



Differentiate Your Product Design with Polymagnets

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For products that can truly stand out in the crowd, Correlated Magnetics Research has developed a patented technology called Polymagnets. Product designers can tune the feel of a magnetic feature to evoke a specific emotional response with a sophisticated tactile feel in their product. Polymagnets are the only tunable magnetic technology with a range of feel and function from both custom and standard magnetic systems.

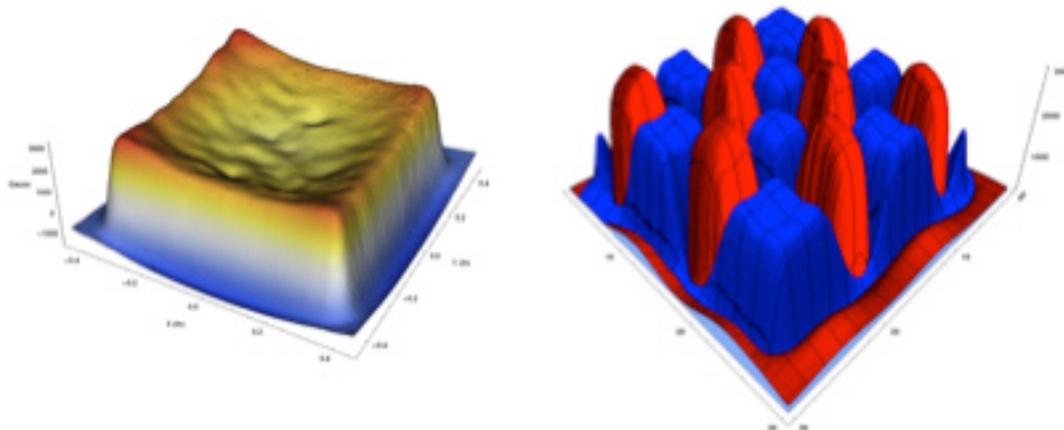
The company has created a library of standard Polymagnets that product designers can choose from. Polymagnets in the catalog have a wide variety of functionality and are available in prototype quantities for immediate delivery. CMR also manufactures Polymagnets in its high volume production facility in China.

What is a Polymagnet?

Polymagnets start as regular rare earth magnets. However, CMR uses their magnet system technology to create something entirely different from conventional magnets, which have one north and one south pole. Polymagnets contain patterns of north and south poles on a single piece of magnetic material. The fields coming off of these patterns of north and south poles in turn define the feel and function of the Polymagnet.

On the Polymagnet field scan shown at right in the graph below, north is red and blue is south. And on the left is the fieldscan of a standard magnet.

Turning a Magnet Into a Polymagnet



Magnet

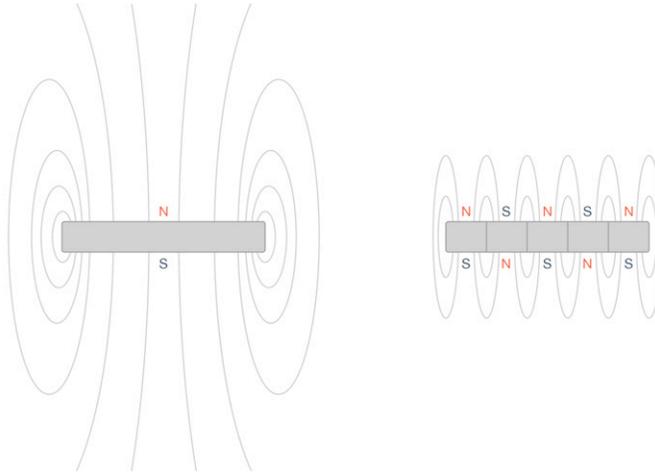
Polymagnet®

This particular Polymagnet has a checkerboard pattern of north and south poles. The field from this Polymagnet contrasts with the field coming off of a standard magnet, which has one north and south. Conventional magnets are limited in their function because they are limited to a basic, conventional field.

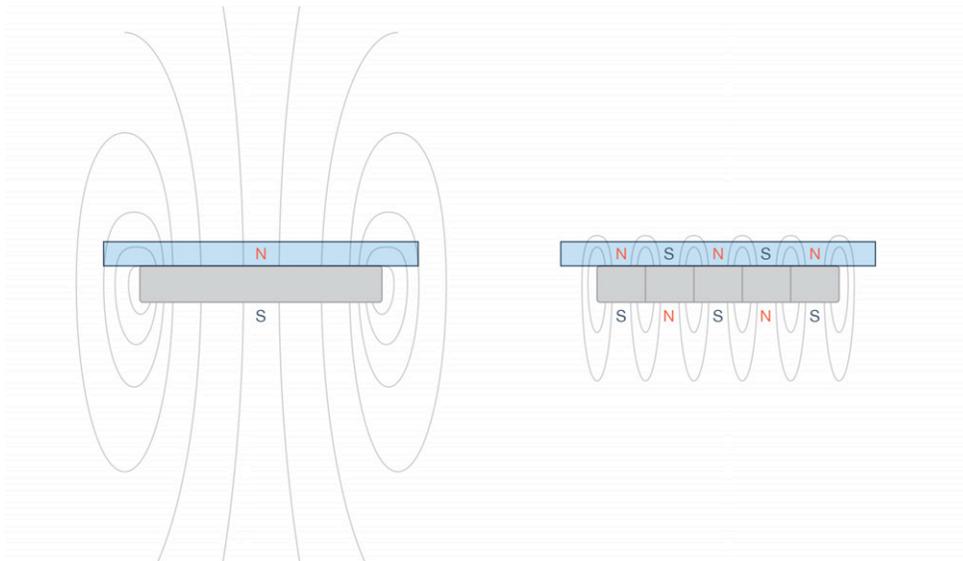
Magnetic Functions

The simplest thing a magnet does is attach to a piece of metal. The diagram on the left below shows the magnetic fields surrounding a conventional magnet. On the right is a diagram of a Polymagnet that has a series of north and south poles on it. The field on the Polymagnet is tightly focused because the fields don't have to go as far to connect from north to south. The same amount of energy is present in both magnets, but the Polymagnet has much more energy focused in front of the magnet where it can do work.

Polymagnets Concentrate Fields



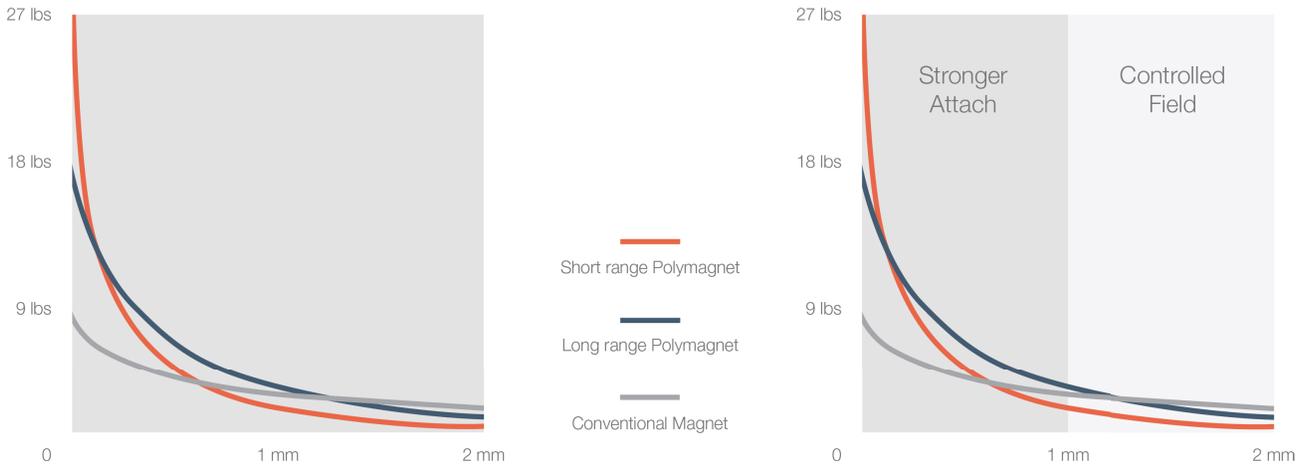
The diagram below shows what happens when a piece of metal is added to each of these magnets.



The conventional magnet on the left won't hold on to the piece of metal as strongly because a limited amount of the magnetic energy stays in the metal. In contrast, much of the Polymagnet's energy stays in the metal and holds much more strongly. In addition, the magnet won't attract from as far away as will a conventional magnet. Both the stronger attachment force and the decreased reach result from the Polymagnet's tightly focused magnetic field, which is created by the specific pattern of norths and souths on its surface.

The graph below compares a conventional magnet to two different Polymagnets.

High Performance Attachment



Force vs. Distance, 25.4mm x 25.4mm x 1.6mm N42 against 0.75mm steel

A magnet's strength falls off as you move farther away from it. As the magnet moves away from the piece of metal, it gets weaker. The force-distance curve for a standard magnet is fixed. The size and/or grade of the magnet can be increased, but the curve is a fixed shape. But the challenge with a standard magnet is that a stronger magnet may not increase the holding strength because the energy simply leaks through the metal and is wasted. By contrast, the pattern of north and south poles on a Polymagnet can be varied to focus the energy nearer or farther from its surface. So magnets can be created that attract at different distances and hold with different strengths.

The orange and blue lines on the graph reveal these differences. Two different Polymagnets are pictured, each with two different patterns of norths and souths. With different patterns the magnet has different tradeoffs between reach and strength. This is useful for a product designer who wants a magnet that holds with a lot of strength but doesn't take up as much space in their product design. A shorter field reduces the leakage of a Polymagnet, which is useful to reduce potential interference with sensitive items like a compass or a credit card's magnetic strip is desired.

The 'near' distance from a Polymagnet is the area that has stronger attachment force. Likewise, the area past where the field has been concentrated is the area where the field is controlled and will not cause interference or damage.

Case Study: Tablet Peripheral

There are many Polymagnets from the Polymagnet Catalog that exhibit both attachment and alignment functionality. Some of these Polymagnets were specifically designed for attaching a tablet peripheral, like a keyboard or a cover, to a tablet. The several variations of these tablet Polymagnets have multiple ways they exhibit alignment: precision alignment can be centering, rotational, or lateral. This stands in contrast with conventional magnets where 'orientation' is only provided when north is attracted to south.



Polymagnets with alignment only want to attach in specific ways. Their field reach is short, so they don't accelerate from a distance and slap together, yet they hold on with substantial force.

These magnets are also designed to distinctly limit their field strength beyond a certain distance to avoid interference with sensitive items like the compass inside a tablet, or with items placed on the outside of a tablet, like a credit card.

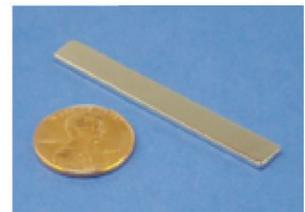
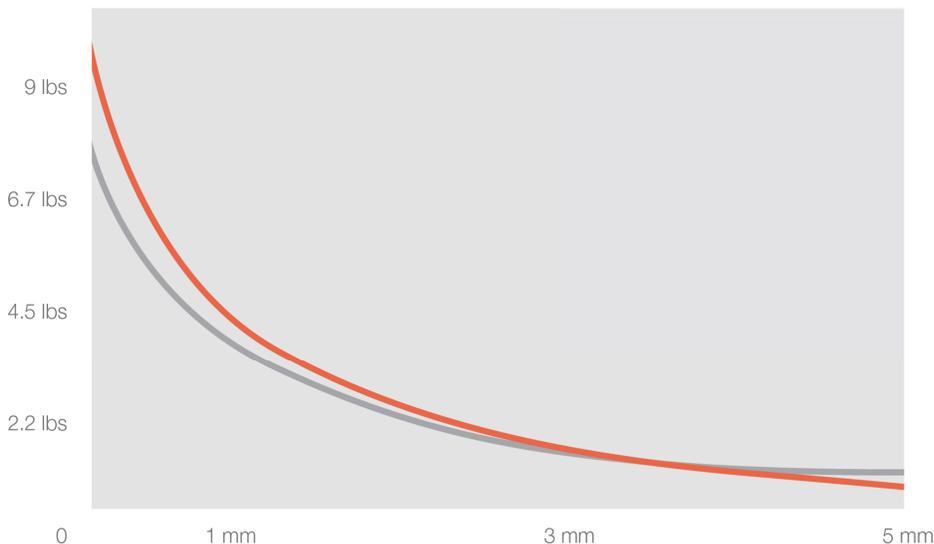
Tuned for Feel and Function



The Polymagnet catalog contains magnets for tablets with the same physical size, yet they come with different alignment characteristics. So a product designer can tune the feel and function they want in a product by choosing the Polymagnet that best meets their needs. For example, a tablet cover that slides seamlessly into place, has a smooth and sophisticated feel.

The tablet Polymagnets are long and thin; two would be placed down the spine of a tablet and two complementary magnets placed down the spine of the peripheral.

Polymagnet vs. Conventional: Force vs. Distance



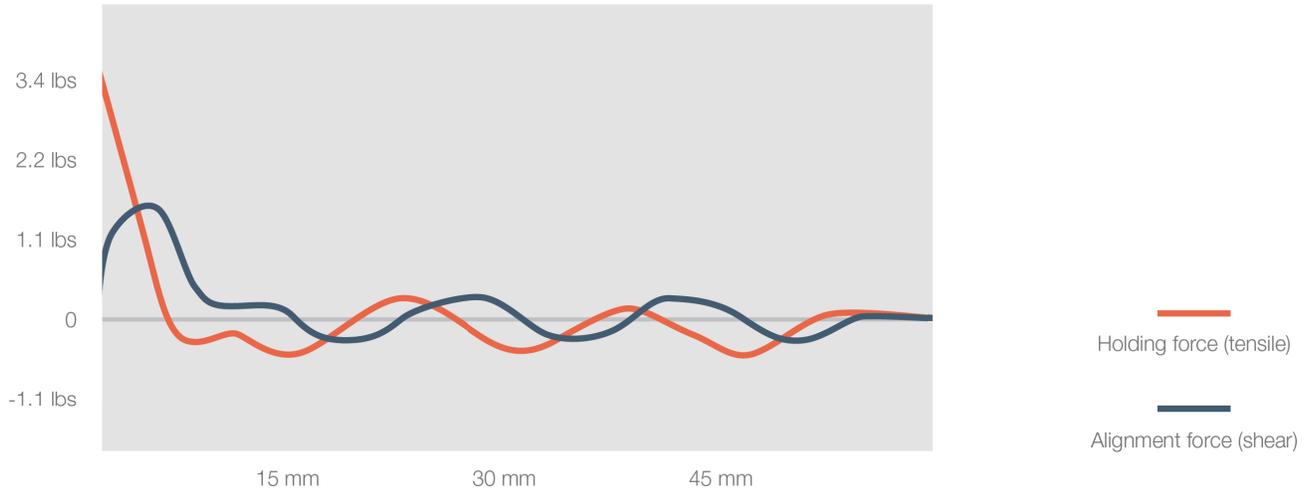
50.8mm x 6.35mm x 1.5875mm

— Polymagnet
— Conventional Magnet

Force vs. Distance. 1000319/1000334 magnet-to-magnet Polymagnet and Conventional

When attached at the intended distance, Polymagnets hold with more strength than conventional magnets. The cover will hold onto the tablet with more force. But that's not all. The chart below shows the alignment features of these magnets.

Polymagnet Force vs. Offset



1000319/1000334 magnet-to-magnet: Force vs. Offset in a linear position at a fixed distance of 1.5mm

The Polymagnets described in the diagram were designed to not only hold when attached (shown in the blue curve), but, unlike a conventional magnet, they were engineered with a distinct and separate force curve to also lightly repel when misaligned (shown in the red curve). These magnets will lightly repel anywhere along their length when not aligned, and they will precisely align and attract with substantial strength when centered on each other. Remember, you can't change the shape of a force curve on a conventional magnet, let alone define how it behaves when misaligned with another magnet. Conventional magnets only have a simple behavior to attract or repel no matter what the alignment.

CMR also offers a pair of Polymagnets, with the same physical size and shape as the ones above, but that lightly attach instead of lightly repel when misaligned. The Polymagnets attach with full strength when centered and precisely aligned. So when a product designer is building a tablet with a cover or keyboard, these Polymagnets are amazing tools for making sure the customer has a great experience with the product.

Polymagnet Catalog

Product designers can consult CMR's Polymagnet Catalog to get the right feel and function for their product. CMR has Polymagnets that are tailored for certain applications, such as tablet products, mobile phones and accessories.

The catalog also offers standard Polymagnets with a range of functions in a range of sizes. Polymagnets come in a variety of versions, each offering a different 'feel' for a particular function. In addition, specialty Polymagnets are available with novel functions not available in standard magnets.



A product designer can choose which Polymagnet to use to 'tune' the overall experience desired for their customers. You can buy Polymagnets from prototype quantities all the way up to high volumes from CMR's manufacturing facility in China. Visit www.polymagnet.com for further information.

Custom Polymagnets

Custom Polymagnets are also available. CMR can combine Polymagnet functions in a wide variety of ways to meet the needs of a specific product if the magnets offered in the Polymagnet Catalog are not the perfect fit.

Next Steps In Designing a Polymagnet system

Polymagnets are available in the Polymagnet Catalog in a variety of shapes and sizes, with a variety of functions, giving product designers a new tool for designing products. The catalog provides an excellent starting point for most products. To discuss a custom design project, please contact a CMR sales representative listed in the contact section of CMR's website: www.polymagnet.com/contact

Polymagnets are an incredible design tool that provide new capability above and beyond the limitations of conventional magnets.