

The importance of cutting edge geometry in inserts

In your home, would you cut a tomato with an axe, or a log of wood with a kitchen knife ?



We however do the equivalent of this every day on our shop floor, when we use inserts without thinking about the cutting edge geometry.

Result ? Higher cycle time, lower product quality, and higher tool costs.

The cutting edge is designed to cut material as well as to break the resultant chips, and follows the same design principles as a kitchen knife or axe. It typically has one or two angles followed by a chip breaker profile.

A less sharp edge	A more sharp edge
<p>Requires more cutting force Has a stronger, larger cross section Is more able to withstand high cutting forces Has a longer tool life</p> <p>Suitable for roughing, that involves higher cutting forces (high depth of cut and feed rate), and possibly interrupted cuts.</p>	<p>Requires less cutting force Is weaker in cross section Is less able to withstand high cutting forces Wears out faster – has a shorter tool life</p> <p>Suitable for finishing, that requires lower cutting forces to reduce part distortion (e.g., higher forces cause greater bending of a part when turning between centers).</p>

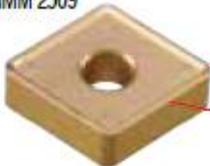
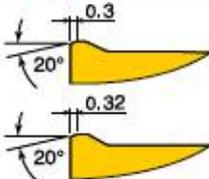
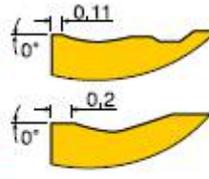
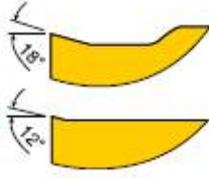
Manufacturers have their own names for cutting edge types.

The picture below shows examples of cutting edge geometry for turning - for roughing, medium machining and finishing.

Notice that the HZ chip breaker has a .32 mm land at the cutting edge, which gives it a stronger cross section, hence makes suitable for roughing.

At the other extreme, the FG chip breaker has a sharp edge, making it suitable for finishing.

The MC, for medium machining, is in between.

	Chip breaker	Edge geometry	
HZ	CNMM 2509 		Heavy roughing Large depth of cut, high feed
MC	CNMG 1204 		Medium machining Steel, CI
FG	WNMG 0604 		Finishing, semi-finishing Steel, stainless steel, CI

Pic. courtesy : Taegutec

The chip is broken by bending it into a small radius, and breaking occurs when the strain on the outer chip surface reaches the ultimate strain of the workpiece material. The chip breaker and the cutting edge are actually designed for a particular workpiece material and range of feed rate. The chip breaker profiles are not just for aesthetics. It is therefore important that the appropriate chipbreaker geometry is selected for the particular workpiece material and application.

The next time you are selecting an insert for an application, check the manufacturer's catalog for the appropriate chip breaker geometry and grade. Just doing this can dramatically improve your productivity and quality.



Chip breaker geometry

Pic. courtesy : Taegutec