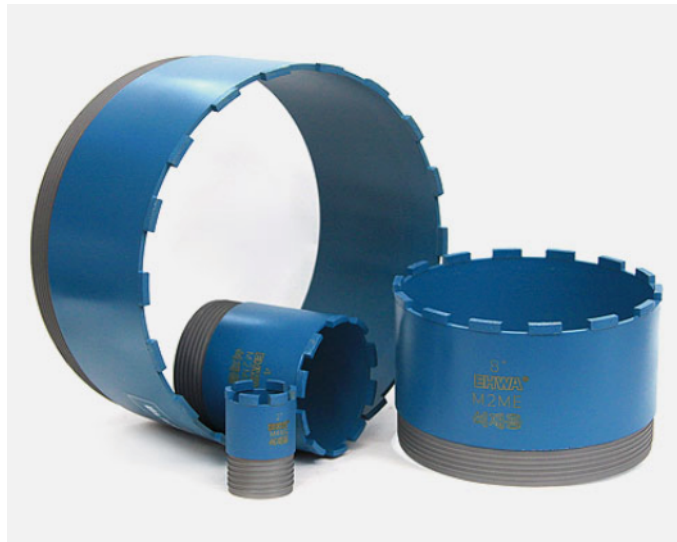


Si and SiC: machining focus rings, wafer edges and notches

EHWA core wheels, electroplated grinding tools and fine-grinding wheels for Si/SiC components, plus tools for wafer edges and notches.



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From a ring blank to the finished contour

Coring, focus-ring contours, and edge and notch grinding

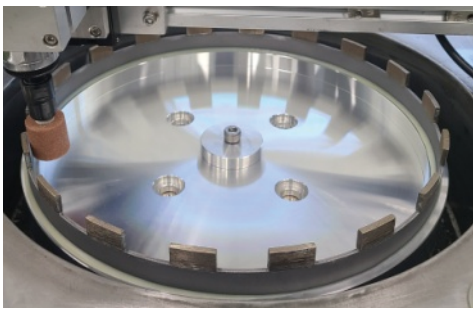
EHWA DIAMOND - since 1975

EHWA offers coordinated tool designs for coring, rough and fine grinding of focus rings, and wafer edge and notch machining. Different bonds and tool geometries combine removal performance, useful life and dimensional accuracy with the machining task.

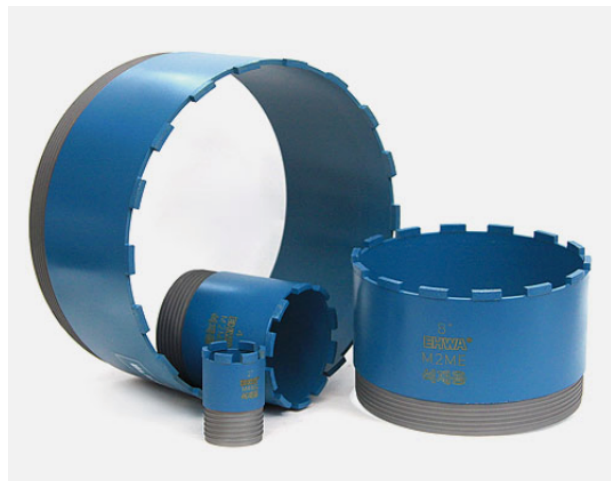
Si means silicon; SiC means silicon carbide. Material and manufacturing route are part of tool selection. The programme covers both materials, while the machining examples below explicitly distinguish Si focus rings from sintered or CVD SiC components.

Core wheels: produce a ring structure from Si or SiC

Core wheels remove the centre of a Si or SiC plate to create a ring-shaped structure. EHWA manufactures different tool shapes and material designs for the machining task.



Core wheel in the machining setup.



Core wheels in different designs.

Characteristics and advantages

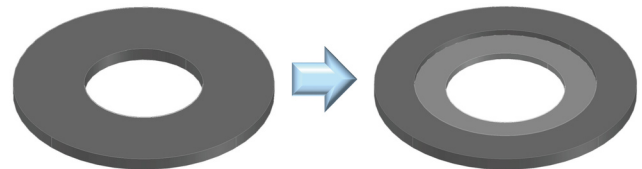
- Different tool shapes for different processing purposes.
 - Electroplated, sintered or brazed cutting tips, matched to customer requirements and the target processing performance.
 - Field-proven, consistent processing quality.
 - Selection of geometry and material design according to useful life, grinding ability and dimensional accuracy.
- Tool mounting, plate thickness and the required ring geometry provide the basis for the specific design.

Electroplated tools for rough machining of Si focus rings

The illustrated electroplated tools machine different Si focus-ring contours, including the outside diameter, internal contour and tapered regions. The shape example shows the transition from a plain ring to a profiled ring contour.



Electroplated tools for rough machining of Si focus rings.



From a plain ring to a profiled Si focus-ring contour.

EHWA can manufacture different tool designs for chamfers, holes, internal contours and the tapping operation named in the source document.

Illustrated tool group	Machining task
Chamfering Wheel	Chamfer machining
Hole Grinding	Hole grinding
Arbor Grinding	Internal-contour machining
Tap Grinding	Thread machining; specific contour according to the component drawing

Chamfering tools



Chamfering tool: first illustrated design.



Chamfering tool: second illustrated design.

Hole grinding



Tools for hole grinding.



Further tool design for hole grinding.

Internal contour and Tap Grinding



Tool for internal-profile machining, EHWA designation Arbor Grinding.



Tool design for Tap Grinding.

Vitrified and resin-bond tools for fine machining

Fine machining covers Si and SiC focus rings with outside and inside contours and tapered regions. EHWA lists vitrified and resin-bond grinding wheels for these tasks. The process diagrams explicitly show vitrified wheels; the specific bond and grit are selected for the material, contour and surface target.



Grinding tools for fine machining of Si/SiC focus rings.

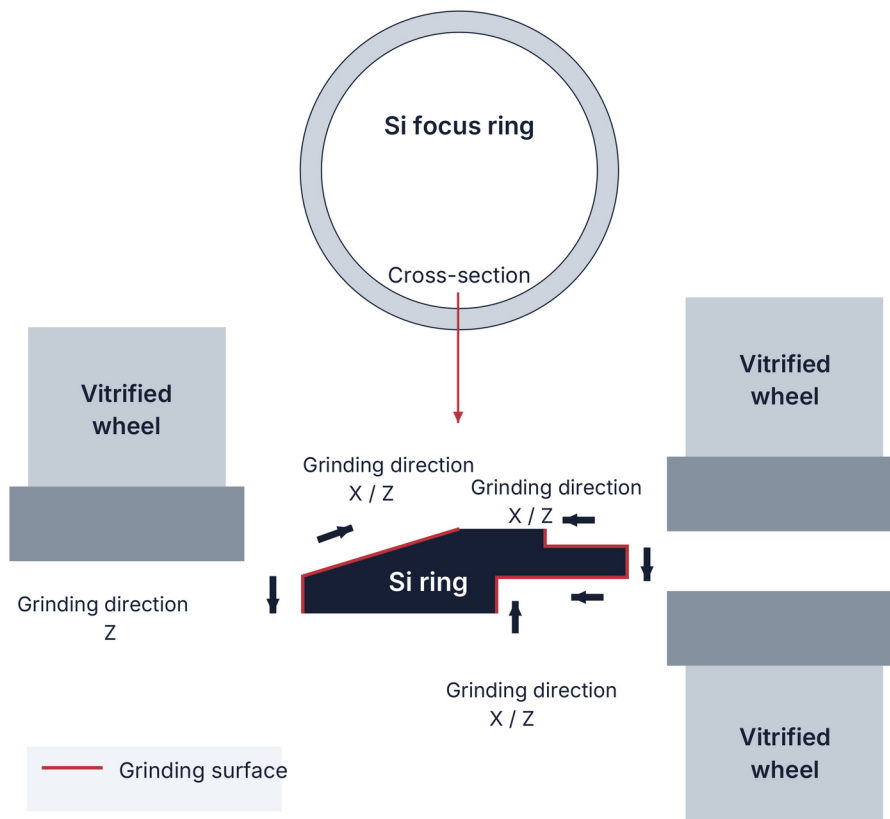


Grinding wheel in the SiC machining example.

Si focus ring: cross-section and machining directions

The cross-section diagram marks the ground surfaces in red. Tool positions and arrows show grinding directions along the Z axis and combined X- and Z-axis directions. Different ring faces and contours can therefore be addressed.

Si focus ring: cross-section and grinding directions



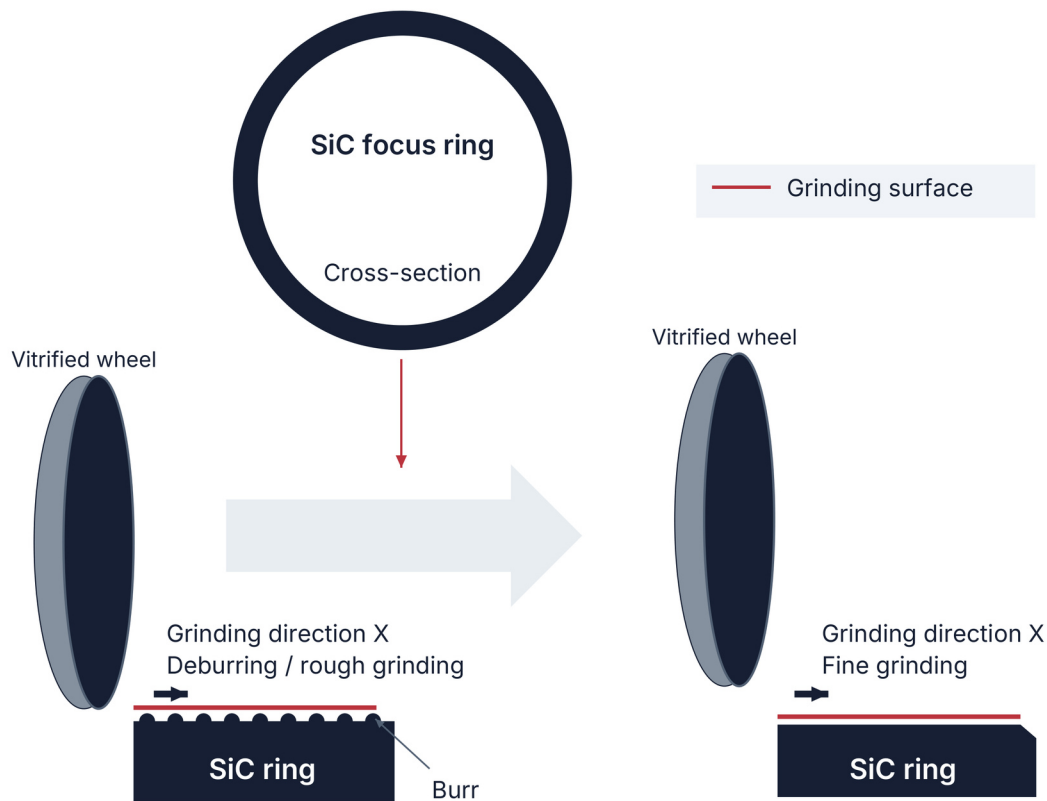
Schematic illustration

Si focus ring: cross-section, vitrified wheels and grinding directions.

SiC focus ring: deburring, rough grinding and fine grinding

The SiC diagram first shows burr removal and rough grinding, followed by fine grinding. Both stages indicate grinding along the X axis. The red line marks the grinding surface; the burr is identified separately in the first state.

SiC focus ring: deburring, rough and fine grinding



Schematic illustration

SiC focus ring: deburring/rough grinding followed by fine grinding.

Documented SiC machining example

The complete specification below describes the illustrated example using sintered or CVD SiC. It provides a starting point for matching the wheel, machine and required surface.

Parameter	Specification in the machining example
Customer	Not named
Wheel designation	VD-14A1_305D-35T-5X-30U-127H
Machine	Rotary surface grinding machine
Wheel specification	D120N125VD, D600N125VA, D800N125VA
Wheel speed	50-70 m/s
Workpiece	Sintered SiC or CVD SiC
Coolant	Emulsion
Required roughness after grinding	Ra 0.10-0.05
Table rotational speed	Not specified
Feed rate	Rough machining: 1500 mm/min
Dresser	SiC #80
Dressing system	Not specified
Dressing amount	Not specified
Dressing interval	3-5

The example gives no unit for Ra or reference basis for the dressing interval. These details are agreed together with the required surface and actual machine cycle.

Si/SiC wafer edges and notches

EHWA offers profiled grinding wheels and small notch tools for machining Si and SiC wafers. Different groove forms can be designed for the required edge contour.



Tools for wafer edges and notches.

Advantages of profiled designs

- Different groove forms to suit the requirement.
- Uniform chamfer width supported by a rigid tool design.
- Good groove-form retention during machining.
- Multiple rough- and fine-grinding stages with a tool designed for that purpose.



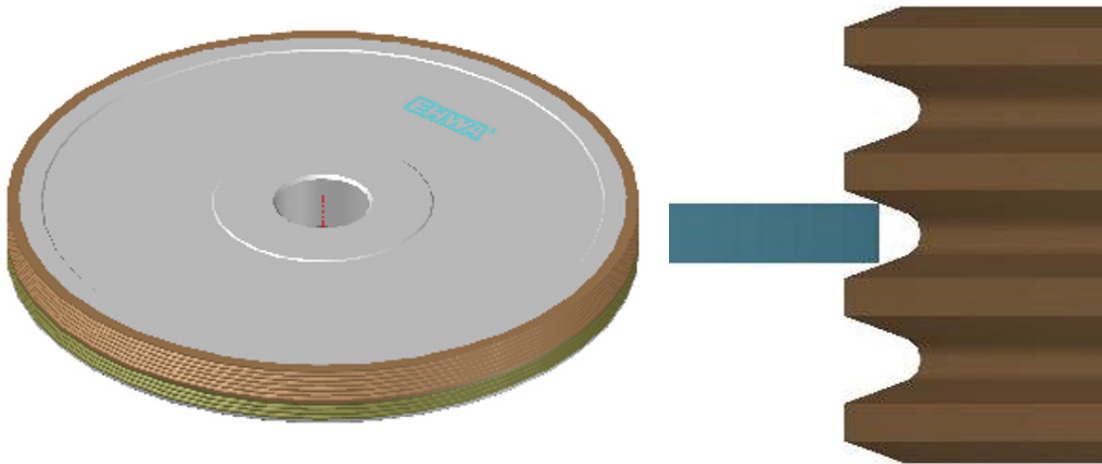
Wafers in a carrier as an application example.



Wafer edges with notches in the application image.

Wheel shape and groove contact

The technical illustration shows the profiled grinding wheel and a contact position within a groove. Profile, chamfer width and tool rigidity are specified together for the wafer edge.



Original technical illustration of the edge-grinding wheel.

Groove profile with the illustrated contact position.

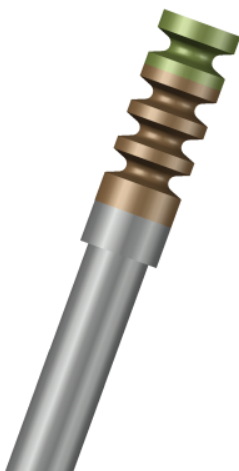
Application	Diameter designation	Grit range
Edge grinding	100D-300D	#400-#3000
Notch grinding	3.2D-4.2D	#400-#3000

The original provides the D designations without a separate dimensional definition; tool diameter and mounting are confirmed for the machine.

Notch grinding: rough and fine stages

The document shows three tool forms: a combined design for the first and second machining stages, a design for the first rough stage and a design for the second fine stage.

Combined first and second stages



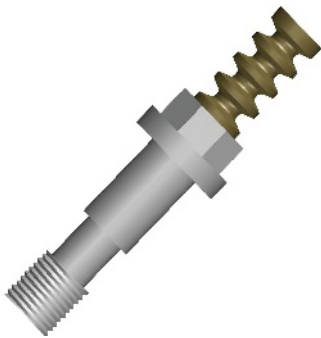
Notch tool for the first and second machining stages.

First stage: rough machining



Notch tool for the first rough-machining stage.

Second stage: fine machining



Notch tool for the second fine-machining stage.



Notch tool with the illustrated contact position.

The before/after photographs illustrate the machined notch edge.



Notch edge before machining.



Notch edge after machining.

Process example for 12-inch wafers

The diagram combines a metal-bond wheel for rough grinding with a resin-bond wheel for fine grinding. It also shows profile truing using a SiC truer.

12-inch wafer: grinding and profile truing



Grit designations in the illustrated process: #800, #600, #2500.

Schematic illustration

12-inch wafer: rough/fine grinding and profile truing.

Component in the diagram	Illustrated relationship
Metal-bond wheel	Rough grinding, #800
Truing region of the metal-bond wheel	Profiling the SiC truer, #600
Resin-bond wheel	Fine grinding, #2500
Si wafer	On a mount between the rough and fine stages
SiC truer	On a mount; SiC profile truing and resin-wheel truing

The #800, #600 and #2500 shown in the sequence belong to this process example. The accompanying #400-#3000 designations describe the wider tool range for edge and notch grinding.

Design your Si/SiC machining process together

Useful starting information includes the component drawing, Si or SiC material grade, machine and tool mounting. For focus rings, outside and inside contours, tapered surfaces, plate thickness and the surface target are particularly helpful. For wafer edges and notches, add wafer size, edge profile, required chamfer width and existing rough/fine stages.

Current specifications, feed rates, coolants and dressing cycles support the discussion. Together, the tool design can be matched to dimensional accuracy, removal performance and useful life.

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