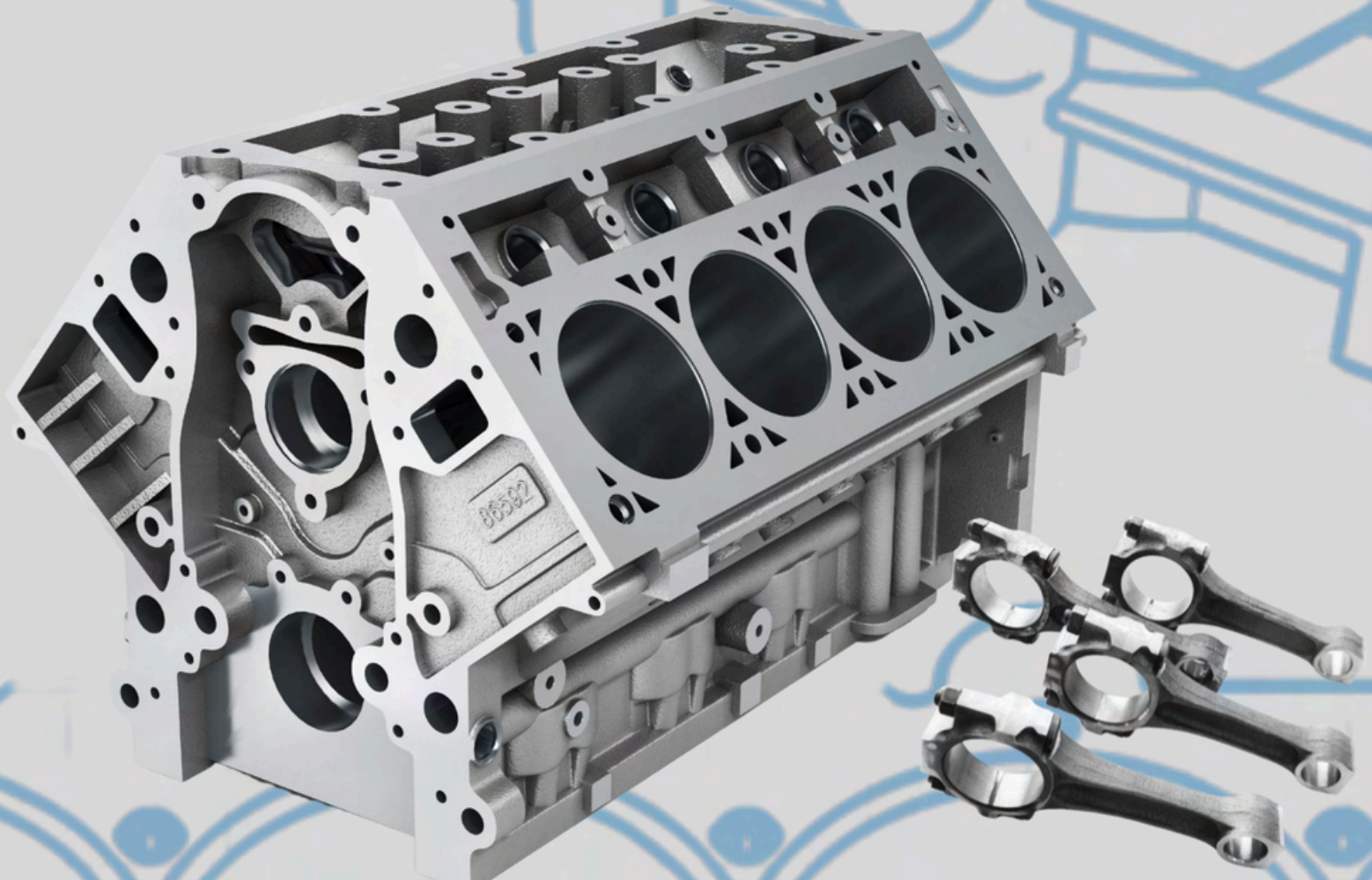
RIGIBORE

The most accurately adjustable boring tools in the world

INTERNAL COMBUSTION ENGINE

Innovative Solutions for Engine Manufacture

Camshaft
Crankshaft
Cylinder Head
Valve Guide , Valve Seat
Connecting Rods



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INTERNAL COMBUSTION ENGINE
Innovative Solutions for Engine Manufacture

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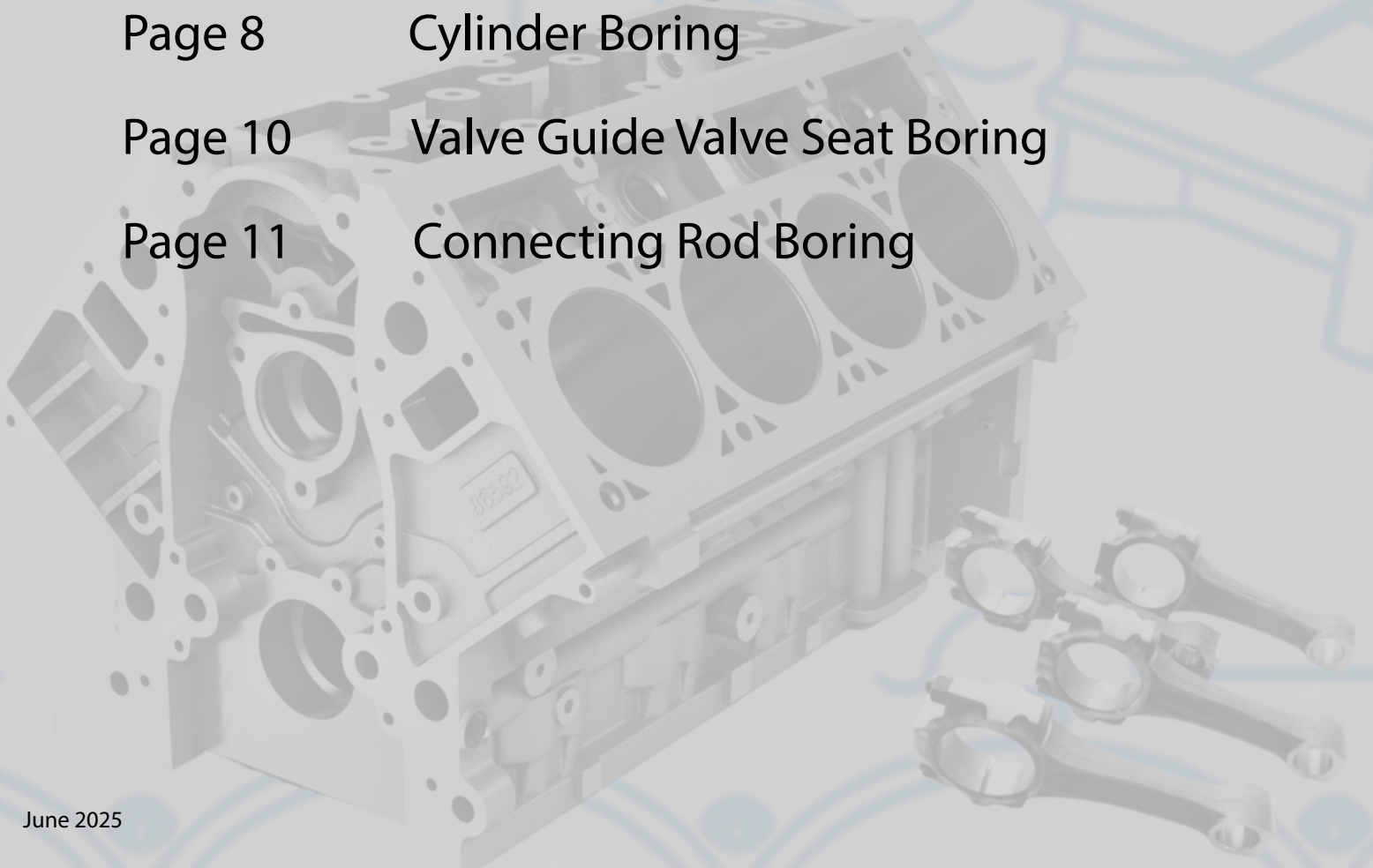


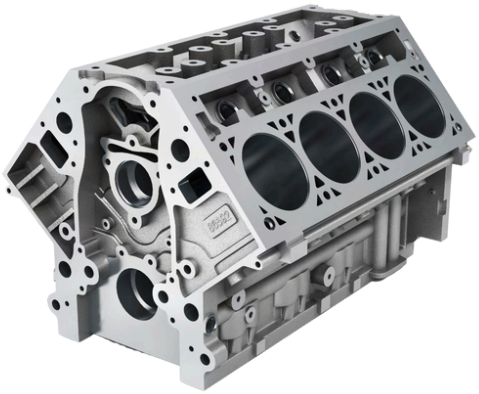
June 2025

Innovative solutions for boring applications in engine manufacture

Boring applications in engine manufacture require high precision and close tolerances. Well machined components contribute to the overall performance, efficiency and durability of the engine.

Boring processes in the manufacture of engine block components must create exact cylindrical bores for pistons to ensure maximum capacity of the engine. Precise internal dimensions are crucial for optimal engine performance and fuel efficiency.

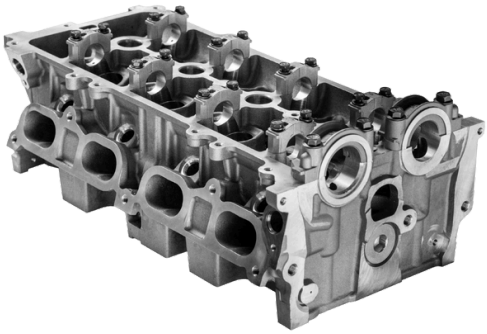
Rigibore has solutions for cylinder, crank, cam, con rod and valve guide/valve seat bores using their innovative tooling lines - ActiveEdge and Smartbore.



Rigibore tooling has many advantages over other brands.

- Cycle time is reduced because of shorter set-up & adjustment times.
- No special presetting equipment is required.
- Our tools use ISO indexable inserts
- Rigibore produces tools that require minimal maintenance.

- Using Rigibore boring tools with advanced technology reduces reliance on highly skilled operators.
- Our bespoke ActiveNet software provides time & date stamped data capture recording the number of adjustments per cutting edge and adjustment value.
- Smartbore makes the adjustment process much easier with the use of the Smartbore adjuster (digital torx wrench) which has a clear, bright display built-in.



Ease of adjustment coupled with unrivalled accuracy make ActiveEdge and Smartbore the ideal tooling solutions.

Return on Investment

ActiveEdge's precision performance and accurate repeatability generates tangible and continuous savings by reducing machine downtime and massively reducing the risk of scrapping parts.

Reduction in Scrap Rates

A speedy and continuous return on investment, far outweighing the value of the initial outlay is one of ActiveEdge's biggest benefits. This automated, closed-loop solution ensures consistent accurate machining and helps to remove the risk of scrapping parts and maximise production.

Adjustment in the tool carousel - successfully reduces cycle time

This automated solution can adjust the tool anywhere within the machine envelope, reducing idle time and maximising spindle utilisation. This offers a significant advantage over manual tool adjustments.

Manual Adjustment

- Process stops while operators make adjustment.
- While operators are occupied with other tasks, the manufacturing operation might be stopped.
- Production is solely reliant on highly skilled operators to make accurate adjustments.
- Health & safety might be compromised by operators entering the machine to make adjustments.

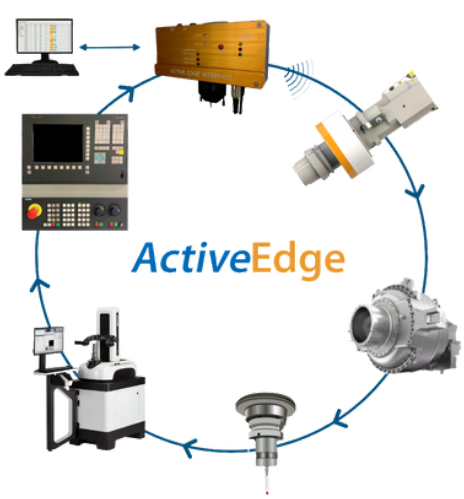
Automatic Adjustment with ActiveEdge

- Faster adjustment time minimises spindle downtime.
- Tools can be adjusted in the tool carousel so the production process can continue without interruption.
- No operator intervention is required, freeing staff up for other tasks & improving staff health & safety.
- Reliable, micron-accuracy in adjustment.
- Streamlined & efficient process reduces cycle time.

Increased Productivity

Automating the bore sizing process accelerates productivity without increasing the variable costs associated with production.

- The automatic adjustment value calculation eliminates the risk of making an incorrect adjustment
- Automation reduces reliance on a skilled operator being present to carry out precise manual adjustments

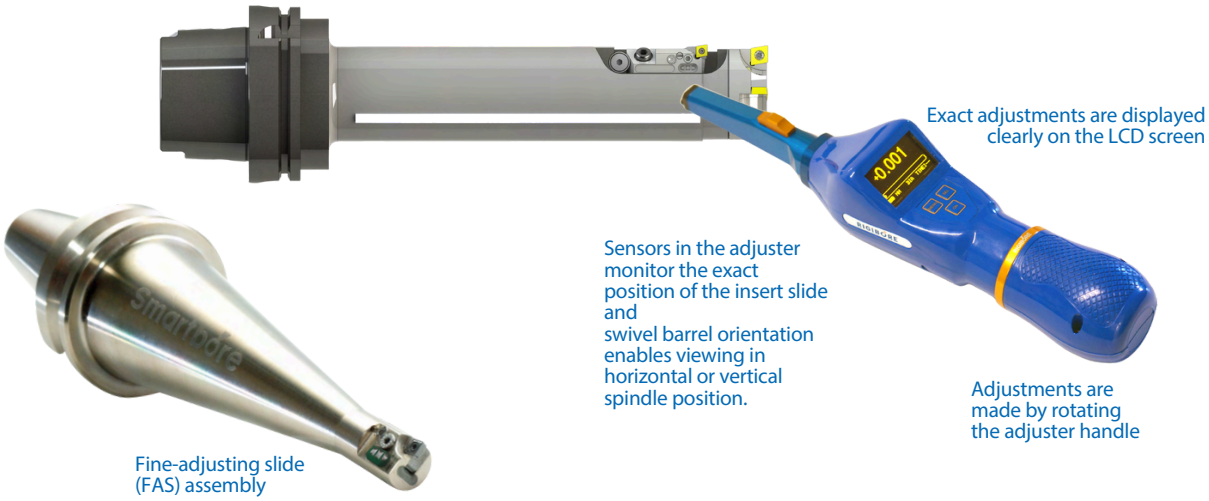


Smartbore is an innovative and unique solution for finish boring providing a user-friendly method to make consistently accurate adjustments.

Available in a range of indexable cartridges, boring heads, a standard module for large diameter bores and a slide assembly, Smartbore is the most flexible 'digital' solution for finish boring applications in the marketplace.

Smartbore works by electronically measuring direct movement of the cutting edge to an accuracy of one micron on diameter.

Smartbore finishing cartridges are used for precision machining on single or multi-feature special tools. Smartbore cartridges are designed with pockets to hold inserts from sizes 06 - 16. The fine-adjusting slide which is built into special tools takes an 04 insert.



Machine operators of all skill & experience levels can accurately set the cutting edge.

Measurement can be toggled between radius & diameter, metric & imperial, boring & over-turning

Adjustments are made without removing the tool from the machine, minimising downtime

No clamping or un-clamping required after adjustment - ensuring accuracy every time

Reduced Cycle Time

Smartbore cartridges are built into special tools which are designed and manufactured to suit your specific application. Any number of cartridges can be built into a boring tool to machine multiple features.

- Micron accurate cartridge adjustment to one micron on diameter. 0.6mm adjustment range.
- Multi-cartridge tooling capabilities reduce cycle time
- Available as replaceable cartridges or built-in slide assembly
- Precise adjustment values displayed clearly on the adjuster, not the tool

Crankshaft Boring

Rigibore's crankshaft boring solutions feature ActiveEdge in a closed-loop, fully automated system or our digital boring solution, Smartbore.

Both solutions are accurate to one micron on diameter and are designed to achieve the desired tolerances and surface finish and produce precise, cylindrical bores. Their use leads to a higher Cpk with less variation and more consistent output.

Tool Design & Process

Line boring bars are traditionally used to bore the journals to accept the crankshaft bearings. To ensure concentricity & accuracy, the bars have a pilot that enters a support bearing or the boring bars have guide pads for support.

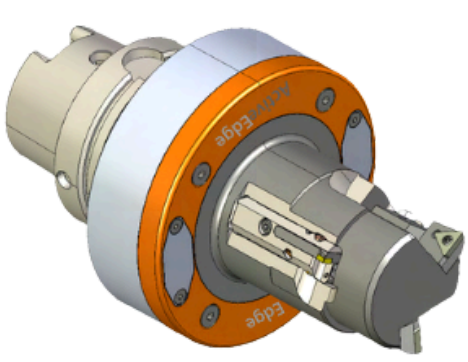
In high volume engine manufacture, line boring bars are considered the best solution for the simultaneous boring of journals in a crankcase, however in lower volume environments, boring bars with guide pads (due to the diameter to length ratio of the boring bar) are often used.

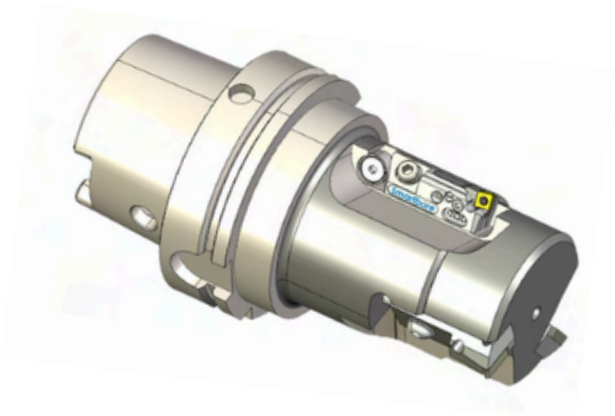
Rigibore's crankshaft solution

Rigibore's solution comprises two tools; a short tool to semi-finish and finish the first journal and a line bar with a replaceable fixed pocket assembly at the front of the tool for semi-finishing and either Smartbore or Active Edge cartridges for finishing the remaining journals.

Tool One

A short tool with a semi-finish cartridge and either an ActiveEdge or Smartbore cartridge.
This tool is used to machine the first journal which acts as support for the line bar.

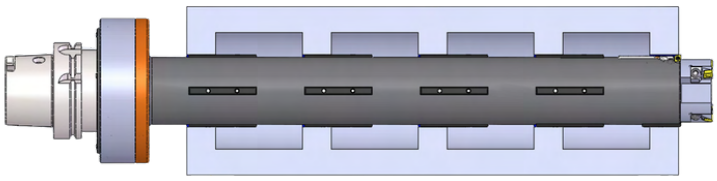


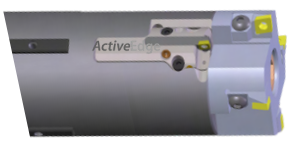


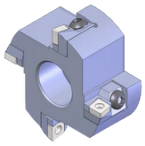
Tool Two

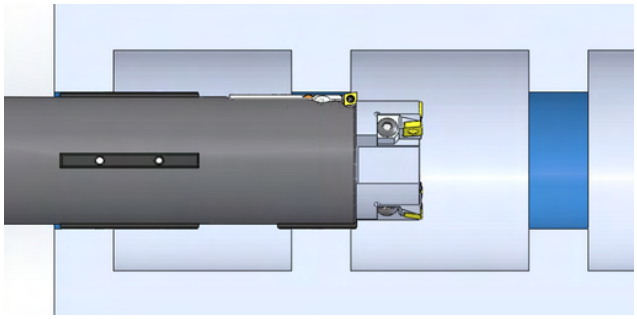
This line boring bar includes a replaceable fixed pocket modular assembly with ActiveEdge cartridges and carbide pads for stability.

This tool is fed to a position where the guide pads support the tool in the first journal before machining the second journal. This process is repeated until all the journals are machined. Once all the journals have been machined, the bar is retracted by back feeding through the last journal and rapid feeding to the next journal. This is repeated until the bar is fully retracted.







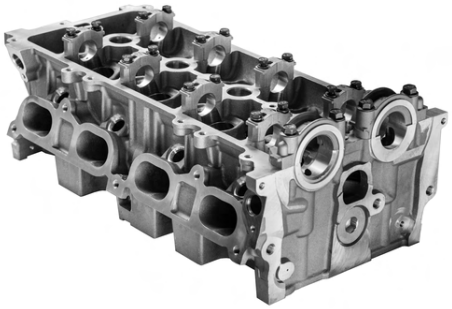


Before the finishing cut starts finish boring the second journal the guide pad engages with the first journal. This process is repeated for all journals.

A Smartbore cartridge can be used as an alternative to ActiveEdge.

Precision is crucial when boring camshaft bearings to ensure that the engine's valve train operates correctly.

Rigibore's reliable solution for consistent accuracy in camshaft bores is to use custom designed boring bars fitted with a unique Smartbore FAS (Fine Adjusting Slide) assembly.



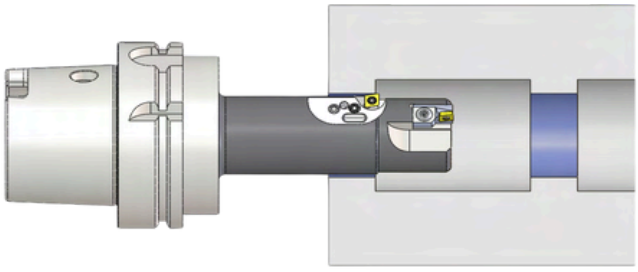
Tool Design & Process

Our camshaft solution comprises two tools. A short tool to semi-finish and finish the first journal and a line boring bar to machine the remaining journals.

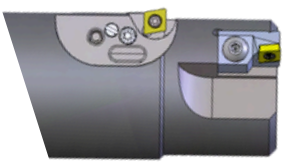
Tool One

A short tool with a semi-finish cartridge and a Smartbore FAS (Fine Adjusting Slide) Assembly.

Tool 1 is used to machine the first journal which acts as support for the line bar.

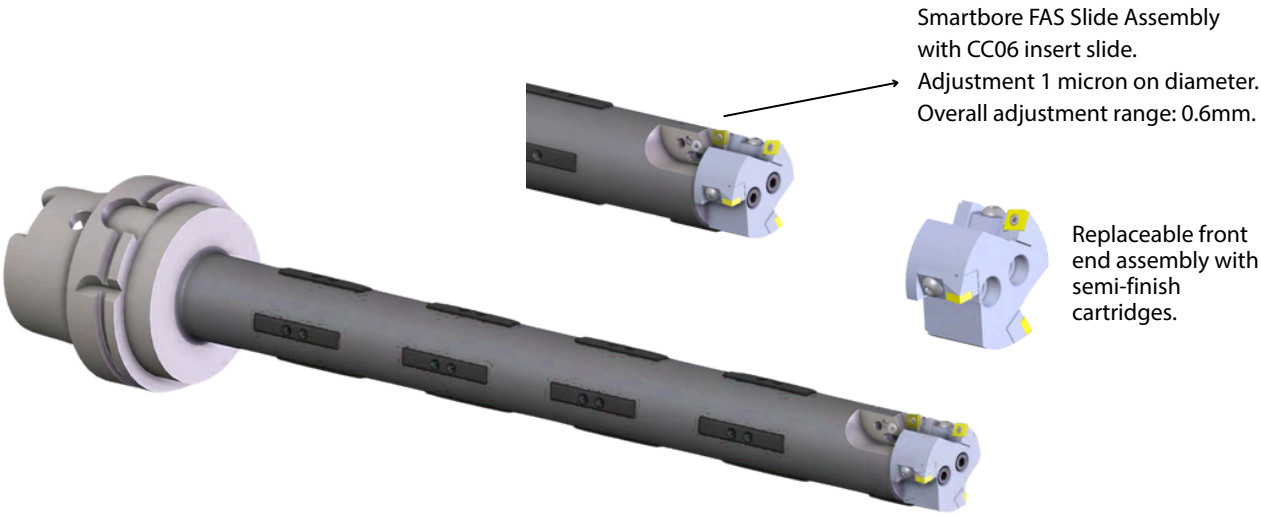


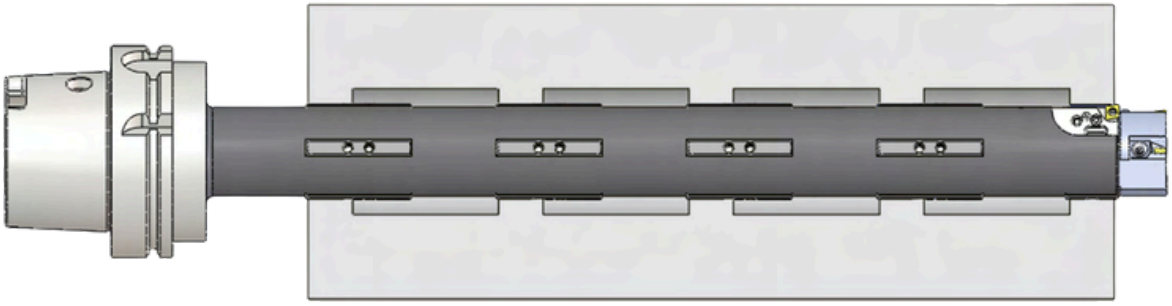
Smartbore FAS Slide Assembly with CC06 insert slide.
Adjustment 1 micron on diameter.
Overall adjustment range: 0.6mm.

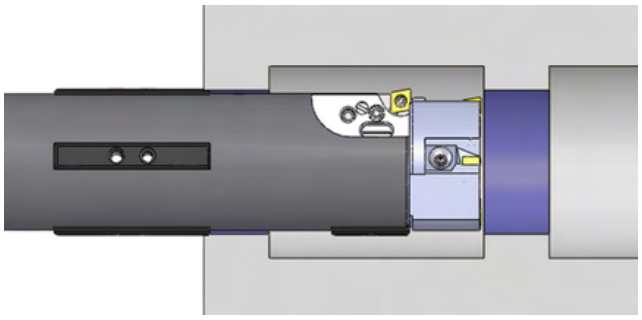


Tool Two:

A line bar with 3 semi-finish cartridges at the front of the tool on a replaceable assembly and a Smartbore FAS (Fine Adjusting Slide) assembly for finishing.







Before the finishing cut starts finish boring the second journal the guide pad engages with the first journal This process is repeated for all journals.

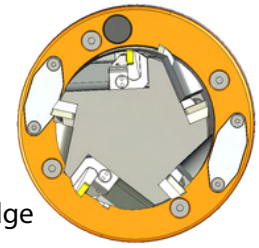
Rigibore uses its unique technology, ActiveEdge to offer custom boring solutions for cylinder boring.

Using Rigibore's closed loop ActiveEdge system with data capture de-skills the process and reduces the number of tools required to machine this cylinder bore.

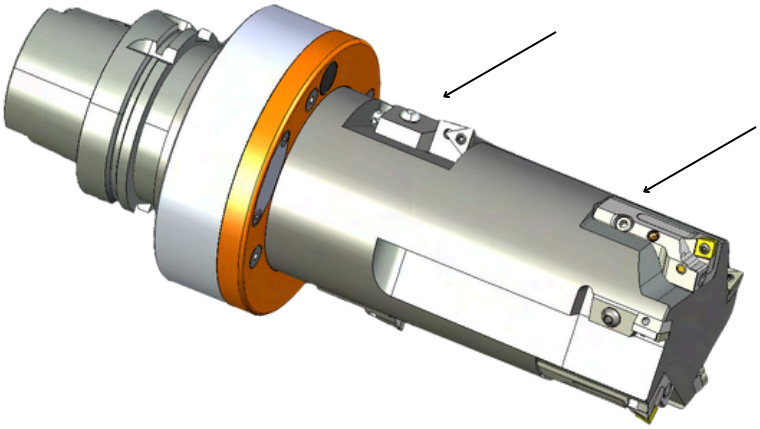
Using a tool that both semi-finishes, finishes and produces chamfer or counterbore features reduces cycle time and increases productivity.

The required bore size can be held to a much closer tolerance due to micron adjustment on diameter. This can be achieved by reducing the upper and lower limits from nominal in the macro that controls the requirement for an adjustment.

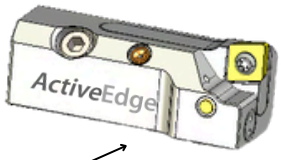
Where the next operation is honing, cycle time will be reduced by machining more accurate and consistent bores in the finishing operation.



ISO Cartridge to chamfer



ActiveEdge cartridge for finishing. Automatically adjustable to one micron on diameter



ActiveEdge finishing cartridge. Easily replaceable, takes ISO standard inserts

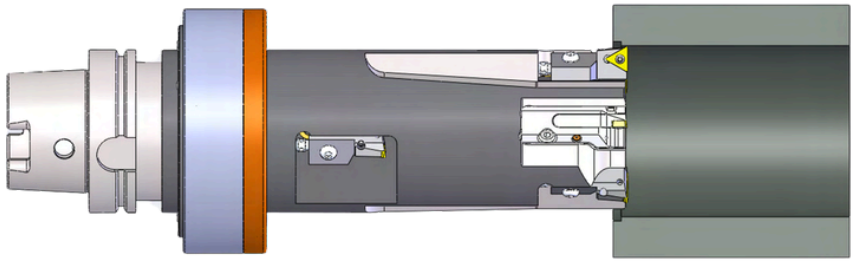
Tool Design & Process

Rigibore's solution comprises one combination boring bar to semi-finish, finish and chamfer the bore.

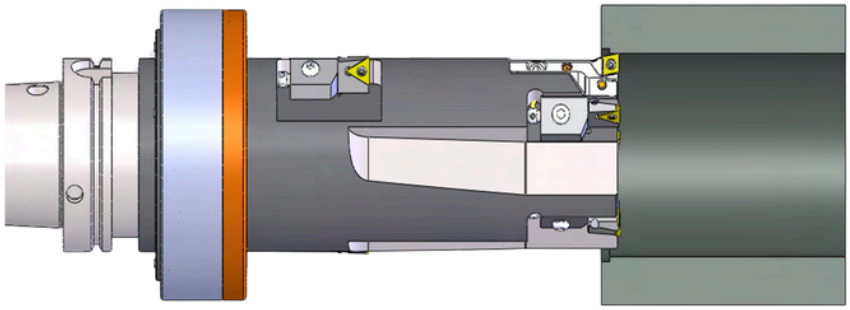
A boring bar with three semi-finish cartridges is set to lead the finishing cartridge by 0.100/0.150 microns (depending on the insert). The bar also has two ActiveEdge finish cartridges to increase the feed rate. The cartridges are positioned radially to allow the tool to be offset at the end of the cycle for rapid retraction. A chamfer or counter-boring cartridge follows the finishing cartridges to complete the feature at the start of the bore.

Cycle time is significantly shortened by reducing the number of tools required and automatic adjustment using in-process measurement and the machine tool control eliminates the need for manual adjustment.

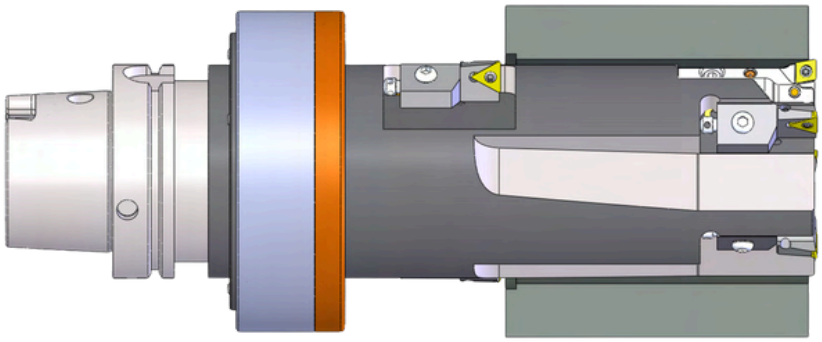
Tool Design & Process



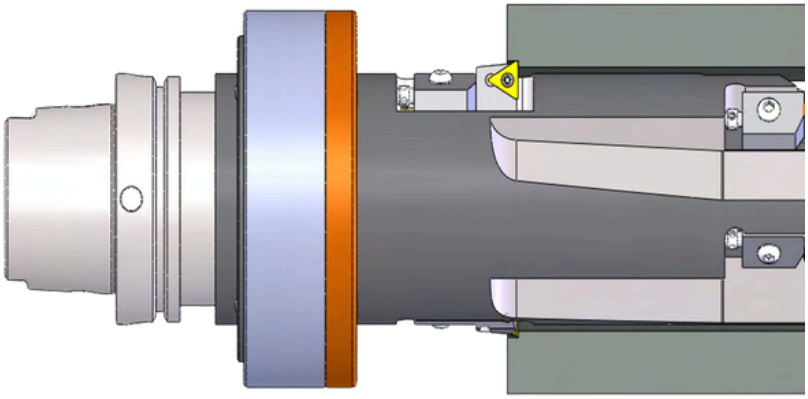
Semi-finish the bore with an ISO cartridge.



ActiveEdge cartridge to finish the bore follows the semi-finish.



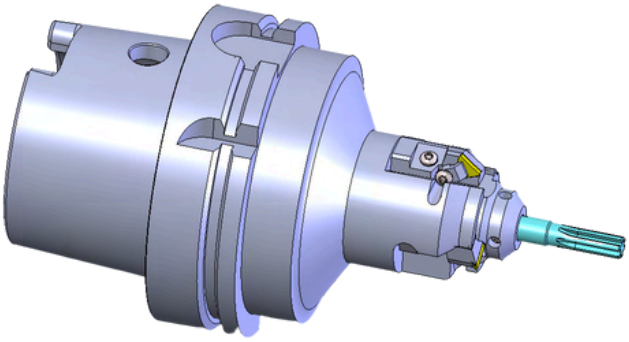
The finishing operation is completed.

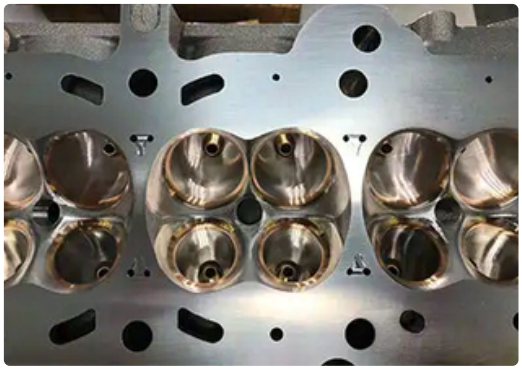


Finally, the counterbore is machined.

Rigibore applies a time and cost saving approach to tooling for boring Valve Guide & Valve Seat holes.

A more accurately bored valve seat angle leads to a better seal, which in turn contributes to lower emissions and improved engine performance because a good seal prevents leakage and ensures efficient combustion.



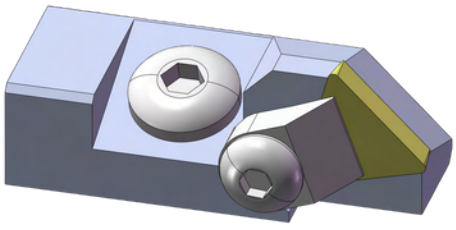


Tool Design & Process

Rigibore's solution uses a boring bar assembled with a qualified cartridge and a reamer to finish machine the seat angle and finish ream the valve guide.

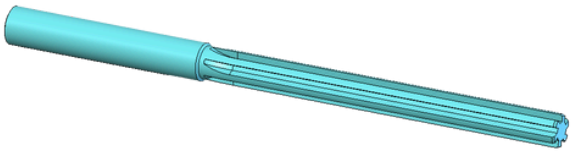
The tip seat position of the cartridge and angles are held to a tolerance of +/-.05° and the insert angles are ground to the same tolerance. The toolholder body has a precision pocket to hold the cartridge for machining the valve seat angle and a precision hole for the reamer to finish the valve guide.

The cartridge pocket is designed to take an indexable insert. In the example shown we use a full top CBN insert that can be indexed without the need to take the tool back to the presetter.



Qualified Cartridge

We use a special cartridge qualified for the seat angle. This saves considerable downtime required for setting.



Reamer

Replaceable reamer. Clamped in the bar with a set screw.

Precision machining of connecting rods is crucial because it directly impacts engine performance, reliability, and lifespan. Rigibore's ActiveEdge technology ensures that accuracy is consistently achieved machining bores in a high volume production environment.

Connecting rods must fit precisely into crankshaft and piston assemblies. An imperfect fit can lead to increased friction, heat buildup, and even bearing failure.

Tool Design & Process

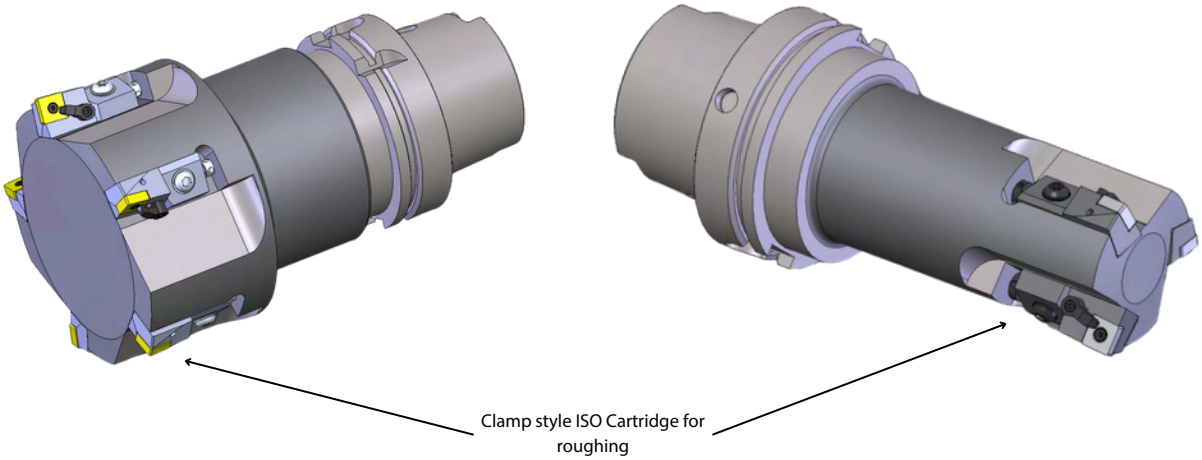
Rigibore's solution for machining the pin and crank bore and finishing the pin bushing bore comprises five tools; two roughing tools, two ActiveEdge finishing tools and a UFP cartridge finishing tool.

The pin bore is roughed and semi-finished using a tool fitted with three ISO cartridges. The crank bore follows with a tool with five ISO cartridges.

The pin bore is finished using an ActiveEdge tool with two ActiveEdge cartridges. The tool will be fitted with RH (right hand) or LH (left hand) cartridges depending on the position of the oil hole in the connecting rod. This is done to avoid leaving a burr after machining.

The bores are probed to check the tolerance. The frequency of probing should be determined by the inspection department by monitoring insert wear. ActiveEdge tooling will adjust automatically with the tool out of the spindle ready for the next part, avoiding a cycle stop for adjustment.

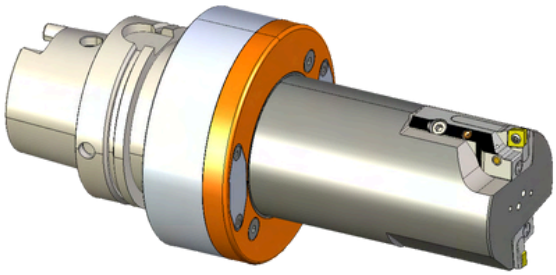
The crank bore is finished using the same process.



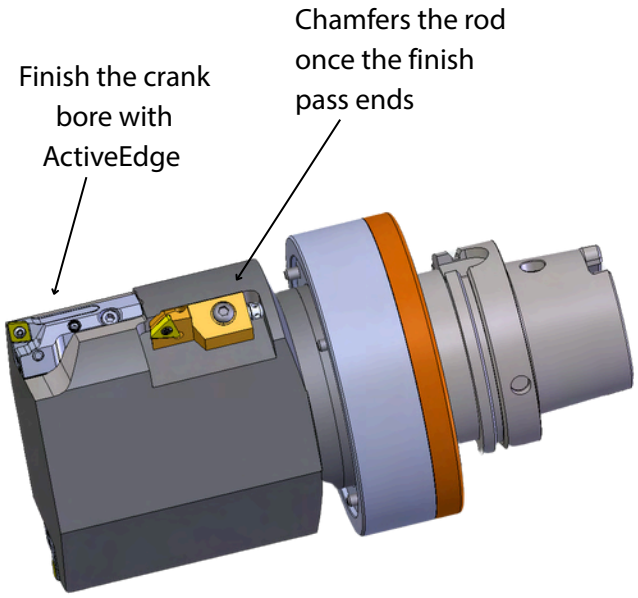
Tool 1 - Rough & semi-finish the crank bore

Tool 2 - Rough & semi-finish the pin bore

The pin bore is finished using an ActiveEdge tool with two ActiveEdge cartridges.

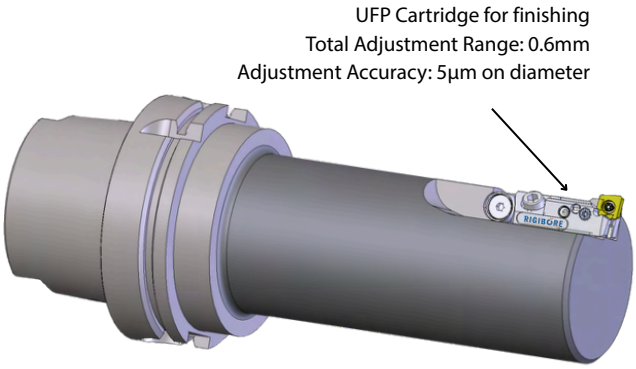


Tool 3 - Finish the pin bore with ActiveEdge



Tool 4 - Finish the crank bore with ActiveEdge

The crank bore is finished using an ActiveEdge tool with two ActiveEdge cartridges. The tool will rotate left or right depending on the position of the oil hole on the connecting rod.



Tool 5 - Finish the pin bore bushing

After the bushing is pressed into the pin bore the bushing bore is machined using a boring bar with a UFP cartridge. This cartridge needs only a small adjustment after approximately 2500 parts while using a PCD insert.

A Smartbore cartridge with 1µm accuracy can also be used.

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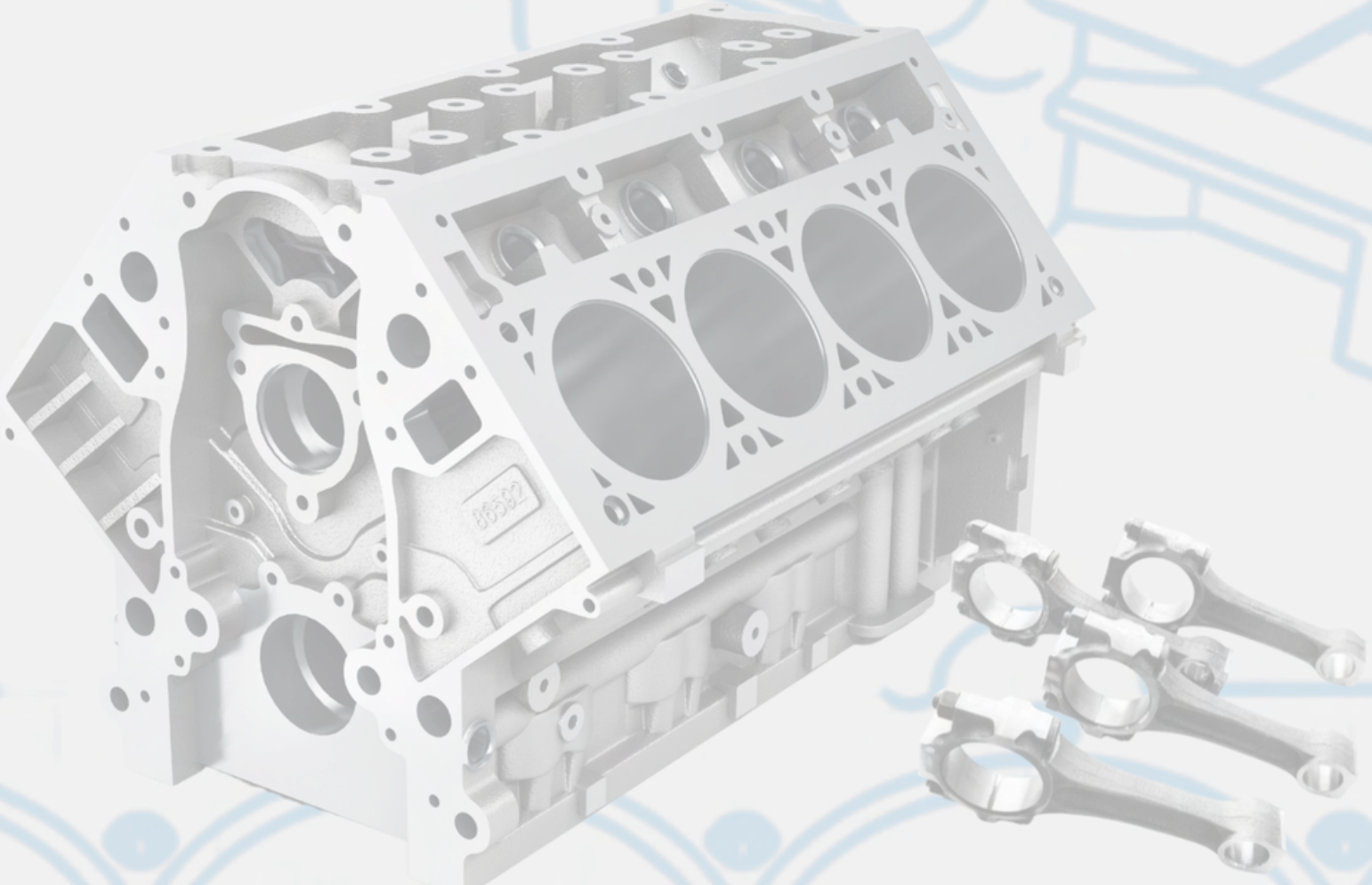

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The most accurately adjustable boring tools in the world

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