

Geometry of single point turning tools

- Both material and geometry of the cutting tools play very important roles on their performances in achieving effectiveness, efficiency and overall economy of machining.
- Cutting tools may be classified according to the number of major cutting edges (points) involved as follows:
 - Single point: e.g., turning tools, shaping, planning and slotting tools and boring tools
 - Double (two) point: e.g., drills
 - Multipoint (more than two): e.g., milling cutters, broaching tools, hobs,
 - gear shaping cutters etc.

Terminology of single point cutting tool

- ***American National Standards Institute (ANSI)***: A private, non-profit organization that administers and coordinates voluntary standards and systems. Tool signatures and carbide insert classifications are standardized by ANSI.
- ***Back Rake Angle***: If viewed from the side facing the end of the workpiece, it is the angle formed by the face of the tool and a line parallel to the floor. A positive back rake angle tilts the tool face back, and a negative angle tilts it forward and up.

Terminology of single point cutting tool

- ***End Cutting Edge Angle***: If viewed from above looking down on the cutting tool, it is the angle formed by the end flank of the tool and a line parallel to the work piece centreline. Increasing the end cutting edge angle tilts the far end of the cutting edge away from the workpiece.
- ***End Relief Angle***: If viewed from the side facing the end of the workpiece, it is the angle formed by the end flank of the tool and a vertical line down to the floor. Increasing the end relief angle tilts the end flank away from the workpiece.

Terminology of single point cutting tool

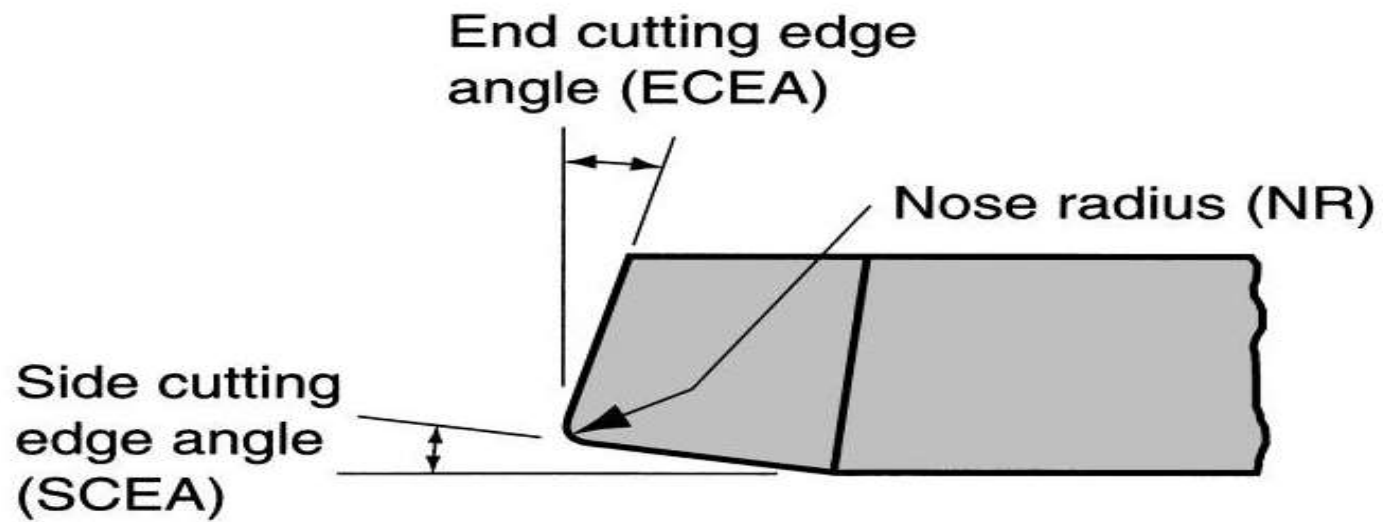
- **Face:** The flat surface of a single-point tool into which the workpiece rotates during a turning operation. On a typical turning setup, the face of the tool is positioned upwards.
- **Flank:** A flat surface of a single-point tool that is adjacent to the face of the tool. During turning, the side flank faces the direction that the tool is fed into the workpiece, and the end flank passes over the newly machined surface.
- **Lead Angle:** A common name for the side cutting edge angle. If a tool holder is built with dimensions that shift the angle of an insert, the lead angle takes this change into consideration.

Terminology of single point cutting tool

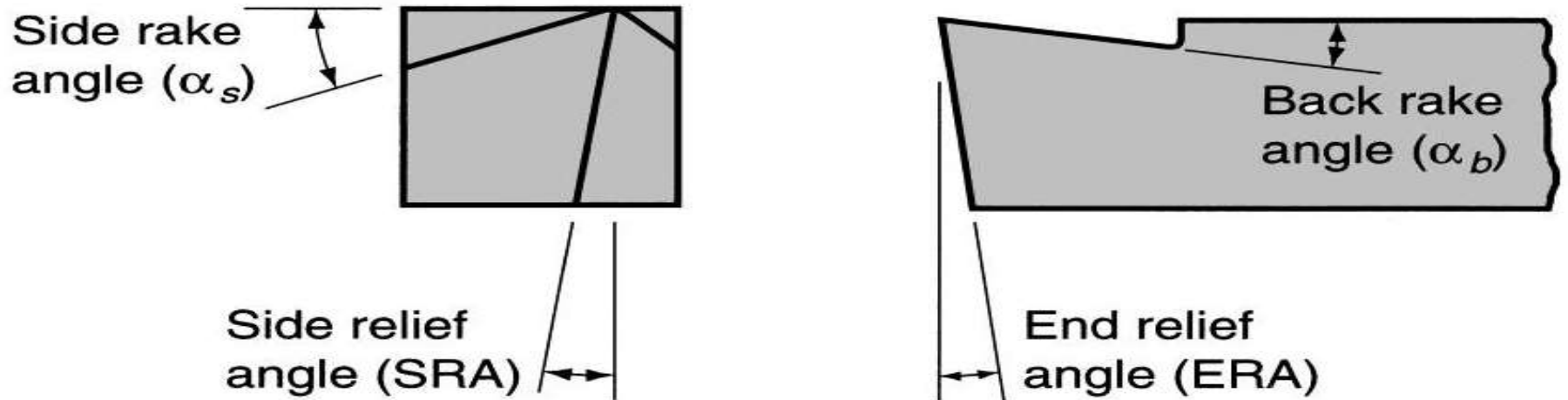
- ***Side Rake Angle***: If viewed behind the tool down the length of the toolholder, it is the angle formed by the face of the tool and the centreline of the workpiece. A positive side rake angle tilts the tool face down toward the floor, and a negative angle tilts the face up and toward the workpiece.
- ***Side Relief Angle***: If viewed behind the tool down the length of the toolholder, it is the angle formed by the side flank of the tool and a vertical line down to the floor. Increasing the side relief angle tilts the side flank away from the workpiece.

Terminology of single point cutting tool

- ***Nose Radius***: The rounded tip on the cutting edge of a single-point tool. The greater the nose radius, the greater the degree of roundness at the tip. A zero degree nose radius creates a sharp point.
- ***Side Cutting Edge Angle***: If viewed from above looking down on the cutting tool, it is the angle formed by the side flank of the tool and a line perpendicular to the workpiece centerline. A positive side cutting edge angle moves the side flank into the cut, and a negative angle moves the side flank out of the cut.



(a)



(b) Tool signature: α_b , α_s , ERA, SRA, ECEA, SCEA, NR

