



IS THE  
ULTRA  
THE RIGHT  
MACHINE  
FOR YOU?

**ANCA**  
CNC MACHINES

## **THOMSON MATHEW, ANCA'S MX AND SOFTWARE PRODUCT MANAGER, SHARES HIS PERSPECTIVE.**

Starting his career at ANCA in 1997, Thomson has worked hand-in-hand with customers in all regions as an Application Engineer to find solutions and test the limits of ANCA's software to design and grind the best tools in the market.

From there, he led the research and development team to design and test our ground-breaking technologies such as the LaserUltra, travelling steady, and various software including ToolRoom, ToolDraft, Management Suite and CIM3D. Always enthusiastic to help our customers maximize on their investment in ANCA technology, Thomson is the 'go to' person globally to glean insight and advice on the most advanced software trends and applications.



Do you manufacture Ballnose and Corner Radius end mills, high feed end mills, barrel cutters, Christmas tree cutters or other form tools? Are you looking for a competitive edge in tool quality?

### **Do you want to stand out from the rest?**

If so, the ANCA's ULTRA range might be the perfect fit for you. The ULTRA not only grinds the listed tool types faster than other machines, but it also produces all tools with both finer surface finishes and greater accuracy than comparable machines—factors that result in measurably superior tool performance and quality, especially for small tools.

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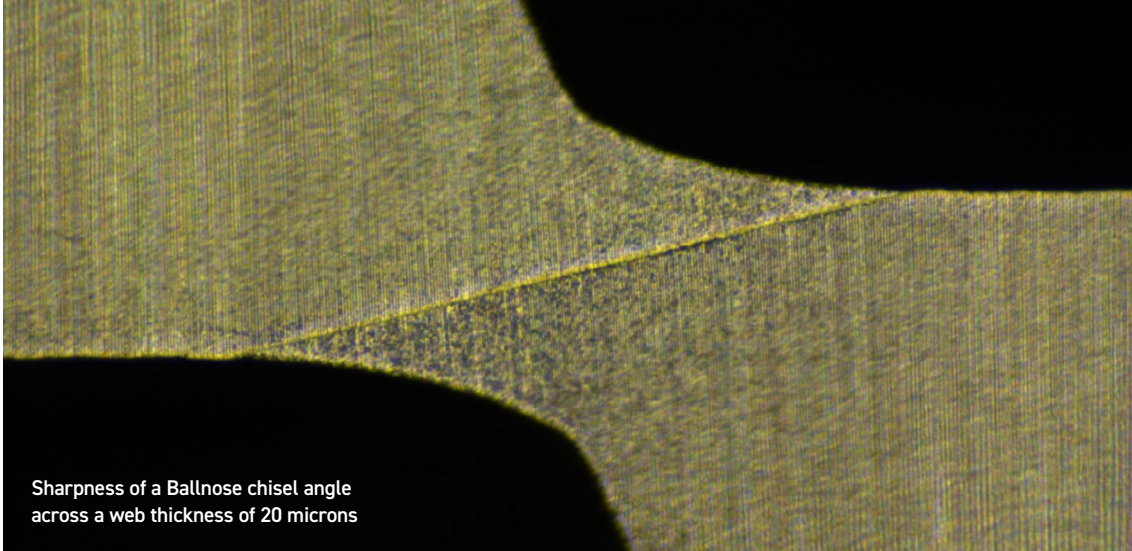
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# THREE UNIQUE FEATURES OF THE ULTRA MACHINE



## 1. ONE NANOMETER RESOLUTION – DEAD NUTS

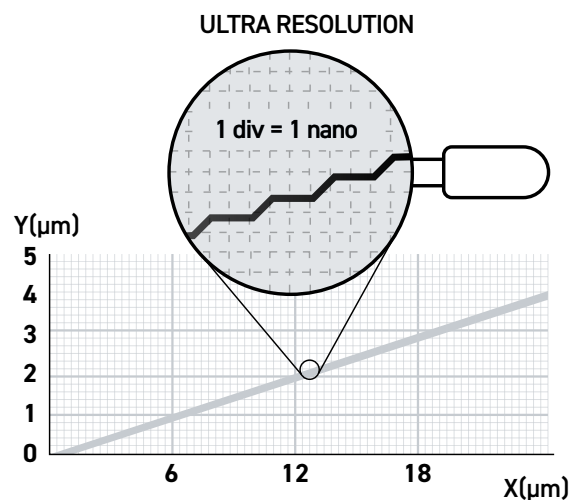
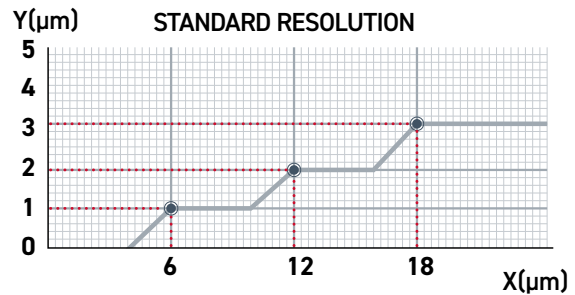
The ULTRA includes three exciting features you won't find on any other tool grinder. Let's start with the control resolution.



All CNC machines govern movement through a feedback loop between the control and the drives and motors that move the mechanical axes.

The tighter that loop (the higher the control resolution), the closer the machine's movements to the ideal programmed path. The ULTRA's control resolution is one nanometer. That's 0.000,001 mm, or 0.001  $\mu\text{m}$ . Literally 10 to 100 times finer than competing machines, including our own standard machine range.

It's true that other world class controls, like the FANUC 30i series and the NUM Flexium+, offer nanometer resolution. And you may find it on some milling machines. But you won't find it on other tool grinders. Just the ULTRA.





## 2. NEW SERVO-CONTROLLED ALGORITHMS - SMOOTH AS SILK AND FAST IN THE CURVES

We're vertically integrated at ANCA, manufacturing everything from [polymer concrete base](#) to canopies, our own servo drives, servo motors, controls and our own [Tool Grinding software](#). This means we have the advantage of fine tuning each of these devices in a way that they can work collaboratively to provide the best possible performance.



For the ULTRA machine, several engineers created a new control algorithm that takes full advantage of the improved control resolution such that the machine moves almost perfectly—and faster—during contouring moves.

You might think that the much higher resolution would require enormous computing power, possibly even slowing things down. But these clever engineers have combined state-of-the-art control techniques with simplified math, making the machine's movement both smoother and faster. The new algorithms, coupled with the higher resolution and faster response time of the control system, enable the machine to "look ahead" and maintain perfect synchronization

between axes so that an accurate grinding path through a curve can be maintained without sacrificing speed or surface finish.

The new control algorithm also helps to reduce the disturbance created by the friction from the rail or the grinding process. Such disturbances are endemic to all machine tools, and they have a subtle effect on the tracking performance of the grinding path - in which the torque will fluctuate and cause error in the tracking position.

It's not a simple problem to solve, and I can't reveal the details, but reducing these effects contributes to the ULTRA's consistent accuracy.





### **3. MOTOR TEMPERATURE CONTROL (MTC) - A PATENTED METHOD OF KILLING SPINDLE GROWTH**

All tool grinders struggle with spindle growth. For example, you typically flute with high torque and wheel speed ranging from 16 to 17 m/s (3,100-3,300 RPM), and then grind the OD with a cup wheel running at 25-30 m/s (4,900-5,900 RPM), removing very little material.





The fluting operation produces much more heat than OD grinding, so if nothing is done, the spindle will expand or contract roughly 10-15 microns over the course of producing a tool. That's not a huge number, it holds significance when striving to achieve the most precise tolerances, intricate features, or grinding small tools down to a diameter as small as 0.1mm.

Other machine tool builders combat spindle growth by incorporating a separate liquid chiller system. This generally works well, but it takes time to reach a steady temperature, takes up floor space, and adds to the cost and complexity of maintenance. In contrast, the ULTRA machine uses [Motor Temperature Control](#) (MTC) (U.S. patent 11,394,331), technology we developed for the CPX peel grinder and GCX skiving cutter grinder, two applications where we needed to maintain micron level precision.

MTC controls the temperature by varying the current to the motor, while maintaining the required torque and speed for grinding operations. It keeps the spindle to within 0.5°C, virtually eliminating spindle growth and achieving grinding accuracies within a few microns. It also achieves a steady state within 5 minutes, eliminating the need for a lengthy warmup cycle at the start of a shift. MTC is built into the motor spindle drive firmware and requires just a few bits of reliable hardware and temperature sensor, so it's essentially maintenance free.

In case you're wondering, like any good builder, we still circulate coolant through the grinding head and work area to help stabilize the temperature in the ULTRA. But we're using the standard grinding coolant for this, with no additional filtration or conditioning. MTC is what keeps the spindle rock steady.

## **A STIFFER C-AXIS - THE FINAL PIECE**

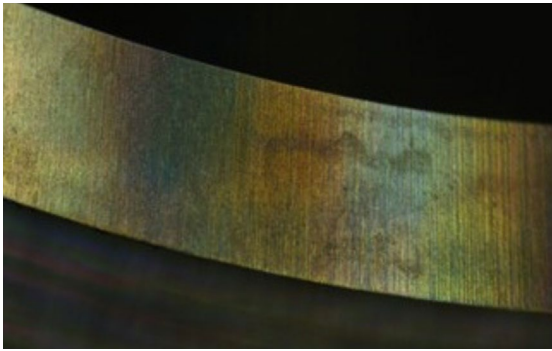
The ULTRA also features a radically improved C-axis, with a new bearing and more rigid and stiff construction. The new design minimizes deflection and vibration, ensuring that the benefits gained by nanometer control and the other new features aren't lost under the strain of grinding forces. We've also incorporated this new C-axis design into the TX, MX and FX Linear range. So unlike the first three features we've discussed, it's not unique to the ULTRA.

## **ARE THESE ADVANTAGES IMPORTANT TO YOU?**

I've alluded to some of the benefits you'd get from an ULTRA, but let's dig into them, starting with cycle time. If you grind mostly square end mills, you won't experience shorter cycle times with the ULTRA. The superior contouring speed of the ULTRA shows up in ballnose end mills, circle segment endmills, form tools, profile cutters, and the like. And the difference can

be measured in seconds, for standard tools with superior surface finish. In some case this could be even minutes by eliminating a secondary operation like finishing or even a sparkout. So, if you're focused quality or productivity, the ULTRA is the right machine for all your production tools.

On another note the ULTRA's nanometer resolution and control algorithm give it the ability to quickly produce a superior surface finish with a standard grit wheel. So ask yourself how often you need to slow your grind on some features to get the desired finish. Or how often you need to add a finishing pass or a sparkout pass. Do you have to switch to finer grit wheels to complete some tools? These considerations might make the ULTRA the right choice on a cost-per-part basis.



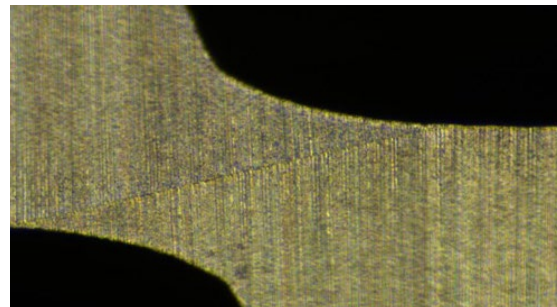
Ballnose area at 125X magnification on the MX7 ULTRA

The image above shows the ball area of a ballnose end mill at 125X magnification, ground on an MX7 ULTRA with a 320 grit wheel.

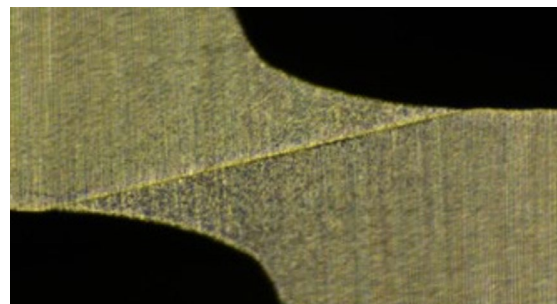
Add MTC to the picture and the ULTRA's micron, to sub-micron, level of accuracy means you can grind the tightest tolerance tools and optimize critical features. For example, users in the die mold, aerospace, and power generation industries often cut with the center of a ballnose end mill, meaning they cut with the chisel. But ordinarily, it's challenging to grind a straight, sharp chisel without slowing down significantly. And even then, the edge would feather roughly in line with the machine resolution. Not so with the ULTRA, which produces a nearly perfect chisel at fast feed rates.

The first ULTRA customers have reported that ballnose end mills produced on the machine perform about 15 to 20% better than others. They've even noted higher performance in corner radius tools, with significantly longer tool life. So if you want to produce tools that stand out from the pack, the ULTRA may be your answer.

Two views of the chisel on a ballnose end mill at 446x magnification. At top, ground on an MX7 Linear with a 320 grit wheel, and at bottom ground on an MX7 ULTRA with the same wheel and a faster feed rate.



Chisel area at 446X magnification on MX7 Linear



Chisel area at 446X magnification on MX7 ULTRA



## ADDITIONAL OPTIONS TO GET YOU TO PERFECT TOOLS FASTER

### LaserUltra

Naturally, the beneficial options available for other ANCA models can be added to the ULTRA. For example, our internal non-contact tool measuring system: [LaserUltra](#). This system uses a Blum DIGILOG laser to perform either digital or analog scans of a tool profile. Let's say you're grinding a Christmas tree cutter. LaserUltra can scan the entire profile in about 10 to 25 seconds depending on the length of profile, compare the measured profile to the nominal, and within another 10 seconds or so, automatically adjust either the wheel file or the grinding program (as required), to bring the tool to within  $\pm 2.5$  microns. It's a fantastic aid for form tools, and things like barrel shaped circle segment end mills and Ballnose end mills.

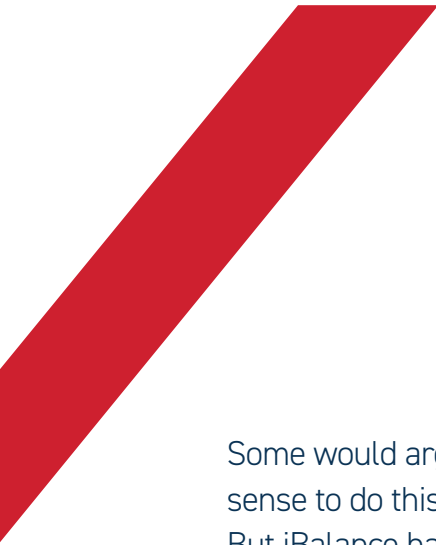
### Total Tool Runout Compensation

[Automatic runout compensation](#) is another great option. It uses the standard Renishaw probe to check the tool blank in 3 planes (competing

systems check just 2), digitizes the actual centerline of the tool, and then compensates the entire kinematic to grind relative to that center, rather than the centerline of the work head. Because we're correcting for runout at a system level, the resulting grind is nearly flawless under a couple of microns, without even leaving a mark on the cutting edges, even though you're moving all the axes together to get that tool. And runout compensation adds just 25 seconds in cycle time.

### iBalance

Getting the best possible surface finish and maximizing both throughput and spindle life requires balancing your wheels, and we offer an excellent way to do that in the machine: [iBalance](#). This option spins the wheel set at operating speeds and identifies any imbalance. If needed, the software tells the operator where to place threaded weights in the clamping nut in order to eliminate the imbalance. The process takes just 5 to 10 minutes per wheel set.



Some would argue that it makes more sense to do this on an offline balancer. But iBalance has the advantage of checking the entire system and correcting for any imbalance introduced by the spindle itself, or the mechanics of the C-axis. It also allows you to do the very fine balancing of the complete system down to less than a gram of imbalance mass. If, for example, you're grinding a critical feature with the C-axis in the -90° position, you can balance in that position.

### **Grinding Best Practices**

Finally, another key option to consider is Toroid Teach wheel conditioning. We created this method because even if you do everything right with regard to wheel dressing, you can't be sure exactly how the toroid (or radius) on the corner of

your cup wheel will contact the tool. This is especially critical for things like maintaining the line form accuracy of the tip of a small ballnose end mill. If you're not extremely lucky, the typical approach to this problem is to condition the freshly dressed wheel by grinding a few tools. It often takes 10-15 tools to expose the grit and dial in the wheel contact so that you get the desired surface finish and form accuracy.

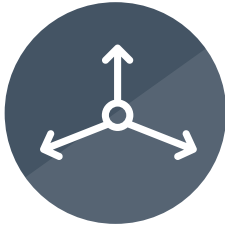
What Toroid Teach does instead is run the newly dressed wheel on a carbide rod, taking roughly 40 passes of just a few microns in material removal. The process thereby conditions the wheel such that you can then go straight to production. Each tool, from the first one on, will have the correct and uniform geometry and surface finish.

## **ARE YOU READY FOR THE ULTRA EXPERIENCE?**

Find out how the ULTRA will take manufacturing to new heights by producing the highest accuracy and quality cutting tools in the world.

[\*\*FIND OUT MORE ABOUT THE ULTRA RANGE\*\*](#)

# WHY ANCA'S ULTRA RANGE IS THE MASERATI OF MACHINE TOOL MANUFACTURING



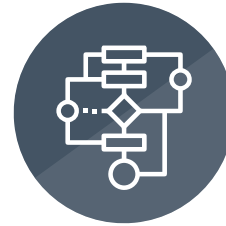
## NEW MECHANICAL C-AXIS DESIGN

Enhances stiffness and rigidity



## ONE NANOMETER RESOLUTION CONTROL SYSTEM

Allows silky smooth motion of an axis



## NEW SERVO CONTROLLED ALGORITHM

ULTRA-fast response to internal or external disturbances



## MTC (MOTOR TEMPERATURE CONTROL)

Actively manages and maintains the temperature of motorized spindles



## SPECIALIZED SOFTWARE

For tool runout compensation



## LASERULTRA

For in-process measurement and compensation



## IBALANCE

For balancing wheel packs inside the machine



## GRINDING BEST PRACTICES

Includes commissioning of machine by grinding



## WHY CHOOSE ANCA?

Founded in 1974, ANCA is a world-leading manufacturer of CNC grinding machines, motion controls and sheet metal solutions, with over 1,000 employees worldwide.

We're pleased to have been recognized with more than 25 industry and business awards, including our induction into the Australian Export Award Hall of Fame. The Australian Financial Review recognized us as one of Australia and New Zealand's most innovative companies. We hold patents for many products, processes and components, from pulse and gap control for electrical discharge machining equipment to collet adaptors and clamping devices.

With global headquarters in Melbourne, Australia, ANCA exports 99% of products to customers across the globe, servicing 45 countries and delivering leading solutions from offices in the UK, Germany, China, Thailand, India, Japan, Brazil and the USA.



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