Magnet Basics & Safety Information

Magnet Materials

Flexible magnetic strips are made of a Ferro-Magnetic powder with a polymer bonding. These **low** energy strips resist demagnetization and will not chip, crack or shatter. Flexible magnets form to any contour and are often used for labeling or advertising purposes. Flexible magnets can be cut, drilled or shaped. Maximum temperature 160°F (70°C).

Ceramic magnets are made of Strontium Ferrite (SrFe) in a sintering process. Ceramic magnets are staples in the electronic, automotive, medical, mining, oil industries, etc. Ceramic magnets are **medium strength** magnet material with a high resistance to demagnetization, long time stability (loses 0.5% of it's magnetic strength in 100 years), brittle material that has to be cut with diamond tipped blades. Maximum temperature 480°F (249°C).

Alnico magnets are made of Aluminum, Nickel and Cobalt (AlNiCo) in either a casting or sintering process. Used in application environments that have **high heat**, Alnico magnets offer **medium strength** and the best temperature characteristics of any standard magnet material. Alnico magnets have a medium resistance to demagnetization and are very hard and brittle. Machining or drilling cannot be accomplished by ordinary means. Maximum temperature 800°F (427°C)

Rare Earth Neodymium-Iron-Boron (NdFeB) magnets are made in sintered as well as bonded forms. Commonly referred to as Neo, this magnet material provides the **highest magnetic strength** of any magnet material, very high resistance to demagnetization and is ideal for applications requiring maximum strength in a limited area. Neo is usually coated or plated to prevent oxidization due to its high iron content and therefore grinding of Neo material must be avoided. Maximum temperature 180°F (82°C).

Rare Earth Samarium Cobalt (SmCo) magnets are made in a sintering process. Samarium Cobalt has the **highest magnetic strength** combined with **high temperature range** making it ideal for applications requiring very high strength in hot environments. Maximum temperature 392°F (200°C).

Magnet Safety Factors

Our magnetic material meets Magnetic Materials Producers Association (MMPA) standards for physical quality and magnetic properties. Some magnetic material is brittle in nature and minor defects such as chips and hairline cracks are unavoidable.

When selecting a magnet for your application, consider the physical shape of the part (round, convex, concave, etc.) and the surface condition (rough, rusty, dirty, oily). Both can result in air gaps* between the contact points on the magnet & the work material, thereby reducing the magnetic power. These factors and the information in this catalog will aid in choosing the correct magnet for your application. If you have speci c questions, our application experts can help you select the right magnet material for your application requirements.

- Work surface
- Temperature
- Direction of magnetization
- Finish
- Part size, thickness and weight
- Material - Ferrous or non-ferrous
- Gauss
- Contact area between magnet & part
- Continuous or intermittent operation
- Tolerance

*Air gap - The air, protective coating, paint, galvanizing, oil, rust, dirt, etc. between the magnet and the part.

Loss of Magnetism

Under normal use conditions, a permanent magnet can experience a decrease in its original holding value. The most common factors which can cause a loss of strength include:

- Every day wear and tear on the magnet face such as: ne metal buildup on or between the magnet's poles, nicks or gouges in the magnet's poles, rust buildup, etc.
- Exposure to extreme temperatures: Ceramic Lifts lower than -76°F (-60°C) and higher than 300°F (148°C). Neodymium-Iron-Boron Rare Earth Lifts lower than -10°F (-22°C) and higher than 180°F (82°C). Electromagnet & Battery Lifts higher than 140°F (60°C).
- Severe blow or shock to the magnet. Do not use a blunt instrument to position the magnet on the load.
- Exposure to electrical currents. Never place the magnet next to a large motor or generator. Never use the magnet as part of a welding ground circuit.
- Exposure to vibration.

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Lift Magnet Basics & Safety Information

Lift Magnet Safety Factors

Lift magnets can be effective even when the surfaces of the magnet and/or load have dirt, paint, scale or other debris on them. However, the best efficiency of any magnetic lift is achieved when these surfaces are clean and the poles of the lift (the surfaces in contact with the load) have good, uninterrupted contact with the load.

It is therefore recommended to:
Avoid setting down the lift in places on the load that are dirty or have rough surface texture. Clear any foreign material from the load before setting the lift on it. Occasionally check the mechanical condition of the magnetic poles to make sure they are flat and have not been damaged during use. After using the lift, protect the pole surfaces with oil. This will keep the steel surface from rusting.

Material Surface & Safe Lifting Conditions

Lifting ferrous items using a magnet requires a good look at the length, width and thickness of the item. Thin metals do not absorb as many of the magnetic flux lines (magnetic energy) as thicker metals. Thin metals also flex, causing the steel to peel-off the magnet. Equally important is the physical size, flatness, surface conditions and type of steel. The charts below illustrate how surface finish and Carbon content effect lifting value.

PERCENTAGE OF STATED LIFTING POWER BY MATERIAL

CARBON CONTENT	
LOW CARBON 0.05 - 0.29%	100%
MODERATE CARBON 0.30 - 0.59%	85%
HIGH CARBON 0.60 - 0.99%	75%
HIGHER CARBON = HIGHER RESIDUAL*	

PERCENTAGE OF STATED LIFTING POWER BY SURFACE FINISH

SURFACE FINISH	
GROUND SURFACE	100%
ROUGH MACHINED	100%
FOUNDRY FINISH	85%
ROUGH CAST	65%

* HIGH CARBON STEEL (TOOL STEEL) WILL ABSORB MAGNETISM & MAY MAGNETICALLY STICK TO STEEL SURFACES, SUCH AS THE MAGNET, OR ATTRACT FERROUS PARTICLES.

Design Factor

Design factor is the relation of the magnet's labeled lifting value compared to the magnets maximum lifting value under ideal conditions. Ideal conditions are when a magnet is new and pulled off a newly machined, thick, low carbon steel plate. ***The pounds of pull it takes to break the magnet away from the steel surface is the "maximum" lifting value.***

> ⚠ **Unless otherwise noted, lift magnet capacities are stated up to 50% of the actual value. These magnets may reach substantially higher holding values, but the surface condition of the part may affect the magnet's performance capabilities.**

Design factor (de-rating) values are then determined by taking this maximum lifting value and dividing it by the manufacturers design factor. Design factors are minimum 2:1 and most cases 3:1. This means a magnet with a 3:1 design factor and labeled to lift 1,000 lbs will have a break-a-way force of approximately 3,000 lbs. The labeled lifting value is stated for the benefit and safety of the user, due to the fact that ideal conditions rarely exist in the field. The steel that you are lifting may have scale, rust, dirt, or coatings on its surface; or the surface of the magnet itself may be worn. Any of these conditions will cause lower lifting values. Pick a lift magnet that has a lifting value slightly higher than the weight of your part.

DO NOT ADD additional weight to your lifting requirements. If you have a 1,000 lb part and you buy a higher stated 2,000 lb lift magnet, it will result in a magnet that is much heavier, harder to handle and cost more than needed since the 2,000 lb magnet should have a Design Factor of 2:1 or 3:1. **Under no circumstances should you lift ferrous objects that weigh more than the stated lift magnet value**.

ASME B30.20 Lifting Standards

The American Society of Mechanical Engineers has established standards for Below-the-Hook Lifting Devices. This standard applies to the marking, construction, installation, inspection, testing, maintenance, and operation of all lifting magnets when used for single or multiple steel piece handling operations in which the operator of the lifting magnet is required to manually position the lifting magnet on the load and manually guide the load during its movement, or in close proximity to people.

Lifting devices designed to this Standard shall comply with ASME B30.20, Below-the-Hook Lifting Devices.

Industrial Magnetics, Inc. offer several lift magnet options that conform to, or even exceed, the ASME B30.20 standards