ROTTLER

SG10A CNC CYLINDER HEAD SEAT & GUIDE MACHINE

OPERATION AND MAINTENANCE MANUAL

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ORDERING PROCEDURE

Contact your regional Rottler sales rep for assistance in ordering optional equipment, replacement parts, or tooling.

If you are unable to contact your regional Rottler sales rep, call the factory at 253-872-7050 and ask to speak to the parts sales specialist.

Have the following information handy to expedite the ordering process:

1. Your name, business name, and contact number
2. Customer number
3. If you don't have a customer number, your billing address
4. Shipping address if different from billing address
5. Machine model and serial number
6. Part number and description of what you want to order
7. Preferred method of shipment
8. You may also contact us via e-mail with the above information. Send e-mail requests to: parts@rottlermfg.com

In some cases you may be requested to send a photo of the part you are ordering if it is a replacement part, or doesn't appear in the database.

If you are unsure which part you need to order, contact our service department and ask to speak to one of our service consultants. They will assist you in determining which part you require.

THERE IS A MINIMUM ORDER OF $25.00

INTRODUCTION

READ THE SAFETY CHAPTER BEFORE INSTALLING MACHINE. THOROUGHLY UNDERSTAND ALL SAFETY ISSUES BEFORE OPERATING MACHINE.

ATTENTION OWNER/BUSINESS MANAGER

To validate the warranty on your new Rottler machine, please be sure to sign and complete the "Installation Report" located in the Installation Chapter of this manual.

We suggest that the new user of the SG10A read the CONTROL DEFINITIONS to get an idea how the machine operates.

The Operating Instructions chapter should be read in order to familiarize the user with the actual button pushing sequences required to carry out a job. These chapters in the manual should be considered an introduction. As the operators of the SG10A series machines gain experience with using the different functions of the machine, complicated setups and programs will make more sense.

The rest of the manual contains information and part number reference on fixtures, cutting tools, and machine maintenance. The operator should read and become familiar with these areas as well.

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Description

The model SG10A machine is an automatic precision, Seat finish machine design to maintain accuracy on every finish seat. It can be equipped with tooling and accessories to handle most American, Import, and Diesel passenger car and truck cylinder heads. Convenient controls, easy cylinder Head Clamping, air floated spindle base (Work Head) centering on the pilot shank and clamping, means considerable savings in floor to floor time, and operator involvement. Making this machine highly suited to the jobber shop where accuracy and dependability is required.

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Rottler Manufacturing and its employees or representatives are not responsible for any information regarding final specifications of any workpiece that is created as a final product when using Rottler equipment. It is the responsibility of the end user of Rottler equipment to determine the final dimensions and finishes of the workpiece that they are working on. Any information regarding final dimensions and finishes that appears in any Rottler literature or that is expressed by anyone representing Rottler is to be regarded as general information to help with the demonstration of or for operator training of Rottler equipment.

Limited Warranty

Rottler Manufacturing Company Model SG10A parts and equipment is warranted as to materials and workmanship. This limited warranty remains in effect for one year from the date of delivery, provided the machine is owned and operated by the original purchaser and is operated and maintained as per the instructions in the manual.

Tools proven to be defective within the warranty period will be repaired or replaced at the factory’s option.

The products are warranted upon delivery to conform to their published specifications and to be free from defects in material and workmanship under normal use for a period of one year from shipment. Should a product not be as warranted, Rottler sole obligation shall be, at its option, to repair, correct or replace the product or to refund the amounts paid for the Product upon its return to a location designated by Rottler. No warranty shall extend to rapid wear Products (including tooling) or to Products which have been subject to misuse (including any use contrary to Rottler instructions), neglect, accident (including during

shipment), improper handling or installation, or subject to any modification, repair or service not certified by Rottler. Rottler shall not be liable for any consequential, direct or indirect damages or for any other injury or loss. Buyer waives any right, beyond the foregoing warranty, to make a claim against Rottler. No warranty is provided for any Products not paid in full.

Merchandise cannot be returned to Rottler without prior approval. Customer must contact the Order Department or representative to get approval and to be issued a Return Goods Authorization number (RGR#). Merchandise authorized for return must be returned prepaid. If merchandise is returned with shipping charges collect, the actual amount of these charges may be deducted from any credit which may be due the customer. The RGR # assigned by the Order Department should be written on the shipping label and must appear on a copy of the invoice(s) covering the original shipment. This invoice copy must be included in the box with the parts. Shipment must contain ONLY those items on the RGR as approved for return. Merchandise must be received within 10 days of the date of RGR or the RGR will be canceled. All returned merchandise may be subject to a 20% restocking fee on under $1,000.00 amount or 10% on any items over $1,000.00. Parts or tooling over 30 days old are considered as customer property and can only be returned with prior written approval from Rottler Corporation Management and/ or Shipping Department.

The issuance of a RGR DOES NOT guarantee credit - it is only authorization for the return of the goods. Credit for return merchandise is at the sole discretion of Rottler. Credit will be issued only after inspection of returned goods.

Tools proven to be defective within the warranty period will be repaired or replaced at the factory's option.

We accept no responsibility for defects caused by external damage, wear, abuse, or misuse, nor do we accept any obligation to provide compensation for direct or indirect costs in connection with cases covered by the warranty.

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INSTALLATION

Contents

ATTENTION OWNER/BUSINESS MANAGER

To validate the warranty on your new Rottler machine, please be sure to sign the installation report after the installation technician has installed the machine and verified the machine is operating correctly and given the operators operation and maintenance training.

Thank you for your cooperation and the opportunity to be of service to you.

ROTTLER MANUFACTURING

INSTALLATION REPORT
SG10A
REV 031717

OFFICE USE ONLY

Route to: Servicer Mgr → Accounting → Andy → Accounting **Warranty Exp Date** _____

ROTTLER MANUFACTURING MUST HAVE THIS REPORT RETURNED TO PROPERLY QUALIFY WARRANTY ON EQUIPMENT

Customer:_____ Address:_____
City:_____ State:_____ Zip:_____ Phone:_____
Country:_____
Machine Model:_____ Serial Number:_____ Representative:_____

MACHINE INSTALLATION: Electrical information MUST be complete to validate this report.

Customer is responsible for providing electricity to machine in a manner that meets the local electrical code requirements.

_____Check machine level for equal support on feet.
_____This machine requires between 208 and 240 Volts AC, Single Phase, 50/60 Hz, isolated power supply. Measure the incoming voltage between L1 and L2. Current requirements for this machine are 15 amps. Measure the incoming AC voltage at least twice during installation.
1) _____VAC 2) _____ VAC
_____Measure each leg of the incoming supply to ground. When using a one leg and neutral of a 380 VAC three phase supply L1 should measure 240 VAC and Neutral should measure almost 0 VAC.
L1 to ground _____VAC L2 to ground _____VAC.

Make sure all electrical equipment has the proper overload protection. The SG10A should have a ***fully isolated*** power supply to prevent damage and uncontrolled movement of the machine. If the SG10A is on the same power lines that are running to other electrical equipment (grinders, welders, and other AC motors) electrical noise can be induced into the SG10A electrical system. Electrical noise can cause the controller to see false signals to move.

⚠ CAUTION Neutral and machine ground are not the same thing. You should measure an open circuit between Neutral and ground.

⚠ CAUTION **IF VOLTAGE IS OUTSIDE THE CORRECT RANGE AT ANY TIME THE MACHINE WILL NOT OPERATE PROPERLY AND MAY BE DAMAGED.**

_____Relocate electrical enclosure from shipping location to operating location on lower right side of machine.
_____Air of the proper pressure and capacity connected to the machine. Air supply must be free from oil and water. Oil or water will damage electrical and air components. Air pressure should never drop below 90 PSI at any time. Failure to provide adequate air supply may cause improper floating and clamping.
_____**BEFORE** turning power on to the machine. Check all wires for security by using the correct screw driver and turning CW until movement stops. Stranded wire can “spread” slightly from vibration during transport.
_____Install electrical component covers inside the electrical enclosure with fasteners provided.
_____Remove all shipping brackets in accordance with the machine manual.
_____Clean any rust inhibitor from the machine surfaces. Slide the spindle base from side to side continually cleaning the machine base until all inhibitor is removed.

_____Have the operator read through the operation manual before training begins. This will help him be familiar with the button pushing sequences. Have the operator read through the manual again after training and some of the sequences will make more sense.

MACHINE START-UP

⚠ CAUTION When starting the machine for the first time, it may move out of control. Make sure all hands are clear of machine parts. Be ready to press the Emergency Stop button if needed.

_____Turn main power on from the main incoming breaker box.

MACHINE MOVEMENTS

_____Make sure there is nothing obstructing the full vertical travel of the machine.
_____When the machine is on the clamp mode and the air pressure is with the requirements, try to move workhead to verify that you have a solid clamp of Work head.
_____Place the level on the leveling post. The level assembly is referenced to the spindle via the level pin. It is therefore important to check alignment of the pin in reference to the spindle. Even though the level has been carefully calibrated at the factory, it is a good idea to recheck calibration before putting the machine into service. In the event that the level is dropped or handled roughly then the following recalibration methods should be implemented. If calibration is required refer to the manual for Calibrating the Digital Level
_____Start the spindle and verify operation.

INSTRUCTING THE OPERATOR:

Note: Rotter employees and representatives per company policy are not permitted to provide end user of Rottler equipment with any OEM specifications for the workpiece that is created by end user using Rottler equipment.

⚠ WARNING

_____ Explain to the customer and operator that at NO time is there to be any software or hardware other than Windows Auto Update and Rottler installed on this machine. This includes screen savers, anti-virus software, and any hardware device that installs software on the machine. Installation of screen savers and anti-virus software can cause dangerous control problems. Any installation of software or hardware will void the warranty on the machine.

_____Explain to the customer and operator that the machine should be hooked up to the Internet anytime it is on. The software on the machine will automatically connect to our server to send back useful information on machine status.

_____Explain to the customer and the operator how the to log onto Skype and communicate with Rottler when needed.

⚠ WARNING

_____ Computer Viruses will cause the machine control system to become unstable. This may cause the machine to make uncontrolled moves which could create a dangerous environment for the machine operator.
_____Connect customer supplied Internet to the machine. Verify that the Internet is accessible from the machine.

_____Explain to the customer the proper way for turn the machine off when it is not in use. Do not leave the machine on overnight. It is important to close all programs followed by shutting down Windows before turning the main power switch off. Do not turn the main power switch off before shutting down Windows.
_____Using the operating manual as a guide explain the function of all buttons.
_____Cycle all machine movements and supervise the handling of same by operator.
_____Demonstrate the engaging of the fine feed system.
_____Point out safety features to customer and operator.

Do not push any buttons without thinking of safety first.

⚠ CAUTION Do not assume the Digital level has been calibrated rotate 180 to verify alignment.

_____The following is a checklist to go through every time the machine is started to begin machining a seat.

- Work piece secure
- RPM set
- Tool holder adjusted to the correct setting base on the type of seat you will be machining
- Tool holder locked in place
- Floating of the Workhead and clamping

_____Proceed to have operator to machine a seat under you control.
_____**Parts ordering, refer to the operating manual for part numbers and description.**
_____Review Emergency stop procedure and with operator per operating manual.
_____Explain to the customer the importance of backing up the block profiles to a separate device. Any computer failure or possible operator input error can result in the loss of all block profiles that were created for the machine. Refer to Chapter 5 of the machine manual for detailed instructions on backing up and restoring block profiles.

General remarks on machine performance, adjustments as received and any further organization or parts required to complete the installation.

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Instructions given to:_____

Sales/Service Engineer:_____ Date_____

Shop Foreman/Superintendent or Owner: _____ Date_____

Once completed send this form to:
Rottler Manufacturing
attn: Service Manager
8029 S 200 St
Kent, WA 98032 USA

Alternately you may send this form via fax or e-mail:
fax: [+1] 253-395-0230
e-mail: service@rottlermfg.com

Installation Procedure

The productivity of this machine will depend a great deal on it's proper initial installation, particularly the means by which cylinder heads are lifted into the machine as well as the material handling to and from other operations in your shop.

The proper loading arrangement and location for your SG10A machine is extremely important.

A slow travel (6 to 10 feet / min.) power hoist operated from either a bridge crane or a jib crane arrangement works very well.

Unpacking and Lifting

Carefully uncrate the machine. Remove all tooling from storage compartments and unpack. Locate the leveling bolts and leveling pads. Clean all surfaces with solvent and rags to remove protective shipping coatings.

⚠ CAUTION

THIS MACHINE IS TOP-HEAVY. Use care when lifting and moving Machine. Approximate shipping Weight of Machine is 2800 lbs. (1258 kg).

Removing Shipping Brackets

Before leveling the machine, loosen and remove the all shipping brackets and bolts. (Figures 1 – 5)

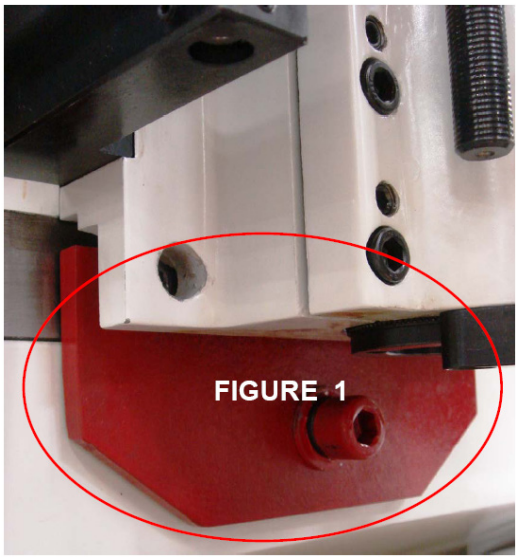


FIGURE 1

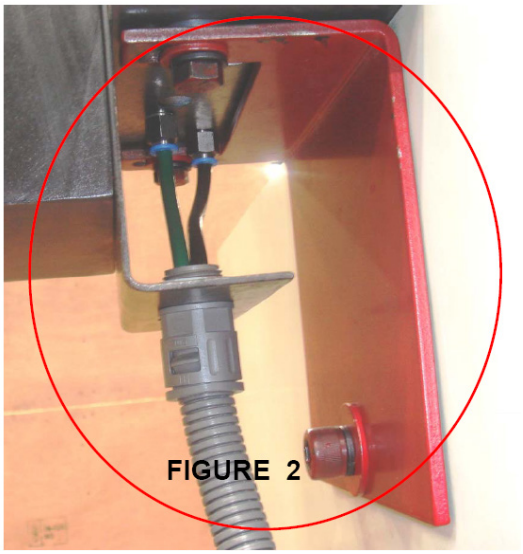


FIGURE 2

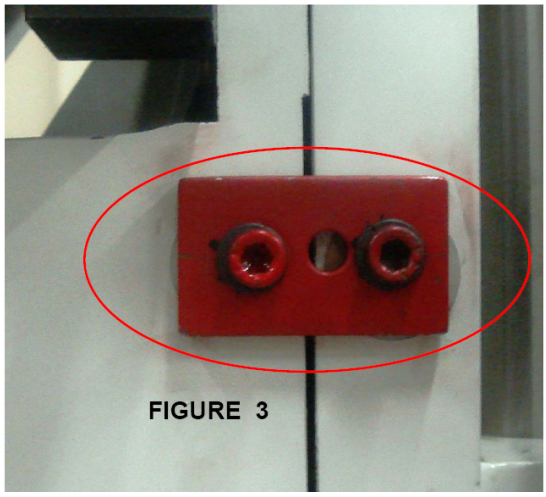


FIGURE 3

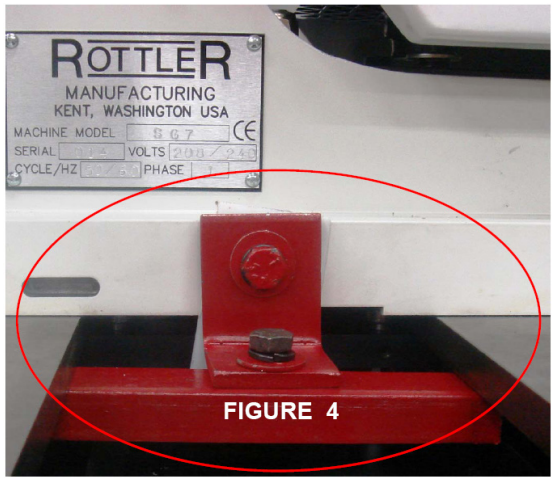


FIGURE 4

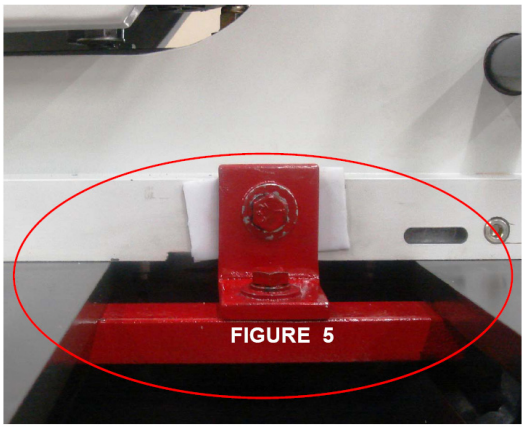


FIGURE 5

Preparation for Placement

Air supply is connected at the left side of the machine, at base of lower casting. Connection can either be a quick disconnect or permanent threaded connection. Be certain to use an adequately sized airline, permitting proper operation of float. Air pressure should never drop below 90 PSI at any time. Failure to provide adequate air supply may cause improper floating and clamping.

At this time, some customers will install a T fitting or manifold at the regulator, allowing another air hose to be connected, providing a connection point for air tools. The auxiliary hose, if fitted, should be of sufficient length to easily reach the entire front of the machine.

This machine comes pre-wired and ready to be connected to the power source. The power source should meet all local and national electrical codes. This service should connect to its own circuit breaker or fuse. The machine will require 220 VAC, 15 amp, single-phase power supply.

Machine Installation

- Lift Machine using a fork lift. Move fork lift to front of Machine and separate forks so they are visually centered.
- Insert forks under front-center of Machine, using care not to damage Foot Pedals Valve or Air Lines. Tilt forks slightly upward so Machine will lean toward fork lift and lift Machine.
- While Machine is on fork lift, install six (6) Leveling Screws and Jam Nuts in holes provided in bottom of Machine Base. Two (2) Screws installed in rear-corners and two (2) Screw installed in front corners of Machine Base will serve as Leveling Screws; while two (2) Screws installed in center of Machine Base will serve only as Support Screws.
- Move Machine to desired location and placed leveling bolts over the center hole of the Leveling Pad. Be certain to allow sufficient clearance to allow access for leveling and also for connecting air and electrical lines.
- Lower machine onto leveling pads making certain that the leveling bolts align into counter bore on leveling pads.
- Be certain nothing interferes with air or electrical tracking running from the floating head assembly to the cabinet.
- Determine there is no possibility of air or electrical tracking dragging on wall surfaces or adjacent machinery.
- Wipe top Rails with a clean, dry cloth to remove protective shipping oil.

CAUTION Do not attempt to move the Work Head unless Air Supply is connected, and air valve is turned on and power has been turn on (make sure the EMERGENCY STOP Button is off). From the touch screen, float the workhead, spray, and clean surface with (WD40) or similar degreaser and flow the work Head side by side to remove all the shipping oil from under the work head. (Top Upper surfaces rails should be clean and free of oil).

Positioning the Machine

- Lift Machine using a fork lift. Move fork lift to front of Machine and separate forks so they are visually centered.
- Insert forks under front-center of Machine, using care not to damage Foot Pedals Valve or Air Lines. Tilt forks slightly upward so Machine will lean toward fork lift and lift Machine.
- While Machine is on fork lift, install five (6) Leveling Screws and Jam Nuts in holes provided in bottom of Machine Base. Two (2) Screws installed in rear-corners and one (2) Screw installed in front and rear -center of Machine Base will serve as Leveling Screws; while two (2) Screws installed in front-corners of Machine Base will serve only as Support Screws.
- Move Machine to desired location and placed leveling bolts over the center hole of the Leveling Pad. Be certain to allow sufficient clearance to allow access for leveling and also for connecting air and electrical lines.
- Lower machine onto leveling pads making certain that the leveling bolts align into counterbore on leveling pads.
- Be certain nothing interferes with air or electrical lines running from the floating head assembly to the cabinet.
- Determine there is no possibility of air or electrical lines dragging on wall surfaces or adjacent machinery.
- Wipe top Rails with a clean, dry cloth to remove protective shipping oil.

CAUTION Do not attempt to move the Work Head unless Air Supply is connected, and air valve is turned on and power has been turn on (make sure the EMERGENCY STOP Button is off). From the touch screen, float the workhead, spray, and clean surface with (WD40) or similar degreaser and flow the work Head side by side to remove all the shipping oil from under the work head. (Top Upper surfaces rails should be clean and free of oil).

Power and Air Connections

Air supply is connected at the right, rear of the machine, at base of upper casting. Connection can either be a quick disconnect or permanent threaded connection. Be certain to use an adequately sized air line, permitting proper operation of float. Air pressure should never drop below 90 PSI at any time. Failure to provide adequate air supply may cause improper floating and clamping.

At this time, some customers will install a T fitting or manifold at the regulator, allowing another air hose to be connected, providing a connection point for air tools. The auxiliary hose, if fitted, should be of sufficient length to easily reach the entire front of the machine.

This machine comes pre-wired and ready to be connected to the power source. The power source should meet all local and national electrical codes. This service should connect to its own circuit breaker or fuse. In most cases the machine will require 220 VAC, 15 amp, single-phase service but you should verify voltage requirements by inspecting the electrical tag located on the rear of the machine

Leveling the Machine

Use required machinist level. (Starret 98 or better).

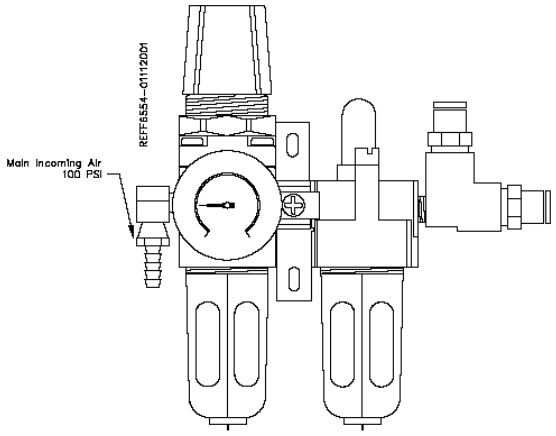
NOTE: Rotate Level 180º to check that Level is properly adjusted. If Level does not read same in both directions, recalibrate level.

Use the level on the upper float surface, level the machine as precisely as possible, front to back and side to side.

Adjust 4 corners until level and then extend the 2 center leveling bolts to support machine. Tighten jam nuts on leveling bolts and recheck level

Air Supply

It is very important the air source for the SG10A / SG80A machine be moisture free. Water and oil in the line will result in early cylinder and valve failure. The factory recommends installing a water trap at the machine. Attach an air source of at least 100 PSI to the appropriate intake in the small enclosure located on the left rear of the machine near the bottom. Bellow you will see the Air regulator panel for the different settings on the floating planes on the machine. And cabinet cooler air regulator.



Air Adjustments

Float

The float regulators are located on the left side of machine base. Marked “Work Head Air Float Adjustment” If the work head is not floating properly it could be from too much or too little air from the regulator. Starting with all regulators set at 1 bar with “workhead float” button activated, slowly turn all up .5 bar at a time until workhead start to float. Pushing work head front to rear checking for stiff spots. If workhead is dragging in the forward position, (workhead pulled closest to operator) raise the 2 front regulators 1 mark until it floats without dragging. Same for rear. You may have to go back and forth a few times to get this correct. If workhead is not dragging lower the PSI until it does and then raise 1 notch at a time until it is free. Typically the front two regulators will be slightly higher than the rear two. Once the correct float is established lock the regulators in place by pushing in on the blue adjusting knob.

CAUTION Use as little air as possible to achieve correct floatation. Using too much air will / could cause excessive movement of workhead.

Power Supply

This machine has the following power requirements:

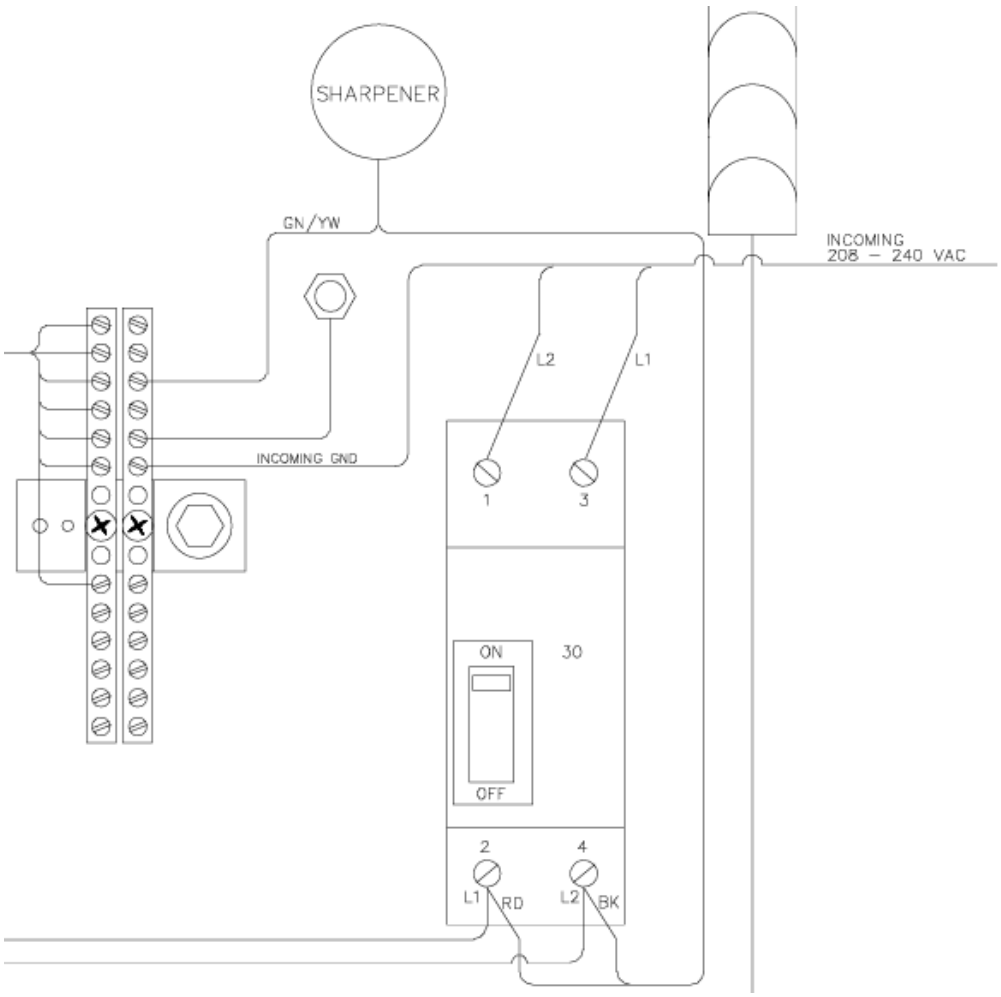
- 208 to 240 VAC not to exceed 240 Volts
- Single Phase
- 50 or 60 Hertz
- 15 amps

See illustration below for correct connection of “measured” incoming power. Connect single phase wiring to the main rear enclosure, located on the right rear of machine base. The connection point for power is located inside the enclosure.

IMPORTANT ***Electrically connect in accordance with national and local electrical codes.***

Grounding

This machine must be connected to a good earth ground rod. A 6 foot, 1/2” diameter, 15 OHM, Copper grounding rod driven into the earth next to the machines is preferred. ***Not providing a grounding rod could void factory warranty.***



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SAFETY

Contents

Safety Information

For Your Own Safety Read This Instruction Manual Before Operating This Machine.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

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

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Safety Instructions for Machine Use

This machine is capable of causing severe bodily injury

ONLY A QUALIFIED, EXPERIENCED OPERATOR SHOULD OPERATE THIS MACHINE. NEVER ALLOW UNSUPERVISED OR UNTRAINED PERSONNEL TO OPERATE THE MACHINE. Make sure any instructions you give in regards to machine operation are approved, correct, safe, and clearly understood. Untrained personal present a hazard to themselves and the machine. Improper operation will void the warranty.

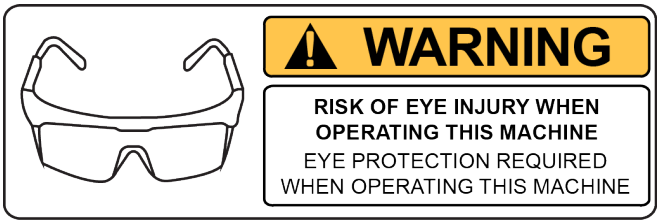
KEEP GUARDS IN PLACE and in proper working order. If equipped with doors, they must be in the closed position when the machine is in operation.

KEEP WORK AREA CLEAN. Cluttered areas and benches invite accidents.

KEEP CHILDREN AND VISITORS AWAY. All children and visitors should be kept a safe distance from work area.

WEAR THE PROPER APPAREL. DO NOT wear loose clothing, gloves, rings, bracelets, or other jewelry which may get caught in moving parts. Non-Slip foot wear is recommended. Wear protective hair covering to contain long hair.

ALWAYS USE SAFETY GLASSES. Also use face or dust mask if cutting operation is dusty. Everyday eye glasses only have impact resistant lenses, they are NOT safety glasses.



DO NOT OVER-REACH. Keep proper footing and balance at all times.

USE THE RECOMMENDED ACCESSORIES. Consult the manual for recommended accessories. The use of improper accessories may cause risk of injury.

CHECK DAMAGED PARTS. Before further use of the machine, a guard or other part that is damaged should be checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, breakage of parts, mounting, and other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.

NEVER OPERATE A MACHINE WHEN TIRED, OR UNDER THE INFLUENCE OF DRUGS OR ALCOHOL. Full mental alertness is required at all times when running a machine.

IF AT ANY TIME YOU ARE EXPERIENCING DIFFICULTIES performing the intended operation, stop using the machine! Then contact our service department or ask a qualified expert how the operation should be performed.

DO NOT MODIFY OR ALTER THIS EQUIPMENT in any way. If modifications are deemed necessary, all such requests must be approved and/or handled by Rottler Manufacturing. Unauthorized modifications could cause injury and/or damage to machine and will void the warranty.

SAFETY DECALS SHOULD NEVER BE REMOVED. They are there to convey important safety information and warn of potential hazards.

ALL LOCAL SAFETY CODES AND REGULATIONS should be followed when installing this machine.

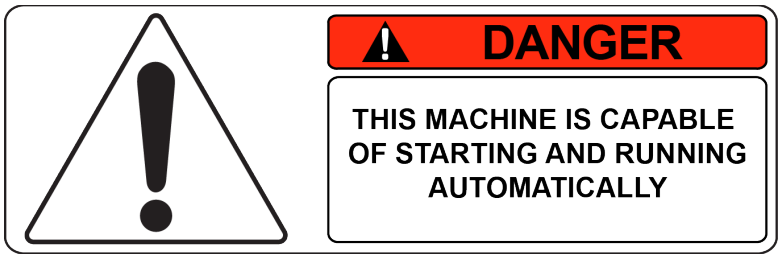
ONLY QUALIFIED PERSONAL should perform service on the electrical and control systems.

When boring the machine is capable of throwing metal chips over 10- feet from the cutting area. Always use the guards. Eye protection must be worn at all times by the operator and all other personnel in the area of the machine.

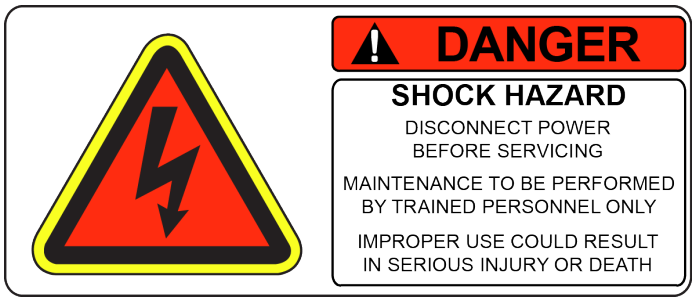
CAUTION No list of safety guidelines can be complete. Every piece of shop environment is different. Always consider safety first, as it applies to your individual working conditions. Use this and other machinery with caution and respect. Failure to follow guidelines could result in serious personal injury, damage to equipment or poor work results.

Electrical Power

THIS MACHINE IS AUTOMATICALLY CONTROLLED AND MAY START AT ANYTIME

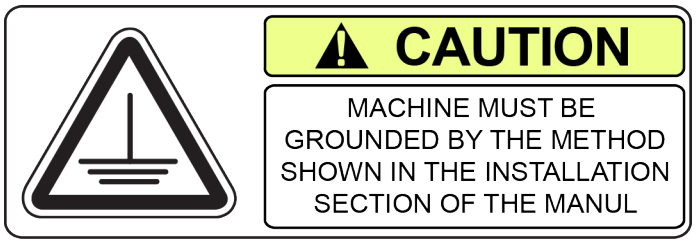


All electrical power should be removed from the machine before opening the rear electrical enclosure.



In the event of an electrical short, grounding reduces the risk of electric shock by providing a path of least resistance to disperse electric current.

Electrocution or a fire can result if the machine is not grounded correctly. Make sure the ground is connected in accordance with this manual. ***DO NOT*** operate the machine if it is not grounded.



CAUTION No single list of electrical guidelines can be comprehensive for all shop environments. Operating this machinery may require additional electrical upgrades specific to your shop environment. It is your responsibility to make sure your electrical system comply with all local codes and ordinances.

WARNING This machine operates under computerized control and, as is all computerized equipment, and is susceptible to extraneous electrical impulses internally for externally produced. The machine may make moves out of the operator control at any time. The operator should work in and around the machine with caution at all times.

The operator and nearby personnel should be familiar with the location and operation of the Emergency Stop Button.

Make sure all electrical equipment has the proper overload protection. This machine should have ***a fully isolated power supply*** to prevent damage and uncontrolled movement of the machine. If this machine is on the same power lines that are running to other electrical equipment (grinders, welders, and other AC motors) electrical noise can be induced into this machines electrical system. Electrical noise can cause the controller to see false signals to move. Not supplying a fully isolated supply to the machine may void factory warranty. Refer to the Power supply section located in the Installation section for voltage and amperage requirements of this machine.

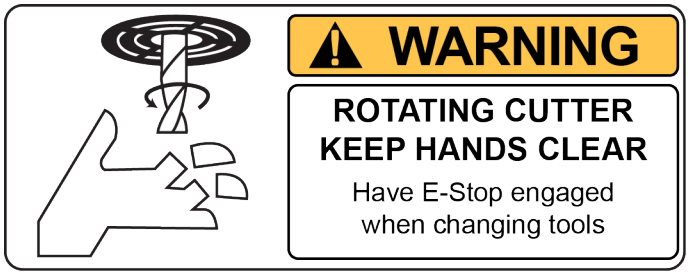
Machine Operator

The operator of this machine should be a skilled machinist craftsman who is well versed in the caution, care, and knowledge required to safely operate metal cutting tools.

If the operator is not a skilled machinist he/she must pay strict attention to the Operating Instructions outlined in this manual, and get instruction from a qualified machinist in both production and operation of this machine.

This machine has the following areas of exposed moving parts that you must train yourself to respect and stay away from when they are in motion:

Cutting Tool Area – Any operation involving hands in the cutter head area, such as inspection or alignment of the cutter head or tools, changing Centering Fingers, tool insertion, and removal, cutter head changes, and size checking etc. requires the machine to be in Neutral.



Machining – Eye protection must be worn during all operations of the machine. Hands must be kept completely away from the cutter head. All chip guards must be in position during machine operations.

CAUTION

Work Loading and Unloading – Carefully develop handling methods of loading and unloading work pieces so that no injury can result if hoist equipment or lift connection should fail. Periodically check lift components for damage that may cause failure.

CAUTION

Machine Maintenance – Any machine adjustment, maintenance or parts replacement absolutely requires a complete power disconnection from the machine.

Emergency Procedure

Assuming one of the following has occurred: tool bit set completely off size, work piece or spindle base not clamped, spindle is not properly centered, and these mistakes will become obvious the minute the cut starts

PRESS THE EMERGENCY STOP BUTTON (on the front control panel) ***IMMEDIATELY!***

Find out what the problem is; return the spindle to its up position without causing more damage. To restart the machine, turn the Emergency Stop Button CW until the button pops out

Be alert to quickly stop the machine in the event of a serious disruption of the boring process either at the top or bottom of the bores.

"REMEMBER" metal cutting tools have the speed and torque to severely injure any part of the human body exposed to them.

Computer and Controller System Safety

The computer and controller are located in the main rear electrical enclosure. This unit is a full computer, running Windows 7 64 Bit operating system. Contact the factory if more information on the computer system is required.

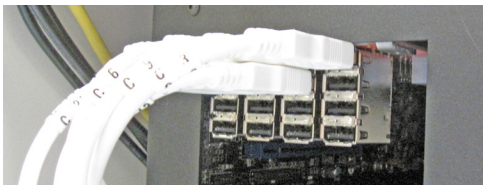
IMPORTANT The computer in this machine has the ability to connect to the World Wide Web via Ethernet or Wireless using a USB wireless (Wi-Fi) adapter. Updating the Rottler software should ONLY be done when directed to do so by a Rottler service technician. Updating Rottler Software when not directed by Rottler personnel will result in a non-operational machine.

The machine should be hooked up to the Internet anytime it is on. The software on the machine will automatically connect to our server to send back useful information on machine status.

Any "IT" personnel should ***ALWAYS*** get approval from Rottler before doing ***ANYTHING*** on the computer.

⚠ DANGER This machine is capable of causing severe injury or death. Doing any of the following without Rottler's direct consent may cause severe injury or death.

⚠ WARNING Do not attempt to install USB devices in the PCI ports. These ports have high voltage and any attempt to connect a USB device in these ports will result in destruction of that device. There is also the possibility of damage to the computer system of the machine.



IMPORTANT Downloading any program or changing any Rottler or Computer settings may cause the machine and/or software to become unstable. DO NOT install ANY screen saver, Anti-Virus, Spyware or any type of Security software on the computer. This could create a hazardous environment for the operator and personnel around the machine. Performing any of the above will also result in the machine warranty being NULL and VOID.

IMPORTANT DO NOT connect any type of external hardware to the computer via USB or any other means. Do not install any type of Device Driver. This could create a hazardous environment for the operator and personnel around the machine. Performing any of the above will also result in the machine warranty being NULL and VOID.

Electrical Safety Features Of Rottler DM Controlled Machines

All Rottler machines that use the DM operational control system are designed to comply with all applicable safety standards. This includes but is not limited to the following systems:

- Thermal sensors in all motors and motor controls.
- Current sensors in all motor control panels.
- Electrical breakers to prevent voltage surges and spikes from reaching electrical system.
- Electrical lockout on main electrical enclosure.
- E-Stop that shuts down all operational systems in an event of an emergency.

All thermal and current limits for motors and motor controls are preset at the factory. In the event that any of those parameters are exceeded during operation of the machine, the machine control system will shut down the machine and a warning of the specific fault will appear on the control screen.

CONTROL DEFINITIONS

Contents

Control Definitions

NOTE: It is important that the operator of the SG10A read the Control Definitions chapter in this manual before proceeding any further.

The purpose of this chapter is to define the function of the buttons throughout the various screens. Certain button functions may not make sense right away in this chapter. As the operator reads through the Operating Instructions chapter of this manual, the function of these buttons will become clear.

NOTE: Not all modes of operation will be discussed in this Chapter. The function of several buttons and actions are the same in many modes. The description of a function or button operation will not be repeated if it exists in another mode. All modes of operation will be discussed in the Operations Section of this manual.

Computer and Controller System Safety for DM Controlled Machines

The computer and controller are located in the main rear electrical enclosure. This unit is a full computer, running Windows 7 64 Bit operating system. Contact the factory if more information on the computer system is required.

IMPORTANT The computer in this machine has the ability to connect to the World Wide Web via Ethernet or Wireless using a USB wireless (Wi-Fi) adapter. Updating the Rottler software should ONLY be done when directed to do so by a Rottler service technician. Updating Rottler Software when not directed by Rottler personnel could result in a non-operational machine.

It is recommended that the machine be hooked up to the Internet anytime it is on. The software on the machine will automatically connect to our server to send back useful information on machine status. It will also record performance parameters that will be used to evaluate any occurrence of a malfunction.

The Auto Update for the Windows Firewall (Security) and Windows Defender (Anti-Virus) is turned on. The computer will automatically download the updates and then install them when the computer is shut down every Friday night.

Any “IT” personnel should ***ALWAYS*** get approval from Rottler before doing ***ANYTHING*** on the computer.

⚠ WARNING Downloading ANY program from the Internet or by other means when not directed by Rottler is prohibited and will result in the machine warranty being NULL and VOID.

⚠ WARNING Downloading any program or changing any Rottler or Computer settings may cause the machine and/or software to become unstable. DO NOT install ANY screen saver, Anti-Virus, Spyware or any type of Security software on the computer. This could create a hazardous environment for the operator and personnel around the machine. Performing any of the above will also result in the machine warranty being NULL and VOID.

COMMON INTERFACE NOTICE

All Rottler machines using Direct Motion technology share a common control interface. This allows for a better environment for programing machine functions across a wide range of different machines. This also allows for easier deployment in shops already using Rottler Direct Motion machines. Because of the common interface some machines may have buttons and menu tabs that may not be applicable to the machine that is being used. If the buttons or menu tabs are not mentioned in the control definitions section of the manual, they will not be used in machine operation.

Master Power On/Off Switch

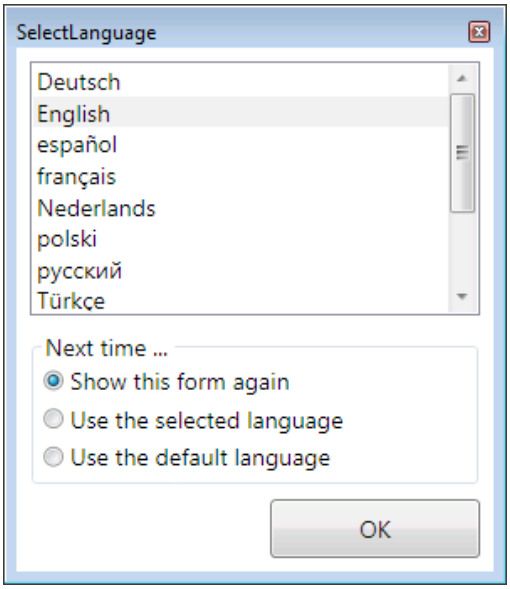
This switch is located on the main electrical control enclosure on back of the machine. The switch must be in the off position before opening the rear enclosure door. When first applying power to the machine the computer will need to boot up. Be patient, it will take several minutes to complete booting. The Rottler program will not automatically start. Double tap the Rottler_WPF icon on the screen to start Rottler. When turning the main power to the machine off there is a specific procedure to follow so as not to damage the computer. The computer must shut down its internal systems before main power is removed from it. Press the “Start” button in the left-hand side of the Start Bar. This will bring up the “Start Menu”. Press the “Shutdown” line at the bottom of the Start Menu. This will bring up a Pop Up menu, make sure that “shut down computer” is selected and press “OK”. This will shut down the computer. It is now OK to turn Main Power off to the machine.

Note: The Rottler SG10A uses a touch screen for control and data transfer to the computer. Be careful not to touch the screen until the machine has fully booted up and a Rottler screen is showing. If the screen is touched prior to full boot –up it may activate a function or interfere with proper boot-up.

Initialization Screen

The first screen to appear is the Rottler Manufacturing Start Up screen. Double click icon to start.

The next screen to appear will be the select language screen. Highlight language wanted and click OK

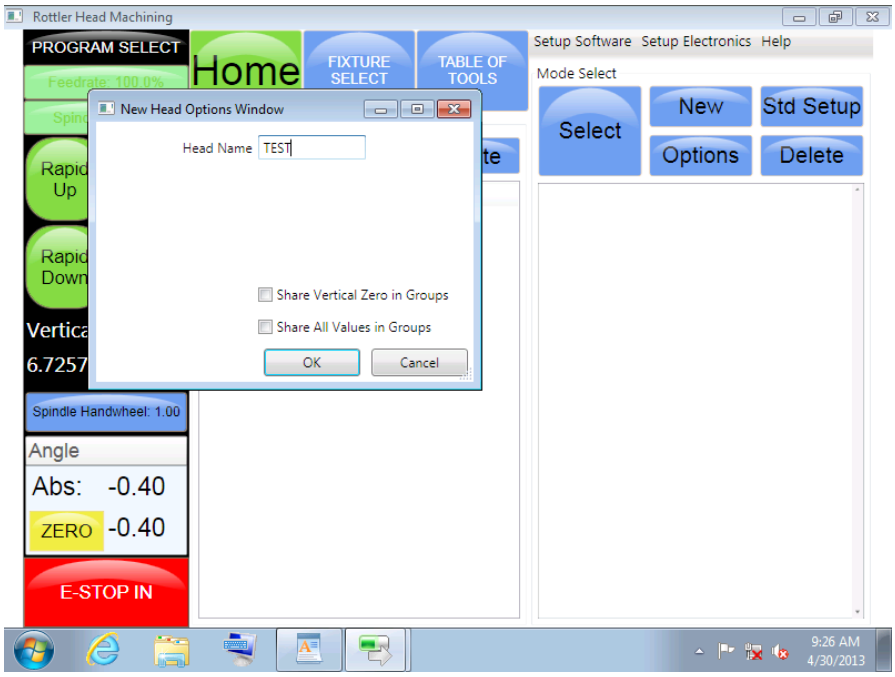


The next screen to appear is the program select screen.

Homing

1st thing you want to do when this screen appears is to HOME the machine. Buy pressing this button the computer will sync itself with the motors. This process must be done each time the SG10A has been shut off and restarted. If the HOME process is not done the machine will not operate.

Next press NEW under program select. Enter in the head name you are going to work on. (To do this either plug in the supplied keyboard or click on the on screen keyboard in the taskbar.) Then click OK



After this click on Std. Setup, a box will pop up saying “DELETE EVERYTHING” WARNING This will delete all existing block data in XXXXX and replace it with Std. Setup . Are you sure you want to precede? Press Yes. This screen will open.

Now you can start the operation you would like to do buy highlighting and pressing select.

Program select Buttons

These buttons work in all modes.

Rapid Up / Rapid Down

These buttons will move the spindle up or down quickly, it will stop when released.

Feed Up / Feed Down

These buttons will move the spindle up or down slowly, it will stop when released.

Spindle Handwheel

This button lets you rotate the spindle with the handwheel. You can speed this motion up by pressing and holding the spindle handwheel button until the screen pops up to change the speed.

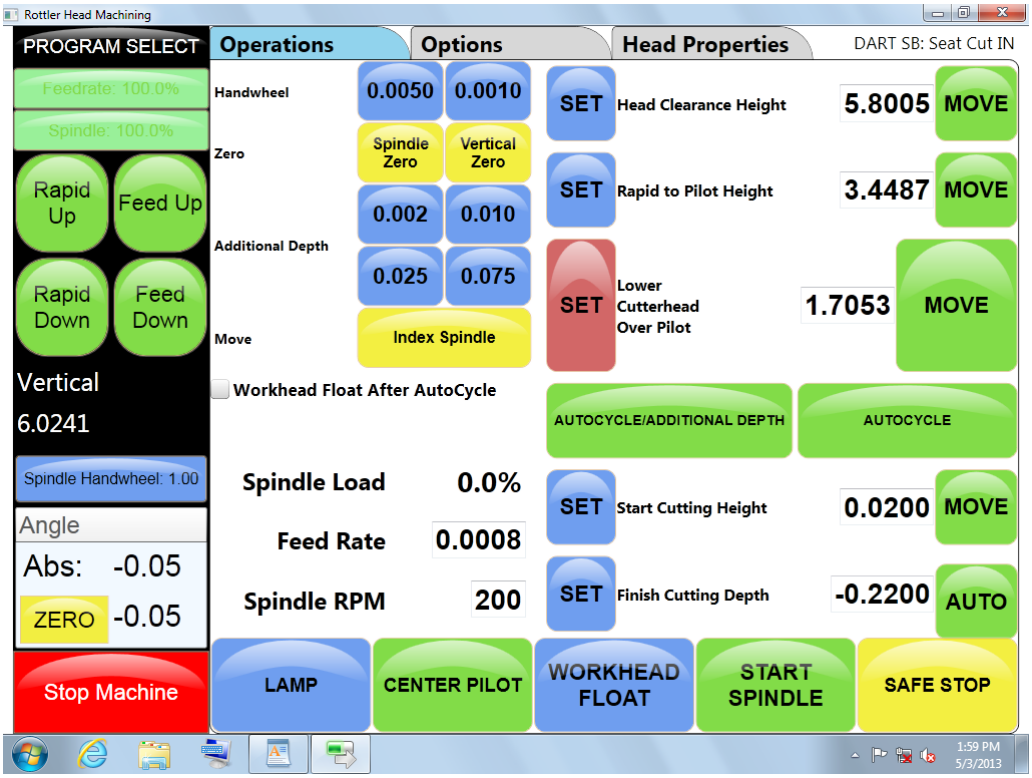
Feed rate override

You can lower and raise the FEED RATE when in the AutoCycle mode buy pressing this and turning handwheel.

Spindle override

You can change spindle RPM when in the AutoCycle mode buy pressing this and turning the handwheel.

These overrides work especially good when reaming and making long cuts in the seat counter bore and seat cut modes.



E STOP

By pressing this button the machine will stop running. Use this for **EMERGENCY** shutdown only. Engage by pressing the E STOP button. Release E-STOP by turning button clockwise until it releases and pops back out.

LAMP
Turns work light on and off

Center pilot
Locks and unlocks spindle sphere

WORKHEAD FLOAT
Floats workhead when pushed RED and clamps when pushed BLUE

START SPINDLE
Turns spindle on and off.

SAFE STOP
Immediately stops downward feed and goes to finish options mode

HANDWHEEL: 0.0100 / 0.0010
Press these and you can move the spindle up and down with the handwheel. 0.0100 moves .010 per click of the handwheel. 0.0010 moves the spindle .001 per click. Press and hold and you can change movement.

SPINDLE ZERO
Indexes spindle in the position you want after auto cycle. Manually rotate into desired position and press “Spindle Zero” after auto cycle spindle will return to this position.

V ERTICAL ZERO
Resets DRO to zero. Reference point all heights are set at. More on this later.

ADDITIONAL DEPTHS
Additional amount of material removed after auto cycle. If a seat does not clean up you can use these buttons to remove more material without changing finish cutting depth. Must be below “lower cutter head over pilot. “and workhead float after auto cycle must be unchecked. These can be reprogramed by pushing and holding the button and entering in a different figure.

Index spindle. Press this and spindle indexes to position set with “Spindle Zero” button

Workhead float after auto cycle:

If its checked it floats, if not it doesn’t, after auto cycle.

FEED RATE
Press and hold to set Feed rate

SPINDLE RPM
Press and hold to set spindle RPM

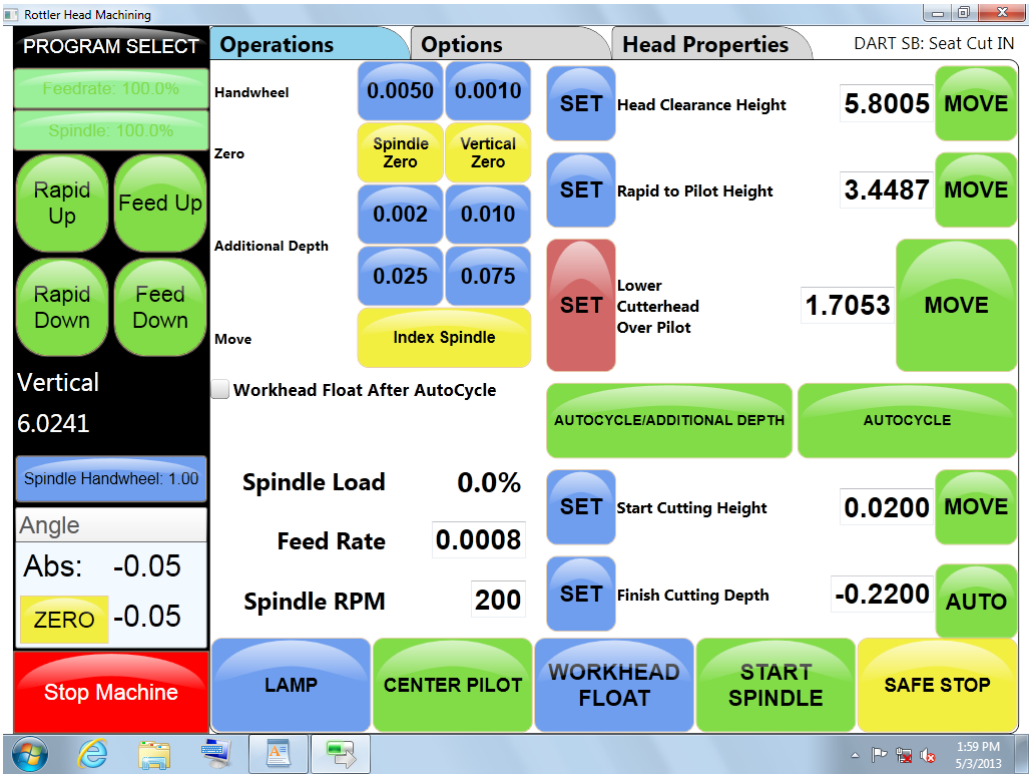
SET
Push and hold to set height. Whatever height the spindle is at will automatically be programed when pushed and held. This height is in reference to the preset vertical zero. More on this later.

MOVE
Push this and spindle will move to the position programed buy the SET button.

ANGLE
Abs - Actual angle the angle sensor is at.
Zero – press to “0” angle sensor. Abs will not change.

ALL OF THESE PREVIOUS BUTTONS WORK THE SAME IN ALL MODES

Seat Cut: Operations screen



Vertical Zero

This is the first step you need to do to set up your program. All of the height figures entered will start from this position. This number represents the spindle vertical position. The “zero” position is when the cutting insert first comes in contact with the seat it is cutting. To set this the head needs to be leveled and all tooling set to cut. (This will be discussed in later chapter.)

You will want to set this on the highest seat. Float workhead and manually lower spindle (with handwheel, press the .001 handwheel button and use handwheel, pictured on right) into cutting position so cutting insert is close to seat but not touching. Let workhead dwell for a couple seconds and then clamp workhead. Start spindle and press the .001 handwheel button on top of page, lower spindle with handwheel one click (.001) at a time until the cutter just comes into contact with seat. Then back off 1 click and stop spindle. Press the yellow “VERTICAL ZERO” button on top of page. A box will ask are you sure you want to vertical zero, press OK. You will notice that the vertical box on left has changed to “0.000” Now the rest of the heights can be set.

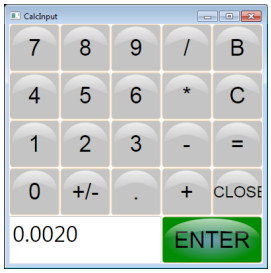
Setting The Rest Of The Heights

Raise the spindle with the rapid up or feed up button until the end of the pilot (using unipilot system) or cutter head (std. system) clears and can float guide to guide without interference, press and hold the “HEAD CLEARANCE HEIGHT “ set button until the figure changes. You will notice that this figure has changed and is now the same as the vertical figure on left.

Next, lower spindle with feed down or handwheel until the tip of pilot (unipilot system) is just above the top of valve guide. Or until the cutter head (std. system) is just above the pilot. Press and hold the “RAPID TO PILOT HEIGHT” button until figure changes. Next, lower spindle until pilot is 1/2” into guide (unipilot system) or tool holder is over pilot 1/2” (std. system) press and hold the “LOWER CUTTERHEAD OVER PILOT” button until figure changes.

Next we need to set the “START CUTTING HEIGHT” This is where the spindle will start turning. This height needs to be above the highest seat. Usually .020-.030 is safe. If you know seats are all equal you can go lower but it is possible to crash machine if not careful here. I would suggest not going any closer until you have good experience with the machine.

To set this tap on the figure next to the MOVE button. A keyboard will pop up, enter in your height (.030) and press ENTER.



Last is to set the “FINISH CUTTING DEPTH” same thing here, tap the figure next to the MOVE button and enter in your depth you want to cut (.-003 is a good starting point) you must also tap the +/- button before you push ENTER. This will make the figure a negative number. This is how much below the preset vertical zero the machine will cut the seat.

Retract height: Set where spindle retracts to after cutting is done by taping any of the “SET buttons. When this is done the button will turn RED. This is where the spindle will retract to after cutting.

Set workhead float after auto cycle buy checking box.

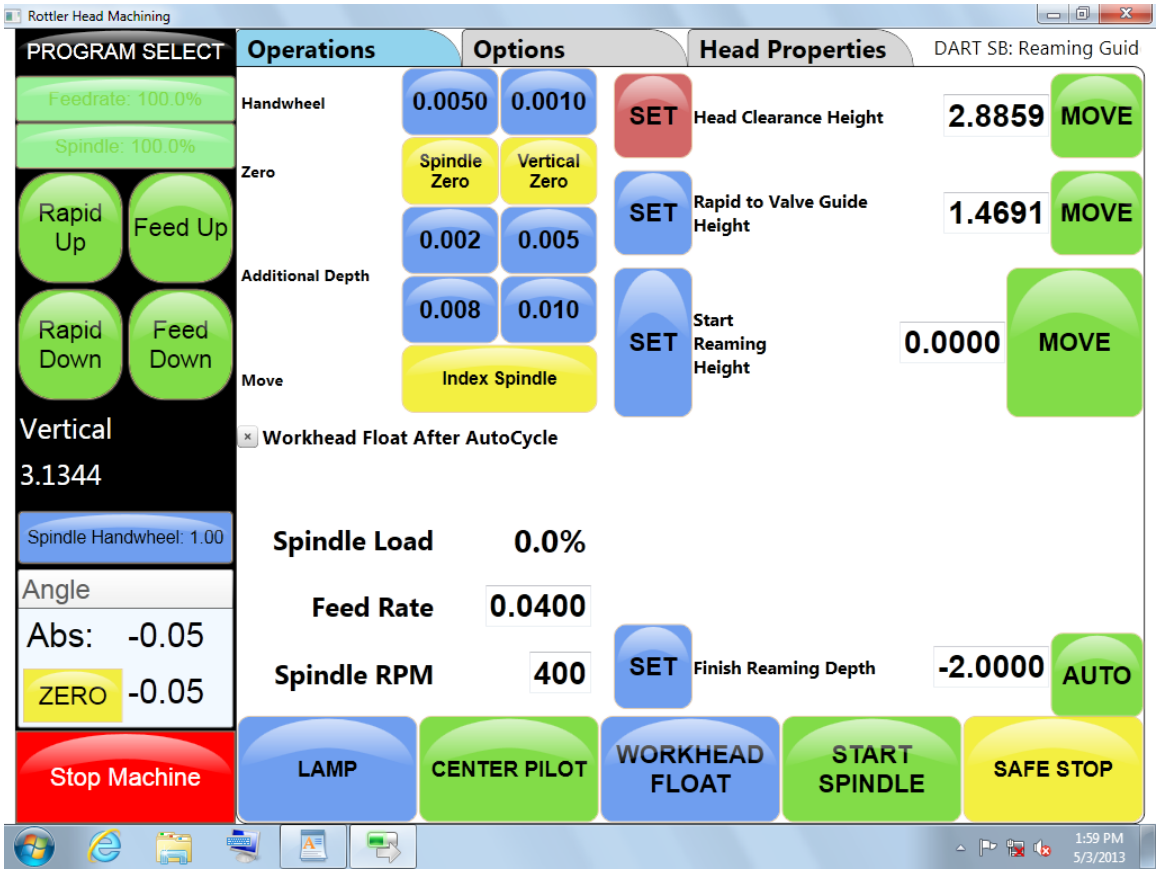
CAUTION Make sure the Head Clearance Height is sufficient for the Tool holder or pilot to clear the Cylinder Head and the fixture when moving the work Head across.

The Vertical stops have now been set. These steps have to be done on every new cylinder head. This information will be save on the Head Selection mode. Is importing to save changes every time you getting out of each mode. The next time you pull up the mode all settings will be stored. All you have to do is set your “vertical zero” and you are ready to go.

Seat Counter Boring Screen

This will be the same seat cutting except for the vertical zero position. This is set when the counter bore cutter first comes into contact with the casting it will be cutting.

Reaming Program: Operations Screen



Vertical Zero

Set this height when tip of reamer just contacts head surface or top of guide. Your choice.

HEAD CLEARANCE HEIGHT and **RAPID TO VALVE GUIDE HEIGHT** is same as previously described.

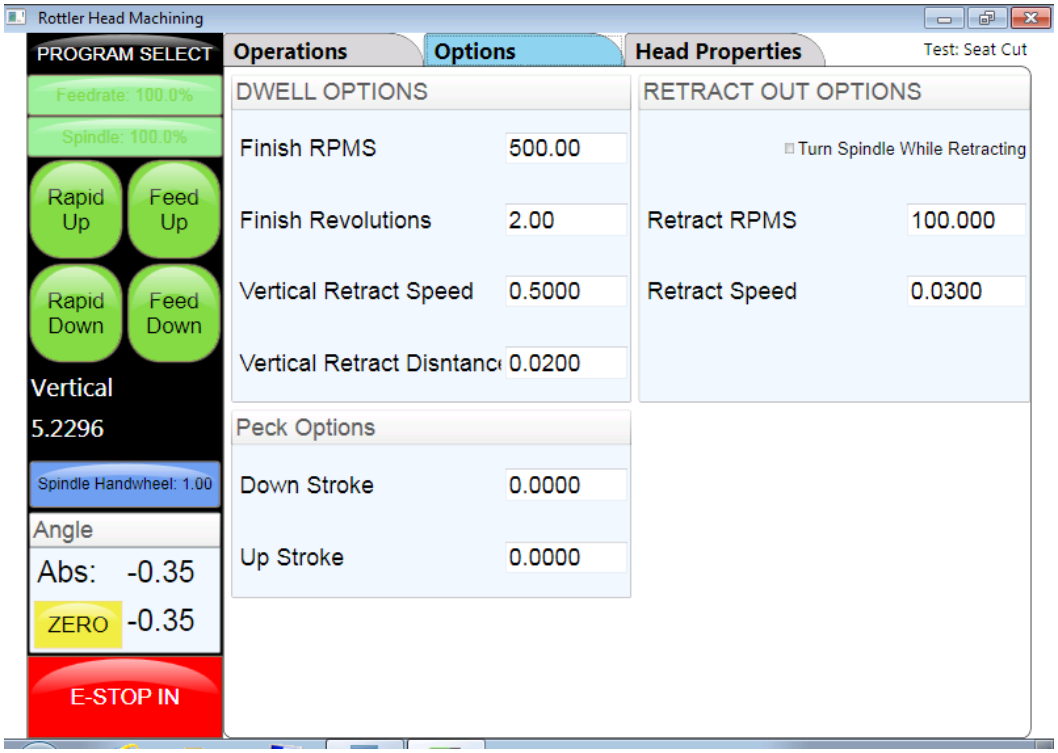
Start Cutting Height

Is set when reamer pilot is into guide enough to center but not yet to cutting edges.

Finish Cutting Depth

Is length of guide being cut. Add guide length to “start reaming height “ figure and add .100 to be safe. Remember to push the +/- for a negative #.

Options Screen



Dwell Options

After finish “cutting depth” in the “seat cutting” and “seat counter boring” mode the “dwell options” go into effect. This means that after the finish cutting depth has been reached the machine will go to this stage. 500 RPM for 2 revolutions of the cutter then retract .020 at a rate of .0500. You can change all of these figures buy taping the figure and entering in your own figures. Normally you shouldn’t have to change the “vertical retract speed” and the “vertical retract distance” The “finish revolutions shouldn’t need to be changed either, you will want a minimum of 2 revolutions here to clean seat after it has been cut. If you enter to many revolutions cutter will drag and possibly cause chatter. Finish RPMs is the one you will need to change the most. Start with 100 RPM above cutting speed used . if you hear or see chatter after seat is cut, slow this down to cutting speed or below. Chatter usually goes away with a slower speed.

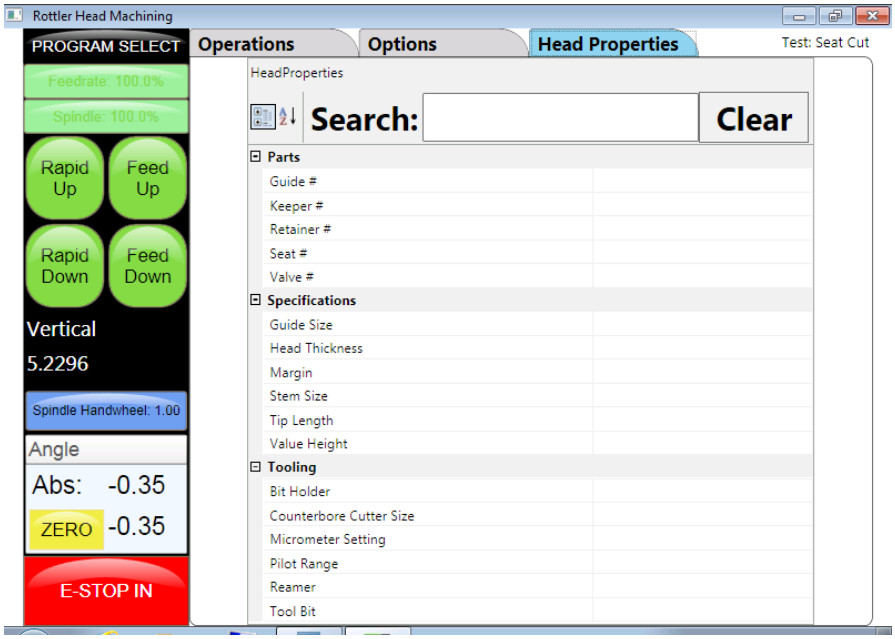
Retract Out Options

This is used in the reaming program. After “finish reaming depth” has been reached, the retract out options go into effect. “Retract RPM” should be set at 100 “Retract Speed “ should be set at .5000 The “Turn spindle while retracting “ box SHOULD be checked.

Peck Options

This works with all modes. It works well when making heavy cuts. Buy entering a number in the “Down stroke” space the spindle will cut down this amount then come up the amount entered in the “upstroke” space. Then repeat until finish cutting depths are reached.

Head Property Screen



In this page you can enter in all head information, it will be saved into the head program you are in.

General Information

Once selected, all operations of the SG10A can perform are stored in that Cylinder Head model.

The following is a more detailed list on the head selecting screen.

Program Select

This screen allows you to select, create, edit or delete a Cylinder Head model.

This will change the screen to the MODE SELECT Screen.

New
Pressing this button will bring up page to ADD new head programs . Using the keyboard, type the desired name for your head, click OK. This will add the head to the list on the left.

Options
To Edit a Cylinder Head Model name, select a Cylinder Head from the list on the left and then press Options. This will put the name of the selected head on the screen. Use the keyboard to edit the name, press OK when finished.

Delete
To delete a head, select the head from the list on the left. Press the DELETE button. The screen will ask you if you want to delete the Head. Select YES or No

Mode Select

One you have selected a head, go to mode select on right half of page.

New
This will pull up different modes available for each head. (The BREAK IN mode is for factory break in only and will not be needed buy consumer.)

Options
To edit a mode select name click here and use keyboard to change. Example – change “Seat Cut” to “Seat Cut INTAKE” or just” INTAKE” press OK when done.

Delete
To delete an operation simply highlight and press delete. . The screen will ask you if you want to delete the operation. Select YES or No

OPERATING INSTRUCTIONS

Contents

Operating Instructions

Mounting Tool Sharpener

Mount tool sharpener on right hand side of machine using the cap screw provided with machine.

Rottler Tool Bit Sharpener

When you sharpener the Rottler form Carbide bits, consists in restoring the tool cutting angle by grinding the face.

To sharp the carbide bit must be fitted on the bit holder also fitted on the tool holder.

The tool holder will be placed on the adjustable 3/8 fixture of the tool sharpener.

Slide the tool holder on the fixture, and release the adjusting knob.

Adjust the fixture to bring the carbide bit flat against the grinding wheel.

Make sure the carbide tip face is perfectly parallel to the wheel face by pushing it with the thumb.

Once a good setting is achieved, lock the adjusting knob.

Before to start the grinding motor, move the carbide bit away from the wheel by rotating the tool holder.

The motor should then be started and the carbide tip face will just be cleaned.

There is no need to remove a lot of stock from the carbide bit. Sharpening only consists in providing a new cutting face.

Built In Venturi Vacuum Tester

Designed to test valve seat and seat surface seal, and particularly to measure the valve seat surface quality after machining. Including a set of 7 pads and connecting extension to fit must common ports.

Mounting Cylinder Heads

360 Degree Rollover Fixtures

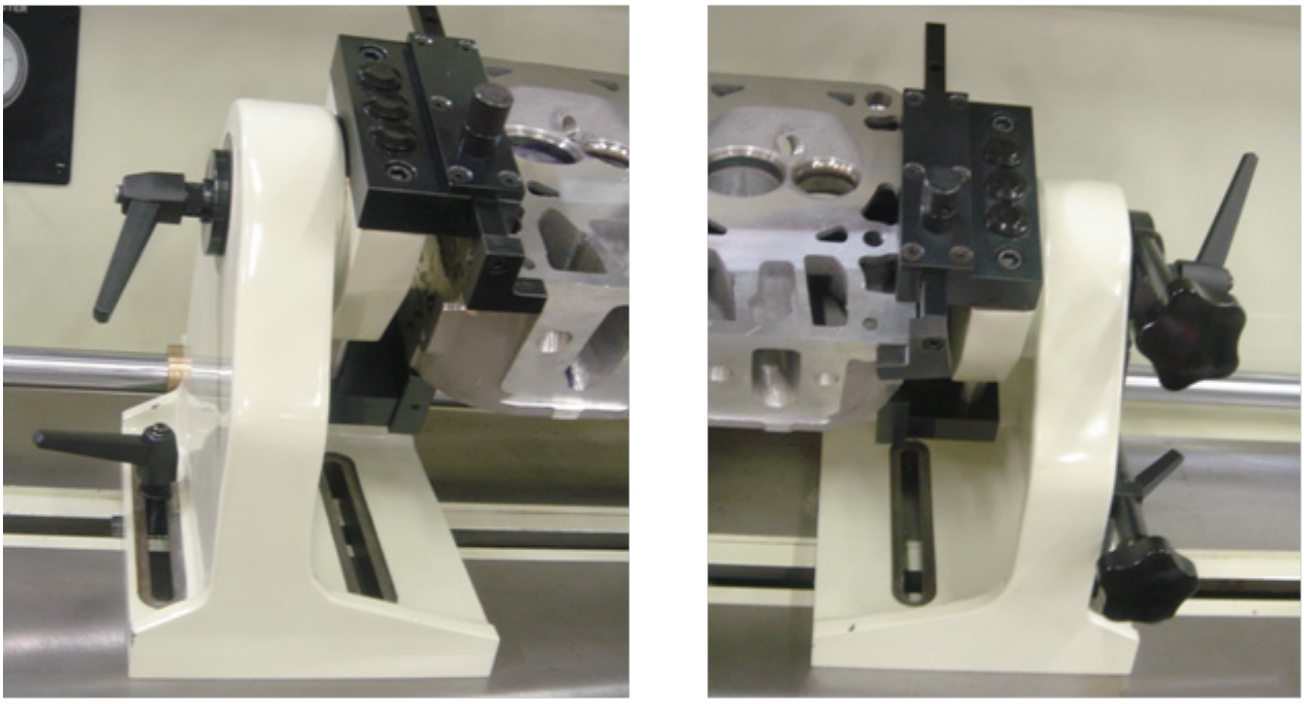
Initial clamp height adjustments to the head trunnions can be accomplished by measuring the head thickness then raising the turning clamping block assembly to the appropriate height using the clamping block acme screws. A 10mm T-handle allen wrench works well.

Measure the length of the cylinder head. Spread the trunnion assemblies apart from each other so that the cylinder head can be clamped in between the trunnions.

Each support has an adjustable stop, located to the front. The stops have indents, allowing a number of different settings. Position of the stops must be checked for each cylinder head put on the supports. In most cases we will install the cylinder head deck side down with the exhaust side of the head against the adjustable stops.

This is particularly true of wedge style heads. It is necessary for the clamps to thrust the cylinder head against the stops when clamped. When heads are mounted in this fashion, the tallest portion of the combustion chamber will be at the rear of the machine when the head is rotated into the working position. Try to keep the valve guide center line parallel to the trunnion centerline. (Figure 4)

FIGURE 4

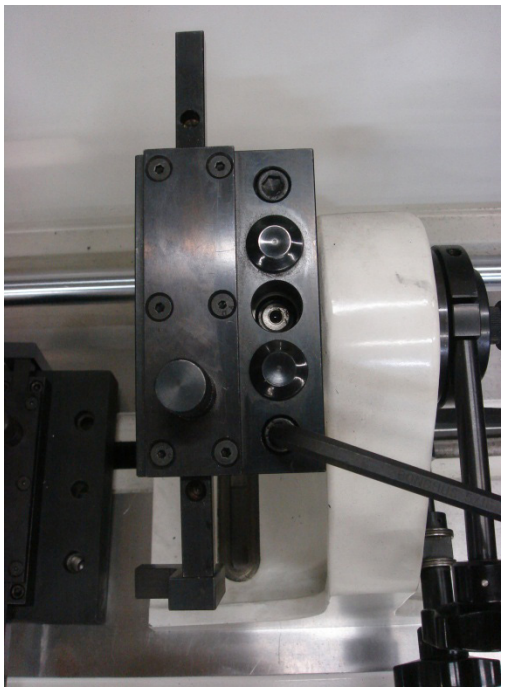


Utilize the grooves in the table to align the trunnion supports square to the machine.

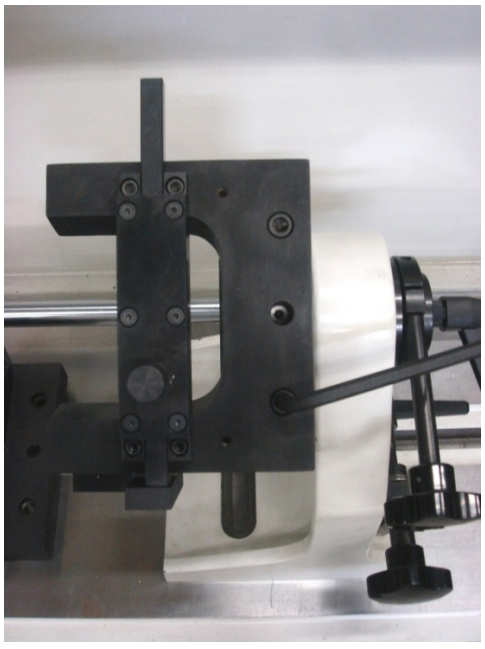
The Quick-Clamp head mounting fixture is provided to accommodate cylinder heads that are difficult to mount directly into the trunions. Some machine operators prefer to use the Quick-Clamp fixture for the majority of heads they do as the mounting is very quick.

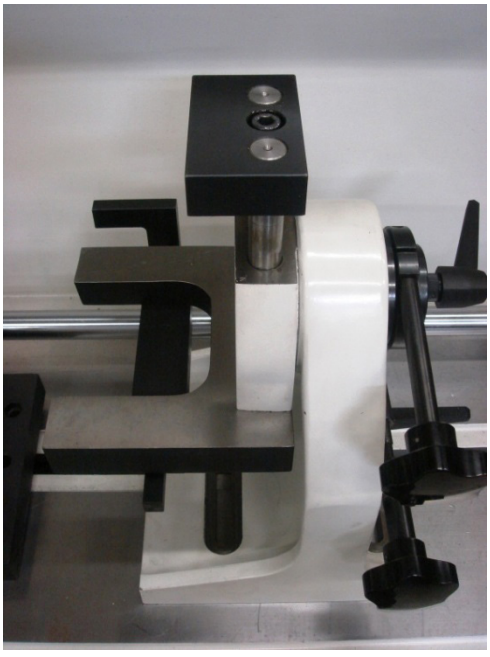
Overhead Cam C Clamp System

Using 10mm Allen wrench, remove the existing lower fixed plate on the 360 degree fixture (left and right)



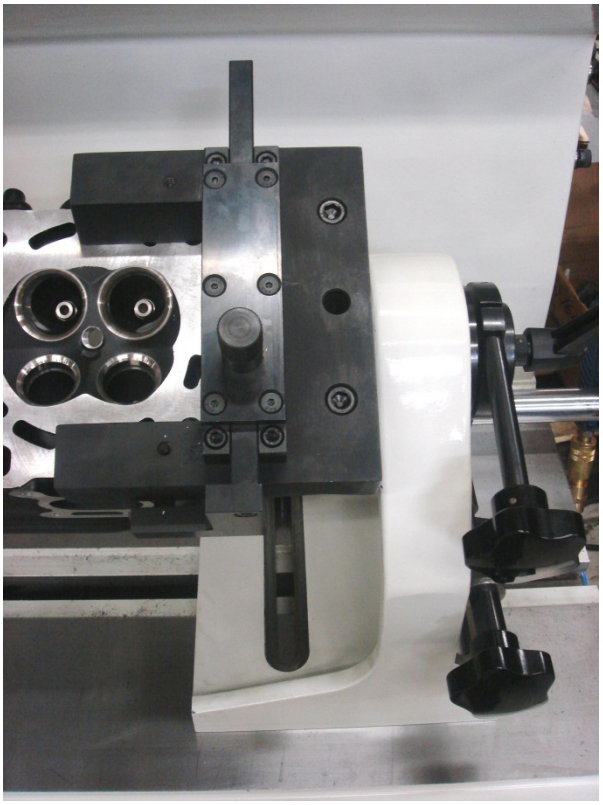
Install the C Clamp, you must use the two bolts included with the fixture and make sure is good and tight

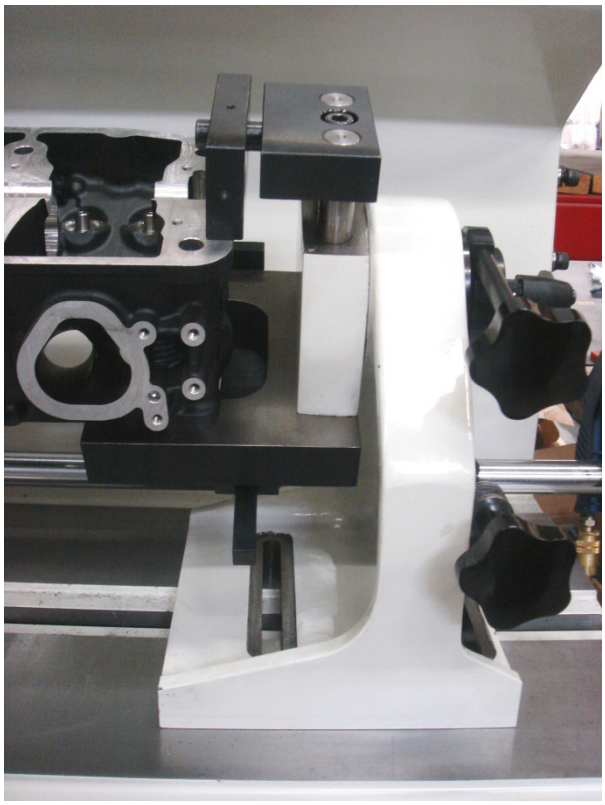




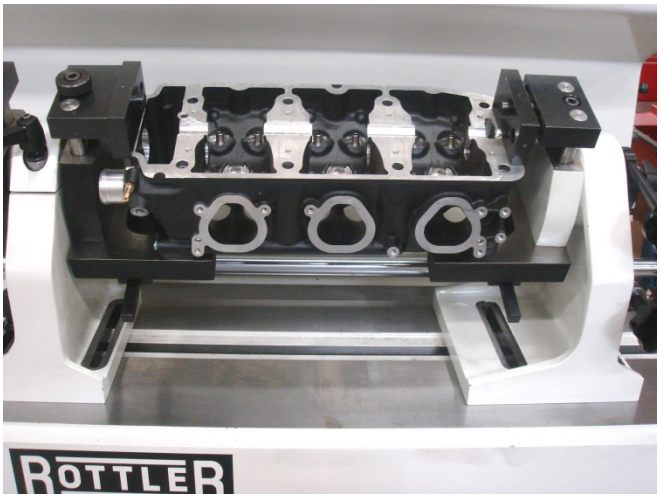
The cylinder head gasket surface must be against the machined surface of the U Clamp Fixture; Slide the stopper rod equally and push the cylinder heads against the stopper rods.

Note: for some cylinder heads, you make need a spacer against between the cylinder head and the stopper rod (not included)





The Quick-Clamp frame is mounted between the trunnions and clamped using the clamping plates. (See Pictures) The cylinder head is then held to the frame with the swivel clamp assemblies through the appropriate head bolt holes or used the standard clamp plates.



On This cylinder head they using both C frames

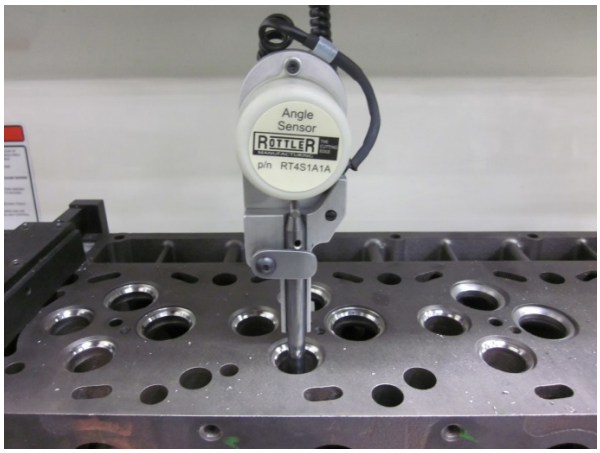
Alignment and Setup

Alignment and setup applies to both the cylinder head and the machine's floating head. The goal is to get perfectly align to the spindle centerline of the area of the head to be machined. Most machining operations on cylinder heads use the valve guide centerline as the reference point so we will use that as an example.

Note: think of the digital electronic level as a comparator. Because the leveling pin is square to the machines spindle, as long as you achieve the same readings front to rear and side to side then the spindle will be in perfect alignment.

Front to Rear Cylinder Head Alignment

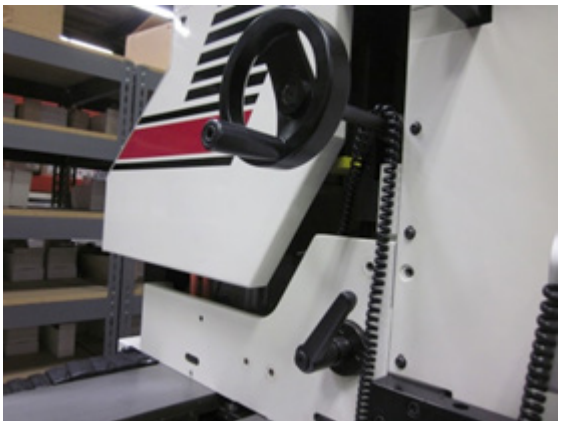
Position the level on level pin to read front to rear and take a reading. Rotate the cylinder head so that the valve seats are facing up. Now place the level on a pilot in the cylinder head and position the level to read front to rear. Loosen the lock levers on the supports. Be certain the fine adjustment lock screw is loosened. Coarse adjustment is made by turning the work piece manually, until the level reading is within a couple of degrees of the reading on the leveling post.



Lightly tighten the lock levers on the supports to remove any play. Now tighten the clamp on the fine adjustment screw. Turn the adjustment knob to achieve the exact reading that was observed on the leveling post. You can now completely tighten both the left and right support locks.

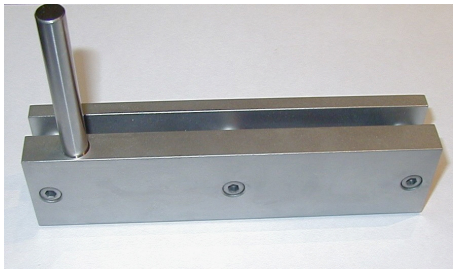
Left to Right Alignment

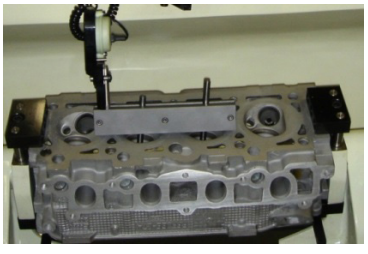
Obtain the left to right reading from a pilot mounted in a guide in the cylinder head. Now place the level on the leveling post . Loosen both of the tilt lock levers on each side of the quill housing. Use the tilt adjusting hand wheel to adjust the reading to be the same as that found on the pilot in the cylinder head. Tighten the tilt lock levers.



Canted Valve Cylinder Heads (Automotive Application)

An optional alignment bar is available that helps establish the front to back alignment on canted valve cylinder heads. The bar is held against two pilots in two adjacent guides. Use the alignment post to adjust the angle. (See Picture)





NOTE: It is important that the operator of the SG10A read the Control Definitions chapter in this manual before proceeding any further.

Three Angle Seat Cutting

1. Place the ball drive adapter in the spindle.
2. Align spindle to valve guide.
3. Place a valve in the setting fixture. Position the pointer on the valve where you wish to place the top of the seat.
4. Remove the valve; replace it with the correct pilot.
5. Select the proper diameter tool holder. Place the carbide insert in tool holder. Slide tool holder onto ball head.
6. Place ball head over the pilot in setting fixture. Use radial adjusting screw to set diameter of cutter to correspond to position of pointer on setting fixture.
7. Tighten hex socket screws on bottom of ball head. See figure 9
8. Remove ball head assembly from setting fixture. Place fixed carbide pilot in cylinder head.
9. Center the spherical ball head toolholder over the pilot shank.
10. Required spindle rotation speed will vary, depending on seat hardness. As seat hardness increases, so does the required spindle speed. Some will require full speed.
11. Special care should be taken in centering the floating head above the valve guide, to achieve a concentric seat.
12. Cut seat only enough to clean up surface.

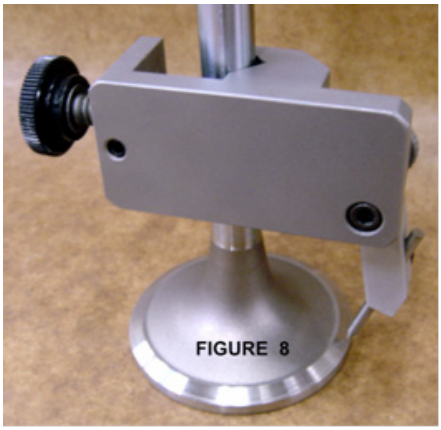


FIGURE 8

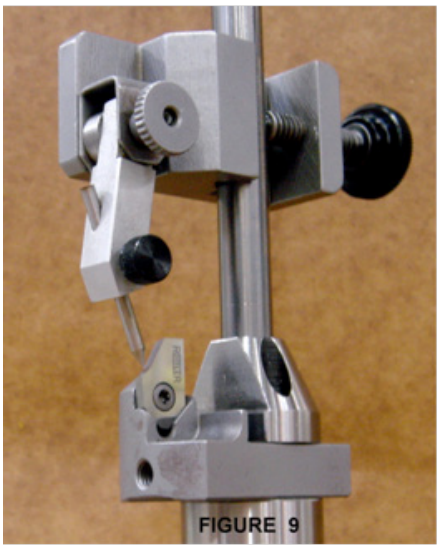


FIGURE 9

Too much cutting will sink the valve too far in the head. Many operators prefer to use the spindle fine feed when machining seats as extreme control of spindle down feed can be accomplished.

The capacity of the Rottler SG80A associated with a complete tooling range allow working on seats of diameters up to 210 millimeters (8.25”).

Four tooling ranges are possible:

1) For seats diameters between 18 and 60 mm (0.71’’- 2.4’’): tool holder BH375R1 or UPTSH375R1 and tip holder TH2000 for seat range .710” - 1.180” (18mm-30mm) or TH2001 for seat range 1.100” - 1.570” (28mm-42mm) or TH2002 for seat range 1.570” - 2.360” (40mm-60mm), with 9,52 mm (3/8 ’’) pilots of shank diameter

2) For seats diameters between 40 and 80 mm (1,570”- 3.150”): tool holder BH375WR1 or UPTSH375WR1and tip holder TH2003 for seat range . 1.570’’ - 2.360’’ (40mm - 60mm) or TH2004 for seat range 2.280” - 3.150” (58mm - 80mm), with pilots with 9,52 mm (3/8 ’’) shank diameter

3) For seats diameters between 60 and 110 mm (2,362” – 4.330”): tool holder BH20R and tip holder TH3005 or TH3006 for pilots with 20mm shank

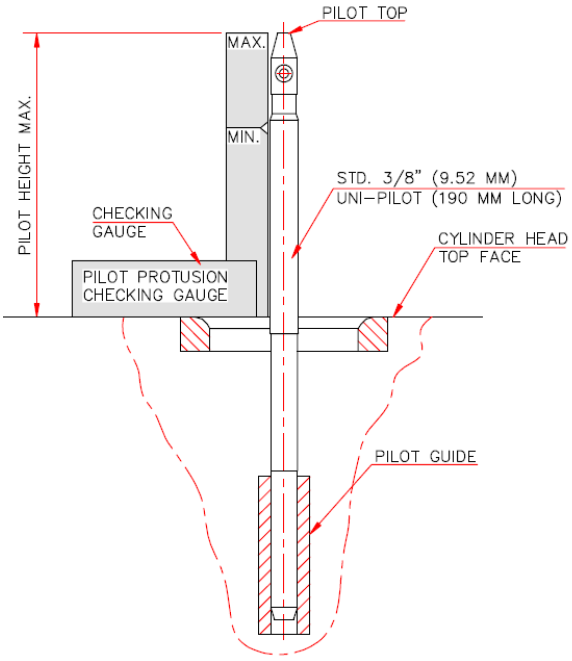
4) For seats diameters between 95 and 150 mm (3.740” – 5.905): tool holder BH20RW and tip holder TH3007 or TH3008 for pilots with 20mm shank

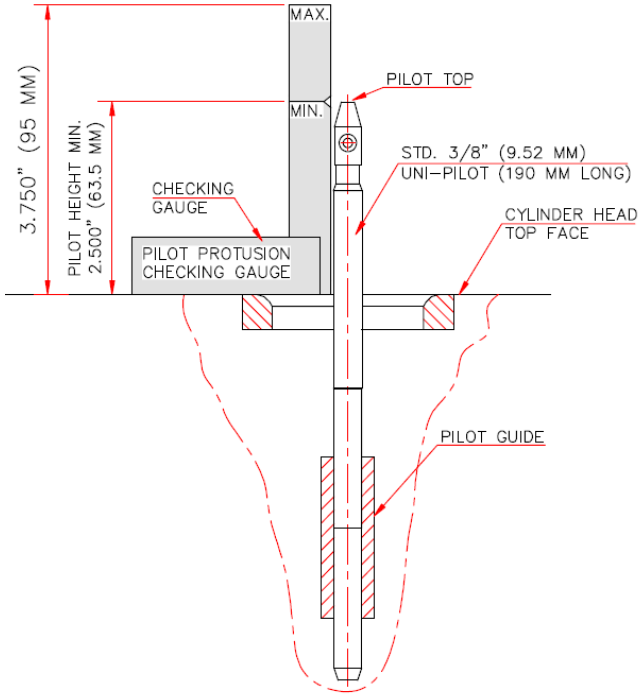
IMPORTANT: When the form tips, the square tips or the triangle inserts are fitted, check that their reference faces are perfectly clean. The accuracy of the seat angles depends on this.

Checking Working Range of UNI-PILOT

Checking Procedure

1. Insert Standard 3/8 (9.52mm) Shank diameter UNI-PILOT in the cylinder head valve guide.
2. Place checking gauge along pilot section that is exposed above cylinder head surface.
3. If pilot top is within Min & Max range of the gauge, then you may proceed with machining seat.
4. If pilot top is above Max range on gauge a smaller diameter pilot must be used.
5. If pilot top is below Min range mark on gauge a larger pilot must be used.





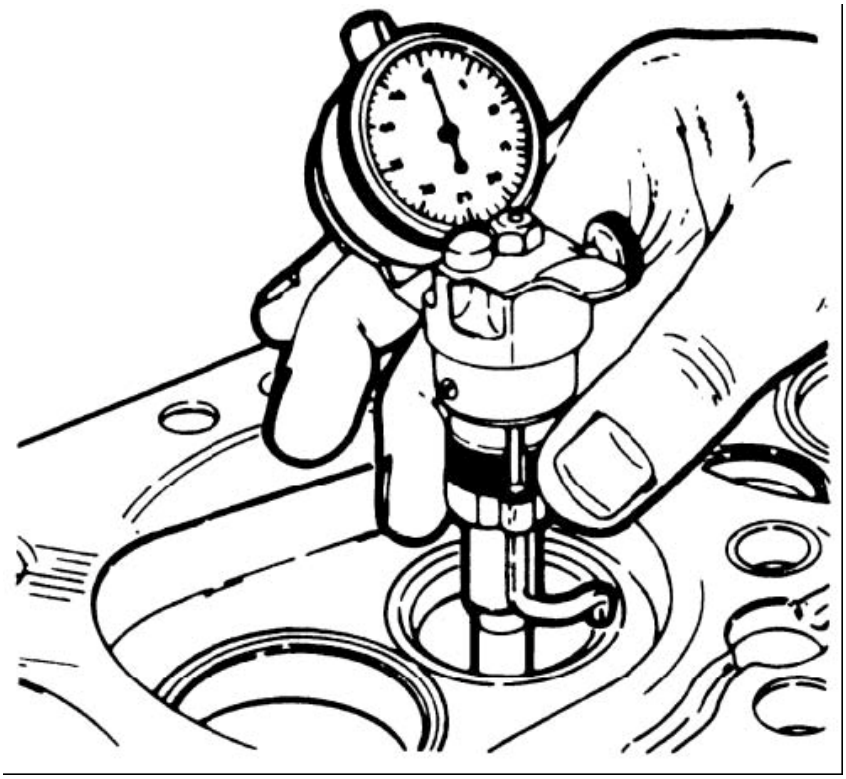
Checking Valve Seat Concentricity

Make sure pilot and valve seat to be measured are free from dust, burrs, etc. A drop of oil or similar lubricant on valve seat will aid measuring. Loosen brass locking screw and lower dial gauge down over pilot. Make certain the tip of the probe is centered on the valve seat to be inspected.

Grasp brass frame in middle of gauge and move upward approximately 1/8". The dial pointer should move as this is done. Center the pointer of the indicator pointing upward and lock the gauge to the pilot using the brass locking screw. Test proper alignment by moving the brass frame up and down. The pointer should move.

Set the pointer at (0) by turning the dial face.

Inspect the seat run out by rotating the probe around the valve seat by twisting the knurled sleeve with your fingers. Each number on the dial indicator is equal to 0.001", (0.0254mm) run out of the valve seat. Each mark on the dial indicator is equal to 0.0001", (0.00254mm) run out of the valve seat.



Machining Seats

1. After all height settings are made, you now are ready to cut seats. Cut counter bores
2. Set “feed rate”.0008 is a good starting point.
3. Set “spindle RPM” 400 is a good starting point.
4. Set “retract height”
5. Set ” workhead float after auto cycle” to float or not to float after auto cycle.
6. Best to set “retraction height” to “lower cutter head over pilot” height and uncheck “float after auto cycle” on the first seat cut. This way if the seat doesn’t cut you can use the additional depth buttons and auto cycle without float.
7. Float workhead over seat to be machined.
8. Press “Rapid to valve guide height” MOVE button. This will lower spindle into position just above guide or pilot.
9. Tap “lower cutter head over pilot” height MOVE button. This is a JOG button and only moves the spindle down when it is being pressed. Let up and spindle stops. Align the pilot and keep taping this until the preset depth is met, workhead float will automatically switch to clamp.
10. Press “AUTO CYCLE” This will “float workhead”, lower spindle to “start cutting height”, dwell to center and “clamp workhead”, turn urn on spindle, cut to “finish cutting depth” and then retract to preset “retract height” floating if checked.
11. At this point, if you have retracted to “lower cutter head over pilot” and workhead is not floating, you can push any of the additional depth buttons and tap “ auto cycle without float” a box will appear asking if you want to add this depth to your “finish cutting depth” if you press yes, the “finish cutting depth” figure you have entered will be changed. If you press no it will cut the additional depth but not change your pre entered figure.

Reaming Guides

1. After all heights are set you are now ready to ream guides.
2. Set “feed rate” .030 is a good starting point.
3. Set “spindle RPM” 200 is a good starting point.
4. Set “retraction height”
5. Set “workhead float after auto cycle “
6. Float workhead over guide to be reamed.
7. Press “rapid to valve guide height”
8. Tap “start reaming height” jog button, works same as “lower cutter head over pilot” button.
9. Press “finish reaming depth “ AUTO button. Spindle will start and ream to the finished reaming depth figure, slow to preset retract RPM and retract to start reaming height while turning, stop turning and retract to the preset “retract height” floating is checked.

Changing the Spindle Adapters

Once that you have the tool holder setup, fit the ball head tool holder into the spring free spindle adapter.

The SG10A spindle has been engineered to allow ultra fast tooling changes.

Make sure the that spindle spring free locking nut is in the off lock position, line up the two ears of the spindle adapter and insert into the spindle ISO 30 taper. The locking nut automatically will be on the lock position, to remove turn the self-locking nut to the left position, hold the spindle adapter, it may drop on the machine table. Damage will result.

Installing the Spherical self Aligning Toolholder

Once the spring free adapter is in the spindle, fit the Rottler Spherical Self aligning Tool holder assembly into the spindle adapter; make sure to align the locator pins before you fit it into the spindle adapter and push it until you feel that is lock.

UNIPILOT Centralizing Pilots

Rottler UNIPILOT Solid Carbide Centralizing Pilots are manufactured from fine grain, sintered tungsten carbide and are ground to a very high degree of accuracy, straightness, and surface finish. They are designed for a lifetime of precision machining

Pilot Diameter

The straight/parallel part of the pilot that fits in to the valve guide is referred to as the pilot diameter. Rottler pilots are available in 0.01mm (0.0004”) increments. For best results, the clearance between the pilot and valve guide should not be more than 0.01mm (0.0004”)

Most new valve guides are manufactured to a nominal size and the valve stem diameters are manufactured to be smaller than the nominal size to allow clearance for heat expansion of the valve stem when the engine is operating. For example: a 7mm valve guide has an internal diameter of exactly 7.00mm (.2756”) The valve stem diameter of the intake valve is 6.98mm (.2748”) and the exhaust is 6.96mm (.2740”). In order for the pilot to fit most of the valve guides, the first choice could be UCP0699 to give .01mm (0.0004”) clearance. If the valve guide is used and has some wear, then the second choice of pilot could be UCP0700 (0.2756”).

Shank Diameter

The part of the pilot that fits inside the tool holder is referred to as the shank. Rottler offers three different shank sizes (6.00mm, 9.52mm, and 20.00mm). For longest tool life and best seat cutting results, the shank needs to go as far as possible inside the tool holder when cutting valve seats or boring out valve seat housings.

Extended Length (EL) Pilots

Some cylinder heads require extended length pilots because the distance from the top of the valve guide to the head gasket surface is longer than normal. Normally this distance is about 1.0” - 1.5”, it is when this distance becomes greater that extended length pilots are needed. The pilots are extended by adding material below the shank and above the tapered section of the pilot.

If you think you need an extended length pilot, please see the order form in the back of the catalog and contact Rottler for ordering assistance.

PILOT DIAMETER SHOULD ALWAYS BE GREAT ER THAN VALVE STEM DIAMETER FOR BEST CONCENTRICITY

Modular Carbide Centralizing Pilot System for Valve Guides Over 0.875" (22.23mm)

Rottler also offers a modular carbide centralizing pilot system for very large engine applications. This system is versatile because it allows you to use different size sleeves, which are adjustable for different lengths, for different applications while using only one pilot. These sleeves are MADE TO ORDER.

Contact Rottler for more information and ordering assistance.

FCM20EL380 Modular Carbide Centralizing Pilot for Valve Guides Over 0.875" (22.23mm). Requires a set of Interchangeable Sleeves (FCMSLXXX & FCMSUXXX) - 20mmShank Pilot

FCMSUXXX Modular Pilot Upper (Tapered) Sleeve - Hardened and Heat Treated - For .XXX" (XX.XXmm) Guide ID

FCMSLXXX Modular Pilot Lower (Straight) Sleeve - Hardened and Heat Treated - For .XXX" (XX.XXmm Guide ID - 3.0" Overall Length

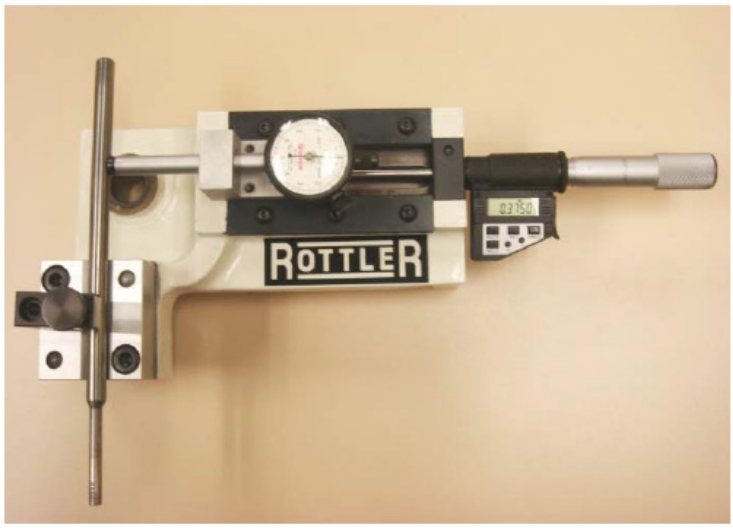
Carbide Inserts

See Carbide Insert Catalog for a complete list of Insert Profiles available from Rottler Manufacturing.

Special Profiles

Special Profile Cutter Inserts can be manufactured to your exact specifications and can include a combination of angles and radius blends. See insert list and profile catalog for custom order form.

Rottler Six and One Instructions



1- Checking the calibration of the six and one Setting Fixture included two tool setting fixtures, 1.250" / 31.750MM and .375" / 9.52MM and on the other end is 6.00MM. On the picture you will see master setting tool (.375" / 9.52MM) this one also will be using it to set you tool holders, for.375" (9.52mm) and 6.00MM ID tooling.,

Fig.1

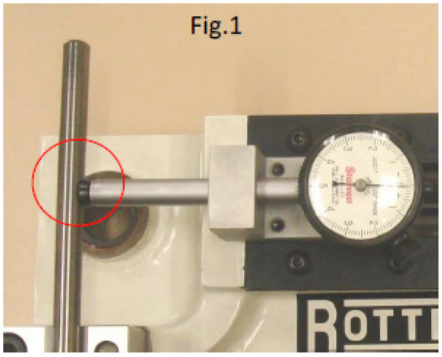
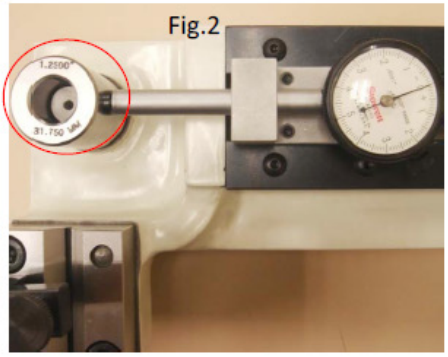
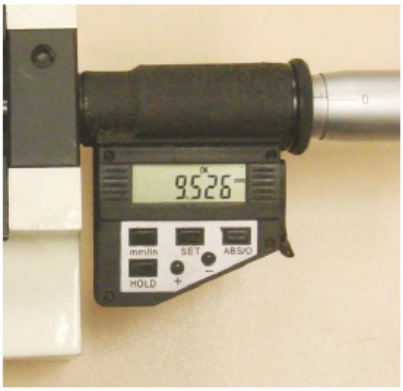


Fig.2



Calibrating the Digital Micrometer

2- Turn the digital micrometer thimble in until the end of the micrometer is flush with the edge of the micrometer frame. Then turn the thimble out until the '0' mark on the thimble lines up exactly with the line on the barrel (see fig.1).



a. Select mode: Press the **mm/in** button until the desired mode is shown in the digital display.
***Note**: use a small instrument such as a pen to gently push the buttons; they are quite small and a bit delicate.*

b. Determine which calibrating setting tool you will be using to calibrate the micrometer is going to be used on. (example; calibrating pilot .375" / 952mm side)

c. Press and hold the **SET** button, then press **+** or **–** button. "SET" will be flash in the display. This will places the micrometer in the edit mode

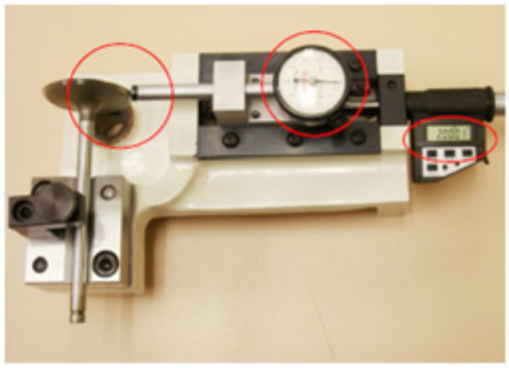
d. Press and hold the **+** or **–** buttons to change the display number to the minimum set diameter Determined earlier (example; setting tool, pilot .375" / 9.52mm side).

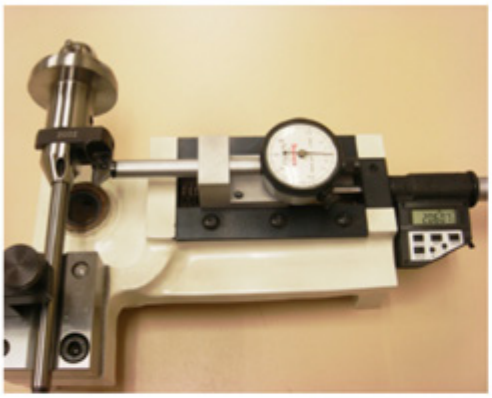
e. After it reach the proper reading, press the **SET** button to exit the edit mode. **"SET"** should no longer be shown in the display. The digital micrometer head is now set to the setting tool. (After initial setting, there is no need to press the SET button again unless display is lost at which time the micrometer must be reset)

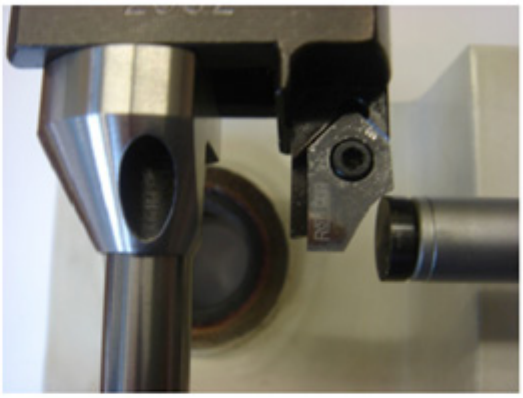
3- MEASURE THE HEAD OF THE VALVE

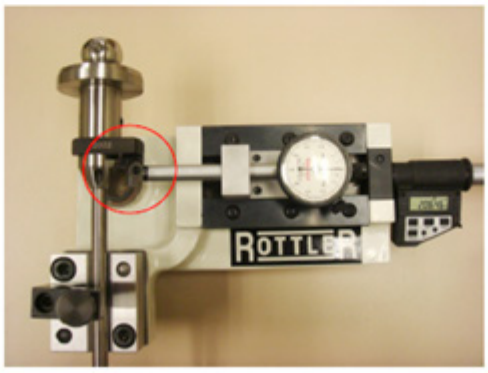
a. Position the Valve Stem on V Block and bring the Indicator tip to may contact with the head of the Valve until zero show on the indicator dial, the amount showing of the digital micrometer display is the actual diameter of the Head of the Valve.

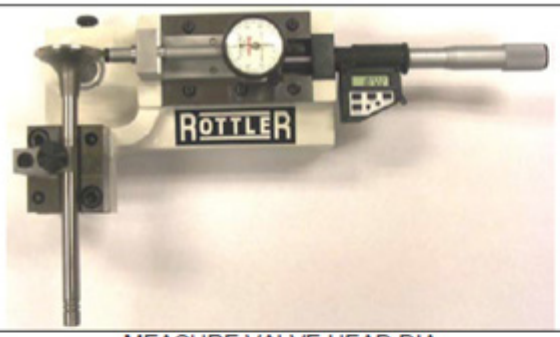
b. From that reading 2.0001"





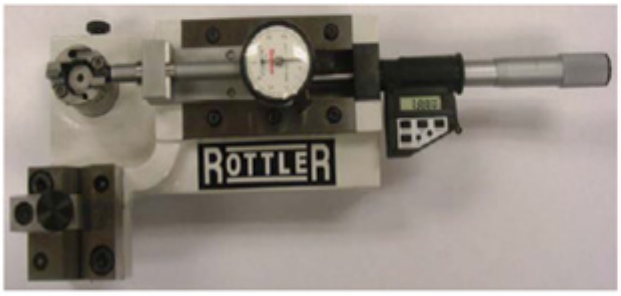






MEASURE VALVE HEAD DIA

MEASURE VALVE STEM AND PILOT DIA.



SET ADJUSTABLE DOUBLE INSERT MILLING CUTTERS

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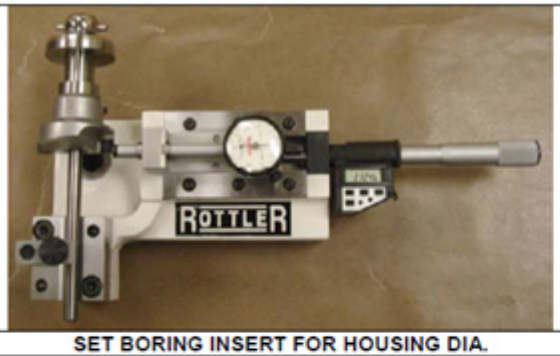
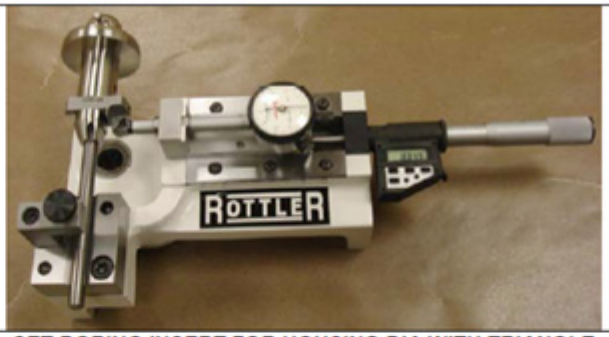
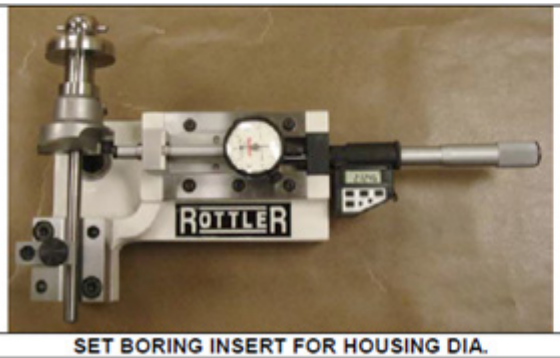


SET BORING INSERT FOR HOUSING DIA.

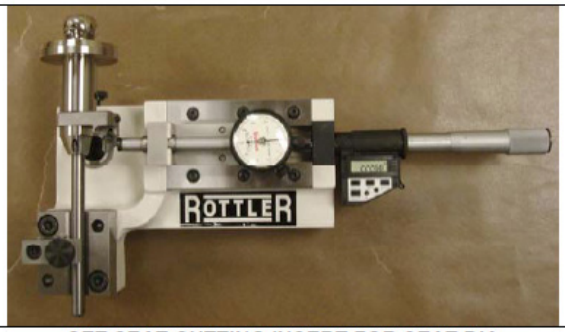


SET BORING INSERT FOR HOUSING DIA WITH TRIANGLE



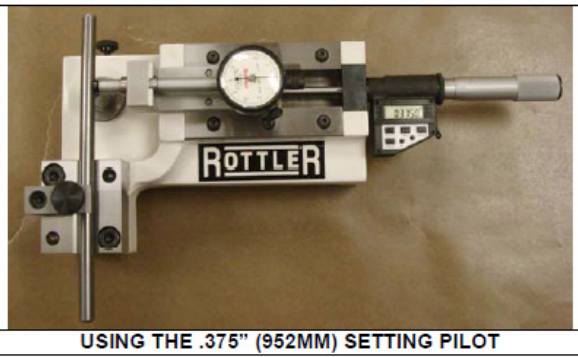
SET BORING INSERT FOR HOUSING DIA.

SET BORING INSERT FOR HOUSING DIA

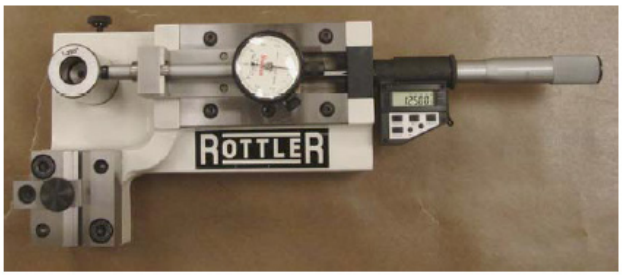


SET SEAT CUTTING INSERT FOR SEAT DIA

SET SEAT CUTTING INSERT FOR SEAT DIA ON



USING THE .375" (952MM) SETTING PILOT



SIX IN ONE WITH STD 1.250"

Adjusting the Square Carbide Inserts

- The micrometer should be used.
- Set the Digital micrometer (BM) according to the valve seat insert diameter and the required interference.
- Slide the tool holder without the pilot on the micrometer.
- With the setting screw, adjust the square tip holder offset.

IMPORTANT: When 90 degreed bits (RCA512) or the Triangle bits are fitted, check that their reference faces are perfectly clean.

The accuracy of the seat angles depends on this:

- While rotating the assembly tool holder/carbide tip holder, the carbide bit's cutting edge should just touch the micrometer spindle.
- Once in contact with the micrometer spindle, the carbide tip should not be moved at all. If this is not observed, the cutting edge may be damaged and the resulting surface quality, when machining, will be deteriorated.

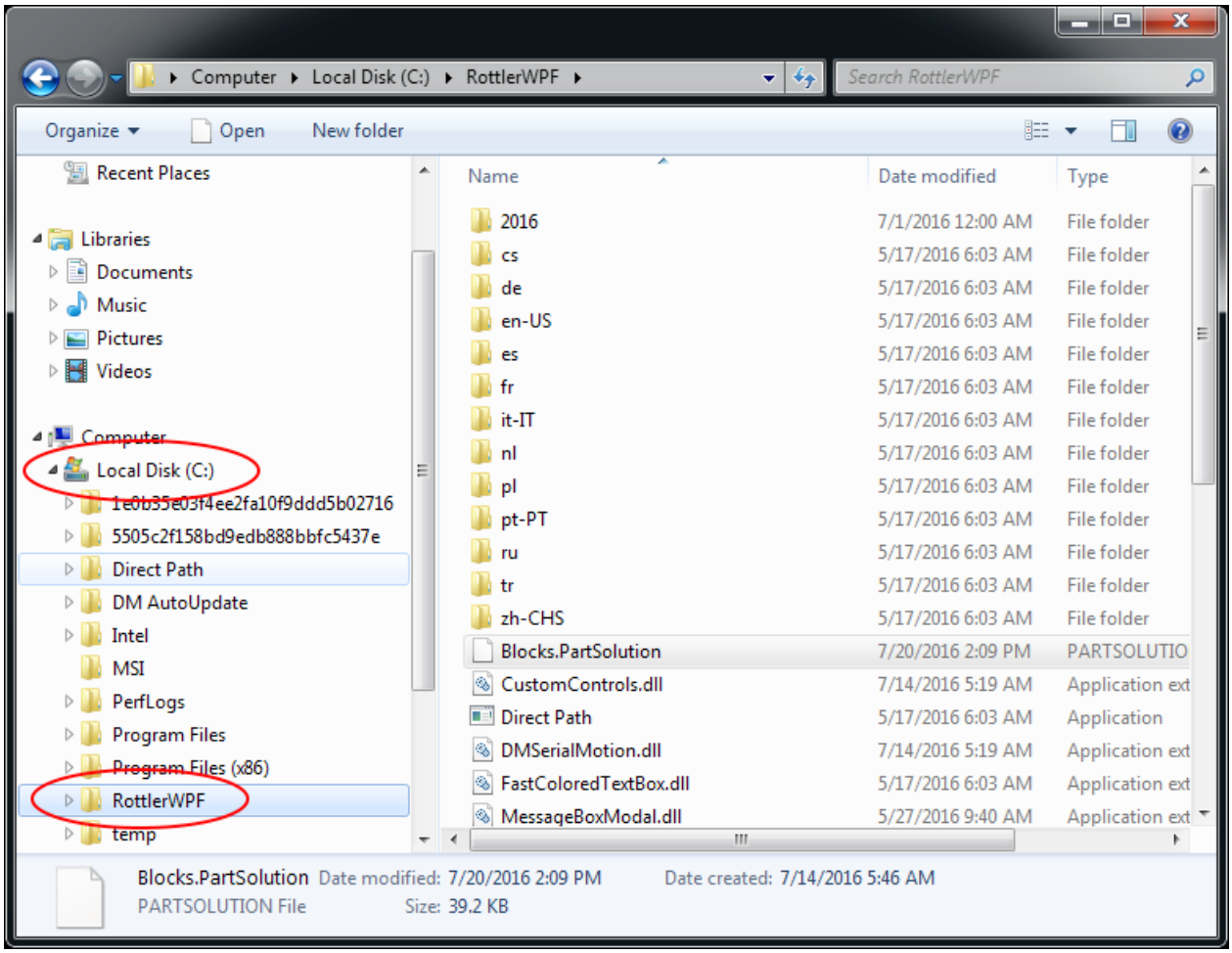
Cutting Small Diameter Valve Seats

The UPT5200 adapter has a set screw as shown in photo below – push pilot all the way into the UPT5200 and tighten set screw to hold pilot inside the UPT5200. Install the Tip Holder TH1999, adjust diameter, release set screw, and remove pilot. Be sure to use special small diameter cutting inserts such as RCA625 or RCA628 where the seat is close to the pilot side of the insert.

Backing Up and Restoring Block Profiles

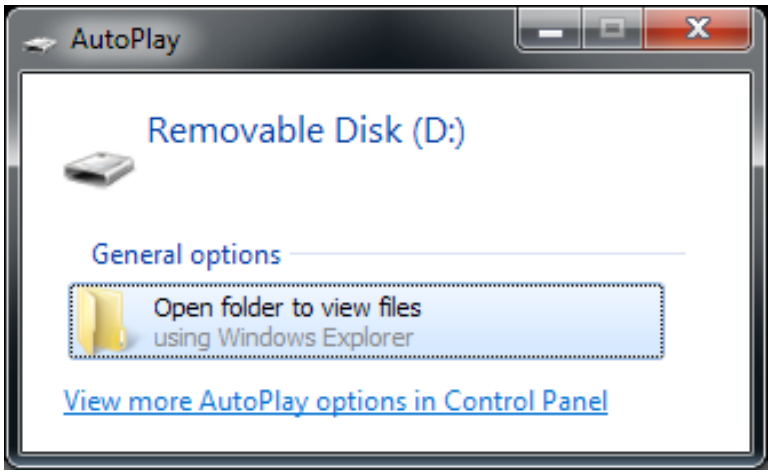
This section will explain how to back up and restore the operator created block profiles for DM controlled machines for archival purposes or to transfer to a different machine.

First step is to open your file bowser locate the RottlerWPF file on the C disk drive.

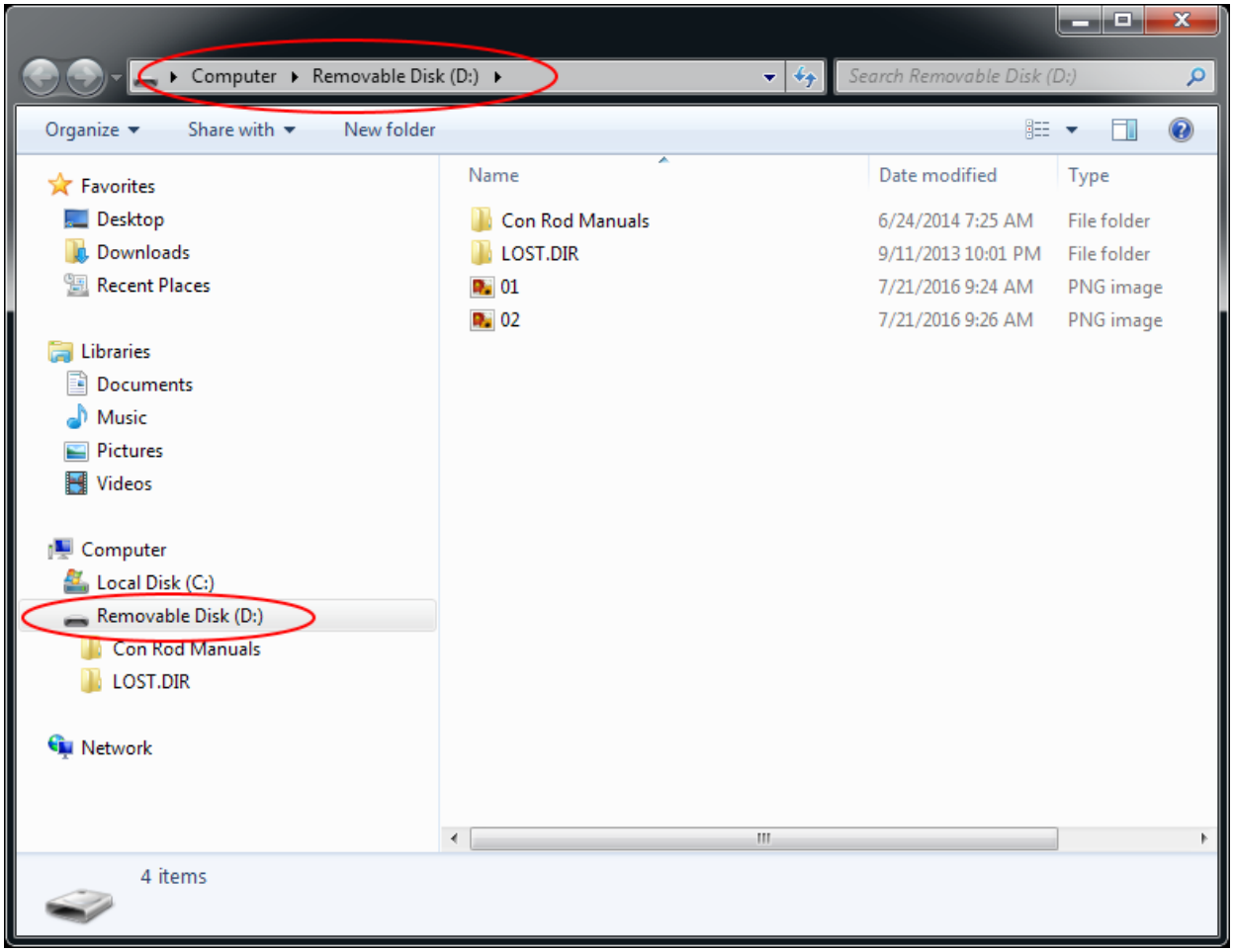


The next step is to plug in a flash drive to an open USB port

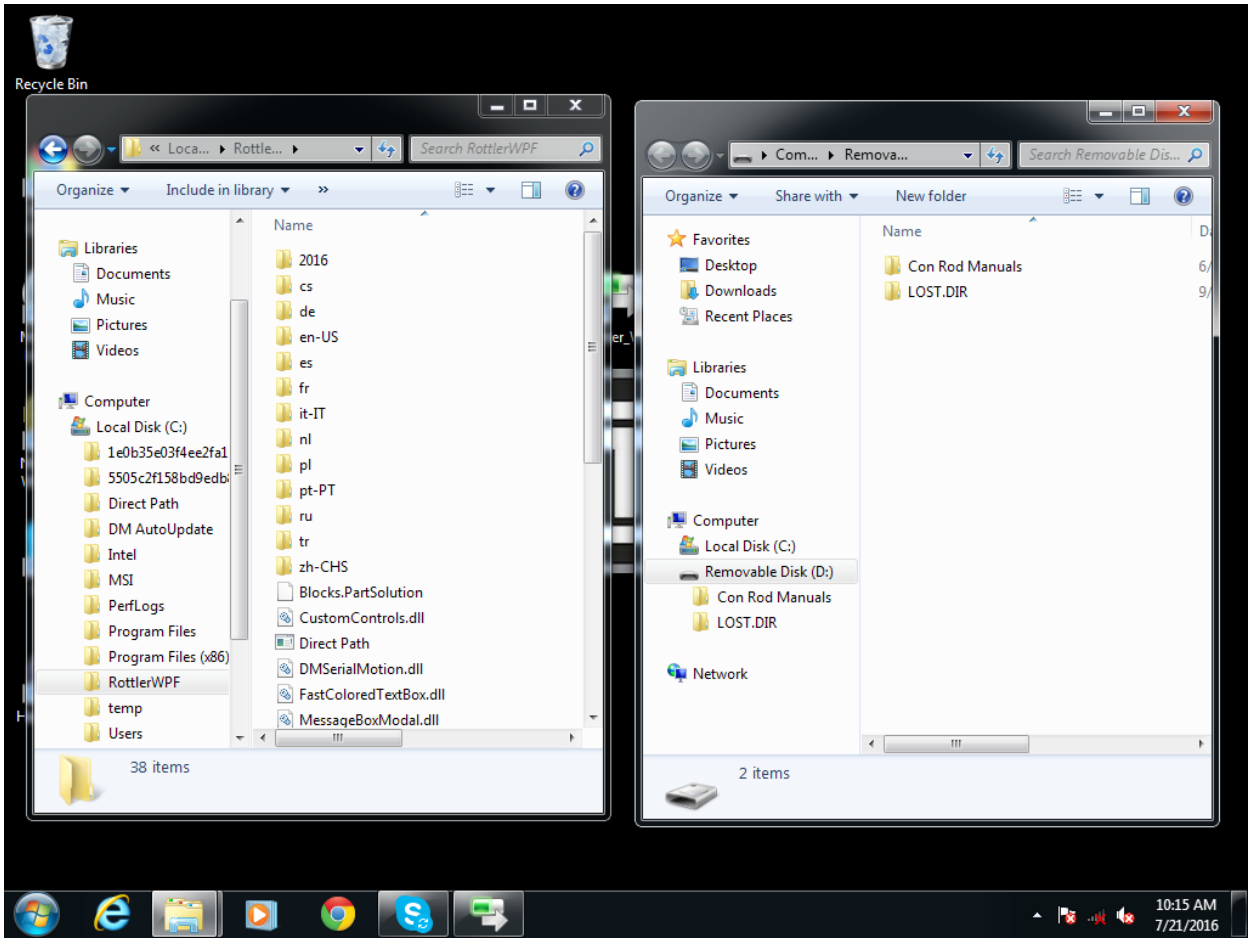
The following pop up box will appear on your screen.



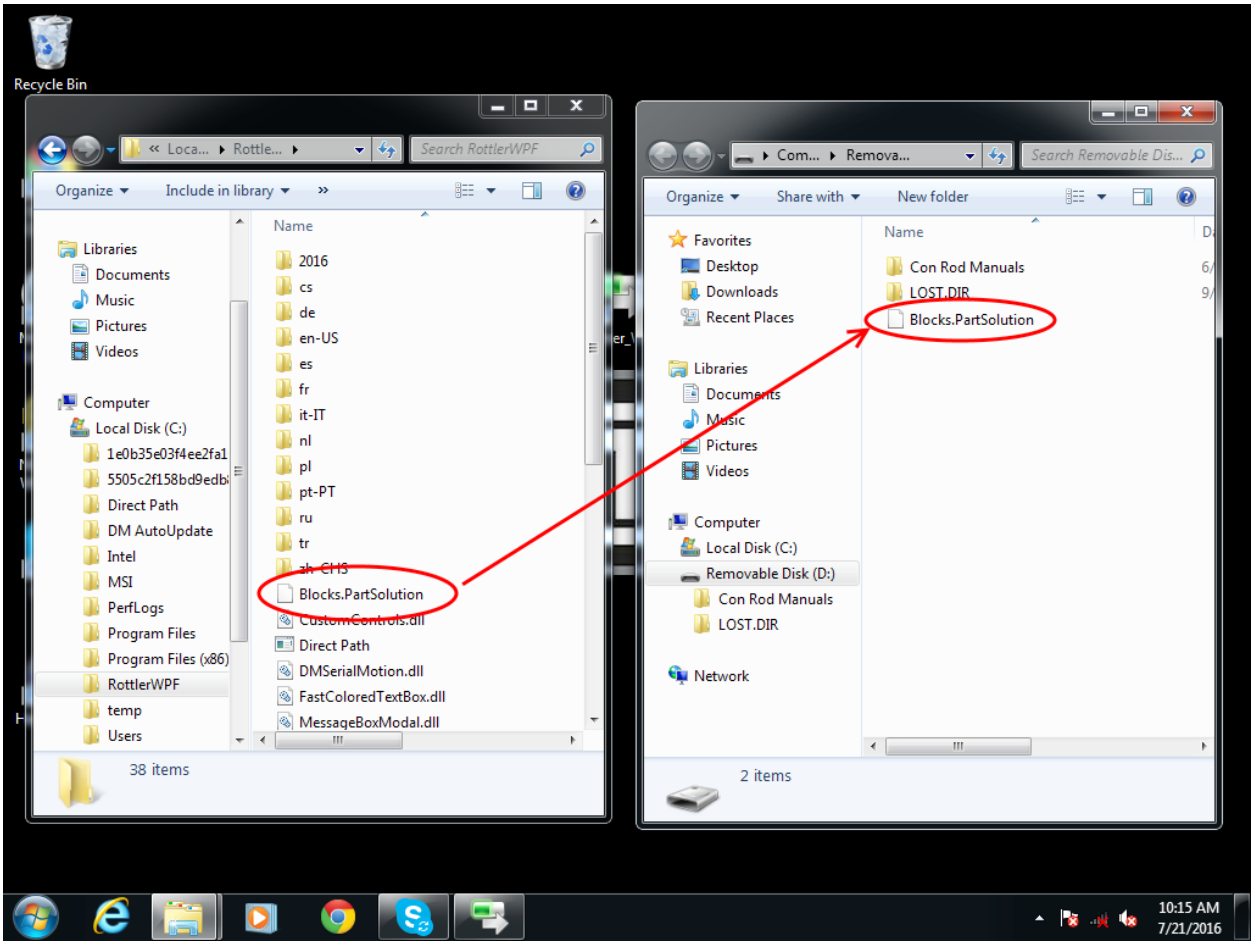
Click on the Open folder to view files option and the following screen will appear. This is the contents of the flash drive you just plugged in.



Next resize and arrange both file browsers so that they are side by side.



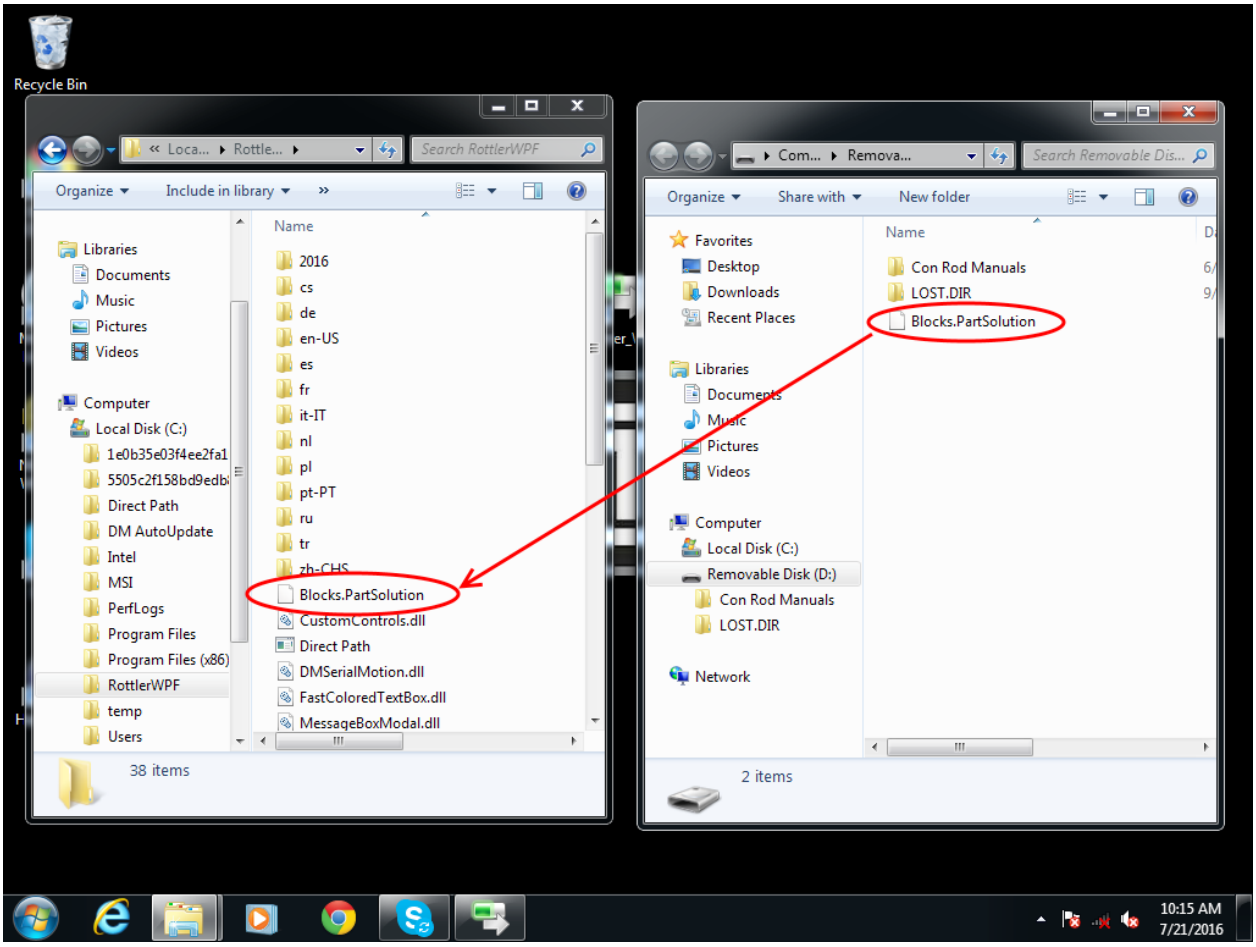
Block profiles are backed up each time the machine is run with the current profiles being shown in the RottlerWPF folder. All that needs to be done to back up the current profile is to simply drag it from the RottlerWPF folder to the flash drive folder. A copy of the file will be placed on the flash drive.



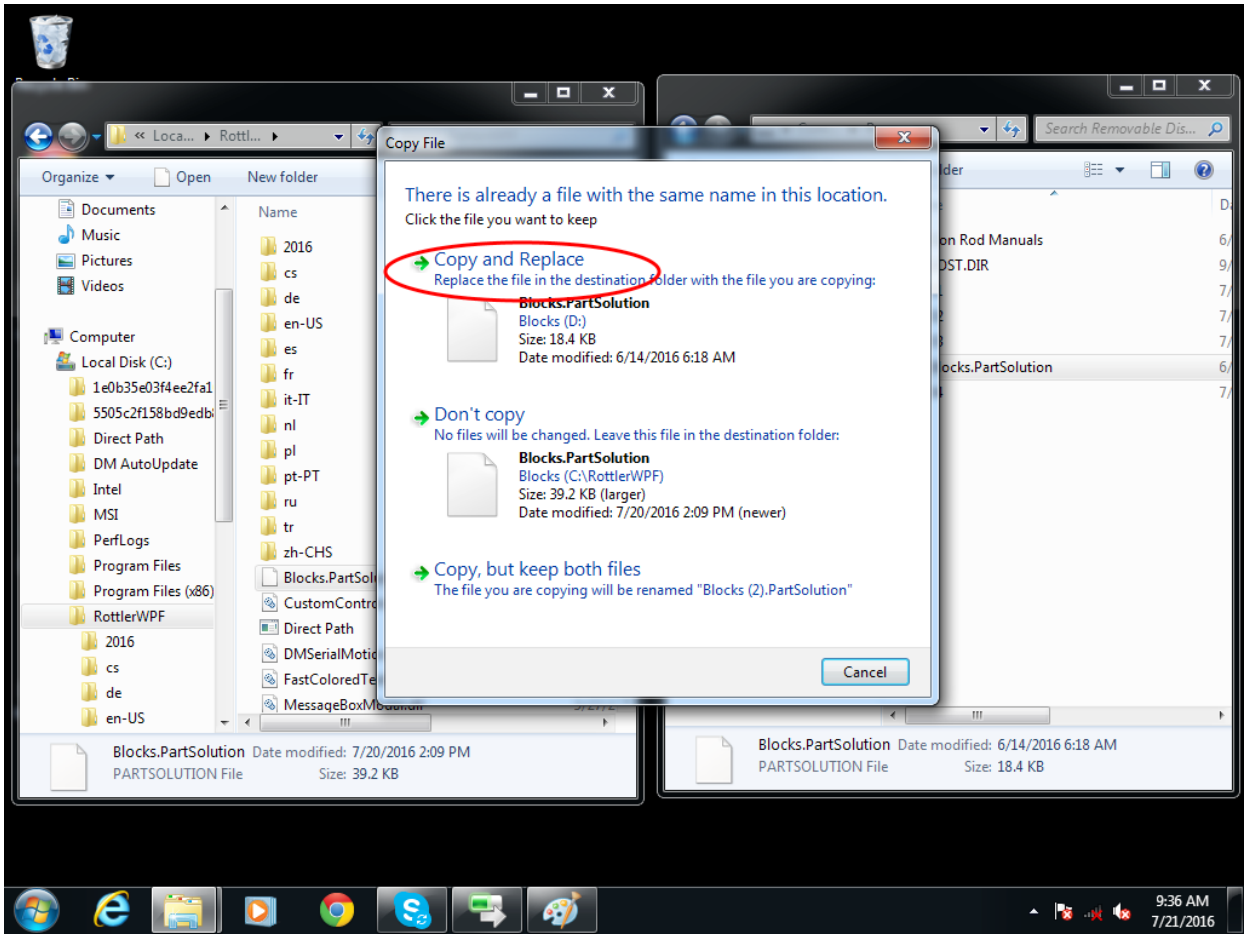
Backup is now complete. Close both file browser windows and remove the flash drive.

To restore or add block profiles go through the first 5 steps explained previously.

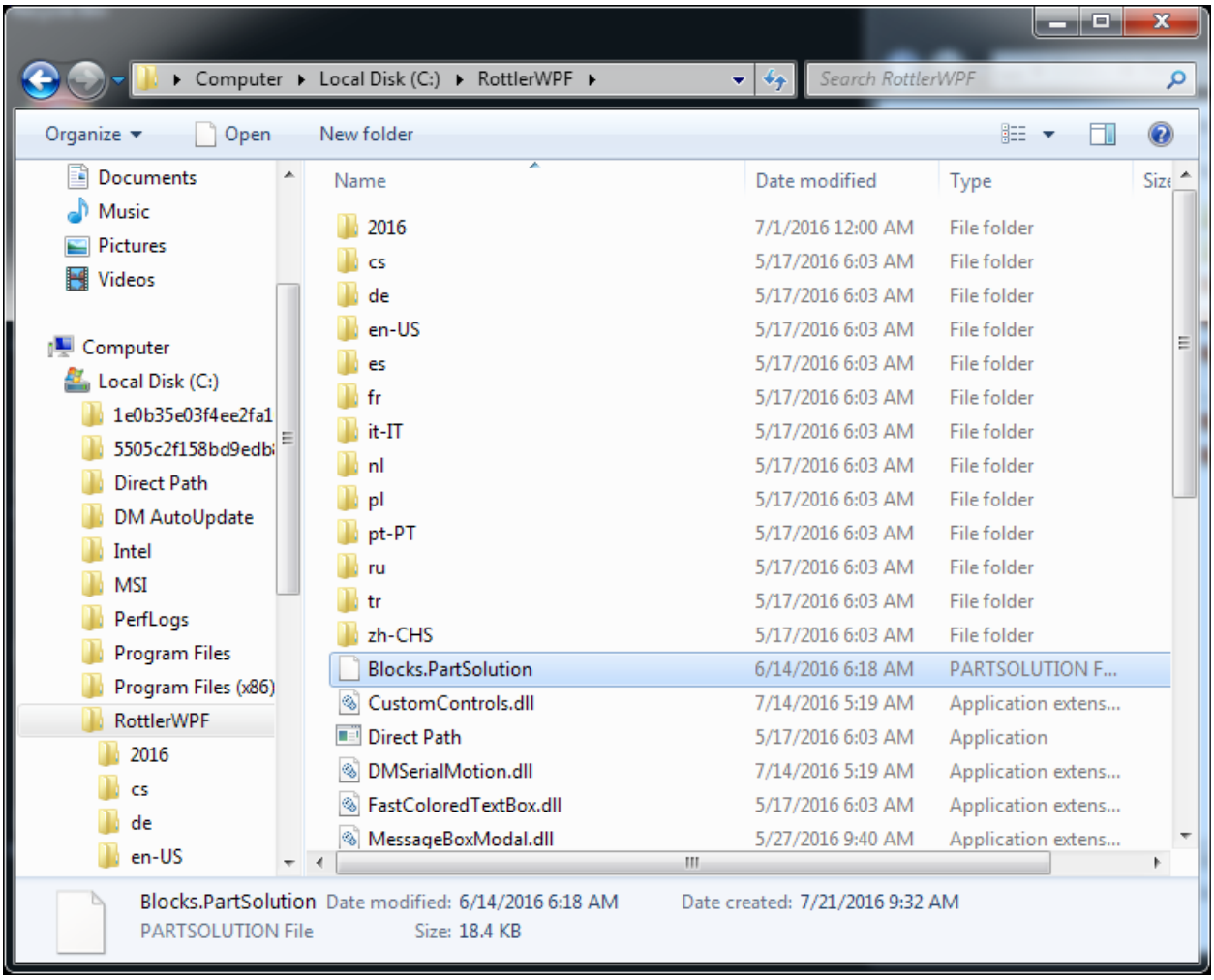
Highlight the block profiles file in the flash drive and drag it into the RottlerWPF folder on the local hard drive.



You will get a pop up window about there being a file of the same name in the destination folder. Click on the Copy and Replace option.



The archived block profiles will now be installed.



Close both browser windows and remove the flash drive. The restore process is now complete.

Tooling for Counterboring Small Diameter Valve Seat Pockets

Rottler offers two options for counterboring small diameter valve seat pockets:

6 mm Pilots Boring Combos

BH600R1 Mini Spherical Toolholder TH2000-00 Tip Holder RT211 Triangular Insert Bore diameter: 1.055” – 1.400” (26.80 mm – 35.55 mm) 	BH600R1 Mini Spherical Toolholder TH1999 Tip Holder RCA513 Seat Cutting Insert Bore diameter: .800” – 1.200” (20.80 mm – 30.48 mm) 

.375” Pilot Combos

BH375R1 Spherical Toolholder TH2000-00 Tip Holder RT211 Triangular Insert Bore diameter: 1.270” – 1.580” (32.26 mm – 40.15 mm) 	BH375R1 Spherical Toolholder TH1999 Tip Holder RCA513 Seat Cutting Insert Bore diameter: 1.000” – 1.280” (25.42 mm – 32.51 mm) 

Rottler can also provide Fixed Milling Heads to cut valve seat pockets. They are available in fixed diameters from 1.000” to 2.250” in .0625” increments

MAINTENANCE

Contents

Maintenance

Quick Reference Lubrication Chart

Refer to the maintenance section in the manual for lubrication location points and instruction.

Assembly	Frequency	Lube Operation	Recommended Lubricant	Date Serviced
Outer Spindle	8 Hours	Clean and Wipe with oil	ISO VG 68 Way Oil	
Brass guide shoes/slide	500 Hours	Clean and wipe with oil	ISO VG 68 Way Oil	
Grease spindle Rack and pinion	500 Hours	Clean and grease	NLGI #2 White Lithium Grease	
Grease spindle worm wheel and worm shaft	500 Hours	Clean and grease	NLGI #2 White Lithium Grease	
Grease spindle drive shaft	500 Hours	Clean and grease	NLGI #2 White Lithium Grease	
Grease rollover clamp fixture bearings	200 Hours	Clean and grease	NLGI #2 White Lithium Grease	
Grease clamp fixture Pins and Acme screw	200 Hours	Clean and grease	NLGI #2 White Lithium Grease	

Preventative Maintenance Quick Reference Chart

Refer to the procedures in the maintenance section of the manual to make or check these adjustments. Not all of the items listed in the table below have adjustment. The information should be recorded and the amount of wear tracked so the part can be replaced before down time on the machine occurs.

Procedure	Frequency	Date Serviced/Comments
Clean top and bottom float tables	8 Hours	
Outer Spindle Bushing Adjustment	500 Hours	
Brass Shoe Adjustment	500 Hours	
Angle sensor calibration	500 Hours	
Spindle Drive Belt Adjustment	1000 Hours	
Adjust workhead clamp plate bearings	1000 Hours	
Rack and pinion adjustment.	1000 Hours	
Machine Level Adjustment	1000 Hours	

CAUTION All floating surfaces should be dry and clean do not oil the surfaces, oil will cause the work heat not to float properly.

Air Adjustments

Float

The float regulators are located on the left side of machine base. Marked “Work Head Air Float Adjustment” If the work head is not floating properly it could be from too much or too little air from the regulator. Starting with all regulators set at 1 bar with “workhead float” button activated, slowly turn all up .5 bar at a time until workhead start to float. Pushing work head front to rear checking for stiff spots. If workhead is dragging in the forward position, (workhead pulled closest to operator) raise the 2 front regulators 1 mark until it floats without dragging. Same for rear. You may have to go back and forth a few times to get this correct. If workhead is not dragging lower the PSI until it does and then raise 1 notch at a time until it is free. Typically the front two regulators will be slightly higher than the rear two. Once the correct float is established lock the regulators in place by pushing in on the blue adjusting knob

CAUTION Use as little air as possible to achieve correct floatation. Using too much air will could cause the spindle base to vibrate and not center properly on the on the pilot.

Float surfaces

CAUTION Wipe clean daily

All floating surfaces should be dry and clean do not oil the surfaces, oil will cause the work heat not to float properly.

Calibrating the Digital Level

NOTE: Even though the level has been carefully calibrated at the factory, it is a good idea to recheck calibration before putting the machine into service. In the event that the level is dropped or handled roughly then the following recalibration methods should be implemented.

The level assembly is referenced to the spindle via the level pin. It is there for important to check alignment of pin in reference to the spindle. This is accomplished by mounting a magnetic base dial indicator to the machine spindle and sweeping the pin vertically by raising or lowering spindle to check alignment. Pin alignment should be checked in two positions at 90 degrees to each other. If the pin alignment needs correcting, do so with the set screws located at base of pin block.

Install level on pin. Orient level to read left to right. Tilt head left or right until level reads 0.00. Now rotate level 180 degrees. The reading should be 0.00, if not then it will be necessary to calibrate the inclinometer to the level body. This is accomplished by loosening the inclinometers two retaining screws and pivoting the inclinometer until it repeats when level is rotated 180 degrees.

Example: level reads 0.05 to the left, when rotated 180 degrees to the right it should read minus 0.05.

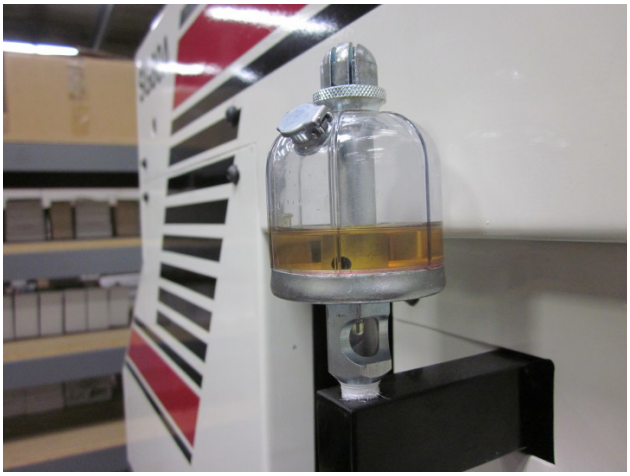
Check the level reading with the pickup oriented front to back. It should read 0.00 if the machine has been properly leveled with a machinist level.

If the LED does not read 0.00 then chances are the machine's leveling procedures have not been properly followed or there are internal problems with the levels electronics.

The sensitivity of the level is so great that it may not zero totally, even while the machine is not being touched. The alignment tolerance for installing guides is plus or minus .05 degrees, and for forming three angle seats is plus or minus .05 degrees.

Spindle

Wipe clean and oil 5 drops daily. To oil, lift lever at top of oiler. To adjust, rotate lever knob.



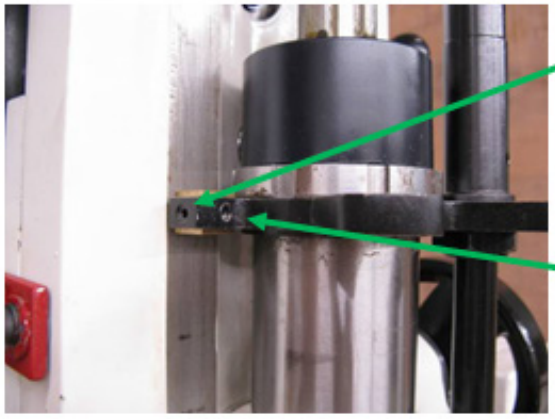
Adjusting And Aligning The Outer Spindle On SG Models

There are 2 brass guide shoes located on the guide plate on top of the spindle that align the rack gear on the back of the spindle with the pinion gear that moves the spindle up and down.

Lower the spindle to the center position of travel.

Check the guide plate at the top of the spindle, tighten if necessary.¶

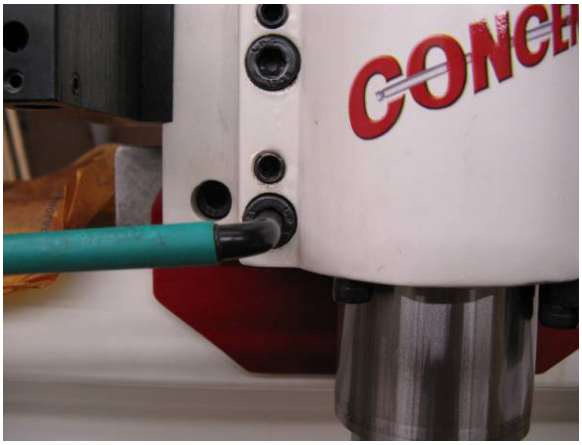
Clean and lightly lubricate sliding guide surfaces with grease. Adjust brass guide shoes on guide plate so that there is no twisting movement. Run the spindle through its full travel to confirm that there is no binding.



Loosen locking screw to adjust brass guide shoe. Tighten after adjusting.¶

Use adjusting screw to adjust brass guide shoe.

Adjusting Outer Spindle Clearance



Loosen the 4 lock bolts.

Loosen the 4 adjusting set screws.

Clean outer spindle and lubricate – add a few drops of oil to a clean cloth and wipe outer spindle.

Starting with the bottom set of lock bolt and adjusting set screws, tighten the lock bolt until there is drag on the spindle when it is move through its range of travel.

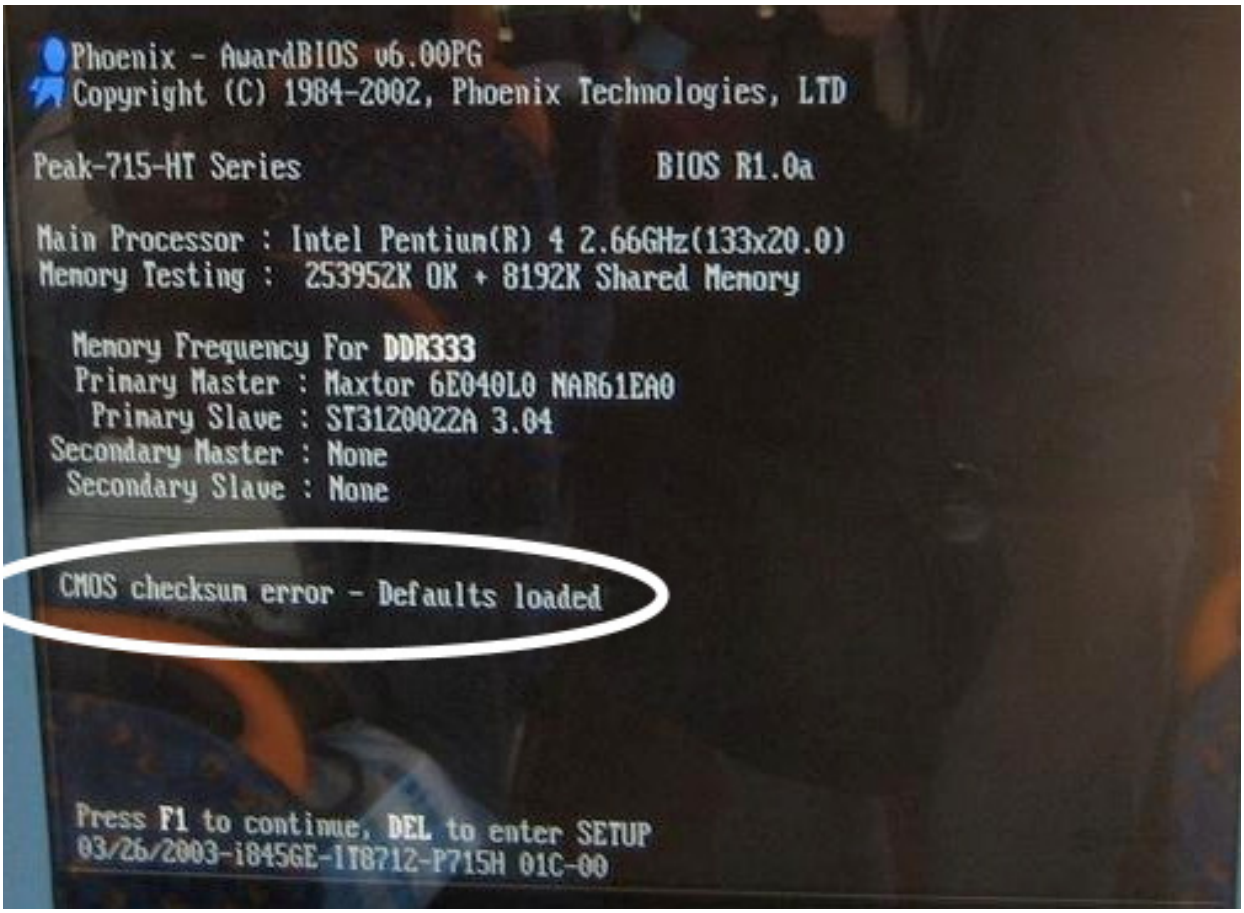
Then tighten the adjusting set screw until the amount of drag on the spindle is reduced to the point that there is a slight drag on the spindle through its range of travel.

You may have to make further adjustment to the lock bolt and set screw the get the spindle adjusted properly.

Repeat the above procedure the other 3 sets of lock bolts and set screws.

Replacing the Motherboard Battery

If computer fails to boot up and you get a CMOS error message on the screen, then the battery on the computer motherboard has failed and needs to be replaced.



The following is the procedure for replacing the motherboard battery.

Turn off the power on the electrical enclosure and remove the enclosure cover.

Locate the computer and check to see that the power light is not on. If it is on turn off the power switch.
Note: On some machines it may be necessary to unbolt the computer from the enclosure in order to gain access to the cover screws.

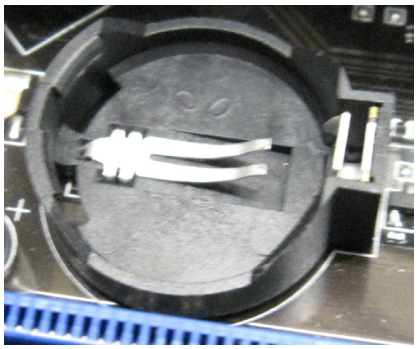
Remove the 6 screws indicated by the arrows from the cover.

Remove the cover.

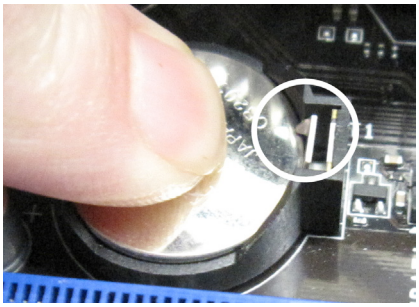
Locate the battery on the motherboard.

Push the battery retention clip away from the battery. When the clip is released the battery will pop up.

Remove the battery and place new battery in the battery holder.



Using your finger tip push down on the battery until the retention clip is in its lock position.



Replace computer cover and make sure that power switch on the computer is on.

Replace the enclosure cover and switch power back on.

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TROUBLESHOOTING

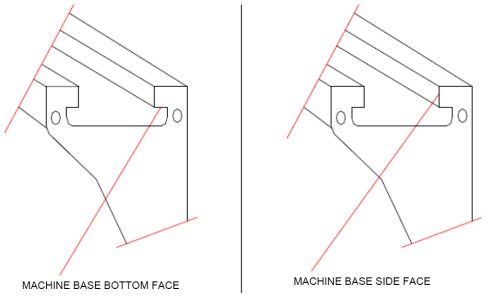
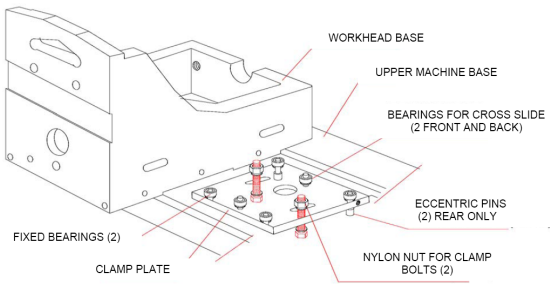
Contents

For further assistance in troubleshooting:

Please visit the service tab of our web page at Send a Service Request www.rottlermfg.com or contact the Rottler Factory Service at service@rottlermfg.com for assistance and your service request.

You may also call Rottler at 1-800-452-0534 or 1-253-872-7050

Please ensure you have the Machine Model and Serial Number available when contacting Rottler for Service

Problem	Possible Cause	Solution
Workhead base does not float	Insufficient air pressure	Set air pressure of supplied line should be minimum 85 PSI (6 Bars)
	Clamping plate does not drop when unclamped due to less clearance between upper floating base and ball bearings mounted on clamping plate	Take the workhead to one end of the of the upper floating surfaces (Left or Right side) float the workhead and pull it against the front on the T Slatted guide surfaces, then loose the set screws of the eccentric pin to increase clearance by using a feeler gage of 0.008” to 0.010” (0.20mm to 0.25mm) in between the T slotted guide surfaces of the upper base and the eccentric ball bearing; (see fig. below)  Lock the setscrews, remove the feeler gage and inspect if is with the tolerance across the all surfaces. Repeat if it is necessary.
	Clamping plate does not drop when unclamped due to the improper adjustment of the four clamping bolts	Adjust nylock nuts to set he correct clearance between the bottom side face of the locking T-Slot of the floating base (Riser) and the top part of the clamping plate. They are two on the SG7. The dropping clearance when is on the floating mode should be 0.015” (0.38mm)on all the four corners of the workhead clamping plate **SG7 MACHINE** **ADJUSTMENT OF CLAMPING PLATE BETWEEN UPPER MACHINE BASE AND WORKHEAD BASE** 

Problem	Possible Cause	Solution
Eccentricity Problems when Cutting Three Angle Seats	Machine is not level	Level machine per instructions in Installation section of this manual
	Workhead is not floating smoothly	Be sure that the work head and main base are clean and floating smoothly side by side and front to back
	Spindle floated to improper center location	Reposition workhead to ensure proper alignment
	Improper setup procedure	The centering switch that is located on the left side of the front panel needs to be on the centering position at the time of centering and machining the vale seat. The Spherical pneumatic switch needs to be on the OFF position and the pilot into the valve guide until reach the proper height or the cutting insert is a few thousands from the valve seat face. Let Workhead flow for few seconds to achieve maximum alignment over the pilot. Be sure there's no contact with the Workhead to allow spindle to stabilize and Cutter to center itself on the valve guide. Release Foot Pedal. Note: Spherical Pneumatic switch should be on the OFF position all the time that you are machining the valve seat; this will give you a positive live centering.
	Toolholder cone dirty	The toolholder cone must be clean before is attached to the spindle and also be sure that the inner spindle cone is clean
	Excessive pressure when cutting seat	Use less pressure when cutting the seat
	Incorrect spindle speed	Adjust spindle speed
	Worn or improperly selected pilot	Check pilot for wear and straightness
	Dull or damaged cutter insert	Replace insert
	Incorrect pilot selection	Follow directions in manual for selecting pilots
	Worn tool holder	Check tool holder with bore gauge to determine if there wear
	Worn valve guide	Service valve guides before attempting to cut valve seats

Problem:

Icon on screen does not move to area touched.

Solution:

Follow the procedure below to recalibrate the touchscreen.

1. Get to the Alignment screen.
    1. If an Elo icon is available in the tool tray at the lower right side of the desktop, click it, then click Align.
    2. Otherwise, go to the Windows Control Panel, double-click Elo Touchscreen and click the Align button on the General tab.
        1. If Windows XP and no Elo icon, click the “Switch to Classic View” button on the left
        2. If Windows 7 and no Elo icon, look for “View by: Category” text toward the upper right; click it and select “Small icons”
2. Touch and release the upper left target; the target should jump to the lower right.
3. Touch and release the lower right target; the target should jump to the upper right.
4. Touch and release the upper right target; a check screen should appear.
5. Touch and release the green check mark; the check screen should disappear.
6. The cursor should now jump to the point of touch.
7. If the Elo Control Panel is open, close it and the Windows Control Panel.

MACHINE PARTS

Contents

Machine Parts

Consumable Parts

REFERENCE	DESCRIPTION
SLEEVE R1	Spindle adapter replacement sleeve
BSW002	Diamond Wheel Cutting Bit Sharpener replacement Wheel (3.000" Diameter OD by .375" ID)
PRW600PIN	Replaceable Pins for PRW600 Pilot Removable wrench tool
PRW375PIN	Replaceable Pins for PRW375 Pilot Removable wrench tool
PRW20PIN	Replaceable Pins for PRW375 Pilot Removable wrench tool
VT-FP1562	Replacement Foam Pad for Round Vacuum Pad 1.562" diameter
VT-FP1875	Replacement Foam Pad for Round Vacuum Pad 1.875" diameter
VT-FP2125	Replacement Foam Pad for Round Vacuum Pad 2.125" diameter
VT-FP3125	Replacement Foam Pad for Round Vacuum Pad 3.125" diameter
VT-FP25X22	Replacement Foam Pad for Square Vacuum Pad 2.500" x 2.250" square
VT-FP31X20	Replacement Foam Pad for Square Vacuum Pad 3.125" x 2.000" square
VT-FP33X27	Replacement Foam Pad for Square Vacuum Pad 3.375"x 2.750" square
511-29-12F	T7 Torx driver for 1/4" insert (straight angle insert holders only)
511-29-12E	TORX SCREW M2.5 X 0.45 X (straight angle insert holders only)
T8S	T8 Torx Tip Holding Screws
T15S	T15 Torx Tip Holding Screws
MHS-375	Fixed Double Replaceable Insert Milling Head Screws for Large diameter milling Head (3/8” insert)
MHS-250	Fixed Double Replaceable Insert Milling Head Screws for Small diameter milling Head (1/4” insert)
S1032-250	BH375R1 and BH600R1 Tip Holder Looking Screw (10/32" X 1/4") **Req. 2**
S250-28-250	BH375WR1 Tip Holder Looking Screw 1/4"-28" X 1/4" **Req. 2**
S1032-437	TH1999 Adjusting Screw (10/32" X 7/16")
S1032-375	TH2000 Adjusting Screw (10/32" X 3/8")
S1032-500	TH2001 Adjusting Screw (10/32" X 1/2")
S1032-625	TH2002 Adjusting Screw (10/32" X 5/8")
S600-1570	TH2003 Adjusting Screw (6.00mm X 15.70mm)
S600-2015	TH2004 Adjusting Screw (6.00mm X 20.15mm)
M10X15X35	SG7 Rollover Fixture Hold down swivel Handle Zinc Handle 35mm (1.375") Long stud (KHF-725)
500-13X2	SG9MTS Rollover Fixture Hold down swivel Handle Zinc Handle 2.000" Long stud (KHF-162)
500-13X1375	SG7- SG9MTS Rollover Fixture Lock swivel Handle Zinc Handle 1.375" Long stud (KHF-158)
ICC003	Insert, Indexable carbide, for Fixed milling heads - large size - for 1.562" and larger cutters
ICC002	Insert, Indexable, carbide, for Fixed milling heads - small size - for 1.250" to 1.500" cutters

Carbide Inserts

See Carbide Insert Catalog for a complete list of Insert Profiles available from Rottler Manufacturing.

Special Profiles

Special Profile Cutter Inserts can be manufactured to your exact specifications and can include a combination of angles and radius blends.

There is three different style insert blanks.

A - Style Blank insert, RCA is a small insert for all standard applications.

B - Style Blank insert, RCB in design for long profiles like High Performances profiles with multi angles o Radius or other special applications

C - Style Blank insert, RCC is a much thicker insert for Heavy Duty tooling and can be use for hard seat materials (will work only on the Large Inserts holders series 3000 style insert holders, for the 20.00mm tooling)

Special Order - Special Profile Carbide Cutter Bits are generally considered to be “Customer Proprietary”. These are uniquely numbered, exclusively for the ordering customer; prices will vary depending on quantities and additional charge for initial run.

Call us for a quote.

RT312 Insert, triangular positive rake, 3/8 1/32” (.787mm) radius, for the TH3000 series insert holder and RT212 Insert, triangular positive rake, 1/4” (6.35mm) 1/32 “ radius for the TH2000 series, for hard seat materials applications (Counterboring and straight angles only)

Carbide Pilots

See Carbide Pilot catalog for a complete list of Pilots available.

Rottler Solid Fixed Carbide Pilots are manufactured from fine grain sintered tungsten carbide and are ground to a very high degree of accuracy, straightness and surface finish - designed for a life time of precision machining!

The part number of the pilot represents the actual diameter in metric of the straight/parallel part of the pilot where the pilot fits into the valve guide.

For example:

UCP0700 means that the diameter of the part of the pilot that goes into the valve guide is 7.00mm (0.2756”)

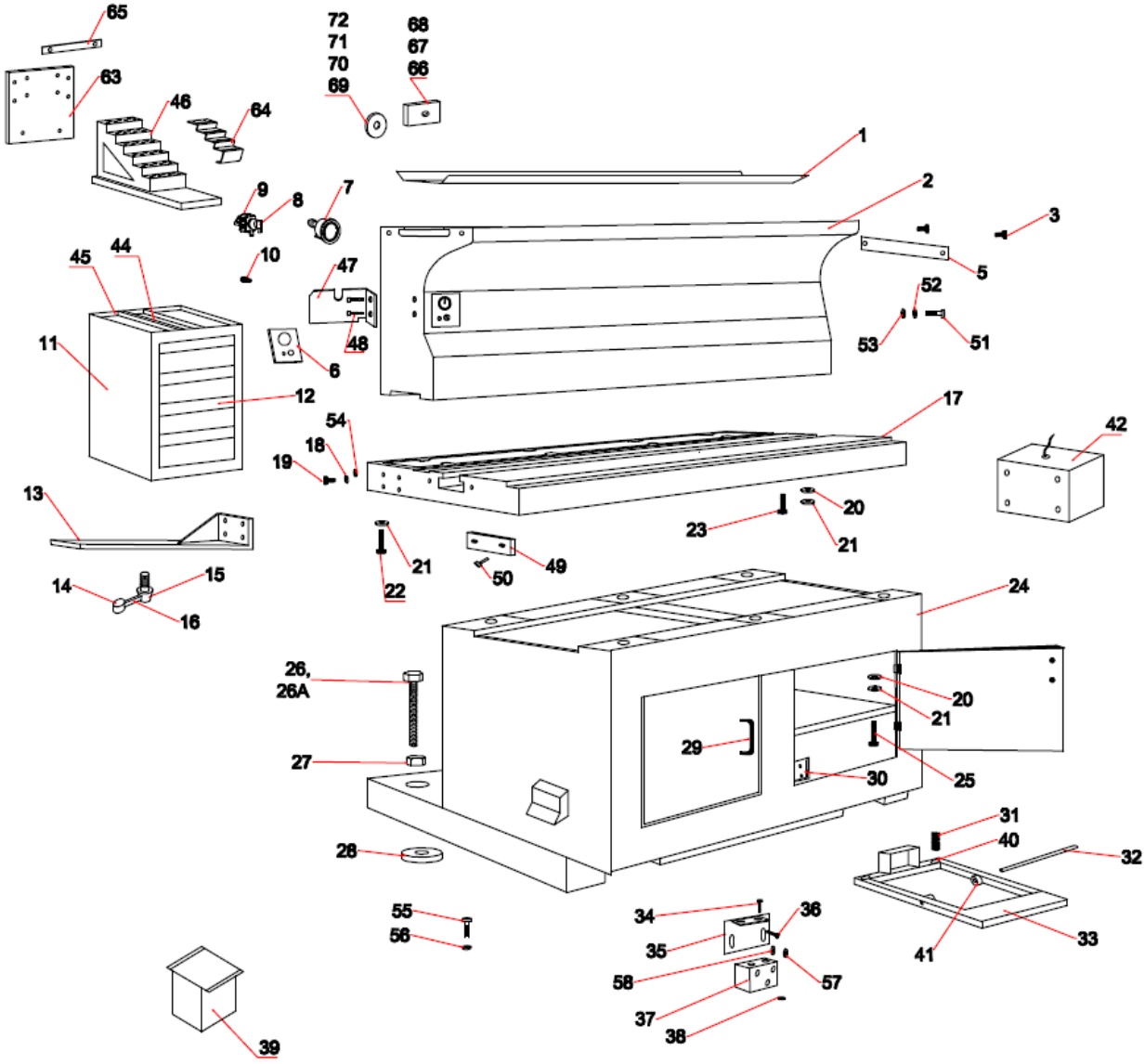
UCP1270 means that the diameter of the part of the pilot that goes into the valve guide is 12.70mm (0.5000”)

Pilots are available in increments of .01mm (0.0004”). Normally, a small amount of clearance approx .01mm (0.0004”) is required between the pilot and the valve guide.

Most new valve guides are manufactured to a nominal size and the valve stem diameters are manufactured to be smaller than the nominal size to allow clearance for heat expansion of the valve stem when the engine is operating. For example: a 7mm valve guide has an internal diameter of exactly 7.00mm (.2756”) The valve stem diameter of the intake valve is 6.98mm (.2748”) and the exhaust is 6.96mm (.2740”). In order for the pilot to fit most all valve guides, the first choice could be UCP0699 to give .01mm (0.0004”) clearance. If the valve guide is used and has some wear, then the second choice of pilot could be UCP0700(0.2756”).

Rottler makes 3 sizes of shanks of pilots:
6.00mm (0.2362”) for small valves guides 6mm (0.236”) and below. The part number for these pilots is UCPM.
0.375” (9.52mm) for common size valve guides, 6-14mm (.236-.625”). The part number for these pilots is UCP.
20mm (0.7874mm) for large valve guides for SG8M0A machine. These pilots are made to order specifications.

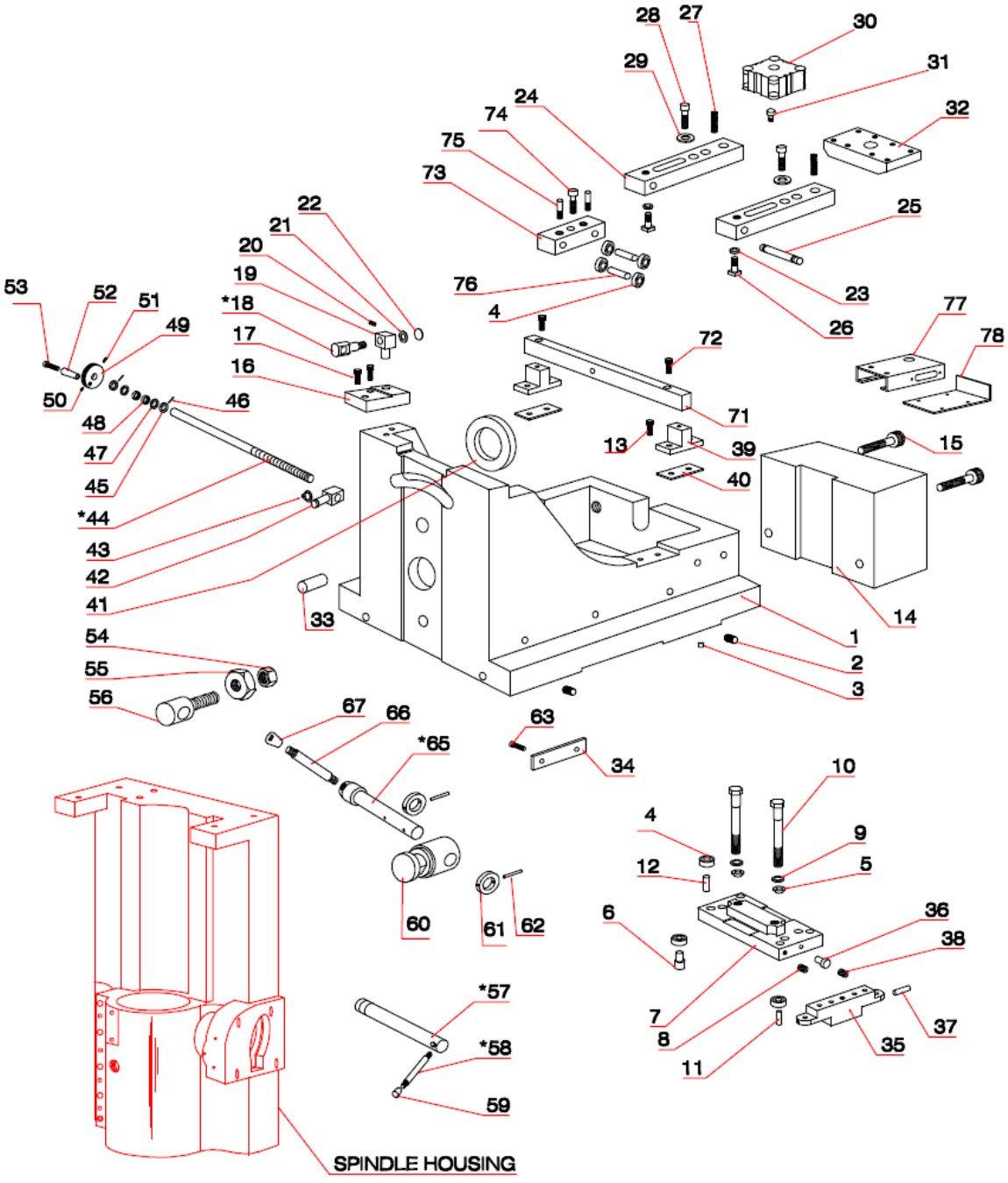
Base Table and Riser Assembly



S. NO.	PART NO.	DRG NO. SG-10A	DESCRIPTION	QTY/M/C
1.	430-820-1		COVER PAN	1
2.	NCL -99-2		RISER	1
3.	430-822		BUTTON HEAD SCREW (M6x12)	4
4.				
5.	430-821-1		STOP PLATE	2
6.	033-071		PLATE	1
7.	430-830		VACCUM GAUGE 2.5" STD-B X ¼ NPT	1
8.	430-831		N-22-SW (9301)	1
9.	430-832		SV-3-M5 (6817)	1
10.	430-837		QSS-6 (153158)	1
11.	430-807		TOOL CABINET	1
12.	430-816		TOOL TRAY	4
13.	430-806		MOUNTING BRACKET	1
14.	430-802		KNOB (M8x25MM O.D.)	1
15.	430-817-1		CLAMP PIN	1
16.	430-823		CLAMP LEVER	1
17.	NC - 41		TABLE	1
18.	VGS-804		SPRING WASHER (M8)	4
19.	VGS-803		ALLEN HEAD SCREW (M8x30)	4
20.	430-811		PLAIN WASHER (Ø12MM)	11
21.	430-810		LOCK WASHER (Ø12MM)	14
22.	430-809		ALLEN HEAD SCREW (M12x70)	3
23.	430-812		ALLEN HEAD SCREW (M12x50)	7
24.	**430-801-A**	**10A-1**	CABINET ASSY	1
25.	430-813		HEX SCREW (M12x50)	4
26.	430-818		LEVELING BOLT (M16x75)	5
26A.	430-818-1		HEX. HEAD SCREW (M16x180)	1
27.	430-818A		HEX NUT (M16)	6
28.	430-819		PAD	6
29.	430-825		HANDLE	2
30.	430-827		MEGNET BLOCK	2
31.	430-833		SPRING	**2**
32.	430-834		ROD	1
33.	430-835		FRAME WELDED	1
34.	430-838		ALLEN HEAD SCREW (M5x12)	**2**
35.	430-836		FOOT SWITCH MTG. BKT	**1**
36.	430-814		ALLEN HEAD SCREW (M6x20)	**2**
37.	430-828		FOOT SWITCH ASSY	**1**
38.	430-805		NUT (M5)	**2**
39.	430-824		CHIP TRAY	1
40.	430-835A		PAD	**2**
41.	430-835B		BUSH	**2**
42.	**NCL-98**	**10A-2**	**AIR FITTING BOX**	**1**
43.				
44.	430-826-1		RUBBER SHEET	1
45.	430-829-1		TOOL BOARD (L.H)	1
46.	430-839-1		PILOT STAND	1
47.	033-069		SUPPORT BRACKET	1
48.			ALLEN HEAD SCREW (M6x16)	2

49.	NC-42		STOPPER PLATE	2
50.			ALLEN HEAD SCREW (M6x16)	4
51.			ALLEN HEAD SCREW (M10x25)	4
52.			SPRING WASHER (10MM)	4
53.			PLAIN WASHER (10MM)	4
54.			PLAIN WASHER (8MM)	4
55.			ALLEN HEAD SCREW(M6x30)	**2**
56.			NUT (M6)	**2**
57.			PLAIN WASHER (6MM)	**2**
58.			LOCK WASHER (6MM)	**2**
59.				
60.				
61.				
62.				
63.	430-839-2		SUPPORT PLATE	1
64.	430-839-3		RACK (INSERT HOLDER)	1
65.	430-839-4		NAME PLATE	2
66.	101A-109		VACUUM PAD	1
67.	101A-110		VACUUM PAD	1
68.	101A-111		VACUUM PAD	1
69.	101A-112		VACUUM PAD	1
70.	101A-113		VACUUM PAD	1
71.	101A-114		VACUUM PAD	1
72.	101A-115		VACUUM PAD	1
73.	430-815-S-1		SHIPING CLAMP (NOT SHOWN)	2
74.	430-841		PIN (NOT SHOWN)	4
75.	430-842		PIN (NOT SHOWN)	3
76.	430-843		PIN (NOT SHOWN)	4

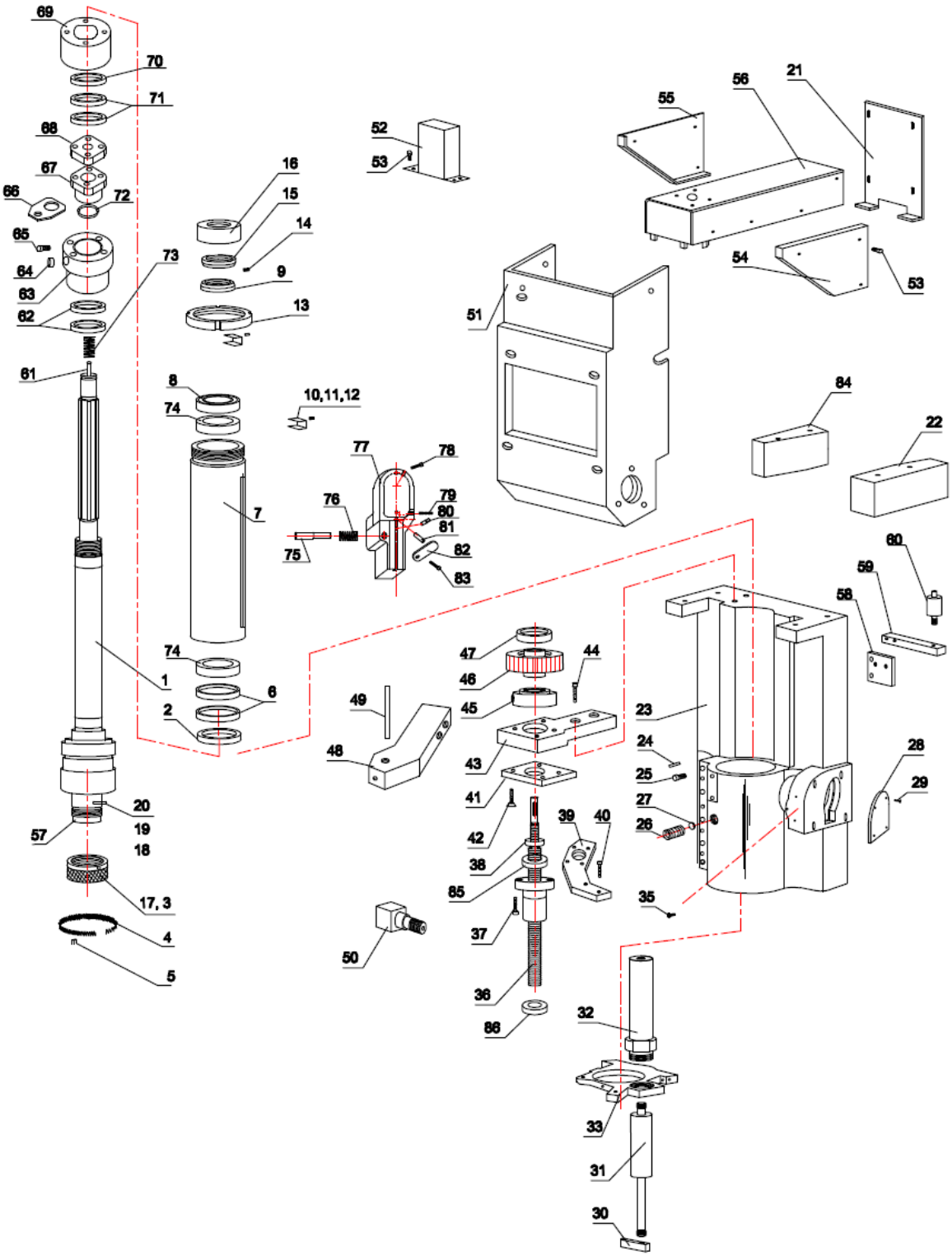
Base Assembly



S. NO.	PART NO.	DRG NO. SG-10A	DESCRIPTION	QTY/M/C
1	NC-25-2A	10A-6	BASE	1
2	VGS-512		PLUG 1/8" NPT	4
3	VGS-513		PLUG (BRASS)	12
4	VGS-505		BALL BRG. (626) 6x19x6	10
5	NC-112-I		SPHERICALWASHER	2
6	430-506		ECCENTRIC PIN	2
7	430-501-1		CLAMP PLATE	1
8	VGS-507		GRUB SCREW (M5x6)	2
9	NC-112-II		SPHERICAL WASHER	2
10	430-509-1		HEX. BOLT(M12x110)	2
11	430-504-1		PIN	2
12	430-502		PIN	2
13			ALLEN HEAD SCREW (M6x25)	4
14	430-518-1		WEIGHT	1
15	430-519		ALLEN HD. SCREW (M12x90)	2
16	430-521		SWIVALING BLOCK	1
17			ALLEN HD. SCREW (M6x16)	2
18	NC-26	10A-7	SWIVALING PIN	1
19	430-522		PIN HOLDER	1
20			GRUB SCREW (M6x6)	1
21	NC-27	10A-8	WASHER	1
22		-------	CIRCLIP (EXT. ½")	1
23	NC-113		SPACER	2
24	NC-109		CLAMP ARM	2
25	NC-110		CLAMP ARM TIE ROD	1
26	NC-111		SQUARE BOLT	2
27			SPRING (1.25x12x9x41)	2
28			ALLEN HEAD BOLT(M8x90)	2
29			PLAIN WASHER	2
30			PNUMATIC CYL. (ADVU-63-10-P-A) 156559	1
31	NC-114		CYL. PAD	1
32	NC-108		CYL. MOUNTING PLATE	1
33	430-629-2		PIVOT PIN	1
34	NC-25-1AC		CABLE CLIP	1
35	NC-122		CROSS-STOP FLAT	1
36	NC-138		NYLON PLUG (Ø0.170"x0.370")	2
37	NC-139		NYLON STOPPER (Ø0.130"x0.250")	2
38			GRUB SCREW (M6x6)	2
39	NC-136		SUPPORT BLOCK	2
40	NC-137		SPACING STRIP	2
41	430-520		SPACER	1
42	430-523		ADJUSTING NUT	1
43	430-524		RETAINING RING (1/2")	1
44	NC-36	10A-9	INCLINATION ROD	1
45	430-548		RETAINING RING	2
46	430-549		SPRING PIN 1/8"x 3/4"	2
47	430-551		NEEDLE BEARING (HK 1210)	1
48	430-550		THRUST BEARING(12x26x4)	2

49	430-531		KNOB	1
50	430-530		GRUB SCREW FLAT PT. (M6x6)	1
51	430-529		SET SCREW F.PT. (M8x20)	1
52	430-532		HANDLE	1
53	430-533		ALLEN HD SCREW (M8x70)	1
54			NYLOCK NUT (M10)	1
55	VGS-640		NUT	1
56	430-670		EYE BOLT	1
57	NC-35		ECCENTRIC CLAMP	1
58	NC-39		LEVER PIN	1
59	VGS-522		KNOB (1/4"x O.D. 1")	1
60	430 -629-1		CLAMP PIN	1
61	430-510		ECCENTRIC COLLAR	2
62	430-552		TAPER PIN	2
63			ALLEN HEAD SCREW (M4x12)	2
64	430-514-S-3		SHIPPING CLAMP BRACKET (NOT SHOWN)	2
65	NC-34		CLAMP	1
66	430-516		LEVER	1
67	430-517		KNOB (M8x50 LONG)	1
68	430-514-S-1		CLAMP PLATE (NOT SHOWN)	1
69				
70	430-514 S-2		SHIPPING CLAMP (NOT SHOWN)	2
71	NC-115-1		PIVOT SUPPORT	1
72			ALLEN HEAD SCREW (M8x40)	2
73	NC-119		BEARING BLOCK	1
74			ALLEN HEAD SCREW (M6x35)	1
75	NC-121		JACK SCREW	2
76	NC-120		ROD	2
77	**NC-44**	**10A-10**	**CABLE TRAY**	**1**
78	**NC-45**	**10A-11**	**TRAY COVER**	**1**

Spindle Assembly

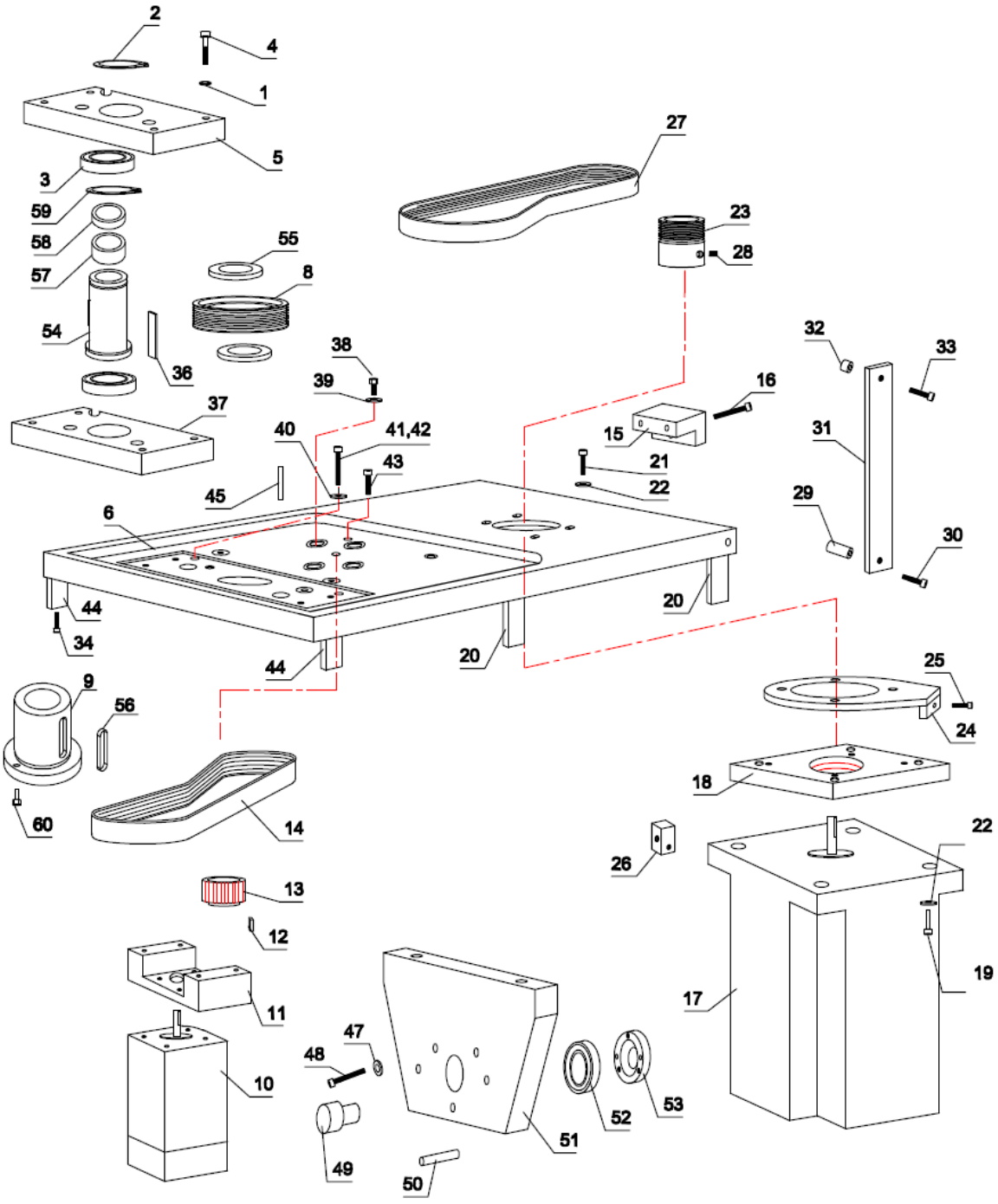


S. NO.	PART NO.	DRG. NO. SG-10A	DESCRIPTION	QTY/M/C
1	NC-151-00		DRIVE SHAFT ASSY. ENCLUDED	1
	NC-151	**10A-16**	DRIVE SHAFT	1
	NCL-71-S		SPACER	1
	NCL-72-S		ROTATING PIN	1
	NCL-74-1		PLUNGER	1
	------	------	------	------
	NCL-77		LOWER CONE	1
	NCL-78		SPACER	1
	FH-079-S		SPHERE CAP	1
2	430-671		RUBBER SEAL (50x70x10)	1
3	KS-08-07		QUICK NUT	1
4	KS-08-03		SPRING	2
5	KS-08-02		PAD	2
6	430-659-1		ANG. CONT. (PAIR) BRG. (40x68x30)	1
7	**NC-43**	**10A-17**	COLUMN	1
8	430-648-1		ANG. CONT. BEARING (40x68x15)	1
9	430-605-1		SPACER	1
10	NC-32		BRASS PAD	2
11	430-623A		C.PT. GRUB SCREW (M5x16)	2
12	430-623B		F.PT GRUB SCR.(M5x6)	2
13	NC-33		STOP PLATE LOCK NUT	1
14	430-603A		GRUB SCREW (M6x6)	2
14A	430-603B		PLUG	2
15	430-603		LOCK NUT	1
16	430-601-1		END STOPPER	1
17	KS-08-06		COVER	1
18	KS-08-05		PIN	1
19	KS-08-04		SPRING	1
20	KS-08-01		STOP PIN	1
21	NC-46	**10A-18**	BACK COVER	1
22	**NC-16-1**	**10A-19**	**EXT. BLOCK (RIGHT)**	**1**
23	**NC-15-1**	**10A-36**	SPINDLE HOUSING	1
23A	430-614S		SHIPPING CLAMP (NOT SHOWN)	1
24	430-627		GRUB SCR. D.PT. (M8x25)	4
25	430-609		ALLEN HEAD SCREW (M8x30)	5
26	430-619		GRUB SCREW (M10x10)	1
27	430-619A		BRASS PLUG	1
28	**430-668-1**	**10A-21**	COVER PLATE	1
29	430-666		BUTTON HEAD SCREW (M5x10)	4
30	**430-712 R**		HOLDER	1
31	430-714-R		GAS SPRING (150N)	1
32	**NC-147**		TUBE	1
33	NC-7	**10A-20**	PLATE	1
34	------	------	------	------
35		------	C' SINK SCREW (M5x12)	2
36	NC-1A, NC-2A	**10A-22**	BALL SCREW ASSEMBLY.	1
37		------	ALLEN HEAD SCREW (M5x16)	4
38		------	ANGULAR CONT. BEARING (7201)	PAIR

			(10x32x20)	
39	NC-3-A	**10A-23**	BRACKET BALL NUT	1
40		------	ALLEN HEAD SCREW (M6x20)	2
41	NC-9	**10A-24**	COVER PLATE	1
42		------	C'SINK SCREW (M5x12)	4
S. NO.	**PART NO.**	**DRG. NO. SG-10A**	**DESCRIPTION**	**QTY/M/C**
43	**NC-8-1**	**10A-25**	**SUPPORT BRACKET**	**1**
44		**------**	ALLEN HEAD SCREW (M8x35)	2
45	NC-10	**10A-26**	NUT	1
46	NC-12	**10A-27**	PULLEY (FEED)	1
47		**------**	BALL BEARING (6000-2RS-1) (10x26x8)	1
48	NC-37		PLATE (LEVELING PIN)	1
49	430-616		LEVELING PIN	1
50	**NC-2A-2**	**10A-28**	OIL FITTING (FOR BALL SCREW)	1
51	NC-40	**10A-29**	FRONT COVER	1
52	**NCL-81-2**		CYLINDER COVER	1
53			**BUTTON** HEAD SCREW (M5x12)	31
54	NC-48	**10A-30**	RIGHT SIDE COVER	1
55	NC-47	**10A-31**	LEFT SIDE COVER	1
56	NC-49	**10A-32**	TOP COVER	1
57	NCL-76-1		DRIVE ADAPTOR	1
58	NC-103	**10A-33**	OIL PUMP MTG. BKT.	1
59	055A-337	**10A-34**	LUB. FEEDER	1
60		**------**	OIL PUMP	1
61	NCL-73-S**-1**	**10A-39**	TIE ROD	1
62			BEARING (20x42x12) 6004-2Z	2
63	NCL-70-1		BEARING HOUSING	1
64	NC-93		STOPPER	1
65			ALLEN HEAD SCREW(M10x50)	1
66	NCL-97		CABLE BRACKET	1
67	NC-140		BEARING HOUSING	1
68	NC-141		SUPPORT PLATE	1
69	NC-143		SPACING BLOCK	1
70	NC-142		SPACER	1
71	NC-144		THRUST BEARING	2
72	NC-145		O-RING	1
73			SPRING (033-KIT)	1
74	NC-150		SPACER	2
75	430-1026		CLAMP PIN	1
76	430-1026-1		SPRING	1

77	430-1049 B		LEVEL BLOCK	1
78			ALLEN HEAD SCREW (M3 x 12)	2
79			DOWEL PIN (Ø3/16 x 3/4 LONG)	1
80	430-1049C		SLIDE PIN	1
81			GRUB SCREW (M5 x 16)	1
82	430-1025		CLAMP	1
83			BUTTON HEAD (SCREW M5 x 10)	1
84	**NC-13-1**	**10A-35**	**EXT. BLOCK (LEFT)**	**1**
85	**NC-31**	**10A-37**	**SPACER**	**1**
86	**NC-50**	**10A-38**	**STOPPER**	**1**

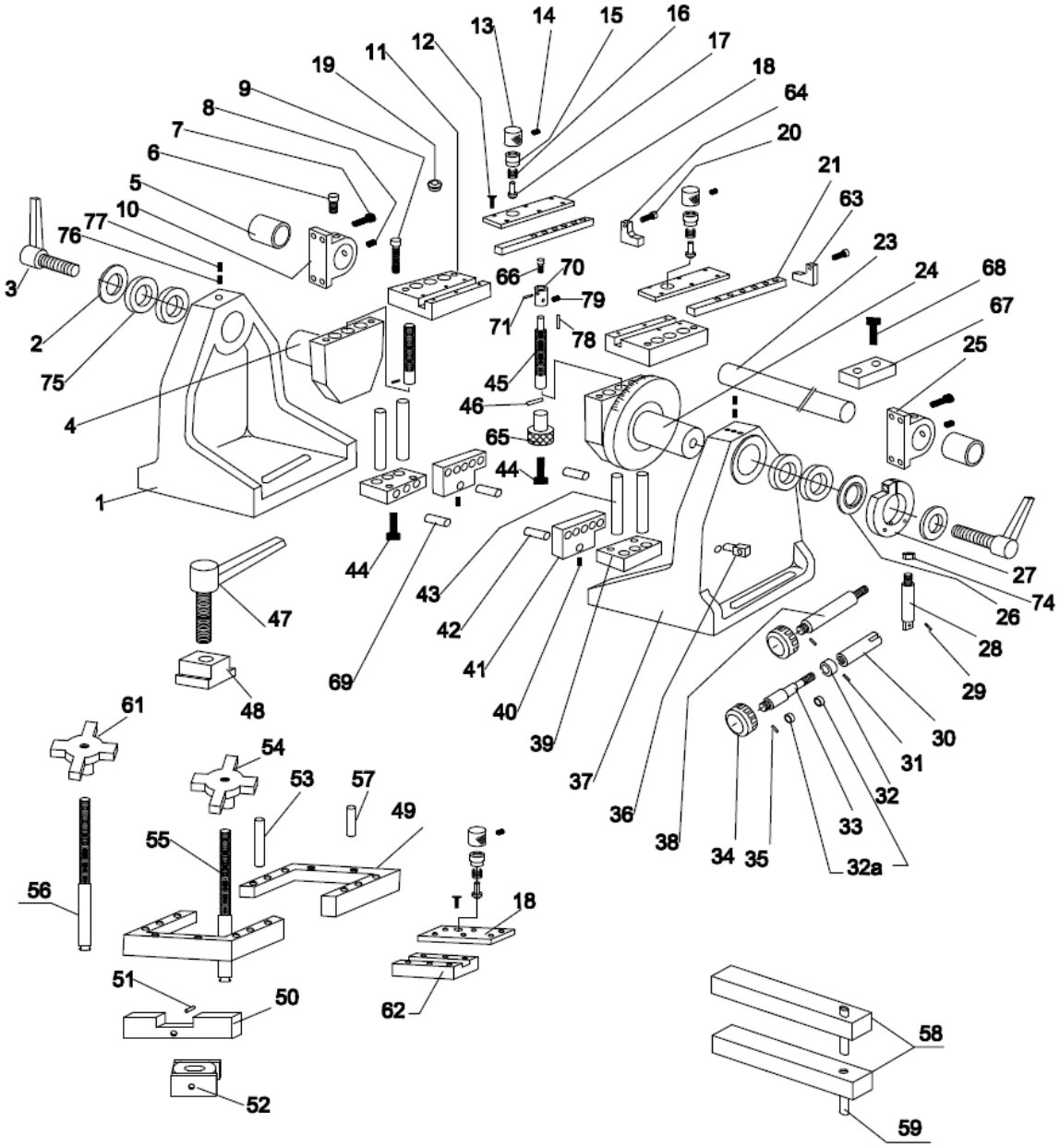
Transmission Assembly



S. NO.	PART NO.	DRG. NO. SG-10A	DESCRIPTION	QTY/M/C
1			SPRING WASHER (M8)	4
2	NC-155		EXT. CIRCLIP (Ø50)	1
3			BALL BEARING (61910-2RS1)	2
4	430-705A		ALLEN HEAD SCREW (M6x90)	4
5	NC-117	10A-41	TOP BEARING PLATE	1
6	NC-14-2	10A-42	TOP PLATE	1
7				
8	NC-6-2		SPINDLE PULLEY	1
9	430-701-1		SPLINE BUSH	1
10	NC-22		FEED MOTOR (BSM 80N-275 AA)	1
11	NC-4	10A-44	MOTOR PLATE	1
12		------	KEY (FEED MOTOR)	1
13	NC-11-1	10A-45	MOTOR PULLEY	1
14	NC-53		TIMING BELT (225L-075)	1
15	NC-134		BACK PLATE	1
16			ALLEN HEAD SCREW (M6x40)	2
17	NC-21		MOTOR (SERVO N-90) (BSM 90N-3250AA)	1
18	NC-20-1	10A-48	MOTOR PLATE (DRIVE)	1
19		------	ALLEN HEAD SCREW (M10x25)	4
20	NC-38	10A-47	MTG. BRACKET	4
21	VGS-731	------	ALLEN HEAD SCREW (M10x30)	4
22	VGS-732		PLAIN WASHER (10MM)	8
23	NC-24-III	10A-49	MOTOR PULLEY	1
24	NC-133		MOTOR FLANGE	1
25			ALLEN HEAD SCREW (M8x45)	1
26	430-720		COVER SUPPORT	4
27	NC-54		TIMING BELT (HTD-1200-8M-30)	1
28	VGS-753	------	GRUB SCREW F. PT. (M6x8)	3
29	430-PP-12	10A-50	LARGE SPACER	2
30			ALLEN HEAD SCREW (M8x90)	2
31	430-PP-5	10A-51	SHIPPING CLAMP	2
32	430-PP-11	10A-52	SMALL SPACER	2
33		------	ALLEN HEAD SCREW (M8x50)	2
34		------	ALLEN HEAD SCREW (M6x50)	12
35	NC-116		SPACER	2
36			KEY (8MM SQ.x30 LONG)	1
37	NC-118	10A-53	BOTTOM BEARING PLATE	1
38		------	ALLEN HEAD SCREW (M6x20)	4
39		------	PLAIN WASHER (6MM)	4
40			SPRING WASHER (M8)	4
41			ALLEN HEAD SCREW (M8x125)	4
42	430-735W		SPACER(NOT SHOWN)	4
43			ALLEN HEAD SCREW (M8x60)	2
44	NC-38-1	10A-54	MTG. BRACKET	2
45	NC-90-1	10A-43	DOWEL PIN	2
46				
47	VGS-740		WASHER	3
48			ALLEN HEAD SCREW (M6x30)	7

49	430-534-A		PIVOT PIN	1
50			DOWEL PIN(Ø6x35)	2
51	NC-152	10A-46	SUPPORT FLAT	1
52			BALL BEARING (6206-2RS)	1
53	430-534-B		BRG. SUPPORT	1
S. NO.	PART NO.	DRG. NO. SG-10A	DESCRIPTION	QTY/M/C
54.	NC-153		FLANGE	1
55.	NC-154		SPACER	2
56.	NC-156		KEY 1/4x1-1/4	1
57.	NC-157		SPACER	1
58.	430-728		LOCATING BUSH	1
59.	430-730		INT. CIRCLIP	1
60.			ALLEN HEAD SCREW M4x16	4

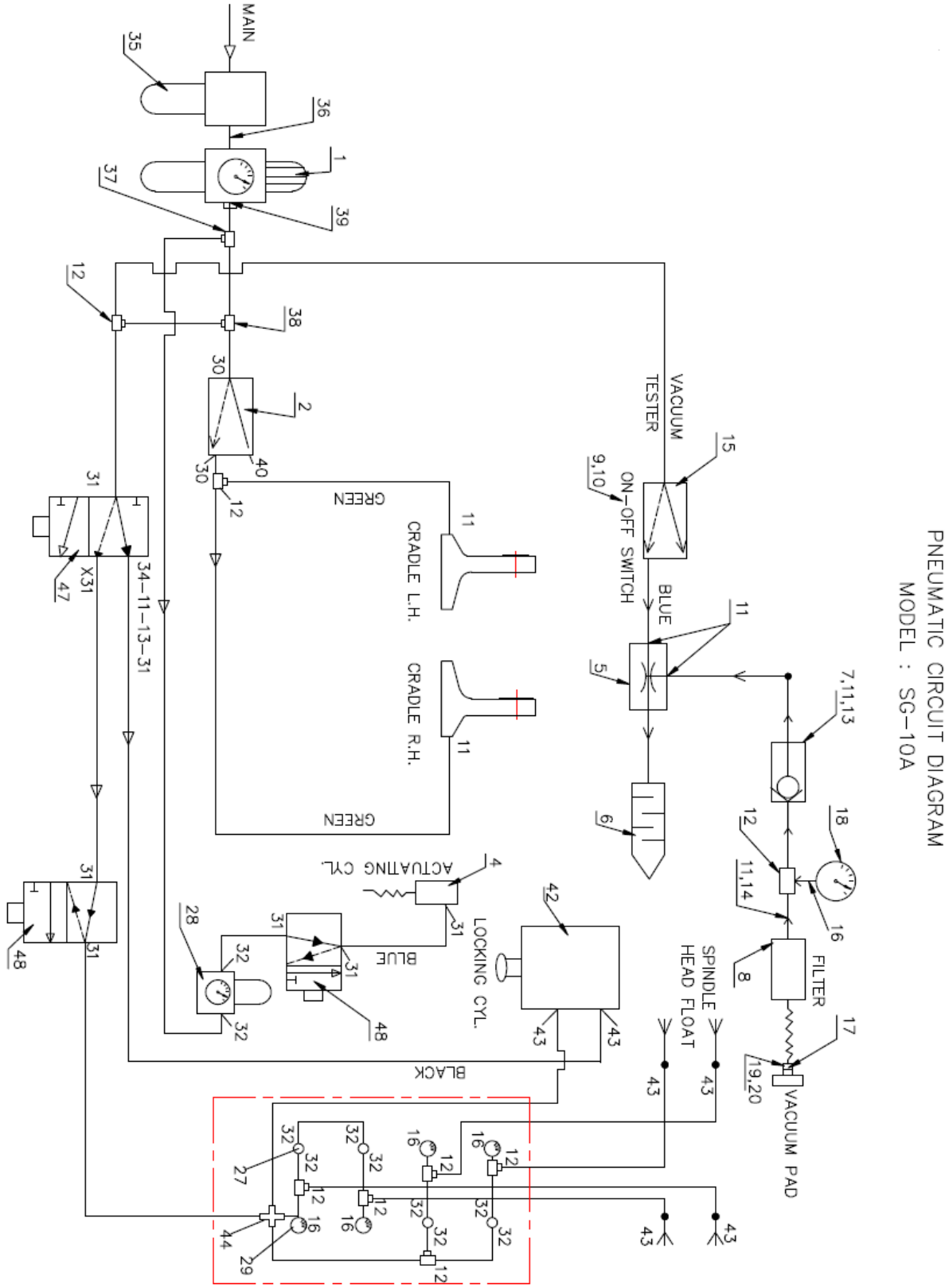
Head Support Assembly



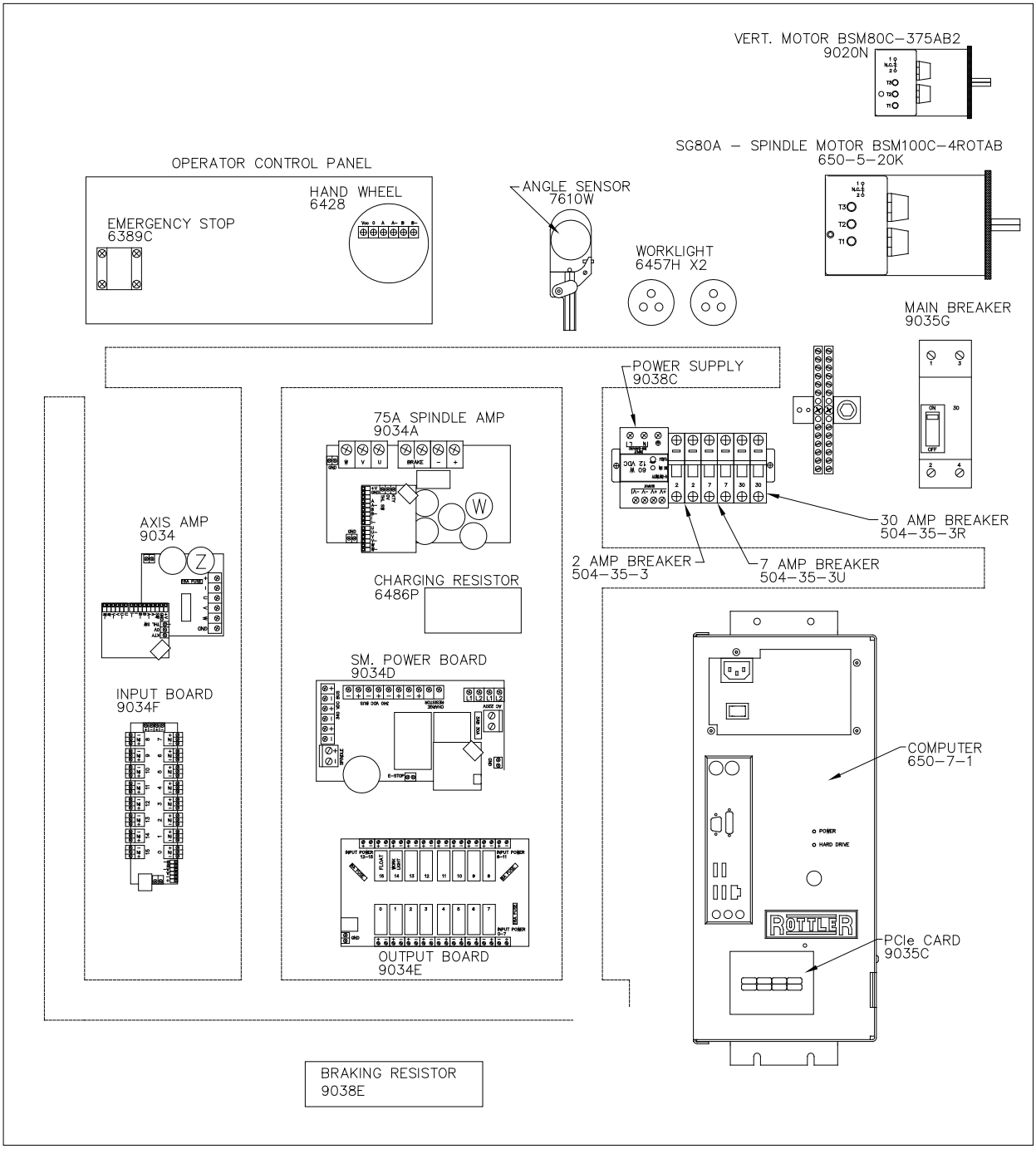
S. NO.	PART NO.	DRG. NO. SG-10A	DESCRIPTION	QTY/M/C
1	430-913-B		HEAD SUPPORT LEFT	1
2	430-912		WASHER	2
3	430-938 A & C		CLAMP BOLT L.H & R.H.	2 EACH
3A	430-938 B		WASHER	4
3B	430-938 D		PIN	4
4	SF-113		HOLDER LEFT	1
5	430-901		BUSH	2
6	430-911		KNOB	1
7	430-906		ALLEN HEAD BOLT (M8x20)	8
8			GRUB SCREW (M8x10)	2
9	VGS-959		ALLEN HEAD BOLT (M10x35 LONG)	4
10	430-902		BEARING BUSH LEFT	1
11	SF-101		PLATE	2
12	430-925		C'SINK SCREW (M5x12)	24
13	430-918		KNURLING COLLAR	4
14	430-917		GRUB SCREW (M6x6)	4
15	430-916		PIN HOLDER	4
16	430-921		SPRING (SAME AS #100-057)	4
17	430-919		PLUNGER	4
18	430-915		PLATE	4
19	**VGS-960**		**CAP (BLACK)**	**4**
20	430-936		ALLEN HEAD SCREW (M6x20)	2
21	SF-108		FLAT	2
22				
23	430-914		GUIDE ROD	1
24	SF-112		HOLDER RIGHT	1
25	430-907		BEARING BUSH RIGHT	1
26	430-934		SPACER	1
27	430-933		COLLAR	1
28	430-929		ARM	1
29	VGS-928		PIN (1/8"x5/8")	1
30	430-927		CLAMP	1
31	430-904		ROLL PIN (1/8"x3/4")	1
32	430-548		RETAINING RING	1
32A	430-550		THRUST BEARING (12x26x4)	2
33	430-926		ADJUSTING SCREW	1
34	430-923		KNOB	2
35	430-924		PIN (1/8" x1 1/16")	2
36	430-922		PIVOT BLOCK	1
37	430-920-B		HEAD SUPPORT RIGHT	1
38	430-931		LOCK COLLAR SCREW	1
39	SF-104		CLAMP PLATE	2
40			GRUB SCREW (M5x6)	2
41	430-964-1		CLAMP	2
42	430-949		PIVOT PIN	2
43	430-961		GUIDE PIN	4
44	430-967		ALLEN HD. SCREW (M12x50)	2
45	SF-103		SCREW	2
46	VGS-963		PIN (5/32"x5/8" LONG)	4
47	430-941		HANDLE	4
48	430-939		T-NUT	2
49	SF-110		HEAD SUPPORT	2

50	430-945		BAR	2
51	430-946		ROLL PIN (1/4"x1 ¼")	2
52	430-947		SWIVEL CLAMP	2
53	430-943		TUBE	2
54	430-942		KNOB	2
S. NO.	**PART NO.**	**DRG. NO. SG-10A**	**DESCRIPTION**	**QTY/M/C**
55	430-948		TAKE UP ROD	2
56	430-948A		TAKE UP ROD (1/4")	2
57	430-943S		TUBE (SMALL)	2
58	430-944S		PARALLEL FLAT	2
59			DOWEL PIN (1/4" X 1") (PURCHASED)	2
60	430-965-1		CLAMPING PIN (NOT SHOWN)	4
61	430-942-A		KNOB (1/4")	2
62	430-944-II		LOCATING BLOCK	2
63	430-935-I		STOP PLATE R. H.	1
64	430-937-I		STOP PLATE L. H.	1
65	430-962-2		KNOB	2
66			ALLEN HEAD SCREW (M12x25)	2
67	NC-105		LOCATING BLOCK	1
68			SCREW (M6x16)	2
69	NC-59B		ALIGNMENT BAR	2
70	SF-107		TOMMY NUT	2
71	SF-130		PIN Ø0.156"x0.970" LONG	**2**
72				
73				
74			NUT M10	1
75	**430-950**		**NEEDLE ROLLER BEARING**	**4**
76	**430-951**		**SETTING SCREW**	**2**
77	**430-952**		**GRUB SCREW M8x10**	**2**
78	**430-953**		**KEY**	**2**
79	**430-954**		**GRUB SCREW M6x6**	**2**

Pneumatic Circuit Diagram

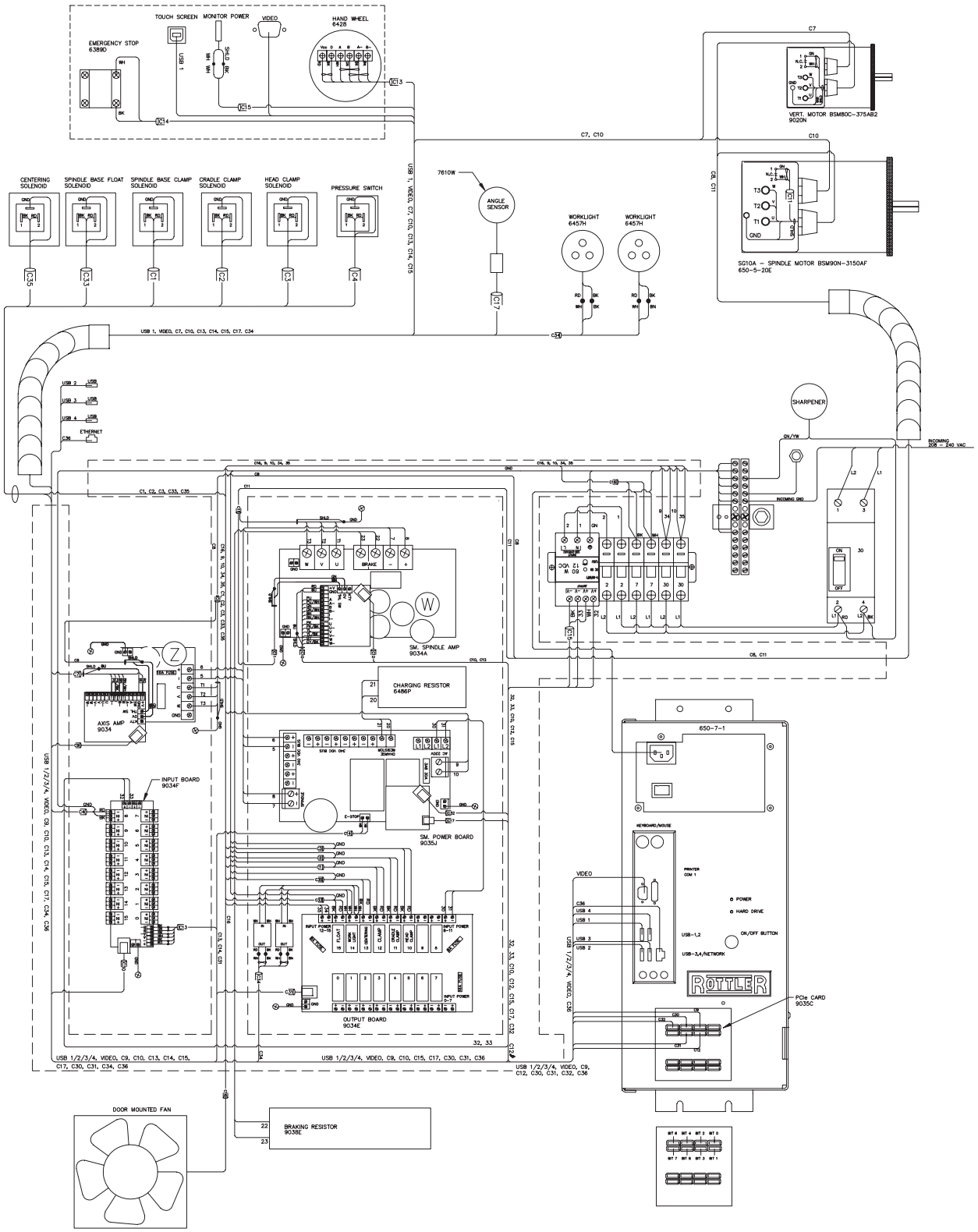


Electrical Components



Electrical Wiring Diagram

A scalable copy of this diagram Is located on the manual CD.



OPTIONS

Optional Equipment

Optional Equipment Catalog and Parts Manual are located on the Manual CD shipped with machine.

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MSDS

The Material Data Safety Sheets list shown in this section are the substances and materials that an operator is most likely to come in contact with while using this machine.

Other substances and materials are used in the manufacture, testing, and shipping of this machine. A complete list of the Material Data Safety Sheets of substances and materials used by Rottler Manufacturing during manufacturing, testing, and shipping is located on the Manual CD shipped with the machine. Material Data Safety Sheets are also located on the company web site: http://www.rottlermfg.com/documentation.php

1) 76 Multi-Way Oil

2) 76 Unoba EP Grease

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: Multi-Way Oil HD
SDS Number: 817776

Synonyms/Other Means of Identification: Multi-Way HD 32
Multi-Way HD 68
Multi-Way HD 220

Intended Use: Way Oil

Manufacturer: Phillips 66 Lubricants
600 N. Dairy Ashford, 2WL9072F
Houston, Texas 77079-1175

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

Customer Service: U.S.: 1-800-822-6457 or International: +1-83-2486-3363

Technical Information: 1-877-445-9198

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

Section 2: Hazard(s) Identification

This material is not considered hazardous according to OSHA criteria.

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Lubricant Base Oil (Petroleum)	VARIOUS	>95
Additives	Proprietary	<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.

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

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

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.

Medical Conditions Aggravated by Exposure: Conditions which may be aggravated by exposure include skin disorders.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

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

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 / 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.

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

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

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

Section 6: Accidental Release Measures

Personal Precautions: 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 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). If spill/release in excess of EPA reportable quantity (see Section 15) is made into the environment, immediately notify 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. 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 extremely slippery surfaces. 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

Component	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/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

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:	Dark amber
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	<1 mm Hg
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	No data
Melting/Freezing Point:	No data
Pour Point:	< 5 °F / < -15 °C
Solubility in Water:	Insoluble
Partition Coefficient (n-octanol/water) (Kow):	No data

Specific Gravity (water=1):	0.865 - 0.884 @ 60ºF (15.6ºC)
Bulk Density:	7.20 - 7.37 lbs/gal
Viscosity:	5 - 20 cSt @ 100°C; 32 - 220 cSt @ 40°C
Evaporation Rate (nBuAc=1):	No data
Flash Point:	> 320 °F / > 160 °C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Lower Explosive Limits (vol % in air):	No data
Upper Explosive Limits (vol % in air):	No data
Auto-ignition Temperature:	No data

Section 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. Avoid all possible sources of ignition.

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.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

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

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.

Signs and Symptoms: 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.

Skin Sensitization: Not expected to be a skin sensitizer.

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). 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.

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

Toxicity: All acute aquatic toxicity studies on samples of lubricant base oils show acute toxicity values greater than 100 mg/L for invertebrates, algae and fish. These tests were carried out on water accommodated fractions and the results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Classification: No classified hazards.

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 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.

Section 14: Transport Information

U.S. Department of Transportation (DOT)

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

International Maritime Dangerous Goods (IMDG)

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

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

UN/ID #: ***Not regulated***
Note: ***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.***

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

Section 15: Regulatory Information

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

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

Acute Health:	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. This material contains the following chemicals subject to the reporting requirements of 40 CFR 302.4:

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

International Hazard Classification

GHS Classification
None

Canada:
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

Section 16: Other Information

Date of Issue:	14-Jun-2012
Status:	FINAL
Previous Issue Date:	04-Aug-2011
Revised Sections or Basis for Revision:	Format change Manufacturer (Section 1) Toxicological (Section 11) Regulatory information (Section 15)
SDS Number:	817776

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

Disclaimer of Expressed and implied Warranties:
The information presented in this 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.

Unoba® EP Grease (All Grades)

Material Safety Data Sheet

1. Product and Company Identification

Product Name:	Unoba® EP Grease (All Grades)
MSDS Number:	722490
Synonyms:	76 Unoba® EP Grease 00 76 Unoba® EP Grease 0 76 Unoba® EP Grease 1 76 Unoba® EP Grease 2 76 Unoba® EP Grease 3
Intended Use:	Lubricating Grease
Manufacturer/Supplier:	ConocoPhillips Lubricants 600 N. Dairy Ashford, 2W900 Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	U.S.: 888-766-7676 or International: +1-83-2486-3363
Technical Information:	800-435-7761
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. Hazards Identification

Emergency Overview

CAUTION!

Eye Irritant

NFPA

Appearance: Green
Physical Form: Semi-Solid
Odor: Petroleum

Potential Health Effects

Eye: Eye irritant. Contact may cause stinging, watering, redness, and swelling.

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 harmful effects from skin absorption are expected.

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

Ingestion (Swallowing): No harmful effects expected from 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 and eye disorders.

See Section 11 for additional Toxicity Information.

3. Composition / Information on Ingredients

Component	CASRN	Concentration*
Lubricant Base Oil (Petroleum)	VARIOUS	<90
Additives	PROPRIETARY	>12
Zinc dialkyl dithiophosphate	68649-42-3	<2

* 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. Remove contact lenses if present and easy to do. For direct contact, hold eyelids apart and flush the affected eye(s) with clean water for at least 15 minutes. If irritation persists, 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): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Notes to Physician: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. Often these injuries require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury.

5. Fire-Fighting Measures

NFPA 704 Hazard Class

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

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: Wear eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment.

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.

"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: Respiratory protection is not normally required under intended conditions of use. Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

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:	Green
Physical Form:	Semi-Solid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	<0.1mm Hg
Vapor Density (air=1):	> 5
Boiling Point/Range:	No data
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Bulk Density:	7.5 lbs/gal
Percent Volatile:	Negligible
Evaporation Rate (nBuAc=1):	<1
Flash Point:	450°F / 232°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:

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.

Acute Data:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil (Petroleum)	>5 g/kg	>2 g/kg	No data
Zinc dialkyl dithiophosphate	>2000 mg/kg (rat)	>2000 mg/kg (rat)	No data

12. Ecological Information

Ecotoxicity: Experimental studies show that acute aquatic toxicity values are in the range 1-100 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Should be regarded as capable of causing long term adverse effects in the aquatic environment.

Mobility: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. Components may behave differently in the aquatic environment with soaps dispersing and dissolving to some extent in water while the hydrocarbons will float on the surface due to their low water solubility. The hydrocarbon portion would be expected to show low mobility in soil and water. The major environmental fate would be expected to be biodegradion.

Persistence and degradability: The base oil constituents of greases are expected to be inherently, but no readily biodegradable. Some of the thickening agents may be readily 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*

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

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

Component	Concentration*	de minimis
Zinc compound(s)	<2	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities. This material contains the following chemicals subject to the reporting requirements of 40 CFR 302.4:

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Silica-Crystalline (Quartz)	Cancer
Naphthalene	Cancer

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
D2B

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

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Revised Sections or Basis for Revision:	Emergency Overview (Section 2) Health Hazard (Section 2) Composition (Section 3) Regulatory information (Section 15)
MSDS Number:	722490

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:
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