

## FACTORS AFFECTING THE MAGNETIC HOLDING FORCE

The holding force depends on the magnetic flux generated by the chuck, but certain factors which limit or impede the flow of the magnetic flux to the piece and reduce the holding capacity should be taken into account:

1. The contact area.
2. The thickness of the piece.
3. The contact surface conditions.
4. The material of the piece.

### 1. The contact area

The holding force is directly proportional to the contact area of the piece with the chuck. Large pieces with large contact surfaces offer sufficient resistance to the machining forces, however small pieces with small contact surfaces will not withstand certain types of machining. The piece should be placed on the chuck in such a way that it covers the largest possible number of poles (each steel strip is a pole).

### 2. The thickness of the piece

The magnetic flux needs a certain minimum thickness of material (iron) to be able to work. If the pieces are really thin and do not reach this minimum thickness, then they will not be able to absorb the magnetic flux generated by the chuck and the holding force will be lessened.

### 3. Contact surface conditions

To achieve good magnetic holding, the contact surfaces, both of the chuck as well as the piece, must be in optimum condition. Pieces that are not completely flat or with a rough finish have a worse holding capacity than those with a ground surface. It is important to maintain the surface of the chuck in good condition, grinding it when necessary.

Level of surface finish	Holding force
Grinded	90 – 100 %
Fine milled	60 – 80 %
Rough milled	40 – 50 %
Cast finish	20 – 30 %

### 4. Material

The material of the piece is very important for good magnetic holding. Soft steels (low carbon content) present the best holding (100%). However, there are others with high percentages of carbon alloys of other materials, which lose their holding capacity. Also some heat treatments reduce the capacity of steels to be held by magnetic chucks. In general, the harder the steel, the worse they behave, and have a tendency to retain magnetism once they have been removed from the chuck. Sometimes it can even be difficult to remove the piece from the chuck.

Material	Holding force
Non-alloy steel 0,1-0,3 % C	100 %
Non-alloy steel 0,4-0,5 % C	90 %
Nondistorting alloy-steel	80 - 90 %
Grey casting	40 - 60 %
Alloy steel hardened to 55-60 HRc	30 – 50 %
Austenitic stainless steel, brass, aluminium, copper	0 %