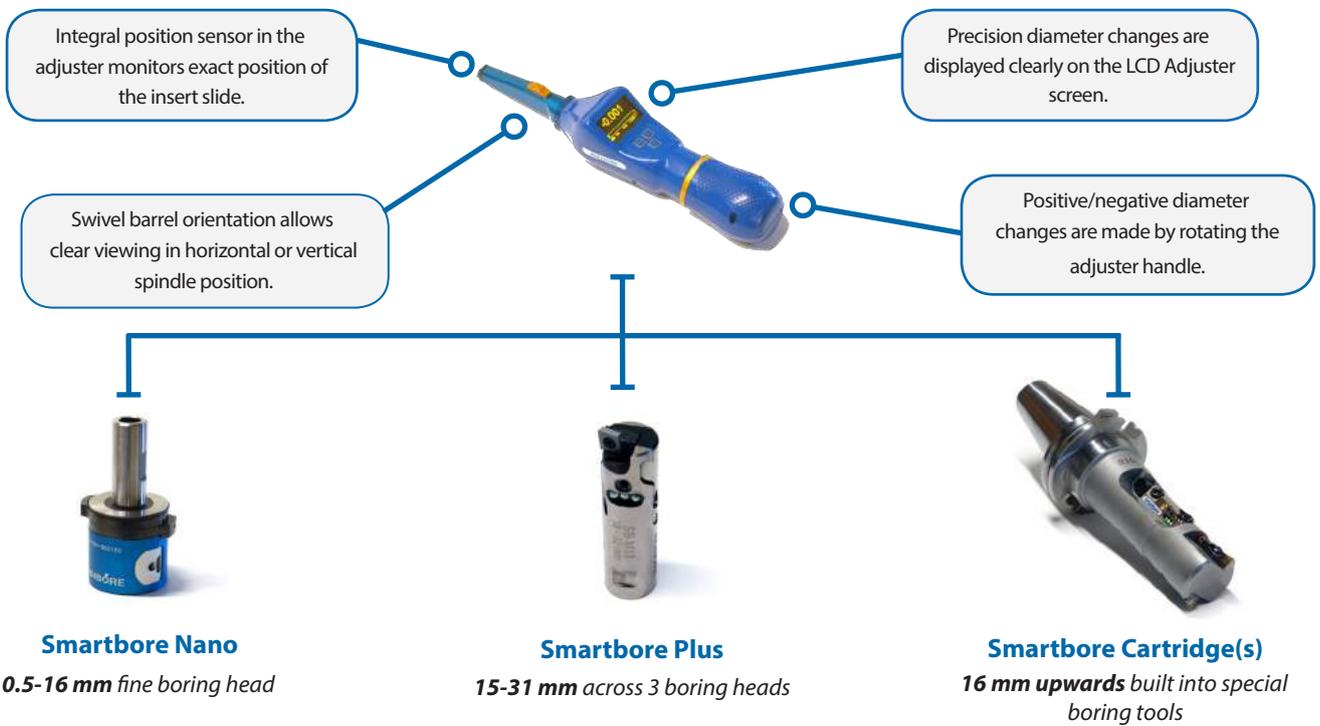


Smartbore

Micron accurate cutting edge tool adjuster

What Is Smartbore?

Patented Smartbore boring technology electronically measures **real-time movement of the cutting edge** to an accuracy of one micron on diameter



Smartbore Benefits



Allows machine operators of all skill/ experience levels to **rapidly and accurately** set the cutting edge to precise limits.



Diameter changes are made without removing the tool from the machine spindle, **minimising spindle downtime.**



Measurement can be toggled between **Radius/Diameter, Metric/Imperial & Boring/Overturning.**



Smartbore digital cutting edge adjustments are made **without the need for clamping/ unclamping.**

Smartbore

Smartbore

Micron accurate cutting edge tool adjuster

Smartbore Cartridge Solution

Rigibore's Smartbore technology allows micron accurate cutting-edge adjustment through precision finishing cartridges, without removal from the machine spindle.

Smartbore Cartridges Overview

Smartbore finishing cartridges are used for precision machining on **single or multi-feature special tools**.

This solution integrates Smartbore technology as either a replaceable cartridge or built-in as a Fine Adjustment Slide (FAS), covering a diameter range of **16mm upwards**.

Patented Smartbore technology allows fast, simple diameter changes to be made in the machine without the need for clamping in operation.



Reduce Cycle Time

Smartbore cartridges are built into special tooling solutions, designed and manufactured to the needs of the customer's application.

In-house software allows design of limitless Smartbore cartridges on a single tool, creating the ability to machine multiple features simultaneously, in just **"one shot"**.



"One Shot" tooling increases process efficiency, reduces cycle time and minimises tooling requirements.

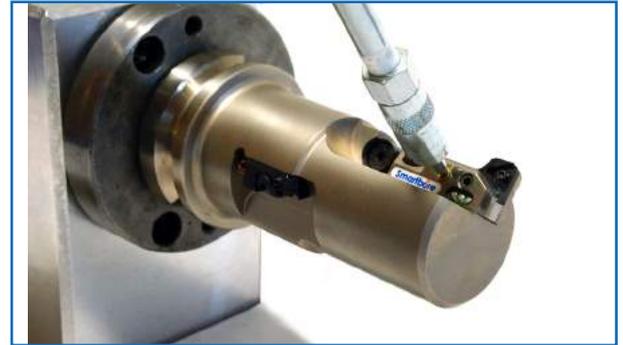
Solution Summary

-  Micron accurate cartridge adjustment down to **1 micron (0.6mm range)** on diameter.
-  Available as replaceable cartridge(s) or built-in configuration.
-  Multi-cartridge tooling capabilities **reduce cycle time**.
-  The Smartbore Digital Adjuster provides simplicity in achieving precision bore sizes.

Smartbore Cartridges require regular greasing for optimal performance and durability, especially when machining cast iron.

The greasing process is designed to evacuate small chips, swarf and machining dust that may accumulate the cartridge mechanism.

Grease must be pumped into the cartridge until it is seen to escape from all around the adjustment slide.



Recommended Greasing Intervals

Material/Usage	Heavy	Medium	Light
Ferrous (Cast Iron) No Coolant	3 Times Per Week	Twice Per Week	Weekly
Ferrous (Cast Iron)- With Coolant	Twice Per Week	Weekly	Weekly
Ferrous (Steel)	Weekly	Bi-Weekly	Monthly
Non-Ferrous	Bi-weekly	Monthly	Every 2 months

The operation and micron-accuracy of the adjustment will be negatively affected unless the schedule is adhered to. The cartridge mechanism could become *permanently damaged* requiring premature replacement.



UFGP-00 Grease Gun- (Includes 1 refill cartridge)

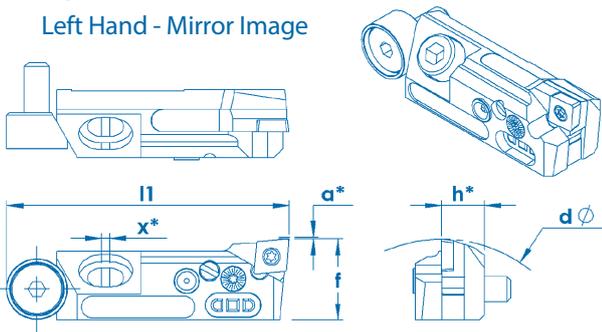
UFGP-RFL Grease Refill for UFGP-00



Smartbore Technical Specification

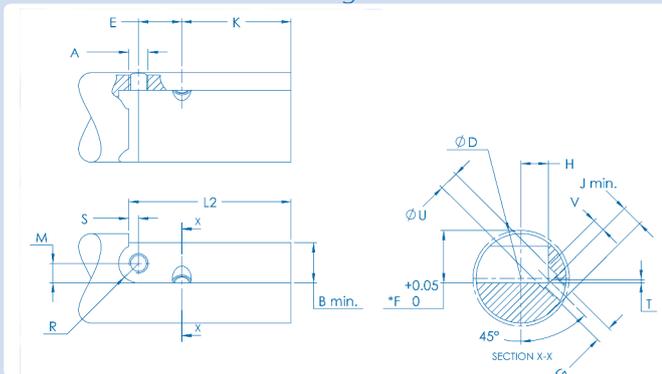
	Part Number	D (Min Bore ϕ)	f	L1	Insert	Datum Rad
		mm	mm	mm		mm
<p>SB-UFP0690</p>	SB-UFP0690 SB-UFP0690LH	28.0	16.0	55.5	CC..0602..	0.4
<p>SB-UFP1190</p>	SB-UFP1190 SB-UFP1190LH	36.0	20.0	55.5	TC..1102..	0.4
<p>SB-UFP0695</p>	SB-UFP0695 SB-UFP0695LH	28.0	16.0	55.5	CC..0602..	0.4
<p>SB-UFP1195</p>	SB-UFP1195 SB-UFP1195LH	36.00	20.0	55.5	TC..1102..	0.4
<p>SB-UFP07120</p>	SB-UFP07120 SB-UFP07120LH	28.0	16.0	55.5	DC..0702..	0.4
<p>SB-UFP1290</p>	SB-UFP1290	75.0	32.0	107.0	CC..1204..	0.8
<p>SB-UFP1690</p>	SB-UFP1690	75.0	32.0	107.0	TC..16T3..	0.8

Right Hand - Shown
Left Hand - Mirror Image



- a*: 0.3 Adjustment on all UFPs Adjustment = 0.001mm per division on diameter
- h*: 8.5 on UFP 06-11
- h*: 18.0 on UFP 12-16
- x*: 1.0 on UFP 06-11
- x*: 1.6 on UFP 12-16

Smartbore & UFP Mounting Dimensions



No machine spindle modification required. Smartbore bars can be carried in a standard magazine and tool management system.

Smartbore cartridges are easily replaceable.

UFP	A	B (min)	H	L2	R	S	K
	mm	mm	mm	mm	mm	mm	mm
Standard	M5 x 0.8	12.5	8.5	47.5	6.1	3.0	34.0
Large	M8 x 1.25	24.6	18.0	98.0	10.1	3.0	63.0
UFP	G	T	U (diam.)	V	J (min)	E	M
	mm	mm	mm	mm	mm	mm	mm
Standard	M5 x 0.8	1.0	6.0	4.0	5.0	13.5	6.1
Large	M10 x 1.5	1.4	11.0	8.0	10.0	32.0	10.0

Smartbore Spares and Accessories

UFP	Clamp Screw	Hexagon Wrench for Clamp Screw	Axial Adjusting Screw	Axial Wedge	Insert Screw	Torx Wrench for Insert Screw	Grease Gun	Hexagon Wrench for Axial Screw	Torx Wrench for Adjustment Screw	Smartbore Adjuster	Smartbore Battery Recharger
Standard	WS360	R58	WS359	WP311	RS2560	R37		R48			
Large 1290 1690	WS1035	R108	WS830	WP411	RS40120	R87 R77	UFG-00	R88	R57 (T10)	SB-ADJ187	SB-CHR07

Smartbore

Smartbore
Micron accurate high speed boring head
Nano

Smartbore Nano Solution

The Smartbore Nano precision boring head combines **simplicity and accuracy** to excel in **small hole boring operations**.

A Measurement You Can Trust

The Smartbore Nano fine boring head covers a boring range from **0.5mm-16mm**.

This rigid design allows fast setting and precision adjustment in the machine spindle.

Unlike mechanical systems which counts the revolutions of a screw, the Smartbore Nano electronically measures the movement of the actual insert position.



Innovation In Design

The Smartbore Nano's functional design houses the electronic components in the Smartbore Adjuster rather than in the boring head itself.

Keeping sensitive electronics out of the working environment **removes the risk of damage** from collisions with chips, coolant or swarf.

Only one adjuster is required regardless of the number of boring heads, allowing organisations to benefit from significant cost savings.



Solution Summary



Clamp free adjustment system, the perfect solution for **small hole precision boring**.



Keeping electronics outside of the machine **removes the risk of damage & unit costs**.



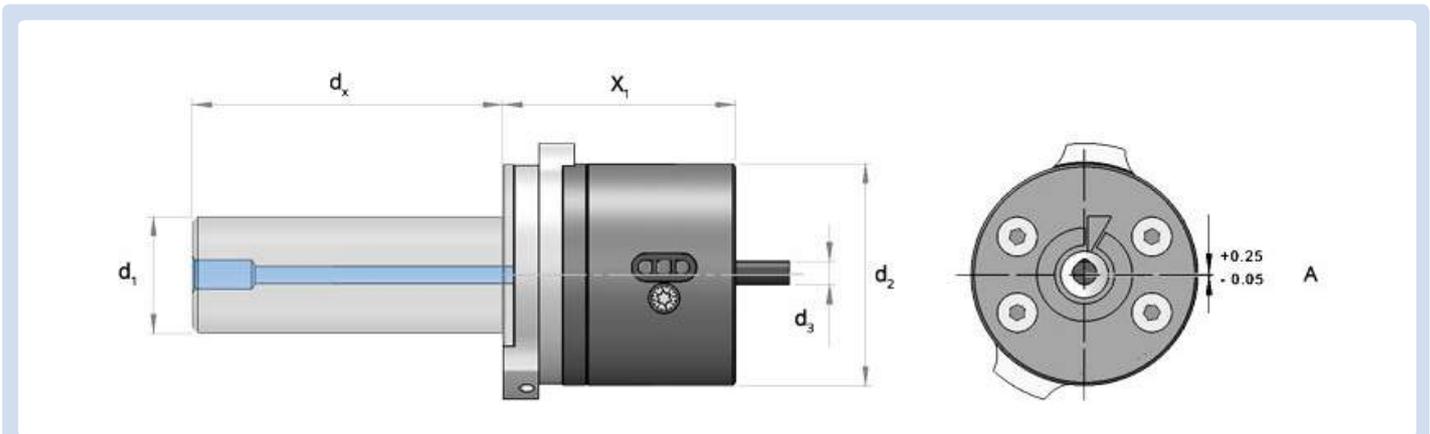
Eliminated risk of distorting the boring head during adjustment, **keeping the tool in true balance**.



The Smartbore Nano fits any standard collet chuck or side lock holder.

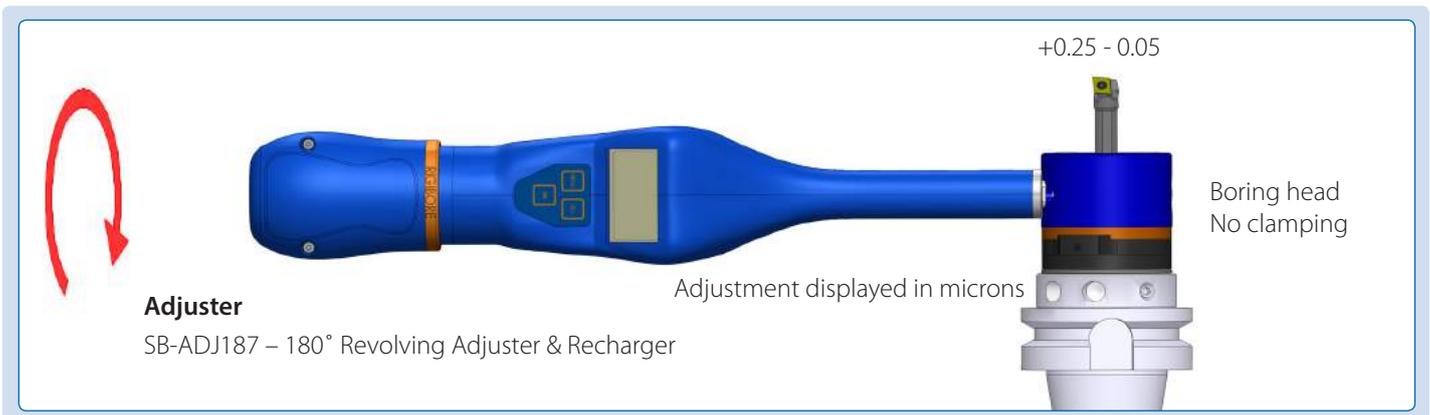


Rigibore Smartbore Nano Head - Specification

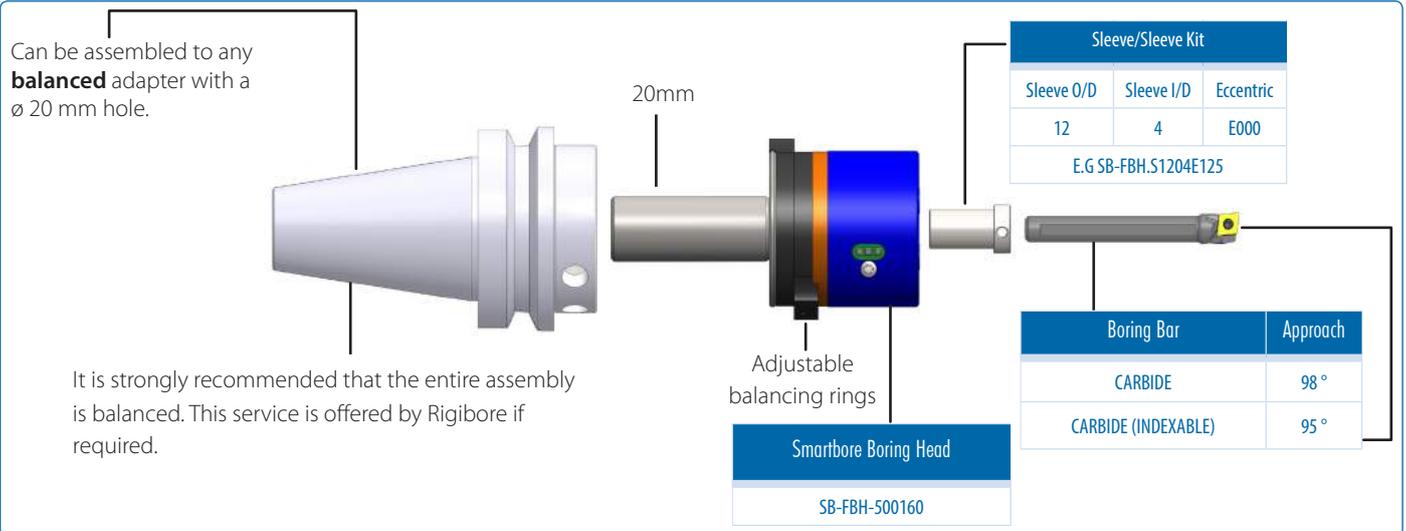


Boring Head	d1	d2	d3	dx	X1	A	kg
SB-FBH500160	20.0mm	48.0mm	4.0-8.0mm	50mm	50.0mm	0.5-16.0mm	0.6

Rigibore Smartbore Nano Adjuster



Rigibore Smartbore Nano - Components



Rigibore Smartbore Ordering - {Boring Bars/Sleeves & Kits} - {Technical Information}

Range	Max Bore Depth	Carbide Boring Bar Number	Sleeve Kit Number	Boring Set Number
0.5-1.0	3	SB-FBH-BB0510	SB-FBH.SK005040	SB-FBH0510
1.0-1.5	4	SB-FBH-BB1015	SB-FBH.SK005040	SB-FBH1015
1.5-2.0	7	SB-FBH-BB1520	SB-FBH.SK005040	SB-FBH1520
2.0-2.5	9	SB-FBH-BB2025	SB-FBH.SK005040	SB-FBH2025
2.5-3.0	12	SB-FBH-BB2530	SB-FBH.SK005040	SB-FBH2530
3.0-3.5	14	SB-FBH-BB3035	SB-FBH.SK005040	SB-FBH3035
3.5-4.0	14	SB-FBH-BB3540	SB-FBH.SK005040	SB-FBH3540
4.0-5.0	17	SB-FBH-BB4050	SB-FBH.SK040050	SB-FBH4050

Smartbore Nano Set Includes

- Smartbore Nano Boring Head
- Smartbore Adjuster
- Relevant Boring Bar
- Sleeve Kit *

* The sleeve kit contains eccentric sleeves that allow the boring bar to be offset to meet the required diameter.

N.B - Adapter and inserts sold separately.

Range	Max Bore Depth	Carbide Boring Bar Number	Sleeve Kit Number	Boring Set Number	Insert Size (Datum Rad)
5.0-6.0	24	SB-C04GSCLCR03	SB-FBH.SK050060	SB-FBH5060	CC..03S102
6.0-7.0	30	SB-C05HSCLCR03	SB-FBH.SK060070	SB-FBH6070	
7.0-8.0	36	SB-C06JSCLCR04	SB-FBH.SK070080	SB-FBH7080	CC.04T002
8.0-9.0	42	SB-C07KSCLCR04	SB-FBH.SK080090	SB-FBH8090	
9.0-10.0			SB-FBH.SK090100	SB-FBH90100	
10.0-11.0	48	SB-FSCLC1008R-06E-2/3	SB-FBH.SK100110	SB-FBH100110	CC..060202
11.0-12.0			SB-FBH.SK110120	SB-FBH110120	
12.0-13.0	60	SB-FSCLP1210R-08E-2/3	SB-FBH.SK120130	SB-FBH120130	CP.080202
13.0-14.0			SB-FBH.SK130140	SB-FBH130140	
14.0-15.0	60	SB-C10KSCLCR06	SB-FBH.SK140150	SB-FBH140150	CC.060204
15.0-16.0			SB-FBH.SK150160	SB-FBH150160	CC.060204

'Boring Set' items are available individually to suit your requirements upon request.

Order Example - 3.5mm-4mm

Boring set number: SB-FBH3540 contains the following:-

- SB-FBH-500160 (Boring Head)
- SB-ADJ187 (Digital Adjuster)
- SB-FBH-BB3540 (Boring Bar)
- SB-FBH.SK005040 (Sleeve Kit)

Smartbore

Smartbore

Precision performance across varying bore sizes

Plus+

Smartbore Plus Solution

The Smartbore Plus boring head enables a range of bore sizes to be reached quickly and accurately through both coarse and digital fine adjustment measures.

Smartbore Plus Overview

The Smartbore Plus boring head range enables micron accurate diameter changes across a range of precision boring heads from 15mm upwards.

- **SB-M15** - 15mm/0.590 inches - 18.5mm/ 0.728 inches (CC Insert)
- **SB-M18** - 18mm/0.709 inches - 22mm/ 0.866 inches (TP/CC Insert)
- **SB-M20** - 20mm/0.787inches - 31mm/1.220 inches (TP/CC Insert)



Dynamic Adjustment Capabilities

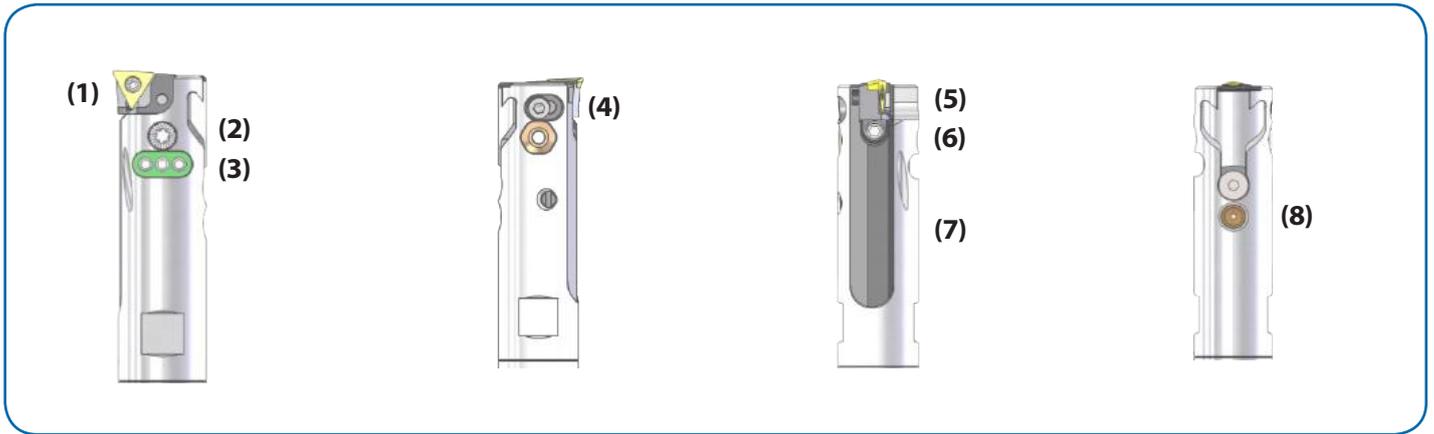
The coarse adjustment capability allows the tool to be set quickly and accurately across a range of bore sizes. Each boring head offers at least **3.5mm of coarse adjustment** on diameter.

Micron accurate fine adjustments are made using the digital Smartbore Adjuster. Coarse and fine adjustment measures combine to offer flexibility and accuracy in setting bore sizes.



Solution Summary

- ✓ A range of bore sizes can be quickly covered using the coarse adjustment feature.
- ✓ Rigid design avoids the risk of movement from clamping/unclamping.
- ✓ For optimal performance the Smartbore Plus head should be mounted in a precision collet chuck.
- ✓ The Smartbore Plus boring head range supports **CC04, CC06 & TP08** inserts.



Smartbore Plus Components			
1. Insert	2. Fine Adjustment Torx Screw	3. Electronic Interface	4. Coarse Adjustment Locking Screw
5. Insert Holder	6. Coarse Adjustment Screw	7. Insert Slide	8. Lubrication Point

Smartbore Plus Head	Part Number	Diameter Range	Shank Length	Shank Diameter	Tool Body Length	Coarse Adjust	Approach Angle
	SB	mm	Short/Long (mm)	mm	mm	mm	°
	SB-M15	∅ 15 - 18.5	55.00/95.00	∅ 14	50	1.75	93°
	SB-M18-CC06 SB-M18-TP08	∅ 18 - 22	52.50/77.50	∅ 16	57	2.0	93°
	SB-M20-CC06 SB-M20-TP08	∅ 20 - 31*	75.00	∅ 18	46	5.5	93°
total adjustment range = 0.30mm on radius							

*Diameter is achieved across two separate insert holders, covering 20mm-26mm & 25mm-31mm.

Smartbore

Frequently Asked Questions

Q: How durable is the handheld Smartbore Adjuster?

A: The Smartbore Adjuster has been tested extensively to ensure it provides extremely minimal risk of damage even in the harshest machining environments.

Adjustments can be made in the machine spindle, without risking damage from dust, oil, chips and coolant that may collide with the tool.

The handheld Smartbore Adjuster is in fact so durable that it will maintain full functionality even if it is dropped into coolant or water.

Q: What adjustment ranges does Smartbore Technology cover?

A: Rigibore's patented Smartbore technology covers a wide adjustment range for boring applications.

Smartbore Cartridges offer an adjustment range of 16mm upwards, either built into the bar as a slide assembly or offered as a cartridge based solution.

Alternatively, for small hole boring operations, the *Smartbore Nano* boasts an adjustment range from 16mm down to 0.5mm in diameter.

Q: How prone to damage is the handheld Smartbore Adjuster?

A: The Smartbore Adjuster's sophisticated design minimises the risk of damage in operation.

Applying a constant preload and determining adjustments using sensor technology means the adjuster does not apply more torque than required, eliminating the risks of damage associated with it.

If accidentally dropped during the adjustment process, the torx will spring back inside the adjuster to eliminate the potential for damage when colliding with the floor.

If damage to the torx driver occurs in operation, the Smartbore Adjuster can be returned to Rigibore where it will be repaired for a small service charge.

Q: How does communication between the Smartbore cartridge and Adjuster work?

A: The Smartbore cartridge contains an integral position transducer. This is activated by the Adjuster when the connection is made.

The Smartbore Adjuster contains a rechargeable power source, together with the control electronics necessary to display the adjustment reading on the LCD display screen.

The Adjuster also supplies power to the cartridge position transducer when connected. The transducer returns position data to the Adjuster which is then interpreted and displayed on the LCD display screen.

Q: What capabilities does the Smartbore Adjuster offer when monitoring diameter changes?

A: The handheld Smartbore Adjuster displays can be changed depending on the boring operation and the operators preference. The measurement system can be toggled between '*MM*' and '*INCH*' by using the menu button .

The adjustment type can also be toggled between '*RADIUS*' and '*DIAMETER*' to suit the operators needs. The Smartbore Adjuster also offers adjustment based on the type of diameter change, displaying both '*BORING*' and '*OVERTURNING*' capabilities.

Q: Are Smartbore Cartridges Interchangeable with UFP Cartridges?

A: Smartbore cartridges are designed to fit UFP cartridge pockets, and are completely interchangeable with standard UFP cartridges.

Q: How can the Smartbore Adjuster be charged in case of a flat battery and how long does the process of charging traditionally take?

A: A Smartbore re-charger kit (SB-CHR07) is included with each Smartbore Adjuster. The re-charger can be purchased separately if required.

The Smartbore Adjuster can be fully charged from flat battery in under an hour.

Q: Is the Smartbore Adjustment system relative or absolute in it's adjustment methods?

A: Smartbore adjustments are based on an absolute scale , beginning at 0 and monitoring positive or negative diameter changes in a certain direction from the established starting point.

The Adjuster's capabilities do not account for a relative measurement scale, meaning it can not establish the current diameter of the tool's cutting edge and therefore must be predetermined before making an adjustment.

Q: Do you have to calibrate the Smartbore Adjuster?

A: No, the Smartbore Adjuster is fully calibrated before dispatch from Rigibore and is ready for use upon arrival.

Gear Housing

Project Overview

Smartbore technology was applied to improve production of gear housing components.

Prior to the project, this second tier automotive supplier was experiencing a number of accuracy issues, contributing towards high scrap rates.

Prior to implementation of Smartbore technology, the organisation in question used carbide support pads to stabilise the bar and counteract deflection when boring the gear housing component.

Rigibore's objectives for this project were focused around designing a tooling package that could operate at a higher speed and feed rate, reducing cycle time whilst significantly increasing accuracy.

Smartbore Solution

Rigibore used specialised in-house design software RADS to design, manufacture and deliver a tool made up of the following components

- Smartbore Cartridge- Smartbore Cartridges allowed simplistic, micron-accurate adjustment down to 0.001mm on diameter using the handheld digital adjuster.
- Hydrostatic Tooling- Rigibore's hydrostatic tooling allowed through-coolant to efficiently evacuate chips between the bar and component.
- Special Insert Geometry- Rigibore's special insert geometry ran at higher surface speeds and lower feeds, .While the cutting tool is operating, burnishing to provide a smooth surface finish.



**HSK36A Smartbore
Finishing Tool**

Results

- CP Data- Smartbore technology contributes to a more efficient process control, Since the introduction of Rigibore tooling, parts are now being produced within the customer's Cpk requirements.
- Scrap Rate- Prior to the introduction of Rigibore tooling, out of every 100 parts produced, 7 were Rejected . Rigibore improved this figure with 100 parts being produced, 1 part was rejected.
- Finish Quality- Whilst vastly increasing the feed rate from S 1800 @ 600mm/min with the old, padded style of tooling to S6000 @ 1000 mm/min with hydrostatic approach.

Rigibore tooling maintained the required surface finish. Proving that higher surface speeds with lower feed rates reduced cutting pressure, therefore less deflection. This coupled with easy micron-adjustment outperforms padded tooling whilst reducing cost .

Connection Rods Case Study

Project Overview

Rigibore tooling was selected to improve boring efficiency of a 2nd Tier Automotive company, machining connection rod components.

Prior to implementation of the Rigibore solution, this industry leading automotive parts manufacturer was using a well known tooling provider incorporating a *bladed reamer style boring bar*.

Although accuracy in operation was of sufficient quality, this tooling package was taking anywhere up to an entire shift to accurately set the diameter.

Often, if a skilled operator was not present on site to make accurate diameter changes the tool would remain idle for hours at a time, dramatically decreasing productivity rates and impacting the organisation's ability to meet critical lead times.



Smartbore Solution

Rigibore selected *Smartbore Cartridge* technology as a solution to improve efficiency this application. The goals of this project were to provide micron-accuracy in adjustment, whilst minimising setting time.

• **Smartbore Adjuster**- The handheld Adjuster allows the capability for operators of all skill and experience levels to make micron-precise adjustments quickly and simply.

Turning the adjusters handle clockwise or anti-clockwise initiates micron-precise positive or negative adjustments to the tools cutting edge.

• **PCD Inserts**- PCD inserts provide superior wear resistance, even when operating at high speeds and feeds. This capability meant that tooling could run for longer periods of time without requiring changes to the tools cutting edge.



Results

• **Scrap Rates** - Prior to implementation of Smartbore tooling, the organisation in question was experiencing an extremely high scrap rate. The Smartbore tool was set, and left to run, after *200 parts were machined just 2 pieces were scrapped*, combining the PCD inserts durability and Smartbore's micron-accurate adjustment capabilities.

• **Setting**- Smartbore technology's capability allowed the organisation to unlock exceptional time saving benefits. Where setting with previous tooling could take an entire shift, Smartbore tooling was accurately set in just *30-40 minutes*. Smartbore tooling dramatically decreased spindle downtime and maximised production capabilities.

• **Cost Savings** - PCD inserts cost around a quarter to replace compared to the bladed reamer solution, results showed the Smartbore tool machined *4,600 parts* using just 1 PCD insert and without the need for adjustment.

Transfer Case

Project Overview

The company in question for this project is a well known provider of precision machine assemblies found in the automotive and heavy plant industry.

Rigibore tooling was enlisted to improve machining efficiencies of an aluminium transfer case for an industry leading 4x4 automotive end user. Prior to implementation of Rigibore tooling, the transfer case was machined utilizing brazed PCD fixed pocketed tooling. Whilst this method provides superior wear-resistance while operating at high speeds and feeds, there were a number of concerns.

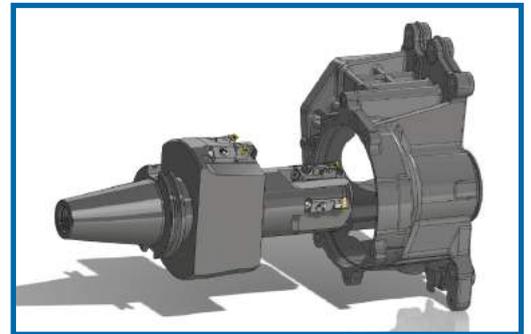
- **Reconditioning**- The PCD tools produce inconsistent finish as they become dull, meaning they must be returned to the manufacturer. Reconditioning times mirrored that of new tools (10-14 weeks), and led to issues meeting critical lead times.
- **Performance**- Reconditioned tools displayed numerous performance inconsistencies. Size, taper and run out differences caused issues with surface finish. Customers could not “plug and play” with confidence due to variability in performance of these tools.
- **Cost**- Not only was this process time consuming, but also extremely expensive. The process of reconditioning approached 60-80% of the tools original cost.

Smartbore Solution

“**One Shot**” Tooling- Development of a tool that performed the roughing and finishing operation simultaneously allowed exceptional tool efficiency, performing multiple critical operations in “one shot”.

PCD inserts - Rigibore provided PCD inserts for their own tooling package, these inserts still possessed the same durability and wear resistance as PCD tooling. However they also offered exceptional simplicity to replace in case of wear or damage.

Ease In Adjustment- Rigibore’s Smartbore technology offers exceptional ease in adjustment. Simply inserting the handheld Digital Adjuster into the connection on the cartridge and turning the handle initiates a positive or negative micron accurate adjustments.



CAT 50 Special Combination Boring Tool designed using sophisticated in house Rigibore design software.

Results

- **Size Control**- Introduction of Smartbore tooling allowed a superior size control on critical bore sizes than previous PCD tooling. Micron-Accurate changes were displayed on the handheld Smartbore Adjusters LCD display, ensuring speed and simplicity in adjustment.
- **Insert Wear**- When inserts were wearing on the Smartbore tool, simply changing the cartridge and insert allowed the operation to continue, minimizing spindle downtime, this was opposed to the fixed pocket system which involved expensive and time consuming reconditioning.
- **Simplicity In Adjustment** - The handheld Digital Smartbore Adjuster allows micron-accurate adjustments to be made by operators of all skill and experience levels, leading to deskilling of the workforce.
- **Surface Finish**- Introduction of Smartbore technology reduced variability in performance, and ensured a consistent surface finish.