Magnetism

Permanent Magnets
Materials and Magnet Systems

IBSMagnet

Table of contents

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Introduction

This section is intended to give you a brief introduction to magnetism and help you find the right magnet for your intended application. We have tried to explain everything as uncomplicated as possible.

We have not answered the question "How magnetism is created in a magnet?". To do this would require a lengthy explanation with terms such as "Electron Spins", "Atomic Orbits" "Weiss' Domains" and more. All this can be found in every good physics book.

The following will explain what a permanent magnet is:

When a material is brought into a strong magnetic field and retains a high degree of magnetism, we have a **remanence Br**. The strength of a counter-field which brings this magnetisation to zero is the **coercivity Hc**. The magnetism is only sufficiently present in the material if the coercivity field is correspondingly strong enough. A permanent magnet must therefore have both, a good remanence and a high coercivity, so that a sufficient amount of magnetism remains in the material.

A magnetised screwdriver may hold a screw but is not a permanent magnet, as just a few impacts with a hammer diminish its magnetisation considerably.
From the magnetic steels of the thirties used in car ignition systems to the new high-energy magnets made from rare-earth metals – the world has witnessed tremendous advances in technology.

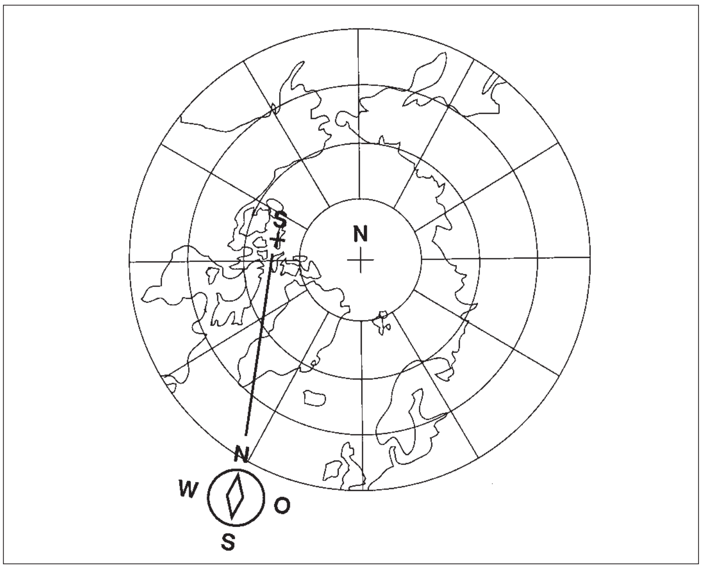
Most of today's permanent magnets and their application in the form of holding magnets and magnet systems will be described in this catalogue.

Please visit our Website:
www.ibsmagnet.de

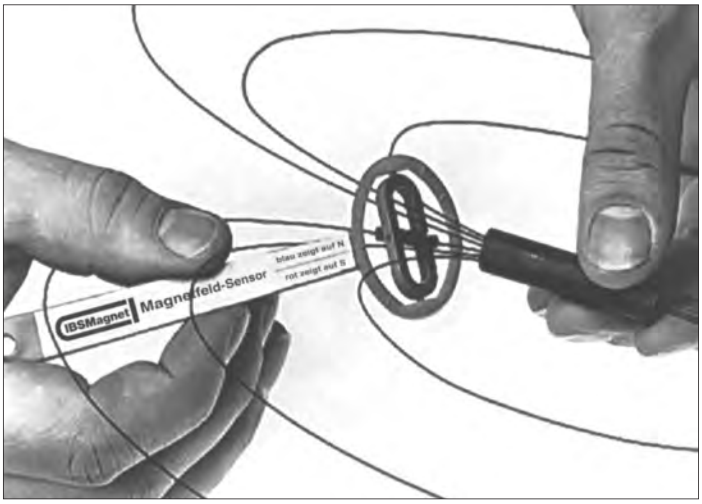
We are certified according to DIN EN ISO 9001-2000 (Certificate No. 0910095190)

Magnetism

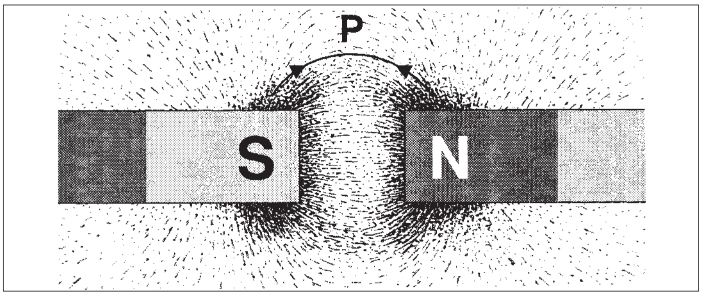
The earth is a gigantic magnet, with a North Pole and South Pole. As a permanent magnet it is surrounded by a magnetic field.
Since the North Pole of a magnet refers to the North, and because opposite magnets attract each other, **the geographic North Pole** is a **magnetic South Pole**.
The geographic and magnetic poles are not at the same location. The magnetic South Pole is situated in the north of Canada, about 1600 km away from the geographic North Pole. Therefore the needle of the compass does not point directly to the North. This **deviation** of the compass needle is different at every place on earth. In Germany the **angle of deviation** is currently 2.5°.
This deviation is caused by the continual and slow shifting of the magnetic poles. Measurements have shown that the magnetic South Pole moved more than 190 km to the Northwest within five years from 1995 - 2000. Analyses of volcanic rock have revealed that the earth's magnetic field has reversed its polarity several times.
The strength of the earth's magnetic field varies over the entire surface. It is diverted or shielded by the magnetic conductive metals contained in the crust of the earth such as nickel, iron and cobalt. At the poles, the magnetic field is strongest. The magnetic field of the earth is weak compared to the magnetic field of a permanent magnet.
A small permanent magnet made of rare-earth metals, such as **DeltaMagnet** (SmCo) and **NeoDeltaMagnet** (NdFeB), supplied by **IBS Magnet**, has a field which is several thousand times stronger. The magnetic flux lines of the geo-magnetic field penetrate from the surface of the globe in different angles relative to the polar axis.
The flux lines surrounding permanent magnets also have a curved course on their flow from South to North Pole. Since the inclination of a small rod magnet follows those flux lines in the same way as the needle of a compass, we can see the pattern of a magnetic field with the **field sensor, Magnaprobe MK II.** This applies to the extension of the field as well as to its direction.
Magnetism is a mysterious force. We can neither see nor feel it. Our senses do not perceive magnetism.
Magnetism has been known to mankind for millennia. The nautical compass with a steel needle has been in use since 1250 BC.
Magnetism has continually inspired technicians and scientists to invent new applications. **The newest generation of high-energy magnets made of rare earth metals** has made many more technical applications possible, e.g. the magnetic levitation railway.
If you are thinking about using the attracting and repelling forces of magnets too, you will find a partner in **IBS Magnet** who can assist you with competence and can supply almost every feasible magnet.



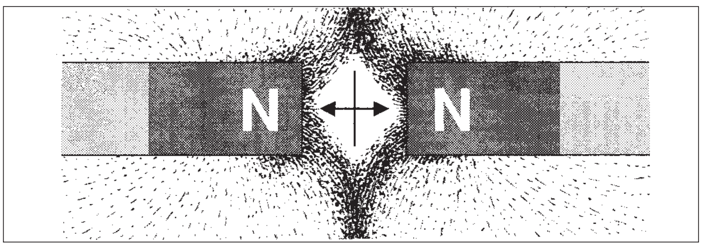
The deviation of a compass



A small magnet and the needle of a compass follow the magnetic flux lines. (IBS Magnet field sensor Type MK II)



Opposite poles attract each other



Equal poles repel each other

Useful facts about permanent magnets…

The proportioning of permanent magnets, that is the ratio of the magnet pole areas to the magnet thickness (L/D-ratio) of any magnet material, is subject to the laws of physics.

The maximum operating temperature also depends on the L/D-ratio. A thin NeoDelta magnet disc of 15 ø x 2 mm e. g. can only be used up to a maximum operating temperature of + 70°C, whereas a thicker disc of 15 ø x 8 mm can be used up to approx. + 100°C.

In the case of most modern magnet materials **the remanence and the coercivity decreases on warming**. When the temperature drops both values rise. This generally means that there is an improvement in most magnet systems up to - 40°C. For example SmCo magnets can be used in temperature areas below zero, which are necessary for the production of superconductors.

The magnetisation of rod magnets with a kept-in **preference direction (anisotropy)** during production is possible only in the preference direction.

It is not possible to state the holding force of an "open" permanent magnet. The "open" permanent magnet is surrounded by a magnet field of differing densities. The holding force is essentially determined by the magnetic effect on the iron to which the magnet is stuck. Thin iron plate holds less well, thick flat bar sticks better. There are a great variety of special **magnets for adhesion on iron and steel for which all the magnetic energy will be concentrated on the active surface using iron poles.**

High-energy magnets made from NeoDeltaMagnet **(NdFeB)** have to be stored dry, otherwise the surfaces would oxidise. Storage in a **hydrogen atmosphere destroys** these magnets. A demagnetisation is caused when permanent magnet materials have been exposed to radioactivity over a long period.

Small hairline cracks and **cracks on the edges** of sintered permanent magnets are not always avoidable during production. This does not affect the magnetic values, and should therefore be tolerated on purchase.

All sintered permanent magnets are **hard and brittle**. They split into many sharp-edged fragments when colliding with each other as a result of magnetic attraction. This especially occurs with high-energy magnets, and can also cause pinching of the skin when there are high attraction forces.

Permanent magnets are surrounded by magnetic fields. These magnetic fields can disturb and even destroy sensitive **electronic measuring devices** as well as **mechanical watches.** Usually a distance of 0.5 m is enough to avoid damage. Persons with cardiac pacemakers should completely avoid magnetic fields.

Harmful effects of magnetic fields on the human body, like those of permanent magnets, are not known. Tests are currently being conducted into the effects on the human body of very high magnetic fields over 3 Tesla. In naturopathy and empirical medicine magnetism is used to cure illnesses. Even Paracelsus described the use of permanent magnets in his work. Later, Mesmer (1734 - 1815) formulated a theory on how to cure illnesses using magnetism. Except for a few applications, the cure with magnetism is not acknowledged by mainstream conventional medicine.

Comparison of magnetic units of measure in the SI and cgs system

Size	Formula character	Unit		Conversion
		SI	cgs	
Magnetic flux density (Induction)	B	T (Tesla)	G (Gauss)	1 T = $1 \frac{Vs}{m^2}$ = 10^4 G 1mT = 10 G
Magnetic polarisation	J	T (Tesla)	G (Gauss)	1 T = 10^4 G 1 mT = 10 G
Magnetic field strength	H	A/m	Oe (Oersted)	1 kA/m = 12.57 Oe 1 kOe = 79.5 kA/m
Maximum magnetic energy density	$(B \cdot H)_{max}$	J/m^3	G · Oe	1 kJ/m^3 = 0.1257 MGOe 1 MGOe = 7.95 kJ/m^3
Induction constant	μ_0	$\frac{T}{A/m}$	$\frac{G}{Oe}$	$\mu0 = 4\pi \cdot 10^{-7} \frac{T}{A/m}$ = 1 G/Oe

Magnetic and physical properties of magnet materials

What does it mean?

The energy product (B x H) max. indicates the magnetic quality. The higher the product, the more "energy" is stored in a magnet material. It results from the largest width and height to be drawn inside the demagnetisation curve.

The **remanence Br** is measured in **Tesla (T)** or **Millitesla (mT)**. In the CGS system, the term is Gauss (G). The remanence is the magnetisation or flux density remaining in a magnet material after saturation, measured in a closed magnetic circuit.

The coercivity Hc is the negative field strength in kA/m or Oersteds (Oe) which is necessary to bring the remanence to zero again. The higher the value, the better the ability of a magnet to withstand negative or alternating fields. A distinction is made between $_BH_C$ and $_JH_C$. The coercivity $_JH_C$ is important for magnet materials with low resonance and high coercivity, e.g. BaFe. $_JH_C$ results from the hysteresis loop.

The permeability is the "magnetic conductivity". For almost all magnet materials, the permeability is only slightly less than for air, while for iron it may reach more than a thousandfold.

The temperature coefficient indicates the reversible decrease of the remanence, based on normal room temperature (20°C) in percent per 1 °C increase in temperature.

The max. temperature is only an approximate value as it depends upon the dimensions of a magnet system (L/D-ratio). The given value can only be reached if the product of width and height reach a maximum (see magnetic design).

The density or the "specific weight" is given in g/cm³.

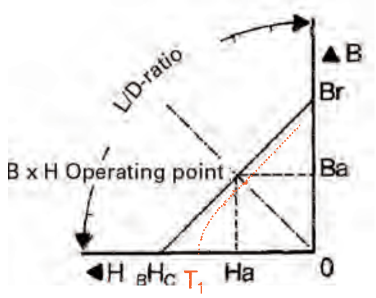
If **the Curie temperature** is reached every magnet material loses its magnetism.

Magnet material	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C)				Relative remanent permeability	Temp. coefficient of remanence per °C	Maximum operating temperature	Density	Curie temperature
					$_BH_C$		$_JH_C$						
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/(kA/m)		°C	g/cm³	°C
Betaflex (BaFe) plastic bonded anisotropic	12	1.5	245	2,450	175	2,200	207	2,600	1.40	- 0.20%	- 40° + 85°	3.7	450°
Hard ferrite (SrFe)	27-32	3.4-4.0	380-400	3,800-4,000	230-275	2,891-3,457	235-290	2,954-3,645	1.45 - 1.65	- 0.20%	ca. 200°	5.0	450°
AlNiCo 500 Precision Casting	35	4.4	1,120	11,200	47	590	48	603	23.80	- 0.02%	450°	7.4	860°
AlphaMagnet Samarium-Cobalt, plastic bonded	56-64	7.0-8.0	550-590	5,500-5,900	360-416	4,500-5,900	600	7,500	1.05 - 1.10	- 0.04%	80°	5.1	725°
NeoAlphaMagnet Neodymium-Iron-Boron, plastic bond.	80-96	10.0 - 12.0	700-800	7,000-8,000	416 - 480	5,230-6,033	640-880	8,045 - 11,060	~ 1.70	- 0.10% (25-90°)	120°	~ 6.0	310°
DeltaMagnet Samarium-Cobalt $SmCo_5$	143-159	18.0-20.0	850	8,500	620	7,800	1,193	15,000	1.37	- 0.04% (20-100°)	ca. 250°	8.4	725°
DeltaMagnet 22 Samarium-Cobalt Sm_2Co_{17}	159-175	20.0-22.0	900	9,000	636	8,000	1,193	15,000	1.42	- 0.03% (20-100°)	ca. 300°	8.4	750° - 800°
NeoDeltaMagnet Neodymium-Iron-Boron, NdFeB	262-278	33.0-35.0	1,170-1,210	11.700-12,100	860-915	10,800-11,500	>1,350	>17,000	1.07 -	- 0.10%	120°	7.5	310°

Magnet design with the help of the demagnetisation curve

Unlike other structural elements in mechanics, magnet design is limited by many factors. Here the area and distance between poles in the direction of magnetisation must be determined by the magnetic properties.

Figure 1



The highest magnetic energy is present if the product of remanence B and coercivity H have reached a maximum. This is the case if the largest possible rectangle forms under the demagnetisation curve of width to height (see figure 1).

The diagram below has a scale on the edge showing the ratio of the length to the diameter (L/D-ratio) of a magnet.

For a disc magnet with 10 mm diameter and 5 mm thickness, the L/D-ratio is 5:10 = 0.5. If a straight line is drawn from "0.5" to zero, the point of intersection on the curve of the corresponding magnet material is the operating point (B x H) of this magnetic material.

If the operating point found is connected horizontally to the width-axis and vertically to the height-axis the remanence and coercivity can now be ascertained.

If width and height have the highest possible value the operating point is in the (B x H) max value.

For "open-circuit" magnets used without an iron counterplate or iron poles, the design should always be selected so that the operating point is near to the (B x H) max value.

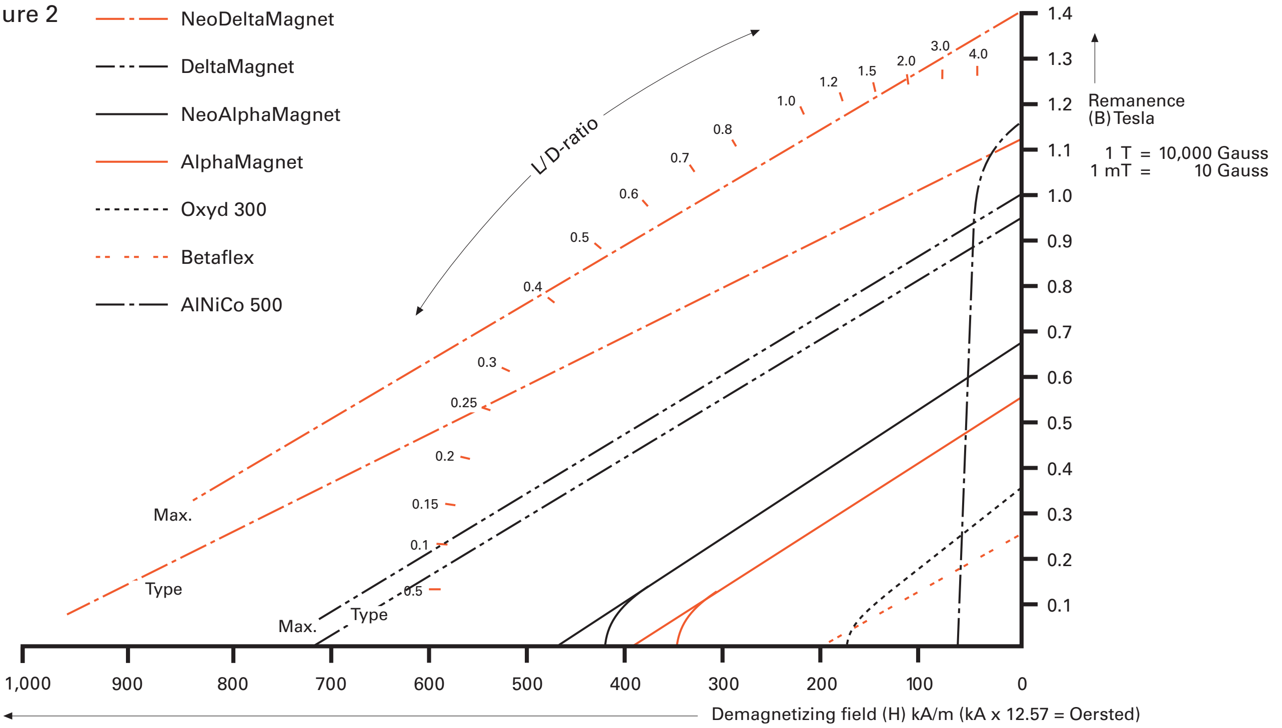
If there is an iron counterplate behind the magnet, the magnet length L can be doubled in the L/D ratio for an approximate estimation of the value. This assumes that the thickness of the iron counterplate is sufficient for there to be no magnetic saturation.

If a magnet has square or almost square poles, its pole area can be converted into a circular area by using this formula:

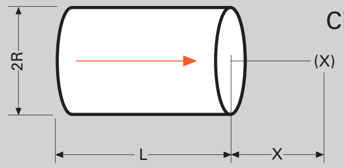
$$D = \sqrt{A \times B \times 4}$$

The curves below refer to various magnet materials. They are simplified and do not show the influence of temperatures. A change of temperature causes the operating point to shift on the demagnetisation curve. As long as this occurs within the linear part of the curve all changes of magnetic properties are reversible. This means that after reaching room temperature again the original flux density reappears. Otherwise irreversible changes of the magnetisation must be expected. Only a new magnetisation brings back the original flux (see red line in figure 1).

Figure 2



Formula to calculate the flux density Bx at a point (X) on the magnet axis



Circular disc magnet

$$Bx\,(X) = \frac{Br}{2}\left[\frac{L + X}{\sqrt{R^2 + (L + X)^2}} - \frac{X}{\sqrt{R^2 + X^2}}\right]$$

We have simplified the calculation for you on the Internet at www.ibs-magnet.de
If you enter the measurement X and the remanence Br of the magnet material there, the software calculates the flux density at point (x)

For example, please enter Br as follows:

NeoDeltaMagnet:	1,100 mT
DeltaMagnet:	1,000 mT
NeoAlphaMagnet:	700 mT
AlphaMagnet:	600 mT
Hard ferrite:	400 mT

Example: How large is the flux density at a distance of 5 mm for a circular disc magnet made of DeltaMagnet (SmCo) 6 ø x 4 mm (IBS standard type DE64)?

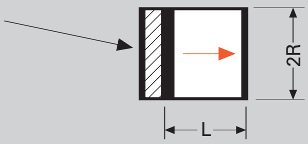
Br of DeltaMagnet from the table = 1000 mT

Result:

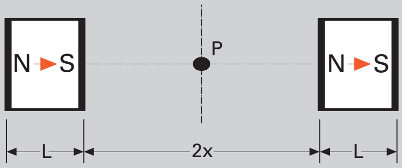
$$Bx\,(X) = \frac{1{,}000}{2}\left[\frac{4 + 5}{\sqrt{3^2 + (4 + 5)^2}} - \frac{5}{\sqrt{3^2 + 5^2}}\right] mT$$

$$Bx\,(X) = \underline{\underline{43\ mT}}$$

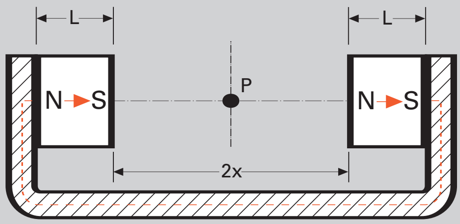
Circular disc magnet with iron reflux plate



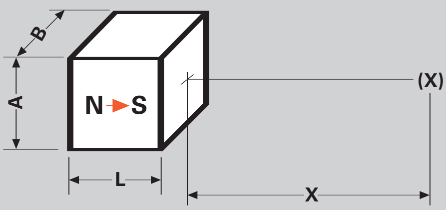
1. You can replace L by 2 x L in the formula, if an iron reflux plate is placed on the pole area behind the circular disc magnet. The thickness of the reflux plate should be chosen in such a way that no magnetic saturation is caused.



2. The value Bx for point P will be doubled, if two identical circular disc magnets (i.e. attractive) are placed parallel to each other.



3. The value Bx for point P will be doubled (L replaced by 2 x L), if the circular disc magnets placed parallel to each other (shown in Fig. 2.) are connected by an iron hitch.



Square magnet

Formula to calculate the flux density Bx in distance (X)

$$Bx\,(X) = \frac{Br}{\pi}\left[\arctan\frac{AB}{2X\sqrt{4X^2 + A^2 + B^2}} - \arctan\frac{AB}{2(L+X)\sqrt{4\,(L + X)^2 + A^2 + B^2}}\right] (G)$$

The formula is not defined for X=0. The Arcus tangent (arc tan) must be calculated in radian measure.

The formulas are for magnet materials with a straight curve on the demagnetisation curve only, i.e. they cannot be used for AlNiCO 500 (ALCOMAX). Can be used for Ferrites, DeltaMagnet (SmCo), NeoDeltaMagnet (NdFeB), AlphaMagnet and NeoAlphaMagnet (plastic bonded SmCo and NdFeB).

The magnet materials

Hard ferrite magnets

Barium ferrite and strontium ferrite are sintered metal oxides BaO_2 or SrO_2 combined with Fe_2O_3.

Raw materials for such magnets are abundant and inexpensive. Hard ferrites are the most used permanent magnet materials worldwide. They are made isotropic or anisotropic.

Isotropic magnets have nearly the same magnetic properties in all directions. They can be magnetised accordingly. Their magnetic energy is low, so is their price.

Anisotropic magnets are compressed in a magnetic field, resulting in one preferred direction of magnetisation. In comparison to isotropic magnets their energy density is about 300 % higher. The coercivity is high in relation to the remanence. This means that such magnets must have a large pole area, i.e. circular magnets must have a disc shape and not a rod form.

Hard ferrites have a high temperature coefficient. The remanence decreases by about 0.2% per degree C. They can be used between - 40 and + 200°C. Like ceramic materials, they are mechanically hard and brittle. Being oxides they do not corrode and are neither affected by climatic influences nor by many chemicals, with the exception of some strong acids. Machining is only possible with diamond tools.

Hard ferrite magnets are standardised in DIN 17 410. **IBS Magnet** provides standard magnets as discs, rings and wafers from existing form tools.

AlNiCo magnets

These metallic alloys made of iron, aluminium, nickel and cobalt plus some copper and titanium are produced by casting in sand moulds or metal moulds and by vacuum investment casting or sintering.

AlNiCo was discovered over 50 years ago and is the oldest magnetic material still used today. Compared to new magnetic materials, AlNiCo magnets have a low coercivity at a higher remanence. AlNiCo magnets must therefore be long in the direction of magnetisation if they are to be able to resist demagnetisation as open-circuit magnets. That means **round magnets stipulate the rod shape.** The main advantage of AlNiCo is the very low temperature coefficient of only 0.02% per degree C and the wide temperature range from - 273°C to more than + 400°C. Therefore such magnets will be needed when a constant magnetic field is required over wide temperature ranges. The required rod shape, i.e. the large gap between the poles, is of advantage when operating reed switches. AlNiCo magnets are almost only made anisotropic. Because of the rise in cost of cobalt and because of the low coercivity, the use of AlNiCo magnets is on the decline.

IBS Magnet offers standard AlNiCo 500 magnets cast by precision methods as circular rods, as rectangular wafers and in U-shapes. We also offer special holding magnets with AlNiCo.

Plastic bonded magnets

Plastic bonded magnets are widely used nowadays and will increase in importance.

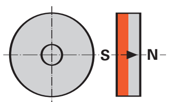
The magnet material is pulverised and mixed with suitable plastics. Calendering, extruding and compression or injection moulding are used in producing the magnets.

With flexible plastics and hard ferrite powders, magnetic sheets and strips are produced with a thickness from 0.5 to 8 mm. Those sheets can be coated with white vinyl foil to be used as labels and other signs.

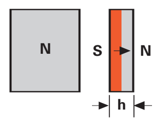
Of a higher magnetic quality are plastic bonded, flexible magnet panels or magnet tapes, which have passed through a homogenous magnetic field during production. As a result the magnetic particles contained in the plastic are oriented and no preferred direction results (anisotropy).

Magnetising patterns

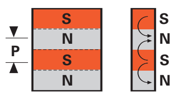
axial



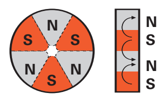
Magnetised through thickness



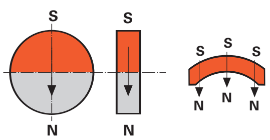
Magnetisation in stripes lateral on one surface *



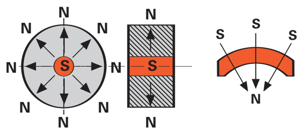
Sectors on one surface only (e.g. 6-pole) *



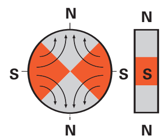
diametrical



radial *



Multiple magnetisation on periphery (e.g. 4-pole) *



*These magnetisations are only possible with special magnetising fixtures.

Safety guidelines for the handling of magnets

When handling magnetic materials, especially made of the high-energy materials NdFeB and SmCo, the following must be observed:

- Magnets can attract one another at significant distances. With larger magnets this results in a risk of injuries.

- All sintered permanent magnets are hard and brittle. When they come together with any force they can split into many sharp parts due to the strong magnetic attractive force. Appropriate safety measures must be taken (protective gloves, goggles).

- The magnetic fields surrounding a permanent magnet at all sides can affect and even destroy sensitive electronic devices and measuring instruments. Please observe sufficient distance (e.g. over 2 m) also from computers, monitors and all magnetic data storage media (e.g. credit cards, disks, audio and video tapes).

- Persons using pacemakers must avoid magnetic fields at all costs!

- Magnets may never be used in an explosive atmosphere. On impact magnets may develop sparks.

- When processing rare earth magnets in particular, please note that dust and chips produced from grinding are self-igniting and can burn at high temperatures. Never process magnets dry. Especially for SmCo the legal relations regarding the handling of Co-containing dust have to be obeyed. We recommend to wear protective gloves for the handling of uncoated SmCo magnets.

- High-energy magnets, especially those made of NdFeB, must be stored dry as this material has a high affinity with oxygen. Even unprotected use in a damp environment can result in corrosion and ultimately in the destruction of the magnets. To protect NdFeB magnets from corrosion the surfaces will be coated i.e. by electroplating. Coatings must not be damaged – even minor cracks may result in corrosion.

- The use of magnets in a hydrogen atmosphere or at radioactive radiation is to be avoided at all costs. This will result in the destruction of the magnets.

- Observe the maximum usage temperature for the relevant material and it´s size. In general the magnetic properties decrease with an increase in temperature.

- In addition, there are no known negative effects of the magnetic fields of permanent magnets on the human body. It can be assumed that persons who are allergic to ceramic or metallic materials will also be allergic to similar magnetic materials.

- We would be happy to provide any advice you need for more complex queries.

Shipping Information

- During the transport of magnetised materials, especially the air transport, the relevant IATA regulations must be observed (no magnetic fields are permitted to penetrate the packing). Parcels containing magnets without sufficient magnetic shielding must be declared as dangerous goods.

- A shielding of the magnetic field can be achieved by ensuring a sufficiently large distance between the magnets and the package wall. A better solution is the shielding of all interior surfaces of the parcel with thin steel plates and / or to pack the magnets in steel directly.

- A simple method to check the outer packaging for magnetic fields is the “paperclip test”. Steel paperclips must not remain attached to the vertical outer wall of the parcel.

- The transport agent should be informed about the sufficient shielding by a special “Shippers Declaration”. In this case the goods are not be declared as dangerous anymore.

- Details of the IATA shipping regulations as well as a form of the special Shippers Declaration are listed as a PDF data on our website www.ibsmagnet.de at “Service & Help – Shipping information”.

- Should you have any further queries, we will be pleased to assist you.

High-energy magnets of rare-earth metals

High-energy magnets

These are permanent magnets containing rare-earth metals. The high energy product of more than 385 kJ/m^3 or 48 MGOe enables many new technical uses. Much smaller magnet systems or considerably higher magnetic energies for the same size in comparison to conventional magnetic materials such as barium ferrites or AlNiCo have become possible. As a comparison: With the same energy content, a barium ferrite magnet has to have a volume 6 times larger. **To create a field with the strength of 100 mT (1,000 G) at a 1 mm distance from the pole, a barium ferrite magnet must be around 25 times larger than a samarium-cobalt magnet.**

The energy product of the new neodymium-iron-boron magnets is about a further 40 % higher than that of the samarium-cobalt magnets cited in the example.

The following is a comparison of the energy products (B x H) max of several magnet materials

Plastic bonded barium ferrite, anisotropic (Betaflex)	12 kJ/m^3
Hard ferrite, sintered, anisotropic (SrFe)	32 kJ/m^3
AlNiCo 500	40 kJ/m^3
Plastic bonded SmCo, AlphaMagnet	64 kJ/m^3
Plastic bonded NdFeB, NeoAlphaMagnet	96 kJ/m^3
Samarium-Cobalt, DeltaMagnet (SmCo)	225 kJ/m^3
Neodymium-Iron-Boron, NeoDeltaMagnet (NdFeB)	360 kJ/m^3

What are "rare-earth metals"?

Rare-earth metals, also called "Lanthanides", are 15 elements, numbered between 57 and 71 in the periodic table. They make up about 1/7 of all elements occurring naturally. This means the "rare-earth" elements are not rare at all. Of economic importance, for example, are: Cerium (Ce) for glass manufacturing or steel production; Lanthanium (La) for X-ray film manufacturing and also for making catalytic converters for reducing exhaust emissions; Europium (Eu) for making the red colour in TV screens visible; Samarium (Sm) and Neodymium (Nd) for the manufacture of magnet materials with the highest energy product.

Samarium forms only a small fraction of the rare-earth elements. Finishing with a high percentage purity is very expensive. Neodymium forms a higher percentage of the rare-earth elements.

The costly processing to make the finished magnet means that rare-earth magnets are more expensive in comparison to conventional permanent magnet materials. Samarium-Cobalt magnets also contain the expensive material Cobalt (Co).

Large-volume applications are limited on account of the high price.

How are high-energy magnets produced?

Normally both SmCo and NdFeB magnets are alloyed by melting. Afterwards the material ingots are crushed and milled into fine powders, compressed under the influence of a magnetic field and finally sintered.

We process ingots made by isostatic pressing and then sintering in large dimensions.

These ingots are then cut up using diamond saws under water. Discs and rings are also produced with diamond tools.

To produce high volume parts the powder is compressed into shapes and then sintered. Only simple geometric shapes can be produced.

The magnetisation

After the magnet has its final shape it must be magnetised until saturation is caused. This needs very high magnetic fields. To produce these strong magnetic fields, charged capacitor batteries are discharged in an air-core coil. The magnet body situated in the inner hole of the low-impedance air-core coil is magnetised until saturation by the induced strong magnetic field when the impulse discharge is "fired off". **Magnetisation is only possible parallel to the magnetic orientation in which it was "impregnated" during production!**

We supply standard magnets magnetised to saturation. On request, we also supply magnets unmagnetised and carry out a later magnetisation in the system.

Properties

SmCo magnets are very hard and brittle. NdFeB magnets are hard and less brittle.

The magnets oxidise in a damp atmosphere; SmCo only very slightly, but NdFeB to a greater extent. SmCo magnets are relatively resistant to water. NdFeB magnets oxidise to a very high degree and dissolve slowly in water.

NdFeB magnets are protected against corrosion by electroplating with tin or nickel-plating.

Structural losses occur with exposure to radiation. As a result the magnetic properties are altered negatively.

Delivery

We supply high-energy magnets in many standard shapes at short notice, generally from stock.

Magnets in accordance with customer drawings can be produced quickly and in all qualities ($SmCo_5$, Sm_2Co_{17}, NdFeB).

DeltaMagnet®

Permanent magnets made of Samarium-Cobalt ($SmCo_5$, Sm_2Co_{17})

These high-energy magnets are produced through powder metallurgy (sintering). The sintered magnets are very hard and brittle and can only be machined in an unmagnetised state using diamond tools.

During production the magnet is oriented in a preferred direction. Magnetisation is only possible in this direction (anisotropy).

The magnetisation is not affected by strong opposing fields. The maximum operating temperature depends on the magnet dimensions (L/D ratio). DeltaMagnets may be used at liquid helium temperatures. In normal environmental conditions SmCo can be used without additional surface protection.

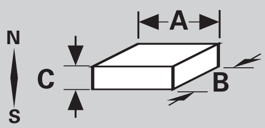
We supply SmCo in various qualities corresponding to the application.

Please ask for our assistance.

The following magnet dimensions are always available from stock. We can offer and supply any other size at short notice. We supply all standard magnets made of the better magnetic material Sm_2Co_{17} (code 190/119). All standard magnets are supplied magnetised.

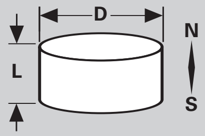
All dimensions in mm. General tolerances after DIN 7168.

Plate and block magnets



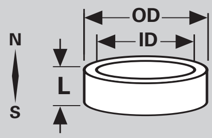
Type	A	x	B	x	C
DE22	2.0	x	2.0	x	1.0
DE33	3.0	x	3.0	x	2.0
DE42	4.0	x	4.0	x	2.0
DE45	5.0	x	4.5	x	1.5
DE55	5.0	x	5.0	x	3.0
DE36	6.0	x	3.0	x	1.0
DE107	10.0	x	7.0	x	2.0
DE1010	10.0	x	10.0	x	3.0
DE1209	12.0	x	9.0	x	2.5
DE1515	15.0	x	15.0	x	6.0
DE1612	16.0	x	12.0	x	3.0
DE1816	18.0	x	16.0	x	4.0
DE2621	26.0	x	21.0	x	5.0
DE3010	30.0	x	10.0	x	6.0
DE3020	30.0	x	20.0	x	10.0
DE3227	32.0	x	27.0	x	6.0

Circular disc magnets



Type	D Ø	x	L (a)
DE153	1.5	x	3.0
DE184	1.8	x	4.0
DE202	2.0	x	2.0
DE204	2.0	x	4.0
DE210	2.0	x	10.0
DE32	3.0	x	2.0
DE30	3.0	x	3.0
DE41	4.0	x	1.5
DE405	4.0	x	5.0
DE52	5.0	x	2.0
DE53	5.0	x	3.0
DE54	5.0	x	4.0
DE505	5.0	x	5.0
DE62	6.0	x	2.0
DE64	6.0	x	4.0
DE610	6.0	x	10.0
DE73	7.0	x	3.0
DE83	8.0	x	3.0
DE85	8.0	x	5.0
DE103	10.0	x	3.0
DE105	10.0	x	5.0
DE110	10.0	x	10.0
DE143	14.0	x	3.0
DE154	15.0	x	4.0
DE155	15.0	x	5.0
DE1510	15.0	x	10.0
DE205	20.0	x	5.0
DE255	25.0	x	5.0
DE258	25.0	x	8.0
DE2515	25.0	x	15.0

Ring magnets



Type	OD Ø	x	ID Ø	x	L (a)
DE2015	20	x	10	x	5
DE2512	25	x	12	x	8
DE3011	30	x	10	x	10
DE4015	40	x	15	x	10

Magnetic values for standard magnets

Sm_2Co_{17} (190/119)			
(BH) max		190	kJ/m^3
Br		1,000	mT
jHc		1,195	kA/m
bHc		680	kA/m
T*	=	300	°C

*T= max. operating temperature for optimum dimensions.

DeltaMagnet®

Permanent magnets made of Samarium-Cobalt ($SmCo_5$, Sm_2Co_{17})

Manufacture of customer-specific magnet dimensions.

DeltaMagnet is manufactured and supplied in two material variants, $SmCo_5$ and Sm_2Co_{17}. Sm_2Co_{17} is used if an extremely high stability is required in opposing fields both at a high energy density and at high temperatures. With suitable dimensions Sm_2Co_{17} can be used at an operating temperature of up to 350 °C. $SmCo_5$ has a somewhat lower energy density and can be used at up to 250 °C.

We produce customer-specific magnets from the following magnet materials so that the magnets can be optimally adapted to the application in terms of both dimensions and material. We produce complicated shapes such as segments for motors by erosion. The numbers in brackets are the code numbers according to DIN 17410 or IEC 404-8-1.

We will be delighted to help you select a suitable magnet material.

■ We can also supply the SmCo magnets shown below.

$SmCo_5$ (145/120)			
(BH) max	≥	145	kJ/m³
Br	≥	850	mT
jHc	≥	1,200	kA/m
bHc	≥	620	kA/m
T*	=	250	°C

Sm_2Co_{17} (200/150)			
(BH) max	≥	200	kJ/m³
Br	≥	1,020	mT
jHc	≥	1,500	kA/m
bHc	≥	720	kA/m
T*	=	350	°C

Sm_2Co_{17} (190/119)			
(BH) max	≥	190	kJ/m³
Br	≥	1,000	mT
jHc	≥	1,195	kA/m
bHc	≥	680	kA/m
T*	=	300	°C

Sm_2Co_{17} (220/119)			
(BH) max	≥	220	kJ/m³
Br	≥	1,050	mT
jHc	≥	1,190	kA/m
bHc	≥	790	kA/m
T*	=	300	°C

*T= max. operating temperature for optimum dimensions.

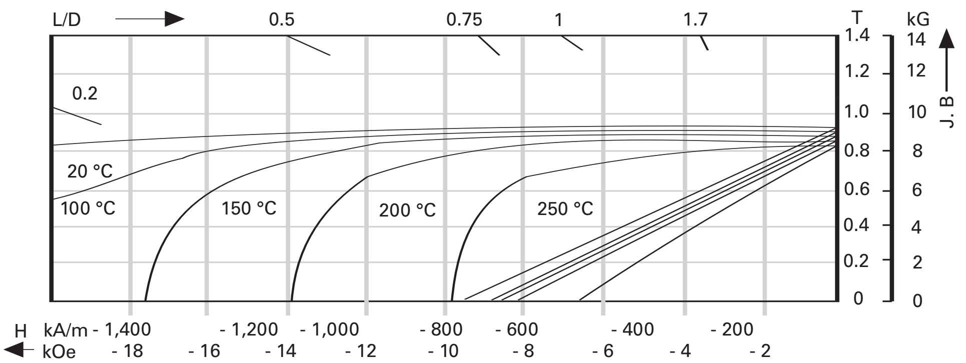
■ The curves shown below show the influence of temperature at various ratios (L/D).

For example: A round magnet 10 ø x 5 mm is to be made of DeltaMagnet $SmCo_5$ code number 160/120. With an L/D-ratio of 0.5 the magnet can be used up to 200 °C. If the magnet is to be used at around 250 °C, the length must be at least 7.5 mm (L/D-ratio 0.75 / see also page 5 of this catalogue).

* Vacomax is the registered trademark of VACUUMSCHMELZE GmbH und Co. KG.

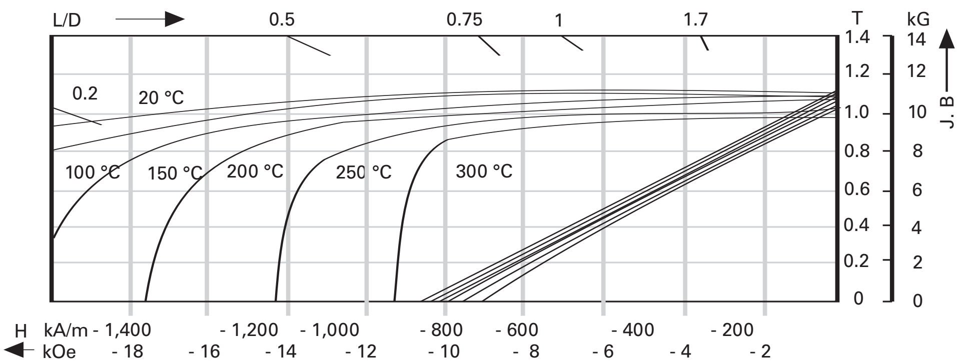
$SmCo_5$ (160/120) Vacomax 170 *

(BH) max	=	160	-	180	kJ/m³
Br	=	900	-	950	mT
jHc	=	1,200	-	1800	kA/m
bHc	=	660	-	720	kA/m
T*	=			250	°C



Sm_2Co_{17} (190/159) Vacomax 225 HR *

(BH) max	=	190	-	225	kJ/m3
Br	=	1,030	-	1,100	mT
jHc	=	1,590	-	2,070	kA/m
bHc	=	720	-	820	kA/m
T*	=			350	°C



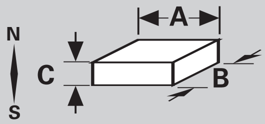
IBSMagnet NeoDeltaMagnet®

Permanent magnets made of Neodymium-Iron-Boron (NdFeB)

NeoDeltaMagnet (NdFeB) is the "strongest" magnet material available. The following standard magnets are generally available from stock. General tolerances according to DIN 7168. Without a protective coating a rust-like surface corrosion occurs with NdFeB magnets under air humidity. Our standard magnets are supplied with a high-quality coating – tin on nickel. NdFeB magnets are hard and brittle. To avoid breakage an impact or pressure load should be avoided. As with all magnet materials, the maximum operating temperature depends on the correct magnet dimensions (L/D-ratio in the operating point on the width x height line).
If the magnet dimensions are wrong chosen with insufficient thickness in the direction of magnetisation, irreversible loss will occur already below 100 °C.

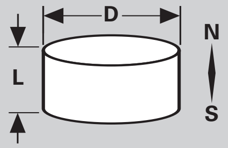
All standard magnets are supplied magnetised.
All dimensions in mm.

Plate and block magnets



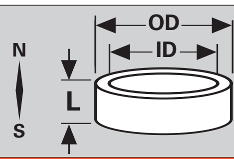
Type	A	x	B	x	C
NE22	2.0	x	2.0	x	1.0
NE33	3.0	x	3.0	x	1.0
NE44	4.0	x	4.0	x	2.0
NE48	4.8	x	4.8	x	4.5
NE55	5.0	x	5.0	x	2.0
NE545	5.0	x	4.5	x	1.5
NE631	6.0	x	3.0	x	1.0
NE66	6.0	x	6.0	x	5.0
NE77	7.0	x	7.0	x	2.0
NE88	8.0	x	8.0	x	6.0
NE107	10.0	x	7.0	x	2.0
NE1010	10.0	x	10.0	x	3.0
NE106	10.0	x	10.0	x	6.0
NE129	12.0	x	9.0	x	2.5
NE1515	15.0	x	15.0	x	5.0
NE1612	16.0	x	12.0	x	3.0
NE1816	18.0	x	16.0	x	4.0
NE2025	20.0	x	5.0	x	2.0
NE2010	20.0	x	10.0	x	5.0
NE2020	20.0	x	20.0	x	8.0
NE2621	26.0	x	21.0	x	5.0
NE3010	30.0	x	10.0	x	6.0
NE3030	30.0	x	30.0	x	6.0
NE3227	32.0	x	27.0	x	6.0
NE3652	36.0	x	5.0	x	2.0
NE5020	50.0	x	20.0	x	8.0
NE7550	75.0	x	50.0	x	10.0
NE1000	100.0	x	100.0	x	15.0

Circular disc magnets



Type	D Ø	x	L (a)
NE152	1.5	x	2.0
NE202	2.0	x	2.0
NE24	2.0	x	4.0
NE210	2.0	x	10.0
NE32	3.0	x	2.0
NE30	3.0	x	3.0
NE412	4.0	x	1.2
NE415	4.0	x	1.5
NE45	4.0	x	5.0
NE52	5.0	x	2.0
NE53	5.0	x	3.0
NE510	5.0	x	10.0
NE62	6.0	x	2.0
NE65	6.0	x	5.0
NE73	7.0	x	3.0
NE83	8.0	x	3.0
NE86	8.0	x	6.0
NE95	9.0	x	5.0
NE103	10.0	x	3.0
NE105	10.0	x	5.0
NE110	10.0	x	10.0
NE143	14.0	x	3.0
NE153	15.0	x	3.0
NE154	15.0	x	4.0
NE155	15.0	x	5.0
NE205	20.0	x	5.0
NE201	20.0	x	10.0
NE255	25.0	x	5.0
NE257	25.0	x	7.0
NE2515	25.0	x	15.0

Ring magnets



Type	OD Ø	x	ID Ø	x	L (a)
NE1035	10.0	x	3.1	x	5.0
NE1031	10.0	x	3.1	x	10.0
NE1556	15.0	x	5.0	x	6.0
NE2045	20.0	x	4.2	x	5.0
NE2016	20.0	x	10.0	x	6.0
NE2512	25.0	x	12.0	x	8.0
NE4023	40.0	x	23.0	x	6.0
NE7642	76.0	x	42.0	x	6.0

NeoDeltaMagnet®

Permanent magnets made of Neodymium-Iron-Boron (NdFeB)

Manufacture of customer-specific magnet dimensions.

Beside standard magnets usually available from stock, we also supply magnets made of different magnet materials, so that the magnets can be optimally adapted to the application in terms of both dimensions and material.

Segment magnets for motors, magnets for couplings or for use at high temperatures should, for example, have a higher coercivity H, while magnets for holding applications or sensor activation should have a higher remanence B.

A range of characteristics for available magnet materials are listed below for selection. The numbers in brackets are the code numbers according to DIN 17410 or IEC 404-8-1.

We will be delighted to help you select the suitable magnet material for your application.

NdFeB (280/167) Vacodym** 655 HR		
(BH) max	=	280 - 315 kJ/m³
Br	=	1,220 - 1,280 mT
jHc	=	1,670 - 1,830 kA/m
bHc	=	925 - 990 kA/m
T*	=	150 °C

NdFeB (360/95) Vacodym** 510 HR		
(BH) max	=	360 - 385 kJ/m³
Br	=	1,380 - 1,410 mT
jHc	=	950 - 1,030 kA/m
bHc	=	915 - 980 kA/m
T*	=	60 °C

NdFeB (240/223) Vacodym** 677 HR		
(BH) max	=	240 - 270 kJ/m³
Br	=	1,120 - 1,180 mT
jHc	=	2,230 - 2,465 kA/m
bHc	=	850 - 915 kA/m
T*	=	190 °C

NdFeB (315/127) Vacodym** 633 HR		
(BH) max	=	315 - 350 kJ/m³
Br	=	1,290 - 1,350 mT
jHc	=	1,275 - 1,430 kA/m
bHc	=	980 - 1,040 kA/m
T*	=	110 °C

NdFeB (246/159)		
(BH) max	=	246 - 262 kJ/m³
Br	=	1,140 - 1,170 mT
jHc	=	>1,590 kA/m
bHc	=	819 - 875 kA/m
T*	=	150 °C

NdFeB (262/135)		
(BH) max	=	262 - 288 kJ/m³
Br	=	1,170 - 1,250 mT
jHc	=	>1,350 kA/m
bHc	=	> 860 kA/m
T*	=	120 °C

NdFeB (315/95)		
(BH) max	=	315 - 330 kJ/m³
Br	=	1,290 - 1,320 mT
jHc	=	> 950 kA/m
bHc	=	> 835 kA/m
T*	=	80 °C

NdFeB (286/135)		
(BH) max	=	286 - 300 kJ/m³
Br	=	1,220 - 1,260 mT
jHc	=	>1,350 kA/m
bHc	=	914 - 955 kA/m
T*	=	120 °C

NdFeB (246/190)		
(BH) max	=	246 - 262 kJ/m³
Br	=	1,140 - 1,170 mT
jHc	=	>1,990 kA/m
bHc	=	819 - 875 kA/m
T*	=	180 °C

Manufacture

The magnets we produce are processed on modern processing machines with diamond tools. Complicated shapes such as segments are eroded.

Surface coating

NdFeB magnets can only be used at an air humidity up to 50 % without condensation if no special coating is used. For most applications a galvanic coating is necessary. We recommend the proven coating “tin plating” and for particularly high resistance in a damp climate “tin plating on nickel”. The thickness of the layer is about 15 µm. For more information please request our information sheet “Surface Coating for Permanent Magnets Made of NdFeB”.
The NdFeB magnet materials Vacodym 655HR/633HR and 677HR mentioned above are materials with high corrosion resistance

Tolerances

Manufacturing tolerances should be agreed on. Sintered materials (like NdFeB magnets) are hard and brittle, therefore small instances of mechanical surface damage such as cracks on the edges and hairline cracks are not always avoidable. For series productions the preparation of limit samples has proven effective.

Influence of temperature

The max. temperature at which a NdFeB magnet can be used at depends on the dimension ratio of the thickness in the direction of magnetisation to the size of the poles (L/D-ratio, see page 5).
The max. operating temperature can be determined with BH-temperature curves by dimensioning the thickness of the magnet in the direction of magnetisation for fixed pole sizes.

*T= max. operating temperature for optimum dimensions.
** Vacodym is a registered trademark of VACUUMSCHMELZE GmbH und Co. KG

Magnetic values for standard magnets on page 12

Magnetic values for standard magnets	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C) $_BH_C$		$_JH_C$		Relative remanent permeability	Temperature coefficient of remanence per °C	Maximum operating temperature	Density	Curie temperature
Type 262/135	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/kA/m		°C	g/cm³	°C
NeoDeltaMagnet (NdFeB)	262-288	33-36	1170-1250	11700-12500	>860	>10800	>1350	>17000	1.07	- 0.10%	120°	7.6	310°

NeoAlphaMagnet®

Permanent magnets made of Neodymium-Iron-Boron (NdFeB), plastic bonded

NeoAlphaMagnet is not sintered like other magnets – the magnetic powder mixed with epoxy resin is hot pressed in form tools. Normal tolerances are therefore within ± 0.1 mm.

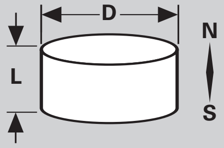
Unmagnetised standard magnets can be machined and thus modified according to customer specifications.

For larger quantities, magnets made of NeoAlphaMagnet can be produced in customer-specific pressing tools with small tolerances and smooth surfaces. We will be glad to assist you in the development of shapes suitable for tools.

The magnets are isotropic, i.e. they have no orientation and can be magnetised in any direction. Multiple pole magnetisation is also possible with special magnetising equipment. In normal environmental conditions (e.g. room temperature and relative humidity < 50%, no condensation), these magnets can be used without special coating. Under more corrosive conditions we suggest plastic coating.

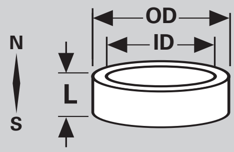
We supply all standard magnets magnetised in the shown magnetisation direction.

Circular disc magnets



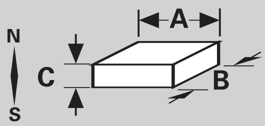
Type	D Ø	x	L (a)
NA009	2.0	x	5.0
NA037	3.0	x	10.0
NA006	4.0	x	10.0
NA007	5.0	x	10.0
NA042	6.0	x	2.0
NA142	6.0	x	10.0
NA853	8.5	x	3.0
NA519	10.0	x	5.0
NA019	10.0	x	10.0
NA504	12.5	x	5.0
NA004	12.5	x	10.0
NA110	15.0	x	3.0
NA002	20.0	x	7.7
NA024	25.0	x	5.0
NA023	30.0	x	10.0

Ring magnets



Type	OD Ø	x	ID Ø	x	L (a)
NA260	26	x	22	x	5
NA300	30	x	16	x	5
NA350	35	x	21	x	5
NA351	35	x	21	x	10

Plate and block magnets



Type	A	x	B	x	C
NA552	5	x	5	x	2
NA105	10	x	5	x	5
NA215	24	x	12	x	10
NA510	50	x	10	x	10
NA015	50	x	12	x	10
NA022	30	x	30	x	10

We supply the following standard magnets at short notice, generally from stock.
All dimensions in mm. General tolerances after DIN 7168.

Magnetic values	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C)				Relative remanent permeability	Temperature coefficient of remanence per °C	Maximum operating temperature	Density	Curie temperature
					$_BH_C$		$_JH_C$						
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/kA/m		°C	g/cm³	°C
NeoDeltaMagnet (NdFeB) plastic bonded	80-96	10-12	700-800	7,000-8,000	416-480	5,230-6,033	640-880	8,045-11,060	1.7	-0.10% (25°-90°)	120°	6.0	310°

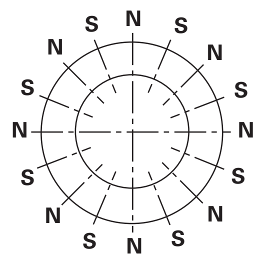
NeoAlphaMagnet®

Permanent magnets made of Neodymium-Iron-Boron (NdFeB), plastic bonded

For series applications we can offer and supply NeoAlpha-Magnet in various material qualities. Material data is given below. Consequently, the optimum magnetic material can be chosen for the required application. Reliefs and holes can be provided in the direction of magnetisation in the pressing tool. The necessary pressing tools are less expensive than transfer molds.

Owing to its isotropy, NeoAlphaMagnet can be magnetised in any direction. NeoAlphaMagnet is also very suitable for rings with narrow, multi-pole magnetisation on the circumference.

Magnetic values	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C) $_BH_C$		Coercivity (T=20°C) $_JH_C$		Maximum operating temperature	Density
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	°C	g/cm³
NM8	64 - 72	8.0 - 9.0	600 - 670	6,000 - 6,700	360 - 440	4,500 - 5,500	640 - 880	8,000 - 11,000	140°	5.8 - 6.0
NM8H	60 - 72	7.5 - 9.0	560 - 650	5,600 - 6,500	400 - 464	5,000 - 5,800	960 - 1,360	13,000 - 17,000	120°	5.6 - 6.0
NM12	80 - 96	10.0 - 12.0	700 - 800	7,000 - 8,000	416 - 480	5,200 - 6,000	640 - 880	8,000 - 11,000	130°	6.2 - 6.6
NM12D	80 - 96	10.0 - 12.0	700 - 800	7,000 - 8,000	448 - 480	5,600 - 6,000	720 - 960	9,000 - 12,000	140°	6.2 - 6.6



Example of a ring magnet with multiple magnetisation (can be produced in special magnetising unit).

AlphaMagnet

Permanent magnets made of Samarium-Cobalt ($SmCo_5$), plastic bonded

AlphaMagnet is hot pressed with epoxy resin bonded Samarium-Cobalt powder. Compared with NeoAlphaMagnet it is much more insensitive to corrosion. AlphaMagnet has a kept-in preference direction (anisotropy), so magnetisation is only possible in direction (a). All standard magnets are supplied magnetised.

Type	Form	Dimensions				
A049	Block	(A)6	x	(B)6	x	(C)8(a)
A191	Ring	(OD)52.5 ø	x	(ID)36 ø	x	(L)10(a)
A271	Plate	(A)76	x	(B)76	x	(C)5(a)

We supply the following standard magnets at short notice, generally from stock. For volume applications we can offer and supply magnets according to customer specifications. **All dimensions in mm.** (a) = preference direction.

Magnetic values	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C) $_BH_C$		Coercivity (T=20°C) $_JH_C$		Relative remanent permeability	Temperature coefficient of remanence per °C	Maximum operating temperature	Density	Curie tempe-rature
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/kA/m		°C	g/cm³	°C
AlphaMagnet Samarium-Cobalt plastic bonded	56 - 64	7 - 8	550 - 590	5,500 - 5,900	360 - 416	4,500 - 5,900	600	7,500	1.05 - 1.10	-0.04%	80°	5.1	725°

Hard ferrite magnets – anisotropic

(BaFe, SrFe, hard ferrite in accordance with DIN 17 410)

Ferrite magnets made of barium ferrite and strontium ferrite are compressed and then heat treated at a high temperature by sintering. They acquire their shape through a magnetic field during compression. As a result the powdered parts take on a geometric alignment in the later direction of magnetisation. Keeping in the preference direction (anisotropy) considerably improves the remanence. A magnetisation is only possible in the predetermined preference direction. The following standard magnets are magnetised in the preference direction designated by N-S.

Ferrite magnets correspond to any ceramic material in terms of hardness and brittleness and can only be machined with diamond tools. As a ceramic material, hard ferrite magnets are resistant to weathering and to many chemicals such as solvents, alkaline solutions, salts, weak acids, lubricants and harmful gases. Hard ferrites are the most inexpensive and most widely used permanent magnets worldwide. A rise in temperature per 1 °C leads to a reduction in the flux density by 0.2% while the coercivity increases by 0.3% at the same time. A reduction in temperature increases the flux density and lowers the coercivity by the same amount.

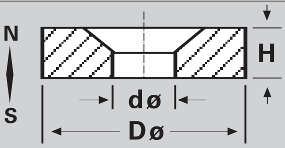
The design of hard ferrite magnets always requires a large magnetic pole area with small thickness in the direction of magnetisation. The ratio between magnet length and magnet diameter for a magnetic disc can be estimated from the curve on page 5.

We supply all standard magnets magnetised in the shown magnetisation direction.

We supply the following standard magnets at short notice, generally from stock. For volume applications we can supply magnets according to customer specifications. **All dimensions in mm.**

H = Direction of magnetisation

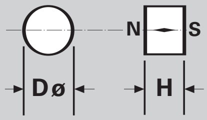
Discs with central hole



Type	D Ø	x	d Ø	x	H	Countersunk d Ø
RL15	15.2	x	3.2	x	6.0	one side 90°
RL20	20.0	x	4.3	x	6.5	both sides 90°
RL21	20.0	x	4.3	x	10.0	both sides 90°
RL30	31.0	x	5.3	x	15.0	one side 90°

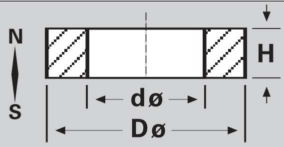
Non-magnetic screws should be used for fixing!

Circular disc magnets



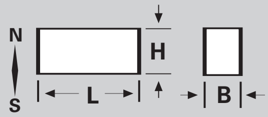
Type	D Ø	x	L (a)	
R4	4.0	x	5.0	H, D ground
R5	5.0	x	2.6	H ground
R8	8.0	x	4.0	H ground
R10	10.0	x	5.0	
R11	10.0	x	10.0	
R12	12.0	x	6.0	
R30	30.0	x	6.0	
R40	40.0	x	7.0	H ground
R45	45.0	x	9.0	H ground

Ring magnets



Type	D Ø	x	d Ø	x	H	
RL8	8.0	x	4.0	x	3.0	
RL62	15.0	x	6.2	x	3.0	
RL19	19.0	x	6.5	x	10.0	H ground
RL10	20.0	x	10.0	x	4.3	H ground
RL16	30.0	x	16.0	x	5.0	H ground
RL36	36.0	x	27.5	x	8.0	ID countersunk one side
RL40	40.0	x	22.0	x	9.0	
RL60	60.0	x	32.0	x	10.0	
RL107	100.0	x	70.0	x	20.0	H ground

Block magnets



Type	L	x	B	x	H	
R1212	12.0	x	12.0	x	7.5	H ground
R2510	25.0	x	10.0	x	5.0	
R4020	40.0	x	20.0	x	10.0	
R5025	50.0	x	25.0	x	7.8	H ground
R6020	60.0	x	20.0	x	15.0	
R7550	75.0	x	50.0	x	20.0	H ground
R1000	100.0	x	100.0	x	25.0	H ground centre hole 14 mm

Magnetic values	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C)				Relative remanent permeability	Temperature coefficient of remanence per °C	Maximum operating temperature	Density	Curie temperature
					$_BH_C$		$_JH_C$						
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/(kA/m)		°C	g/cm³	°C
Strontium Ferrite (SrFe)	27-32	3.4-4.0	380-400	3,800-4,000	230-275	2,891-3,457	235-290	2,954-3,645	1.45-1.65	-0.20%	ca. 200°	5.0	450°

AlNiCo rod magnets

Precision-cast AlNiCo rods are oriented and magnetised parallel to the length. Crystal orientation during heat-treatment improves the magnetic properties in this direction. Magnetisation can only occur in the predetermined preference direction.

AlNiCo is a hard material, workable only by grinding. We grind the surface of both ends of our round rod magnets. The optimum ratio of length to diameter (L : D) is > 4 : 1. Shorter magnet dimensions are not very stable in open circuits. Most of our magnet rods have optimum dimensions.

AlNiCo magnets have a high remanence, but a fairly low coercivity. This means the AlNiCo magnetic material has a high flux density which, however, is only weakly present in the magnet and can easily be weakened by demagnetising influences. For this reasons AlNiCo rod magnets should not be stored or used with equal poles opposing each other (repelling).

In temperatures ranging from - 270°C up to + 400°C AlNiCo is very stable. Its temperature coefficient is as low as - 0.02% per degree C.

A high nickel content of the alloy results in good stability against most acids and against oxidation.

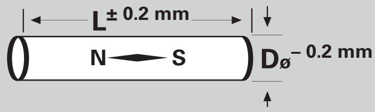
Most AlNiCo magnets are used for operating magnetic switches (reed switches). The magnet lengths should correspond to the length of the glass housing of the reed switch, with parallel arrangement of switch and magnet.

All standard magnets are supplied magnetised parallel to the length.

The following standard magnets are generally available at short notice from stock. Circular rod magnets with other dimensions in the diameter range from 3 to 20 mm are available for volume applications. **All dimensions in mm.**
L = direction of magnetisation

AlNiCo 500 corresponds to AlNiCo 35/5 according to DIN 17410 or ICE 404-8-1.
We can also supply other AlNiCo alloys for volume applications.

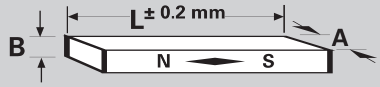
Circular AlNiCo 500 rods precision casting



Type	D Ø	x	L
A315	3	x	15
A420	4	x	20
A520	5	x	20
A625	6	x	25
A832	8	x	32
A1045	10	x	45
A1560	15	x	60
A2012	20	x	120

Design: Smooth precision cast, end faces separation grinding

Rectangular rods made of AlNiCo 500 Sand or metal moulded



Type	A	x	B	x	L
V48	4.8	x	4.8	x	25.4
V63	6.3	x	6.3	x	32.0
V105	10.0	x	5.0	x	20.0
V155	15.0	x	5.0	x	60.0

Design: Rough cast, end faces ground

Order or find out more online:
www.ibsmagnet.de

Magnetic values	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C) $_BH_C$		Coercivity (T=20°C) $_JH_C$		Relative remanent permeability	Temperature coefficient of remanence per °C	Maximum operating temperature	Density	Curie temperature
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/(kA/m)		°C	g/cm³	°C
AlNiCo Precision casting	35	4.4	1,120	11,200	47	590	48	603	23.8	- 0.02%	450°	7.4	860°

Betaflex®

The flexible permanent magnet that you can work yourself. Cutting, punching, drilling and sawing with normal tools.

Good magnetic properties through anisotropic orientation.

Betaflex is a remarkable magnet material made of flexible rubber-like plastic with barium or strontium ferrite powders imbedded. During production the magnetic orientation (anisotropy) is made parallel to the thickness of the material, resulting in superior properties.

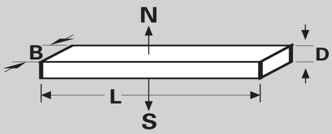
Betaflex can also be worked in magnetised condition with normal tools and is insensitive to demagnetising influences.

We also supply Betaflex magnet strips in thicknesses of 1.5 to 8 mm, with a max. width of 440 mm in max. production lengths of 1,040 mm. We can also supply Betaflex magnet sheets with one-side, multi-pole magnetisation up to 5 mm in thickness, which are to be used for holding. The magnet sheets can also be supplied with a self-adhesive coating on the unmagnetised side

All units in mm.

The following standard dimensions are available from stock.

Block magnets



Type	D	x	B	x	L	Tolerances
BF325	3	x	25	x	200	Thickness ± 0.15 mm
BF525	5	x	25	x	200	Width ± 0.25 mm
BF630	6	x	30	x	200	Length ± 0.5 mm
BF830	8	x	30	x	200	Orientation and
BF809	8	x	9	x	250	magnetisation
BF800	8	x	24	x	500	through thickness

Application

The energy product of Betaflex is higher than that of sintered isotropic barium ferrite (Oxyd 100). Many interesting applications are therefore possible.

By bending Betaflex strips into circular shapes, ring magnets with radial orientation can be produced. As a result, small DC motors can be produced by inserting this shaped magnetic ring into the stator sleeve.

Good and effective applications are possible in contactless position indicators with magnetic switches.

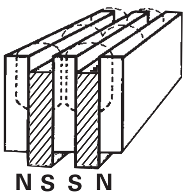
Hardness: (Shore A) 90 ~ 100
Radius for bending max.: Thickness x 8
Ageing: No change of magnetic and mechanical properties. Becomes neither hard nor brittle.
Chemical resistance:
- Air, ozone, water: excellent.
- Mineral oil, weak acids and bases, kerosene, glycol: no effect.
- Nitric acid: some effect.
- Petrol, acetone, 90% alcohol: some swelling.
- Benzene, chlorinated solvents: destruction.

Rings or discs magnetised parallel to the length can be punched from strips.

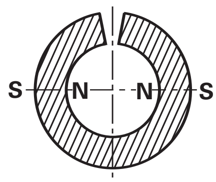
An outstanding application can be found in magnetic rails for holding purposes. Here Betaflex strips are placed between 2 flat iron bars (sandwich system). This enables magnetic rails of any length with excellent holding force to be easily made (see bottom left figure).

Examples of use

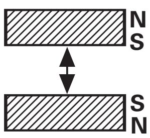
Holding magnet system



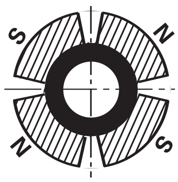
Radial magnetisation



Magnetic repulsion



Multi-pole magnetisation



Magnetic values	Energy product (BxH) max		Remanence Br		Coercivity (T=20°C) $_BH_C$		Coercivity (T=20°C) $_JH_C$		Relative remanent permeability	Temperature coefficent of remanence per °C	Temperature for practical use	Density
	kJ/m³	MGOe	mT	G	kA/m	Oe	kA/m	Oe	mT/(kA/m)		°C	g/cm³
Betaflex (BaFe), anisotropic plastic bonded	12	1.5	245	2,450	175	2,200	207	2,600	1.40	- 0.20%	- 40°… 85°	3.7

IBSMagnet Information about holding magnets

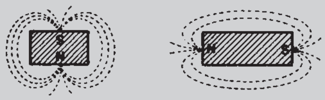
A large variety of holding magnet systems is shown on the following pages.

All holding magnet systems are combinations of permanent magnets and iron structures. The iron on the magnet's pole – shaped into sleeves, pots or other pole pieces – guides and concentrates the magnetic flux onto the holding surface.

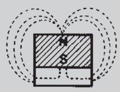
This surface must be sufficiently large to be able to carry the total flux of the magnet. The best holding forces are obtained by using annealed steel (St 37 K) with a flat, smooth surface.

Several magnet systems are shown below. The holding force of the system shown in comparison to an open magnet is given as an approximate factor.

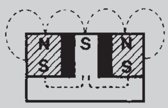
1.1 "Open" disc or rod magnet
Factor 1



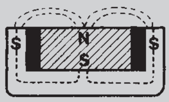
1.2 With iron backing plate
Factor 1.3



1.3 With iron backing plate plus central pole
Factor 4.5

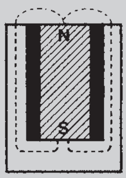


1.4 Disc magnet in iron pot (disc-type holding magnet)
Factor 6

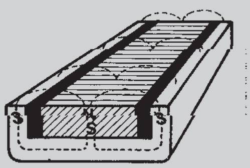


1.5 Ring magnet in iron pot with additional central pole.
Factor 6

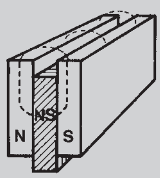
1.6 AlNiCo rod magnet in iron sleeve (Deep pot holding magnet, pot magnets)
Factor 7.5



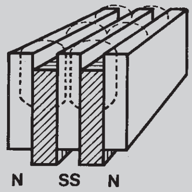
1.7 U-shaped magnetic rail
Factor 5.5



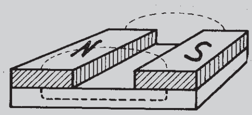
1.8 Magnet wafer between 2 flat iron strips (sandwich system)
Factor 18



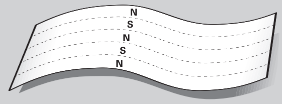
1.9 Battery of sandwich systems (Types L50 . . . L200)
Factor 18 x number of systems



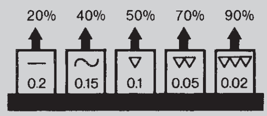
2. Two magnet wafers with opposing poles on iron backing plate, for achieving a wide-reaching, concentrated magnetic field, as required for catching magnets.



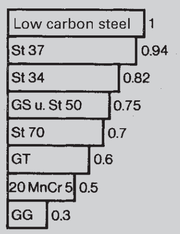
3. Multiple pole magnetisation on the holding surface of magnetic foils and strips enables a high density of flux lines over the magnetic surface.
This magnetisation is particularly suitable for application to thin iron sheets.



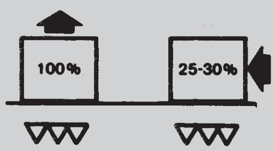
4. Dependence of holding force on smoothness of surface = remaining holding force.



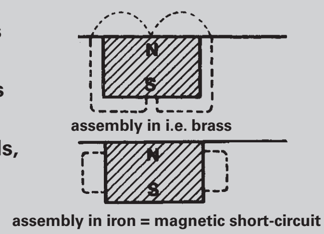
5. Dependence of holding force on material of holding surface.



6. Ratio of shifting force to holding force.



7. A "magnetic short-circuit" is caused when both poles are bridged by iron. Connections should therefore be made from unmagnetised materials, e.g. brass, stainless steel.



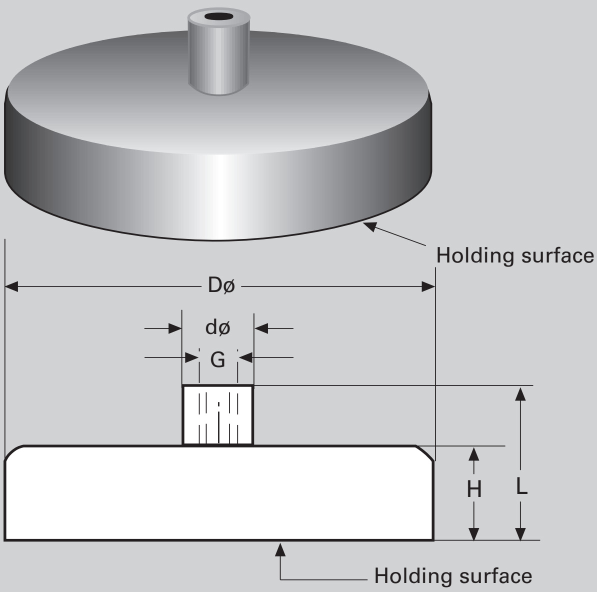
Disc-type holding magnets

With barium ferrite magnets

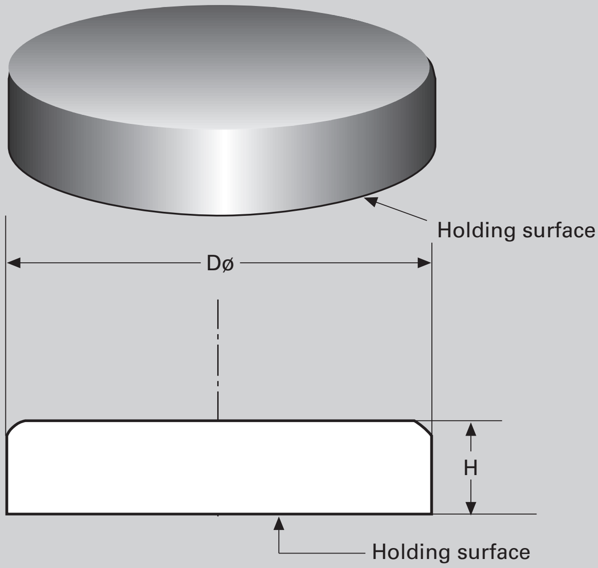
These flat holding disc magnets make it possible to fasten and release heavy parts quickly and safely to and from any steel surface. With a low system weight, the holding forces are high. No loss of force through wear or aging occurs.

Operating temperatures:	Max. + 150 °C Min. - 35 °C
Holding force decrease:	- 4 % per + 10 °C reversible Reference temperature: + 20 °C
Housing surface:	zinc plated

With threaded hole = Types H..



Without threaded hole = Types HB..



Types		Units in mm					Holding force*		Weight in g	
With threaded hole	**Without threaded hole**	**D Ø**	**H**	**L**	**G**	**d Ø**	**N**	**kp**	**H..**	**HB..**
H10	**HB10**	10.0	4.5	11.5	M3	6.0	4.0	0.4	5.0	3.0
H13	**HB13**	13.0	4.5	11.5	M3	6.0	10.0	1.0	7.0	5.0
H16	**HB16**	16.0	4.5	11.5	M3	6.0	18.0	1.8	8.0	6.0
H20	**HB20**	20.0	6.0	13.0	M3	6.0	30.0	3.0	12.0	10.0
H25	**HB25**	25.0	7.0	15.0	M4	8.0	40.0	4.0	22.0	19.0
H32	**HB32**	32.0	7.0	15.0	M4	8.0	80.0	8.0	31.0	28.0
H37		36.0	7.7	16.0	M4	8.0	100.0	10.0	45.0	
H40	**HB40**	40.0	8.0	18.0	M5	10.0	125.0	12.5	60.0	52.0
H47		47.0	9.0	20.5	M6	12.0	180.0	18.0	90.0	
H50	**HB50**	50.0	10.5	22.0	M6	12.0	220.0	22.0	110.0	100.0
H57		57.0	10.5	22.0	M6	12.0	280.0	28.0	145.0	
H63	**HB63**	63.0	14.0	30.0	M8	15.0	350.0	35.0	240.0	230.0
H80	**HB80**	80.0	18.0	34.0	M10	20.0	600.0	60.0	520.0	490.0
H100	**HB100**	100.0	22.0	43.0	M12	22.0	900.0	90.0	940.0	900.0

All dimensions in mm.

*The holding forces were measured on a ground sheet made of mild steel with a thickness of 10 mm with vertical drawing power. The values given are typical values and can be undershot or exceeded slightly. Small hairline cracks in the magnetic material do not affect the holding force. Ceramic magnetic material is non-corrosive and can be used in wet areas.

The shifting force is between 20 - 35% of the holding force, depending on the surface state.

Diameter-Tolerance in mm		Tolerances H and L in mm	
10 - 25	± 0.2	4.5 - 6.0	+ 0.3 / - 0.2
32 - 40	± 0.3	7 - 7.7	+ 0.3 / - 0.2
47 - 50	+ 0.5 / - 0.3	8	+ 0.4 / - 0.2
57 - 1,000	+ 0.6 / - 0.3	9 - 22.0	+ 0.5 / - 0.2

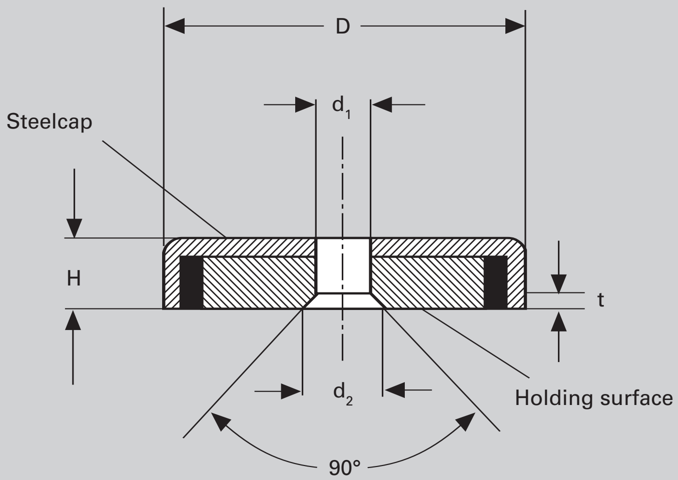
Disc-type holding magnets with central hole With barium ferrite magnets

In comparison to the disc-type holding magnets opposite these holding magnets have a central hole. As a result the holding magnets can be economically attached to a surface using countersunk-head or fillister-head screws.

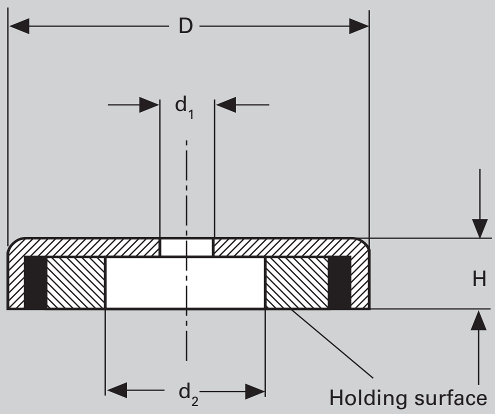
For fastening, only countersunk-head screws made from non-magnetic, non-conducting material (e.g. stainless steel, brass) may be used for style A.

Order online: www.ibsmagnet.de

■ **Style A – 90° countersunk in active area**



■ **Style B – cylindrical hole in active area**



Type	Design	D	d_1 Ø	d_2 Ø	t	H	For countersunk screws	Holding force * N	kp
		Dimensions in mm							
HL16	A	16.0	3.5	6.5	1.6	4.5	M3	14.0	1.4
HL20	A	20.0	4.2	8.6	2.1	6.0	M4	27.0	2.7
HL25	A	25.0	5.5	10.4	2.5	7.0	M5	36.0	3.6
HL32	A	32.0	5.5	10.4	2.5	7.0	M5	72.0	7.2
HL40	A	40.0	5.5	10.4	2.5	8.0	M5	90.0	9.0
HL50	B	50.0	8.5	22.0		10.5		180.0	18.0
HL63	B	63.0	6.5	24.0		14.0		290.0	29.0
HL80	B	80.0	6.5	11.5		18.0		540.0	54.0
H90M	A	90.0	10.0	18.0		12.0		500.0	50.0

All dimensions in mm.
All the above technical data also applies for disc-type holding magnets with central hole.

Possible special designs (minimum order quantity 50 items):
- Holding magnets Type H..., but with threaded stem.
- Holding magnets Type H.. with screwed-in hook, white lacquer, for decoration purposes.

IBSMagnet Disc-type holding magnets with very strong holding force

The holding magnets have a pot-shaped, flat iron surface as turned part.

Consequently the holding force is concentrated onto the holding surface and the magnetic effect is shielded toward the other sides.

The surface is electroplated with nickel. The disc-type holding magnets are completely resistant to demagnetising forces and do not suffer any reduction of the holding force with ageing.

The holding magnet surfaces are supplied by us with and without a threaded hole. (Type series FB… and FD…).

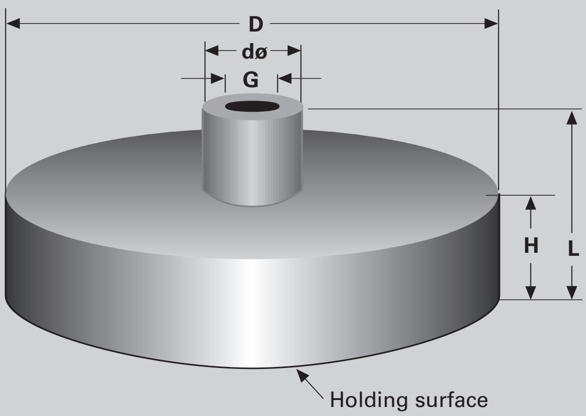
The housing variants are fitted with two different high-energy materials.

DeltaMagnet (SmCo)
Continuous operating temperature 160 °C, for a short time even up to 200 °C, slight reduction of holding force as a result of temperature influence. Holding area resistant to corrosion without surface treatment.

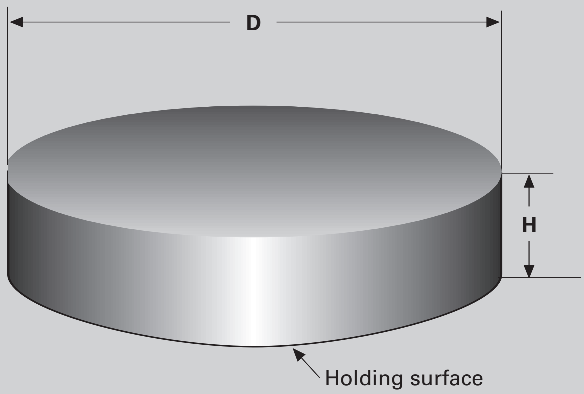
NeoDeltaMagnet (NdFeB)
Continuous operating temperature 80 °C, for a short time even up to 100 °C. Holding force reduction at 80 °C, approx. 15 %, reversible.
Corrosion may occur if there are scratches in the electroplated magnet surface or if used in moist conditions.

Tolerances: After DIN 7168 average, deviating dimension H ± 0.2 mm general for all types.
* The holding forces are minimum values which are reached when the magnet sits directly on the surface of a low carbon steel part, e.g. St 37, with no air gap and is lifted off vertically. The displacement force is, depending on the nature of the surface, around 20 - 35 % of the holding force.

With threaded hole = Types FB..



Without threaded hole = Types FD.. / HN..



Version Deltamagnet (SmCo) Type with	without threaded hole	Version NeoDeltaMagnet (NdFeB) Type with	without threaded hole	Dimensions in mm D Ø	H	L	G	d Ø	Holding force* SmCo N	NdFeB N
FB01	FD01	FB01N	FD01N	6.0	4.5	11.5	M3	6.0	5.0	5.0
FB02	FD02	FB02N	FD02N	8.0	4.5	11.5	M3	6.0	9.0	10.0
FB03	FD03	FB03N	FD03N	10.0	4.5	11.5	M3	6.0	12.0	15.0
FB04	FD04	FB04N	FD04N	13.0	4.5	11.5	M3	6.0	40.0	60.0
FB05	FD05	FB05N	FD05N	16.0	4.5	11.5	M4	8.0	60.0	95.0
FB06	FD06	FB06N	FD06N	20.0	6.0	13.0	M4	8.0	90.0	140.0
FB07	FD07	FB07N	FD07N	25.0	7.0	14.0	M4	8.0	150.0	200.0
FB08	FD08	FB08N	FD08N	32.0	7.0	15.5	M5	10.0	220.0	350.0
	HN06			6.0	4.0				5.0	
	HN10			10.0	5.0				12.0	
	HN13			13.0	5.0				40.0	
	HN17			17.5	5.0				60.0	
	HN25			25.0	9.0				160.0	

All dimensions in mm.

Deep pot holding magnets

With waterproof surface made from stainless steel, seawater resistant, pressurised-water-tight, usable in food areas

Strong holding force by component parts with high-energy magnets (NdFeB), non-demagnetisable, no attenuation of the holding force.
Operating temperature of - 40 °C to + 110 °C.

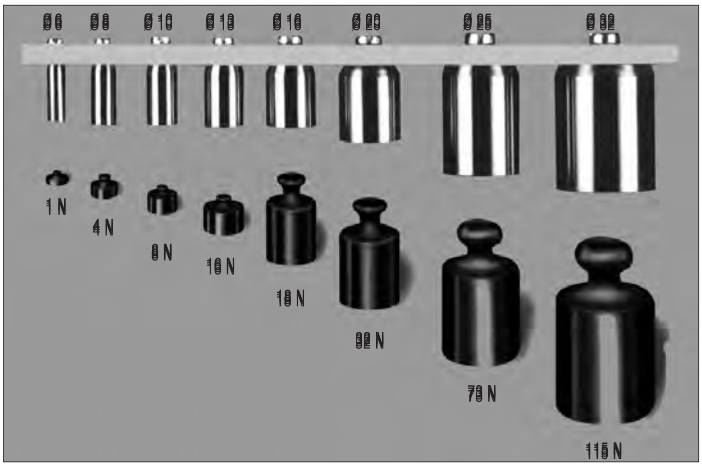
Only slight loss of holding force due to air gap between holding area and magnet.

Can also be used as a catching element for iron and steel parts. General diameter tolerance h9, fixing thread on the rear.

Options:

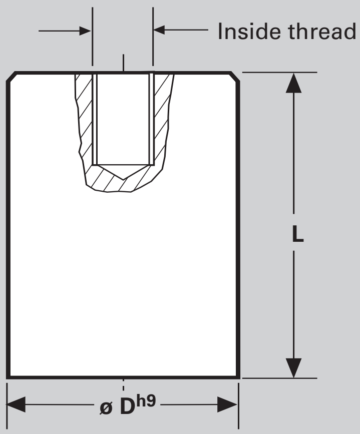
Option 1:
An operation temperature up to + 200°C is possible using DeltaMagnet.

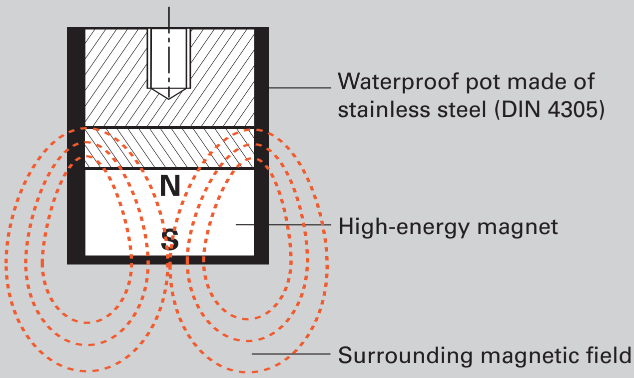
Option 2:
Two magnets, with their magnet areas facing each other, attract each other with a high force if they are installed counterpole-wise in a stainless steel pot. It is therefore also possible to create waterproof rotating head clutches.



The holding forces are minimum values which are reached at full surface contact of the magnet holding area when it sits directly on the surface of a low carbon steel part and is lifted vertically off this part. Application sample 29704858.4. **All units in mm.**

Deep pot holding magnets





Type	Ø D^{h9}	L ± 0,15	Inside thread	Weight	Holding force
GX01	6	20	M3	4 g	1 N
GX02	8	20	M3	7 g	4 N
GX03	10	20	M4	11 g	8 N
GX04	13	20	M4	19 g	16 N
GX05	16	20	M5	28 g	18 N
GX06	20	25	M5	55 g	32 N
GX07	25	35	M6	124 g	73 N
GX08	32	40	M6	228 g	115 N

Deep pot holding magnets

With normal holding force for operating temperatures up to 450 °C

These deep pot holding magnets have been in use for several decades and only hold on one end face. This holding surface is ground. The deep pot magnet system concentrates the holding force onto the holding surface and shields all the other surfaces from the effect of the magnet.

For best use of these holding systems it is recommended not to insert them flush into a steel housing, but to leave them projecting by about 2 mm. It is also sufficient to countersink the space around the system by a clearance of about 3 to 4 mm width. A sleeve made from unmagnetised material, e.g. aluminium, brass or plastic is also recommended. If it is only possible to install them in steel directly, a holding force reserve of 30 % must be considered when choosing the size.

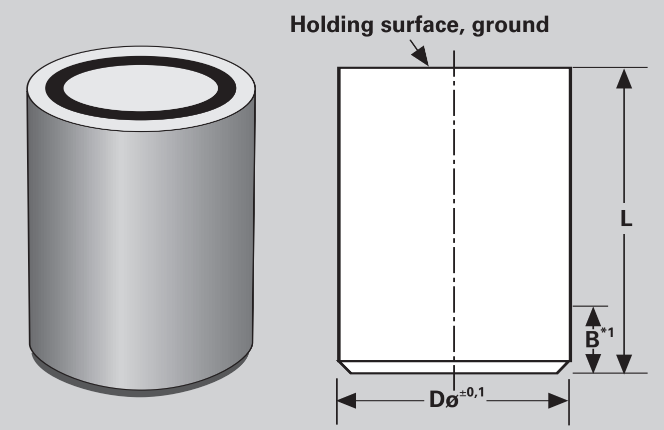
The deep pot holding magnets do not age and maintain their holding force indefinitely. They can only be weakened by strong magnetic fields. With a rise in temperature the holding force only decreases by approx. 10 % per 100 °C reversibly.

Increasing the air gap or roughness on the holding surface rapidly reduces the holding force. With an air gap of 1 mm only about 20 % of the intended holding force remains.

Magnet material: Circular rods made of precision-cast AlNiCo 500.

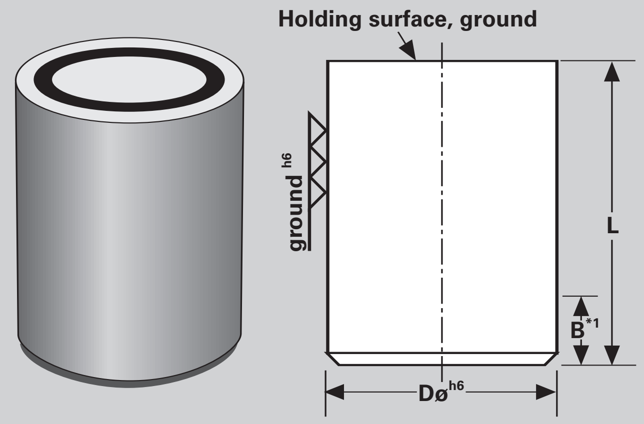
Questions? We would be delighted to offer you advice:
Tel. +49 (0)30 706 30 05
Email: vertrieb@ibsmagnet.de

With diameter tolerance ± 0.1 mm



Type	D Ø ± 0,1	L ± 0,2	B *2	Weight	Holding force *2
G01	6	20	12	4 g	1.5 N (0.15 kp)
G02	8	20	11	7 g	3.5 N (0.35 kp)
G03	10	20	10	10 g	7.0 N (0.70 kp)
G04	13	20	9	19 g	10.0 N (1.00 kp)
G05	16	20	5	29 g	18.0 N (1.80 kp)
G06	20	25	6	57 g	42.0 N (4.20 kp)
G07	25	35	10	140 g	96.0 N (9.60 kp)
G08	32	40	8	240 g	180.0 N (18.00 kp)

Diameter, ground with tolerance h6



Type	D Øh6	L ± 0,2	B *2	Weight	Holding force *2
G01 T	6	10	2	2 g	1.5 N (0.15 kp)
G02 T	8	12	3	4 g	3.5 N (0.35 kp)
G03 T	10	16	6	9 g	7.0 N (0.70 kp)
G04 T	13	18	7	17 g	10.0 N (1.00 kp)
G05 T	16	20	5	29 g	18.0 N (1.80 kp)
G06 T	20	25	6	57 g	42.0 N (4.20 kp)
G07 T	25	30	5	110 g	96.0 N (9.60 kp)
G08 T	32	35	3	200 g	180.0 N (18.00 kp)

All dimensions in mm.

*1 The total length L may be shortened by dimension B without decreasing the holding force. Holding surface can be ground to 2 mm deep.

*2 The holding forces are minimum values which are reached when the magnet sits directly on the surface of a low carbon steel part, e.g. St 37, minimum thickness 3 mm and no air gap, and is lifted off vertically.

Deep pot holding magnets

With very strong holding force

In contrast to our pot structure systems of similar external appearance, the use of high-energy magnets together with the highly effective sandwich system leads to a dramatic increase in the holding force. **If you compare both pot structure systems measuring 16 ø x 20 mm with each other, type G05 has a holding force of 18 N (1.8 kp), while DeltaMagnet system type GD05 has a holding force of 125 N (12.5 kp). That means an increase of nearly 700 %.**

DeltaMagnet pot structure systems are completely resistant to demagnetising fields and maintain their holding force indefinitely. Even the effect of strong magnetic opposing fields resulting from spot welding and hard mechanical impacts does not weaken this force.

Continuous operating temperatures:

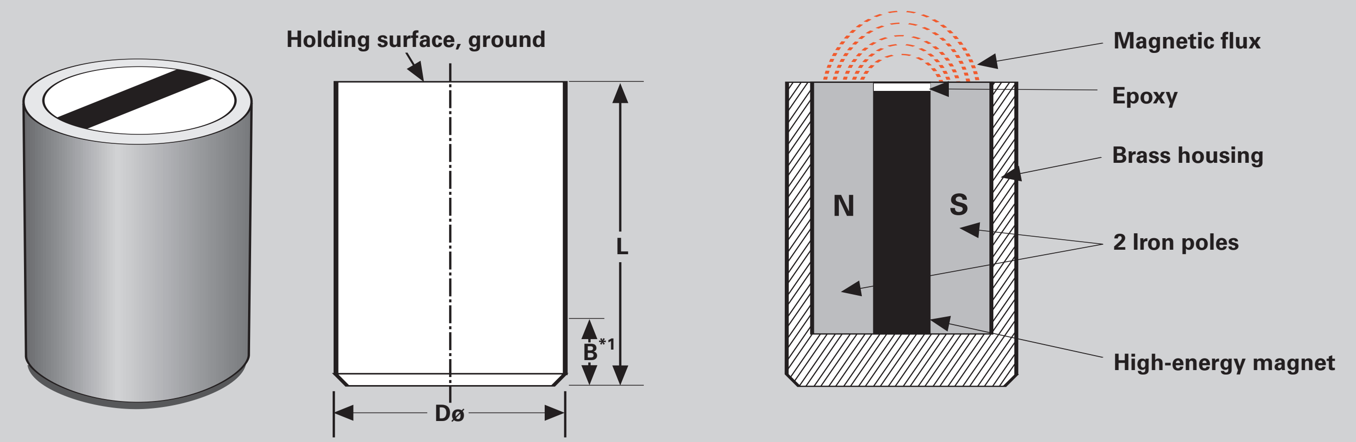
Design with **DeltaMagnet – Type GD…** 160 °C, short time 200 °C. Slight reduction in holding force owing to temperature.

Design with **NeoDeltaMagnet – Type GD…N** 100 °C, short time 120°C. The reduction in holding force at 100 °C operating temperature is approx. 35 % reversible.

Both designs can safely be used at temperatures down to - 70 °C.

Option 1: Rear inner thread according to data.
Option 2: Continuous operating temperature 250°C with DeltaMagnet design. Contains option 3.
Option 3: Extra fixation of the pole pieces with the external structure for frequent temperature changes, impacts or vibrations.
Option 4: Shortening of length (L) by max. B*1

Deep pot holding magnets

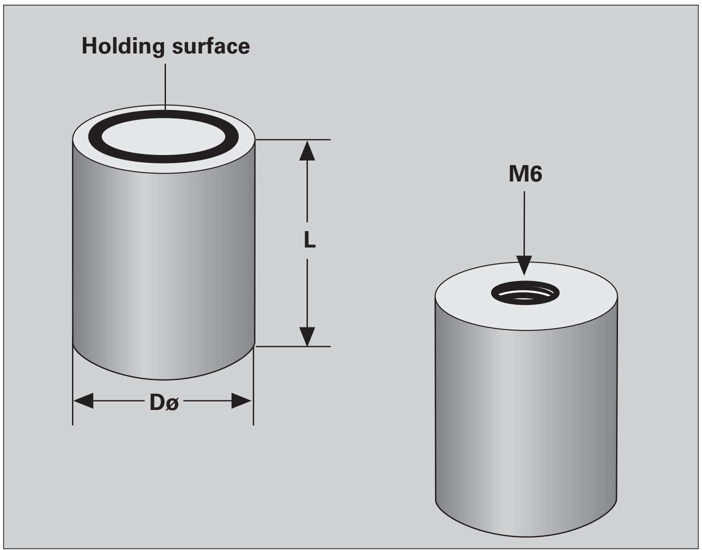


Armament DeltaMagnet (SmCo) Type	Armament NeoDeltaMagnet (NdFeB) Type	D Ø	L ± 0.15	Holding force*2 Armament SmCo	NdFeB	Options 1.	2.	3.	4. (B*1)	Weight
GD01	GD01N	6^{h9}	20	6 N	6 N	M3			10	4 g
GD02	GD02N	8^{h9}	20	10 N	10 N	M3			10	8 g
GD03	GD03N	10^{h6}	20	40 N	45 N	M3	X	X	8	12 g
GD04	GD04N	13^{h6}	20	60 N	70 N	M4	X	X	6	20 g
GD05	GD05N	16^{h6}	20	125 N	150 N		X	X	2	32 g
GD06	GD06N	20^{h6}	25	250 N	280 N	M5	X	X	5	60 g
GD07	GD07N	25^{h6}	35	400 N	450 N	M5	X	X	7	140 g
GD08	GD08N	32^{h9}	40	600 N	700 N	M6	X	X	5	265 g

All Dimensions in mm.

*1 Total length L may be shortened by dimension B. Holding surface may be machined by grinding.
*2 The listed forces are minimum values which result with complete of the magnet holding surface area surface (air gap = 0) on low carbon steel, e.g. St 37, with the pulling force vertical to the surface. Reference temperature +25 °C. Temperature coefficient of the holding force - 1 % per 10°C.

Pot magnets



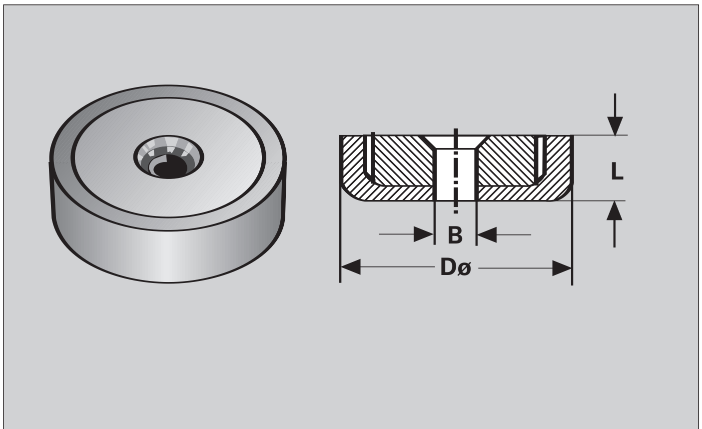
These pot magnets are industry standard in all English-speaking countries where they are referred to as "deep pot magnets".

The installed alloy magnet ALCOMAX is built in with an spacer collar made of aluminium in a soft iron pot. As a result the holding force is concentrated onto the holding area. All pot magnets have an inner thread M6 on the rear.

Max. operating temperature: + 200 °C, surface: lacquered. **All dimensions in mm.**

Type	D Ø	L	Weight	Holding force
DP17	17.5	16.0	23.0 g	27.0 N (2.7 kp)
DP20	20.5	19.0	39.0 g	40.0 N (4.0 kp)
DP27	27.0	25.0	85.0 g	65.0 N (6.5 kp)
DP35	35.0	30.0	184.0 g	159.0 N (15.9 kp)

Disc-type holding magnets for use up to 500 °C

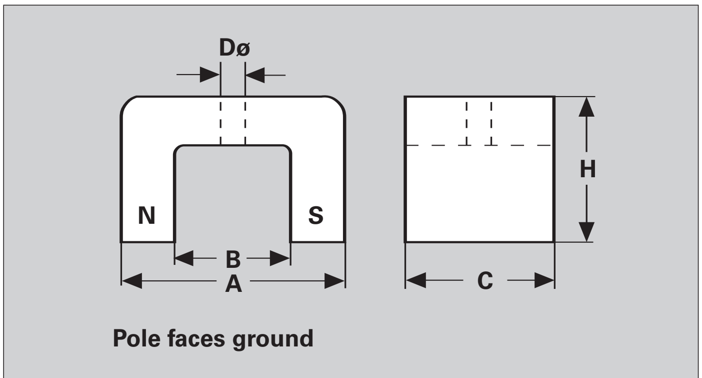


These disc-type holding magnets have a ring made of the metallic magnetic material AlNiCo. They can be continuously used up to a temperature of + 500 °C. However, the stability against demagnetisation is not as high as with pot or deep pot holding magnets. Only fix with countersunk screws made of non-magnetic materials, e.g. brass or stainless steel.

All dimensions in mm.

Type	D Ø	L	B Ø	Weight	Holding force
HT19	19.0	8.0	3.2	13.0 g	32.0 N (3.2 kp)
HT28	29.0	8.5	5.0	36.0 g	50.0 N (5.0 kp)
HT38	38.0	11.0	4.5	80.0 g	80.0 N (8.0 kp)
HT60	60.0	15.0	8.0	300.0 g	500.0 N (50.0 kp)

U Magnets

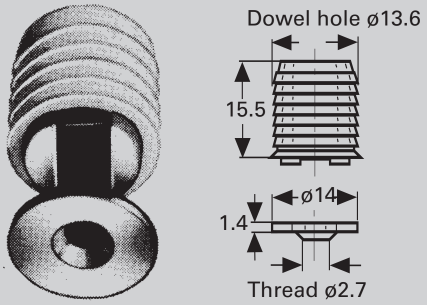


Cast alloy magnets in U shape with both poles on the area. Through-hole on the back of the magnet to fix a screw made of non-magnetic material (stainless steel, brass etc). Delivery with pole cover plate. Magnet material: AlNiCo.

All dimensions in mm. Surface: laquered.

Type	A	B	C	H	D Ø	Weight	Holding force
U30	30	15	20	20	4	55 g	45 N (4.5 kp)
U40	40	20	25	25	5	120 g	90 N (9.0 kp)
U45	45	23	30	30	5	182 g	120 N (12.5 kp)

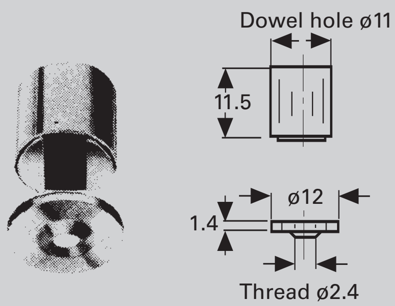
Small holding magnets as inserts



Type EH10

Dowel-shaped magnet system, to be pressed into rough dowel holes.

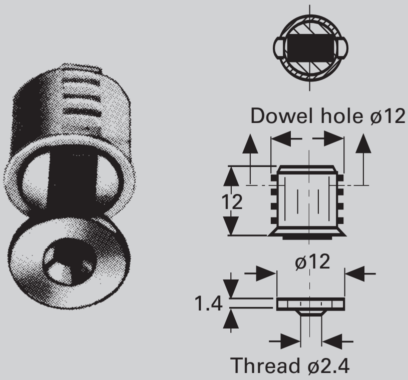
Holding force: 30 N (3 kp)
Housing: plastic, white
Weight: 11 g
Supplied with anchor plate 14 mm diameter



Type EH12

This magnet system is mounted in a brass pot structure. Fastening by means of gluing or press-fit.

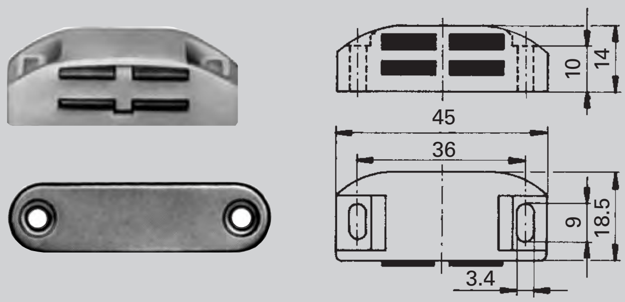
Holding force: 20 N (2 kp)
Housing: brass, nickel-plated
Max. operating temperature: max. + 100 °C
Weight: 8 g
Supplied with anchor plate 12 mm diameter



Type EH11

Smooth plastic housing with notches for solid insertion or gluing into dowel holes.

Holding force: 20 N (2 kp)
Housing: plastic, white
Weight: 7 g
Supplied with anchor plate 12 mm diameter



Type EH13

Holding magnet block in plastic housing with two pairs of magnet poles. The magnet poles are flexible and can be adapted to the holding area. Delivery with iron counterplate.

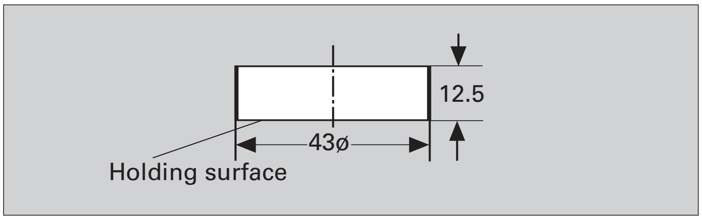
Holding force: approx. 45 N (4.5 kp)

All dimensions in mm.

Magnets in plastic housing

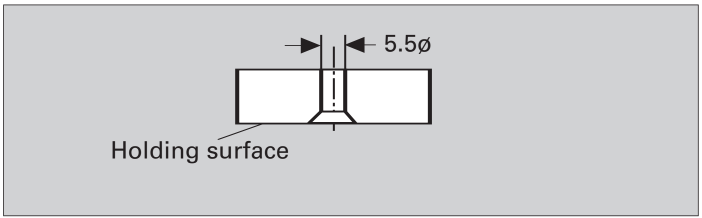
Disc-shaped holding magnets, 43 mm diameter, available in four different variants. Holding magnet systems with white plastic casing. **All units in mm.**

Holding force: 80 N (8 kp)
Max. operating temperature: 75 °C



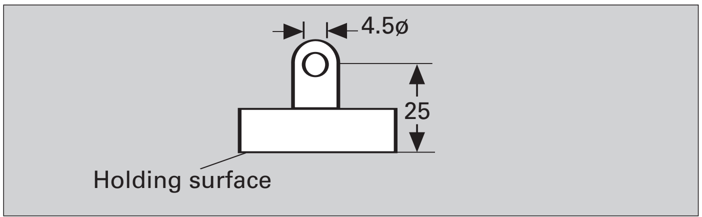
Type K43

Smooth disc magnet.



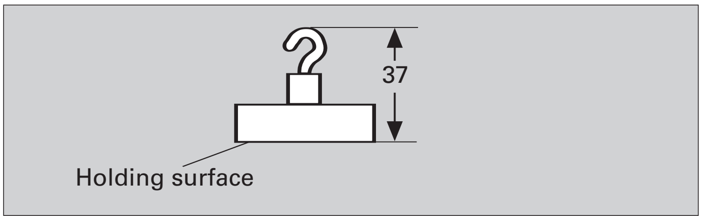
Type K43 S

Disc magnet with centre hole and 90 °C countersink on holding surface.



Type K43 L

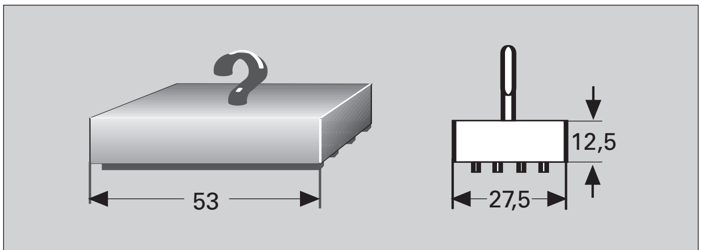
Disc magnet with bracket for fastening.
Thickness of bracket: 4 mm



Type K43 H

Disc magnet with hook screwed into a screw block.

Holding magnet with hook

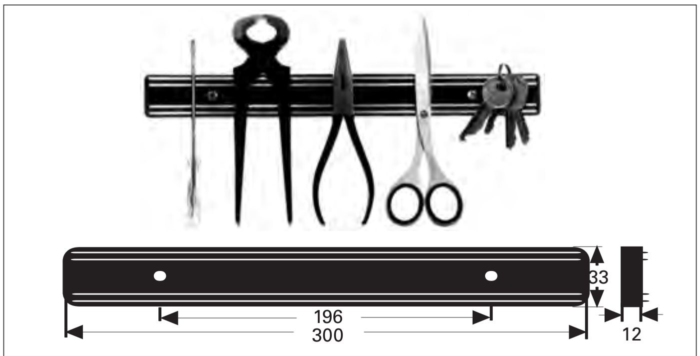


Type Z01

Holding force: 150 N (15 kp)

White plastic housing with 2 sandwich-type magnet systems. Particularly suitable for thin sheet metal.

Magnetic holding rail



Type ML 30

This magnetic rail can be used to keep your workplace tidy. Two long magnet systems are mounted in a solid black plastic rail. Any iron or steel parts are safely held magnetically. Screwdrivers, pliers and other tools made of iron or steel, as well as keys, spare parts, scissors and knives are magnetically held in place. The magnetic holding rail can be fastened to any wall using two countersunk screws (5 mm diameter). Using several magnetic holding rails creates an extremely practical storage system.

IBSMagnet High-power magnet rails

These magnetic rails create a very strong field on the active surface. They can be used, for instance, as a safe stopper on machine tools, as a fixing for heavy doors or to create simple clamping tables.

The active surface may be machined with any normal cutting or grinding tools without weakening the magnetic force. In normal applications the holding force stays constant indefinitely.

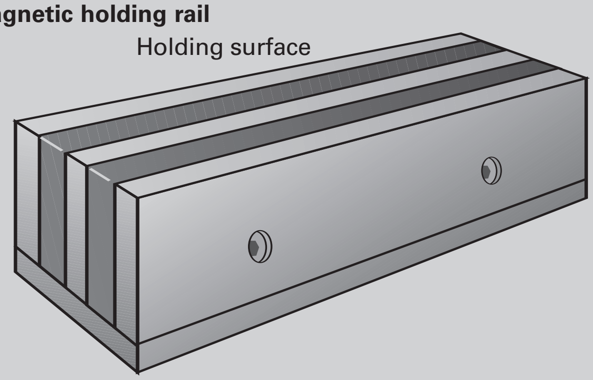
Operating temperature: max. + 85 °C, min. - 40 °C (short-term + 100 °C)

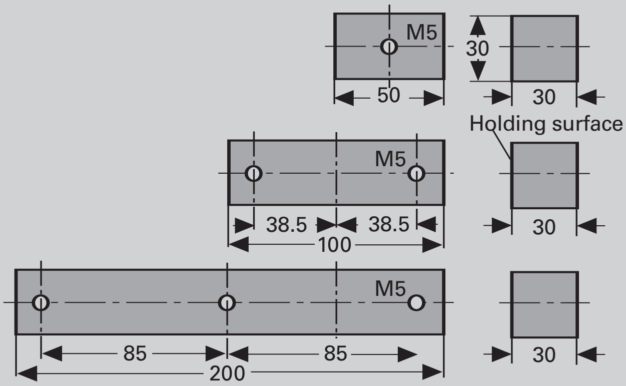
Temperature coefficient of the holding force: - 4 % per 10 °C (Reference temperature + 20 °C)

Type	Holding force*
L50	250 N (25 kp)
L100	500 N (50 kp)
L200	1,000 N (100 kp)

*The holding forces are minimum values which are reached with complete contact of the magnet holding area when it sits directly on the surface of a low carbon steel part, e.g. St 37, minimum thickness 5 mm, and is lifted off vertically.

Magnetic holding rail



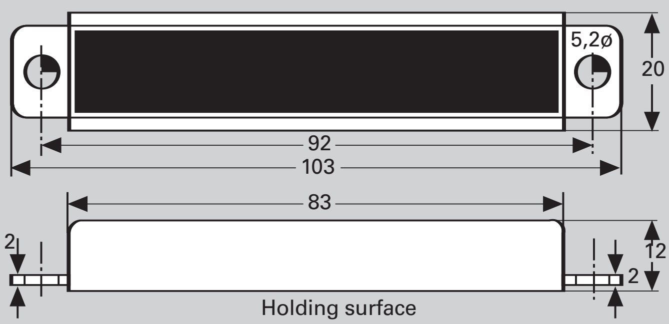


Type HL10

Low-price holding rail in 2 mm steel housing. Unit can also be used for separation of iron particles into small separation systems.

Holding force: 140 N (14 kp)
Max. operating temperature: + 160 °C
Surface: zinc plated, blue passivated

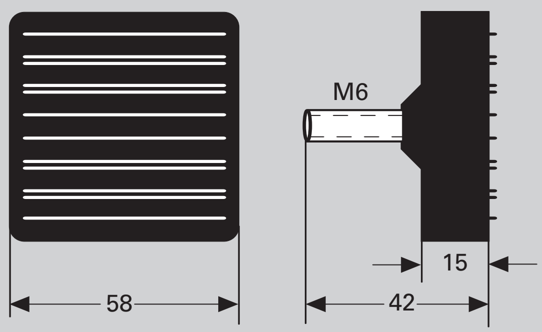
Magnetic holding rail



Type HM500

Holding force: 300 N (30 kp)
Due to the “floating” pole ribs, an excellent holding force on uneven or curved surfaces (car bodies) is obtained. A total of 6 magnet systems with 12 pole ribs ensure optimum holding forces even on thin and painted steel sheets.
Max. operating temperature: + 50 °C
Design: Housing made of glass fibre reinforced plastic, black.
Upper part with fastening bolt M6 x 20 mm is attached by ultrasonic welding.
Special version: Instead of bolt M6 the holding magnet can also be supplied with inside thread M6.

Holding magnet for uneven surfaces and iron sheets



All dimensions in mm.

Magnetic ball joints

Steel ball magnetically held in spherical socket

The steel ball is subject to a magnetic field in the permanent magnetic system and is thus held in the spherical socket by this magnetic force.
This results in a joint which can be turned in any direction with an angle up to 180°C. If the holding force of the magnet system is exceeded, the ball is released without damage.

Application examples:

Since the magnetic ball joint is electro-conductive, rapid-release and rotatable electrical connections can be made with such a system. This is of advantage, for instance, in modern low-voltage lamps. Rapid-release connections for test fixtures are also possible. In lifting linkages a predetermined breaking point can be provided, or sideways movements compensated.

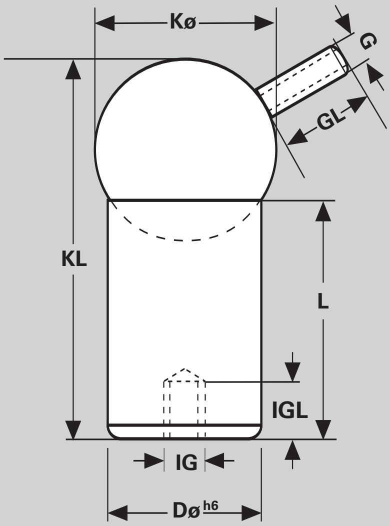
Due to the use of high-energy rare-earth magnets, magnetic ball joints types KD... have a very strong holding force. The resulting displacement force of the ball is strong enough to hold the optical systems of cameras, lighting fixtures or laser units without requiring a mechanical fixation.

For magnetic ball joints with other dimensions please consult us.

Operating temperature:	Max. 100 °C
Tolerances:	KL/GL ± 0.5 mm D ø ground, tolerance h6 (Exception Type K8) otherwise general tolerance ± 0.1 mm **All units in mm.**

Special designs possible: All-round galvanic plating – units with max. operating temperature of 200 °C.

Magnetic ball joints



Type	K Ø (Ball)	D Ø (Magnet)	KL	L	G	GL	IG	IGL	
K8	8.0	12.5 ± 0.05	18.0	12.0	-	-	-	-	Ball with inner thread M 4/3.5 mm deep without thread IG on the rear Holding force 10.0 N (1.0 kp)
KD310	10.0	10.0	28.0	20.0	M3	12.0	M3	5.0	Holding force 18.0 N (1.8 kp)
KD312	12.0	10.0	30.5	20.0	M3	12.0	M3	5.0	Holding force 18.0 N (1.8 kp)
KD413	13.0	13.0	31.0	20.0	M4	12.0	M4	6.0	Holding force 40.0 N (4.0 kp)
KD418	18.0	13.0	36.0	20.0	M4	12.0	M4	6.0	Holding force 40.0 N (4.0 kp)
KD516	16.0	16.0	34.0	20.0	M4	12.0	–	–	Holding force 70.0 N (7.0 kp)
KD625	25.0	20.0	47.0	25.0	M5	16.0	M5	5.0	Holding force 150.0 N (15.0 kp)
KD725	25.0	25.0	56.0	35.0	M5	16.0	M5	7.0	Holding force 200.0 N (20.0 kp)

Rubber-covered holding magnets

For holding on sensitive surfaces

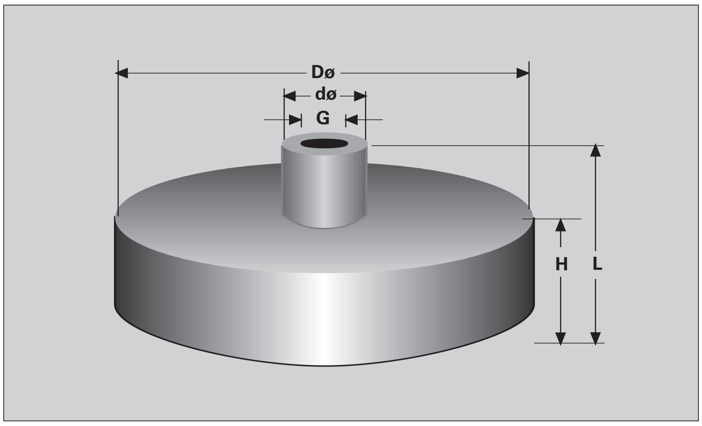
The holding magnets are fitted with high-energy magnets made of NeoDeltaMagnet (NdFeB). These magnets not only have a strong holding force, but are also completely resistant to demagnetising influences. The holding force is not weakened even after years of use. The multi-pole structure of the magnets ensures a dense magnetic field on the holding surface. This allows good holding on thin, painted car body metal. The side displacement forces are extremely good on account of the "suction effect" of the rubber surface.

These rubber-covered holding magnets are especially suitable for magnetically fixing items such as advertising displays and safety lights on car roofs. They are also suitable for fixing signs, plates or sample parts scratch-free on highly polished, chrome-plated or painted steel surfaces.

Rubber-coated holding discs with threaded hole on the backside

Type	D Ø	H	L	d Ø	G	Holding force 1*	Holding force 2*
GS12	12.0	7.0	14.8	8.0	M4	12.0 N	10.0 N
GS43	43.0	6.0	12.0	8.0	M4	77.0 N	55.0 N
GS66	66.0	8.5	15.0	10.0	M5	180.0 N	125.0 N
GS88	88.0	8.5	17.0	12.0	M8	420.0 N	280.0 N

Holding force 1* St 37 steel, 8.0 mm
Holding force 2* steel sheet 0.8 mm
All units in mm.

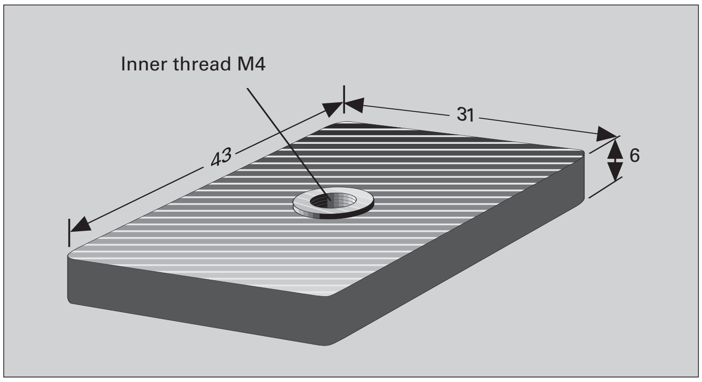


The holding magnets of this series opposite are available with threaded stud instead of threaded bush with inner thread.

Rubber-coated holding system with six high energy magnets installed

Type GU12

Holding forces: St 37, 8.0 mm: 120 N
steel sheet, 0.8 mm: 80 N



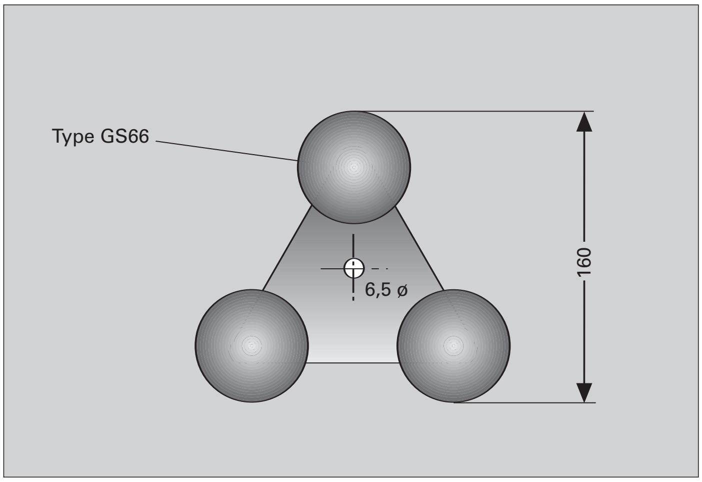
Holding system with three rubber-coated holding magnets, which are flexibly installed on a triangular aluminium plate. Good holding on arched car roofs.

Type GS443

Equipped with 3 holding discs type GS43
Holding forces: St 37, 6.0 mm: 230 N
Steel sheet, 0.8 mm: 165 N

Type GS663

Equipped with 3 holding discs type GS66
Holding forces: St 37, 6.0 mm: 540 N
Steel sheet, 0.8 mm: 375 N

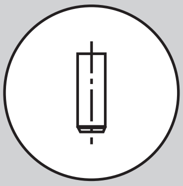


Miniature holding magnets

Pin, Set screw and Holding rail

Small holding magnets made of stainless steel V2A (material 1.4301). These holding magnets are completely stable against demagnetisation and are not subject to long term loss of holding force.

Type MI 04

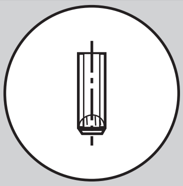


Scale 1 : 1

Miniature holding magnet

4^{m6} ø x 10 mm; Holding force: 1,75 N (175 p)
stainless steel with circular disc made of Sm_2Co_{17}
completely water resistant and non-corrosive
max. operation temperature: + 180 °C

Type MG 4

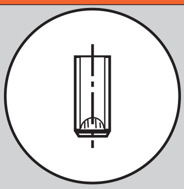


Scale 1 : 1

Set screw with Allen key connection at the rear

M4 x 10 mm; Holding force: 0,6 N (60 p)
stainless steel with circular disc made of Sm_2Co_{17}
completely water resistant and non-corrosive
max. operation temperature: + 180 °C

Type MG 5

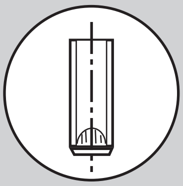


Scale 1 : 1

Set screw with Allen key connection at the rear

M5 x 10 mm; Holding force: 2,5 N (250 p)
stainless steel with circular disc made of Sm_2Co_{17}
completely water resistant and non-corrosive
max. operation temperature: + 180 °C

Type MG 6

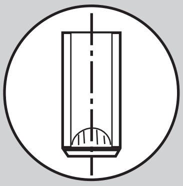


Scale 1 : 1

Set screw with Allen key connection at the rear

M6 x 14,5 mm; Holding force: 4,2 N (420 p)
stainless steel with circular disc made of Sm_2Co_{17}
completely water resistant and non-corrosive
max. operation temperature: + 180 °C

Type MG 8

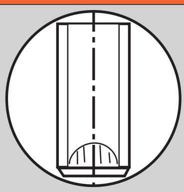


Scale 1 : 1

Set screw with Allen key connection at the rear

M8 x 15,5 mm; Holding force: 8 N (800 p)
sandwich magnet system with 2 iron poles and NdFeB magnet
set screw made of stainless steel, completely water resistant
max. operation temperature: + 120 °C

Type MG 10

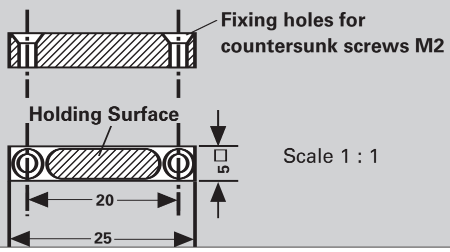


Scale 1 : 1

Set screw with Allen key connection at the rear

M10 x 19,5 mm; Holding force: 10 N (1 kp)
sandwich magnet system with 2 iron poles and NdFeB magnet
set screw made of stainless steel, completely water resistant
max. operation temperature: + 120 °C

Type MG 25



Scale 1 : 1

Miniature magnetic holding rail

5 x 5 x 25 mm; Holding force: 5 N (500 p)
Housing made of stainless steel
Holding surface cast with epoxy resin and ground
completely water resistant and non-corrosive
max. operation temperature: + 120 °C

IBSMagnet Betaflex® magnet tapes

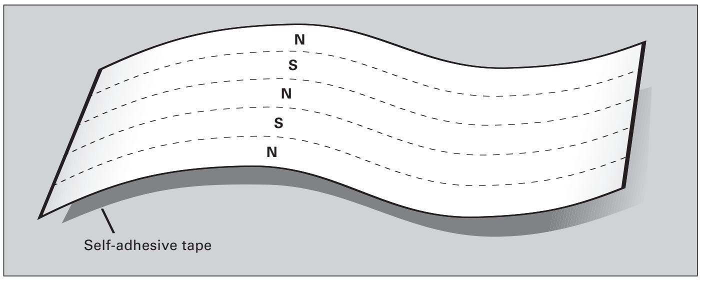
■ **Self-adhesive magnet tape**

Betaflex magnet tape is anisotropic, that means the magnet particles made of strontium ferrite contained in the flexible plastics are aligned by a magnetic field in the direction of the thickness (1.5 mm) during production.

The very strong holding force 80 cN/cm² (80 g/cm²) of Betaflex magnet tape results from anisotropy and the subsequent multipole magnetisation.

The non-magnetic side of the self-adhesive magnet tape is provided with a protective cover. The adhesive area should be kept clean and free from dust, oil or grease. Sticking the tape onto steel sheet increases the holding force.

Max. operating temperature: + 75 °C
Holding force with air gap:
0.0 = 0.80 N/cm² (80 g/cm²)
0.1 = 0.61 N/cm² (61 g/cm²)
0.2 = 0.51 N/cm² (51 g/cm²)
0.5 = 0.29 N/cm² (29 g/cm²)
Displacement force: Approx. 1/3 of the holding force



We supply the following standard magnet tapes at short notice, generally from stock.
Single metre or 40 m roll.

Type	Dimensions (mm) width x thickness	Tolerance of width	Roll legth (m)	Roll weight (kg)
MB14	14.0 x 1.5	±0.3	40.0	3.1
MB20	20.0 x 1.5	±0.3	40.0	4.4
MB50	50.0 x 1.5	±0.3	40.0	11.0

IBSMagnet Betaflex® magnet foil

The magnet foil consists of a mixture of strontium ferrite powder and a flexible thermoplastic bonding material. The foil is produced in thicknesses of 0.4 mm to 2.0 mm by calendering. The magnet foil sticks to all surfaces containing iron, e.g. steel plate. The permanent magnetic properties are not reduced even after long-term use.

The magnet foils are resistant to temperatures between - 40 °C and + 80 °C and widely resistant to diluted alkaline solutions and acids. They can be cut, punched and screen-printed.

We supply the following types according to customer dimensions:
- Plain (uncoated, both sides brown)
- White or colour-coated with adhesive foil on the non-magnetic side
- With self-adhesive coating on the non-magnetic side

Applications:
Stock labelling, committee nameplates, information and warning signs, magnetic bags, price signs, magnetic signs for car advertising, information walls.

We are able to supply the following standard magnet foils at short notice, generally from stock.

■ **Magnet foil – white laminated**

Thickness 0.8 mm, magnetic side dark brown, holding force 50 cN/cm² (50 g/cm²)

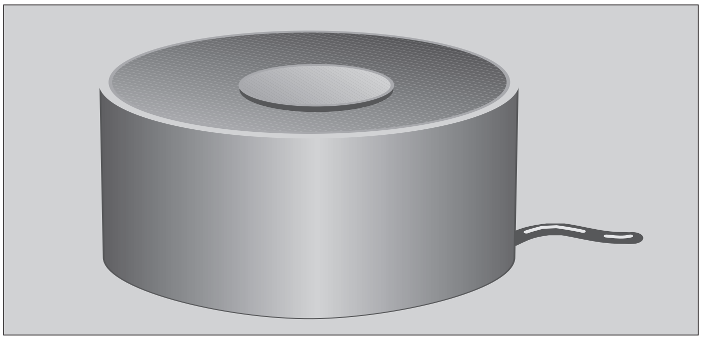
Type	Sheet size
FP69	600 x 900 mm
FP23	200 x 295 mm
FP13	100 x 295 mm

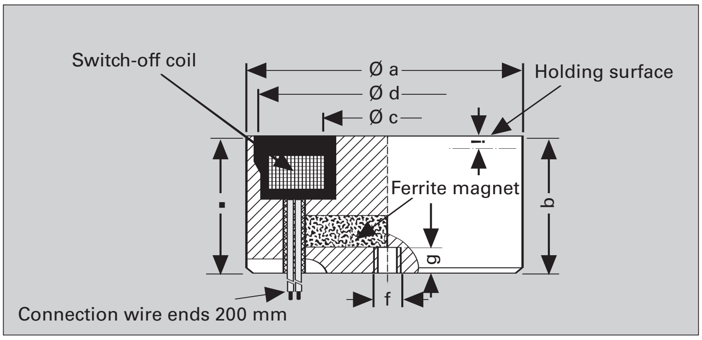
■ **Magnet foil – self-adhesive**

Thickness 0.8 mm, non-magnetic side with self-adhesive coating and paper cover. Holding force 50 cN/cm² (50 g/cm²)

Type	Sheet size
SF21	210 x 300 mm
SF15	150 x 210 mm
SF100	1000 x 1000 mm

Holding magnets with electrical switch-off





Holding magnets with electrical switch-off

The permanent magnet system of these holding magnets creates a magnetic field between the centre pole and the outer border of the holding surface. In addition to the permanent magnet, which creates the holding force, a coil is installed. When 24 V= is applied to this switch-off coil a counterpole magnetic field is set up to neutralise the permanent magnetic field. As a result workpieces can easily be removed. These holding magnets will preferably be used when long-term holding times are required and tools should be loosened by switching on the coil for a short period. Installation: Fixing by inner thread on the back. Observe the thread depth. When installing flush in steel a case made of non-magnetisable material (e.g. brass) is required, or the holding area has to project from the surface (thickness of the case wall or projection corresponding to the thickness of the outer pole).

Turning-on duration: The holding magnets are made for 25 % TD at a duration of = 2 min. or 40 % TD at = 0.5 min. In maintaining the turning-on duration the remaining holding force amounts to max. 3 % of the nominal force. You can increase the holding force by reversing of the electric polarity and switching on the coil for a short period

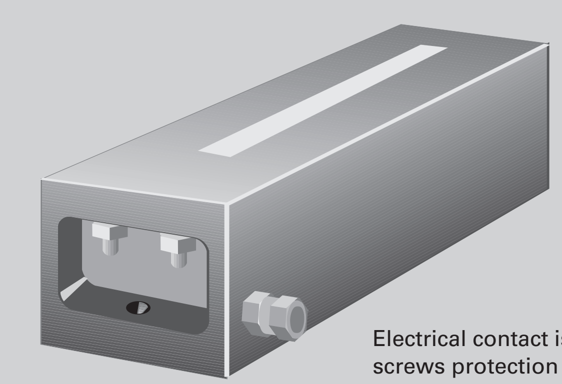
$$\text{Turning on duration (TD)} = \frac{\text{Turning on duration}}{\text{Duration}} \times 100$$

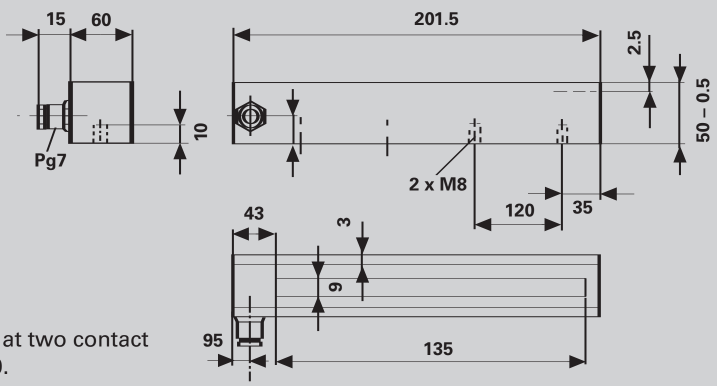
Operating voltage of switch-off coil: 24 V = / + 5 % ... - 10 %
Connection to switch-off by free wire ends : red + / blue -

Type	Holding surface ø a (- 0.1)	Holding force* N	kp	b	ø c	ø d	f	g	i	Input power	Weight	Minimum thickness
SE2	20.0	40.0	4.0	22.0	9.0	18.0	M4	5.0	1.0	3.6 W	37.0 g	2.5 mm
SE3	35.0	160.0	16.0	28.0	11.2	33.0	M4	5.0	2.0	4.6 W	200.0 g	3.0 mm
SE5	55.0	420.0	42.0	36.0	18.0	52.0	M5	6.0	2.0	9.0 W	500.0 g	4.5 mm
SE7	70.0	720.0	72.0	45.0	24.0	65.6	M8	8.0	2.0	13.3 W	900.0 g	6.0 mm
SE9	90.0	1,200.0	120.0	48.0	30.0	84.7	M8	8.0	2.0	21.8 W	1,700.0 g	7.5 mm
SE15	150.0	3,500.0	350.0	63.0	55.0	140.0	M16	16.0	3.0	44.0 W	6,400.0 g	12.5 mm

All units in mm.

Magnetic holding rail with electrical switch-off



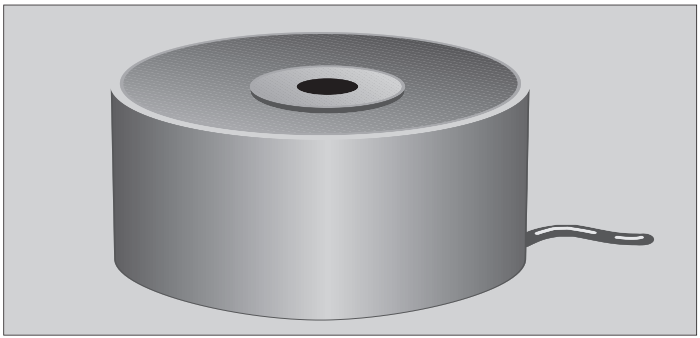


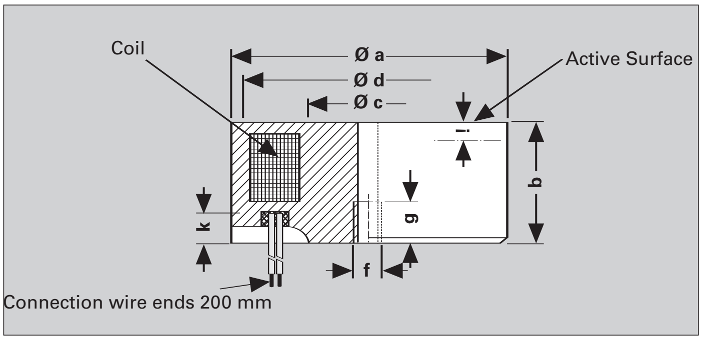
Electrical contact is created at two contact screws protection type IP00.

Type	Holding surface	Holding force*		Imput power	Weight	Minimum thickness of Magnetlayer
LE8	200 x 60	1,530	150	40 W	3.0 kg	10 mm

* The holding forces depend on the minimum thickness of the magnet layer, a 100 % contact of the magnet holding surface area and zero air gap on an even surface with vertical pulling force at a warm operating temperature. No holding force when air gap.

Electrical holding magnets





Electrical holding discs

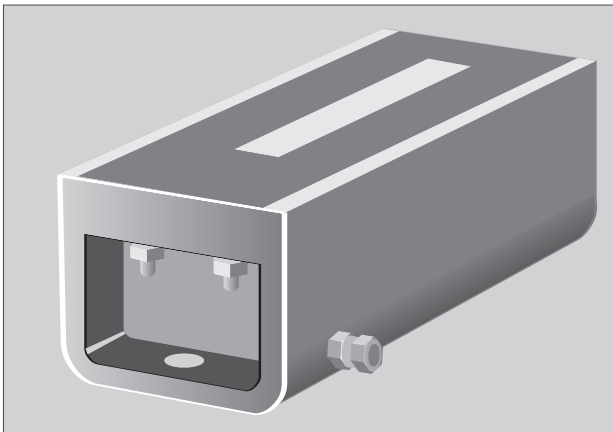
For this DC holding magnet system, the magnetic holding effect only occurs on power up. The operating voltage is 24 V =. The switch-on duration can be 100 %. The holding discs are supplied with free wire ends, the magnetic holding rails with two open connection screws. Depending on the application, it is necessary to observe accident prevention regulations. For the following magnetic holding rails the holding area can be reduced by 2.5 mm in order to carry out necessary reworking. For circular holding magnets the holding area can be reduced by the measure "i".

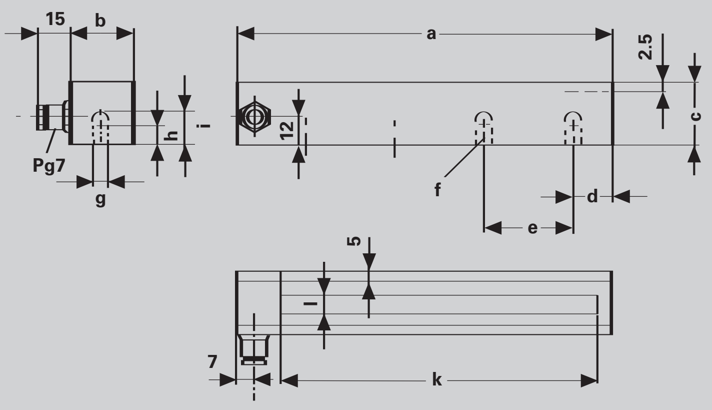
The diameter of the middle hole corresponds to the size of the reverse inner thread.

Type	Holding surface ø a (- 0.1)	Holding force* N	kp	b	ø c	ø d	f	g	i	Input power	Weight	Minimum thickness
EM1	18.0	40.0	4.0	11.0	8.0	16.1	M3	5.0	1.0	1.4 W	17.0 g	2.0 mm
EM2	25.0	140.0	14.0	20.0	11.1	22.3	M4	6.0	1.0	3.2 W	60.0 g	3.0 mm
EM3	32.0	230.0	23.0	22.0	14.3	28.6	M4	6.0	3.0	3.6 W	110.0 g	3.6 mm
EM5	50.0	700.0	70.0	27.0	22.4	44.7	M5	8.0	3.0	6.5 W	300.0 g	6.0 mm
EM8	80.0	1,800.0	180.0	38.0	34.0	72.8	M8	12.0	3.0	15.0 W	1,100.0 g	9.0 mm
EM15	150.0	9,000.0	900.0	56.0	67.9	134.0	M16	24.0	3.0	37.0 W	6,400.0 g	17.0 mm

All dimensions in mm.

Magnet holding rails



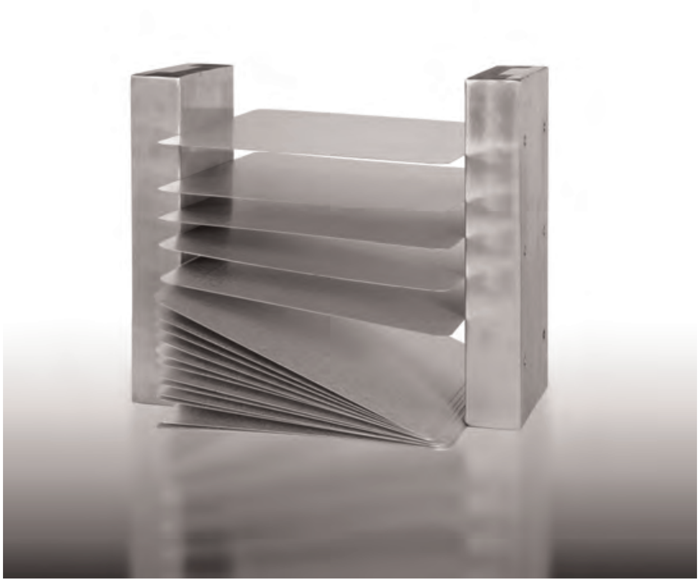


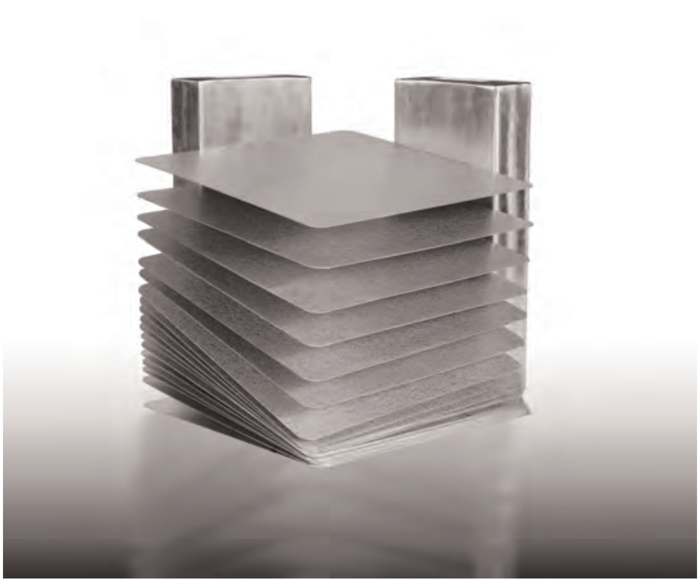
Type	Holding surface a x b	Holding force* N	kp	c	d	e	f	g	h	i	k	l	Input power	Weight	Minimum thickness
EL1	100.0 x 32.0	880.0	88.0	31.0	20.0	50.0	2 x	M6	10.0	13.5	68.0	10.0	7 W	650.0 g	8.0 mm
EL3	200.0 x 32.0	2,100.0	210.0	31.0	20.0	50.0	4 x	M6	10.0	13.5	168.0	10.0	14 W	1,250.0 g	8.0 mm
EL5	500.0 x 32.0	6,000.0	600.0	31.0	20.0	50.0	10 x	M6	10.0	13.5	468.0	10.0	35 W	3,150.0 g	8.0 mm
EL7	150.0 x 60.0	2,600.0	260.0	49.0	30.0	75.0	2 x	M8	12.0	15.0	93.5	12.0	22 W	2,350.0 g	10.0 mm
EL8	200.0 x 60.0	3,750.0	375.0	49.0	35.0	120.0	2 x	M8	12.0	15.0	144.0	12.0	31 W	3,200.0 g	10.0 mm

All dimensions in mm.

* The holding forces depend on the minimum thickness of the magnet layer for mild steel (St 37), a 100 % contact of the magnet holding surface area and zero air gap on an even surface with vertical pulling force at a warm operating temperature (at 90 % working voltage). On request we can provide information about the decrease of holding force when working with an air gap or thinner magnet layer. The magnets with a bigger distance between the poles (i.e. type EL7, EL8) are suitable for holding parts with unclean, rough surfaces.

IBSMagnet | Speading magnets for steel plates A helpful device for manufacturers of steel





Stacked steel plates can be separated with spreading magnets. As shown above the separation of plates can be done by different arrangements of the spreading magnets at the pile of sheets. Only steel with magnetc conductivity can be separated.

The size and the amount of spreading magnets that should be used depends on the following conditions:

1.) Thickness of the steel plates
2.) Size of the steel plates
3.) Thickness of the pile
4.) Surface conditions (dry, oily, damp, rusty...)

Dry and smooth steel plates having a thickness of 0.7 to 2.0 mm will be spread using only one single spreading magnet in the middle of the pile. Please ask for our assistance when using thicker steel plates. Steel sheets with a size over 0.6 m^2 - depending on the thickness of the sheets - require two magnets at opposite sides or magnets at all four edges of the pile. To calculate the required length of the magnets to be used, add 15 to 20% to the thickness of the pile of sheets. Always double the amount of magnets when having oiled sheets.

Just send us details about your application telling us the surface conditions of the plates used. We will offer the best possible solution. When using spreading magnets please pay attention to the very high magnetic attraction between two magnets and between magnets and steel parts. When using them careless injuries may happen.

Design: Equipped with anisotropic ferrite magnets (SrFe). Housing made of stainless steel. Backside stable plate with threaded holes for fastening. The SrFe magnets are stable against demagnetisation for a lifetime.

Type	L x W x H in mm	Threaded holes	Weight
SP2	220 x 102 x 36	6 x M6 in two rows	5,0 kg
SP3	340 x 102 x 36	10 x M6 in two rows	6,6 kg
SP4	460 x 102 x 36	14 x M6 in two rows	9,0 kg
SP5	580 x 102 x 36	18 x M6 in two rows	11,5 kg
SP67	280 x 180 x 90	2 x M12 central	23,5 kg
SP68	400 x 180 x 90	3 x M12 central	33,5 kg
SP08	400 x 205 x 88	2 x M10 central	33,0 kg
SP66	765 x 105 x 50	4 x M6 central	20,3 kg

All Dimensions in mm.

Magnet systems for iron separation

■ **Iron catching blocks**

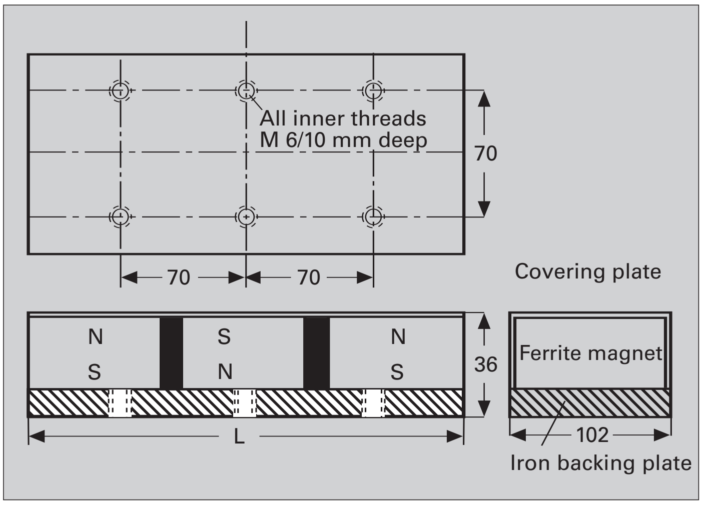
These are fitted with strong, ceramic permanent magnet blocks (SrFe). The iron poles in the magnetic system concentrate the magnetic flux in one direction so that there is a strong and wide-reaching magnetic field at the active surface. The magnet material installed has good magnetic stability – the block magnets will retain their magnetic force for a lifetime.

The active surface is covered with stainless steel (material 1.4301).

For installation purposes, there are inner threads on the rear.

The block magnet systems can be used up to a working temperature of + 100 °C.

Caught iron parts should periodically be removed from the magnet surface.

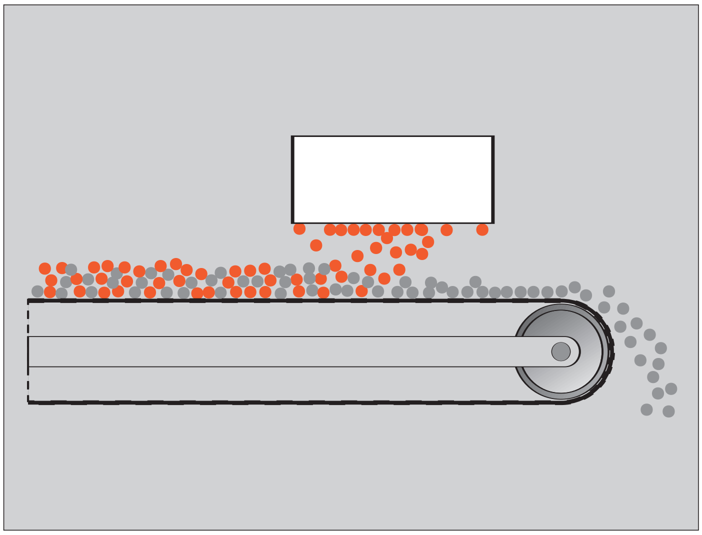


Type	Dimensions
FM2	220 x 102 x 36 mm
FM3	340 x 102 x 36 mm
FM4	460 x 102 x 36 mm
FM5	580 x 102 x 36 mm

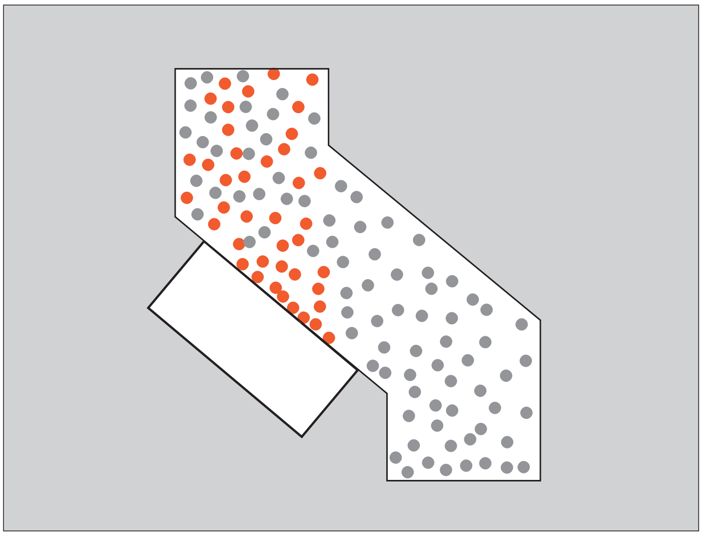
Custom-made dimensions on request.

Catching distance for all types e.g.

For a steel nut M5 approx. 60 mm
For a bolt M5 x 30 approx. 100 mm



Mounted over a conveyor belt, the iron parts "jump" to the holding surface.



Installed in a pipe system with direct contact to the material flow. To guarantee a high degree of separation a cascade-type structure of several block magnets behind each other is possible.

CAUTION!
Installation and safety note: During handling, unpacking and assembly ensure that no loose iron parts such as tools or bolts are in the vicinity.
The magnetic force is so strong that personal injuries can occur if your finger comes between iron parts and the active surface. No steel parts should be within a distance of 400 mm below the active surface.

Super-strong magnet systems for iron separation

Magnetic filter bars

Highly effective magnetic filter bars to also collect smaller iron particles from liquids and/or dust or grain-like materials.

The filter bars are equipped with high-energy magnets which create a strong and dense magnetic field around the circumference. With these super-strong filter bars, it is possible to catch and separate even small iron particles.

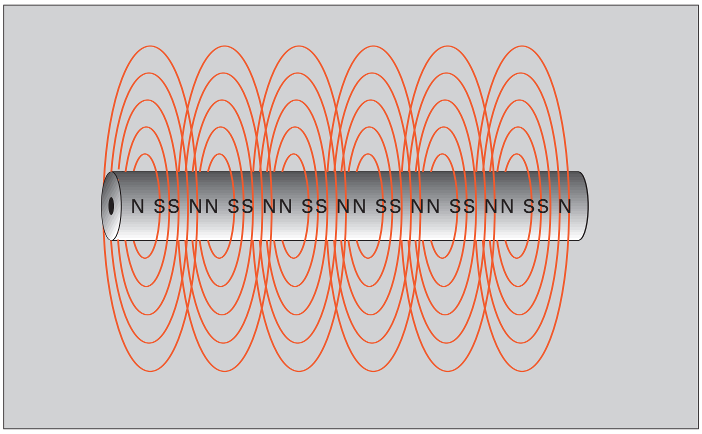
The installed high-energy magnets are completely stable against demagnetisation and are not subject to a loss of holding force long-term.

Type	Diameter	Length
RS1100	10 mm	100 mm
RS1150	10 mm	150 mm
RS1200	10 mm	200 mm
RS2100	22 mm	100 mm
RS2150	22 mm	150 mm
RS2200	22 mm	200 mm
RS2250	22 mm	250 mm

Both end faces with inner threads M5 x 5 mm deep.
Custom-made dimensions on request.

The tube case is made of stainless steel (material 1.4301) and can also be used in food areas.

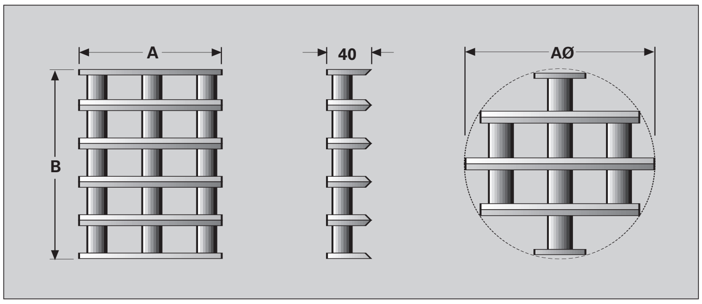
The max. operating temperature is + 110 °C.



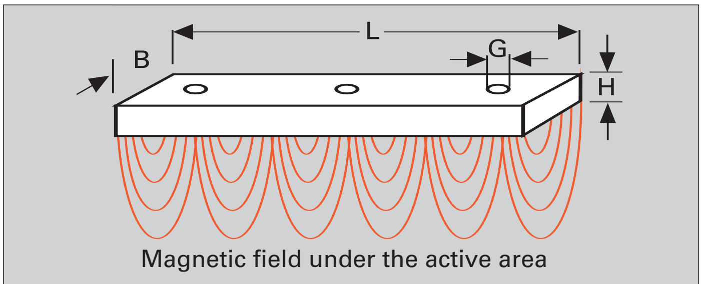
Magnetic lattice

For installation in shafts or pipes for iron separation from synthetic granulate, for example, or grained goods in free fall.

We can supply the magnet lattices according to your requirements. Please ask us!



A strong magnetic field is formed between the lattice by the circular magnets installed. Iron or steel bodies are gathered by this and kept fixed.



Type	H	B	L	G
HS125	20	40	125	3 x M6
HS250	20	40	250	5 x M6

All dimensions in mm. Custom-made dimensions upon request

Magnetic holding rail

These magnetic holding rails are equipped with high-energy magnets and have an extremely strong magnetic field on the active area.

It is therefore possible to catch and hold small iron particles. This is, for instance, necessary when small iron particles have to be separated from textile raw materials.

The magnetic holding rails not only have a strong collecting power, but also a strong holding force. The magnetic field which extends far out from the active area ensures that there is almost no loss of holding force if, for example, there is a magnetic, non-conductive cover on the holding surface.

Design: Case made of stainless steel (material 1.4301). Max. operating temperature: + 100 °C (special type + 250°C). Fastening thread on the rear.

Magnetic chip catcher

■ **Type FM 4 S**

The permanent magnetic chip catcher is equipped with the high-energy material **NeoDeltaMagnet (NdFeB).** The strongest producible permanent magnet catches ferrous parts with a strong force. The "caught" ferrous parts cling around the lower part of the rod-shaped catcher system. To remove the ferrous parts from the rod, the internal permanent magnet system is slid towards the end of the rod using the handle. The ferrous parts follow the permanent magnet and are stripped off by the middle flange.

The magnetic chip catcher is used to separate and collect iron parts from liquids or goods consisting of dust or granulate; in smooth grinding systems for collecting steel parts from burnishing stones; for separating steel parts from nonferrous metals or plastics; and for magnetically "sucking up" iron chips on surfaces.

Technical properties: Stable tube construction made of brass, glossy nickel-plated.
The installed permanent magnet system made of high-energy magnetic material retains its magnetic force indefinitely with no weakening.

Magnetic chip catcher catches and holds ferrous parts

Caught parts are removed by stripping

Measurements:

Tube diameter:	27 mm
Middle flange diameter:	47 mm
Overall length:	440 mm
Effective magnetic length:	90 mm
Weight:	0.75 kg
Operating temperature:	Max. + 100 °C

Handling magnet

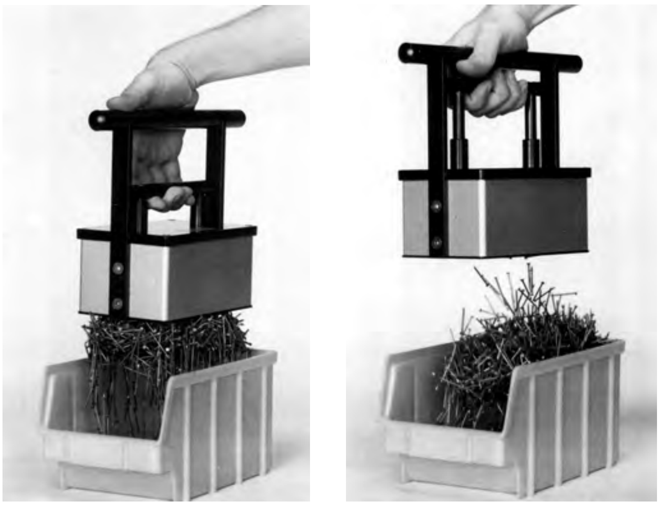
■ **Type HH 1**

The permanent handling magnet is an excellent aid for removing bulk material made of steel and iron such as screws, nuts, turned and punched parts from stock and transport containers.

The iron particles "jump" onto the holding area where they are permanently held. As the magnetic field takes effect outwards from the holding area, a "mushroom" composed of caught particles is formed on the holding surface.

When reaching the unloading place the handle to broach the magnetic field is pulled and the collected particles fall from the holding surface. The device is also extremely suitable for collecting small particles and iron chips as well as separating iron parts from other materials.

Structure:
Stable aluminium construction with low weight of 2 kg.
Easily handled broaching operation on smooth guides.
Handle suitable for two-handed operation.
Permanent magnetic system will not wear or weaken.
Excellent workmanship.
Magnetic collection area: 165 x 105 mm.



The "small" but effective handling aid that pays for itself.

Imprint
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Design and Copyright: IBS-Magnet, Ing. K. H. Schroeter

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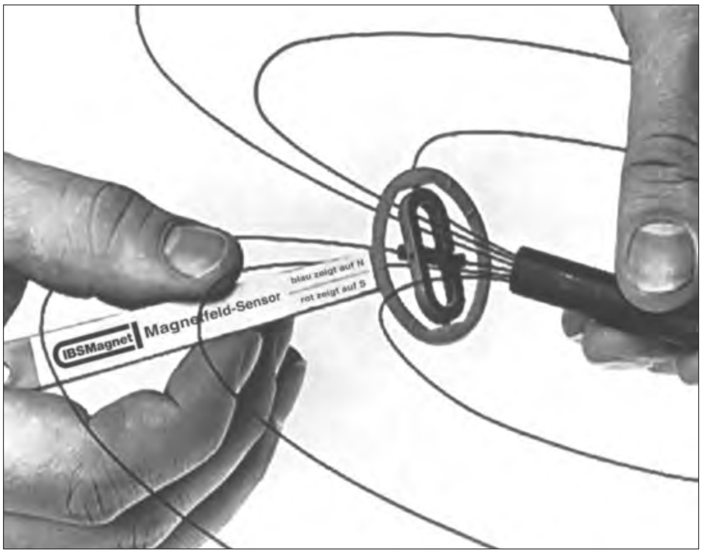


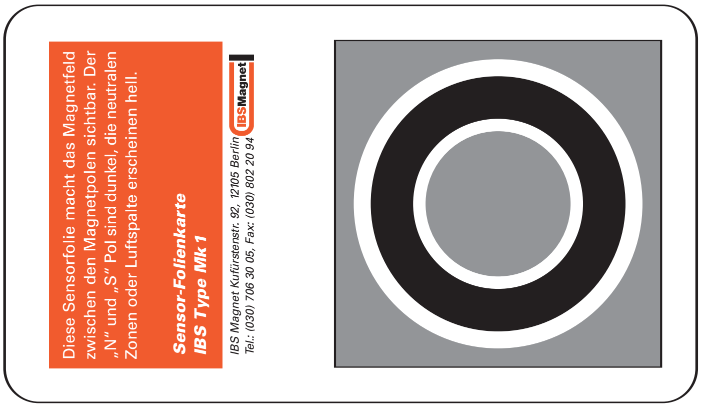
Magnetic field sensor Magnaprobe MK II

The inexpensive, versatile device for evaluating magnetic fields on permanent and electric magnets. A sensor magnet mounted in a fine-bearing gimbal follows the magnetic flux lines three-dimensionally with its longitudinal axis.

Magnetic field description: Bringing the magnetic field sensor into a magnetic field will cause both the direction and expansion to be displayed three-dimensionally.

Magnet pole marker: Display the North and South Pole of permanent and electric magnets (red = S / blue = N).

Application:
Magnetic field recognition for permanent and electric magnets by "scanning". Evidence of remaining magnetism. Evaluation of magnetic shields.

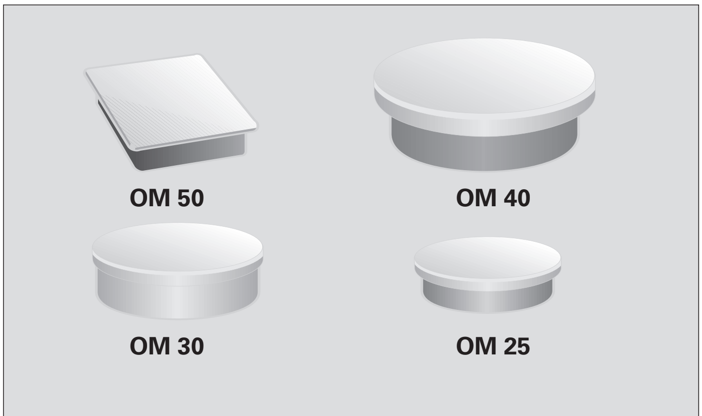


Magnetic field sensor foil MK 1

Makes the magnetic fields between the magnet poles visible. The areas between the North and South Poles will be shown brightly when placed on a magnet or a magnet system.

Sensor foil 50 x 50 mm, sealed in transparent card.

The illustration in the margin shows the picture of a ring magnet with axial magnetization lying under the sensor foil.

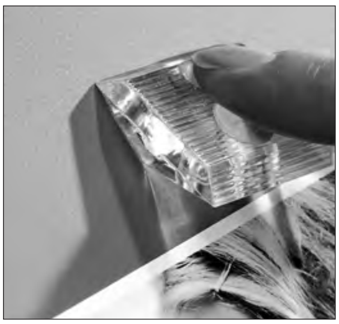


Personal organiser magnets

Powerful magnets with nicely formed cover made from coloured plastic for holding sheets of paper or for marking. With edge for easier handling.
Colors available from stock: white, black, blue, red, green.
For a min. qty. of 1,000 pcs we could offer with printed logo.

Type	Ø and ▭	Height
OM25	ø 25.0 mm	7.5 mm
OM30	ø 30.0 mm	8.0 mm
OM40	ø 36.0 mm	8.5 mm
OM50	▭ 22.0 x 37.0 mm	7.5 mm

New: OfficeClip



The unique office magnet with tip effect Type OC1

- A particularly strong office magnet which can also securely hold thick cardboard or stacked papers in place.
- The holding force is considerably stronger than with conventional personal organiser magnets. Also holds thick cardboard.
- The pages kept in place are quickly released by tipping the holding surface over with the finger.
- Even after releasing the tip magnet is magnetically held on the holding surface.
- This unique office magnet enables documents to be kept in place magnetically thanks to its strong holding force. A simple tipping motion allows them to be released again rapidly.
- Design: Crystal-clear plastic cover with high-energy magnets inside, ribbed paper-holding surface.

TÜV CERT

CERTIFICATE

The TÜV CERT Certification Body

of TÜV Rheinland Cert GmbH

certifies in accordance with

TÜV CERT procedures that

IBSMagnet

Kurfürstenstraße 92

D – 12105 Berlin

has established and applies a quality management system for

production and sale of permanent magnets.

An audit was performed, Report No. **95190**.

Proof has been furnished that the requirements according to

DIN EN ISO 9001:2000

are fulfilled.

The certificate is valid until **2010-08-18**.

Certificate Registration No. **09 100 95190**

Deutscher Akkreditierungs Rat

DAR

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Cologne, 2007-09-17

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TÜV Rheinland Cert GmbH

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Production of permanent magnets specially high energy magnets from rare-earth metals

Production and development of permanent magnet systems, holding magnets and magnet systems for iron separation

Edition No. 13