

**ROTTLER**

# **F100 Series**

## **Multi Purpose CNC**

## **Machining Centers**



**THE CUTTING EDGE**

# Big Engines

The massive F100 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.

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.

## Productivity

Up to 75% time savings over traditional machines.

## Control

Touch Screen Controls located on a flexible adjustable pendant arm for ease of operation from front or rear of the machine.

## Automation

Automatically machines precise dimensions.

## Flexibility

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

## Versatility

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

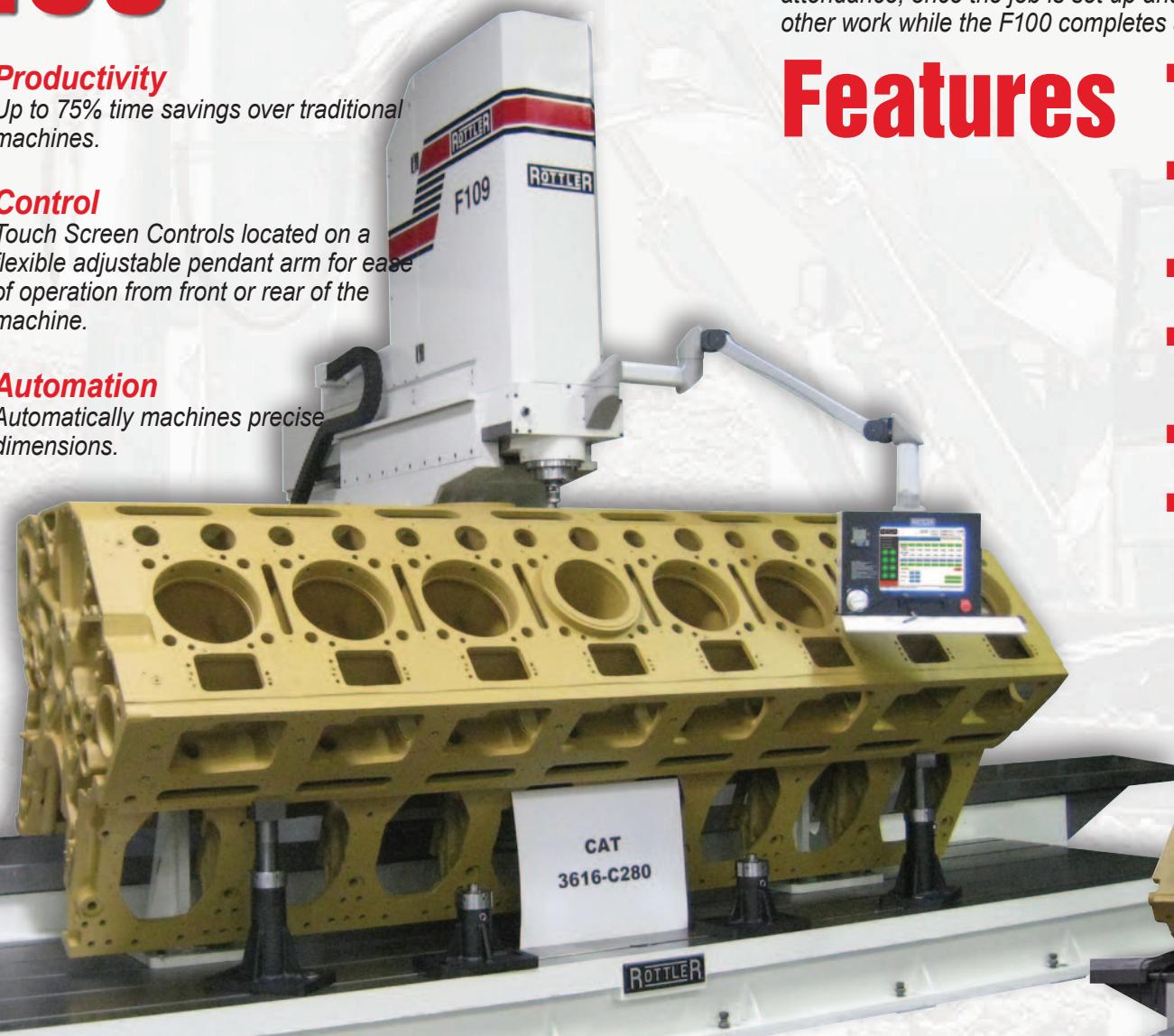
## Heavy Duty

Rottler rugged machine tool quality for accuracy and long life – cast iron castings coated with Turcite reduce friction and improve lubrication.

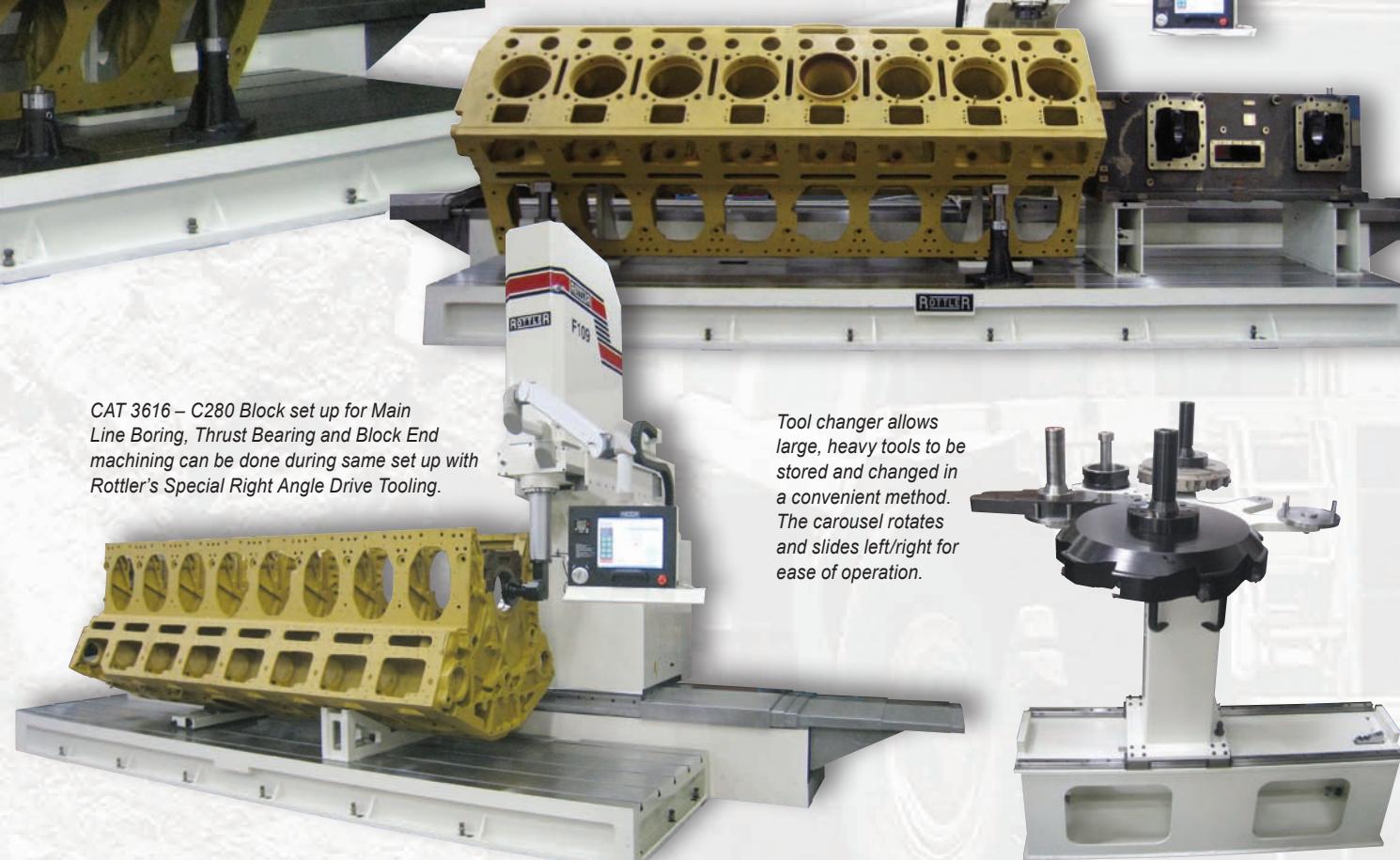
All F100 machines employ an array of features which help maximize the productivity capabilities of the machines. Quick tooling change-over maximizes the versatility and flexibility of the machine, allowing boring and surfacing in one set-up. F100 Series machines have the capability of Boring, Surfacing, Line Boring, and Universal Machining. Traveling column and spindle movements are 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 F100 completes a block bank or main line bore unattended!

# Features

- F100 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.



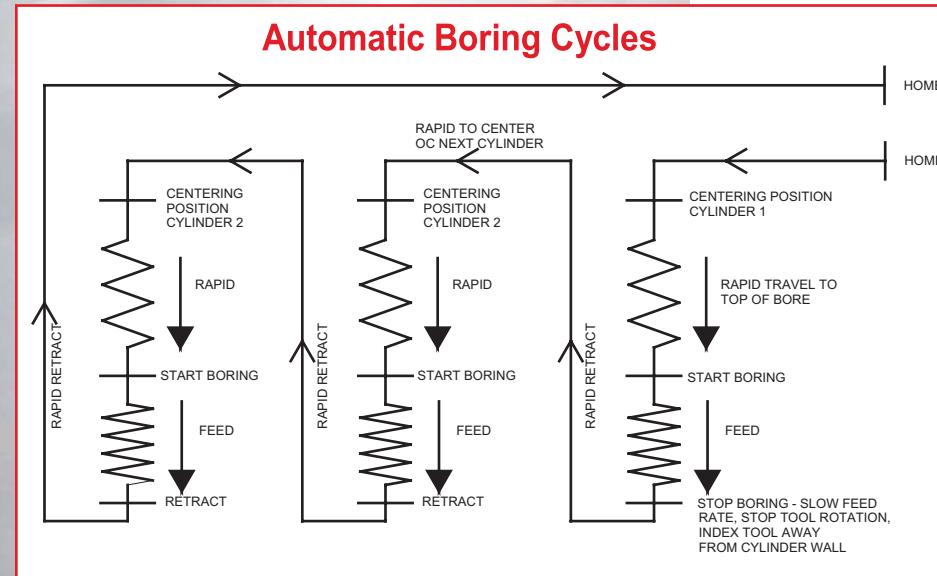
The large work table of the F109 allows multiple fixtures to allow the set up of different jobs at the same time. This photo shows a CAT3616 set up for upper end work and an Ariel frame set up for line boring.



Tool changer allows large, heavy tools to be stored and changed in a convenient method. The carousel rotates and slides left/right for ease of operation.

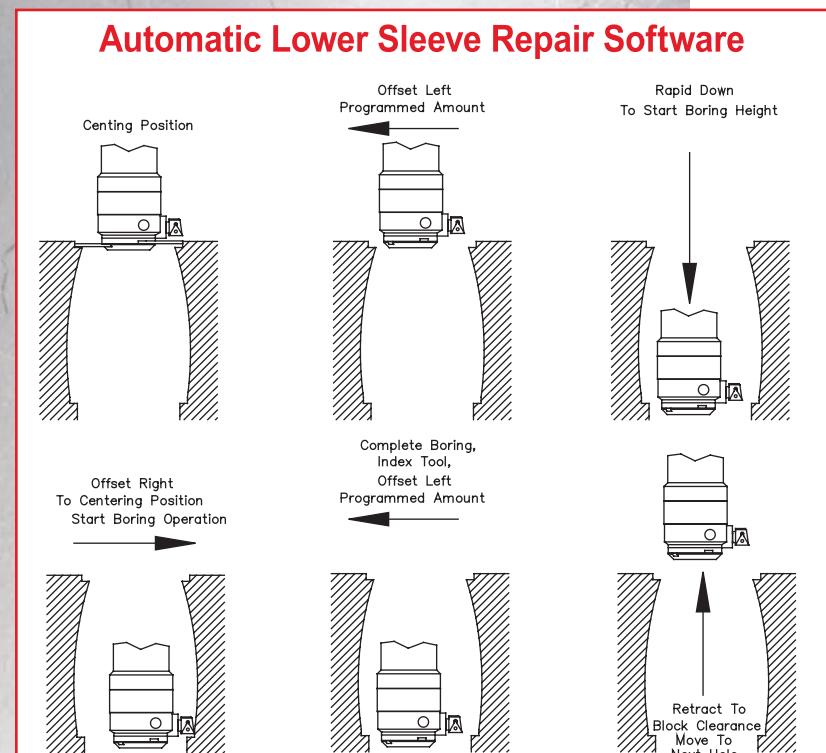
# Automation

Over 20 years ago, Rottler pioneered automation by utilizing electronics and computers. Today, Rottler utilizes 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 advanced machining functions in just a few days.



Common, everyday jobs such as boring, surfacing and line boring can be easily automated with the F100 machines. Operator attendance is only required for set up. The machine is able to bore 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 F100 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 F100 machine moves automatically to the exact positions, which is 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. Operators can do other work while the F100 completes automatic cycles unattended.

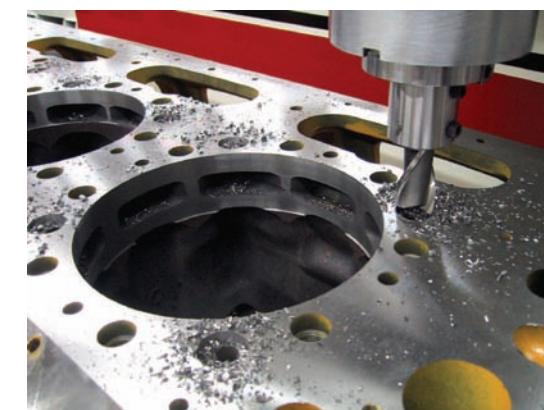
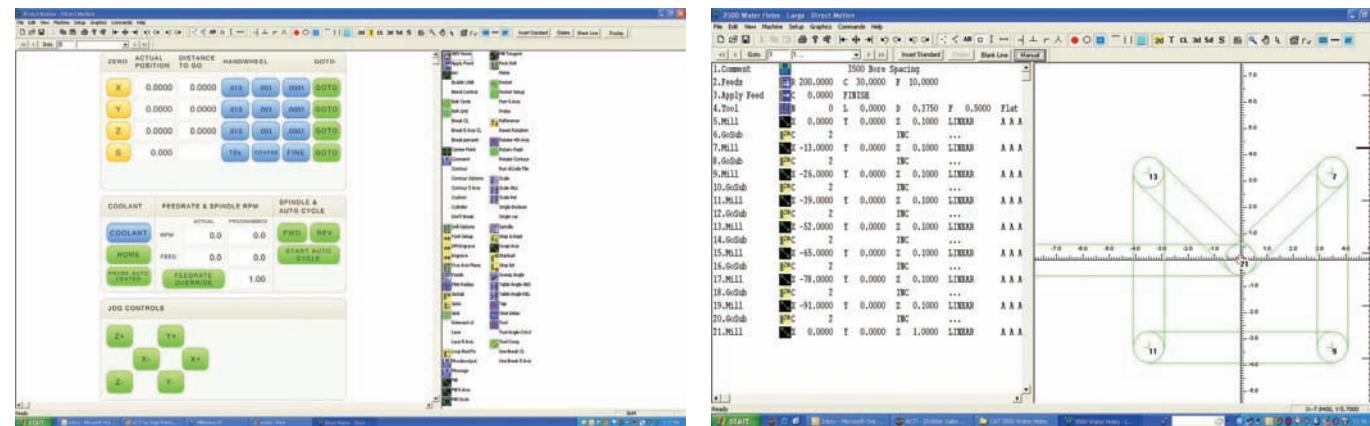
# CNC Programming & Machining

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 familiar 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.



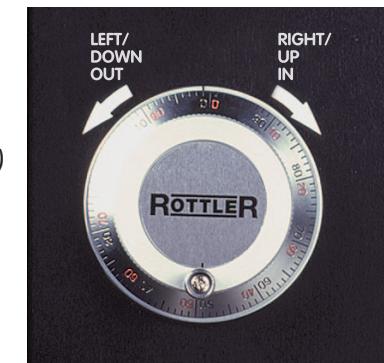
### Water Hole Repairs

Large engine blocks and castings require many different repair and machining processes. The full three axis CNC control of the F100 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 F100 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 F100 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 F100 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 three axis CNC control, PC based with Windows operating system.

Dimensions and Control through Touch Screen:

- Program Bore Centers, Exact Depth, Speed, Feed, etc.
- Machines complete bank or main line in Automatic Cycle.
- 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

## Benefits

Moves accurately from bore to bore unattended

Programmable

Saves all settings in memory for future use

PC Control/Windows

Can be easily updated for additional functions

Versatile and Flexible

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

Variable Speeds and Feeds

Allows surface finishes as low as 10Ra.

AC Servo Motors

Maximum torque and performance at all speeds.

Power Drawbar

Quick, easy tool changing at the press of a button

Hardened Boxway Bed

Ensures exceptional rigidity for accurate machining

Turcite Coated Bedways

Reduced friction for smooth movement and long life

Precision Ball Screws

Precision ball screws give accurate positioning

T-Slot Table

Clamp any fixture and job quickly and easily

## Centering - Three 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:



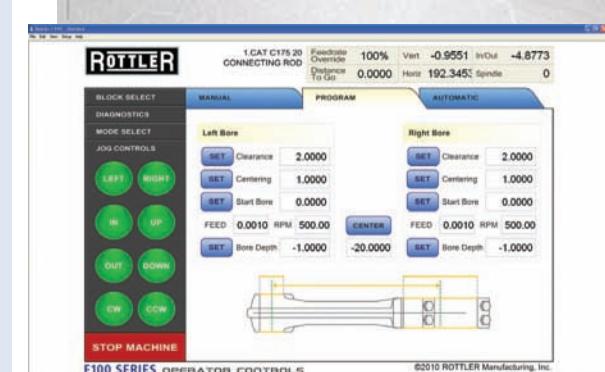
### Main & Cam Line Bore

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.

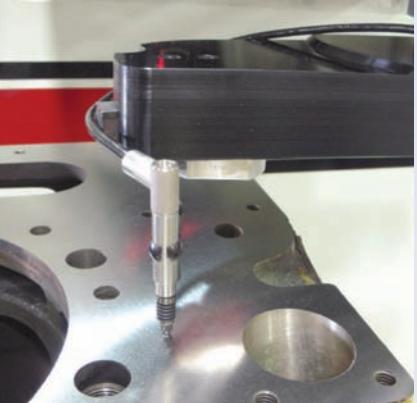


## Wireless Probing

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!

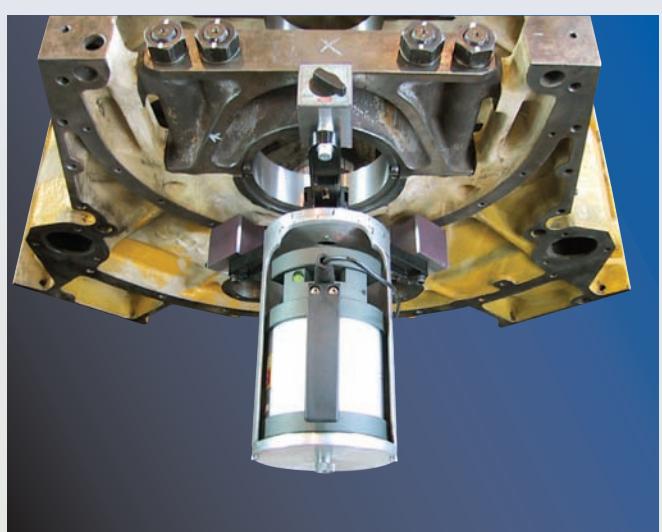
The deck (head gasket face) can be probed to check flatness and squareness to ensure accuracy and minimum metal removal when surfacing.

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.



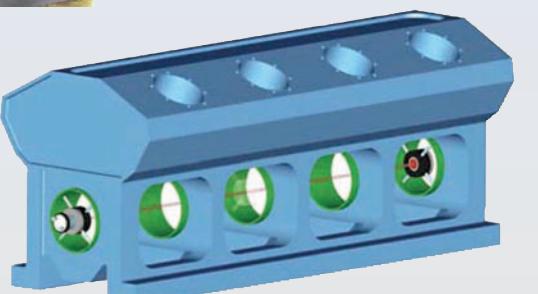
## Digital Run Out Probe and Readout

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.



# Tooling & Cutter Heads

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 F100 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. The 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.



## 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

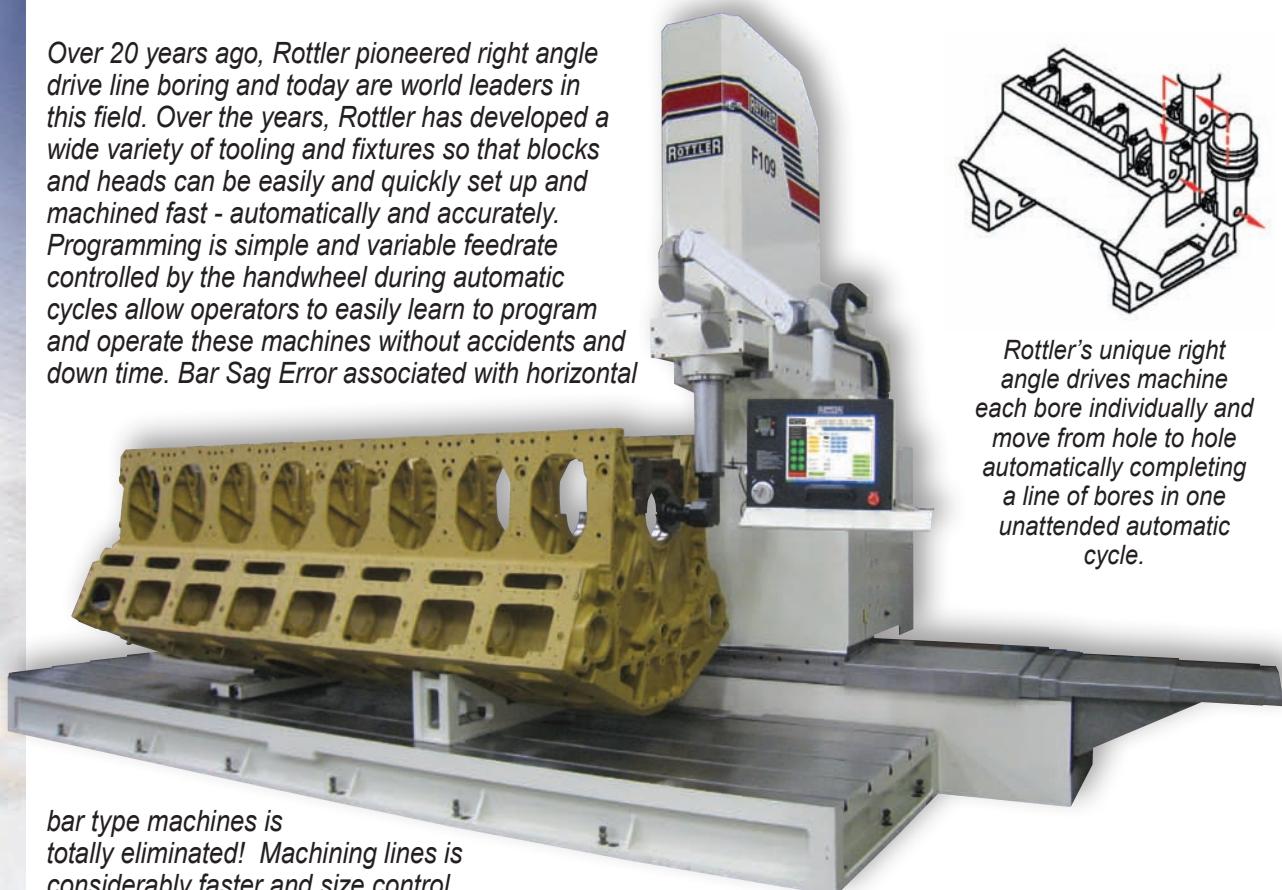
Rottler's logo is – The Cutting Edge – and we take pride in offering many different grades of cutting inserts for dry, high speed cutting a wide variety of materials. Decades of experience machining engines worldwide allows Rottler machines to be able to dry cut a wide variety of parts. CBN inserts give 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

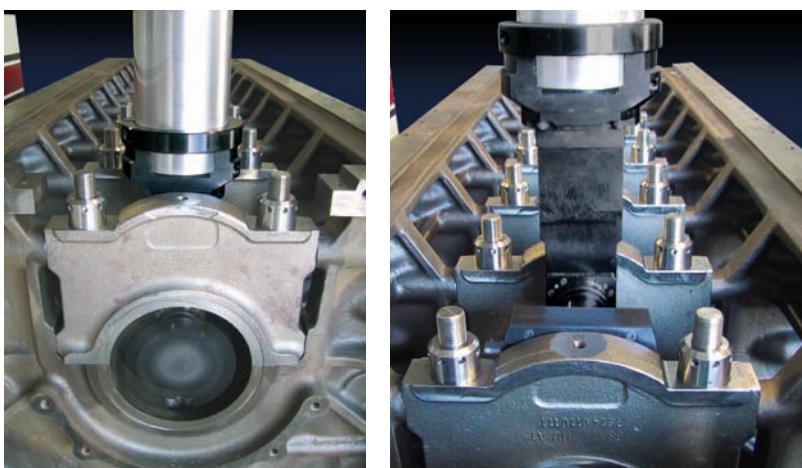
Industry standard combination boring and facing heads allow a wide variety of machining operations.

# Automatic Line Boring

Over 20 years ago, Rottler pioneered right angle drive line boring and today are world leaders in this field. Over the 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

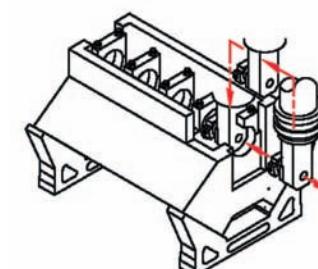


bar type machines is totally eliminated! Machining lines is considerably faster and size control is consistently within a fine tolerance. Thrust facing using Rottler circular interpolation software can be done in the same set up ensuring perfect squareness with bearing centerline.



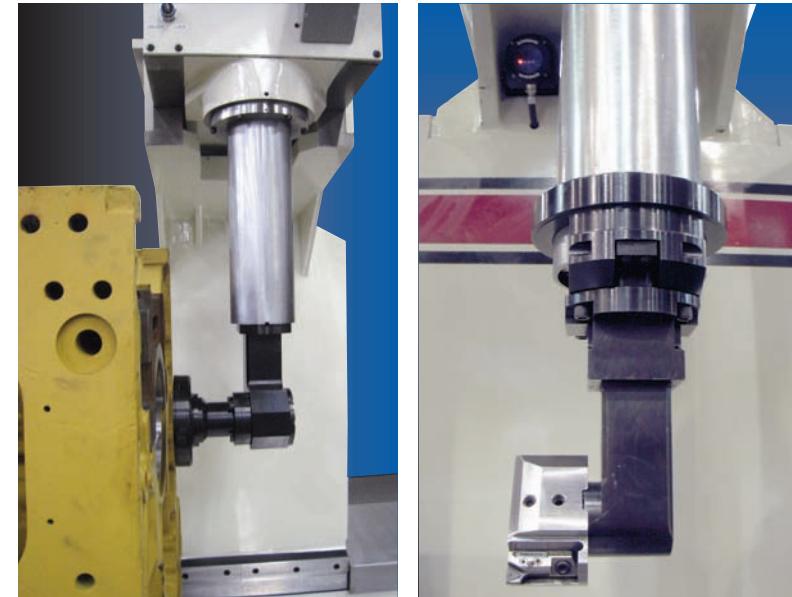
Special steel main bearing housings found in high power diesel engines such as MTU 4000 require high speed machining to obtain superior accuracy of roundness, straightness, parallelism and surface finish.

Line Boring Ariel  
Natural Gas  
Compressor Frame.



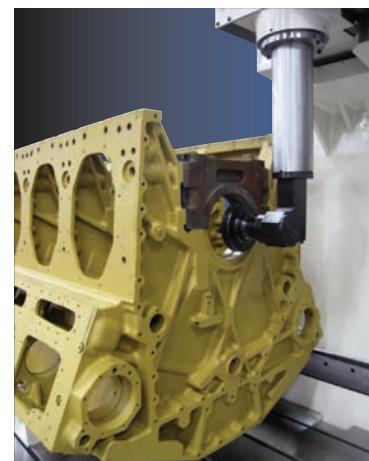
Rottler's unique right angle drives machine each bore individually and move from hole to hole automatically completing a line of bores in one unattended automatic cycle.

# Line Boring Equipment



## Line Bore Tooling

Rottler's Unique Right Angle Drive Line Boring Attachments allow for accurate machining of bearing lines from small cylinder heads such as CAT3406 and Detroit 50/60 Series up to large blocks such as CAT3616, Waukesha AT, White Superior 16G825, MTU8000, EMD 710 V20. 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 CAT3616, Waukesha AT, White Superior 16G825, MTU8000, EMD 710 V20, to be set up and adjusted for line boring. Adjustable fixtures are air floated to allow easy positioning on the machine's work table.

## Thrust Facing

Rottler's unique circular interpolation software and thrust facing tooling allow thrust faces to be machining 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.

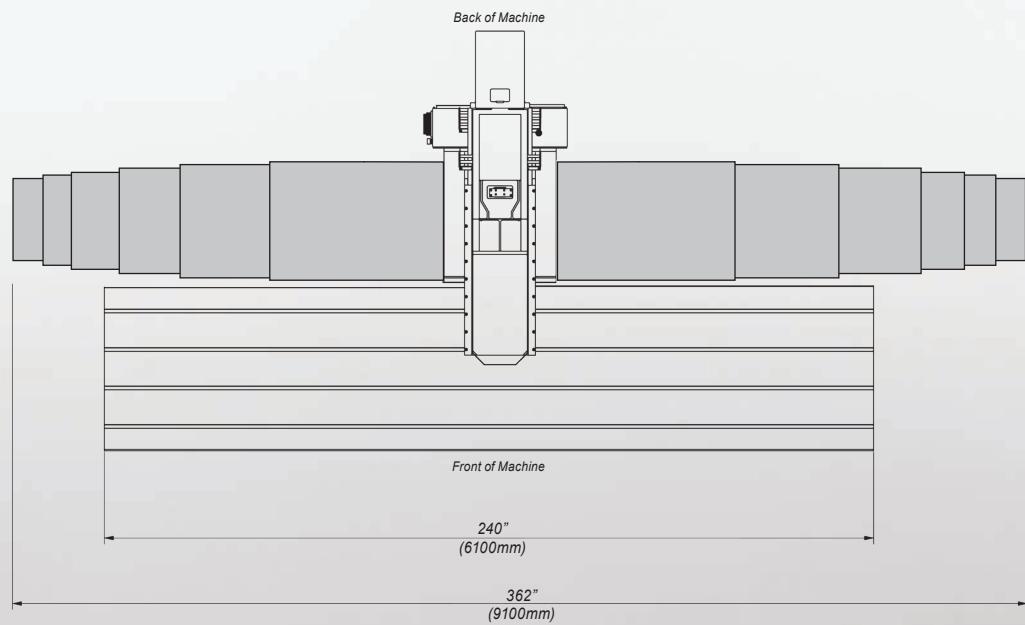
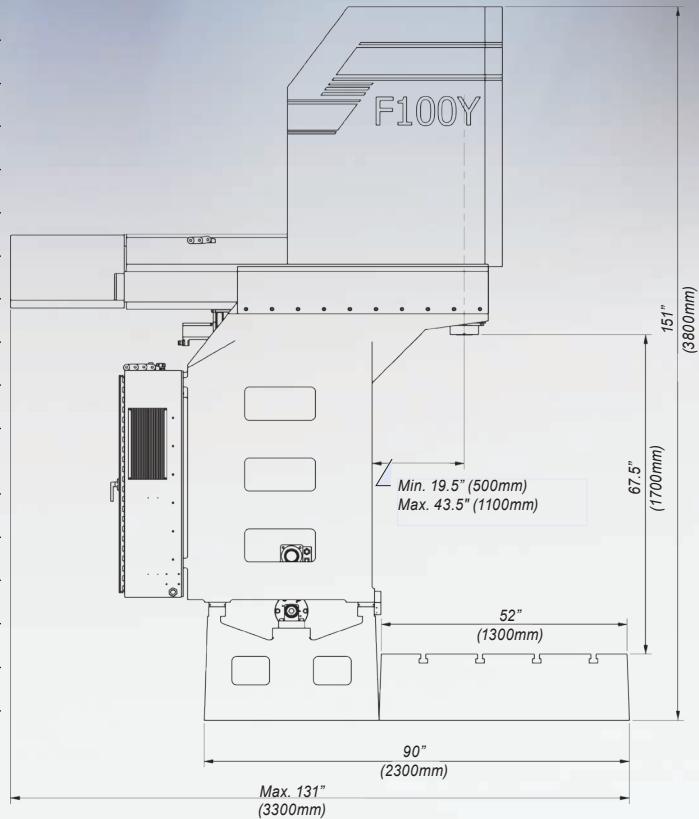


# F100 Specifications

Made in U.S.A.

Maximum Height – Table to Spindle Taper	67.58" (1716mm)
Table Size – 4 T-slots	67.5" x 240" (1700 x 6100mm)
Maximum Distance – Spindle Center to Column	43.50" (1100mm)
Horizontal Column Travel (X Axis)	248" (6300mm)
Vertical Column Travel (Z Axis)	36" (915mm)
Workhead Travel In/Out (Y Axis)	24" (600mm)
Spindle Speeds Infinitely Variable	To 1,000RPM
Spindle Motor-Continuous Power	10 HP, 7.5kW
Cylinder Bore Range with Optional Cutterheads	.75" – 20" (19 – 500mm)
Line Bore Range with Optional Cutterheads	2" – 12" (50 – 300mm)
Surfacing Cutterhead Diameters	10", 14", 18" & 22" (250, 340, 460 & 575mm)
Floor Space Requirements	362" x 130" (9200 x 3300mm)
Machine Weight	50,000 Lbs (22,500kgs)
Power Requirement	220V 70A 3PH
Air Requirement	100PSI, 6Bar
Paint Color Code	RAL9002 (Grey White)

Specifications and design subject to change without notice.



October 2010

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