Sq. Shank LH
8 45530 Screw M8 x 1.25 x 30mm
4 59085 Setup Finger FF7200

Dimensions and Clearance



NOTE: ±.25 [± 6.4] is travel of leveling foot

FF7200 ID MOUNT SINGLE POINT - FF7200 FLANGE FACER 30" TO 72" - REV -

FOR REFERENCE ONLY

Setup

Receipt and Inspection

Your CLIMAX product was inspected and tested before 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. Check the contents of the shipping containers against the included invoice to ensure that all components have been shipped.
3. Inspect all components for damage.
4. When unpacking the machine, place machine on 4-inch high blocks to prevent damaging the components.
5. The machine is coated with a waxy preservative to prevent corrosion during shipping. Clean this substance off the machine with solvent to prevent excess accumulation of dirt.

Contact CLIMAX immediately to report damaged or missing components.

Preparing the Machine for Use

Pre-setup Check

The FF7200 can be set up and mounted in many ways. Before setting up the flange facer, check the following:

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

Assessing the Work Area

The FF7200 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 page 5) for each job before starting work.

The FF7200 has remote operation features that enable you to choose the optimum location to work from (see the checklist on page 5).

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.

Lifting and rigging

	DANGER
	The FF7200 is very heavy when fully assembled. 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 FF6200 has lifting points for individual sub-assemblies and for the completely assembled machine, as shown below.

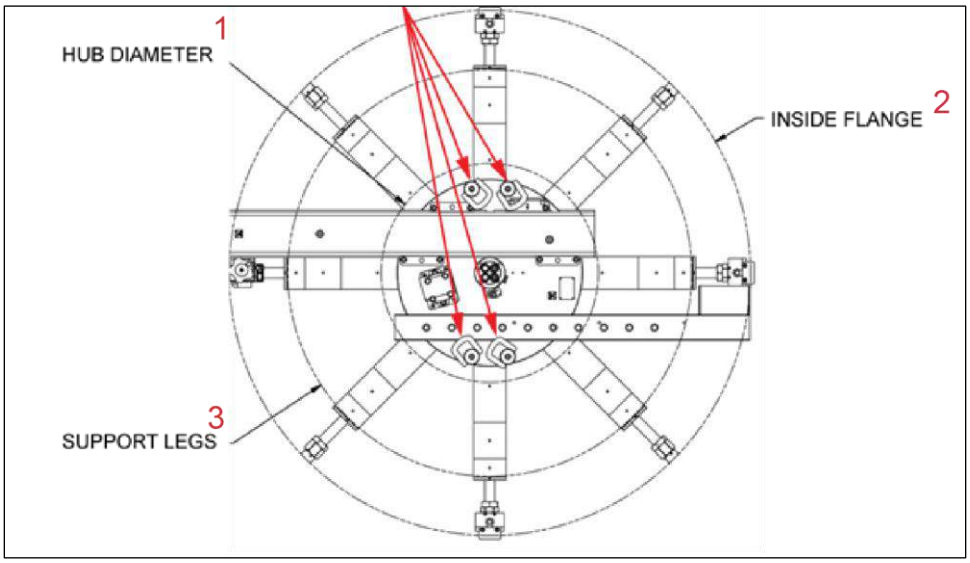


Figure 4. Designated lifting points

Table 4. Lifting point figure identification

Number	Description
1	Hub diameter
2	Inside flange
3	Support legs

	CAUTION
	Lift the machine ONLY by the hoist rings marked.

The sub-assemblies may be disassembled and individually lifted by the labeled hoist rings on each sub-assembly.

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.

- Connect the appropriate lifting equipment to the lifting eyes located on top of the machine when lifting the entire assembly.
- Use all four lifting eyes for stability.
- Never lift the machine by the drive motors, pneumatic lines, controls, machining arm, or counterweight.
- The machine can be broken down into more manageable sections for easier lifting.

- Follow all proper lifting procedures and secure the machine properly before lifting.
- Only use slings, straps or chains that are rated for the weight of the equipment.

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 lifting eyes.

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. When lifting the machine, pay special attention to the location of the center of gravity when lifting. Always make sure that all machine parts are tightened properly to prevent hazards.

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.

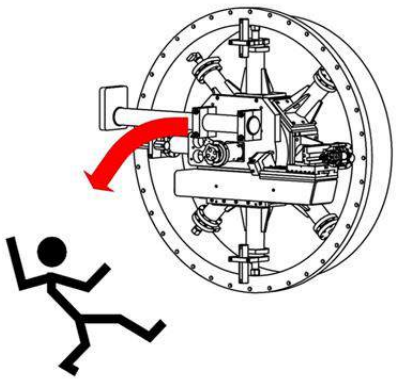
WARNING

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

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 safety weld plates should be utilized when possible.**
- **If not possible, contact CLIMAX to determine a custom solution.**



To avoid the risk of a falling machine, secure the machine by tack-welding safety blocks over the upper jaws or by using clamps bolted to the underside of the leveling feet (safety blocks and clamps not included with the machine).

WARNING

Do not remove the crane until the jacking bolts are tightened to the specified torque (for milling 150 ft-lb [203 Nm]; for single-point, 55 ft-lb [75 Nm]) and at least one of the securing methods is in place.

IMPORTANT

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 jacking feet over 3” (mm). If needed, add additional leg sections to minimize the length of the threaded jacking screw that is exposed.

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.

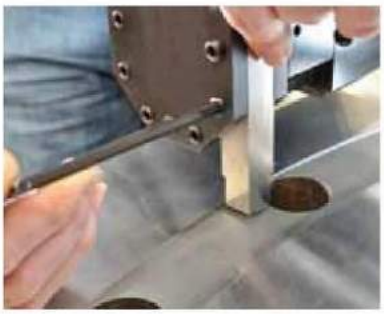
3 Install setup fingers.

4 Tighten legs.

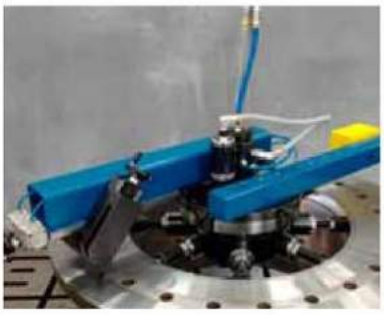
5 Set machine onto flange using setup fingers. Lightly tighten leveling feet in the flange.

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

7 Install tool bit. Connect to power.



8 You are ready to begin machining!



The FF6200 is shown in the above illustration.

Overview of FF7200 flange facer 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 FF7200 in the ID mounting configuration.

Do the following to mount the machine to the workpiece:

1. Make sure 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.
3. Before inserting the flange facer into the work piece, confirm the legs are securely attached to the machine.
    a. For ID mounting: Confirm that the ID mounting legs are set to a diameter smaller than the internal mounting diameter.
    b. For OD mounting: Confirm that the OD mounting legs are set to a diameter larger than the flange diameter. Refer to the Chuck mounting section on page 23 for the complete procedure for chuck leg setup.

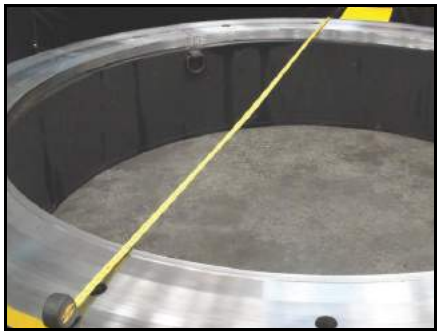


Figure 5. Measure the workpiece

	IMPORTANT
	If mounting the FF7200 in the vertical orientation, then the machining arm and counterweight should be attached to the rotary table (step 4) 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
5. from the center of the machine, the same location number, in order to balance the machine.
6. 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).
7. Attach the crane slings to the lifting points on the rotary table.

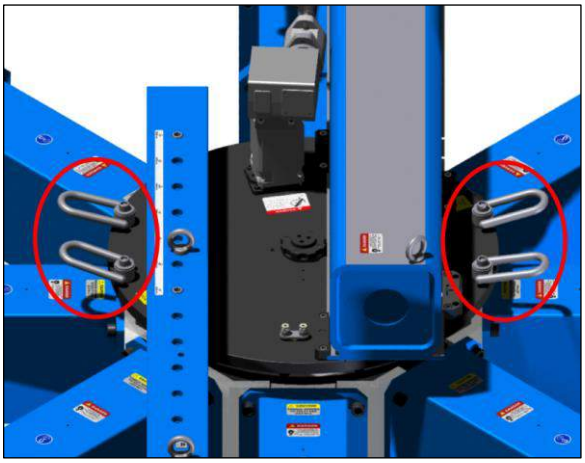


Figure 6. Assembled machine lifting points (FF8200 shown)

	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.

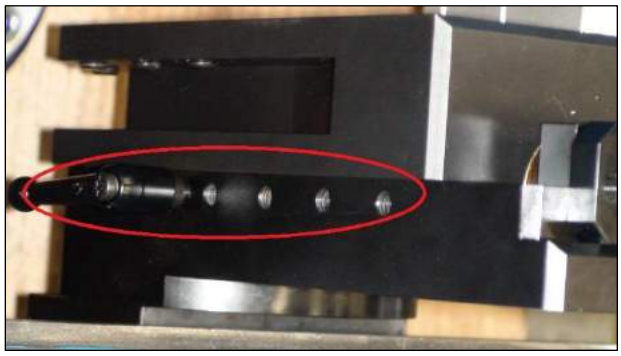
8. Lift the machine slowly and carefully. If it is out of balance, lower the machine to the ground. Make adjustments before attempting to lift and maneuver it again.
9. Mount the machine to the workpiece using setup fingers (Figure 7).
10. Connect any control cables that may be necessary (depending on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

Figure 7. Setup finger

Adjusting the tool head gib screws

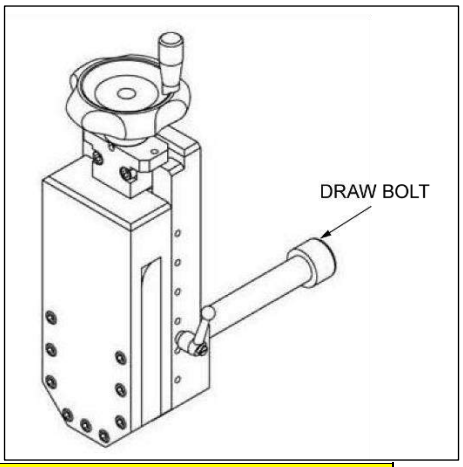
The tool head gib is adjusted using the six M6 screws. Adjustment should only be necessary after many hours of use and if the machine is no longer producing a good finish.

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.



Rotating the tool head

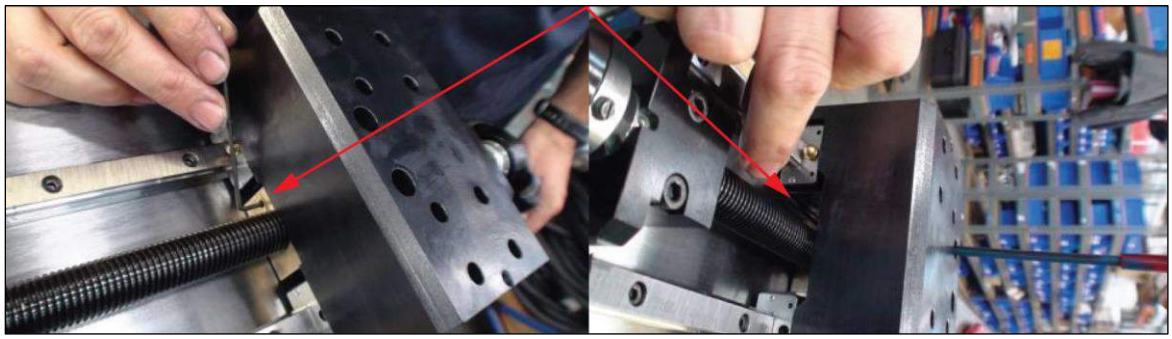
The tool head can be rotated by loosening the single draw bolt coming from the back of the tool head, positioning the tool head, and tightening the draw bolt.



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

Adjusting the radial slide anti-backlash lead nut

The radial slide lead nut is adjustable to provide near zero backlash. Adjustment of the lead nut is done by one M4 set screw on each of the two lead nuts.



Adjustment should only be necessary after many hours of use. These 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.

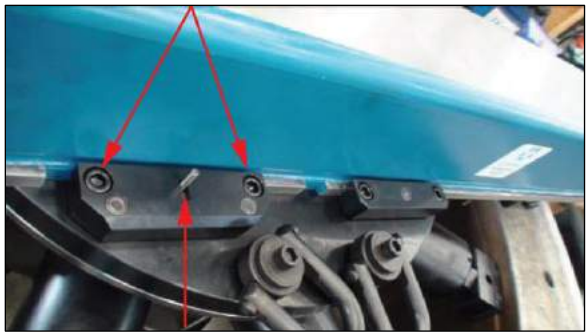
After adjustment, check travel over the full length of leadscrew for tight spots.

Positioning the machining arm

The machining arm is 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. If necessary, adjust the machining arm until the safety stop pin engages in the retention notch.
5. Retighten the clamps and the counterweight.



	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.**

	CAUTION
⚠	**After adjusting the machining arm, make sure that the counterweight is set to the corresponding bolt location increment.** **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.**

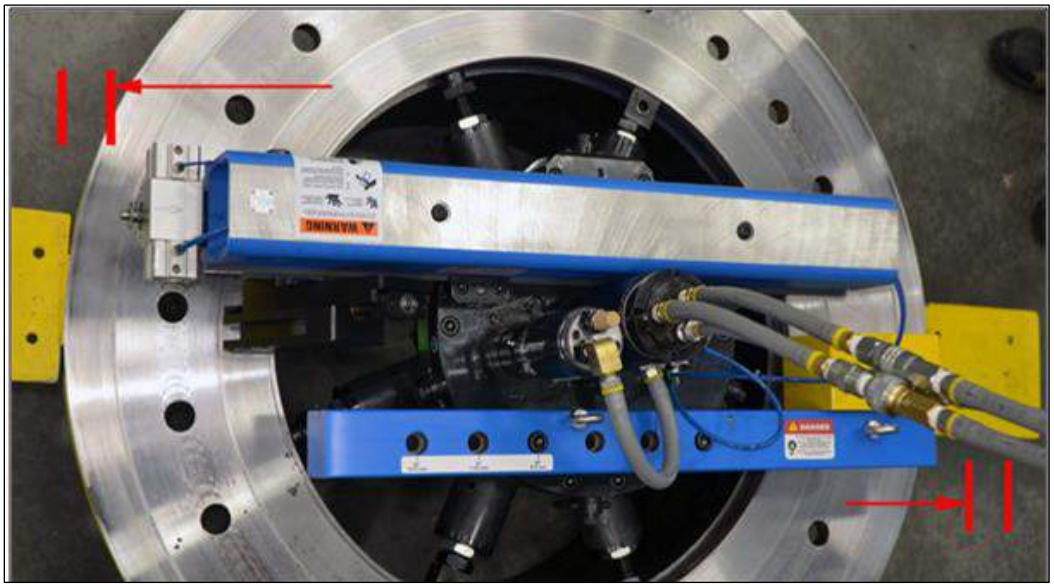


Figure 8. Machining arm and counterweight equally spaced

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 9. 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 9.

Figure 10. 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 are marked with ranges (Figure 11) that match the approximate setting on the machining arm.

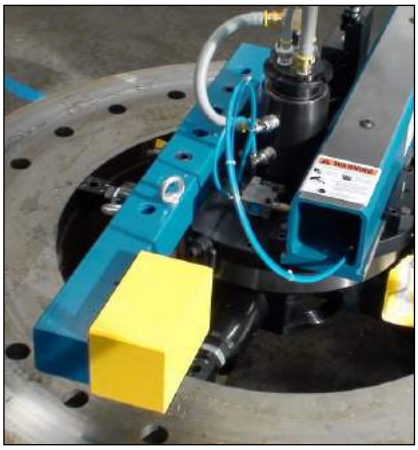
Figure 11. Counterweight fasteners

Positioning the counterweight

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

This allows the counterweight to be set the same distance from the center of the machine as machining arm and be sufficiently balanced.



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

Chuck mounting

See the Installation Hazards section on page 15 for a full list of installation hazards.

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

To prevent accidental machine rollout, tack weld safety blocks over the upper chuck arms immediately after lifting the machine into place, before leveling or centering the machine.

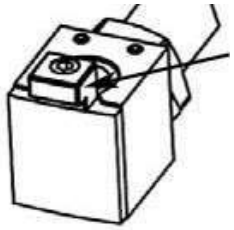
Recommended ID mounting setup			
Chucking leg chart			
Diameters	**10" (762 mm) leg**	**5" (127 mm) leg**	**2.5" (63.5 mm) leg**
30–35" (762–889 mm)	0	0	0
35–40" (889–1,016 mm)	0	0	1
40–45" (1,016–1,143 mm)	0	1	0
45–50" (1,143–1,270 mm)	0	1	1
50–55" (1,270–1,397 mm)	1	0	0
55–60" (1,397–1,524 mm)	1	0	1
60–65" (1,524–1,651 mm)	1	1	0
65–70" (1,651–1,778 mm)	1	1	1

Do the following to mount and align the machine:

1. Measure the bore diameter of the work piece.
2. Select the proper leg extensions and screw actuators.
3. Apply never-seize (provided in the tool kit) to the threads and contacting faces of each leg section before screwing them together.

Figure 12. Anti-seize lubricant locations

4. Before putting the chuck onto the workpiece, ensure the jacking screws are roughly retracted equally and equipped with the setup fingers.



SETUP FINGER

LEVELING FOOT

5. 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.
6. 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.

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

7. Adjust the jacking screws to center the machine. Set a dial indicator or other tool to the bore if the exact center is required.
8. After **securely attaching** the machine to the flange, mount a dial indicator on the turning arm and indicate the surface of the flange by manually rotating the machine.
9. Level the machine by turning the jacking screws in each of the leveling feet.
10. Tighten the leveling feet and stationary feet by torqueing to the following specifications: for milling, 150 ft-lb (203 Nm); for single-point, 55 ft-lb (75 Nm).
11. Check the machine for level once again.
12. Repeat this procedure until the machine is aligned.
13. Secure the chuck by tightening the jam nuts with the wrench.
14. Check the machine for level once again.
15. Repeat this procedure until the machine is aligned.
16. Make sure that the machine is secure in the fixture.
17. 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.

Figure 13. Tool kit

Feed system

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

	IMPORTANT
	CLIMAX recommends that you do not adjust this valve.

Figure 14. Flow control

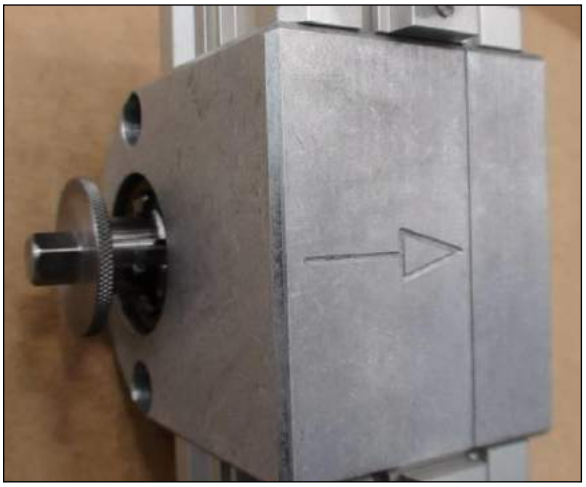
Feed box

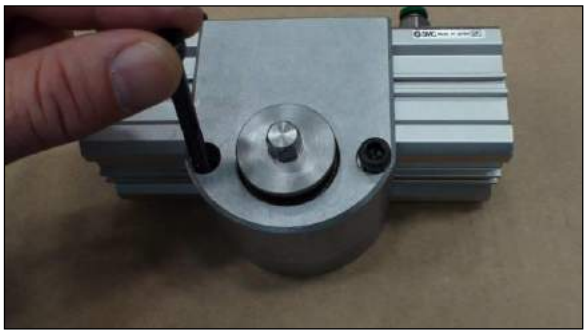
The machines are fitted with a remote feedbox adjustment at the air shut-off valve. All adjustments to the feed rate are done from this point. The air supply lines to the feed box are supplied in two sizes, 1/4“ and 1/8”. This prevents accidentally swapping hoses.

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

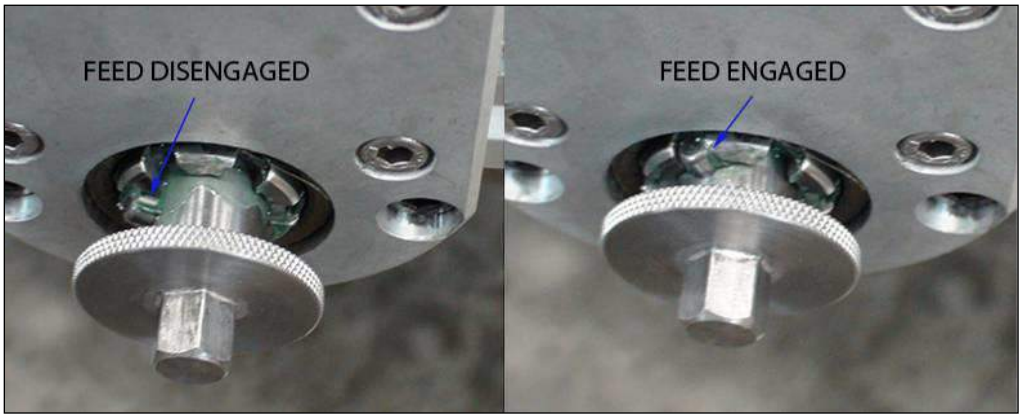
To reverse the direction, it is not necessary to disconnect the hoses. Do the following:

1. Remove the feed shaft and the two bolts connecting it to the arm.
2. Rotate the feedbox until the arrow points in the desired feed direction.
3. Reinstall the bolts and feed shaft.





This feedbox has two positions, engaged and neutral.



In neutral, the tool may be manually fed in either direction. Hoses connected to the feedbox should have approximately 12” of extra length coiled inside the arm to allow the arm to move and still keep the hoses clear of snag hazards.

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

Single point turning with the milling arm option

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

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

Check the following before milling:

- All machine parts are secure, including the tool head, tool holder, and tool bit.
- The tool head is set at the desired angle.
- The feed direction and rate are set correctly.

Surface mount (optional equipment)

The surface mount kit provides the ability to use the FF7200 in situations where the regular inside diameter mount cannot be used. The surface mount kit may be used in backfacing applications or where there is a need to machine up to or past the outside dimension and there is no way to mount the FF7200.

The surface mount kit (P/N 79550) does not change the operation of the FF7200.

The FF7200 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, turning 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.

Setup

Do the following procedure to assemble the machine for surface mounted facing.

1. Remove the chuck from the bottom of the FF7200, as seen in Figure 15.
2. Attach the plate extensions to the bottom plate, as seen in Figure 16.
3. Attach the tack weld blocks to the plate extensions using the supplied bolts, as seen in Figure 17 and Figure 18.
4. Attach the tack weld plates to the workpiece by either tack welding them or another desired method, such as clamping or bolting.

Figure 15. Remove the chuck

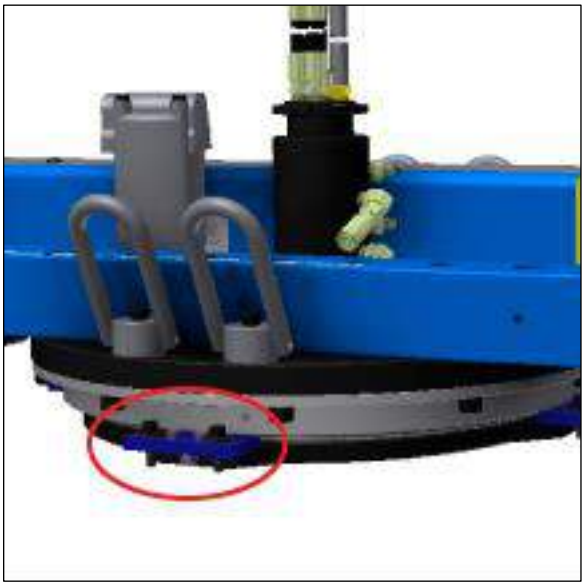


Figure 16. Plate extensions attached to the bottom plate

Figure 17. Detail of surface mount kit

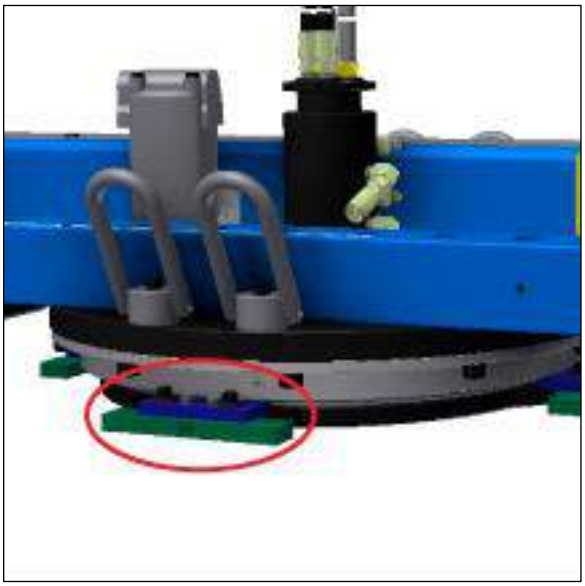


Figure 18. Tack weld blocks attached to the plate extensions

Centering and leveling the machine

The surface mount kit (P/N 79550) has two leveling set screws and one centering set screw per plate extension/tack weld block combination as seen in Figure 19.

1. Center the machine using a tape measure to get a rough centering.
2. Use the set screws to make the final adjustments.
3. Level the machine using the eight leveling set screws.

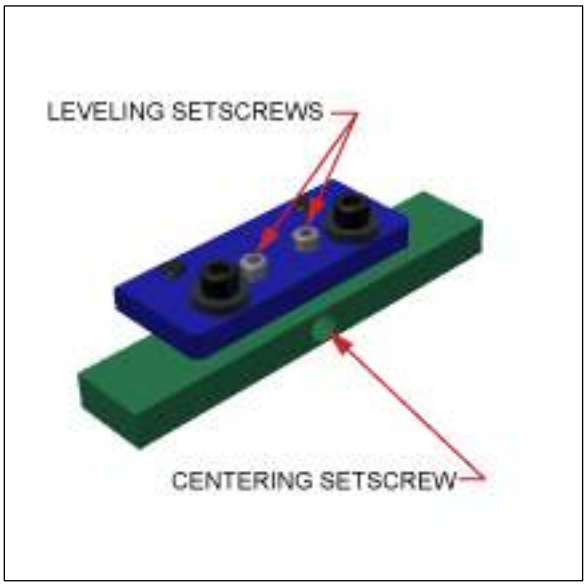


Figure 19. Location of leveling and centering set screws

Back face attachment setup (optional equipment)

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

Figure 20. Backfacing 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.**

Back face attachment assembly

Do the following 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 21. Tighten the cap screws to 58Nm (42ft-lb). The height of the back face attachment may be adjusted by using the provided mounting holes, position back face attachment based on the flange thickness.

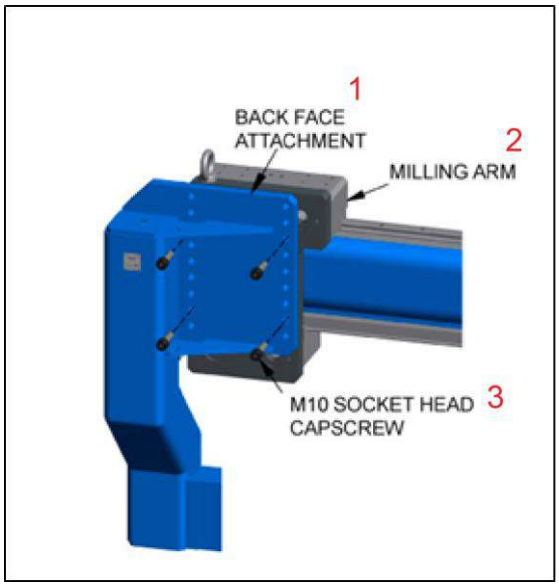


Figure 21 Detail of assembly of backfacing attachment

Table 5. Backfacing attachment detail figure identification

Number	Description
1	Back face attachment
2	Milling arm
3	M10 socket head cap screw

3. Position the turning arm based on the workpiece flange diameter (see Figure 22).
4. Position the counterweight arm based on turning arm location.

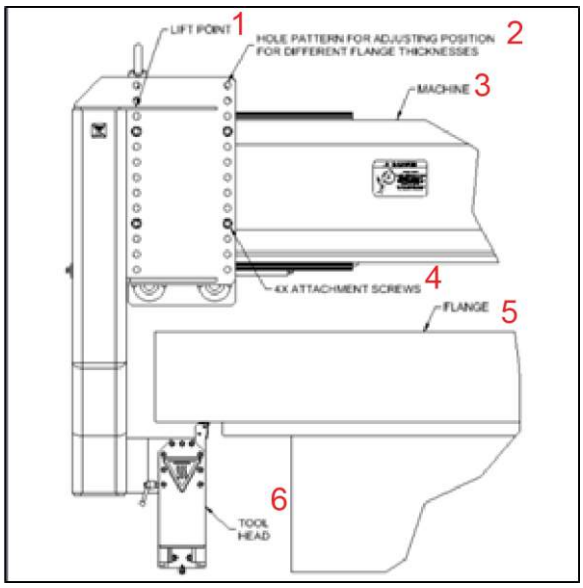


Figure 22 Backfacing attachment on flange

Table 6. Backfacing attachment on flange figure identification

Number	Description
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

Tool head assembly

Do the following to assemble the tool head for back facing:

1. 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 23). Tighten the cap screw to 135 ft-lbs (185 Nm).
2. Place the cutting tool into the tool head.

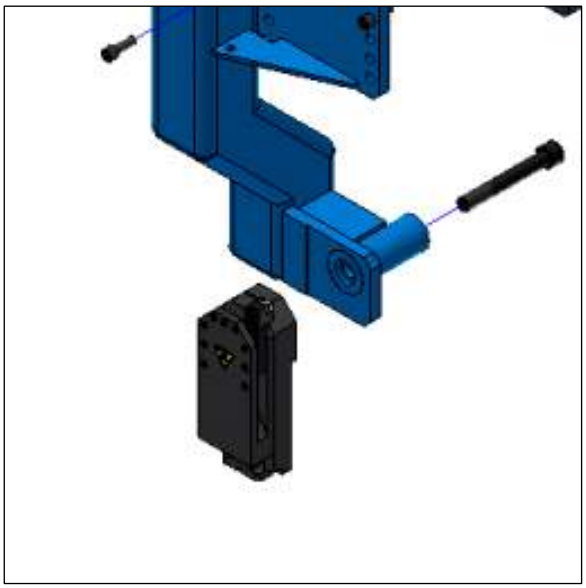


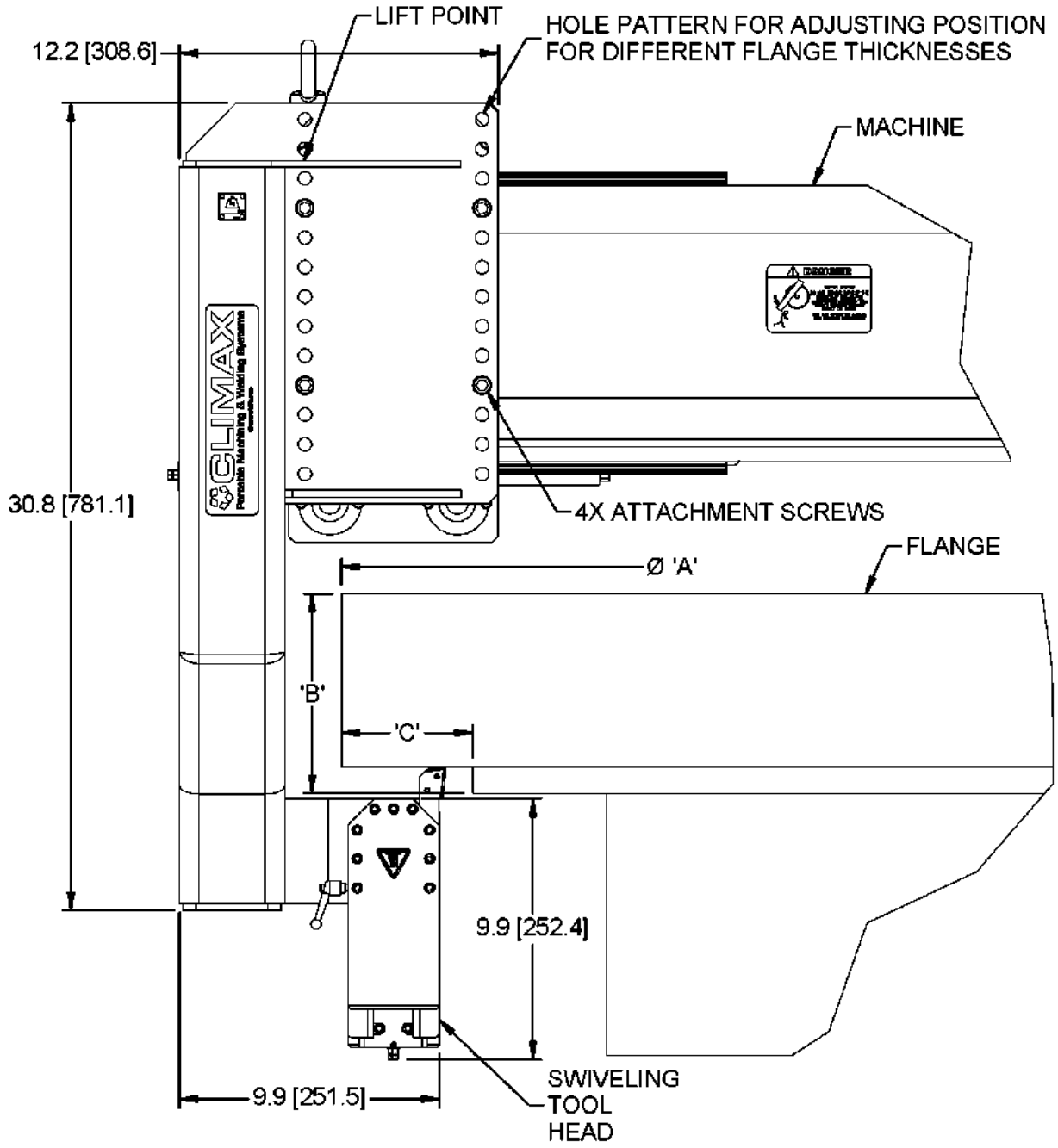
Figure 23. Detail of tool head assembly

Counterweight assembly

The counterweight should be moved out the same distance as the turning arm, as described in the counterweight section of this operation manual. Figure 24 shows the arrangement when using the facing attachment.

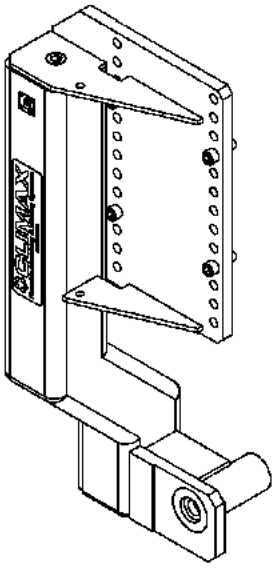
Figure 24. Counterweight position

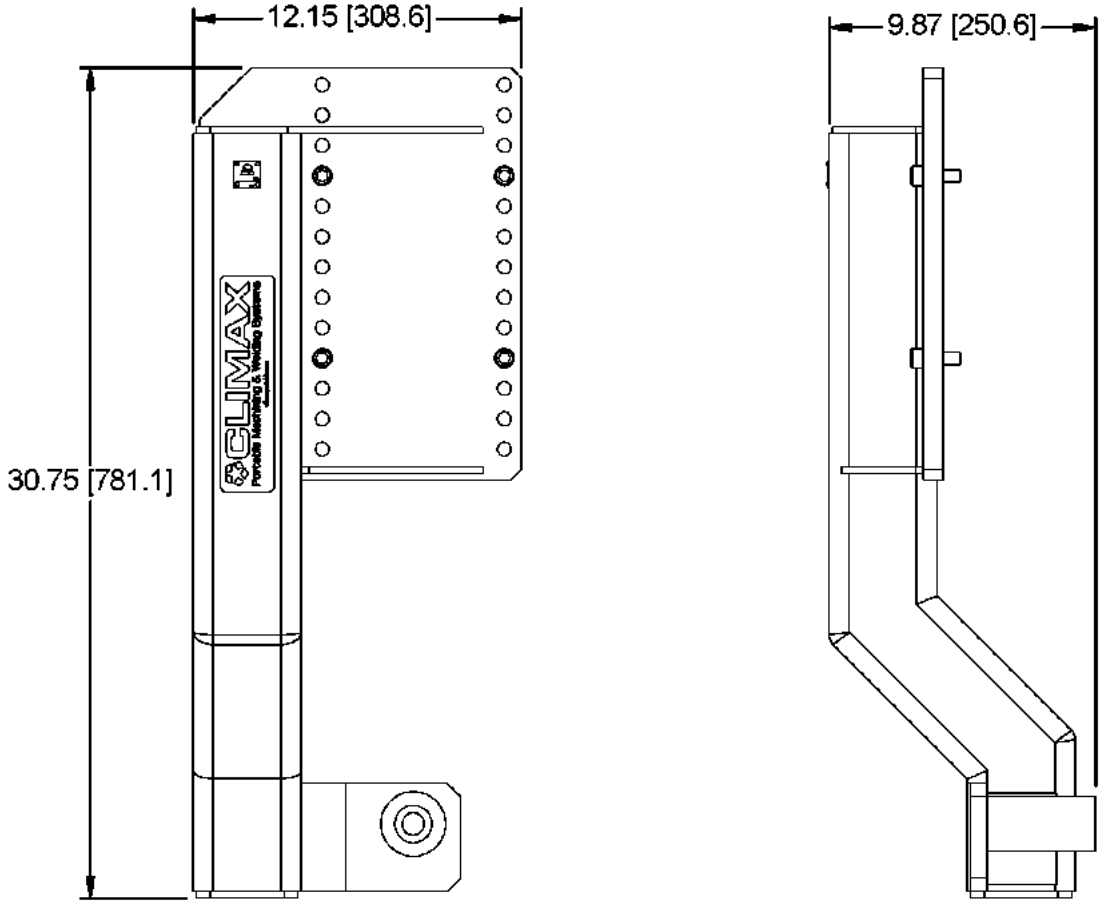
MACHINING RANGES			
MACHINE	'A'	'B'	'C'
FF7200	30 - 67.5 inches (762.0 - 1714.5 mm)	1 - 8 inches (25.4 - 203.2 mm)	6 inches (152.4 mm)
FF8200	45 - 115.5 inches (1143.0 - 2933.7 mm)	1 - 8 inches (25.4 - 203.2 mm)	6 inches (152.4 mm)



69711 - ASSY BACK FACE FF7200 FF8200 - REV A

FOR REFERENCE ONLY





69711 - ASSY BACK FACE FF7200 FF8200 - REV A

FOR REFERENCE ONLY

OD mount (optional equipment)

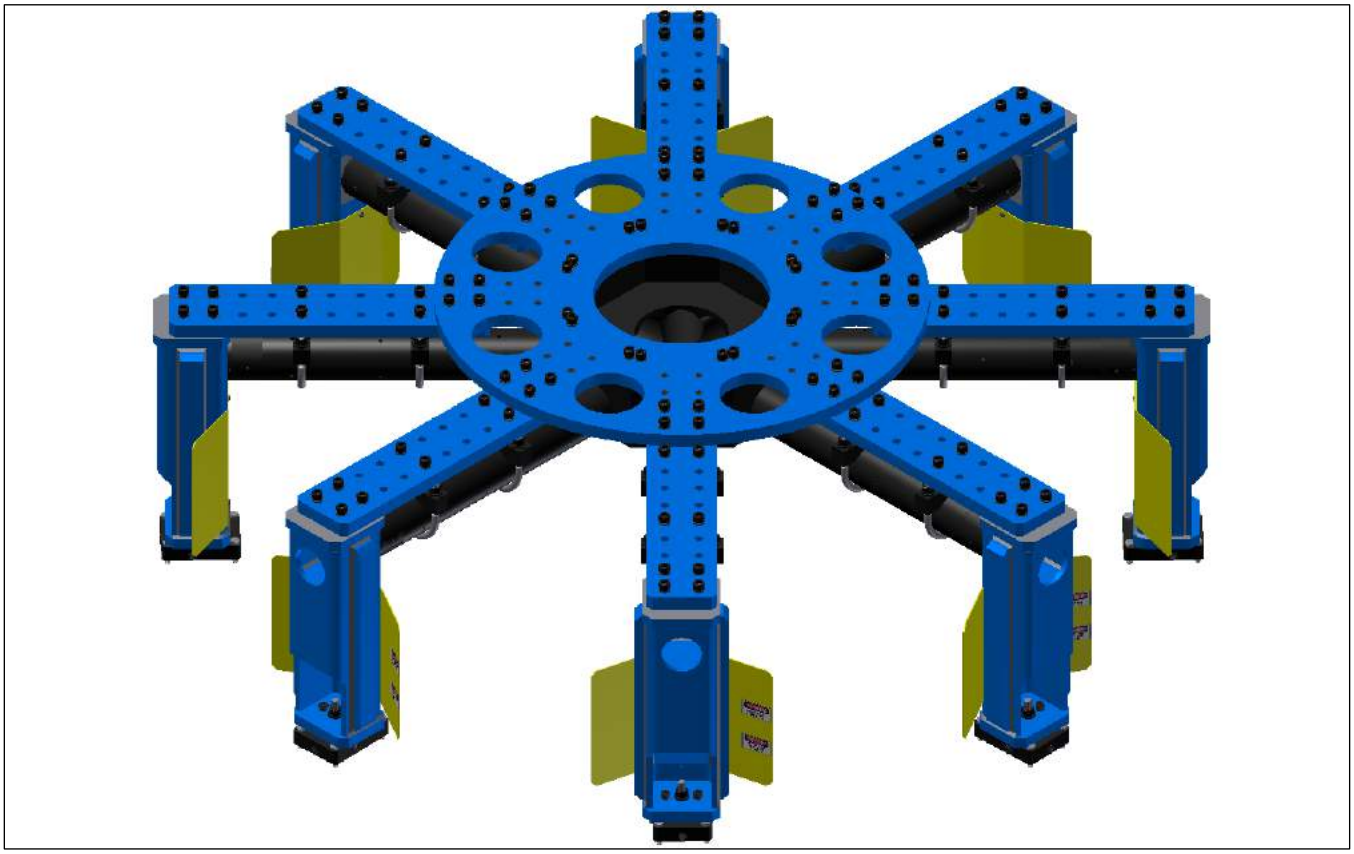
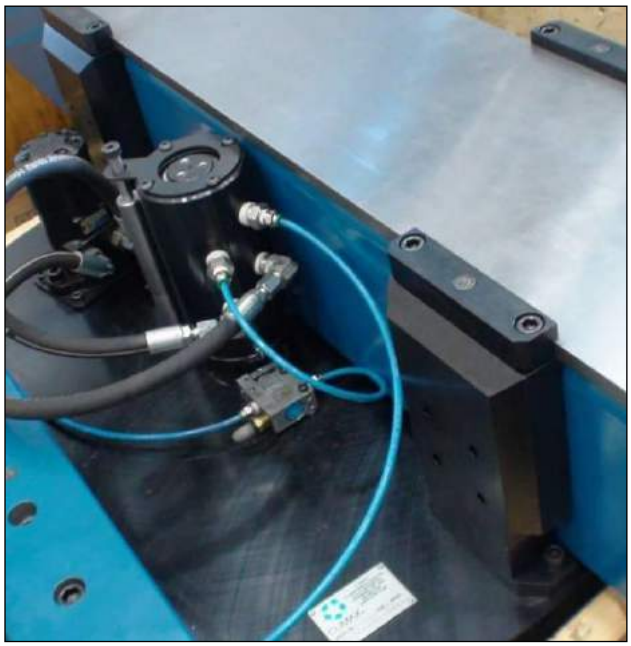


Figure 25. FF7200 OD Mount

Preparation

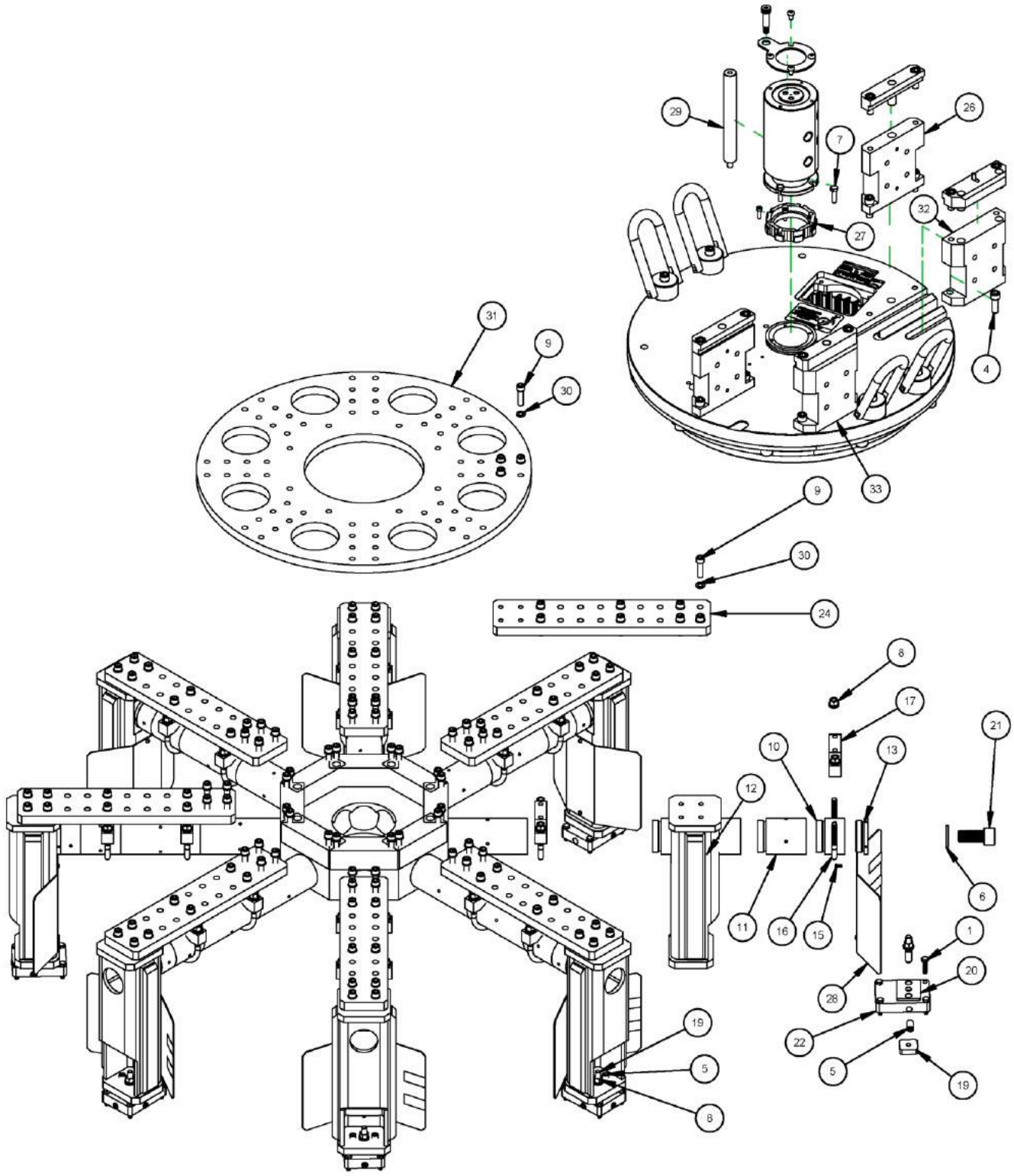
If the machine is not setup for OD machining, then the main body or chuck of the flange facer must be rotated upside down in order to use the OD mount.



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

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

See the following drawings for details.



OD MOUNT OPTION FF7200 61451

KIT CONVERSION OD MOUNT FF7200 62672

CLIMAX
Portable Machining & Welding Systems

WWW.CLIMAXPORTABLE.COM inside U.S. 1-800-333-8311

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	32	19867	SCREW M12 X 1.75 X 50MM HHCS ZINC PLATED GRADE 8.8
2	8	25979	LABEL WARNING PINCH POINT
3	8	26151	LABEL WARNING WATCH YOUR HANDS AND FINGERS
4	1	30207	SCREW M12 X 1.75 X 35mm SHCS
5	48	44239	SCREW M20 X 2.5 X 40mm SSSFP
6	8	48538	WASHER 1.563 ID X 2.75 OD X .30 THK FLTW
7	1	55799	SCREW M8 X 1.25 X 30MM HHCS
8	40	57215	NUT M16 X 2.0 FLANGED
9	112	57422	SCREW M16 X 2.0 X 60mm SHCS
10	8	57701	CHUCK EXTENSION 2.5 IN
11	8	57702	CHUCK EXTENSION 5 IN
12	16	57703	CHUCK EXTENSION 10 IN
13	8	57704	CAP END 4.5 DIA THREADED
14	1	57876	HUB CHUCK FF7200
15	16	59827	SCREW M8 X 1.25 X 16MM BHSCS
16	16	60671	UBOLT METRIC M16 OD MOUNT FF7200
17	16	60672	CLAMP VEE BLOCK OD MOUNT FF7200
18	8	60673	LEG VERTICAL SUPPORT OD MOUNT FF7200
19	8	60674	WELDED STUD HOLD DOWN OD MOUNT FF62/72
20	8	60675	PLATE WASHER LEVELING OD MOUNT FF7200
21	8	60676	SCREW M36 X 4.0 X 80MM SHCS
22	8	60677	PLATE CENTERING OD MOUNT FF62/FF72
23	8	60680	BLOCK SPACER OD MOUNT FF7200
24	8	60681	ARM HORIZONTAL SUPPORT OD MOUNT FF7200
25	16	60695	SCREW M16 X 2 X 180MM SHCS
26	1	60797	RISER CLAMP OD MOUNT FF7200
27	1	60831	CAM FEED OD MOUNT
28	8	61364	SHIELD OD MOUNT FF6200 & FF7200
29	1	61395	POST CIRCULAR 212MM TALL X M10 MALE TO FEMALE
30	112	61546	WASHER M16 FLTW 28MM OD 3MM THICK
31	1	68643	PLATE TOP OD MOUNT FF7200
32	1	72500	RISER CLAMP SAFETY OD MOUNT FF7200
33	1	72502	RISER CLAMP OD MOUNT FF7200

OD MOUNT OPTION FF7200 61451
KIT CONVERSION OD MOUNT FF7200 62672

Table 7. Recommended OD mounting setup

Mounting Diameter*	Machining Diameters	10" (254 mm) leg	5" (127 mm) leg	2.5" (63.5 mm) leg	Arm bolt position
58" (1,473 mm)	30–45" (762-1,143 mm)	1	1	0	Leg in 3
63" (1,600 mm)	30–50" (762-1,270 mm)	1	1	1	Leg in 2
68" (1,727 mm)	30–55" (762-1,397 mm)	2	0	0	Leg in 1
73" (1,854 mm)	30–60" (762-1,524 mm)	2	0	1	Top plate inside 4
78" (1,981 mm)	30–65" (762-1,651 mm)	2	1	0	Top plate middle 4
83" (2,108 mm)	30–70" (762-1,778 mm)	2	1	1	Top plate outside 4
88" (2,235 mm)	30–72"** (762-1,828.8 mm)	2	2	0	Top plate outside 2

The tool head may be tilted to cut at a 3" (76 mm) larger diameter than what is listed at each mounting diameter.

*Diameter denotes the location of center of clearance hole in setup foot. It may be adjusted slightly to fit need. Setup feet may also be flipped 180° for another 2.5" (63.5 mm) diameter adjustment.

****Important:** The setup requires an experienced machinist. Machine may need some modifications or adjustments when machining at these diameters. It is recommended to mount at 83" (2,108 mm) and tilt the tool head.

Reference Figure 26 for the following procedure:

1. Remove the 4 arm clamps from the rotary table.
2. Remove the rotary union.
3. Install the clamp risers, be sure to note the location of the safety clamp risers.
4. Plumb the rotary union with pigtails.
5. Flip the arm and rotary union over.
6. Replace cam. Arm should be very near to the rotary union but should not touch.
7. Reassemble the clamps on the risers, note the position of the safety clamp relative to the safety slots in the arm.

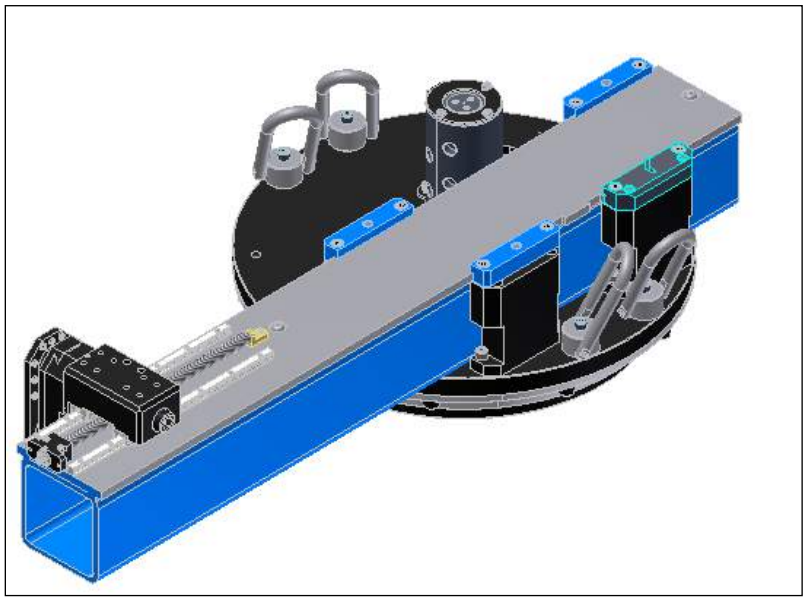


Figure 26. OD mount rotary table and arm assembly

Reference Figure 27 for the following procedure:

1. Invert rotary table and arm and set onto wooden blocks or some other fixture to protect the motor.
2. Remove the lifting eyes.
3. Determine the workpiece diameter.
4. Install the proper leg pieces shown in Figure 27. Tighten with spanner wrench included in the tool kit (2x 10", 5" and 2.5" pieces per leg).
5. Apply never-seize (provided in the tool kit) to the threads and contacting faces of each leg section before screwing them together.

Figure 27. Detail of leg pieces

6. Unscrew 2 chuck screws on either side of one leg and install a block spacer with new screws. Repeat for the other three legs.

7. Install the top plates as shown.
8. Install lifting eyes in holes on top plate.

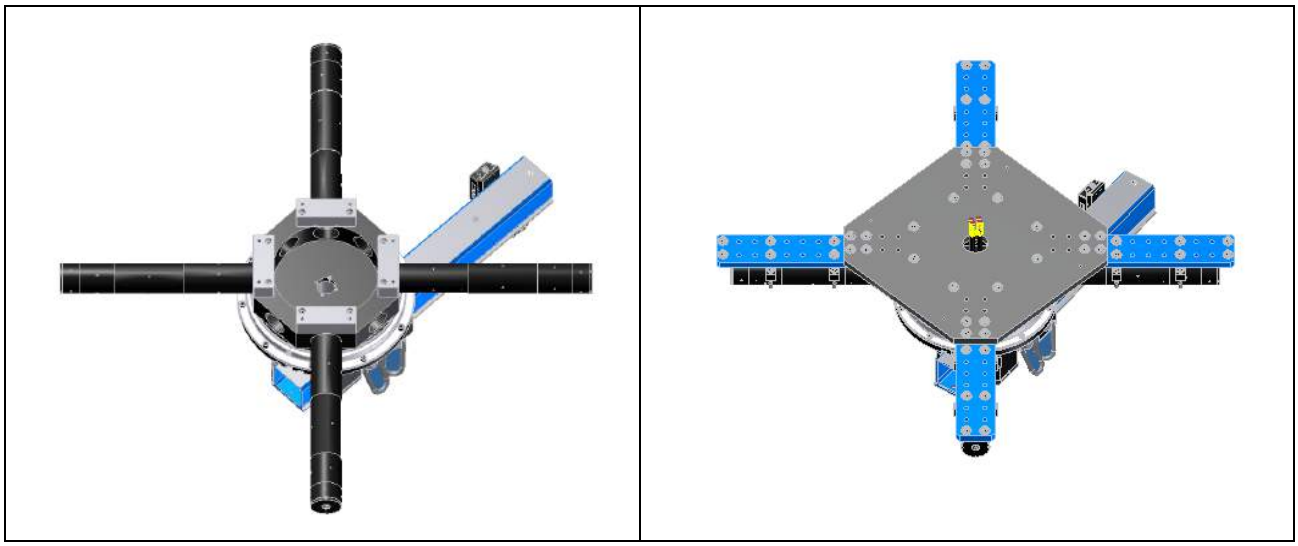
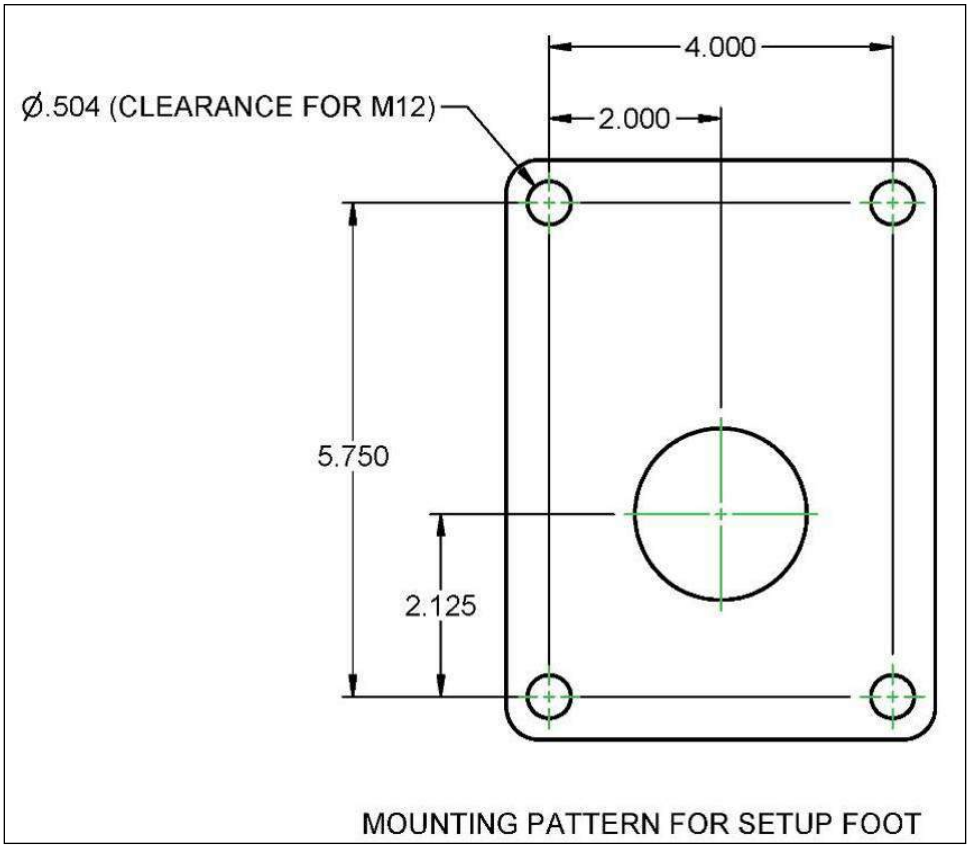


Figure 28. Block Riser and Leg Assembly

9. Weld on tack weld plates to quadrants of the fixture on the underside. (1.5x5x10 minimum dimensions)



10. Match drill and tap mounting hole pattern M12x1.75. (Inside hole dimension is 75.5".)

11. Setup the machine legs (according to workpiece diameter) to allow the machine legs to clear the work piece
12. Apply never-seize (provided in the tool kit) to the threads and contacting faces of each leg section before screwing them together (see Figure 27 on page 40).

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

13. Install the proper vertical supports shown in Figure 29.
14. Leave leveling and centering fasteners loose for later setup steps.

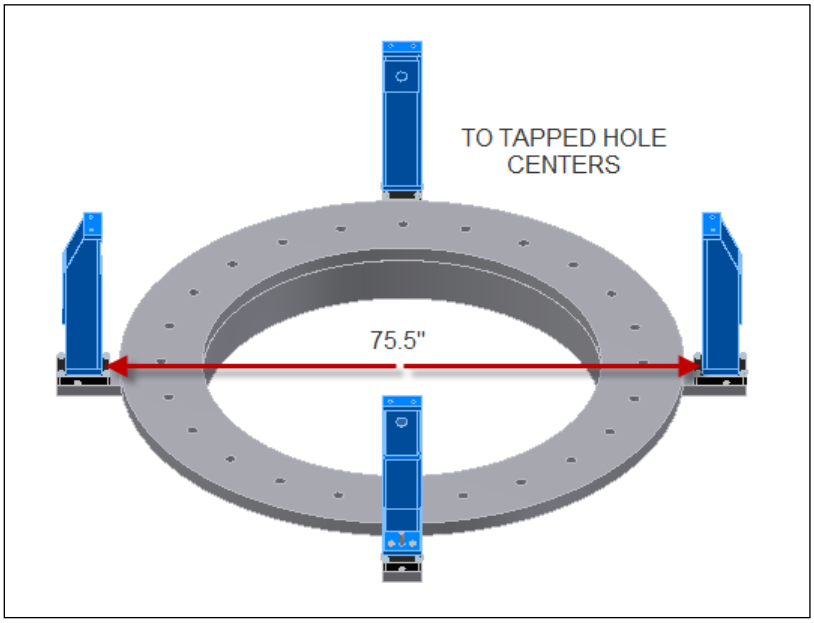


Figure 29. Fixture and vertical assembly

Refer to Figure 30 while doing the following:

1. Lift the assembly using the lifting eyes.
2. Carefully lower the machine in between the vertical supports.
3. Position the machine onto workpiece. Use the jack screw legs while positioning.
4. Adjust to approximate center and align the verticals radial to the machine using the leveling and centering fasteners and tighten.
5. Adjust the machine parallel to the workpiece. Measure from the tool head to the workpiece using a dial indicator.
6. 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. Make sure they are both moving in the appropriate direction evenly. Move to the leg that is 90º from the first leg.
7. Repeat this process until you have achieved the desired alignment.
8. After all machine legs have been tightened, verify alignment before you operate the machine. Check alignment periodically during machine operation.
9. Once you have achieved final alignment to the work piece, lock the assembly into place, using the lock nuts on the outside legs, M36 screws and washers.
10. Install M16 screws into the top of the arm at the vertical supports.
11. Check that all fasteners are tight.

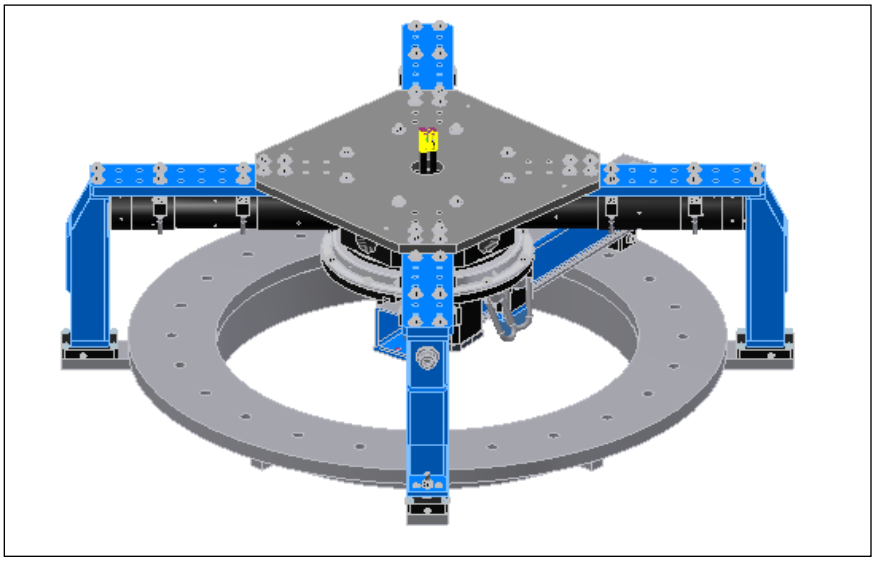
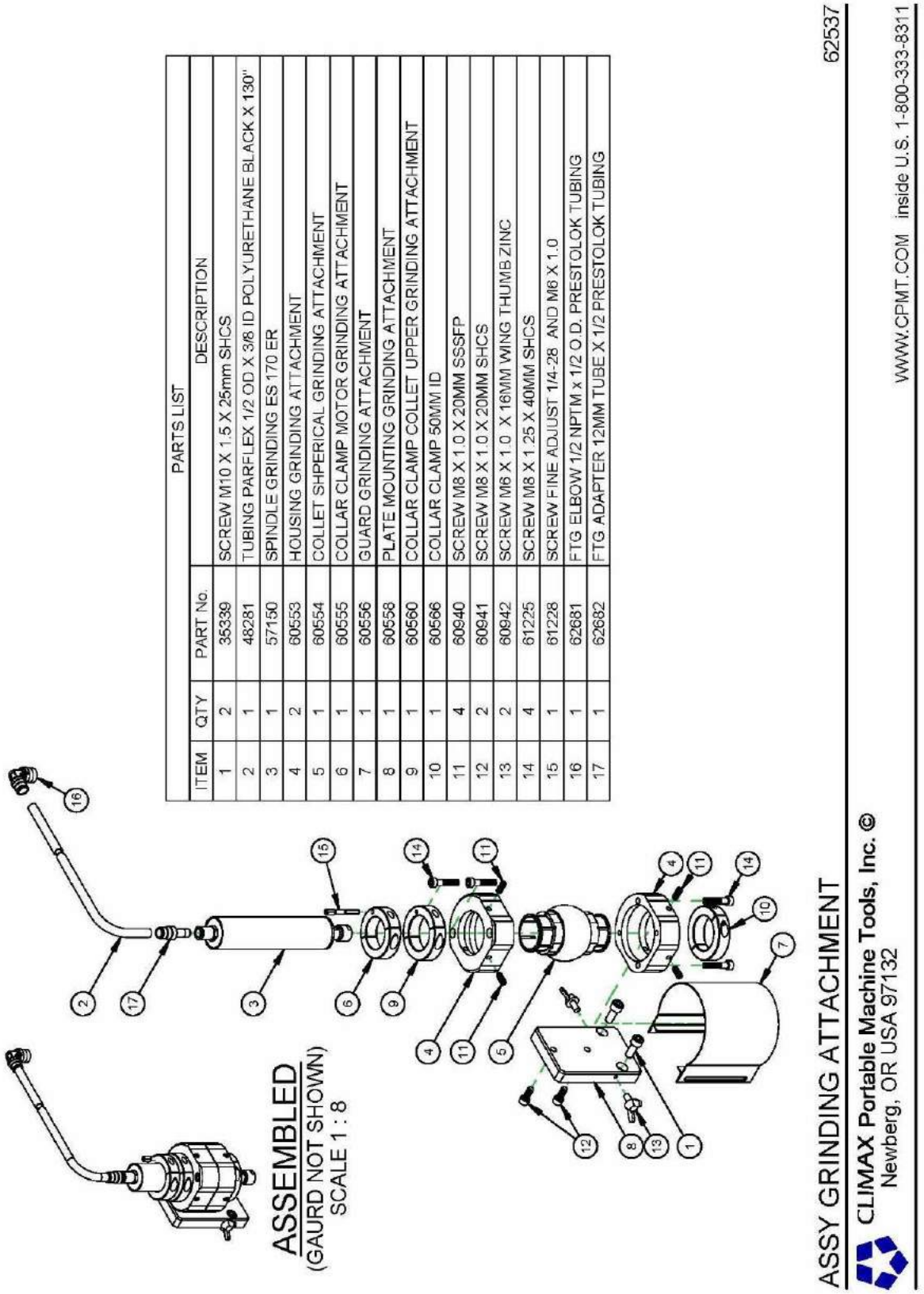


Figure 30. Fixture and vertical assembly

Grinding attachment (optional equipment)



PARTS LIST

ITEM	QTY	PART No.	DESCRIPTION
1	2	35339	SCREW M10 X 1.5 X 25mm SHCS
2	1	48281	TUBING PARFLEX 1/2 OD X 3/8 ID POLYURETHANE BLACK X 130"
3	1	57150	SPINDLE GRINDING ES 170 ER
4	2	60553	HOUSING GRINDING ATTACHMENT
5	1	60554	COLLET SHPERICAL 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	60586	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	4	61225	SCREW M8 X 1.25 X 40MM SHCS
15	1	61228	SCREW FINE ADJUST 1/4-28 AND M8 X 1.0
16	1	62681	FTG ELBOW 1/2 NPTM x 1/2 O.D. PRESTOLOK TUBING
17	1	62682	FTG ADAPTER 12MM TUBE X 1/2 PRESTOLOK TUBING

ASSEMBLED
(GAURD NOT SHOWN)
SCALE 1 : 8

ASSY GRINDING ATTACHMENT

62537

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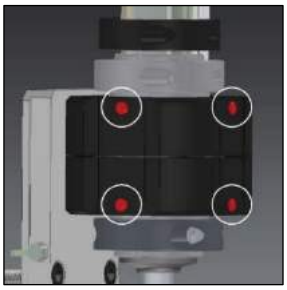
Grinding attachment setup

1. Set up the ID machine in the flange.
2. Install the grinding head to the arm.
3. Screws mount the grinder to the face of the tool head.
4. Attach hoses to the grinding attachment and rotary union. See the Airline Connection section.
5. Adjust leveling screws until you achieve the desired grinding angle.



Red dots indicate the adjustment points for leveling the grinder to the surface.

6. Use height-adjusting screw on the grinding head to adjust the height.
7. Make sure the guard is in place and all fasteners are tight.

Airline Connection

When using the grinding attachment, the port on the rotary union used for the pneumatic feed also supplies air to the grinder motor.

1. Detach the blue 1/4" tube from the large fitting by pressing inward on the green ring while pulling out the tubing.
2. Remove the fitting from the rotary union. Install the elbow fitting shown in the next photo.
3. Cap or plug the end of the blue tubing to prevent contamination from entering.

Operation

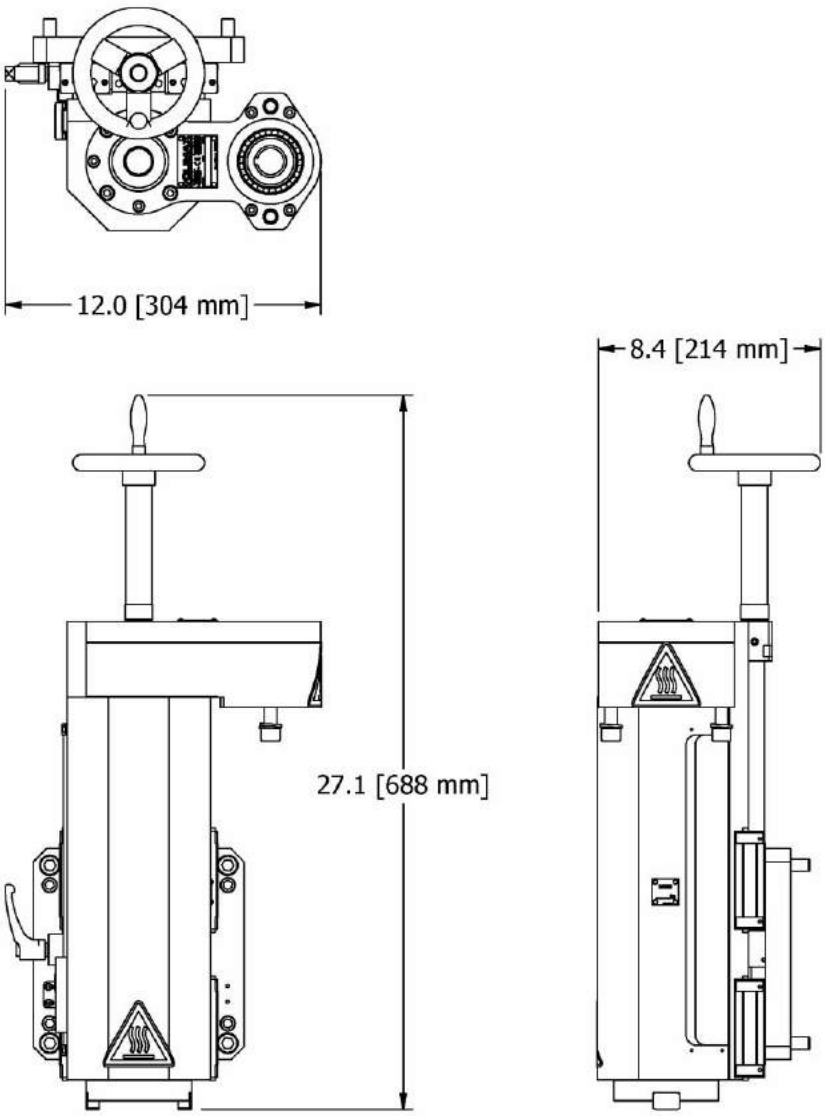
Grinding should be done after the flange has been cut flat with a single point tool or the milling head.

1. Turn on the grinding head and ramp to the desired operating speed.
2. Set the spindle to touch the surface and make a light grind.
3. Check the surface finish.
4. Make any necessary adjustments to the grinder settings.
5. When the finish is satisfactory, continue grinding the surface as required.

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

6. When the grinding operation is complete, lift the spindle and shut off the grinder.

Milling attachment (optional equipment)



MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER 72277

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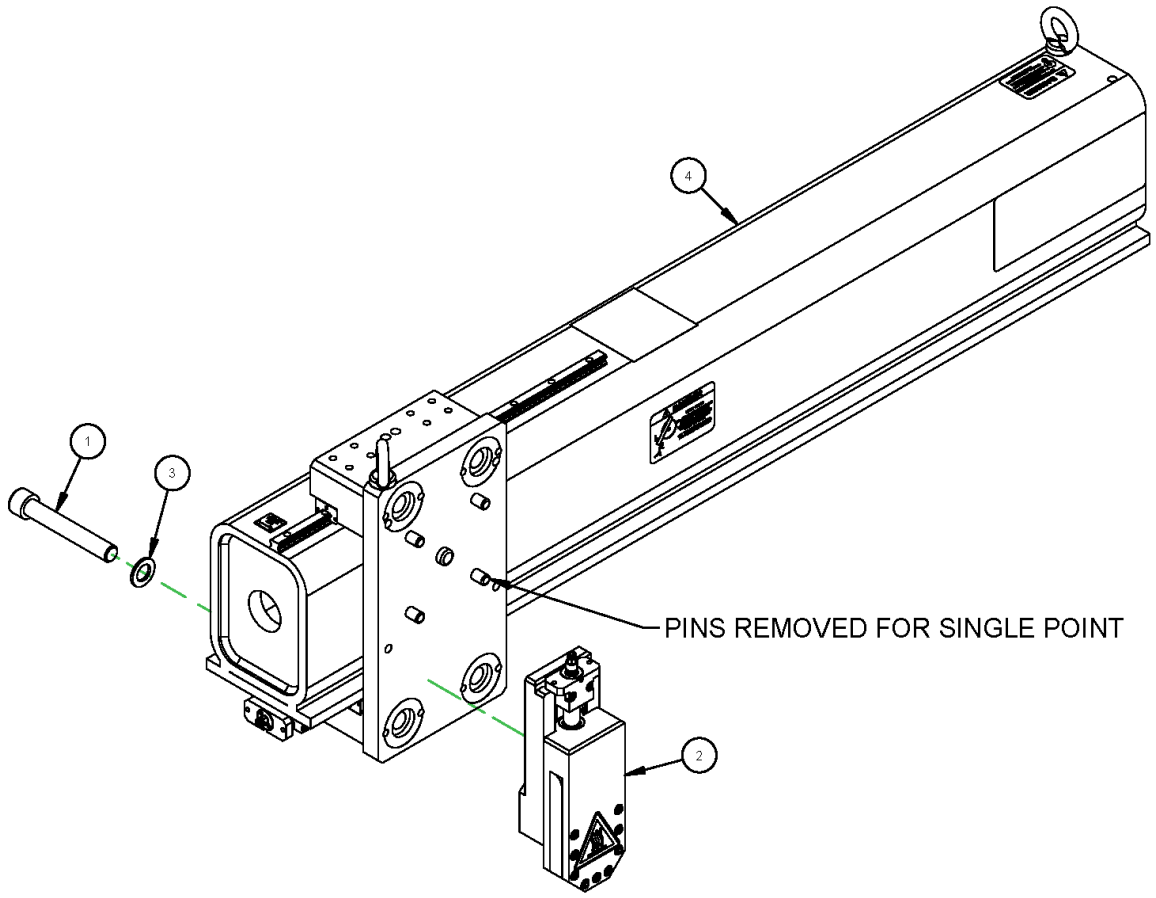
If you have the standard flange facer, you must replace that turning arm with the milling turning arm and counterweight (for vertical applications), arm assembly with the milling arm assembly, and standard drive with the milling drive.



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	57220	SCREW M20 X 1.5 X 130MM SHCS
2	1	57781	TOOL HEAD ASSY FF LINE
3	1	57888	WASHER FIXTURING 21MM ID X 35MM OD X 3MM CASE HARDENED
4	1	60869	ASSY ARM MILLING FF7200

ASSY ARM MILLING FF7200 W/ SINGLE POINT TOOL HEAD 62577

Quick setup

Milling attachment setup

1. Install the milling head assembly to the machine.
2. Install the machine into the workpiece (Hydraulic/Hydraulic machines must be operated using a dual pump 25hp HPU).
3. Attach all hoses.
4. Adjust the drag brake as necessary. 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.

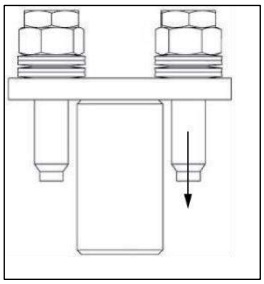


Figure 31. Drag brake

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

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. Two additional screws are on top of the plate to adjust 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 turning arm.

Do the following to adjust the milling head and spindle:

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.

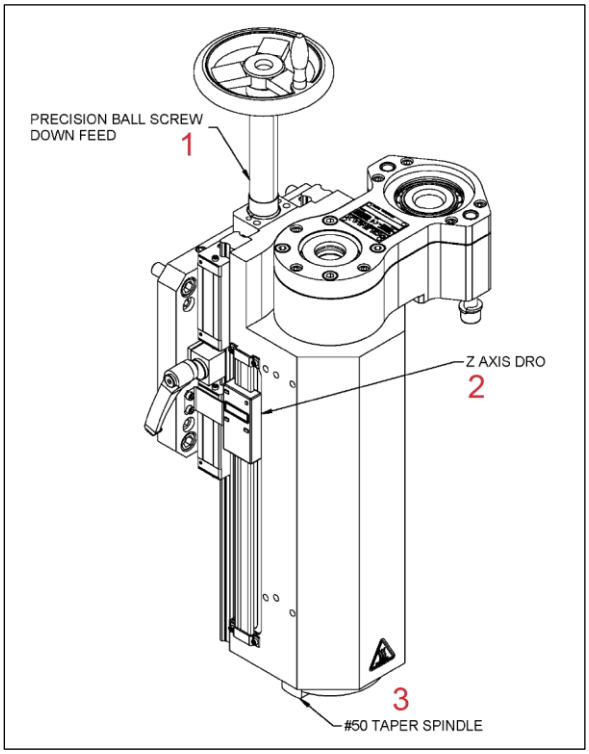


Figure 32. Milling head components (P/N 72277)

Table 8. Milling head figure identification

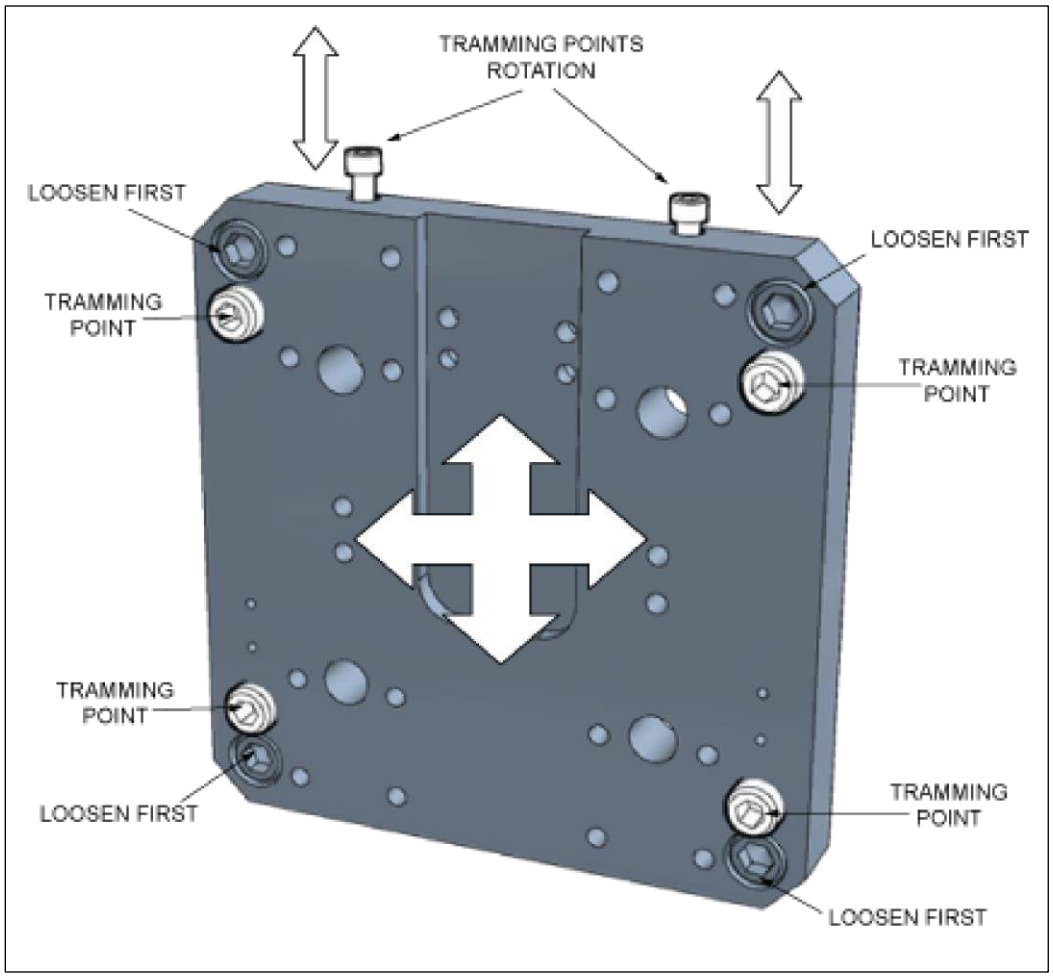
Number	Description
1	Precision ball screw down feed
2	Z axis DRO
3	#50 taper spindle

Do the following to tram the spindle to the table:

1. Install and secure an appropriate indicator into the mounting hole.
2. If the spindle drive motor is installed, remove it from the spindle gearbox to enable easy hand-rotation of the spindle.

	CAUTION
	Be careful not to remove the RDU drive motor when the machine is vertical as the hub could rotate rapidly.

3. Sweep the table with the indicator by rotating the spindle.
4. Tram the direction along the X-axis by adjusting the jacking screws on the housing. The mounting screws will have to be loosened slightly to make these adjustments.



5. Tram the direction along the Y-Axis by using the rotation adjustment screws.
6. Once both directions are adjusted, tighten the mounting screws. It is best to have the dial indicator still installed while performing the final tightening of the mounting screws to ensure that the housing does not move during tensioning of the mounting screws.
7. Reinstall the spindle drive motor (if necessary).

TIP

With the standard spindle, the angle is limited to ± 0.17 degrees. If a greater angle is needed, a swivel head adapter will be needed. For further information, contact CLIMAX.

Optional swivel head

P/N 63250 is an optional swivel head for use with the milling head.

Operating

Do the following:

1. Check that the tooling and milling head are set up correctly (see the “Tool setup” section on page 42).
2. Check that the milling cutter is securely mounted (see the “Milling head cutter” section on page 44).
3. Extend the spindle to touch the surface.
4. Take a skim cut to test the settings.
5. Check the finish.
6. Adjust as necessary.

Milling head cutter

Installing

Do the following to install the milling head cutter:

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

Machining

Do the following to machine with the milling head cutter:

1. Follow Section “Pre-start checks” on page 53.
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 workpiece, test the travel direction of all axes to ensure that the settings match the direction you want to machine.

	**CAUTION** **Be aware of all personnel near the machine when operating.**

7. Turn on the spindle and verify 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 it 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.

Adjusting the machine when the cut is complete

	**IMPORTANT** **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.**

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Operation

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

	WARNING
	To avoid serious personal injury, keep clear of moving machinery during operation.

Pre-start checks

	WARNING
	Rotating machinery can cause serious injuries. Turn off and lock out the machine before making the pre-start checks. When operating the machine, always be aware of the location of all people in the vicinity of the machine.

Before starting the machine, always check the following:

- All energy sources are off.
- Lines are properly connected.
- The machine is securely mounted to the workpiece and leveled or aligned to the job's requirements (see "Chuck mounting" section on page 23 and "Centering and leveling the machine" section on page 30).
- The machining arm and counterweight arm are secured to the turntable and correctly adjusted and secured. 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).

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

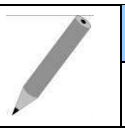
- The rigging has been removed from the machine. Do not remove the lifting eyes.
- All handles and tools are removed from the machine.
- Cables and hoses are secured away from the path of moving machine parts.

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

Lubricating the machine

Do the following to lubricate the machine:

1. 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 also keep the machine from oxidizing.
2. Add a small amount of grease to the drive gear and bearing after every 500 hours of use.



NOTE

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

Safe operating ranges

Table 9 shows the surface feet per minute (sfpm) for a given tool diameter and hydraulic motor size at 20 gallons per minute (gpm).

CAUTION

Do not pick a motor and tool combination that is less than 150 sfpm at 20 gpm. 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 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 9. Maximum SFPM capable from the hydraulic motor at 20 gpm

Optional hydraulic motor sizes								
Tooling Diameter	**6.2 cu-in**	**8.0 cu-in**	**9.6 cu-in**	**11.9 cu-in**	**14.9 cu-in**	**18.7 cu-in**	**24.0 cu-in**	**29.8 cu-in**
1”	194	151	125	101	81	64	50	40
2”	389	302	250	202	161	129	100	80
4”	777	603	500	403	323	258	200	160
5”	971	754	624	504	403	322	250	200
6”	1,166	905	749	605	484	386	300	240
8”	1,554	1,206	905	806	645	515	400	320
10”	1,943	1,508	1,206	1,008	806	644	500	401

The colors shown are defined in Table 10.

Table 10. Operating range color definitions

SFPM	Definition
<150	Do not operate
150-250	Safe to operate
250-500	Optimal operating range
>500	Safe to operate

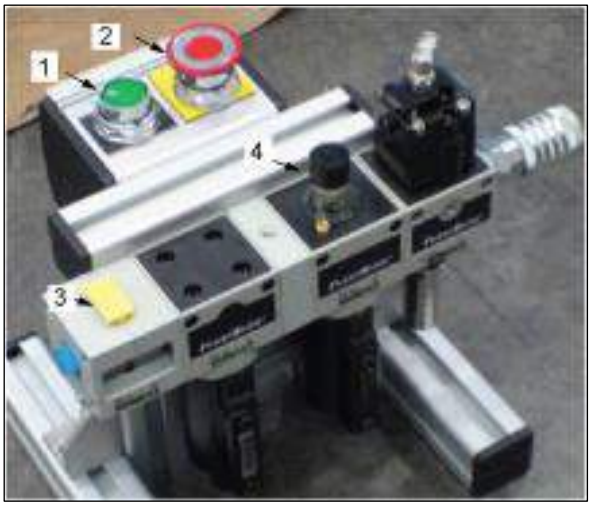
Pneumatic conditioning unit

	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.

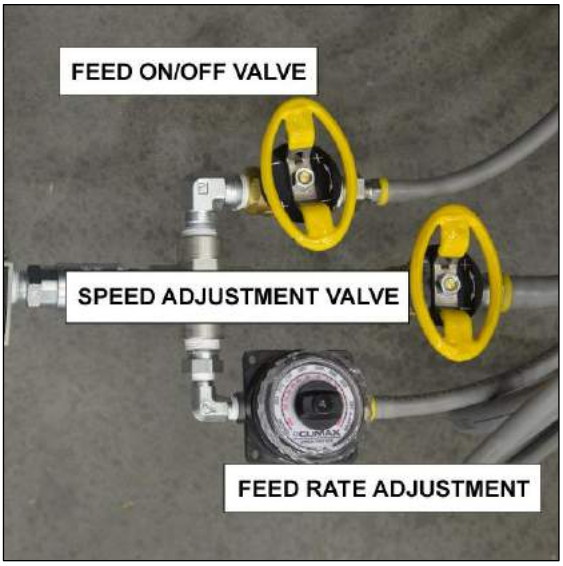
There are different pneumatic configurations depending on machine type.

Controls



The PCU controls include the following (see the figures to the right and the nest page):

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 the Maintenance section on page 60.



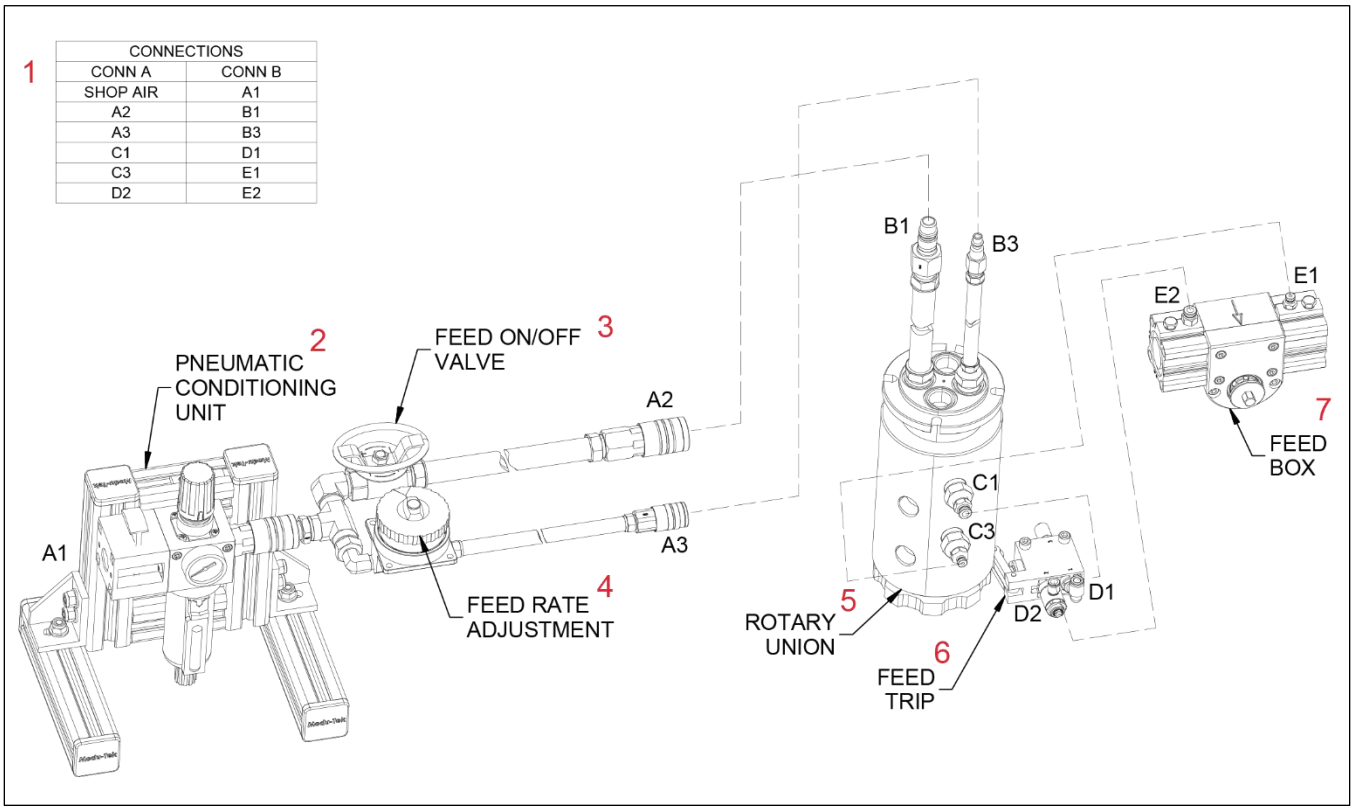


Figure 33. PCU components

Table 11. PCU components figure identification

Number	Description
1	Connections (Conn A [Shop Air] and Conn B)
2	Pneumatic conditioning unit
3	Feed on/off valve
4	Feed rate adjustment
5	Rotary union
6	Feed trip
7	Feed box

Machining

Do the following:

1. Connect the energy sources.
2. Push the START button on the PCU.
3. Use the speed adjustment valve to turn on the drive motor.
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.

Hydraulic power unit

Controls

The hydraulic power unit (HPU) controls include:

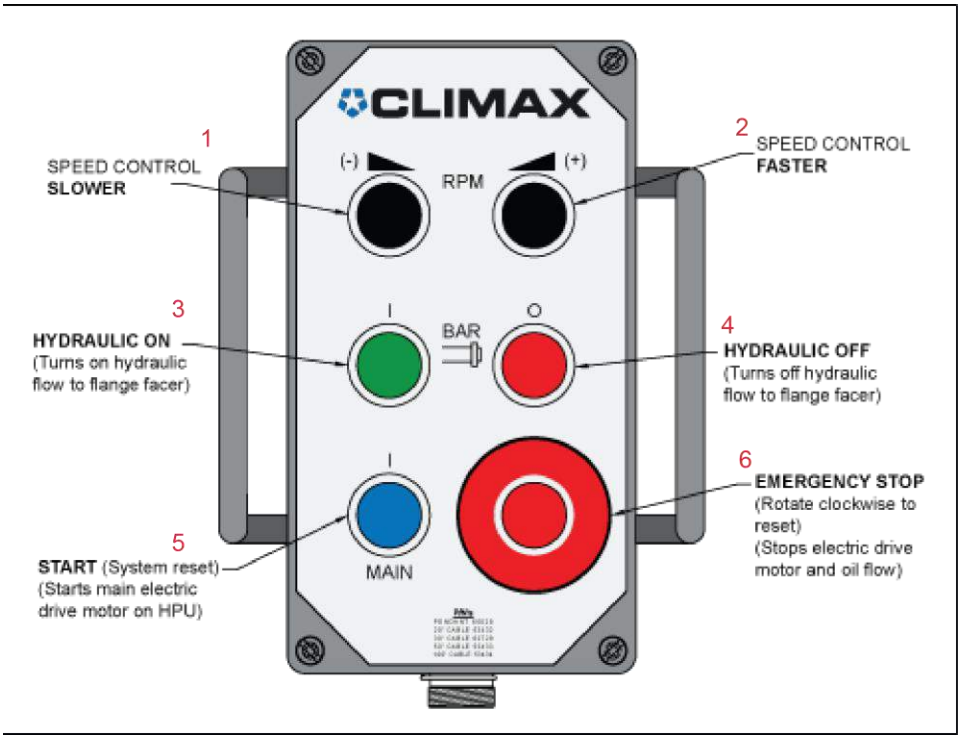


Table 12. HPU control figure identification

Number	Name	Description
1, 2	**Speed control buttons**	Control the machine's rate of rotation. Press to speed up or slow down machine rotation.
3, 4	**Hydraulic on and off buttons**	Control the hydraulic flow to the flange facer. Press to start or stop machine rotation.
5	**Start button**	Turns on the electric drive motor on the HPU. Press to start the HPU.
6	**Emergency stop button**	Press to stop the machine. Rotate clockwise to reset.

	**DANGER**
	To avoid serious injury to hands or arms, do not reach inside the swing of the turning 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.

To operate, do the following:

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.

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. Make sure 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.

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 work piece.

Maintenance

Recommended Lubricants

CAUTION

Avoid damage to the machine and protect your warranty by using only approved lubricants.

LUBRICANT	BRAND	WHERE USED
Light lubricant	LPS1™ or LPS2™	Unpainted surfaces
Cutting oil KOOLKUT ™	UNOCAL	Tool bits, work piece
Pneumatic lubricant	10W30 weight motor oil	Air motors
Way oil	10W30 weight motor oil	Square Ways – Acme Screws , Dovetail and Linear Rails
Gear Grease	CONOCO PolyTac EP 2	Gearboxes

Leadscrew Maintenance

During operation, clean ball screws and ACME leadscrews frequently to prevent thread damage to nut and leadscrew.

Lightly oil the lead screws periodically to ensure smooth travel.

NOTE

Do not grease the ball screws.

Milling Head Gearbox

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

Storage

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

Before storing, clean the machine with solvent to remove grease, metal chips, and moisture.

Prevent corrosion by spraying with LPS for short-term storage and Cosmoline for long-term storage.

Spare Parts

The following table lists items most frequently replaced due to wear, loss, or damage. Avoid downtime by maintaining a small inventory of these critical parts.

QTY	PN	DESCRIPTION
FF7200 ROTARY TABLE		
1	58128	CLAMP ARM ASSY SAFETY STOP
3	57815	CLAMP ARM LARGE FF7200
4	43001	HOIST SWIVEL RING M12
8	40697	SCREW M12 X 1.75 X 30MM
FF7200 ARM SYSTEM		
1	57898	TAIL SUPPORT LEADSCREW
1	57895	LEADSCREW RADIAL FEED FF
2	57886	PLUG RAIL THK SHS15 400MM
14	68500	CAP RAIL 15MM METAL THK SHS
1	57794	KNOB ASSY MODIFIED
1	58133	HANDLE ADJUSTABLE M6 X 1 X
9	42969	SCREW M10 X 1.5 X 12 SSSFP
4	41772	SCREW M16 X 2.0 X 95 SHCS
2	59626	BOLT EYE M12 X 1.75 X 20.5MM
FF7200 FEED SYSTEM		
1	58671	FEED BOX PNEUMATIC
120	50985	TUBING 1/4 OD X .040 WALL
120	59151	TUBING 1/8 OD X .023 WALL
1	59318	VALVE 2-POSITION 3-WAY
1	58519	SHAFT FEED REMOVABLE
2	58446	CYLINDER AIR 40MM DIA 10MM
1	57530	BRG NEEDLE 1 ID X 1-5/16 OD
2	25957	BRG ROLLER CLUTCH 1 ID X
2	25959	SEAL 1.000 ID X 1.312 OD X
2	59156	SCREW M6 X 1.0 X 60MM SHCS
FF7200 CHUCK SYSTEM		
4	59085	FINGER SETUP EXTENSION FF7200
2	45530	SCREW M8 X 1.25 X 30MM
4	57637	ASSY FOOT CHUCK
4	57899	ASSY FOOT NON LEVELING
8	57704	CAP END 4.5 DIA THREADED

QTY	PN	DESCRIPTION
8	57701	LEG CHUCK TUBE 4.5 OD X 2.5
8	57702	LEG CHUCK TUBE 4.5 OD X 5
8	57703	LEG CHUCK TUBE 4.5 OD X 10
FF7200 DRIVE SYSTEM		
4	42494	SCREW M8 X 1.25 X 25MM SHCS
1	59340	REGULATOR PRECISION 1-60
1	59635	AIR CONTROL ASSY FOR
1	60887	MOTOR AIR 3.5HP REVERSIBLE
2	35215	SCREW M12 X 1.75 X 40MM
2	11238	WASHER 1/2 LOCW
4	18215	SCREW M8 X 1.25 X 35MM
4	59329	PNEUMATIC CONDITIONING
1	67730	MOTOR HYD 11.9 CU IN 1-1/4 INCH KEYED SHAFT SAE O-RING 2000
1	69216	MOTOR HYD 14.9 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	69218	MOTOR HYD 24.0 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
2	59240	HOSE ASSY 451 1/2 X SAE-10M
2	59233	HOSE ASSY 451 1/2 X JIC-8

Specifications

Specifications

		US	Metric
Machine Performance Ranges			
ID:	Mounting range	30 - 72 inches	762.0 - 1828.8 mm
	Facing diameter range	30 - 72 inches	762.0 - 1828.8 mm
	Milling diameter range	35 - 72 inches	889.0 - 1828.8 mm
	Grinding diameter range	30 - 72 inches	762.0 - 1828.8 mm
	Swing diameter @ minimum with feedbox on end of arm	55.8 inches	1417.3 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 (± 0.25 inches (± 6.4 mm) is travel of leveling foot)	4.03 ± 0.25 inches	102.4 ± 6.4 mm
	Feed Rate	0.002 - 0.035 in/rev	0.051 - 0.889 mm/rev
OD:	Mounting range *	56.5 - 82.7 inches	1435.1 - 2100.6 mm
	Facing diameter range	30 - 72 inches	762.0 - 1828.8 mm
	Milling diameter range	35 - 66 inches	889.0 - 1676.4 mm
	Grinding diameter range (w/ feed box)	30 - 66 inches	762.0 - 1676.4 mm
	Grinding diameter range (w/o feed box)	30 - 71 inches	762.0 - 1803.4 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		5.143:1	
Single point turning speed range:			
	Pneumatic	12 - 31 RPM	
	Hydraulic (based on motor choice)	2.4 - 20 RPM	
Milling & grinding speed ranges (with reducer):			
	Pneumatic (rapid only, not in cut)	0.006 - 0.25 RPM (58 ipm @ 72 inch dia.)	(1473.2 mm/min @ 1828.8 mm dia.)
	Hydraulic (based on motor choice)	0.01 - 0.54 RPM	
Power input requirements			
	Pneumatic - 3.5 Hp (2.6 kW)	95 ft³/min @ 90 psi	2.69 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		1500 lb	680.4 kg
ID machine weight with mill, approximate		1650 lbs	748.4 kg
OD machine weight, approximate		2020 lb	916.3 kg
ID machine weight with mill, approximate		2170 lbs	984.3 kg
ID Crate dimensions (WxDxH)			
	Wood, approx.	80.5 x 37 x 32 in	2045 x 940 x 813 mm
	Metal, approx.	75.9 x 36.2 x 28.2 in	1928 x 920 x 716 mm
OD crate dimensions (WxDxH)			
	Wood, approx.	40 x 38.5 x 20 in	1016 x 978 x 508 mm
	Metal, approx.	38.7 x 36.8 x 28.2 in	983 x 935 x 716 mm

* OD mount minimum arm swing is 55.8 inches (1417.3 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 Climax 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 EMC, UV or other radiation hazards. The machine does not use lasers nor does it create hazardous materials such as gasses or dust.

Exploded Views and Parts

The following diagrams and parts lists are for your reference purposes only. The machine Limited Warranty is void if the machine has been tampered with by anyone who has not been authorized in writing by CLIMAX to perform service on the machine.

Tool Kit P/N 58185

P/N	DESCRIPTION	QTY	UOM
14818	WRENCH RATCHET 1/2 DRIVE	1	Piece
19700	CONTAINER SHIPPING FLAT ROOF 20 X 8.75 X 10.5	1	Piece
33999	WRENCH HEX SET .050 - 3/8 BONDHUS BALL END (KB)	1	Piece
34866	OIL AIRTOOL COMPLETE	1	Piece
35516	HAMMER DEAD BLOW 1-3/4 DIA HEAD (KB)	1	Piece
38678	WRENCH HEX SET 1.5 - 10MM BONDHUS BALL END (KB)	1	Piece
46249	WRENCH HEX BIT SOCKET 14MM X 1/2	1	Piece
46250	WRENCH HEX BIT SOCKET 10MM X 1/2	1	Piece
46252	WRENCH HEX BIT SOCKET 17MM X 1/2	1	Piece
48854	WRENCH RATCHET BOX 3/8 X 7/16	1	Piece
50985	TUBING 1/4 OD X .040 WALL DOT 1200 PSI NYLON BLUE	120	Inch
58353	WRENCH END 55mm X 9-1/2 LONG TIGHT ACCESS	2	Piece
58354	WRENCH EXTENSION 1/2 DRIVE X 5	1	Piece
58368	INDICATOR ELECTRONIC .500 TRAVEL 2-1/4 DIA FACE .0005" INC	1	Piece
59129	MANUAL INSTRUCTION MODEL FF7200	1	Piece
59151	TUBING 1/8 OD X .023 WALL DOT 1000 PSI NYLON BLUE	120	Inch
63678	KNOB MODIFIED 3 SPOKE REVOLVING HANDLE CAST IRON 3 OD	1	Piece
64370	HOLDER INDICATOR ARTICULATED ARM W/ MAG BASE 282MM REACH NOGA	1	Piece
65183	LUBRICANT ANTI SEIZE MOLY GRAPHITE EXTREME PRESSURE 10 OZ CAN	1	Piece
65188	WRENCH SPANNER 110MM TO 115MM (4-1/2) DIA .300 DIA PIN	2	Piece

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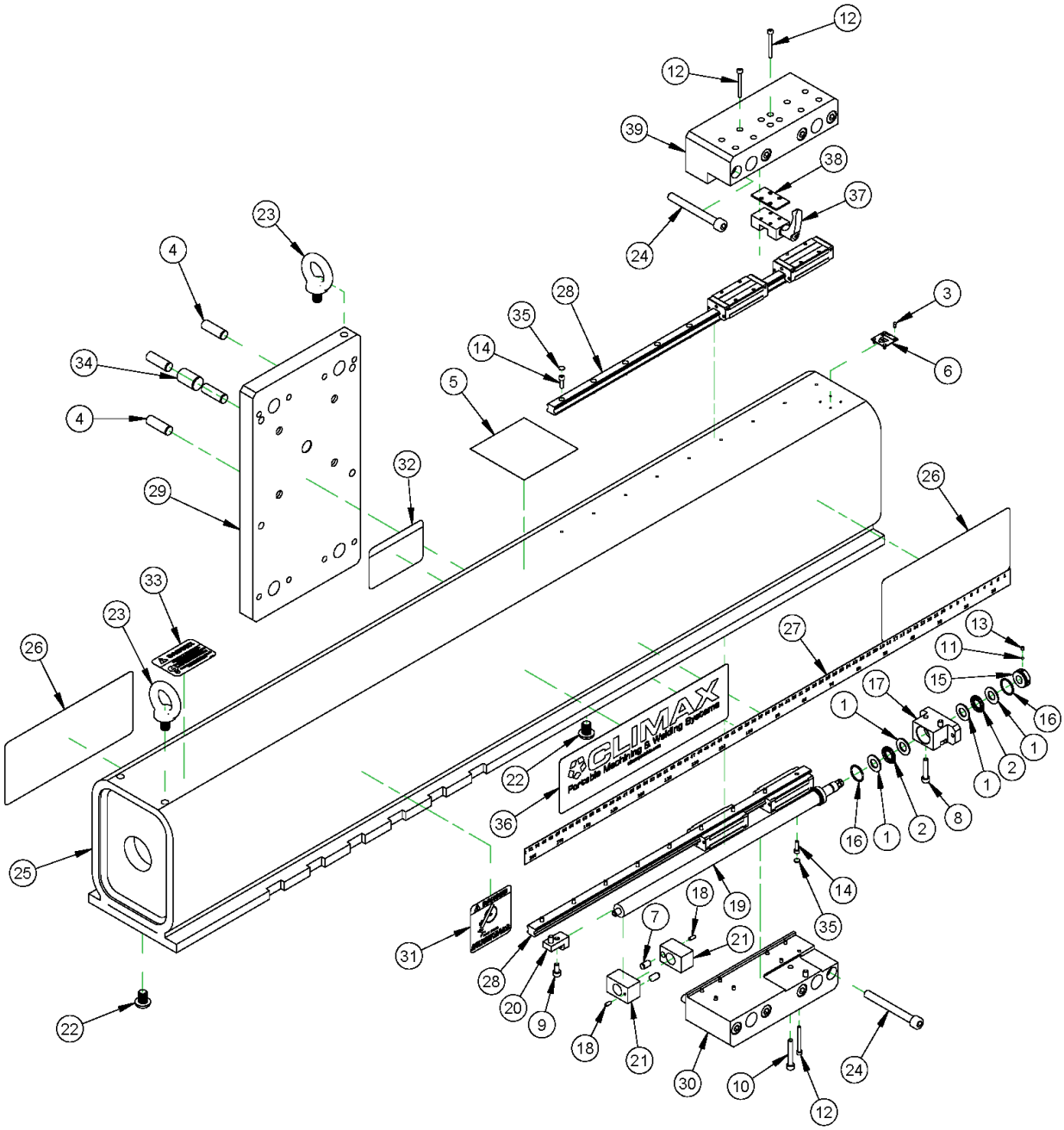


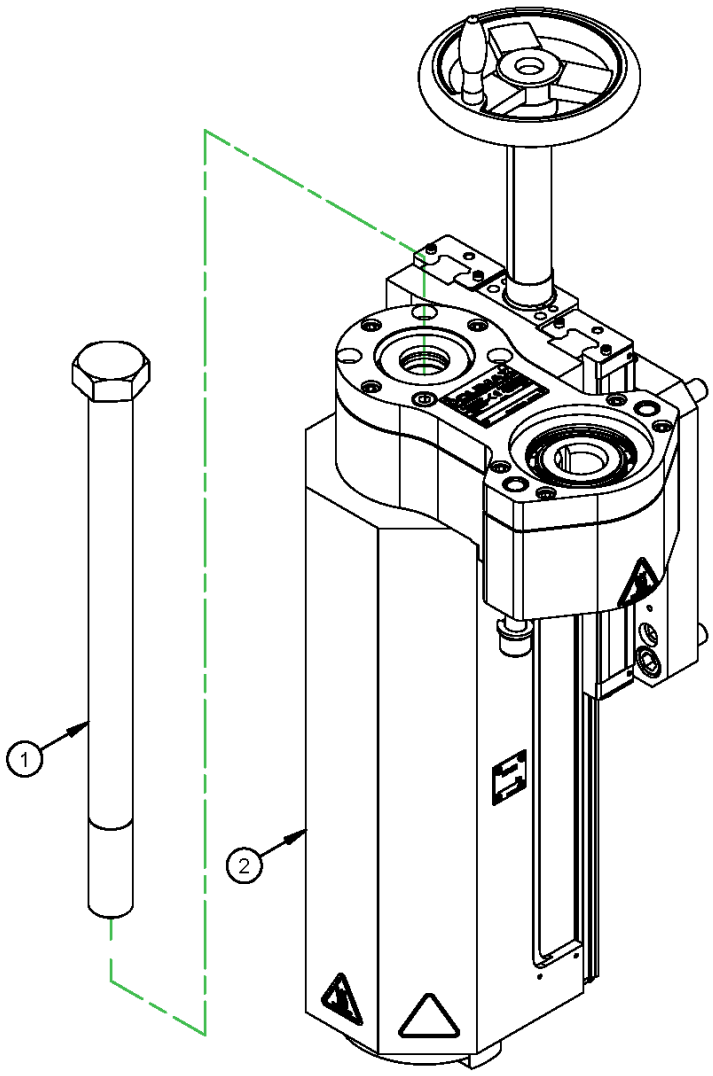
72697 - ASSY ARM MILLING FF7200 - REV A

FOR REFERENCE ONLY

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	4	11832	PIN DOWEL 1/2 DIA X 1-1/2
5	1	27462	LABEL WARNING STICKER SINGLE POINT MACHINES
6	1	29152	PLATE MASS CE
7	2	31592	PIN DOWEL 5/16 x 1/2
8	2	35505	SCREW M6 X 1.0 X 30 SHCS
9	2	36051	SCREW M6 x 1 x 12 SHCS
10	2	36125	SCREW M6 X 1.0 X 40mm SHCS
11	2	43489	BALL NYLON 1/8 DIA
12	20	45209	SCREW M4 X 0.7 X 40mm SHCS
13	2	53365	SCREW M4 X 0.7 X 4 mm SSSFP
14	18	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	57793	BEARING BLOCK LEADSCREW
18	2	57854	SCREW M4 X 0.7 X 10 mm SSSFPPL
19	1	57895	LEAD SCREW AXIAL FEED FF LINE
20	1	57898	TAIL SUPPORT LEADSCREW RADIAL FEED FF LINE
21	2	57915	ACME NUT LEADSCREW FF LINE
22	2	58107	SCREW M12 X 1.75 X 16 BHSC
23	2	59626	BOLT EYE M12 X 1.75 X 20.5MM LG
24	8	60031	SCREW M10 X 1.5 X 90MM SHCS
25	1	60817	TOOL ARM FF7200 MILLING
26	2	61457	LABEL WARNING OD MOUNT FEDERAL SAFETY YELLOW
27	1	61541	RULE ADHESIVE BACKED 1 X 50 R-L HALF SCALE INCH AND MM GRAD
28	2	62454	SLIDE RAIL THK SHS15 520MM LG PRELOADED METAL SCRAPERS 2 BLOCKS
29	1	62562	PLATE MOUNTING MILL FF7200
30	1	62563	BLOCK RAIL LOWER FF7200 FF8200
31	1	62883	LABEL FLANGE FACERS CRUSH HAZARD
32	1	62884	LABEL FLANGE FACERS IMPACT HAZARD
33	1	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3
34	1	63557	PIN DOWEL 3/4 DIA X 1-1/4
35	18	68500	CAP RAIL 15MM METAL THK SHS
36	1	70228	LABEL CLIMAX LOGO 3.5 X 12.5
37	1	72636	ZIMMER BRAKE 15MM RAIL
38	1	72637	ZIMMER ADAPTER 15MM RAIL
39	1	72692	BLOCK RAIL UPPER

72697 - ASSY ARM MILLING FF7200 - REV A

FOR REFERENCE ONLY

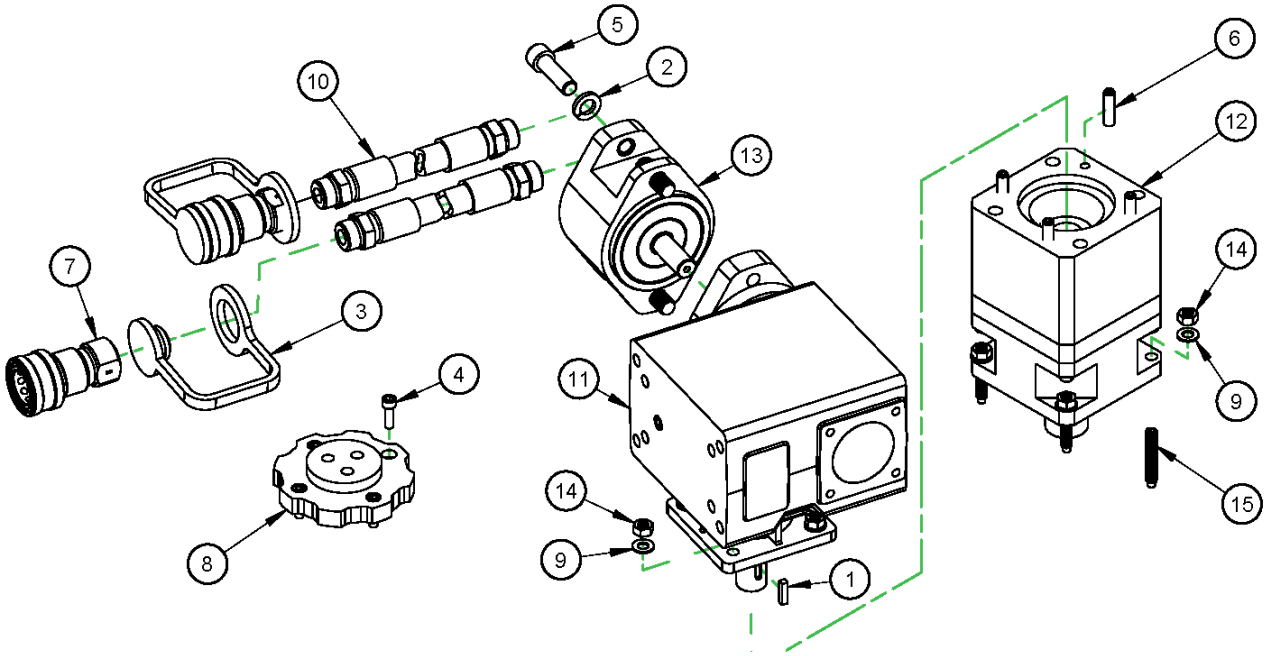


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	62330	DRAWBOLT 1"-8 X 14.5 (INCH NMTB)
		62331	DRAWBOLT M24X3 X 14.5 (METRIC NMTB)
		62845	DRAWBOLT 1"-8 X 15.5 (INCH V-FLANGE)
		62846	DRAWBOLT M24X3 X 15.5 (METRIC V-FLANGE)
2	1	72277	MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER

COMPLETE ASSY (MILLING HEAD W/DRAWBOLT)	
P/N	CONFIGURATION
62282	MILLING HEAD 8 STROKE #50 TAPER INCH NMTB
62734	MILLING HEAD 8 STROKE #50 TAPER INCH V-FLANGE
62644	MILLING HEAD 8 STROKE #50 TAPER METRIC NMTB
62735	MILLING HEAD 8 STROKE #50 TAPER METRIC V-FLANGE

73354 - CHART ASSY MILLING HEAD 8 STROKE #50 TAPER - REV A

FOR REFERENCE ONLY

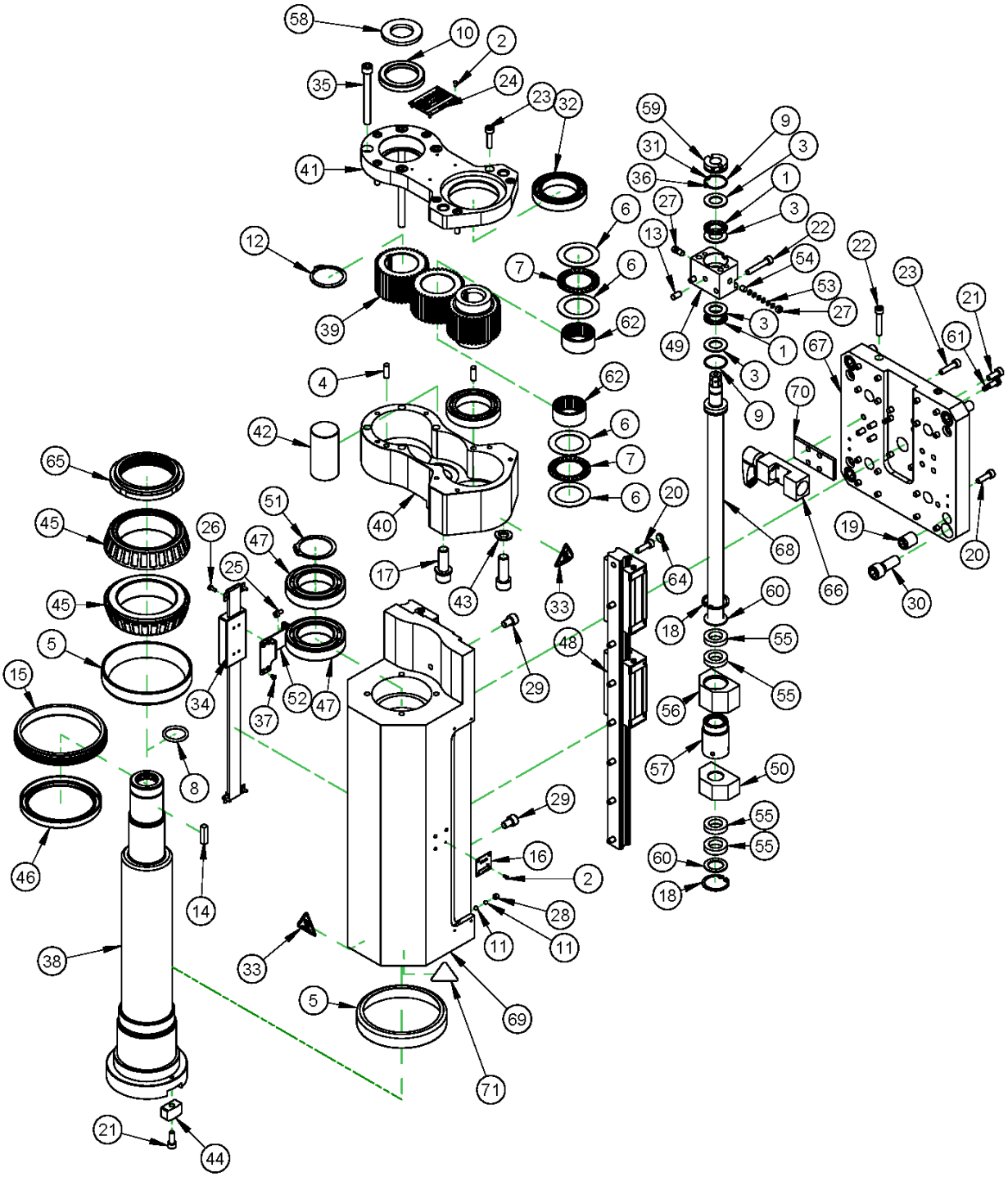


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10217	KEY 3/16 SQ X .75 SQ BOTH ENDS
2	2	11238	WASHER LOCK 1/2
3	2	27977	FTG DUST PLUG 1/2 QD COUPLER
4	4	35009	SCREW M6 X 1.0 X 20 SHCS
5	2	35215	SCREW M12 X 1.75 X 40mm SHCS
6	4	36240	SCREW M8-1.25 X 30mm SSSFP
7	2	40615	FTG QUICK COUPLER FEMALE 60 SERIES 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

CLIMAX
Portable Machining & Welding Systems

DESCRIPTION:
KIT CONVERSION DRIVE HYD LESS MOTOR FOR MILL FF72 82

DWG NO.
64336



72277 - MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER - REV B

FOR REFERENCE ONLY

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

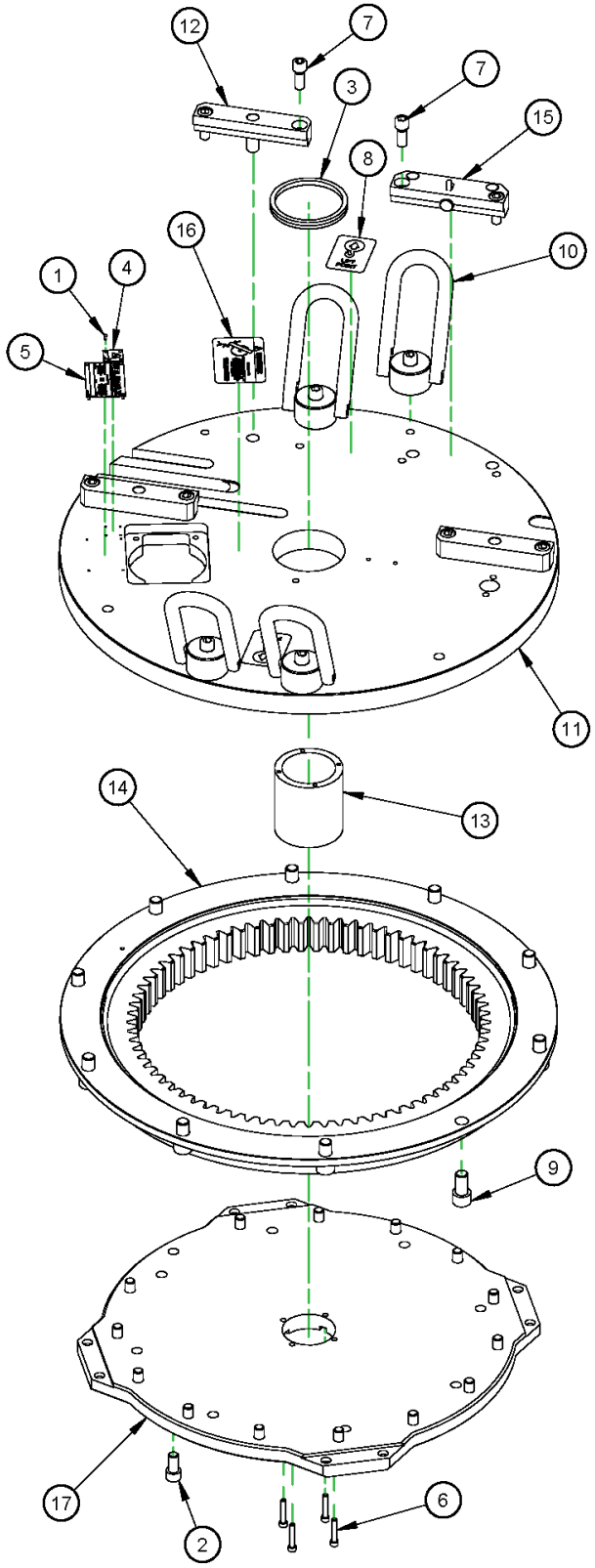
72277 - MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER - REV B

FOR REFERENCE ONLY

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
71	1	80510	LABEL WARNING CUTTING OF FINGERS/ROTATING BLADE

72277 - MILLING HEAD 2-29/32 BRG 8 STROKE #50 TAPER - REV B

FOR REFERENCE ONLY



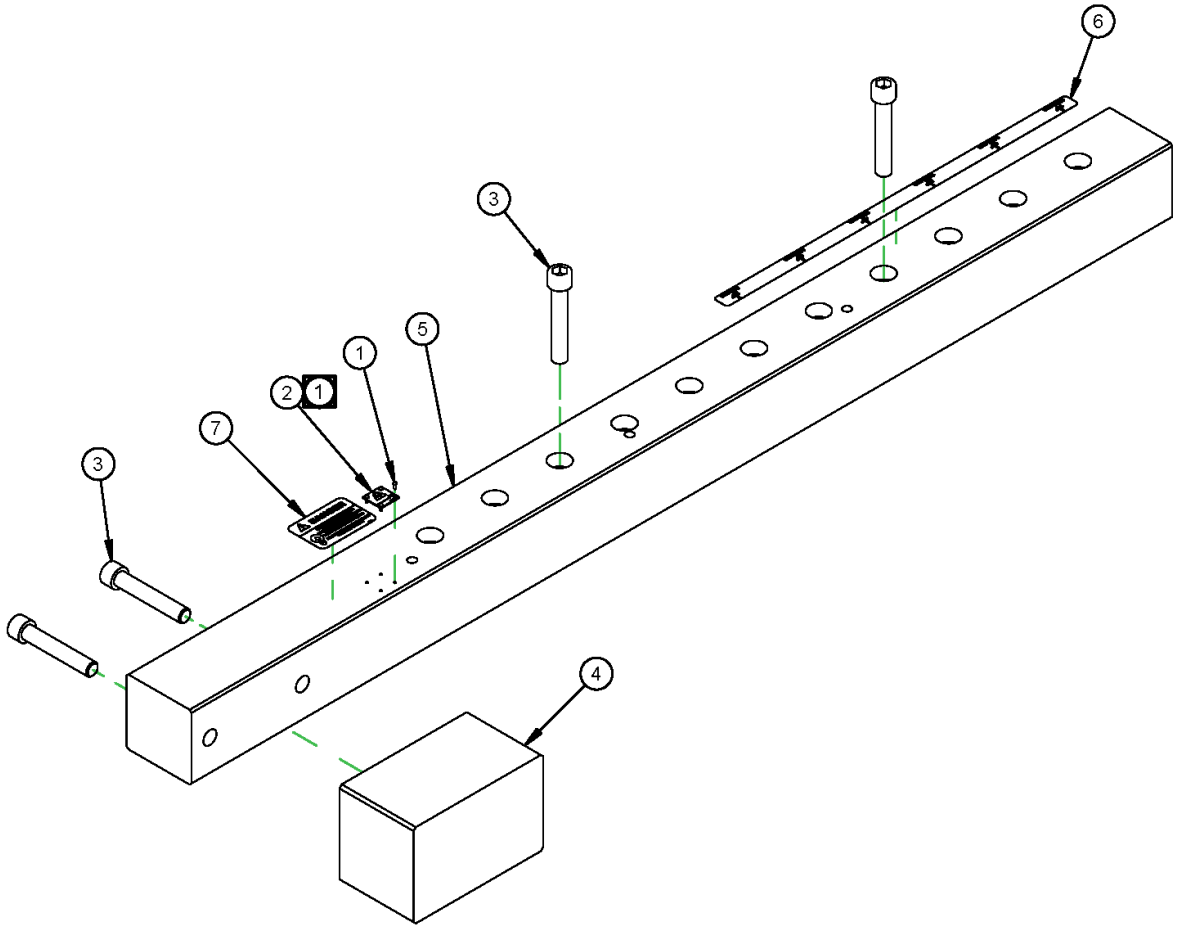
58060 - ASSY TABLE ROTARY FF7200 - REV B

FOR REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	8	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	15	15307	SCREW 1/2-13 X 1 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	10	41738	SCREW M16 X 2.0 X 30MM SHCS
10	4	43001	HOIST SWIVEL RING M12 X 1.75 1050 KG
11	1	57786	TOP PLATE FF7200
12	3	57815	CLAMP ARM PINNED
13	1	58050	SHAFT CENTER FF7200 AND FF8200
14	1	58053	ASSY BRG AND RING GEAR 25.5 OD
15	1	58128	CLAMP SAFETY STOP ASSY
16	1	62884	LABEL FLANGE FACERS IMPACT HAZARD
17	1	79544	PLATE BOTTOM SURFACE MOUNT FF7200

58060 - ASSY TABLE ROTARY FF7200 - REV B

FOR REFERENCE ONLY

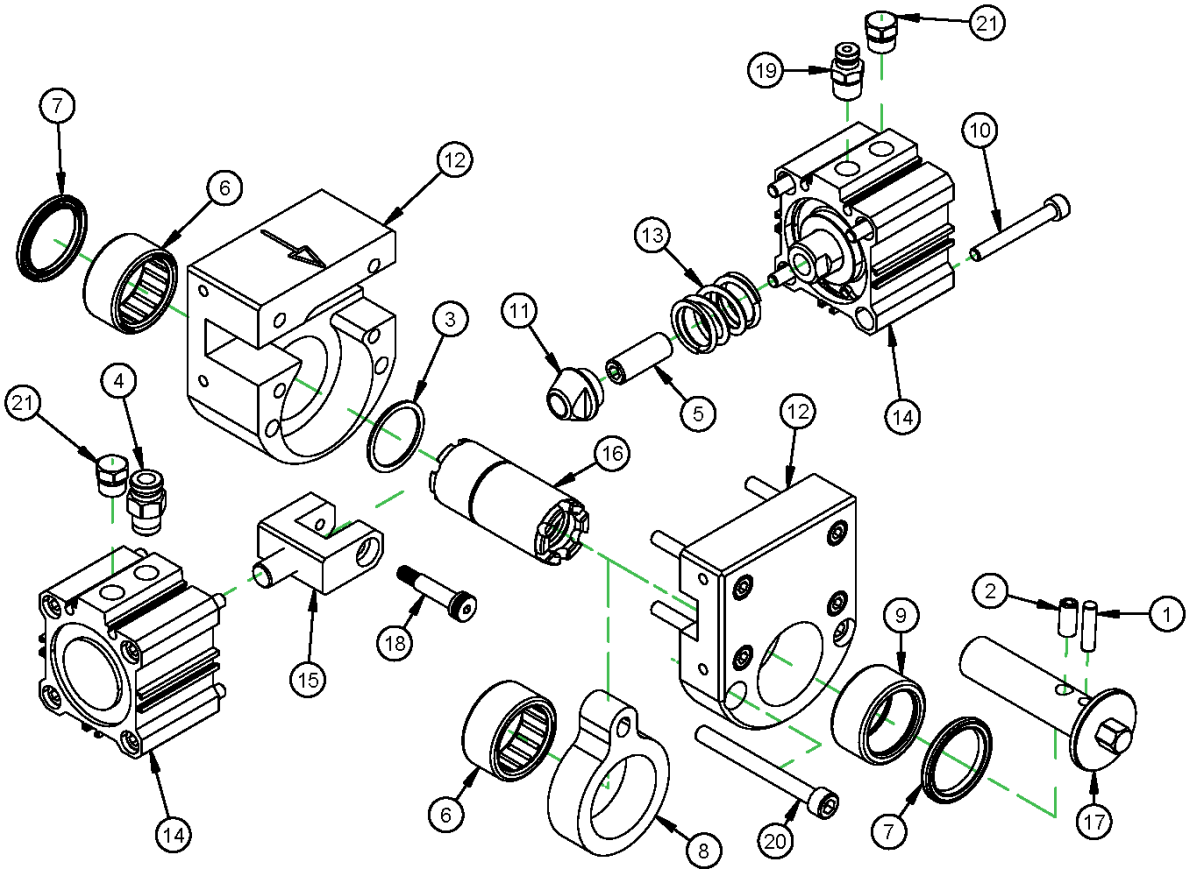


NOTES:

1. MASS = 96kg (210lbs)

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	41772	SCREW M16 X 2.0 X 90MM SHCS
4	1	58056	COUNTERWEIGHT
5	1	58062	ARM COUNTERWEIGHT FF7200
6	1	61539	LABEL COUNTERWEIGHT ARM FF7200
7	1	62888	LABEL DANGER PART LIFT POINT ONLY 2 X 3

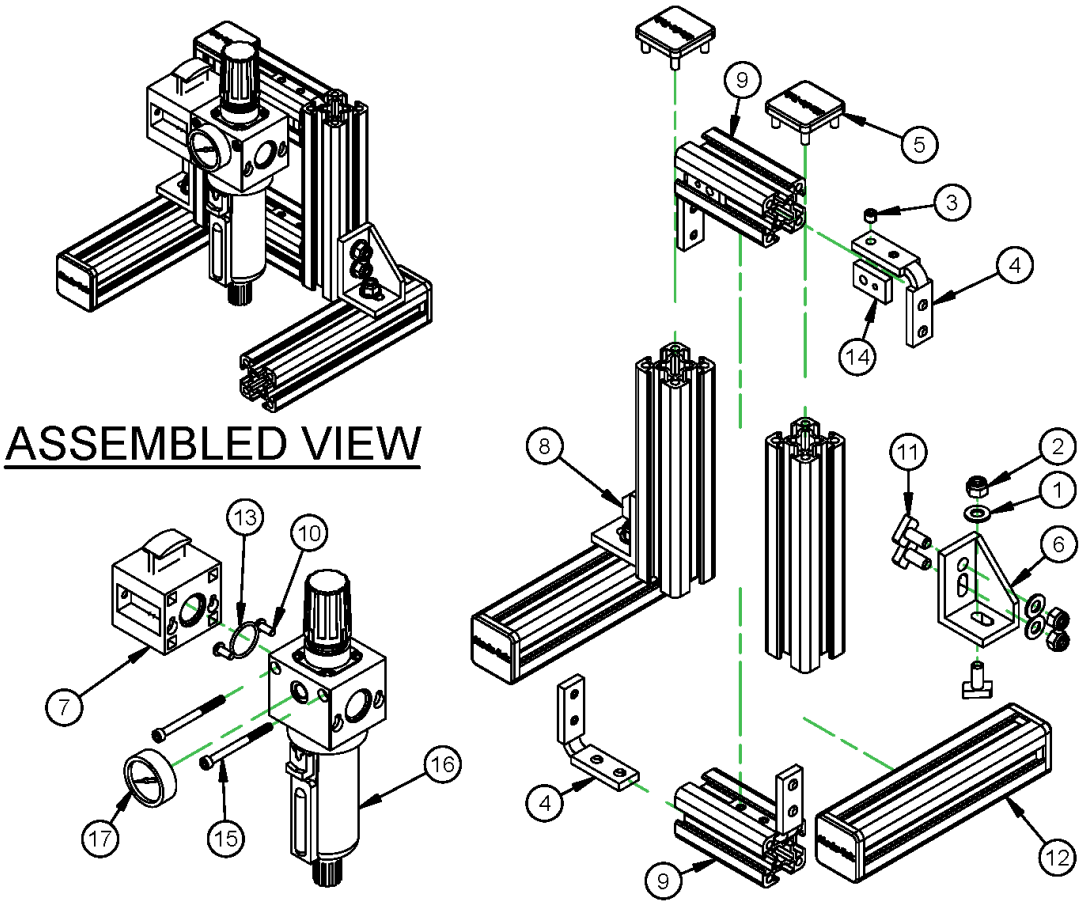
ASSY COUNTERWEIGHT FF7200 58063



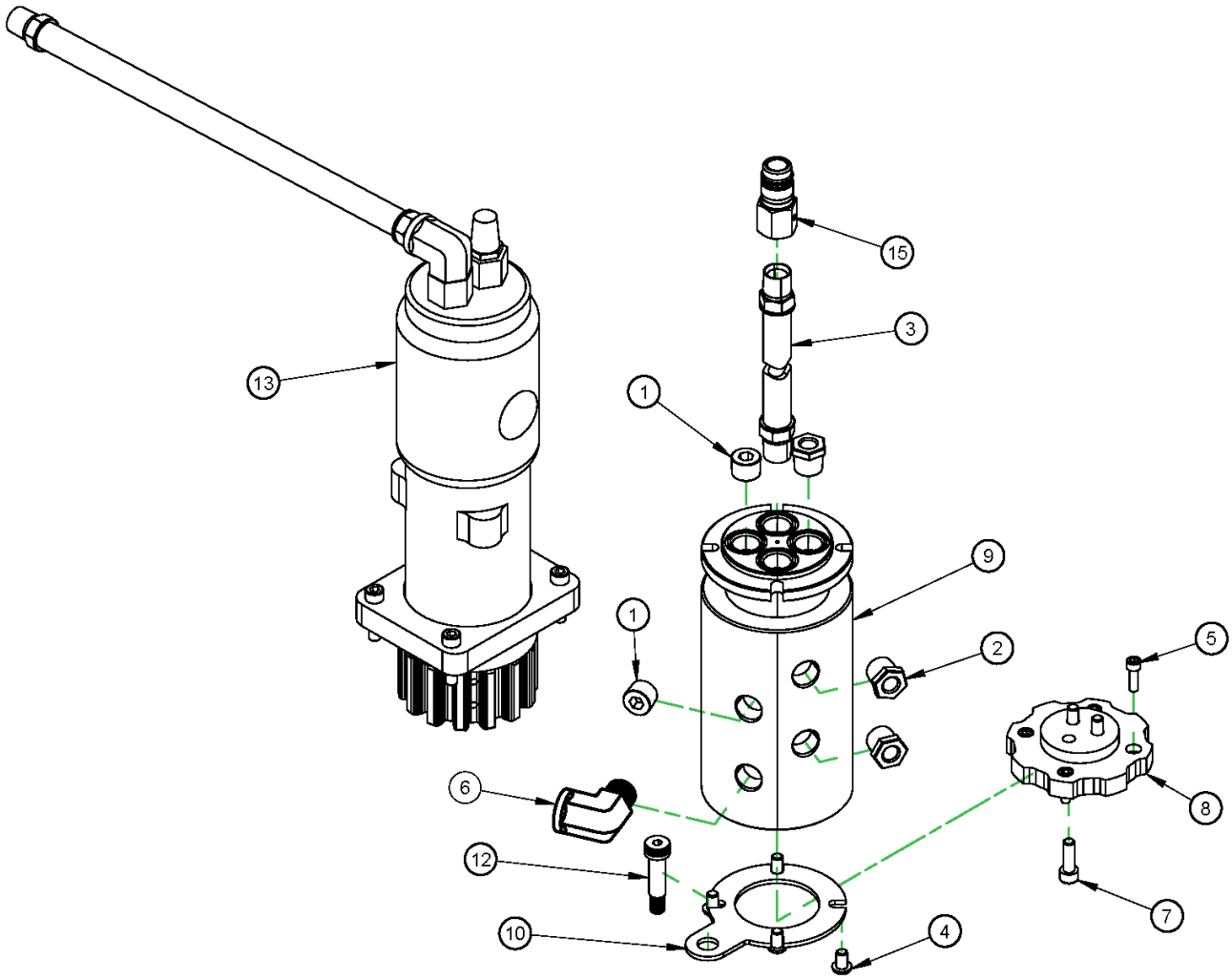
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	11763	PIN DOWEL 3/16 x 3/4
2	1	13061	DETENT PLUNGER BALL 1/4-20 X .531
3	1	14241	RING SNAP 1 OD SPIRAL HEAVY DUTY
4	1	18439	FTG ADAPTER 1/8 NPTM X 1/4 TUBE F PRESTOLOCK NICKEL PLATED
5	1	19630	SCREW 3/8-24 X 1 SSSFP
6	2	25957	BRG ROLLER CLUTCH 1 X 1.312 X .625
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

58671 - FEED BOX PNEUMATIC REMOTE FEED ADJUST - REV A

FOR REFERENCE ONLY



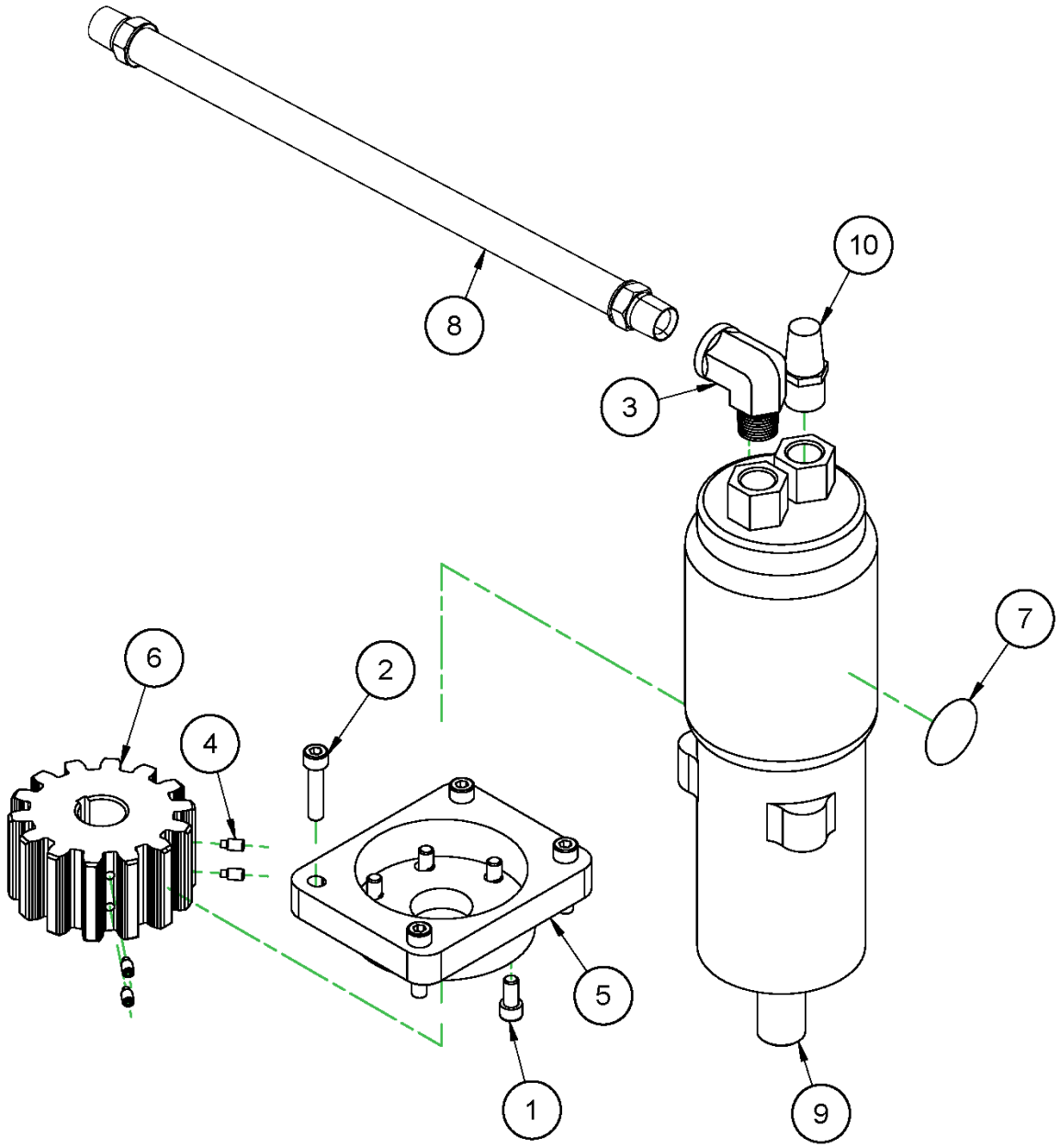
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	6	13489	WASHER 5/16 FLTW SAE
2	6	19729	NUT 5/16-18 NYLON INSERT LOCKNUT
3	16	27895	SCREW 5/16-18 X 5/16 SSSFP
4	4	46761	BRACKET 90DEG JOINER MODU-TEK
5	6	46764	ENDCAP 1 X 1 FOR 1.63SQ MODU-TEK EXTRUSION
6	1	46765	BRACKET 1X2 SLOT HALF WEB LEFT MODU-TEK
7	1	46777	VALVE SHUT OFF VS22 SERIES
8	1	46783	BRACKET 1X2 SLOT HALF WEB RIGHT MODU-TEK
9	2	46802	1.63 X 1.63 X 3.375L MODU-TEK EXTRUSION
10	2	53617	SCREW M5 X 0.8 X 12MM BHCS BLACK FINISH
11	6	59436	SCREW 5/16-18 X 3/4 T-BOLT
12	4	59437	1.63 X 1.63 X 7.00L MODU-TEK EXTRUSION
13	1	59442	RING O 2mm X 23mm ID X 25mm OD
14	2	59705	NUT PLATE M5 X .08 AND 5/16-32 .75 X 1.25 X .25
15	2	59754	SCREW M5 X 0.8 X 40MM SHCS
16	1	78054	FILTER/REGULATOR PARTICULATE 1/2NPTF METAL BOWL GLASS
17	1	83486	PRESSURE GAUGE, 0-160 PSI, 1/8 NPT CENTER BACK MOUNT



PARTS LIST			
ITEM	QTY	P/N:	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	1	35692	FTG ELBOW 1/2 NPTM X 1/2 NPTF ST 90 DEG BRASS
7	3	42494	SCREW M8 X 1.25 X 25mm SHCS
8	1	58039	CAM FEED
9	1	58751	UNION ROTARY HYDRAULIC 4 CHANNEL 1/2 NPTF PORTS MOD
10	1	58902	PLATE TORQUE ROTARY UNION
11	1	59244	(NOT SHOWN) PLUMBING PNEUMATIC FEED ASSY
12	1	59328	SCREW 12MM DIA X 35MM X M10 X 1.5 SHLDCS
13	1	59632	ASSY DRIVE PNEUMATIC FF7200 AND FF8200
14	1	59636	(NOT SHOWN) AIR CONTROL ASSY FOR PNEUMATIC FEED AND 1" DRIVE SUPPLY
15	1	59692	FTG QUICK COUPLER 3/4B 1/2 NPTF MALE AIR

58186 - ASSY DRIVE AIR MOTOR W/ HOSES AND FEED CONTROL FF7200 AND FF8200 - REV B

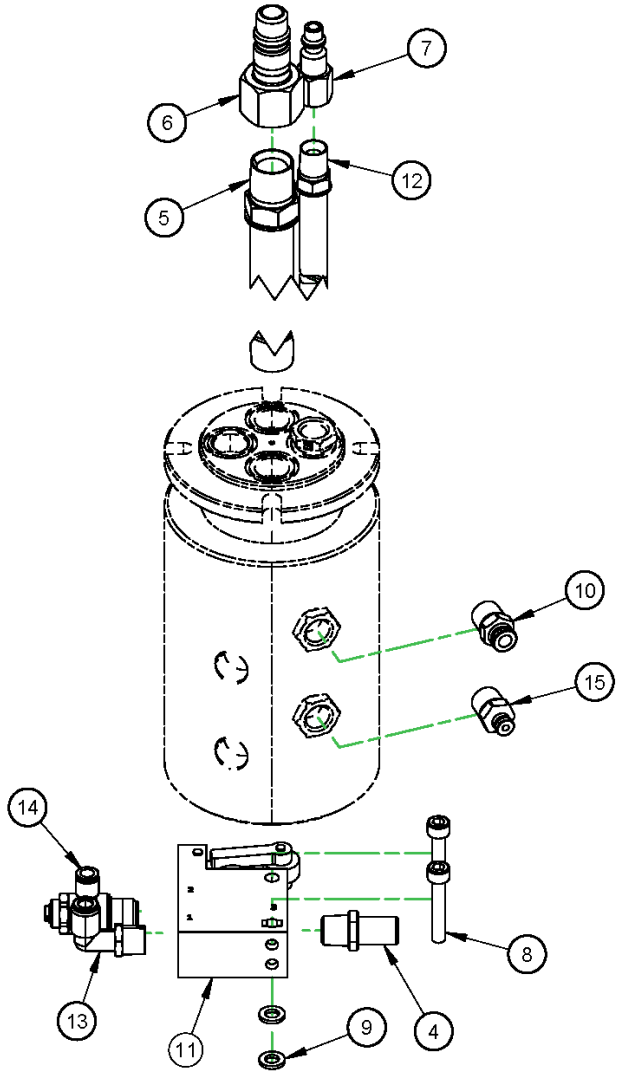
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	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

59632 - ASSY DRIVE PNEUMATIC FF7200 AND FF8200 - REV A

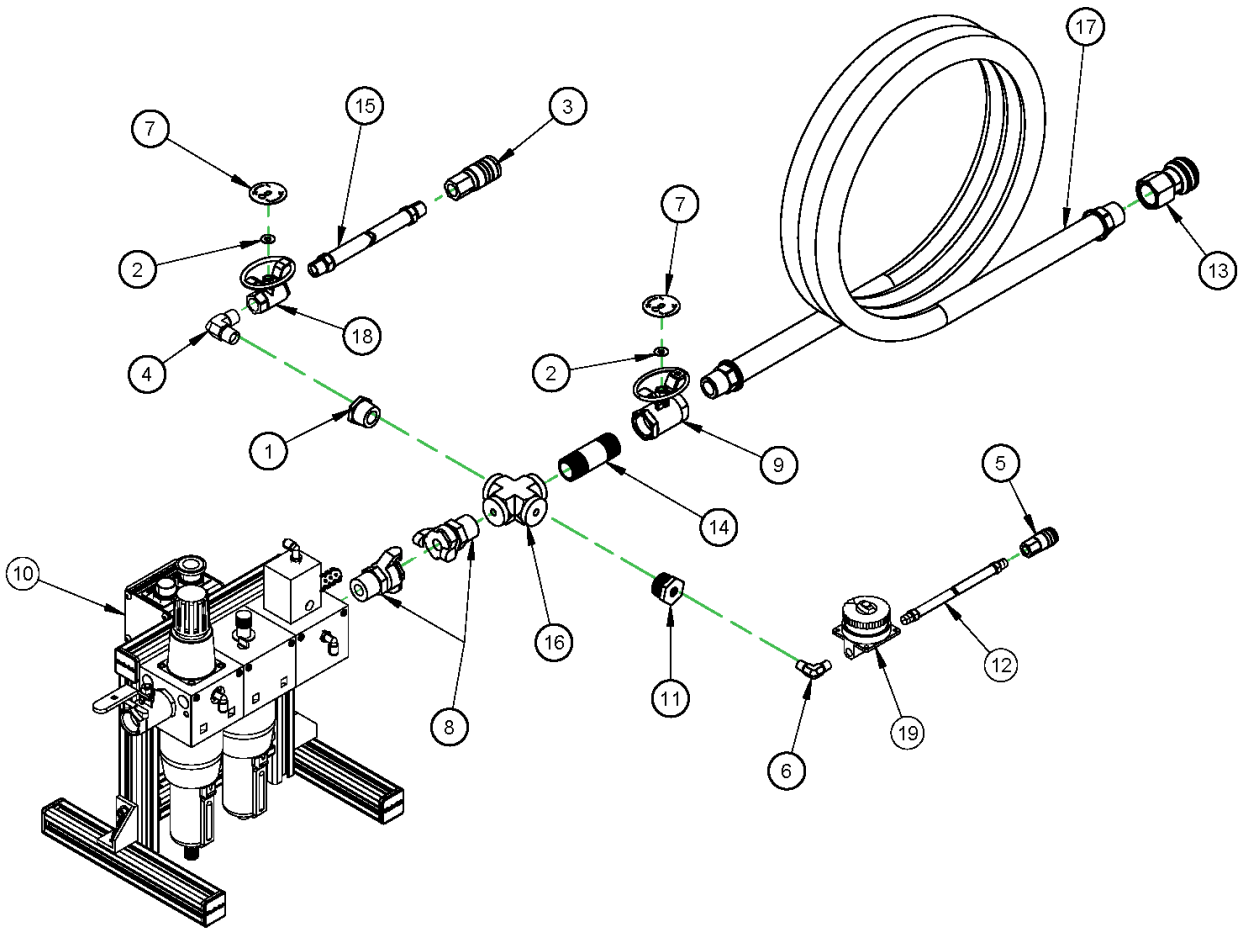
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	180	50985	(NOT SHOWN) TUBING 1/4 OD X .040 WALL DOT 1200 PSI NYLON BLUE
2	180	59151	(NOT SHOWN) TUBING 1/8 OD X .023 WALL DOT 1000 PSI NYLON BLUE
3	1	59244	(NOT SHOWN) PLUMBING PNEUMATIC FEED ASSY
4	1	13641	FTG MUFFLER 1/4 NPTM
5	1	15625	HOSE ASSY 801 1/2 X 1/2 NPTMS ENDS X 12
6	1	24851	FTG QUICK COUPLER 1/2B 1/2 NPTF MALE AIR
7	1	28493	QUICK COUPLER 1/4B MALE 1/4 NPTF
8	2	35504	SCREW M6 X 1.0 X 35mm SHCS
9	2	35891	WASHER M6 FLTW DIN 12.5
10	1	51263	FTG ADAPTER 1/4 NPTM X 1/4 TUBE F PRESTOLOCK NICKEL PLATED
11	1	59318	VALVE 2-POSITION 3-WAY NORMALLY OPEN
12	1	59341	HOSE ASSY 801 1/4 X 1/4 NPTM ENDS X 12
13	1	59342	FTG ELBOW 1/4 NPTMS X 1/4 TUBE F PRESTOLOCK NICKEL PLATED
14	1	60669	VALVE 1/4 NPTM X 1/4 TUBE F PRESTOLOCK FLOW CONTROL RIGHT ANGLE METERED AT 5 SCFM
15	1	63083	FTG ADAPTER 1/8 TUBE F PRESTOLOCK X 1/4 NPTM STRAIGHT

59244 - PLUMBING PNEUMATIC FEED ASSY - REV A

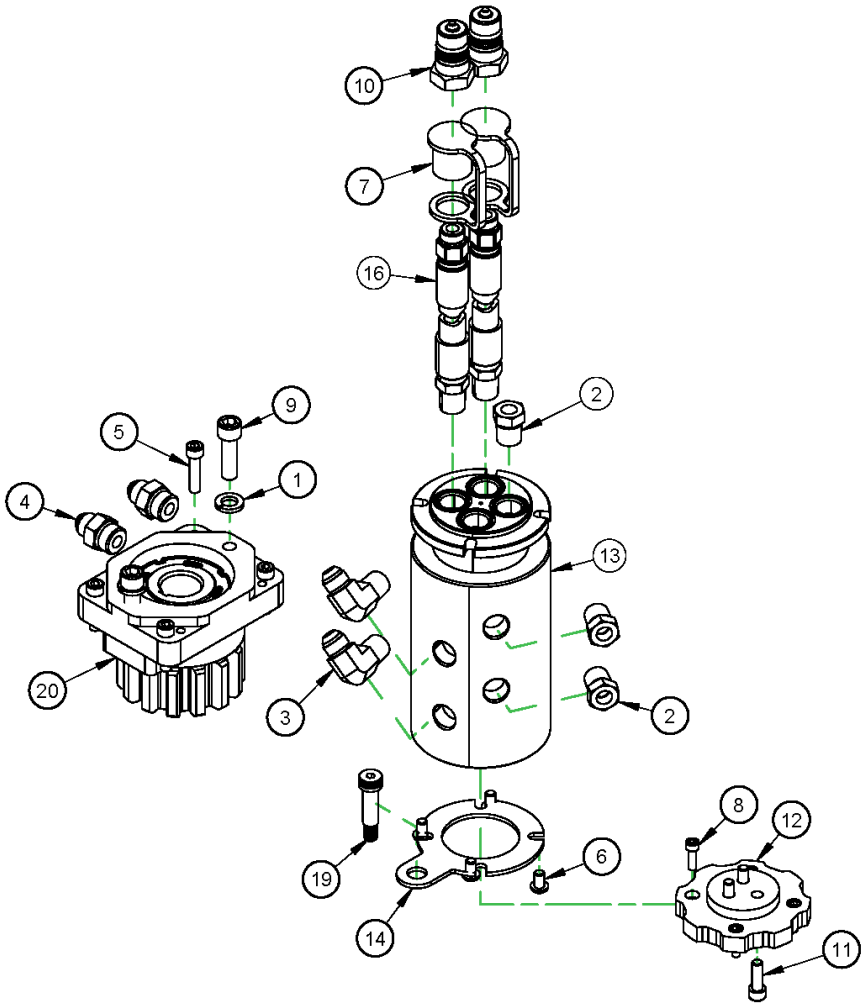
FOR REFERENCE ONLY



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

59636 - AIR CONTROL ASSY FOR PNEUMATIC FEED AND 1" DRIVE SUPPLY - REV A

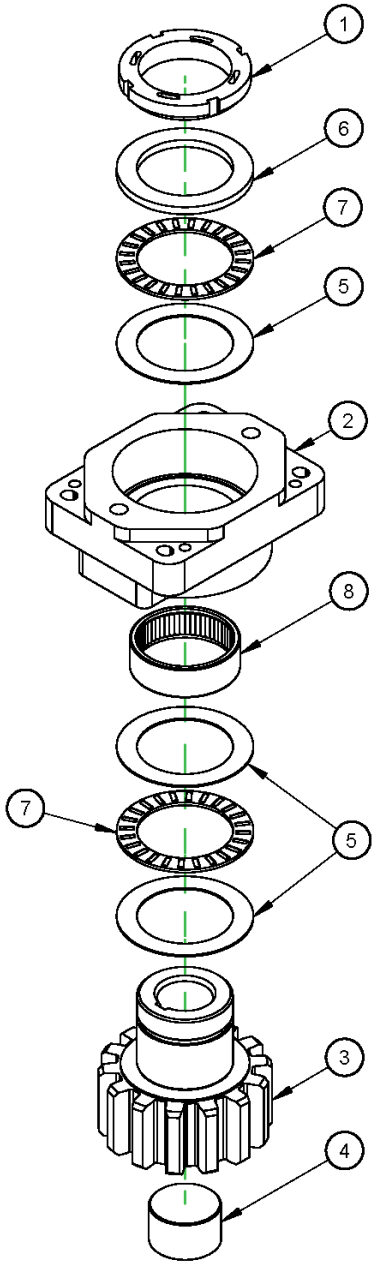
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	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 MALE 1/2B X SAE-10F
11	3	42494	SCREW M8 X 1.25 X 25mm SHCS
12	1	58039	CAM FEED
13	1	58751	UNION ROTARY HYDRAULIC 4 CHANNEL 1/2 NPTF PORTS MOD
14	1	58902	PLATE TORQUE ROTARY UNION
15	2	59233	(NOT SHOWN) HOSE ASSY 451 1/2 X JIC-8 FEMALE ENDS X 23 STRAIGHT END AND 90° END
16	2	59240	HOSE ASSY 451 1/2 X SAE-10M TO 1/2 NPTM X 12 STRAIGHT FITTINGS
17	1	59244	(NOT SHOWN) PLUMBING PNEUMATIC FEED ASSY
18	1	59245	(NOT SHOWN) AIR CONTROL ASSY FOR PNEUMATIC FEED
19	1	59328	SCREW 12MM DIA X 35MM X M10 X 1.5 SHLDCS
20	1	67358	ASSY DRIVE GEAR HYD 1.25 INPUT FF7200 AND FF8200

58180 - ASSY DRIVE HYD LESS MOTOR W/ FEED COND. UNIT FF7200 FF8200 - REV A

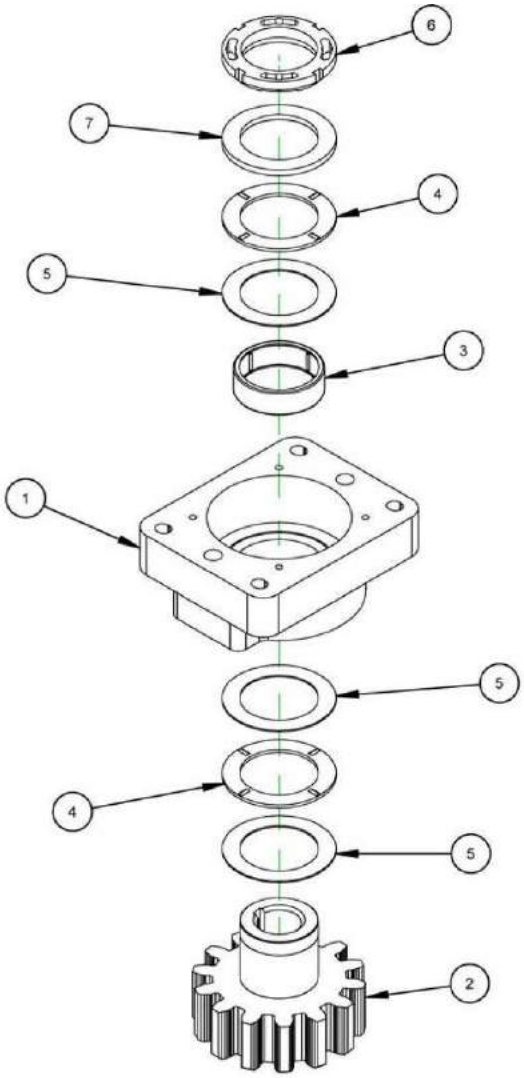
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	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 1MM
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

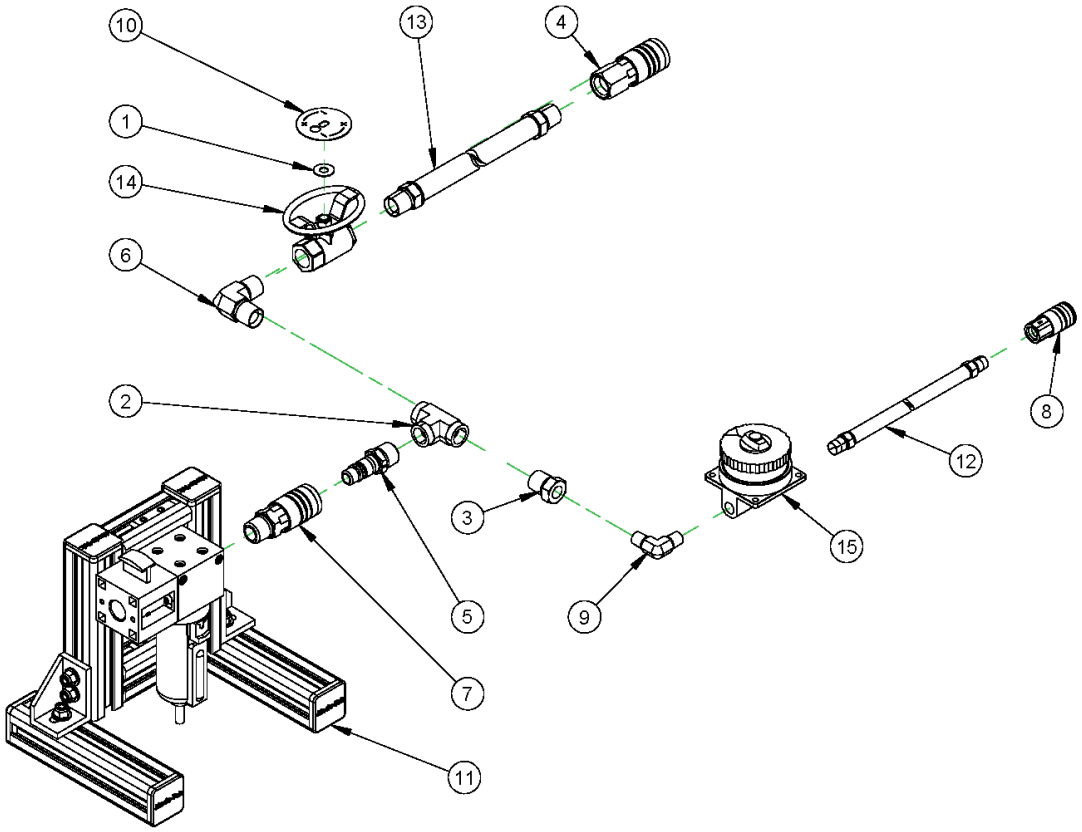
67358 - ASSY DRIVE GEAR HYD 1.25 INPUT FF7200 AND FF8200 - REV A

FOR REFERENCE ONLY



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

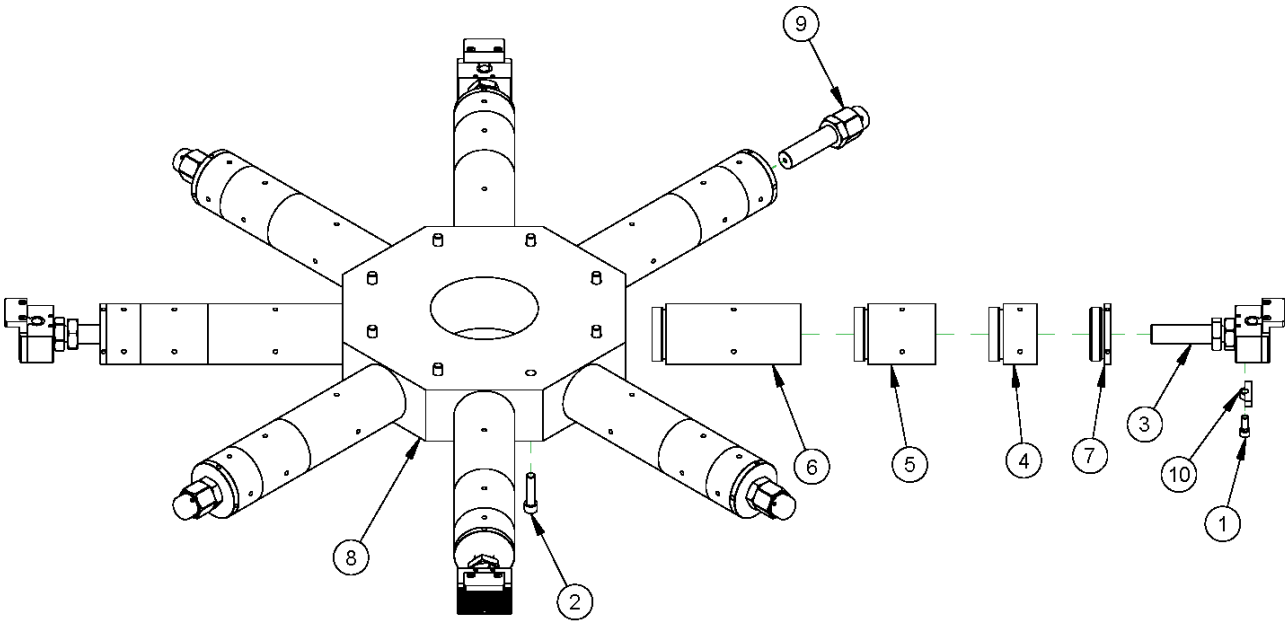
ASSY DRIVE GEAR HYD FF7200 FF8200 57819



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

59245 - AIR CONTROL ASSY FOR PNEUMATIC FEED - REV A

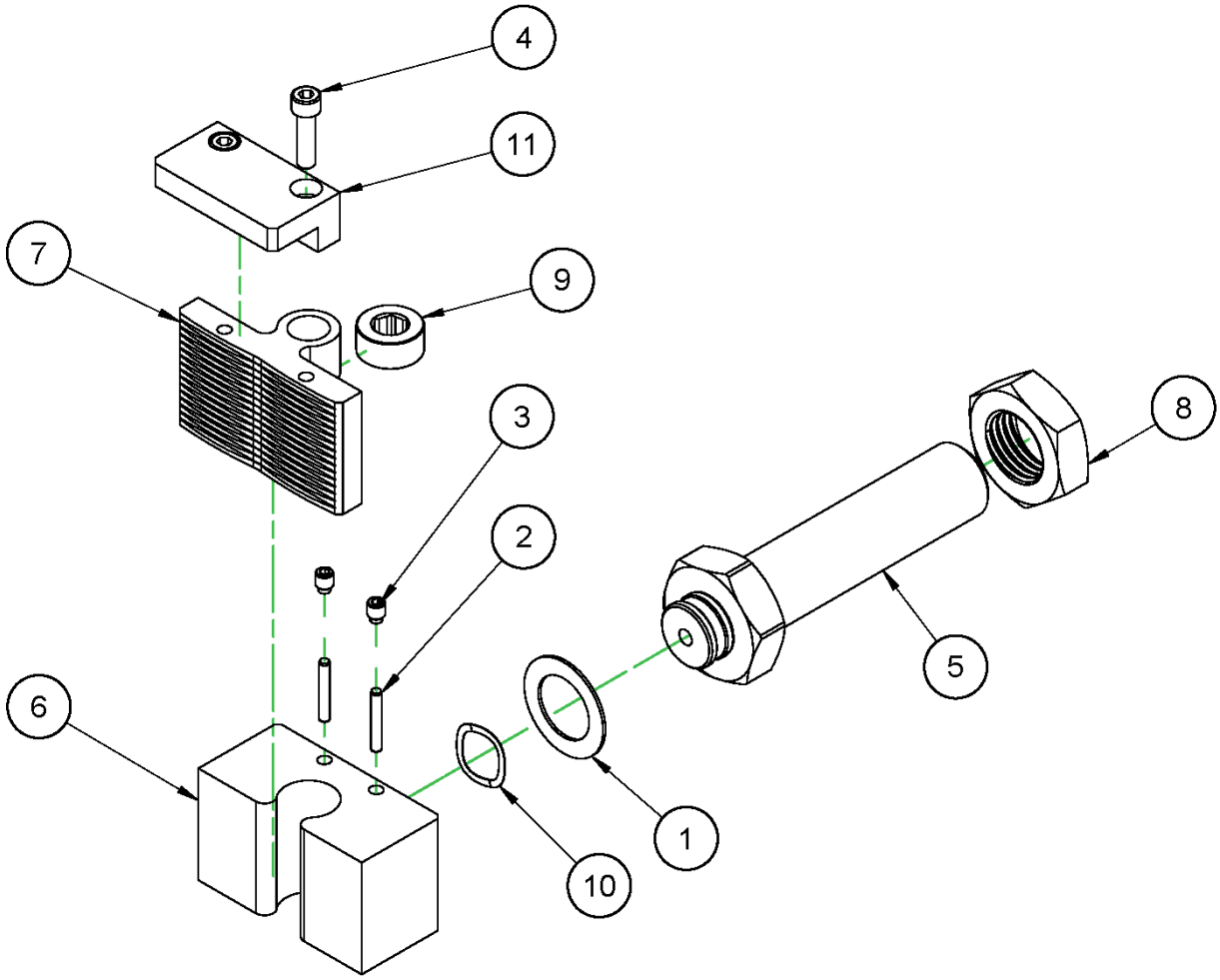
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	40697	SCREW M12 X 1.75 X 30mm SHCS
2	8	44410	SCREW M16 X 2.0 X 65mm SHCS
3	4	57637	ASSY FOOT CHUCK ADJUSTABLE FF7200 AND FF8200
4	8	57701	CHUCK EXTENSION 2.5 IN
5	8	57702	CHUCK EXTENSION 5 IN
6	8	57703	CHUCK EXTENSION 10 IN
7	8	57704	CAP END 4.5 DIA THREADED
8	1	57876	HUB CHUCK FF7200
9	4	57899	ASSY FOOT NON LEVELING LARGE FF LINE
10	2	61362	RESTRAINT SAFETY WELD PLATE

57877 - ASSY CHUCK ID FF7200 30 - 72 - REV A

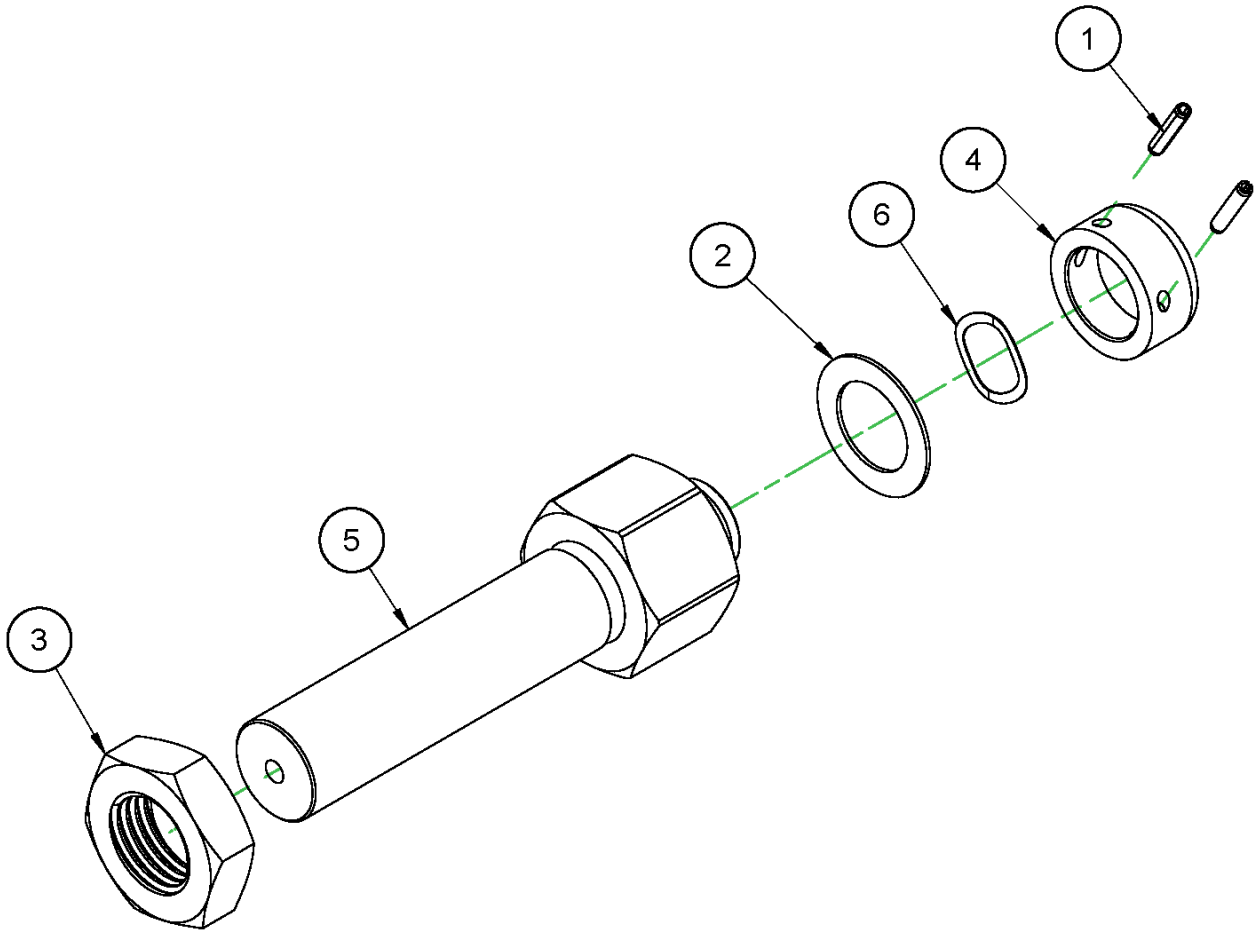
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	16666	WASHER THRUST 1.250 ID X 1.937 OD X .060
2	2	19735	PIN DOWEL 3/16 DIA X 1-1/4
3	2	44257	SCREW M8 X 1.25 X 10mm SSSDP
4	2	45530	SCREW M8 X 1.25 X 30mm SHCS
5	1	57625	JAW SCREW LEVELING
6	1	57626	BASE ADJUSTER
7	1	57627	JAW ADJUSTER FF7200 & FF8200
8	1	57655	NUT M36 X 4 JAMN
9	1	58143	SCREW M30 X 1.5 HOLLOW LOCK MOD
10	1	58244	WASHER SPRING WAVE 1.235 OD X .961 ID X .014
11	1	59085	FINGER SETUP EXTENSION FF7200

57637 - ASSY FOOT CHUCK ADJUSTABLE FF7200 AND FF8200 - REV A

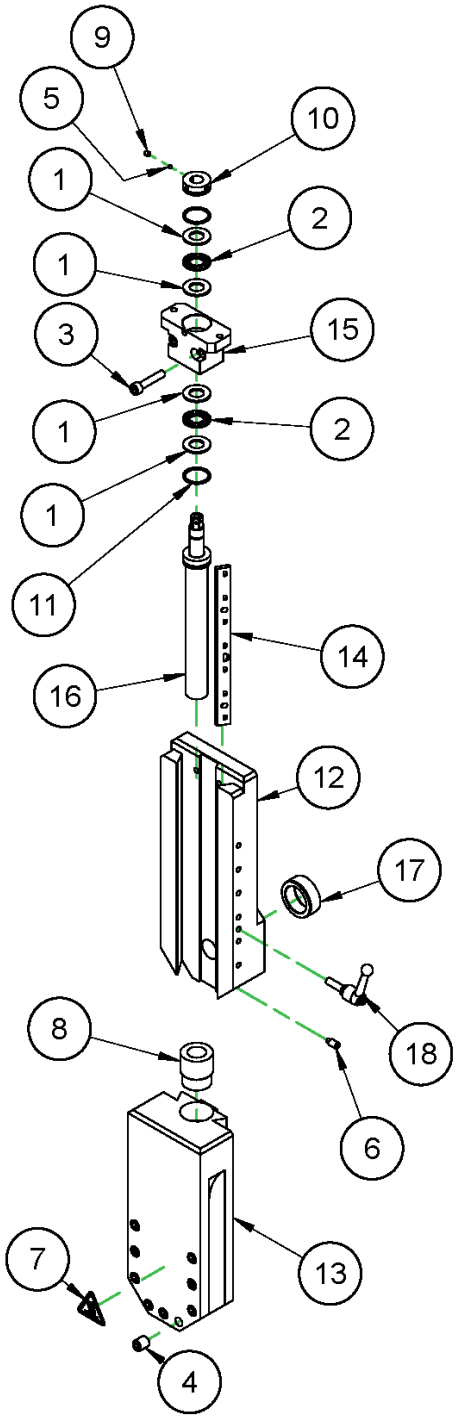
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	12959	PIN ROLL Ø3/16 X 1
2	1	16666	WASHER THRUST 1.250 ID X 1.937 OD X .060
3	1	57655	NUT M36 X 4 JAMN
4	1	57900	CAP JAW SCREW
5	1	57904	SCREW FOOT 36MM LARGE FF LINE
6	1	58244	WASHER SPRING WAVE 1.235 OD X .961 ID X .014

57899 - ASSY FOOT NON LEVELING LARGE FF LINE - REV A

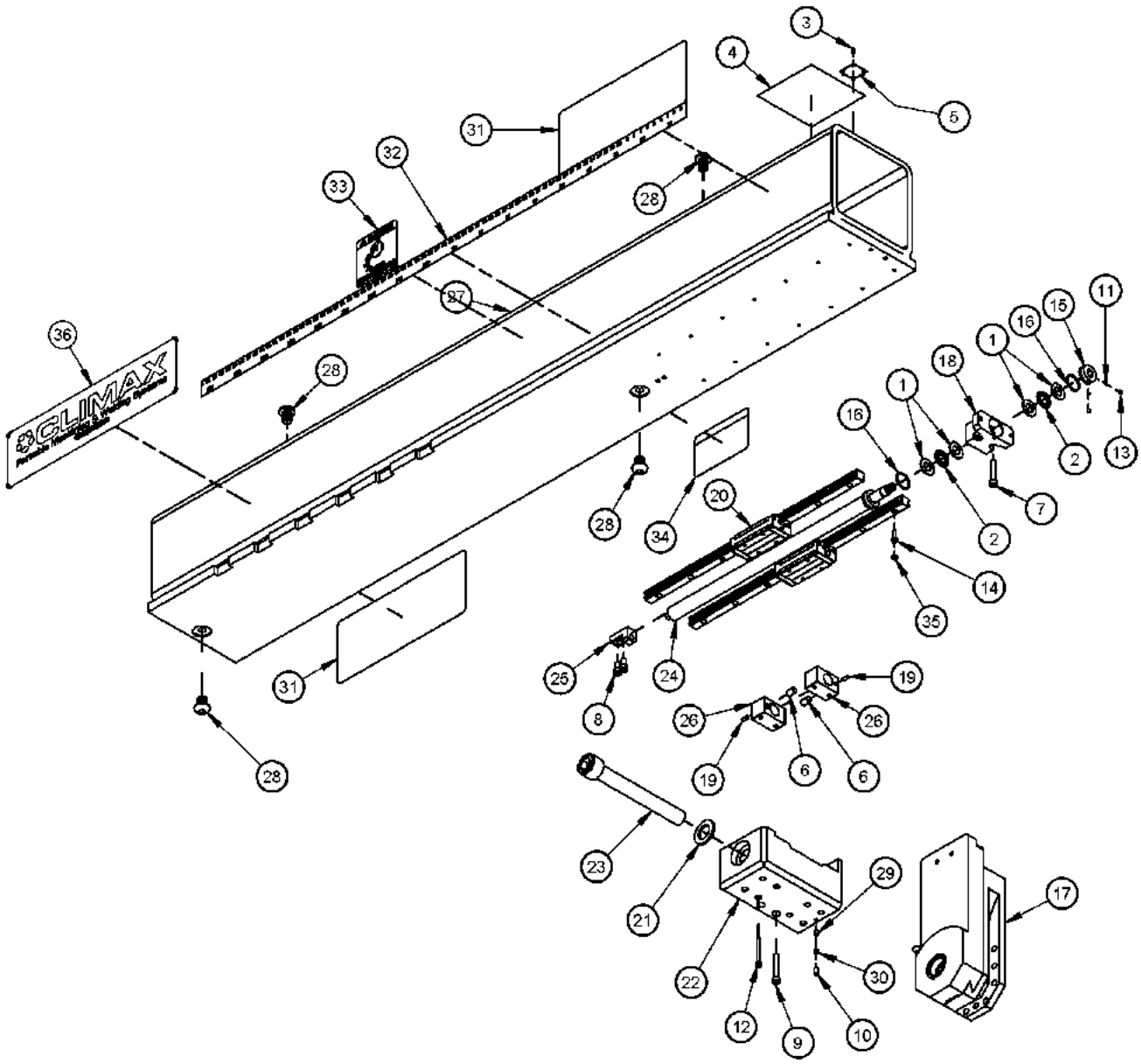
FOR REFERENCE ONLY



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	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	46902	LABEL WARNING HOT SURFACE GRAPHIC 1.13" TALL
8	1	48526	NUT LEADSCREW ACME 3/4-10 BRONZE LH
9	2	53365	SCREW M4 X 0.7 X 4 mm SSSFP
10	1	57214	NUT BRG RETAINING AXIAL
11	2	57320	RING O 1/16 X 13/16 ID X 15/16 OD
12	1	57782	BOTTOM SLIDE TOOL HEAD FF LINE
13	1	57783	TOP SLIDE TOOL HEAD FF LINE
14	1	57784	GIB TOOL HEAD FF LINE
15	1	57793	BEARING BLOCK LEADSCREW
16	1	57912	LEAD SCREW AXIAL FEED FF LINE
17	1	57963	BUSHING DRILL 1-3/8 OD X 1 ID X 1/2 LG
18	1	58133	HANDLE ADJUSTABLE M6 X 1 X 20MM

57781 - TOOL HEAD ASSY FF LINE - REV A

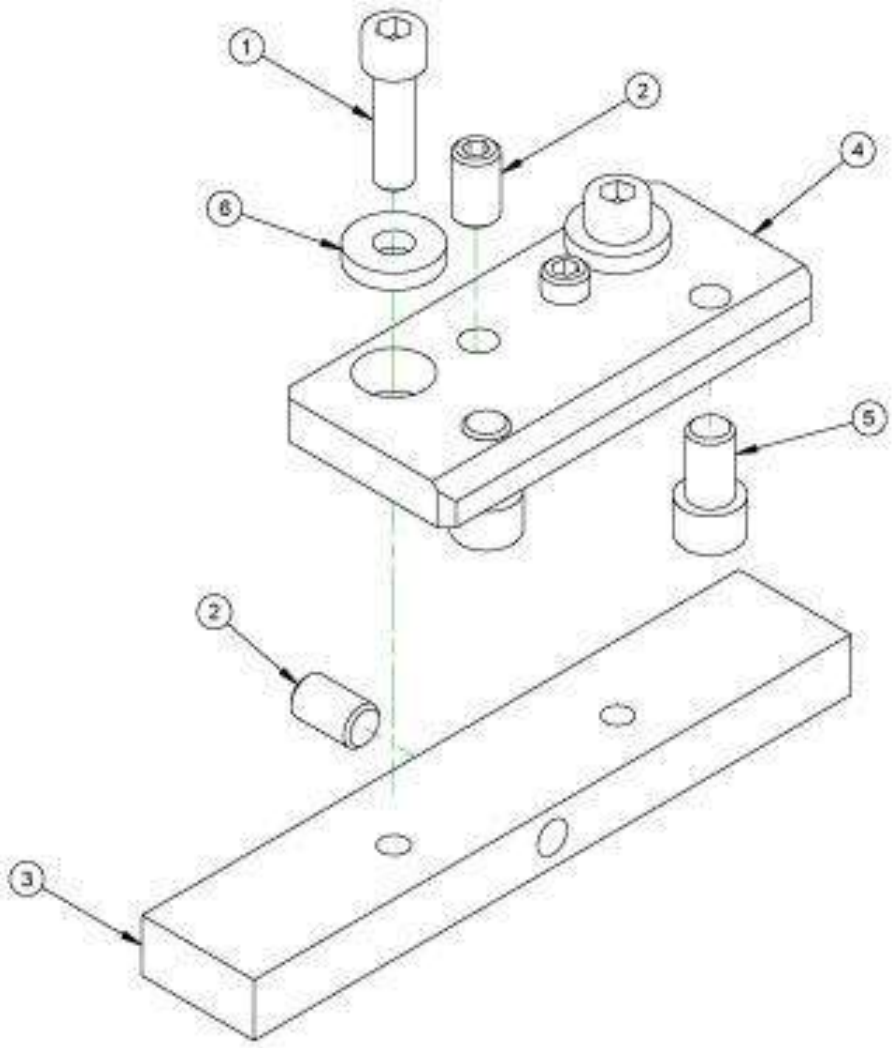
FOR REFERENCE ONLY



57873 - ASSY ARM TURNING FF7200 - REV B

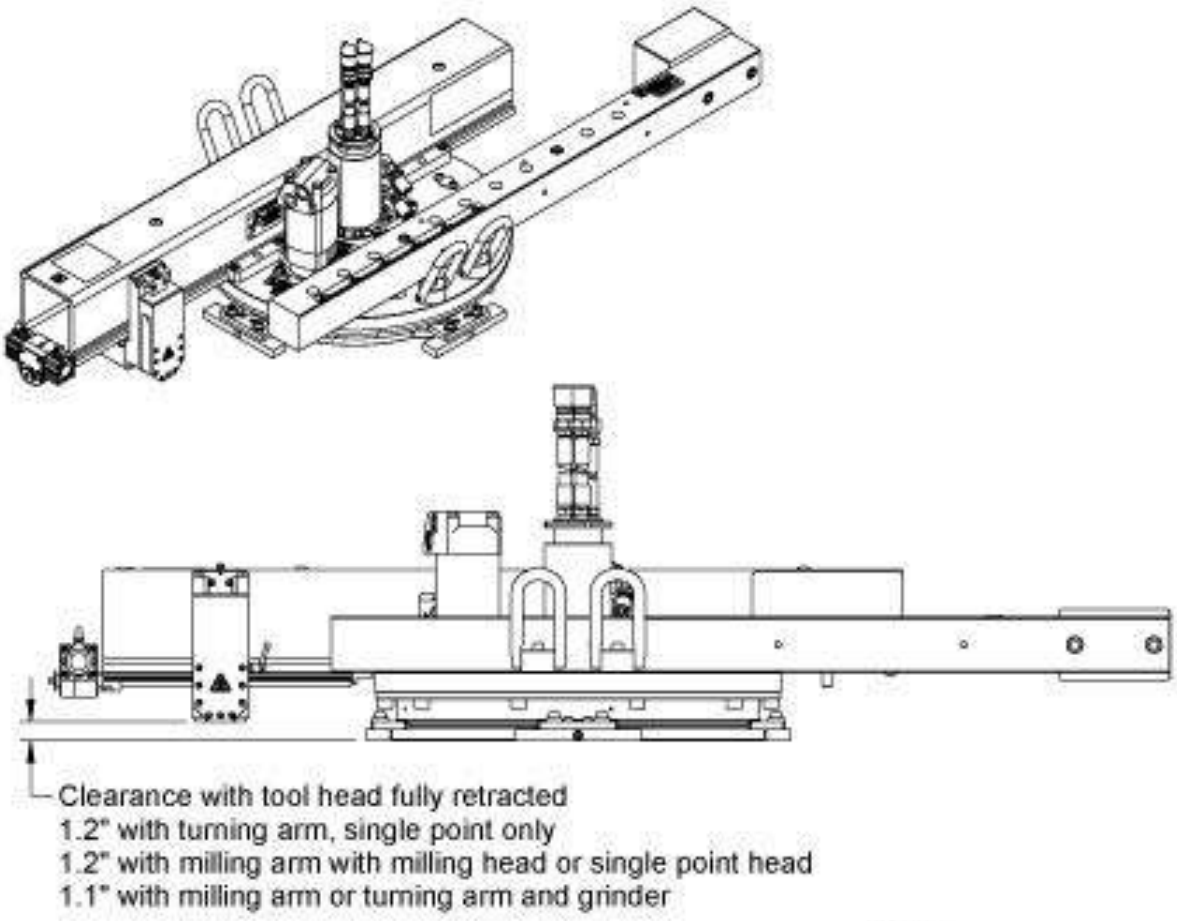
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10436	WASHER THRUST .500 ID X .937 OD X .060
2	2	10437	BRG THRUST .500 ID X .937 OD X .0781
3	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
4	1	27462	LABEL WARNING STICKER SINGLE POINT MACHINES
5	1	29152	PLATE MASS CE
6	2	31592	PIN DOWEL 5/16 x 1/2
7	2	35504	SCREW M6 X 1.0 X 35mm 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	58096	TOOL ARM FF7200
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	61541	RULE ADHESIVE BACKED 1 X 50 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	70228	LABEL CLIMAX LOGO 3.5 X 12.5

57873 - ASSY ARM TURNING FF7200 - REV B

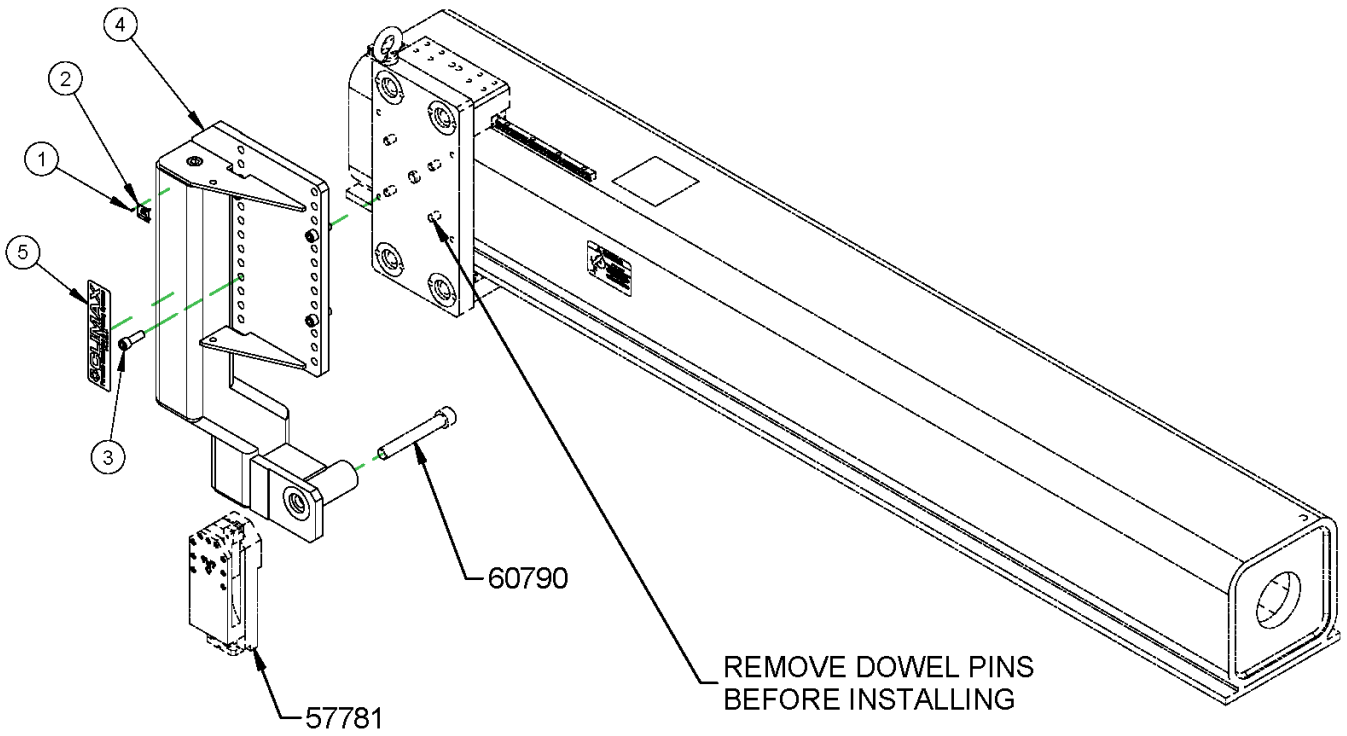


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	36079	SCREW M10 X 1.5 X 35mm SHCS
2	3	43186	SCREW M12 X 1.75 X 20mm SSSFP
3	1	79545	BLOCK TACK WELD
4	1	79546	PLATE EXTENSION
5	2	79552	SCREW M12 X 1.75 X 20mm SHCS
6	2	79927	WASHER 3/8 FLTW HARDENED 1 OD X .2 THK BLACK OXIDE FINISH

79550 - ASSY SURFACE MOUNT FF7200



FF7200 SURFACE MOUNT SINGLE POINT -



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	30207	SCREW M12 X 1.75 X 35mm SHCS
4	1	69673	BACK FACE ATTACHMENT FF7200 FF8200
5	1	70227	LABEL CLIMAX LOGO 2 X 8

69711 - ASSY BACK FACE FF7200 FF8200 - REV A

FOR REFERENCE ONLY

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SDS

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.

Koolkut® Spectrum

Material Safety Data Sheet

1. Product and Company Identification

Product Name:	Koolkut® Spectrum
MSDS Number:	778731
Intended Use:	Metalworking Fluid
Manufacturer/Supplier:	ConocoPhillips Lubricants 600 N. Dairy Ashford Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	888-766-7676
Technical Information:	800-255-9556
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. Hazards Identification

Emergency Overview

May be harmful to breastfed babies

NFPA

Appearance: Amber
Physical Form: Liquid
Odor: Petroleum

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin, and possibly dermatitis (inflammation). No information available on skin absorption.

Inhalation (Breathing): No information available on acute toxicity.

Ingestion (Swallowing): Low to moderate degree of toxicity by ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, nausea and diarrhea. Inhalation of oil mist or vapors at elevated temperatures may cause respiratory irritation.

Pre-Existing Medical Conditions: Conditions which may be aggravated by exposure include skin disorders.

See Section 11 for additional Toxicity Information.

3. Composition / Information on Ingredients

Component	CASRN	Concentration*
Lubricant Base Oil (Petroleum)	VARIOUS	>90
Chlorinated Paraffins (C14-C17)	61788-76-9	<5
Additives	PROPRIETARY	<5

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

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): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek medical attention.

Ingestion (Swallowing): If swallowed, seek emergency medical attention. If victim is drowsy or unconscious and vomiting, place on the left side with the head down and do not give anything by mouth. If victim is conscious and alert and ingestion occurred within the last hour, vomiting should be induced for ingestions of large amounts (more than 5 ounces in an adult) preferably under direction from a physician or poison center. Do not leave victim unattended and observe closely for adequacy of breathing.

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.

5. Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 0 **Flammability:** 1 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

OSHA Flammability Category: None

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.

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient 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.

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.

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

6. Accidental Release Measures

Personal Precautions: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. 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 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. 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 for Containment and Clean-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.

7. Handling and Storage

Precautions for safe handling: Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective 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.

"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.

Conditions for safe storage: Keep container(s) tightly closed. 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.

8. Exposure Controls / Personal Protection

Component	US-ACGIH	OSHA	Other
Lubricant Base Oil (Petroleum)	TWA: 5mg/m^3 STEL: 10 mg/m^3 as Oil Mist, if generated	TWA: 5 mg/m^3 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.

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
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	<1 mm Hg
Vapor Density (air=1):	>1
Boiling Point/Range:	No data
Melting/Freezing Point:	<-4°F / <-20°C
Solubility in Water:	Insoluble
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.89 @ 60ºF (15.6ºC)
Bulk Density:	7.4 lbs/gal
Viscosity:	5.4 cSt @ 100°C; 32 cSt @ 40°C
Evaporation Rate (nBuAc=1):	No data
Flash Point:	>399°F / >204°C
Test Method:	Cleveland Open Cup (COC), ASTM D92
LEL (vol % in air):	No data
UEL (vol % in air):	No data
Autoignition Temperature:	No data

10. Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Extended exposure to high temperatures can cause decomposition.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

11. Toxicological Information

Chronic Data:

A mortality study sponsored by General Motors and the United Auto Workers suggested a link between cutting oils or machining fluids and various forms of cancer (e.g., esophageal, laryngeal,and rectal) The study evaluated workplace exposures from 1940-1984. Since the composition of these materials has changed substantially since 1940, and because the most notable effects were seen among those with work histories dating back to that time, the relevance of these findings to present-day exposures is uncertain. Cutting oils or machining fluids have not been identified as carcinogens by NTP, IARC, or OSHA.

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.

Chlorinated Paraffins (C14-C17)

Carcinogenicity: Certain Chlorinated paraffins mixtures have caused an increase in tumors when given in very high oral doses to mice and rats. This particular chlorinated paraffin has not been identified as a carcinogen by NTP, IARC or OSHA.

Target Organs: Administration of intermediate length chlorinated paraffins has demonstrated limited evidence of liver toxicity in experimental animals. Effects seen include increased liver:body weight ratios and hepatocellular hypertrophy.

Reproductive: Animal studies in both rats (up to 5000 mg/kg, orally) and rabbits (up to 100 mg/kg), orally did not demonstrate effects on the developing fetus. However, the rat studies found increased mortality in pups exposed to chlorinated paraffins via lactation.

Acute Data:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil (Petroleum)	>5 g/kg	>2 g/kg	No data
Chlorinated Paraffins (C14-C17)	>4 g/kg (rat)	>10 ml/kg (rabbit)	No Data

12. Ecological Information

Ecotoxicity: Experimental studies show that acute aquatic toxicity values are greater than 1000 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Mobility: 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 base oil components in soil and sediment.

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.

Bioaccumulation Potential: Log Kow values measured for the hydrocarbon components of this material range from 4 to over 6, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

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 MSDS 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.

14. Transportation 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.***

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:	---	---	---

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:	No

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

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.

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

WHMIS Hazard Class
None

National Chemical 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

16. Other Information

Date of Issue:	15-Oct-2008
Status:	Final
Previous Issue Date:	20-Jun-2007
Revised Sections or Basis for Revision:	Emergency Overview (Section 2) Toxicological (Section 11)
MSDS Number:	778731

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; IARC = International Agency for Research on Cancer; 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 Material Safety Data Sheet is based on data believed to be accurate as of the date this Material 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 (CO_2).

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 @ 20°C (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/m^3 STEL: 10 mg/m^3 as Oil Mist, if Generated	---	---	---
Lubricant Base Oil (Petroleum)	TWA: 5mg/m^3 STEL: 10 mg/m^3 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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