

BOULE PRO 200AX

ID/OD GRINDING MACHINE



THE BOULE PRO 200AX MULTI-TASK CNC GRINDERS

SiC BOULE MATERIAL MEANT FOR SEMICONDUCTOR APPLICATIONS

SiC MARKET AND END USE APPLICATIONS

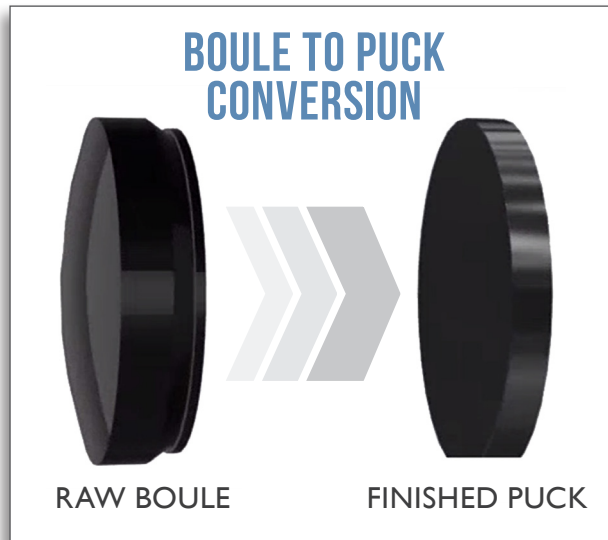
- Silicon Carbide is a semi-conducting or semi-insulating material used in many different types of electronic devices such as diodes, MOSFETS, JFETS, etc.
- It is replacing Silicon based devices for applications that require high power density, high frequency, and high voltage applications
- Electric Vehicles and 5G are a major user of these types of devices
- Silicon Carbide is grown via a Physical Vapor Transport (PVT) process in high temperature furnaces and it takes 2-4 weeks to grow a crystal (boule) that is only a few kilograms in size
- The crystal then needs to be shaped into a wafer ready puck and then sliced into wafers for device makers to process
- It is this post growth processing step taking the as grown boule to a wafer ready puck for which Hardinge has developed an innovative solution



THE HARDINGE SOLUTION



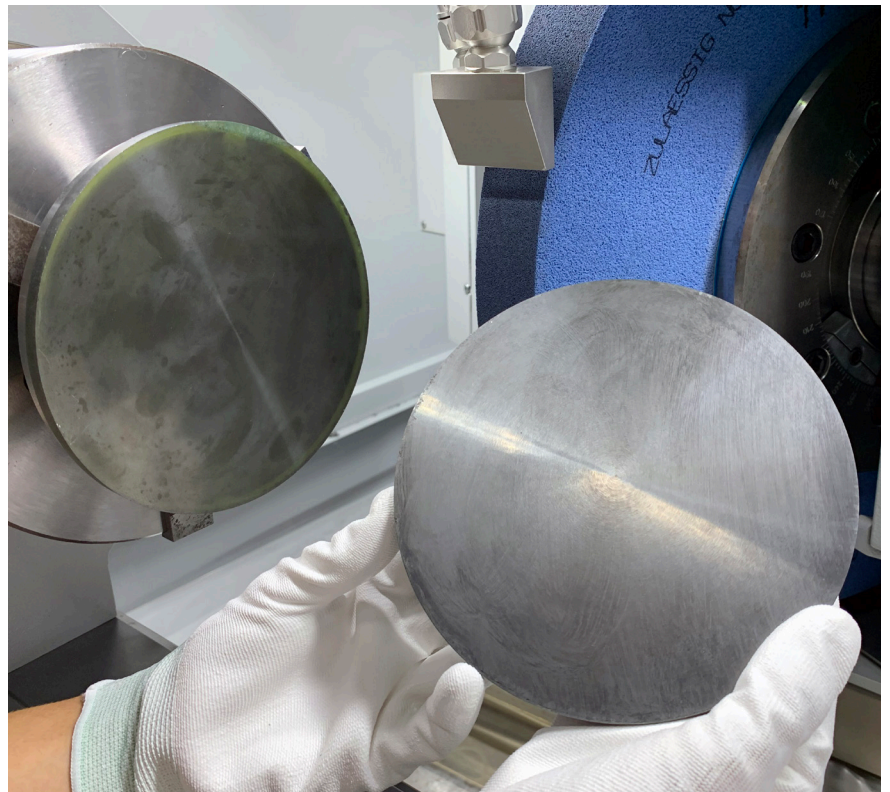
CRYSTAL GROWTH



WAFERING

OUR EXPERIENCE WITH SiC

- Extensive experience machining SiC material meant for semiconductor applications – machines running at SiC producers today
- Successfully executed all major boule to puck process steps for 150mm and 200mm material – OD, Flat and Notch, Dome / Seed side removal
- Optimized all boule to puck process steps including XRD to determine and compensate for crystal orientation Single Step Dual plane Compensation (SSDC) capability
- Integrated into a single machine design that includes advanced workholding that negates the need for gluing the boule to any fixturing throughout the processing steps
- Provide SiC crystal producers with the most efficient and lowest cost solution to machine boules



Hardinge Boule Pro 200AX for SiC transformation from boule to puck

BOULE PRO 200AX TECHNICAL DATA

Dimensions, approximately	105" x 118" x 87" (2670 x 3000 x 2210 mm)
Weight, approximately (in basic configuration)	18,000 lbs. (8165 kg)
Required power, approximately	60A
Electrics	480 V +/- 5%, 3 phase, 60 Hz Or 400 V +/- 5%, 3 phase, 50 Hz Control voltage 24 VDC

Above data may vary depending on application.

CUSTOM OPTIONS / FUNCTIONALITY THAT CAN BE ADDED TO THE MACHINE:

- A** – Automated: the machine is fully automated to receive a SiC boule and create a wafer ready SiC puck.
- X** – X-Ray Diffraction (XRD) capable: the crystal structure of the SiC boule must be identified so to correctly orient the crystal in the finished SiC puck and the XRD Single Step Dual plane Compensation (SSDC) capability allows this to be completed
- U** – UV light detection: when SiC boules are placed under a UV light, certain foreign polytypes (wrong kind of SiC crystal) will show as a different color. 4H is the polytype desired to grow and 6H is a foreign polytype grown inadvertently in some cases. The UV light shows the location of the 6H grown crystal and the machine removes it so the final SiC puck contains only the desired 4H polytype



- L** – Laser scribing: The ability to make a laser scribe on the finished SiC puck surface can be added so the customer can appropriately track the lot #, boule #, etc. for material tracking purposes
- V** – Vision system: The vision system can take high end photos of the boule or puck as the customer desires at any stage of the process.

THE BOULE PRO 200AX IS THE ANSWER

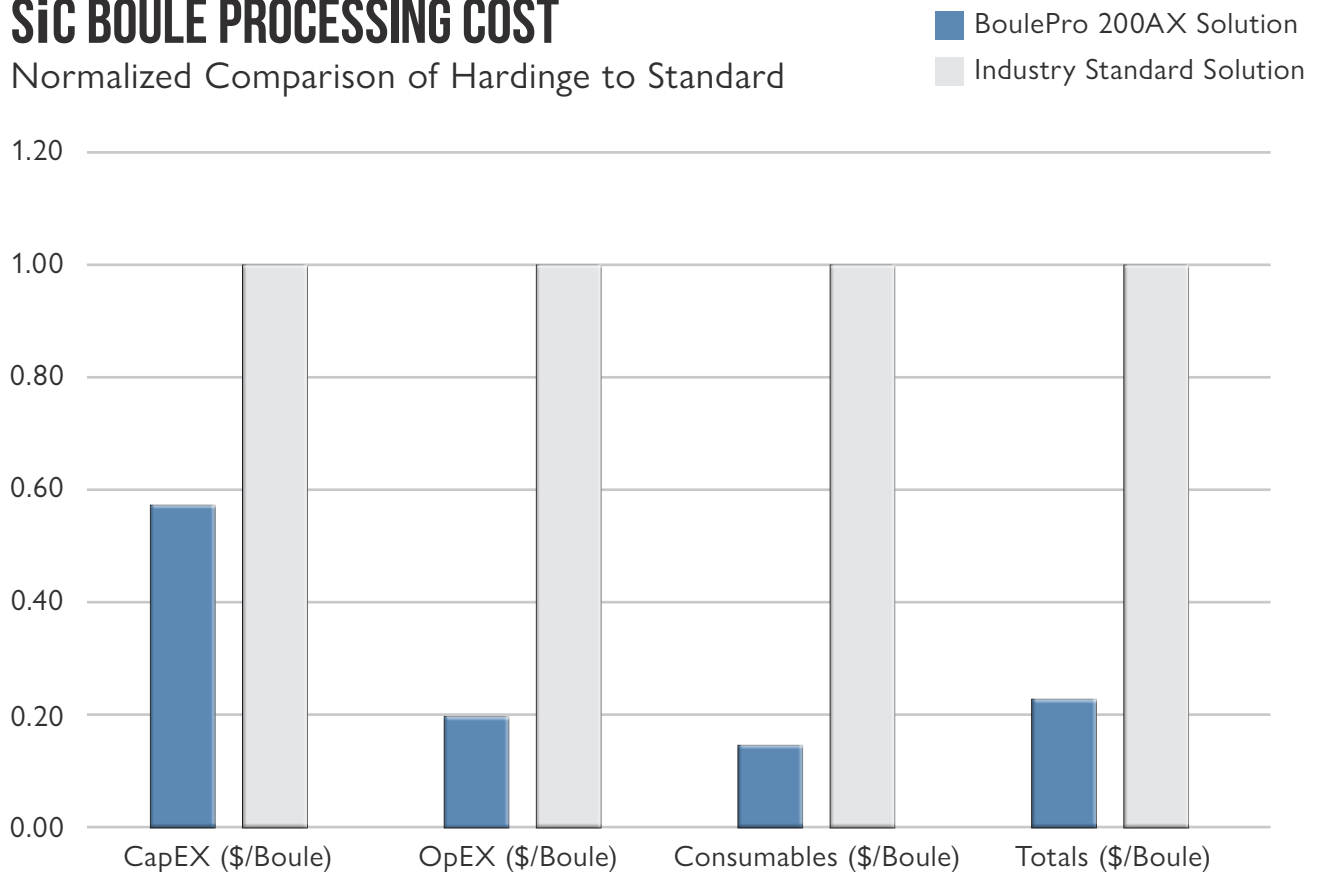
The Boule Pro 200AX offers an avenue for SiC manufacturers to streamline their boule fabrication process in order to meet the accelerating demand for high quality and lower cost SiC. Most producers are expanding as quickly as they can to meet this downstream demand and require a means to optimize all aspects of their SiC production facility. The Boule Pro 200AX checks all the boxes for SiC boule to puck conversion optimization:

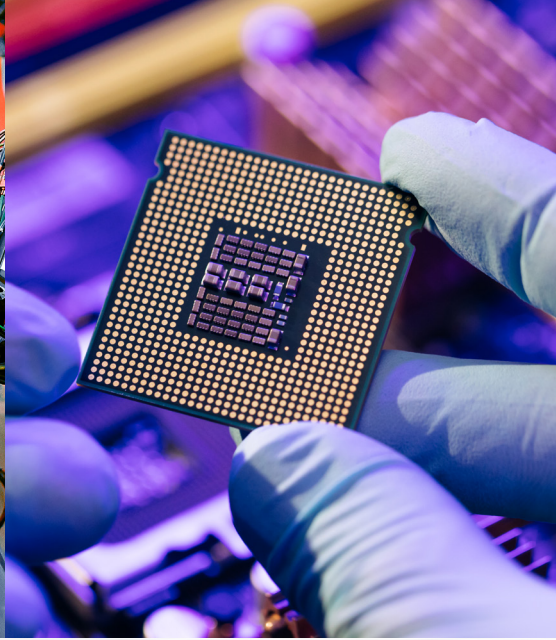
- 85% reduction in labor cost
- 80% reduction in manufacturing footprint
- One machine tool accomplishes all the required steps in a fully automated process that takes two – three hours
- Advanced degree of automation provides for improved process repeatability
- Total cost (CapEx, OpEx, consumables) reduction of nearly 80% compared to today's industry standard



SiC BOULE PROCESSING COST

Normalized Comparison of Hardinge to Standard



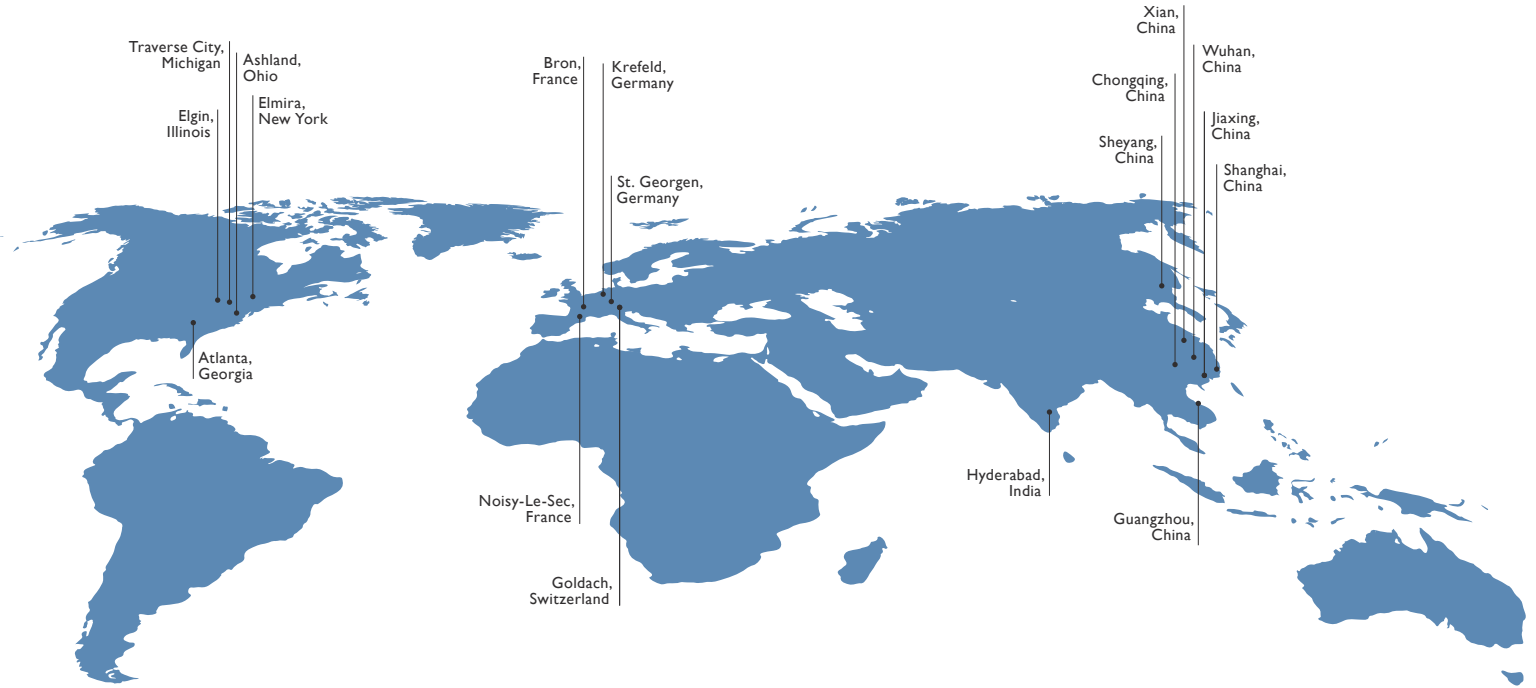


SUPPORTING GLOBAL INDUSTRIES:

Hardinge's product portfolio is ideally suited to support all major industries. Our technology continues to develop some of the world's most cutting edge solutions for companies across the globe.



HARDINGE WORLDWIDE



Hardinge is a leading international provider of advanced metal-cutting solutions. We provide a full spectrum of highly reliable CNC turning, grinding, and honing machines as well as technologically advanced workholding accessories.

The diverse products we offer enable us to support a variety of market applications in industries including aerospace, agricultural, automotive, construction, consumer products, defense, energy, medical, technology, transportation and more.

We've developed a strong global presence with manufacturing operations in North America, Europe, and Asia. Hardinge applies its engineering and applications expertise to provide your company with the right machine tool solution and support every time.

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