Application

Magnets are simple elements that help solving tasks easier, more efficient, and safer. If drilling is not allowed for mounting, e.g. to avoid damaging corrosion protection layers, if a retrofit /portable installation is desired, or if only a temporary fix is required, this product group offers a large selection of suitable magnets.

Types

There are seven different magnet types based on a conceptual classification with respect to the shape and function:

Button magnets and U-magnets as well as disk-shaped or rod-shaped retaining magnets, together with the screws with retaining magnet, represent the largest group. The name retaining magnet is given to those elements that are used for direct mounting. Raw magnets are usually used for the assembly of application-specific magnet systems.

Structure

Apart from the button magnets, U-magnets and raw magnets, they are all magnetic systems. Due to their structure, they have only one magnetic contact surface. The return plates concentrate the entire magnetic energy on the magnetic surface and limit the spatial effect of the magnetic field in order to prevent any magnetization of the environment.

Magnet materials

Within the various types, different magnet materials are available to choose from. In order to meet application-specific requirements as far as possible, the most important characteristics of the respective magnet materials are specified in the following table.

Magnet materials in comparison

Description	Hard ferrite (HF)	AlNiCo (AN)	SmCo (SC)	NdFeB (ND)
Magnetic force	High	Medium	High	Very high
Max. operating temperature*	≈ 392 °F (200 °C)	≈ 842 °F (450 °C)	≈ 392 °F (200 °C)	≈ 176 °F (80 °C)
Magnetic force when heated	Lower	Constantly good	Lower	Lower
Corrosion resistance	Very high	Very high	High	Nickel plated - high
Made from	Iron oxide	Aluminum, nickel, cobalt and iron	Samarium and cobalt	Neodymium, iron and boron
Manufacturing process	Sintering	Sintering, casting	Sintering	Sintering
Mechanical material properties	Very hard, brittle	Very hard, tough	Very hard, brittle	Very hard, brittle
Machineability	Not possible	Diamond grinding possible	Not possible	Not possible
Demagnetization capability	Moderate, by demagnetizing fields	Easy, by demagnetizing fields	Very difficult, only by strong demagnetizing fields	Difficult, only by strong demagnetizing fields
Price level	Very reasonable	High	Very high	Reasonable

* The max. operating temperature is only a guide value since it also depends on the magnet dimensions

Handling and safety notes

The partially high magnetic forces are a possible source of danger as fingers or skin can be crushed or pinched. Suitable protective measures, such as protectve gloves, should therefore be observed in the handling of magnets to prevent injuries. It should also be noted that magnets can attract each other from great distances, depending on their magnetic force, and also pose a risk of injuries.

When magnets collide, edges may splinter or, in extreme cases, the magnet may break. Especially raw magnets in an unassembled condition can be affected in case of improper handling.

Magnets must not be installed in potentially explosive atmospheres, as they can trigger sparks.

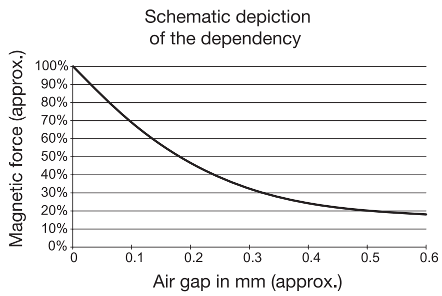
Strong magnetic fields can influence or damage electrical or electronic devices. This applies to pacemakers, for example. The device manufacturer's information regarding the intended safety distance must be observed.

Disadvantageous effects of magnetic fields on the human body are not known at this time.

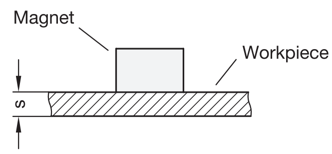
Magnetic force
The actually achievable magnetic force not only depends on the type and the magnet material, but also on other influencing factors.

Influencing factors

Air gap
An air gap or magnetically non-conductive materials between the workpiece and the magnet have an insulating effect on the magnetic flux. The magnetic force is reduced depending on the distance.



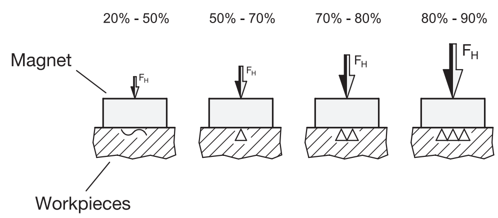
Workpiece thickness
A minimum workpiece thickness should be maintained in order not to restrict the magnetic flux and thus the magnetic force.



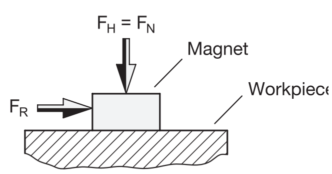
Material
Steel and iron materials with low carbon and alloy contents promote the magnetic flux. Also unhardened workpieces conduct the magnetic flux better, which enables greater magnetic forces.

100%	Technical pure iron	86%	C60, X6Cr17
95%	St37, C15	84%	42CrMo4
94%	St44-2, 34CrNiMo6	75%	St50
93%	St52-3	72%	X155CrMo12
92%	90MnV8	65%	X210CrW12
90%	C45	50%	20MnCr5
87%	Ck45	30%	GG

Workpiece surface
Extreme roughness or unevenness has the same effect as an air gap. It reduces the magnetic force.



Displacement force
The displacement force corresponds to the friction force and depends on the coefficient of friction between magnet and workpiece, as well as the magnetic force of the magnet. Rubberized magnet systems have high displacement forces due to their high coefficient of friction.



The nominal magnetic forces stated in the tables on the series pages are minimum values obtained at room temperature, vertical „tear-off“ and full-surface contact of the magnet with low carbon steel workpieces and a minimum thickness of 10 mm.