

# ROTTLER

## SG9MTS HEAVY DUTY CYLINDER HEAD SEAT & GUIDE MACHINE OPERATIONS MANUAL





# PARTS ORDERING

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# **MANUAL SECTIONS**

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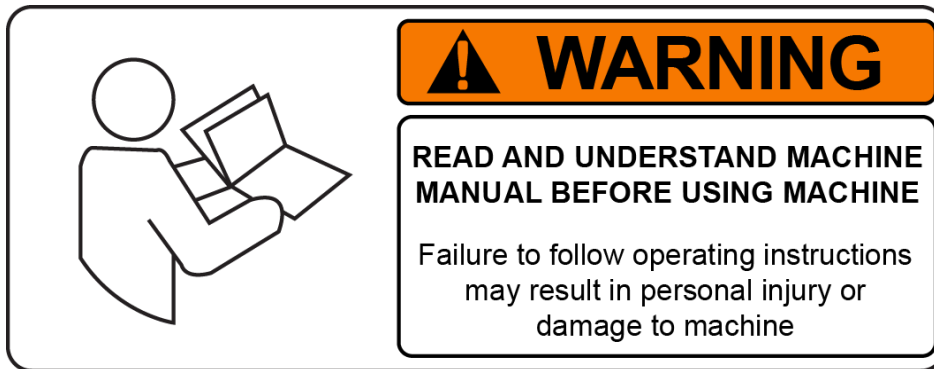
**OPERATING INSTRUCTIONS**

# INTRODUCTION

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## 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 SG9MTS 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 SG9MTS 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.

## Description

The SG9MTS uses the proven patented UNIPILLOT tooling system. The machine has 2 modes of operation:

**MANUALMATIC** – a brand new concept has been added to these machines which should increase productivity by 30-50%. During seat cutting, the operator does not have to operate any buttons or switches, simply turn the spindle feed steering wheel up and down and the control takes care of all the functions like workhead float/clamp, pilot centering in the valve guide and spindle on/off. When depth of seat is reached, the control automatically changes spindle RPM to high/finish speed to give equal depth of every seat and consistent surface finish results.

**MANUAL** – the buttons on touch screen are the same as the previous SGM machines. There is no external dial gage, the spindle vertical position is displayed on the touch screen. Simply feed the spindle down until the cutting insert touches the valve seat, touch set zero button and then the digital display will show exactly where the spindle is at all times. The change from low to high/finishing speed is easier as there are 2 separate buttons. The foot pedal for clamp and float of workhead has been eliminated and now controlled on touch screen for manual and automatically for MANUALMATIC.

The Rottler SG9MTS spindle is mounted on a sphere which allows the UNIPILLOT to automatically center with the valve guide centerline while the Workhead is floating on air cushions. Once air floating stops and the Workhead clamps, the UNIPILLOT and valve guide centerline are maintained while cutting the valve seat.

**ACTIVE SPINDLE** - Spherical Pneumatic Automatic Alignment System built into the Spindle for fast location of the pilot into the Valve Guide and Accurate Centering (Patent Pending)

Rottler Automatic Tightening and Quick Release Spindle Lock Nut System for One Hand Operation for fitting and removing tooling to and from the spindle – never comes loose!

Gives Best Concentricity

Rottler's Rigid Precision carbide centering UNIPILLOTS are manufactured to less than one tenth (.002mm) tolerance. Combined with the light weight air float Workhead the SG9MTS gives perfect centering in the valve guide and the best concentricity of any machine on the market.

## Disclaimer

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## Limited Warranty

Rottler Manufacturing Company Model SG9MTS parts and equipment is warranted as to materials and workmanship. This limited warranty remains in effect for one year from the date of installation or two years from the date of the original shipment from Rottler or whichever date occurs first. This only applies if the machine is owned and operated by the original purchaser and is operated and maintained as per the instructions in the manual. A machine is warranted only if the Installation Report has been properly executed by a certified installation person and received by Rottler at the time of actual installation.

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 Parts Department 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 Parts 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 approval from Rottler Corporation Management.

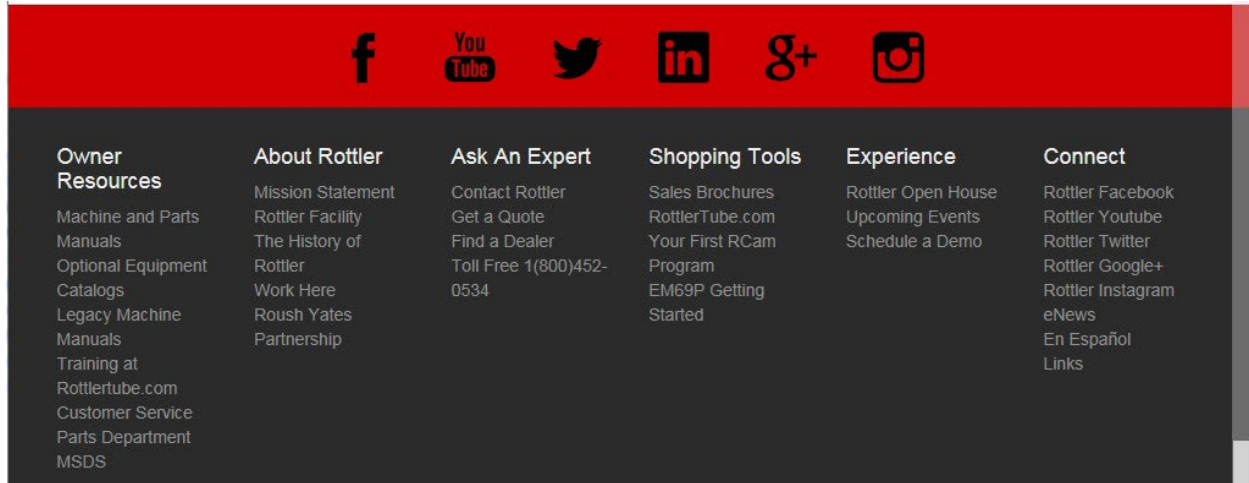
The issuance of a **RGR DOES NOT** guarantee credit - it is only authorization for the return of the goods. Credit for return merchandise is at the sole discretion of Rottler. Credit will be issued only after inspection of returned goods.

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.

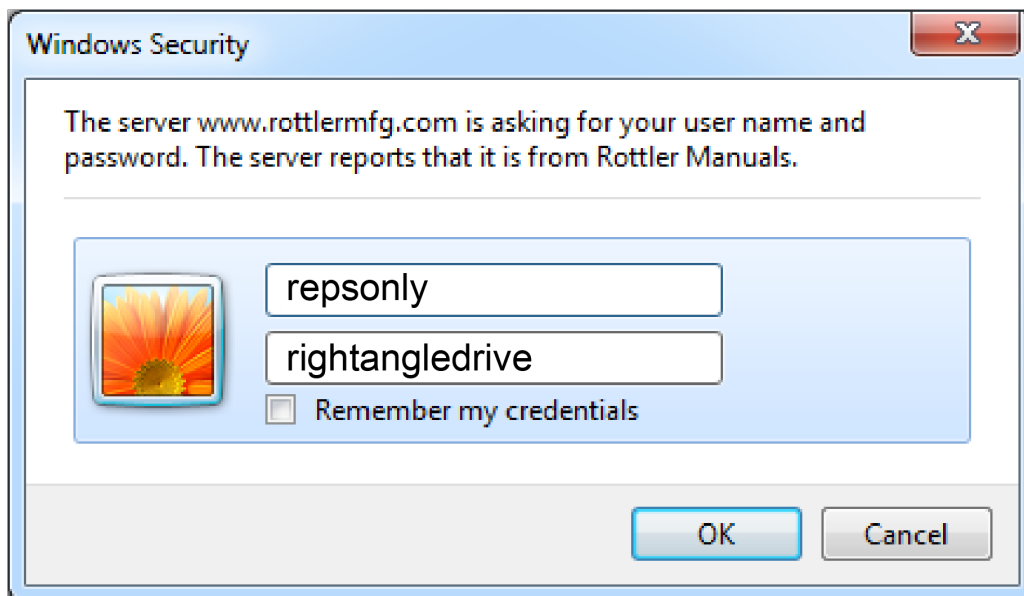
## Online Documentation Access

Online documentation for machines and optional equipment can be accessed at the Rottler website. To access documentation open your browser and navigate to <https://www.rottlermfg.com>.

Scroll to the bottom of the page and under the Owner Resources title click the type of documentation you want to access.



If a log in window pops up asking for user name and password fill in the blanks as shown.



# **SAFETY**

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## 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 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.



This machine is capable of causing severe bodily injury.

## Safety Instructions for Machine Use

**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.

**KEEP GUARDS IN PLACE** and in proper working order.

**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 safety shoes are 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.

**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.

#### **Machine Capacity:**

Do not attempt to use the machine beyond its stated capacity or operations. This type use will reduce the productive life of the machine and could cause the breakage of parts, which could result in personal injury.

#### **Avoid Accidental Starting:**

Make certain the main switch is in the OFF position before connecting power to the machine.

#### **Careless Acts:**

Give the work you are doing your undivided attention. Looking around, carrying on a conversation and horseplay are careless acts that can result in serious injury.

#### **Job Completion:**

If the operation is complete, the machine should be emptied and the work area cleaned.

### Replacement Parts:

Use only Rottler replacement parts and accessories; otherwise, warranty will be null and void.

### Misuse:

Do not use the machine for other than its intended use. If used for other purposes, Rottler Manufacturing disclaims any real or implied warranty and holds itself harmless for any injury or loss that may result from such use.



No list of safety guidelines can be complete. Every 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

Make sure all electrical equipment has the proper overload protection. The SG9MTS should have a **fully isolated** power supply to prevent damage and uncontrolled movement of the machine.

If the SG9MTS 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 SG9MTS 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 later in this chapter for voltage and amperage requirements of the SG9MTS.



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. 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.



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



When you doing any operation on the cylinder head; the machine is capable of throwing metal chips. Eye protection must be worn at all times by the operator and all other personnel in the area of the machine.



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



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.

### Machine Operator

The operator of the SG9MTS 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.

The SG9MTS machines have the following areas of exposed moving parts that you must train yourself to respect and stay away from when they are in motion.

 **WARNING**

**Cutting Tool Area** – Any operation involving hands in the tool holder, such as inspection or alignment of the tool holder or tools, changing tool holder or insert holders, tool insertion, and removal, tool holder changes, and size checking etc. requires the machine to be in neutral or on the off position.

**CAUTION**

**Machining** – Eye protection must be worn during all operations of the machine. Hands must be kept completely away from the cutter head.

**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 of Cylinder head Handler Assembly.

**CAUTION**

**Machine Maintenance** – Any machine adjustment, maintenance or parts replacement absolutely requires a complete power disconnection from the machine, this is an absolute rule.

### 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.

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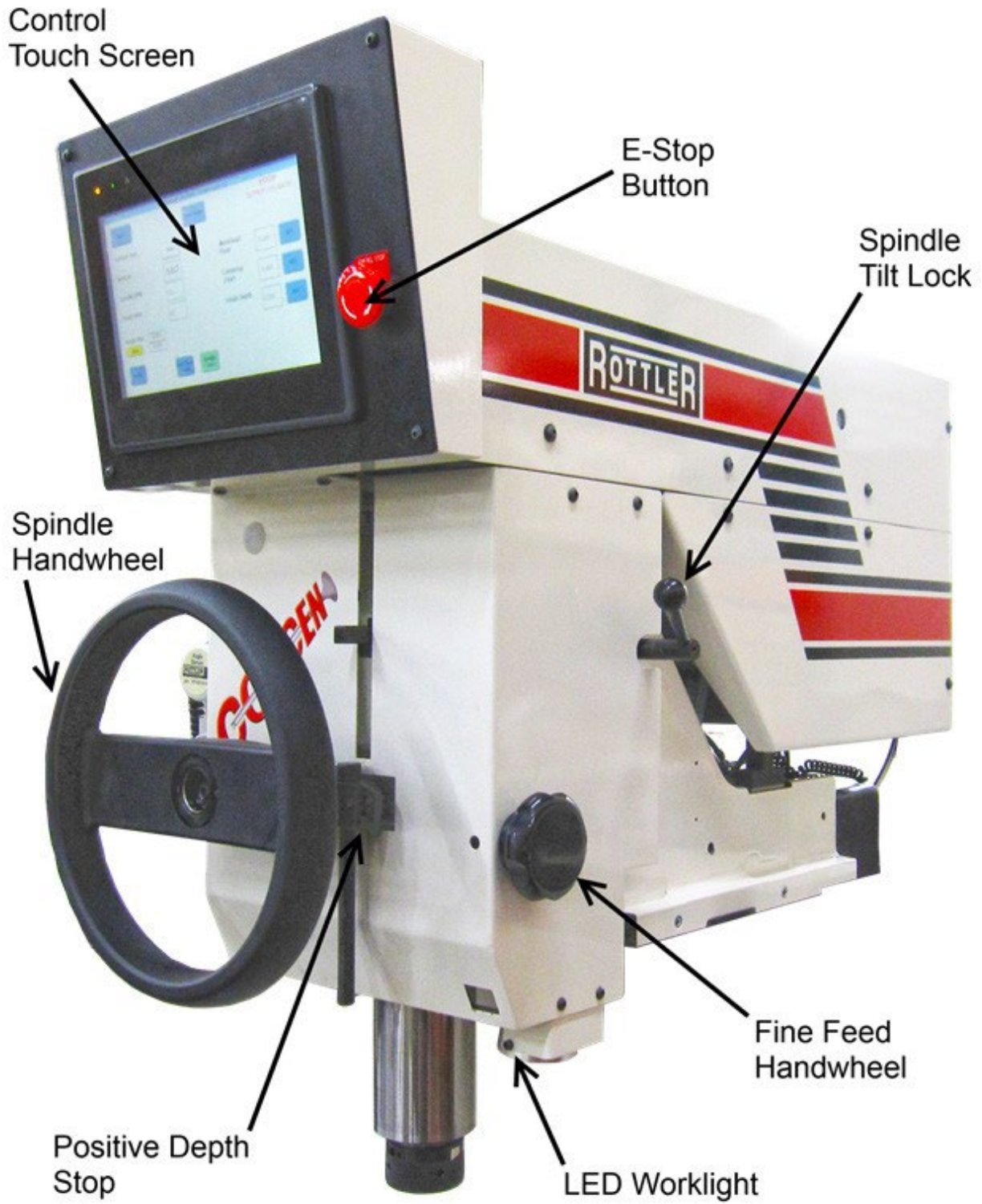
# CONTROL DEFINITIONS

## Left Side Controls





### Right Side Controls



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## Operating Instructions

### Insert Sharpener Operation

The Rottler sharpening can re-condition inserts to a finish almost identical to new. The grinding wheel is designed to provide a very fine lapped finish across the entire face of the insert. It should be noted that the grinding holder is designed to accept RCA/RCB inserts on one side and the larger formant RCC inserts on the other. It should also be noted that the set screw which holds the inserts in the holder is specifically designed to not interfere with the grinding operation, at no time should a different set screw be used as this can result in damage to the grinding wheel.



#### Operation:

With the insert set into the holder, use two hands to support the holder and keep the insert face flush and stable against the grinding wheel. Sweep the insert across the face of the wheel with light pressure to clean up the entire face of the insert.

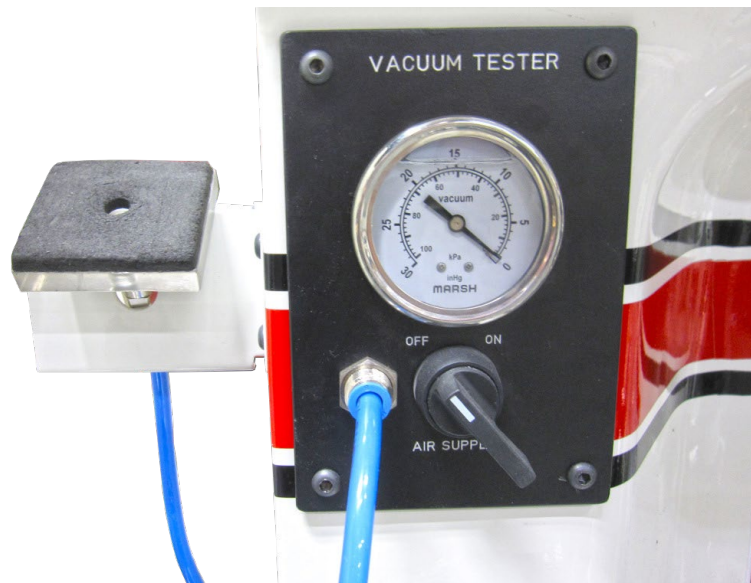


Check the insert as you grind it to make sure that it is cleaning up uniformly, also make sure that the set screw does not contact the grinding wheel. When done properly the insert face should look like the image below:



### 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.



### Mounting Cylinder Heads

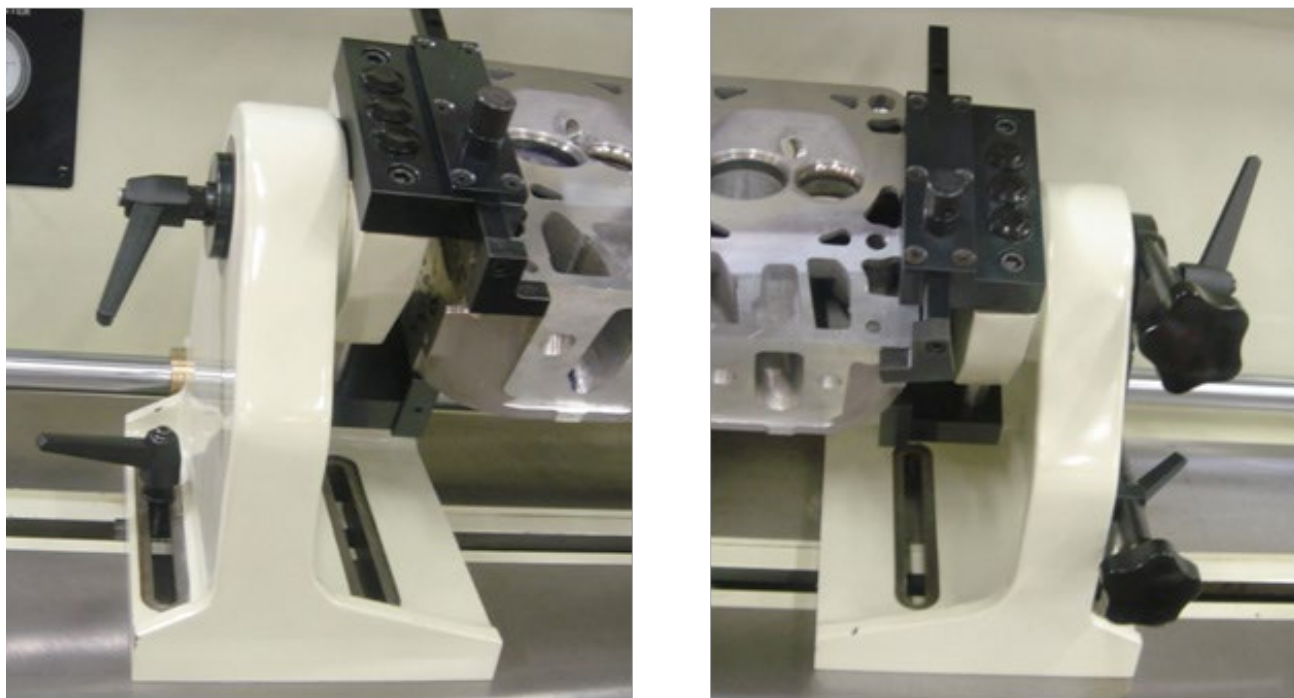
### 360 Degree Rollover Fixtures

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)

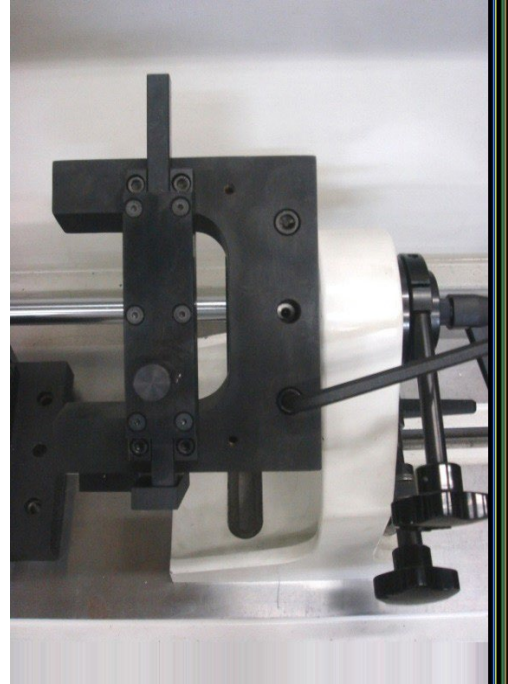
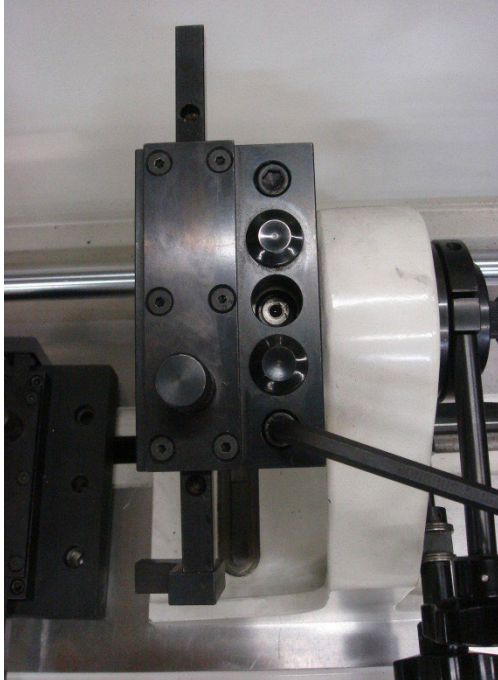
**FIGURE 4**



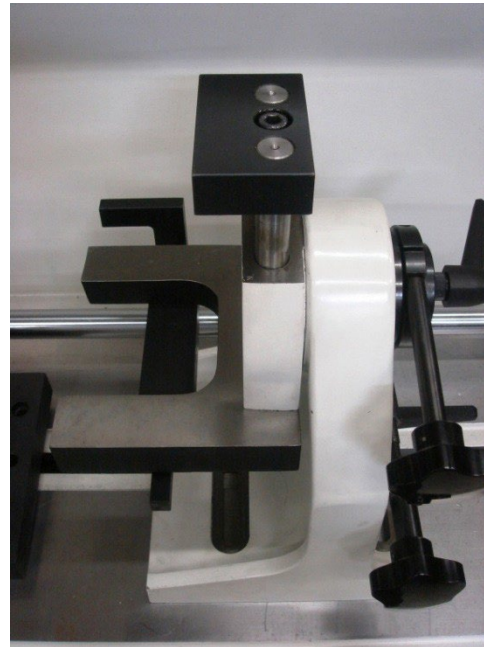
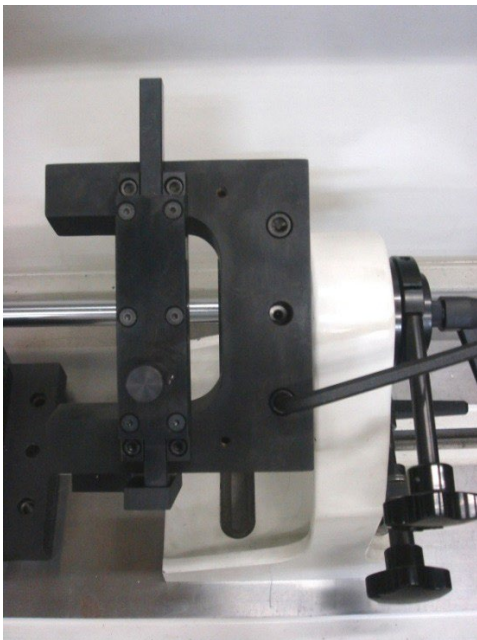
Utilize the grooves in the table to align the trunnion supports square to the machine.

#### **Overhead Cam C Clamp System**

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

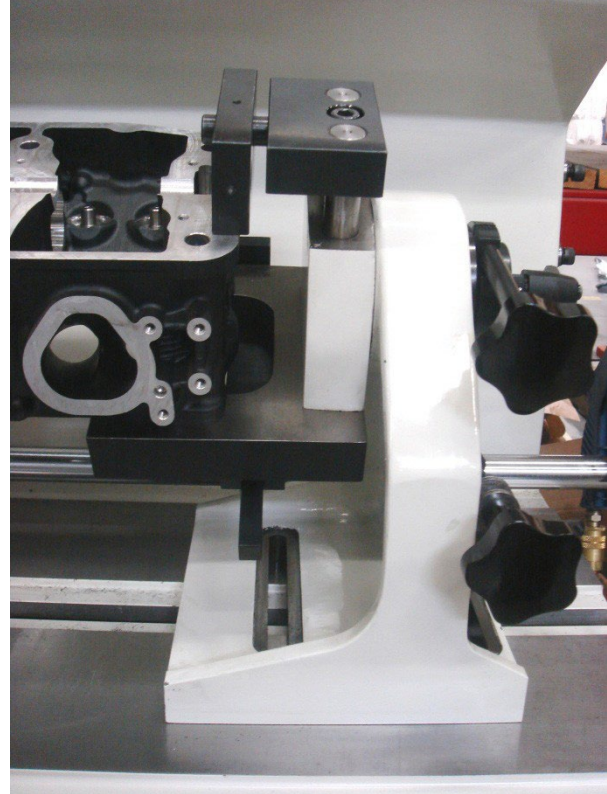
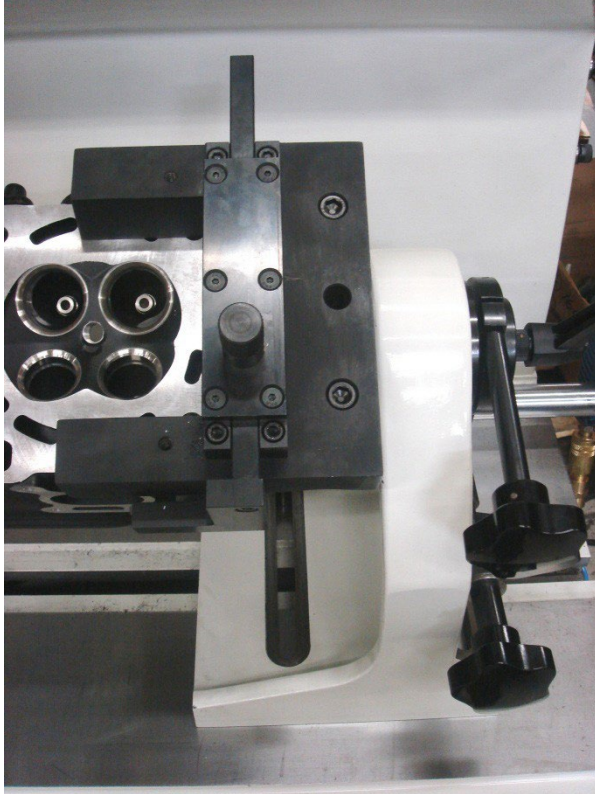


Install the C Clamp, you must use the two bolts included with the fixture and make sure is good and tight

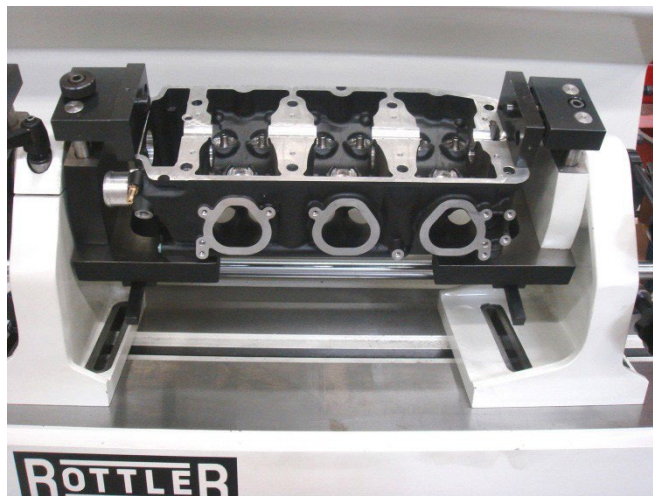


The cylinder head gasket surface must be against the machined surface of the U Clamp Fixture; Slide the stopper rod equally and push the cylinder heads against the stopper rods.

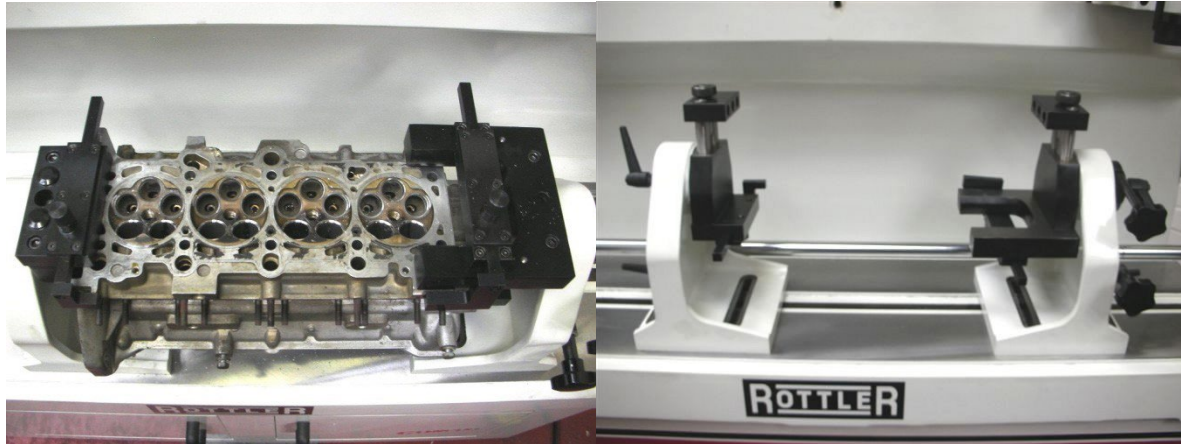
**Note: for some cylinder heads, you may need a spacer against between the cylinder head and the stopper rod (not included)**



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.





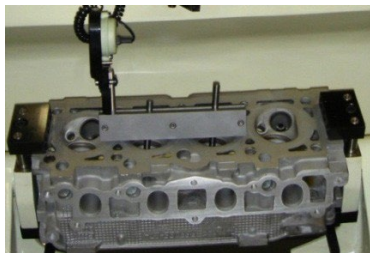
### Left to Right Alignment

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)



### Three Angle Seat Cutting

Place the ball drive adapter in the spindle. Align spindle to valve guide.

Place a valve in the setting fixture. Position the pointer on the valve where you wish to place the top of the seat.

Remove the valve; replace it with the correct pilot.

Select the proper diameter tool holder. Place the carbide insert in tool holder. Slide tool holder onto ball head.

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.

Tighten hex socket screws on bottom of ball head. See figure 9

Remove ball head assembly from setting fixture. Place fixed carbide pilot in cylinder head.

Center the spherical ball head tool holder over the pilot shank.

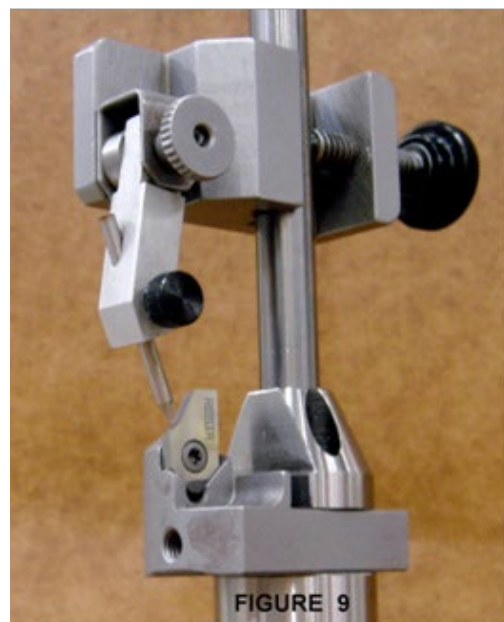
Required spindle rotation speed will vary, depending on seat hardness. As seat hardness increases, so does the required spindle speed. Some will require full speed.

Special care should be taken in centering the floating head above the valve guide, to achieve a concentric seat.

Cut seat only enough to clean up surface.

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 SG80MTS associated with a complete tooling range allow working on seats of diameters between 14 and 120 millimeters (0.55" - 4.7").

Three tooling ranges are possible:

- 1) For seats diameters between 14 and 25 mm ( 0.55" - 1"): tool holder BH600R1 and Mini tip holder TH1999 for seat range .551" - .984" (14mm-25mm) with pilots with 6.00mm shank diameter.
- 2) For seats diameters between 18 and 60 mm ( 0.71" - 2.4"): tool holder BH375R1, or UPT5100 (SG10A,9M only) 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
- 3) For seats diameters between 40 and 80 mm (1,570" - 3.150"): tool holder BH375WR1 or UPT5300 (SG10A,9M only) and 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.

**IMPORTANT:** When the form tips, the square tips or the triangle inserts are fitted, check that their reference faces are perfectly clean.

### 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 valve seats and Counter Boring

#### Aligning Spindle to Work

Most machining operations require the spindle to be directly centered over the work to be performed. This is usually accomplished by air floating the work head above the area to be machined then manually

lowering the spindle to engage the tooling that's going to be used. Most of the tooling used with the SG9M has been engineered with this centering feature incorporated into the design

**CAUTION** If the pedal is released too quickly, the floating head may bounce. True centering may not be achieved, if this happens. Slowly releasing the air float pedal gives the best results. Removing your hands completely from the work head during the final seconds of centering will insure that you do not negatively influence centering accuracy.

### 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 SG9MTS spindle has been engineered to allow ultra-fast tooling changes.

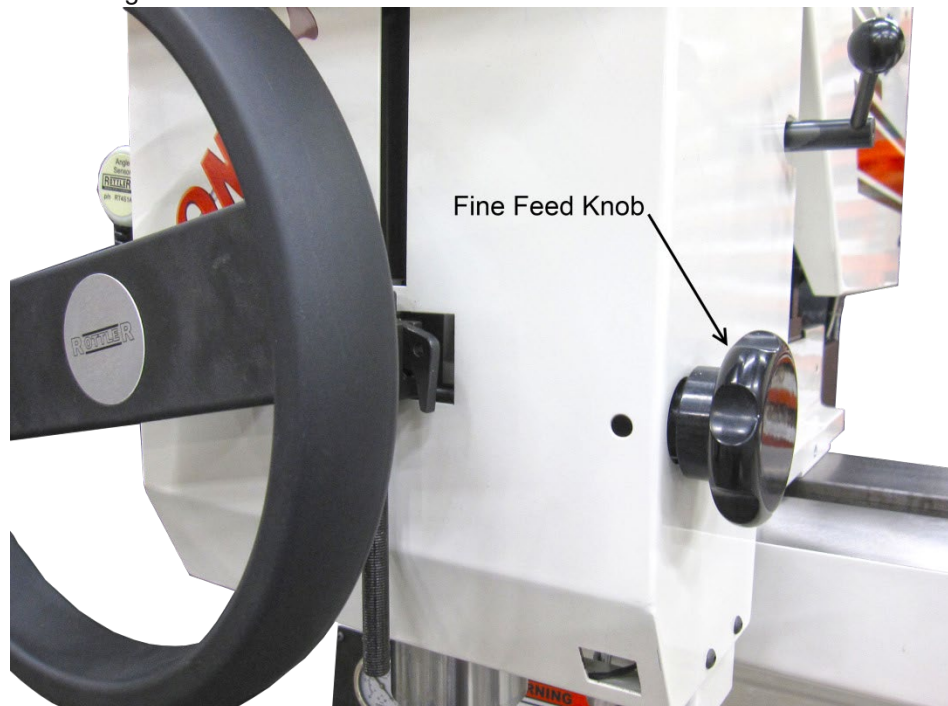
Make sure the spindle spring free locking nut is in the off lock position, line up the two ears of the spindle adapter and insert into the spindle ISO 30 taper. The locking nut automatically will be on the lock position, to remove turn the self-locking nut to the left position, hold the spindle adapter,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

### Installing the Spherical self Aligning Toolholder

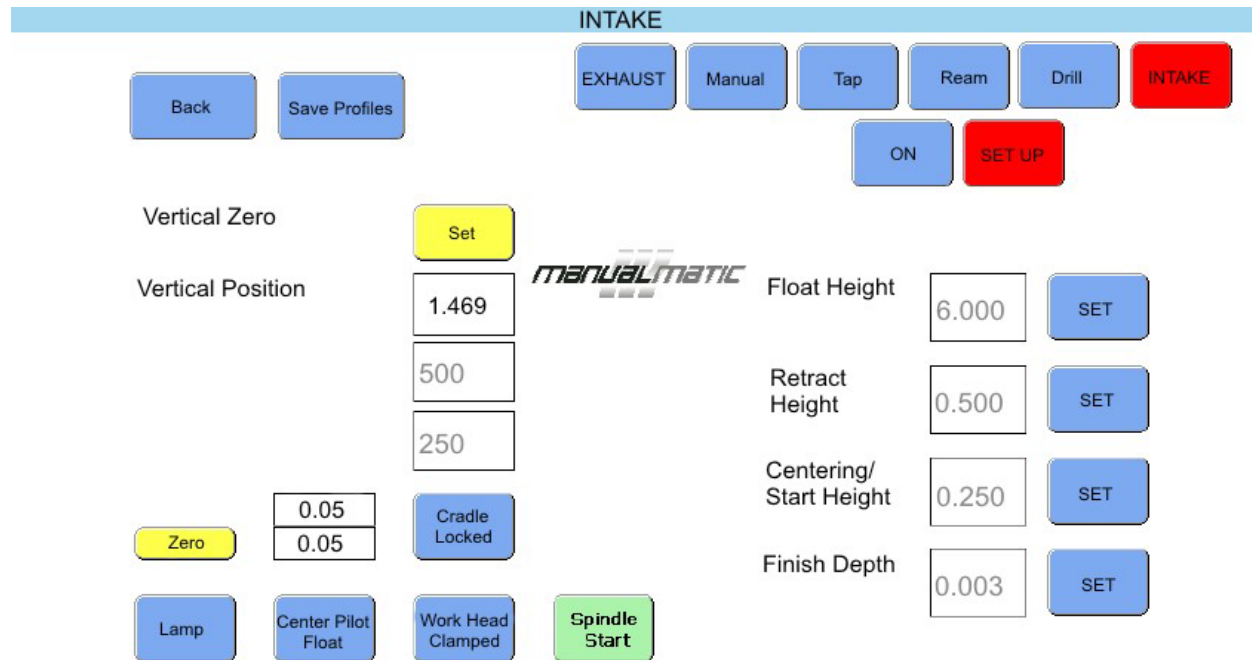
Once the spring free adapter is in the spindle, fit the Rottler Spherical Self aligning Tool holder assembly into the spindle adapter. Make sure to align the locator pins before you fit it into the spindle adapter and push it until you feel it lock.

### Fine Feed Engagement

To engage the fine feed mechanism it is necessary to push inward on the steering handwheel while rotating the fine feed handwheel until engagement is achieved. To disengage the fine feed simply pull outward on the steering handwheel



**Rottler SG9MTS MANUALMATIC Touch Screen Control Panel**



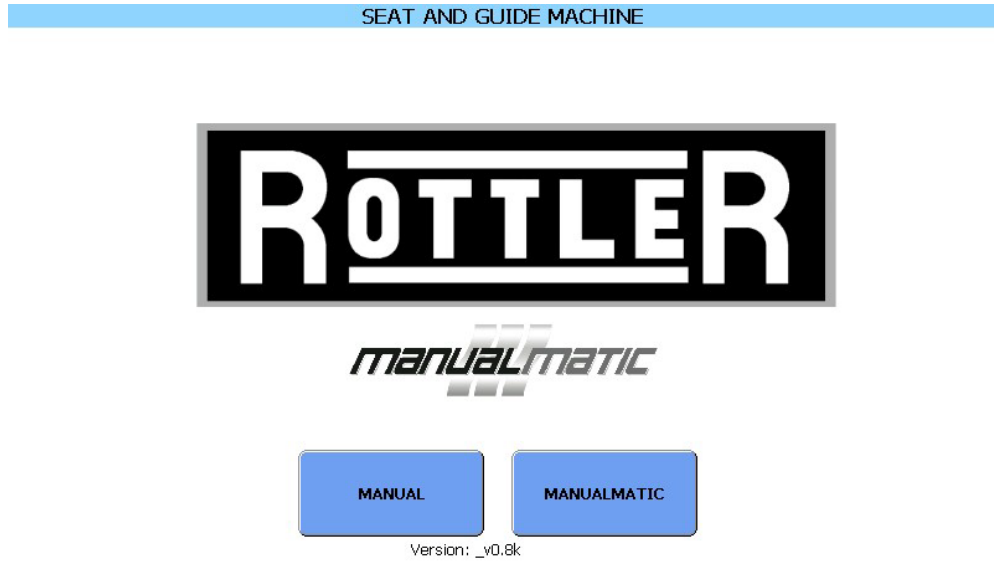
### Safety Tips Before Machining

- Always wear proper Safety Items (such as safety glasses and other personal safety equipment as necessary or required).
- Never wear loose fitting clothes or jewelry while working on or around Machine.
- Use proper lifting procedures when moving Cylinder Head.
- Use care when installing and/or removing Cylinder Head from Machine. Lock Head Support Assembly before loading or unloading Cylinder Head.
- Keep area around Machine free of paper, oil, water and other debris at all times.
- Keep Machine and area cleaned of excessive lubricant and lubricant spills.
- Keep Machine clear of tools and other foreign objects not needed for the operation.
- Maintain all tools clean and in their proper storage compartments to maintain them in proper working condition and to prolong tool life.
- Before machining always Inspect tooling for cracks, burrs or bent parts that might affect operation. Inspect Carbide Inserts (Seat Pocket Cutter) and Carbide Cutters (Seat Angle Cutter) to ensure they are sharp, firmly attached and are not damaged.
- NEVER force tools when operating. Tools will do a better and safer job when operated at speed rate for which they were designed.
- Always turn OFF electrical power when performing service on your machine, if service does not require power.
- High Voltage exists inside Electrical Control Enclosure – use caution when working on or around Enclosure. Machine must be disconnected from main power supply before any work can be performed inside of Enclosure.
- Machine must ONLY be operated with all Safety Guards in place and locked.

### Operation

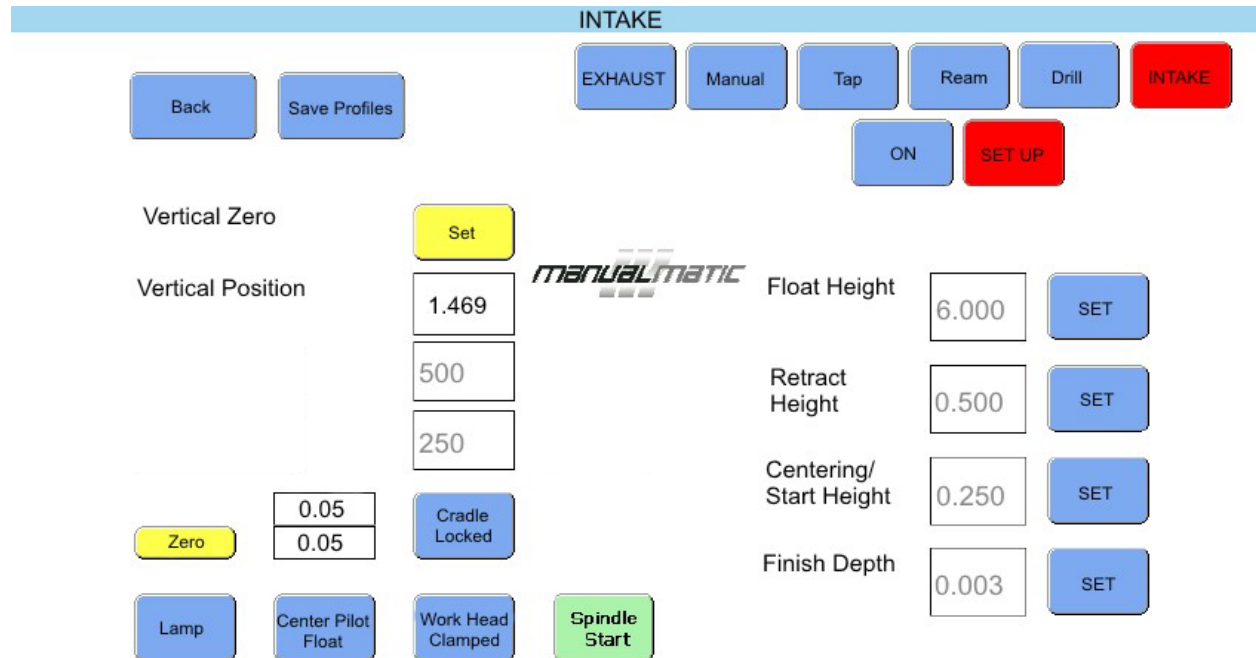
Make sure E Stop is in.

Flip switch on Electrical enclosure to ON (up) position, wait for screen to boot up, this may take a few seconds. This is the screen that will appear



Tap MANUALMATIC for auto mode. Tap MANUAL for manual mode.

### MANUALMATIC



## Buttons

BACK - goes 1 page back.

VERTICAL ZERO - tap the SET button to set the vertical spindle height.

VERTICAL POSITION - height spindle is at from VERTICAL ZERO height set.

SPINDLE RPM - tap the box and a keyboard will pop up, enter RPM you would like to run and tap enter.

FINISH RPM - this will be activated as soon as spindle reaches finish cutting depth. Set same as above.

ANGLE - this is the actual angle the angle sensor is in.

ZERO - by tapping this button you can ZERO the angle reading for easier setup.

LAMP - turns ON and OFF the LED work lights

CENTER PILOT – locks and unlocks the spindle sphere

WORKHEAD FLOAT - floats the workhead

SPINDLE START - turns ON and OFF the spindle

SET UP – turns off auto mode for setup

AUTO MODE - turns on MANUALMATIC mode

WORKHEAD FLOAT – Vertical height the spindle is at when workhead will float. Set by tapping the set button, or tapping display box and entering height wanted.

CENTERING/START – Vertical height the spindle will be at when the workhead centers itself on pilot. As soon as workhead clamps the spindle will start. Set by tapping the set button, or tapping display box and entering height wanted.

FINISH CUTTING DEPTH - Depth Finish RPM activates. Set by tapping the display box and entering in the amount you want to remove from the seat.

TAPPING – locks spindle sphere, instantly reverses spindle at finish cutting depth, will also change to FINISH RPM.

REAMING – locks spindle sphere for reaming and drilling.

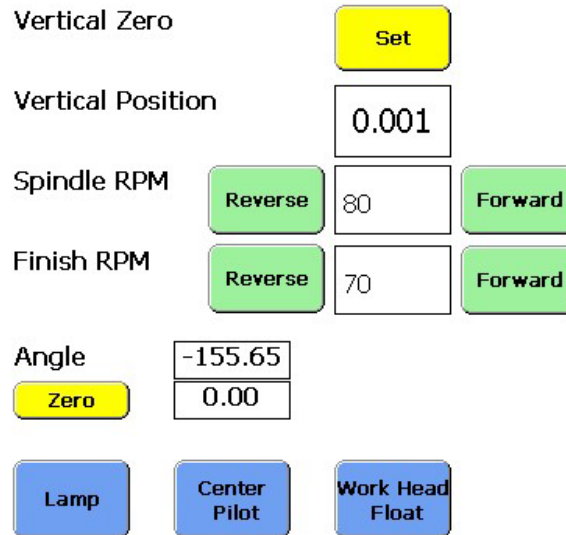
## MANUALMATIC Operation

1. Level cylinder head, set all tooling and install in spindle.
2. Tap the SETUP button, this turns off the AUTO MODE for setting up.
3. Press WORKHEAD FLOAT so workhead is floating. Float over guide and lower tool holder until cutter is touching seat and press the VERTICAL ZERO, "SET" button. This will change the VERTICAL POSITION height display to read 0.000. The Vertical Zero height, this is the height all of the Auto functions are set off of.
4. Next raise the spindle all the way to the top, then lower about 1/2" and press the WORKHEAD FLOAT "SET" button, anything above this height the workhead will be clamped, below it will float.
5. Next lower the spindle down to about 1/2" above the VERTICAL ZERO height and press the CENTERING/START "SET" button, when this height is met the spindle will center itself on pilot, clamp and spindle will turn on.
6. NOTE: The default settings for WORKHEAD FLOAT and CENTERING/START will work for most heads. You can also tap the display box and enter in a height manually if wanted.
7. Next manually set the amount needed to be removed from seat by tapping the FINISH CUTTING DEPTH "display box" and entering in the amount you want to remove, you must make this a negative number as it will be below the VERTICAL ZERO.
8. Next RPM settings. Touch the display boxes and enter the RPM settings that are desired.
9. Raise spindle to the top and then turn on the AUTO MODE. You're ready to cut.

**NOTE: each time a height is met the LED WORK LIGHTS will flash.**

- When spindle is lowered it will automatically float when the WORKHEAD FLOAT height is met.
- When you reach the CENTERING/START height it will automatically dwell to center, clamp and start spindle. Remove hands from steering wheel when lights flash for perfect centering.
- When finish cutting depth is met the spindle will automatically change to the FINISH RPM previously entered.
- When raised it will automatically float and stop spindle at the CENTERING/START height.
- This program will be saved automatically. All you will need to do is set your vertical zero.



**MANUAL****MANUAL****Buttons**

BACK - goes 1 page back.

VERTICAL ZERO - tap the SET button to set the vertical spindle height.

VERTICAL POSITION - height spindle is at from VERTICAL ZERO height set.

SPINDLE RPM REVERSE – runs spindle Counter Clockwise

FORWARD – runs spindle Clockwise

Tap display and enter desired RPM

FINISH RPM – same as above, you can instantly change RPSMs to the programed setting buy tapping the forward or reverse button. You can instantly change from forward to reverse if needed.

ANGLE - this is the actual angle the angle sensor is in.

ZERO - buy taping this button you can ZERO the angle reading for easier setup.

LAMP - turns ON and OFF the LED work lights

CENTER PILOT – locks and unlocks the spindle sphere

WORKHEAD FLOAT - floats the workhead

**Operation Tips before Machining Valve Seats**

Clean valve guide with a brush to remove foreign matter.

Required spindle rotation speed will vary, depending on seat hardness. As seat hardness increases, so does the spindle speed will change. Some will require full speed

**NOTE: If valve guides are so badly worn that the proper centering will be impossible, it will be necessary to replace that valve guide to achieve the a concentric valve seat.**

See following suggested machining speed chart .

## SEAT MACHINING SUGGESTED RPM CHART

VALVE SEAT DIAMETER		SPINDLE SPEED
INCH	METRIC	RPM
15/16"	24MM	175
1.000"	25.4MM	150
1.125"	29MM	150
1.250"	32MM	125
1.375"	35MM	100
1.500"	38MM	100
1.625"	41MM	100
1.750"	44.5MM	100
1.875"	47.5MM	75
2.000"	51MM	75
2.125"	54MM	75
2.250"	57MM	75
2.375"	60MM	50
2.500"	63.5MM	50

### Valve Seat Machining Procedure

Seat Pocket and valve guide must be clean to ensure proper fit of the carbide pilot.

Select the correct Carbide pilot for the valve guide ID Diameter

At this point, the spindle and work head should be level according to the position of the cylinder head.

Fit the Rottler Tool Holder and pilot assembly into the spindle cone; make sure to align the locator pins before you fit it into the spindle adapter and push it until you feel that is lock.

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

Make sure the that spindle Self 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

### Changing Language

Press the screen in the lower right hand corner, then press the screen in the upper right hand corner to bring up the Machine Settings screen. Be sure to press the screen with your finger and not just tap it.

SEAT AND GUIDE MACHINE

2



Program Type  
Production



MANUAL      MANUALMATIC

Version: \_v1.0g

1

Press the Okay button on the pop up warning box to continue.

Machine Settings

Back      Save Changes      Centering Timer (seconds)

2.000

WARNING: DO NOT ADJUST WITHOUT MANUFACTURER APPROVAL

Variable Finish Acceleration (RPM/sec)

Okay      1000

Encoder Normal      English      VARIABLE RPM ENABLED

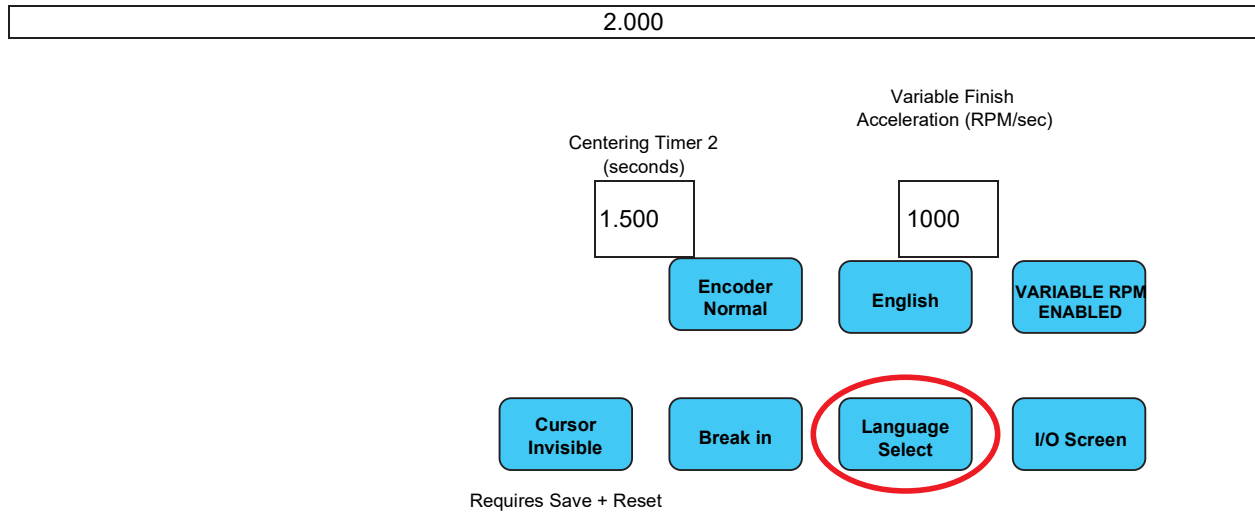
Cursor Invisible      Break in      Language Select      I/O Screen

Requires Save + Reset

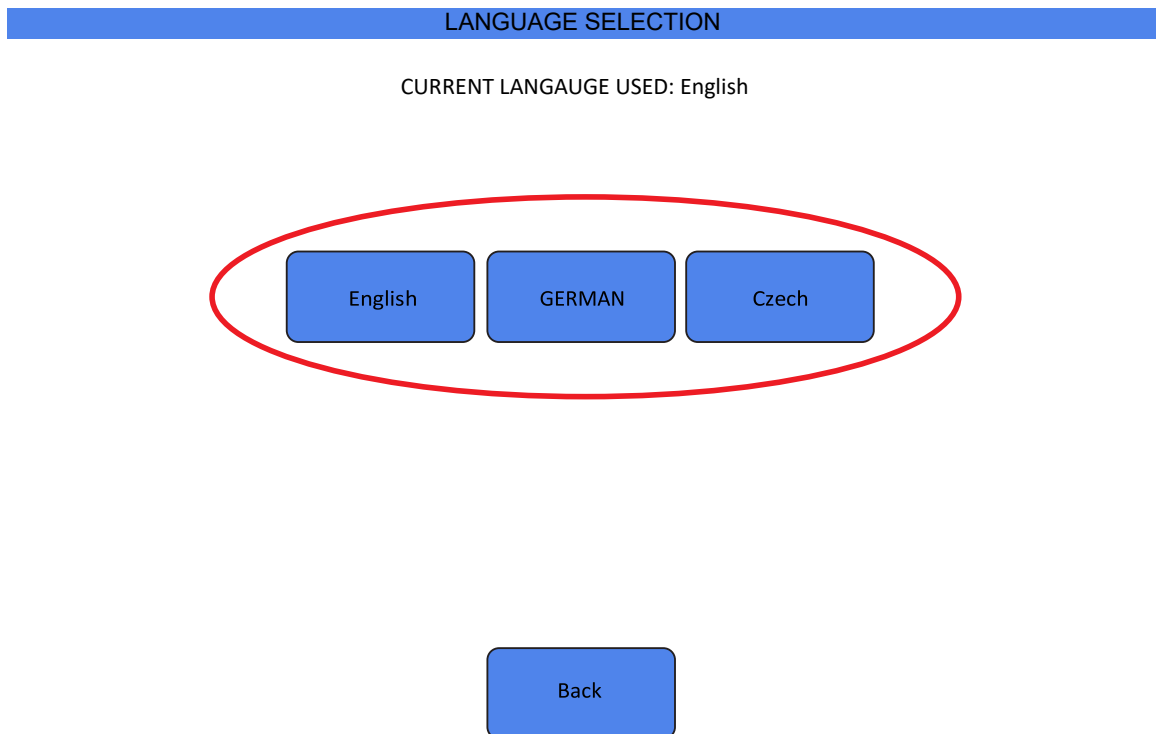
Press the Language Select button.

Machine Settings

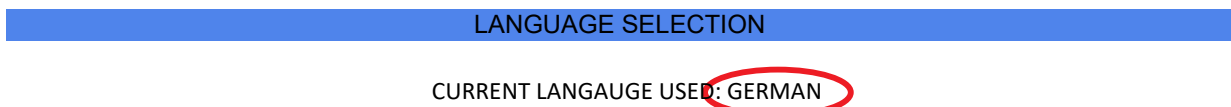
Back      Save Changes      Centering Timer (seconds)



Select the language you want to switch to and press the button.



Confirm that the language you have selected is indicated and then restart the machine for the change to take effect. Turn the main power switch located on the electrical cabinet off and then back on to restart the machine.





YOU MUST RESTART.

Back



### UNIPILLOT Centralizing Pilots

Rottler UNIPILLOT 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 GREATER 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**

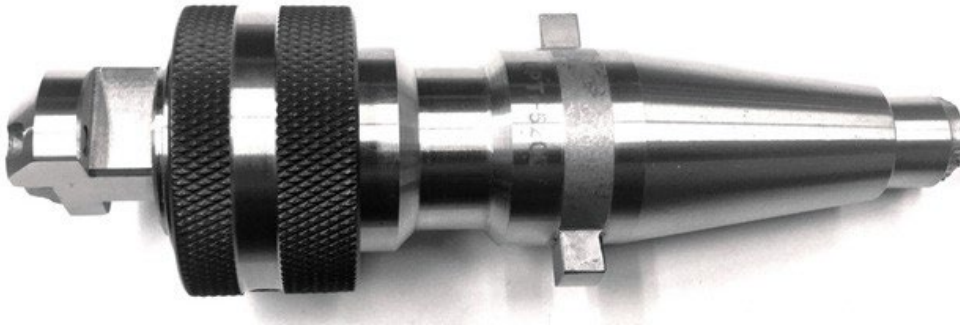
Modular Carbide Centralizing Pilot for Valve Guides Over 0.875" (22.23mm). Requires a set of Interchangeable Sleeves (FCMSLXXX & FCMSUXXX) - 20mm Shank Pilot

**FCMSUXXX**

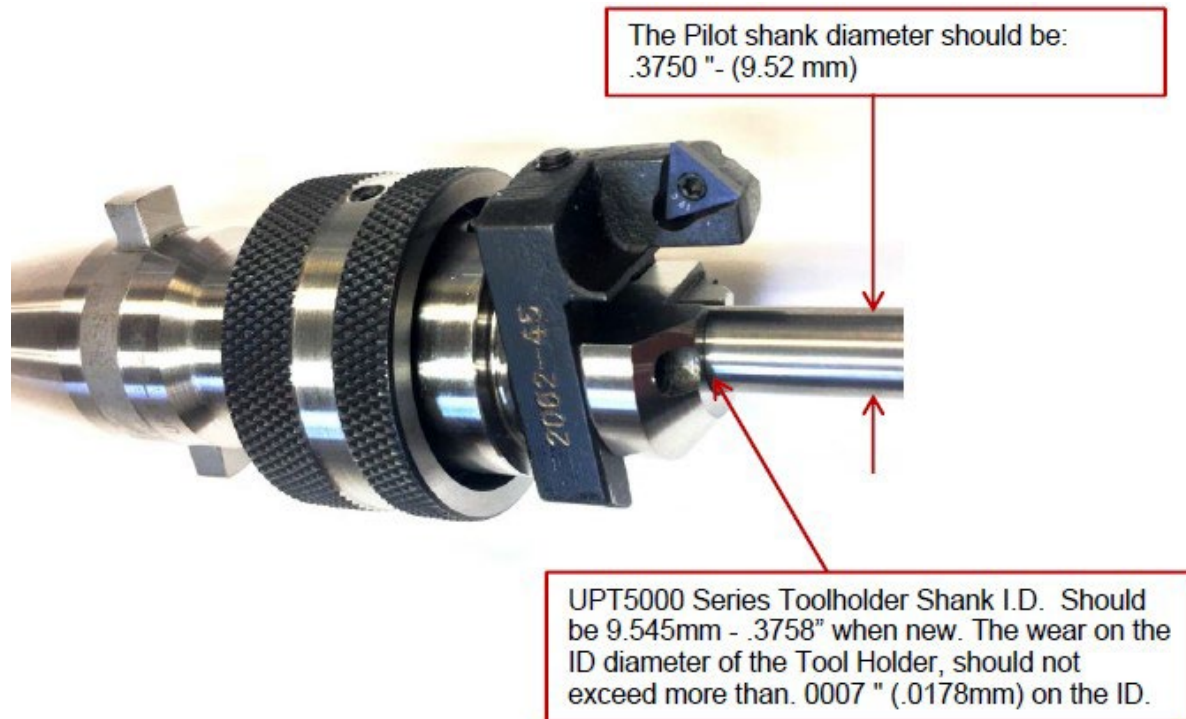
Modular Pilot Upper (Tapered) Sleeve - Hardened and Heat Treated - For .XXX" (XX.XXmm) Guide ID

**FCMSLXXX**

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

**How to Use UPT Series Uipilot Toolholders**

1. Pilot shank and toolholder Inside Diameter for the pilot shank must be clean from cast iron dust, few drops on lite oil may be necessary at least twice a day.
2. Measure pilot shank diameter for wear, it's supposed to be .3758 "- 9.545mm. The shank should not have more than .0007" - .0178mm of wear less the shank diameter of .375"- (9.525mm) diameter.



3. The UPT5200 Series toolholder shank ID it supposed to be 9.545mm - .3758" when new. The ID diameter should not be more than .0010" - .0254mm of wear.

**Note:** Please make sure to follow these inspections to avoid concentricity problems on every valve seat that has been machined.

4. Is very important not to over tighten the "C" Looking screws that lock the insert holder on the Toolholder, tightening the locking screws will collapse the ID bore diameter on the toolholder keeping the shank of the pilot not to fit easy into the Toolholder ID.

This is the correct way to lock the Insert holder using the long part of the Allen wrench like you see on the picture below to avoid too much torque and collapse the Pilot shank ID Bore of the Toolholder.



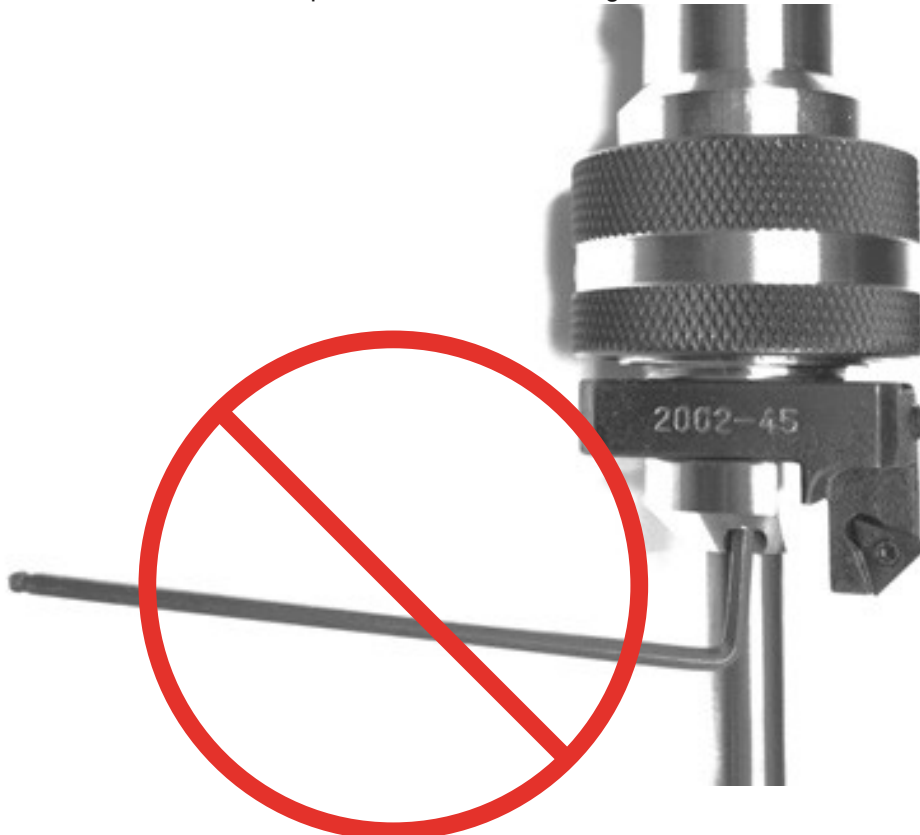
For safety please avoid overtighten the insert holder, it will be better to use the 2.5mm Ball End Metric Screwdriver like the one you see on the picture below.

The 2.5mm Ball End Metric Screwdriver will work to lock the insert holder and it will also to adjusting screw to set the diameter for the seat that you will be machining.





On the Picture below is showing the wrong way to Lock the Insert holder, will put too much torque and collapse the Pilot shank ID bore of the Toolholder. The Pilot shanks will not slide smoothly into the toolholder shank inside diameter; it will create excessive wear on the toolholder and possible over tolerance in concentric limits problems when machining the valve seat.



### Using the Unipilot System for the UPT5200 / UPT5400 Series Tool Holders

1. Insert standard 3/8" (9.52mm) shank UNIPILOT into the cylinder head valve guide.
2. Place checking gage next to Pilot shank to inspect range.
3. If pilot is with in MIN. and MAX. range of the checking gauge, ( Figure 3) proceed to machine seat inserts after removing gage from the cylinder head.
4. In case pilot height exceeds MAX. limit of the gauge. Inspect valve guides and ream guide if need to be or use proper pilot size diameter till pilot height is within tolerance of the checking gauge.
5. In case pilot is below the MIN. limit of the Gauge, select next size up pilot until pilot height is Gauge within tolerance.

## MAXIMUM AND MINIMUM PILOT HEIGHT FROM HEAD SURFACE

**Figure 1**

*On the picture below you will see that the Pilot shank is above the Pilot Gauge. This will damage the Toolholder*



**Figure 2**

*On the picture below you will see that the Pilot shank is minimum on the Pilot Gauge mark. If it's below the minimum will create poor centering and possible concentricity problems*



**Figure 3**

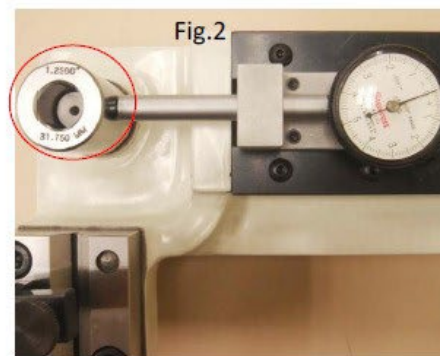
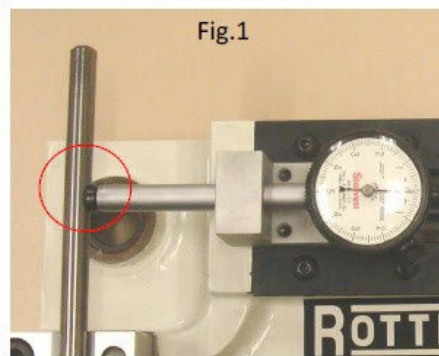
*On the picture below you will see that the Pilot shank is within the MAX and MIN range of the Pilot Height Gauge. This is the correct pilot to be used to machine the valve seats*



### 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.,



### Calibrating the Digital Micrometer

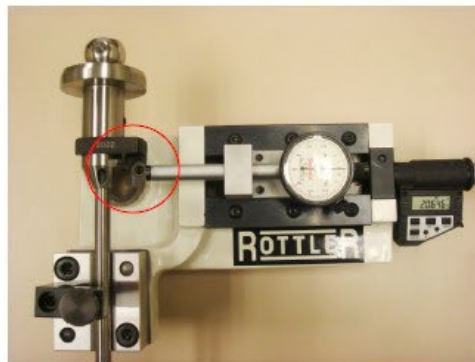
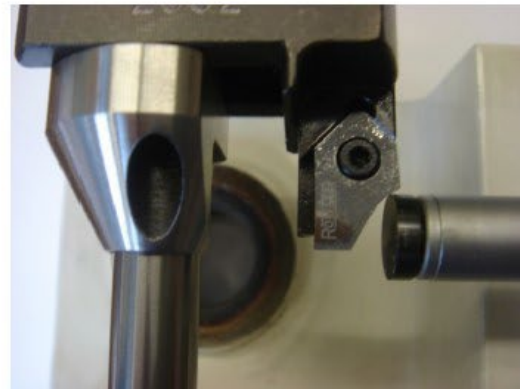
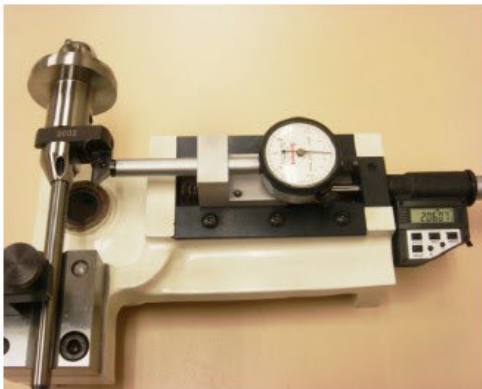
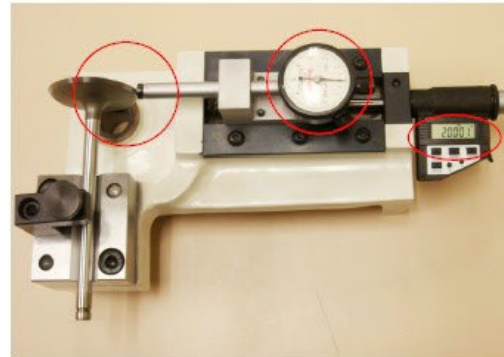
- 2- Turn the digital micrometer thimble in until the end of the micrometer is flush with the edge of the micrometer frame. Then turn the thimble out until the '0' mark on the thimble lines up exactly with the line on the barrel (see fig.1).

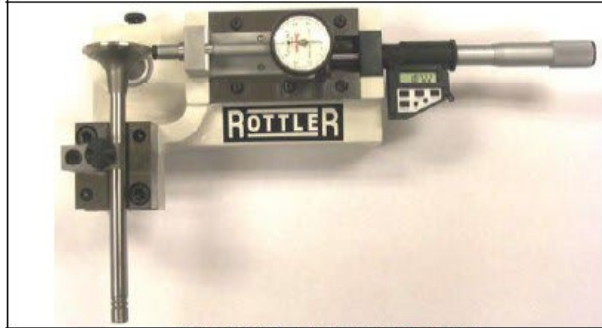


- a. Select mode: Press the **mm/in** button until the desired mode is shown in the digital display.  
**Note:** use a small instrument such as a pen to gently push the buttons; they are quite small and a bit delicate.
- b. Determine which calibrating setting tool you will be using to calibrate the micrometer 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 place 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"

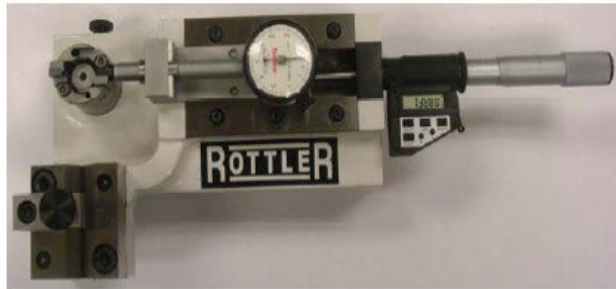




MEASURE VALVE HEAD DIA



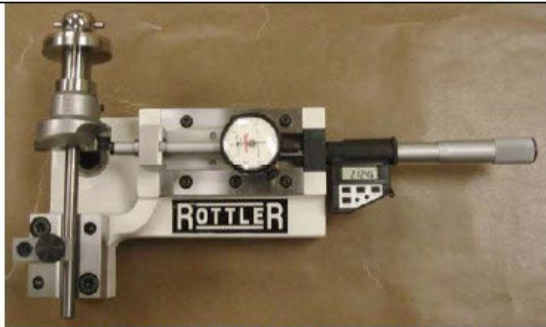
MEASURE VALVE STEM AND PILOT DIA.



SET ADJUSTABLE DOUBLE INSERT MILLING CUTTERS



SET ADJUSTABLE DOUBLE INSERT MILLING CUTTERS



SET BORING INSERT FOR HOUSING DIA.



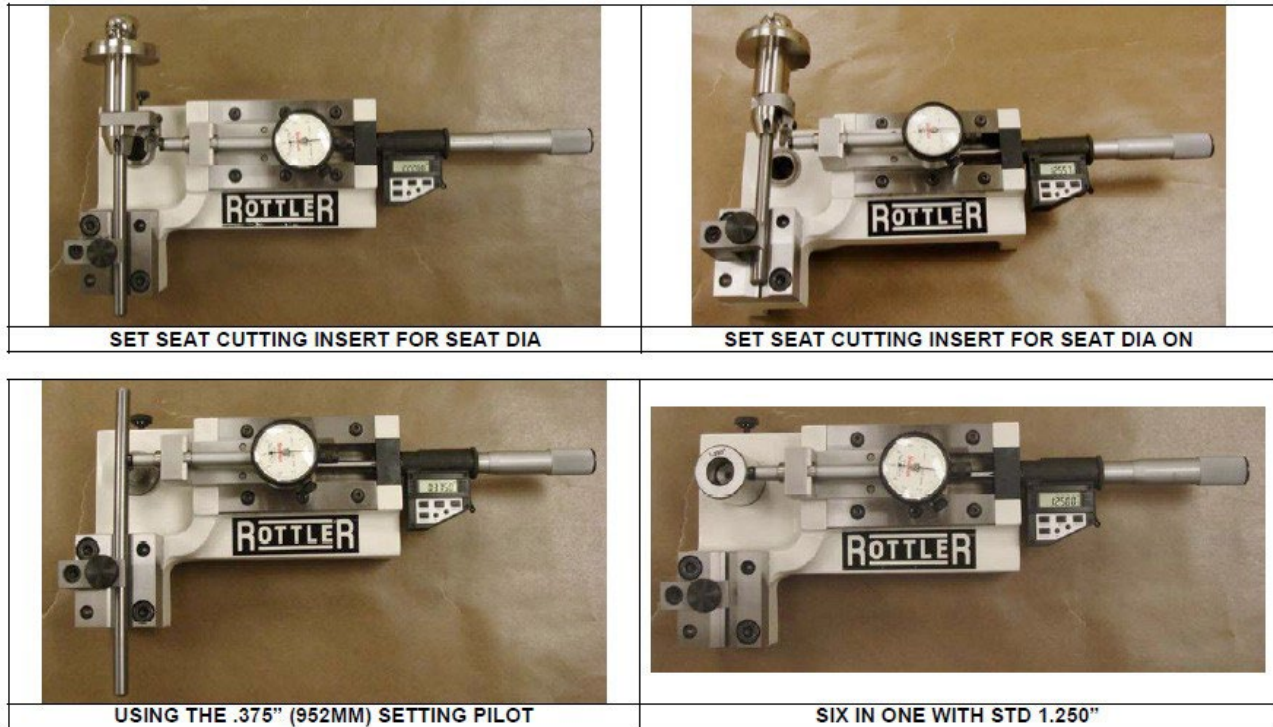
SET BORING INSERT FOR HOUSING DIA WITH TRIANGLE



SET BORING INSERT FOR HOUSING DIA.



SET BORING INSERT FOR HOUSING DIA



### 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 degree 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.



**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)



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