

(1) - Basics of Milling

- a) *Direction of cutting*
- b) *Direction of the helix*

Milling means to the removal of material in the form of chips obtained with a machine tool (milling machine) which uses the action of a rotating multi-edge tool called milling cutter.

The milling machine gives a rotating movement of the cutter and simultaneously gives to the piece a linear movement (feed) , in general, against the edge of the cutter.

This is the most common case, but today there are very complex milling machines, managed by a numerical control system, that can advance the workpiece or the cutter, also in several directions simultaneously performing complex profiles such as, for example, molds.

The general definition of milling could also adapt for drilling and reaming, but these operations are classified as operating on the closed surfaces (holes) while the mill operates normally on open surfaces.

Milling also includes processes that today are classified separately, such as the production of cylindrical gears with the hob, the cutting with circular saws, etc..

The wide field of application of the milling cutters has generated a considerable differentiation of types and a great development of construction techniques and use.

For processing large surfaces we moved over the years from high-speed steel milling cutters to carbide brazed cutters to reach the modern carbide inserts that have the greatest advantages of economy and maintenance.

However, in past years, the milling operation has suffered a great decrease, especially in mass production and in processing of very large surfaces, replaced by faster external broaching operation.

In the past, shaping the surface was performed exclusively by the constant profile milling cutters , but today, this is done faster with external broaching machines that, among other things, give surfaces better and more precise.

But where the production is medium-low, and in many other cases where broaching is not applicable, the milling cutter will reign uncontested: one of the oldest tools, however, is quite complex in construction and use.

a) Definition of the cut direction

It's important to give some simple definitions that are crucial to understand what you are talking about when illustrating milling cutters.

The direction of cutting or rotation is determined by observing the cutter mounted on the milling machine in working position.

The cutting direction is right if seeing the milling cutter on the side of the spindle site, ie from the part from which the movement is transmitted, the rotation is clockwise.

The direction of cutting is called left if you see the milling cutter rotates counterclockwise (figure N°1).

The above applies to symmetric profile cutters, also known as reversible milling cutters, that can be used either left or right to cut such as: cylindrical milling cutter for working flat surfaces, three-edged disc milling cutters, milling cutters angle prismatic, cutters with semicircular, concave or convex, profile, etc..

For cutters with asymmetric profiles, not reversible, it is necessary to give a further definition in relation to the position the profile.

In fact, in this type of cutters if you invert the rotation the profile is also reversed.

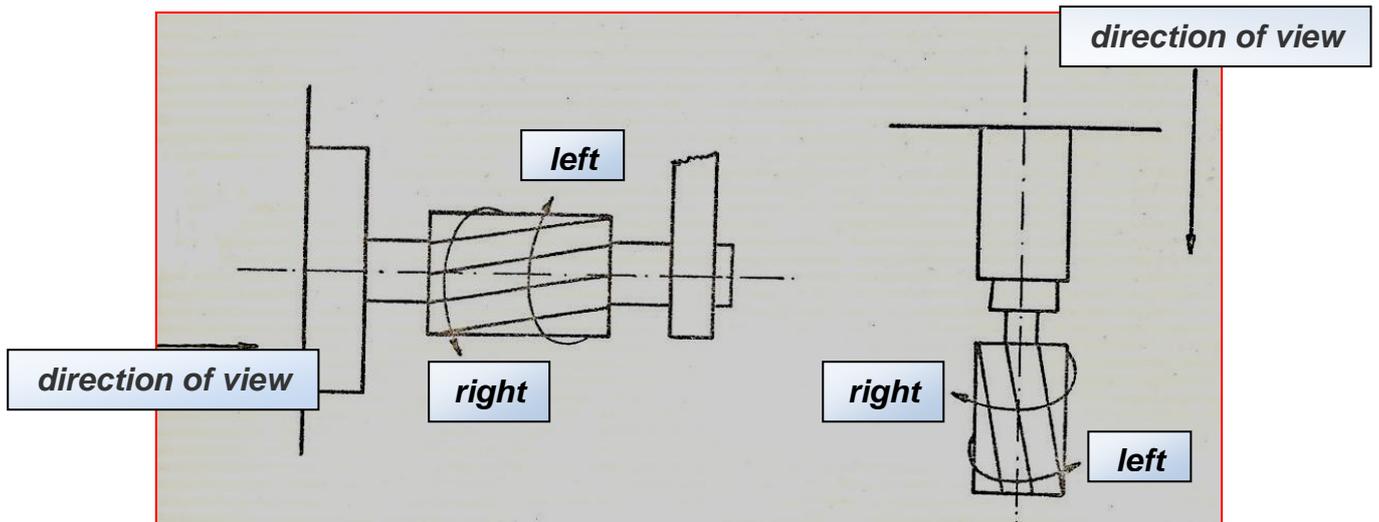


Fig. N°1- Definition of the cut direction

This category includes the cylindrical front milling cutters, disc taper milling cutters with two cuts, taper milling cutters (conical and biconical) , the quarter-circle concave milling cutters, etc..

Figure N°2 shows the direction of cut in relation to the position of the profile of the most common asymmetric milling cutters.

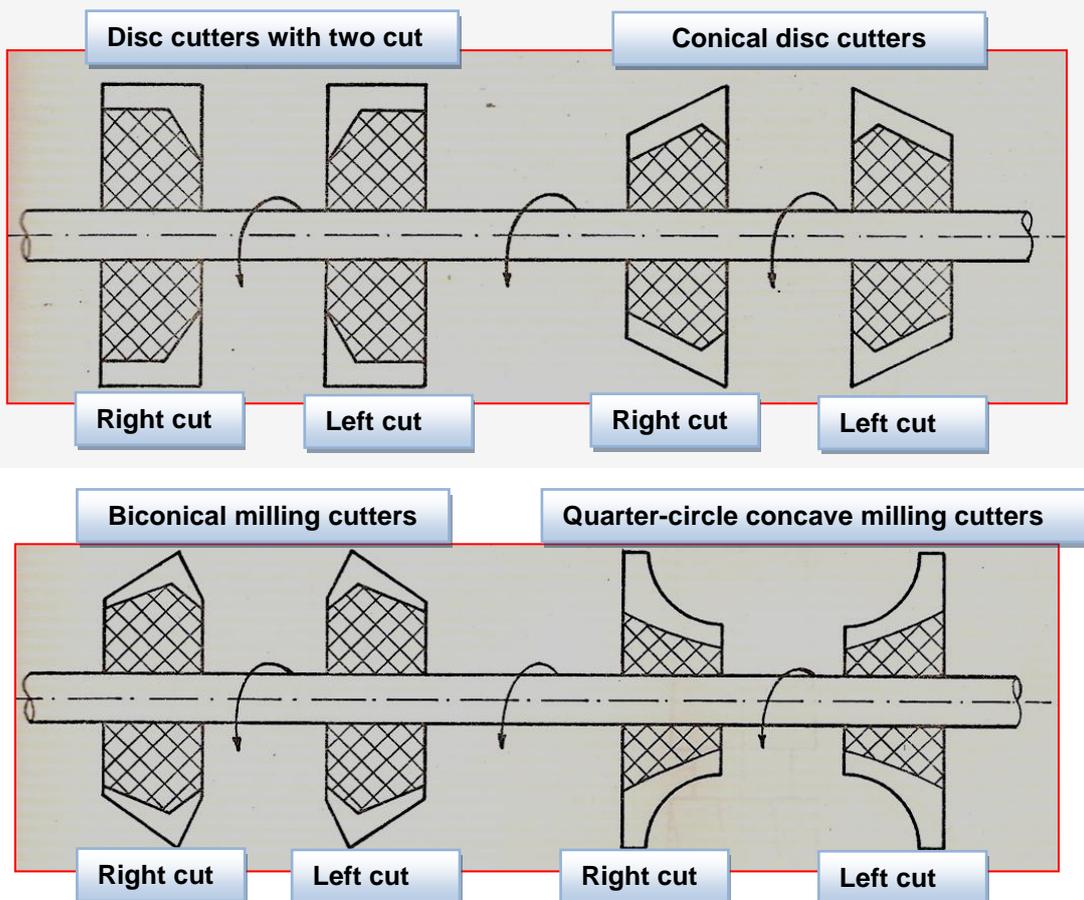


Fig.N°2- Definition of cut direction of asymmetric milling cutters

Definition of helix direction

Is determined by observing the flutes from any of the two ends.

The direction of the helix is right when the flute proceeds in a clockwise direction away from the viewer and obviously it says left if it proceeds in a counterclockwise away from the viewer (figure N°3).

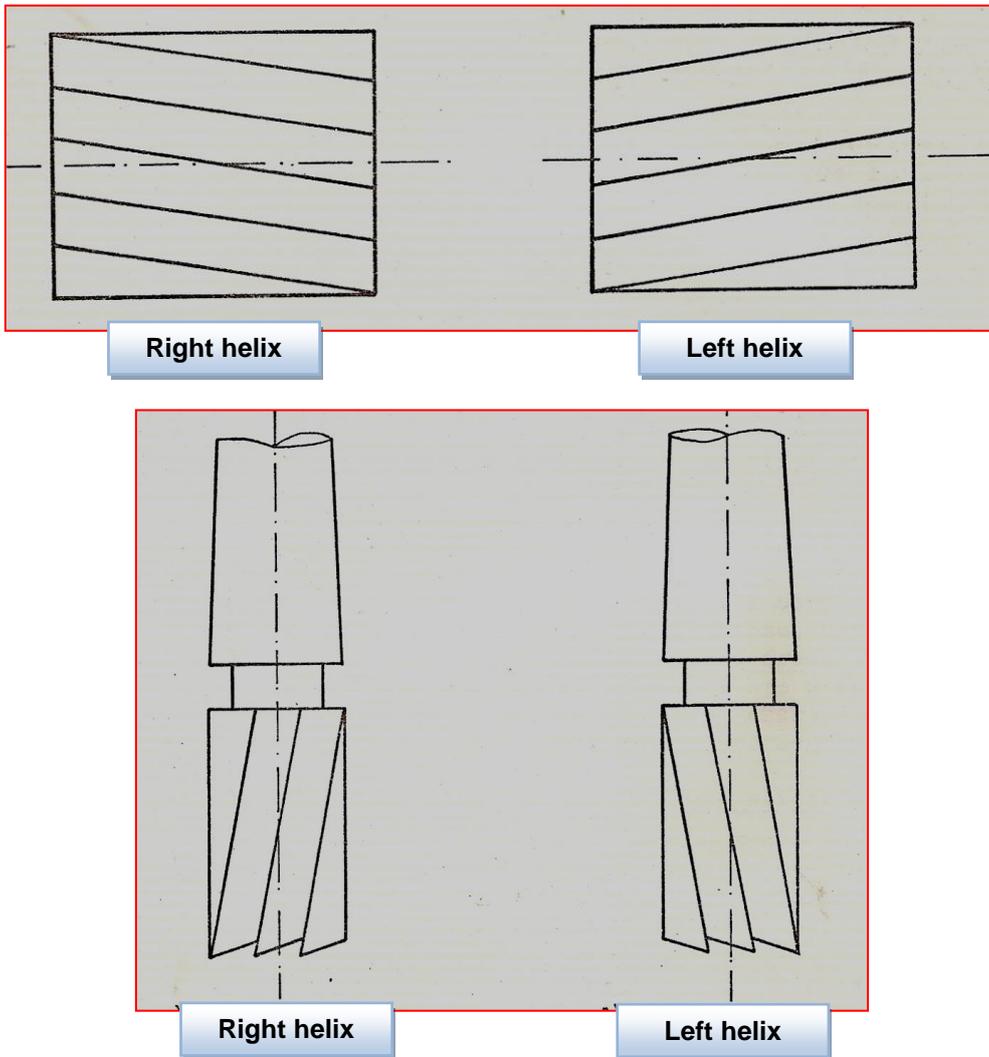


Fig.N°3 – Definition of helix direction