

ROTTLER

F90Y Series Multi Purpose CNC Machining Centers

PERFORMANCE RACING AND ENGINE REBUILDING MACHINERY AND EQUIPMENT



CAT 3520



Waukesha 7042

THE CUTTING EDGE

Big Engines

In both size of the engines and scope of the market, "heavy-duty" has taken on a new and more important role on the world's stage. Around the globe, businesses depend on heavy-duty equipment for transportation, construction, mining and innumerable other functions. And though they operate in some of the most severe conditions imaginable, they are quite efficient – yet when they are out of service, they are extremely costly. Rottler's commitment to this arena has earned a reputation among OEM remanufacturers and large engine rebuilders worldwide. Our rugged equipment and unmatched versatility make Rottler the number one choice for this kind of engine work. Rottler's Programmable Automatic Control makes these machines fast and accurate. The machines work like advanced CNC machining centers but Rottler's conversational programming technology makes them very easy to operate. No programming knowledge is required and operators are trained by factory technicians in just a few days to run these machines at full speed. The machines can be run manually and many unique jobs such as large connecting rods, gear housings and other often overlooked jobs can be performed with this versatile equipment.

DUAL WORKSTATIONS
Line Boring a CAT 3406E
Cylinder Head and
Boring/Surfacing a
Mercedes 4000 Block



F99Y

The massive F99Y is designed for machining large engines used in the earthmoving, mining, oil and gas, power generation and marine work boat industries up to the size of V20 engines blocks such as the CAT 3520, MTU 4000 V20, Cummins QSK78, Waukesha 9390, etc.

Productivity

Up to 75% time savings over traditional machines.

Control

Touch Screen Controls located on one panel for ease of operation.

Automation

Automatically machines precise dimensions.

Flexibility

Block boring and surfacing, head surfacing, line boring, and general CNC machining.

Versatility

Change cutterheads from surfacing to boring and back in 15 seconds.

Heavy Duty

Rottler rugged machine tool quality for accuracy and long life – heat treated mehanite cast iron castings.



Main Line Boring a
Waukesha 7042

F98Y

The F98Y is designed for machining large engines used in the earthmoving, mining, oil and gas, power generation and marine work boat industries up to the size of the CAT 3516 and 399, Cummins QSK 78, MTU 4000 V16, Waukesha 7042, etc.

CNC Machining Water Holes on the Head Gasket Face of a CAT 3516 Engine Block



Features

- All F90Y machines incorporate the use of a large diameter hard chromed spindle, utilizing high precision angular contact bearings and automatic lubrication.
- Machine ways are induction hardened and coated with turcite low friction material and supplied with air pressure to reduce friction and give long service life.
- Anti friction ball screws and AC Servo motors provide precise machine positioning and rapid feed rates.
- Air power drawbar allows cutterheads to be changed in seconds increasing productivity and reducing operator fatigue - the machine can be changed from boring to surfacing in less than 15 seconds!
- Automated workhead tilting system for surfacing provides "back clearance" for superior surface finish.
- Increased clearance from spindle centerline to the machine's column allow large castings to be set up and machined.

F97Y

The F97Y is designed for machining smaller engine blocks used in 'On Highway' applications such as trucks and buses. At the same time it is a large machine capable of machining mid range size blocks up to the size of a CAT 3508 and 3412, Komatsu 170 V12, MTU 2000 V16, Cummins K38, Detroit 60, Mercedes 400 V12, etc.

All F90Y machines employ an entire array of features which help maximize the productivity capabilities of the machines. Quick tooling change-over maximizes the versatility and flexibility of the machine, allowing boring and surfacing in one set-up. All F90Y Series machines have the capability of Boring, Surfacing, Line Boring, and Universal Machining. Traveling column and spindle movements operated by precision ball screws and AC servo motors. Optional Automatic cycle software and production tooling allow complete block banks to be machined without operator attendance, once the job is set up and the "cycle start" button is pressed, the operator is free to "walk away" and do other work while the F90Y completes a block bank or main line bore unattended!

F97Y Surfacing a CAT 3508 Block



Automation

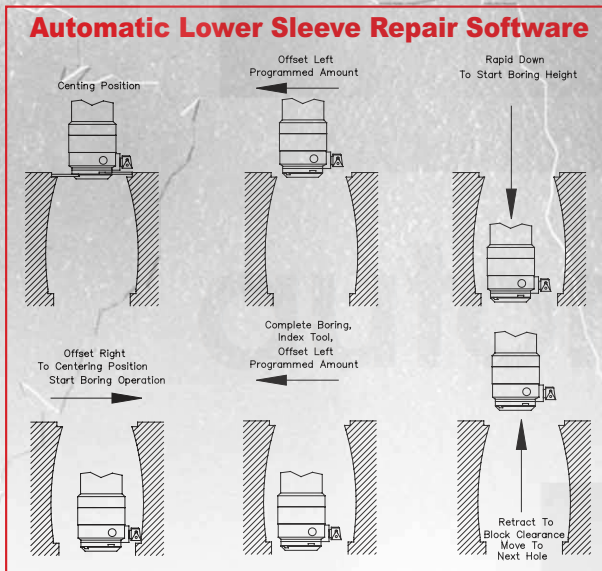
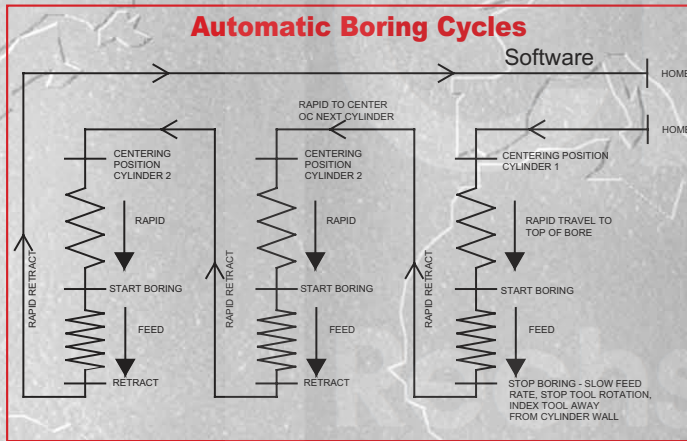
Over 20 years ago, Rottler pioneered automation by utilizing electronics and computers. Today, Rottler utilize the latest computer technology to make automation easy to learn, versatile to operate and upgradeable for future software. Windows operating system and touch screen control make a simple operator interface. Touch screen control allows ONLY the buttons and information required for each operation to be displayed, 'hiding' the complex computer functions in the background. Operators are able to learn complex and advanced machining functions in just a few days.

Common, everyday jobs such as boring, surfacing and line boring can be easily automated with the F90Y machines. Operator attendance is only required for set up. The machine is capable of boring along a complete cylinder bank automatically. Likewise, the machine is capable of line boring along a main line automatically.

Often when surfacing a block, more than one pass is required. The F90Y can be programmed for multiple passes, moving down the exact amount each pass and completing with a finish cut for the required surface finish during the final pass.

Bore centers are either measured from the block or from a blueprint, then saved in the memory. The F90Y machine moves automatically to the exact positions, useful when multiple boring operations are required for jobs such as resleeving. For special applications, Optional Renishaw Wireless Probing can automatically find bore centers and measure diameters.

When resleeving the lower seal area of wet liner blocks, it is often required to bore a diameter larger than the upper diameter. Rottler's Automatic Lower Sleeve Repair Software allows the machine to offset so that the boring tool will clear the upper diameter, move down, then move back on center to bore the lower area on center with the upper bore. Once boring is complete, the machine will index the cutting tool, offset the programmed amount and retract and continue to the next cylinder – automatically.



Productivity

Jobs can be completed in 1/3 the time of conventional machines while operators can also do other work while the F90Y completes automatic cycles unattended.

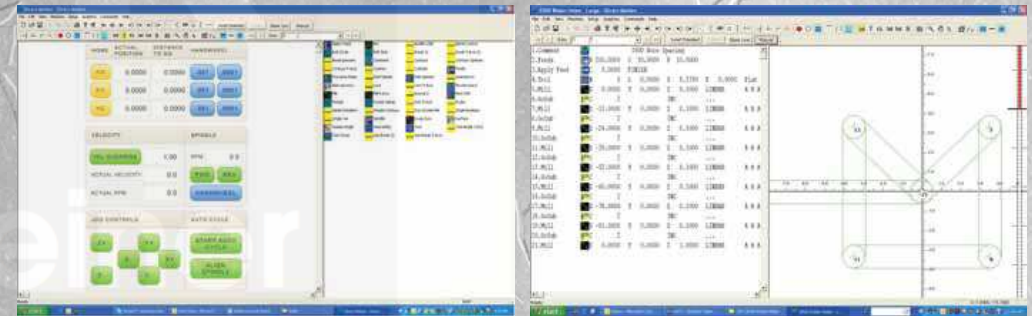
CNC Programming & Machining

Rottler has combined our own in house CNC programming and machining experience with software and programming experts to develop a new conversational programming system that is easy to learn and operate. The use of Windows style icons and graphical displays makes programs easier to understand, the old fashioned abstract G&M code programming has been replaced with easy to understand conversational icons and menus.

The use of Windows information allows easy handling - everyone knows about file saving and copying to external laptops and desktop computers. Programs can be emailed worldwide via the Internet and transferred by simple USB flash memory drives.

Rottler CAD/CAM (Computer Aided Design and Manufacturing)

While the operator is developing a program on the machine, laptop or desktop, the software is calculating things like tool paths in the background. The software is able to convert a drawing into a complex CNC program and run the machine with very little operator involvement.



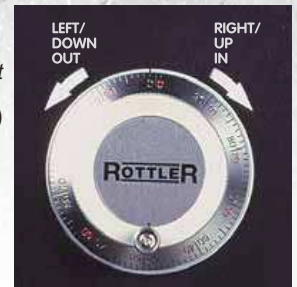
Water Hole Repairs

Large engine blocks and castings require many different repair and machining processes. The full 3 axis CNC control of the F90Y series allows custom programs to be written on the touch screen and saved in the memory for future use. For example, CAT 3500 blocks have water holes in the head gasket face and often rust/corrode as a result of acidic water and require to be milled out (see picture), plugs fitted and the head gasket face to be surfaced. The F90Y allows a simple CNC program to be written and these holes to be machined out in one automatic cycle. Plugs can then be fitted and the block surfaced – all this can be done while the block is set up for boring and surfacing work - saving hours of time and improving accuracy.

Handwheel for Manual Movement and Variable Feedrate

The electronic handwheel of the F90Y machines has many uses. For manual movement, the operator is able to move the machine by rotating the handwheel just like a manual machine. The handwheel has a clicking action and each click moves the machine an exact amount: In Coarse Mode, the machine moves .010" (0.25mm) per click allowing very fast movement. In Medium Mode, the machine moves .001" (0.025mm) per click allowing slower movement. In Fine Mode, the machine moves .0001" (0.002mm) per click allowing very fine movement of the machine.

Once the machine is operating in automatic cycle, the operator is able to vary the feedrate or speed of movement from zero to 100%. This allows operators to slow down and speed up automatic movement while not changing the spindle/cutting speed. This function is ideal for operators learning the machine and checking their programs to be sure they have best productivity and safety, and not damaging cutting tools and jobs.



Offers Versatility & Simplicity



Mode Screen

Select the operation that this required, information is saved in the Computer Memory.



Set Zeroes

Simply set zeroes to begin the set up of the job and start automatic cycle.



Vertical Stops

Enter length of bore, sleeve, counterbore, etc and the machine will bore to the exact depth. Lower Sleeve Repair allows a lower diameter that is larger than an upper diameter to be bored in one automatic cycle.

Rottler Exclusive F90Y Touch Screen Programming

The conveniently located control pendant centralizes the machine controls. Only the buttons and interactive menus required for a particular machine operation are displayed. Machine operations can easily be done manually or automatically, with the ability to store programs in memory. Digital readout allows the operator to accurately monitor position at all times. Control operates in metric and inch systems.

Fully Programmable Cycles

Conversational 3 axis CNC control, PC based with Windows XP operating system.

Dimensions and Control thru Touch Screen:

- Program Bore Centers, Exact Depth, Speed, Feed, etc.
- Machines complete bank or main line in Automatic Cycle.
- Lower Offset Boring allows lower sleeve repair in Automatic Cycle.
- Circular Interpolate Counterbores for Radius Undercut or Wide Counterbores.
- Surfacing/Milling – Multiple Pass – program for Rough Cut and Finish Cut for superior surface finish.
- Line Boring – program the bearing bores and length of each bore and the machine automatically moves from bore to bore, completing the line unattended.
- Face Main Line Thrust Faces square to centerline of Crankshaft using Rottler Circular Interpolation software.

Features

Automatic

Programmable

PC Control/Windows

Versatile and Flexible

Variable Speeds and Feeds
AC Servo Motors

Power Drawbar

Hardened Boxway Bed

Turcite Coated Bedways

Precision Ball Screws

T-Slot Table

Benefits

Moves accurately from bore to bore unattended

Saves all settings in memory for future use

Can be easily updated for additional functions

Bore, surface, line bore, ream, drill, tap, etc.

Allows surface finishes as low as 10Ra. Maximum torque and performance at all speeds.

Quick, easy tool changing at the press of a button

Ensures exceptional rigidity for accurate machining

Reduced friction for smooth movement and long life

Precision ball screws give accurate positioning

Clamp any fixture and job quickly and easily

Centering - 3 methods

1. Blueprint

Enter centers of bores from blueprint drawing into touch screen and the machine will bore to exact blueprint dimensions.



2. Indicate

Center Cutterhead in bore using digital or dial gage then touch – Set button – and the machine memorizes the bore center.



3. Probe

Machine will automatically probe all bores and memorize dimensions of centers and measures bore diameters.



After centering is completed, touch – Auto Cycle – and the machine will automatically bore to the exact dimensions. These dimensions are saved under a block name for future use.

Just a few of the other operations available for Rottler owners:



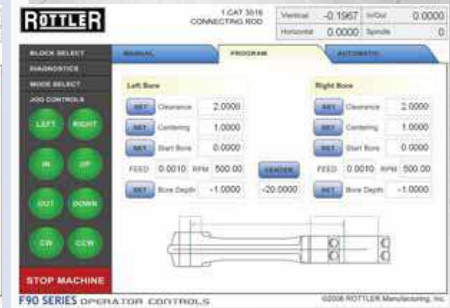
Main & Cam Line Bore

Enter distance to each bore and length of each bore and the machine automatically bores the complete line.



Thrust Cutting

Allows operator to easily program for thrust cutting on main cap.



Connecting Rod

Combined with Rottler Connecting Rod Fixtures, allows both big end and small end to be bored in one set up ensuring perfect parallelism and center to center distance.

Set Up and Measuring Instruments



Rottler has a wide selection of micrometers, probes, indicators, setting fixtures and magnetic holders to allow versatile and accurate size setting for all machining requirements.

Wireless Probing

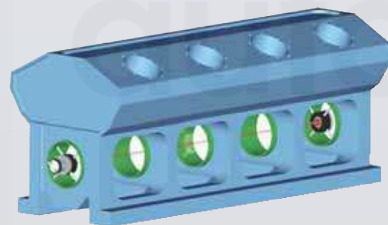
Computer controlled wireless probe automatically finds cylinder bore centers and at the same time measures bore diameters. The difference between the drawing blueprint and the probed dimensions can be displayed by touching one button!

The deck(head gasket face) can be probed to check flatness and squareness to ensure accuracy and minimum metal removal when surfacing.

With the use of a radio probe, the upper and lower bores of wet liner blocks can be probed to check concentricity and perpendicularity to ensure that the block is set up correctly before machining.

Digital Run Out Probe and Readout

Where the wireless probe is not able to be used because of size restrictions, the digital run out probe allows leveling and precise centering with digital readout on the control panel. Check level and alignment of decks, center in cylinder bores and main lines, etc.



Laser Alignment

Engine Block Laser Alignment has provided engine machinists with a fast, reliable method of measuring a line bore for straightness. The laser system has proven to decrease inspection times significantly and virtually eliminated dedicated, expensive gauging. Computer printed results are available for future reference.

Rottler has a wide selection of tools, interchangeable cutterheads and spindle adapters to allow endless cutting operations.



Boring Cutterheads

Rottler manufactures a complete range of quick change boring cutterheads for boring and sleeving operations from .750" (19mm) to 20" (500mm). The air assisted quick change retention system minimizes down time between tooling changes. Cutterheads can be changed in as little as 10 seconds!



Flycutters and Milling Heads

Surfacing with the F90Y machines can be done during the same set up as boring. 10" (250mm), 14" (360mm), 18" (460mm) and 22" (570mm) flycutters can be used with CBN inserts for high speed dry surfacing giving excellent surface finish results. A deck of a large block such as a V16 can be surfaced in less than 10 minutes! Multi Teeth Milling Heads can be used for milling welded and spray built up surfaces. Small diameter milling heads are ideal for facing main bearing housing contact surfaces in preparation for line boring to standard diameter.

Tooling & Cutter Heads



Circular Interpolation Single Point Counterbore Tool

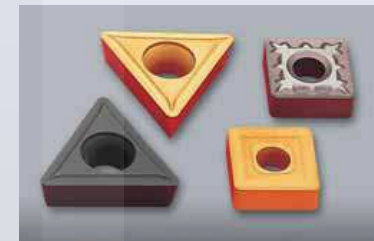
Combined with Rottler's unique software, counterbores and thrust faces can be finished with a single point machining method resulting in perfectly flat surfaces and fine surface finish. Special software and cutting inserts allow vertical undercuts to increase the corner radius to suit OEM requirements.

Spindle Adapters

A selection of spindle adapters allows the use of a wide variety of industrial tooling. ISO 40 Taper, R8, Morse Taper #5 and 1" (25.4mm) are available. Rottler also have a blank spindle adapter to allow customers to machine to adapt special requirements.

Milling Cutter Holders

Collet Kits with ISO 40 chuck and wrench allow milling tools such as end mills, slot drills, reamers to be used.



Indexable Carbide and CBN/PCD Cutting Inserts

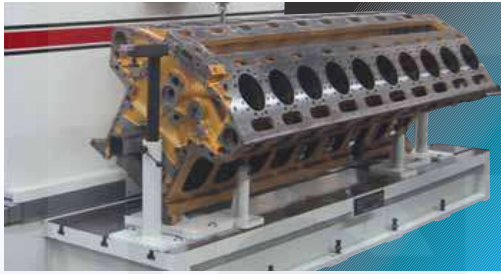
Rottler's logo is – The Cutting Edge – and we take pride in offering many different grades of cutting inserts for dry, high speed cutting a wide variety of materials. Decades of experience machining engines worldwide allows Rottler machines to be able to dry cut a wide variety of parts. CBN inserts give exceptional long life for surfacing gasket faces and at the same time give fine surface finishes for reliable sealing of metal gaskets. Dry CBN surfacing totally eliminates the need for wet grinding and at the same time gives flatter surfaces as cutting pressure is substantially reduced compared to surface grinding. PCD inserts allow soft metals such as Aluminum to be surfaced at high speed without coolant. Rottler offers several different grades of indexable carbide inserts for cylinder boring & sleeving and main & cam line boring. Special Black coated carbide inserts are capable of standard to heavy sleeve cuts up to 1000rpm. Triangle inserts work well where cutting a bore to a square shoulder is needed, such as sleeves and counterbores. Finishing Inserts provide a sharper edge which results in a smoother surface finish on the cutting surface, ideal for finishing counterbores. Carbide inserts are available with 1/64" (0.4mm) and 1/32" (0.8mm) corner radius. Specially custom sharpened tools are available for operations such as chamfering, O-ring grooving, undercutting and blind hole boring.

Universal Boring and Facing Heads

Industry standard combination boring and facing heads allow a wide variety of machining operations.

Fixtures

Rottler manufacture a selection of universal fixtures to allow wide variety of jobs – small and big! Boring, Surfacing, Line Boring and general machining of most all jobs can be done on the versatile F90 machines.



Dual Work Stations

Rottler's versatile fixtures and open sided T-Slot work table allows in-line and V- blocks to be mounted on the same fixture. A second operation such as head surfacing or line boring can be done on a second fixture without removing the part from the other fixture. Blocks are set up with reference to their main centerline ensuring that the decks are parallel and the counterbores are square to the main centerline. Universal quick clamp tower type hold down assemblies makes clamping easy and rigid.

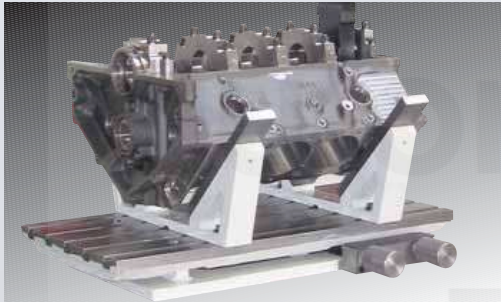
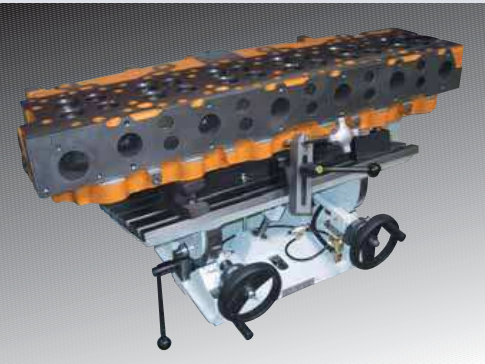


Dual Axis Leveling Table

Rottler's answer to the problem of holding a wide variety of cylinder heads from a single cylinder to a large 6 cylinder diesel. The Rottler Dual Axis Leveling Table allows clamping of the head to be completed first – then the level adjusted in both directions – simply by rotating the 2 hand wheels – fast and rigid! Combined with Rottler's Dual Axis Level, any job can be clamped and leveled in seconds! This process results in minimum stock removal when surfacing.

Line Bore Pivot Table

Rottler's Line Bore Pivot Table allows small blocks and cylinder heads to be set up and adjusted for line boring. The T-Slot Table allows versatile clamping of a wide variety of jobs.



Dual Axis Level

Displays both axis' simultaneously.

Large Connecting Rod Machining

Connecting Rod Fixtures

Rottler's patented Connecting Rod Fixtures allow large connecting rods to be surfaced and bored on the F90Y machines. The Rottler boring fixtures allow both big end and small end to be bored in one set up resulting in perfect parallelism between big end and small end. All the rods in a set can be accurately bored for equal center to center distance – a must for today's high compression diesel engines. Special heavy duty fixtures available for boring very large, heavy connecting rods found in natural gas compressors and workboat marine engines.



Connecting Rod Touch Screen Control



Surfacing Fixture

Heavy Duty surfacing fixture to prepare Natural Gas Compressor Rods for boring.



Leveling Table

Rottler's Dual Axis Leveling Table with 2 piece vice used for surfacing Connecting Rod Caps and Main Bearing Housings in preparation for main line boring.

Automatic Line Boring

Over 20 years ago, Rottler pioneered right angle drive line boring and today are world leaders in this field. During these years, Rottler has developed a wide variety of tooling and fixtures so that blocks and heads can be easily and quickly set up and machined fast - automatically and accurately. Programming is simple and variable feedrate controlled by the handwheel during automatic cycles allow operators to easily learn to program and operate these machines without accidents and down time.

Bar Sag Error associated with horizontal bar type machines is totally

eliminated! Machining lines is considerably faster and size control is consistently within a fine tolerance. Thrust facing using Rottler circular interpolation software can be done in the same set up ensuring perfect squareness with bearing centerline.

Special steel main bearing housings found in high power diesel engines such as MTU 4000 require high speed machining to obtain superior accuracy of roundness, straightness, parallelism and surface finish.



Waukesha 7042/9390 set up for main line boring and thrust facing

Line Boring Equipment

Line Bore Tooling

Rottler's Unique Right Angle Drive Line Boring Attachments allow for accurate machining of bearing lines from small cylinders heads such as CAT3406 and Detroit 50/60 Series up to large blocks such as CAT3520 and Waukesha 9390. Special cutterheads with micro adjust tools are available from Rottler's engineering department. Repairs such as sleeving and cutting spray weld can be done. Operators like this system as there is no bar in their way when measuring and boring/repairing bearing housings.

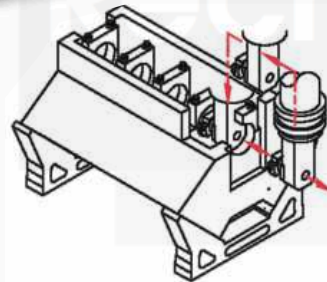
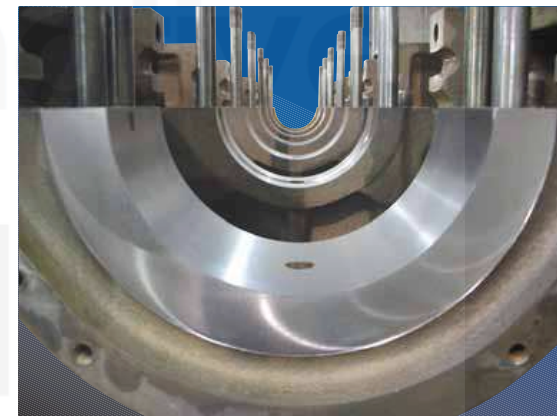


Line Bore Fixtures

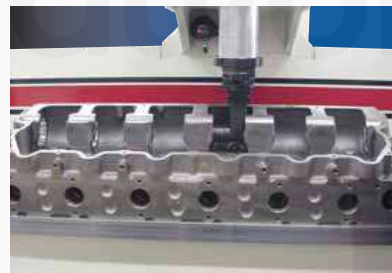
Heavy duty fixtures allow heavy blocks such as CAT3520, Waukesha 9390, White Superior 825, MTU4000, etc to be set up and adjusted for line boring. Adjustable fixtures are air floated to allow easy positioning on the machine's work table. (See Line Bore Pivot Table on page 12 under Fixtures)

Thrust Facing

Rottler's unique circular interpolation software and thrust facing tooling allow thrust faces to be machined perfectly square to bearing centerline using the same right angle drive that is used for line boring. Single point cutting allows build up to be removed without chatter resulting in fine surface finish.



Rottler's unique right angle drives machine each bore individually and move from hole to hole automatically completing a line of bores in one unattended automatic cycle.



Rottler is able to design special tooling to line bore restricted areas such as the CAT 3406E overhead cam cylinder head.

