Classification and nomenclature of single point cutting tools

The tool most widely used to remove material in the form of chips is the single-point cutting tool.
In fact it is used in all lathes, multi-spindle copy lathes, shaping machines, planing, slotting, boring etc..
This section we talking mainly about the traditional tools, one that is constructed entirely of high speed steel and carbide, or more frequently the tool that the carbide insert is brazed on a body of construction steel.
Today, however, you should specify it now, the majority of single-point cutting tool has a cutting element fixed mechanically on a steel body, it is a question of inserts, usually made of carbide and coated with TiN, housed in a special place and clamped with mechanical systems.
These tools will be diffused widely and we will be examined in another section, now here is some info on the various cutting tool types, their names and defining characteristic of the cutting edges, as provided by the main international standardization.
Names and angles that are applicable even though the indexable insert tools on the market today.

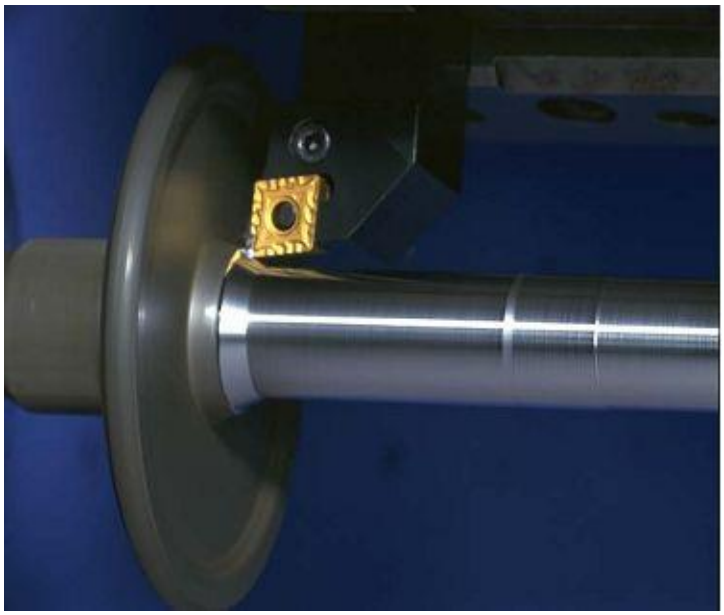


Figure # 1 - *Example of a turning insert mechanically fixed*

Given the wide variety of work performed with single-point cutting tools, there are very varied types that can be classified, following the indications to UNI according to:
1) - *The shape and position of the cutting edge*
2) - The construction system
3) - The way of working
4) - The quality requested

Then each group is divided into other subgroups, as follows.

1) *- The shape and position of the cutting edge*
a) *cutting tools, right*: when looking the tool from the front, the main cutting edge is on the right.
b) *tools, cutting left*: when looking at the tool from the front, the main cutting edge is on the left.
c) *Front cutting tools*: when the main cutting edge is disposed normal to the tool axis.
d) *Symmetric tool*: when the position of the main cutting edge and secondary are

equal with respect to the tool axis, so that the cutting edge distinction between the two is only possible during processing.

2) - *System of construction*

a) *Solid tools*: the material of the edge are of the same of the tool body. The profile is obtained and or through a forging or milling or grinding operation.
b) *Tools with different head*: when the head are in high speed steel or carbide, welded to the tool body.
c) *Tools with welded insert*: when the material of the cutting edge is welded to the body with a brazing process.
d) *Tools with cutting edge clamped mechanically*. In this type you can make a further subdivision according to the shape of the insert:
¬ tool with cutting insert pre-sharpened. After use, the insert will be thrown out.
¬ *Regrindable insert tool*. The insert may undergo repeated sharpening. This type is mainly used in heavy machining operations.
¬ *Regrindable bar tool*. The bar may be a very high number of sharpening that make, in some cases, its use very convenient.

3) - *Way of working*

a) *External tools*: suitable for to remove of chips from the external surfaces of the pieces.
b) *Tools for internal use*: suitable for to remove the chips from the internal surfaces
c) *Tools for cutting*: parts suitable for cutting or grooving.
d) *Tools for facing*: Facing suited to smooth or flat surfaces
e) *Constant profile tools*: that may be of various types and serve, with their sharp-profiled to shape the piece directly. Can be distinguished:
¬ Normal form tools
¬ Constant profile tools, that maintain a constant profile in subsequent sharpening.

4) - *Quality of machining*

a) *Roughing tools*: suitable for removing large sections of the chip, with a considerable nose radius and surfaces that do not pretend to be good
b) *Finishing tools*. Used to remove small sections of the chip, with high cutting speed and to achieve an accurate finish of the machined surfaces.

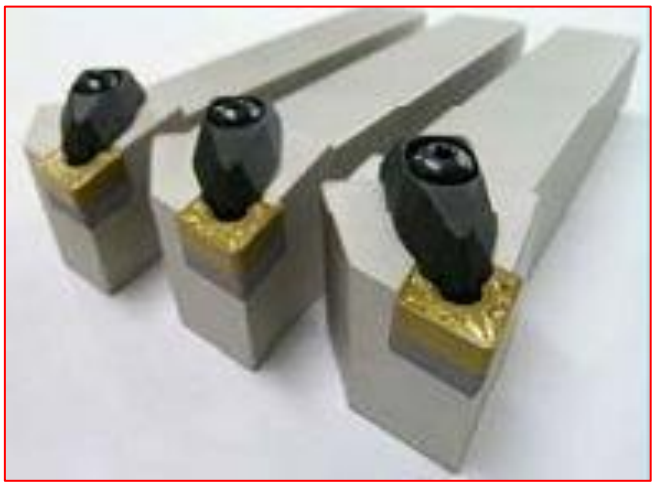
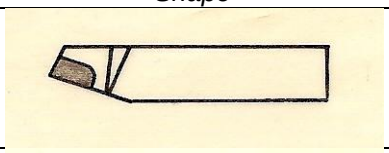
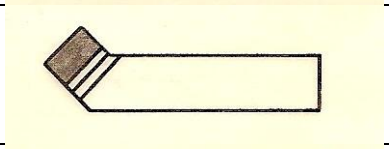
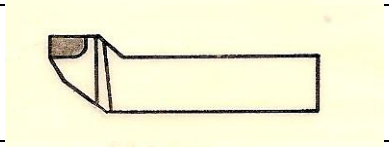
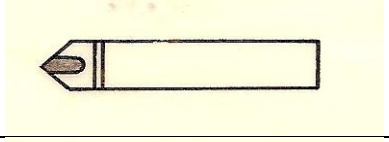
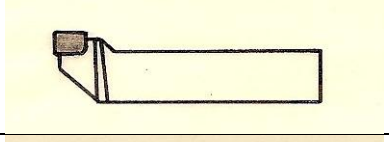
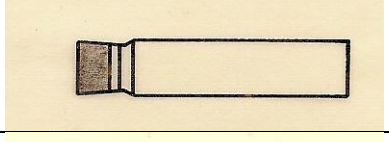
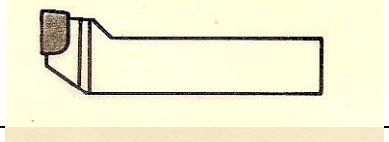
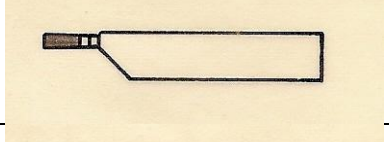
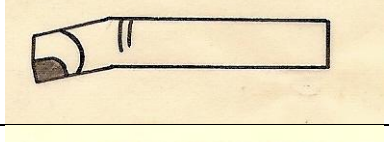
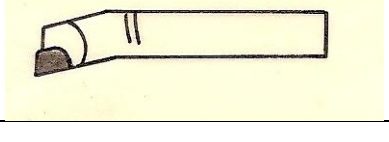


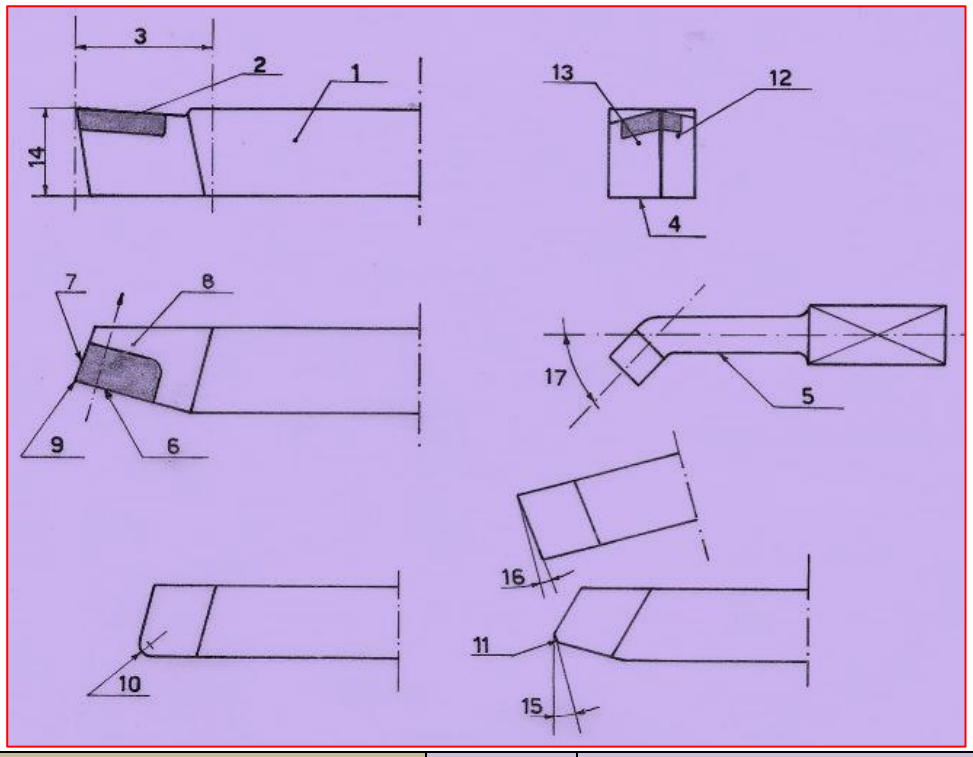
Figure # 2 - *Examples of tools named indexable inserts (inserts mechanically clamped)*

The table # 1 shows the types of standardized tools and correspondence with those of UNI & DIN tables.

Tab. N°1 – Main types of tools in according with the UNI & DIN normalization

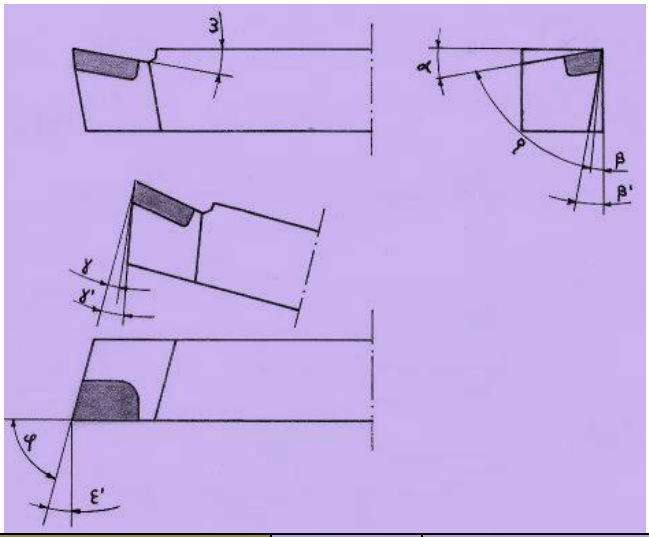
Shape	*Name*	*Tab. UNI*	*Tab. DIN*
	*Straight for roughing*	*4102*	*4971*
	*Bent for roughing*	*4103*	*4972*
	*Bent for facing*	*4104*	*4980*
	*Straight for finishing*	*4105*	*4975*
	*Bent for finishing*	*4106*	*4978*
	*Frontal for roughing*	*4107*	*4976*
	*Bent for facing*	*4108*	*4979*
	*For cutting*	*4109*	*4981*
	*Bent for reaming*	*4110*	*4973*
	*Bent for internal facing*	*4111*	*4974*

Figures N ° 3 – 4 – 5 - 6 shows the most used nomenclature of characteristic parts and angles of the tools.



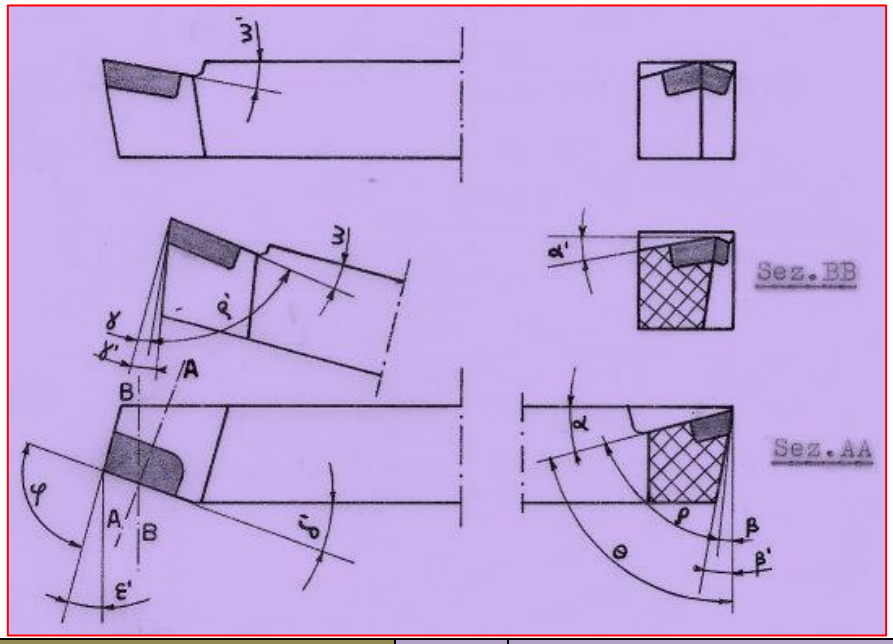
1	Shank	10	Nose radius
2	Brazed insert	11	Chamfer of nose
3	Head of tool	12	Major flank
4	Base of tool	13	Minor flank
5	Neck of tool	14	Height of the cutting edge
6	Major cutting edge	15	Angle of nose chamfer
7	End cutting edge	16	Clearance angle of nose chamfer
8	Face	17	Angle of the shank
9	Nose of tool		

Fig.N°3



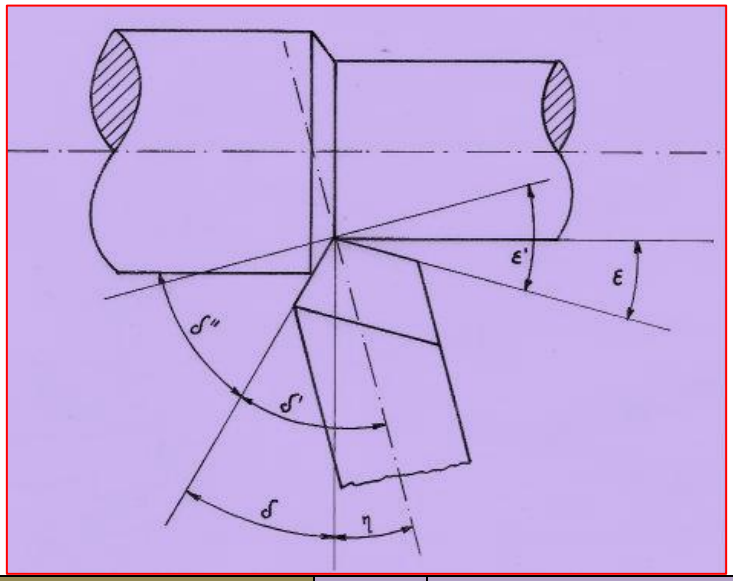
α	Side rake angle	ρ	Cutting angle
β	Side clearance angle	ω	Back rake angle
β'	Side relief angle	ϵ'	End cutting edge angle
γ	Front clearance angle	φ	Nose angle
γ'	Front relief angle		

Fig.N°4



α	*Side rake angle*	θ	*Working angle*
α'	*Side rake angle (apparent)*	δ'	*Side cutting edge angle*
β	*Side clearance angle*	ϵ'	*End cutting edge angle*
β'	*Side relief angle*	φ	*Nose angle*
γ	*Front clearance angle*	ω	*Back rake angle*
γ'	*Front relief angle*	ω'	*Back rake angle (apparent)*
ρ	*Cutting angle*	ρ'	*Cutting angle (referred to the secondary cutting edge)*

Fig. N°5



η	*Setting angle*	δ'	*Side cutting edge angle*
ϵ'	*End cutting edge angle*	δ	*Effective side cutting edge angle*
ϵ	*Effective end cutting edge angle*	δ''	*Entry angle*

Fig. N°6