MPI

Magneti Permanenti Industriali

CATALOGUE 2016

THIRTY YEARS

EXPERIENCE

IN THIS FIELD.

TECHNICAL SKILL AND COMPETENCE.

OVERALL SERVICE.

ENVIRONMENTAL FRIENDLY.

INDEX

The properties shown in the foregoing materials tables and the demagnetization curves are for general reference purposes only, as the same are measured on laboratory test samples. These values cannot be used as inspection standards in real applications as they may differ from those shown in the tables.
Therefore the content of materials tables is not binding: variations caused by modification in the production processes as well as in the raw materials used for manufacturing magnets, are to be expected. Safety charts can be released upon specific request.

MPI Magneti Permanenti Industriali

MPI is an established international company certified UNI EN ISO 9001.

Well known as a leading permanent magnet supplier for all industrial applications.

Well known companies selected and qualified us

as preferencial supplier, since years they have been trusting us for our competence and often they ask us to develop together **new projects.**

We have been taking great steps since 1985, when MPI was founded as manufacturing company of magnetic tools. Today we are able to supply companies in different industrial fields, granting a complete service concerning permanent magnets in all of the following topics: material supply with complete traceability, support in 2D and 3D electromagnetic design by mean of advanced computing software, sampling and prototypes, materials characterization in MPI laboratory.
Our primary target consists in giving detailed information on all materials we deal, from design and prototyping to final production step.
To achieve this, we rely on few essential aspects in our business: excellent knowledge of manufacturing processes, equipped laboratory with sophisticated and advanced instruments able to supply all essential information on permanent magnets; a warehouse able to supply magnets efficiently and in short time.
We have a long tradition in electromechanical industry: such knowledge allows us to assist our customers and to offer the use of the advanced instrumentation of our lab. An essential aspect of our activity consists in being able to select the proper manufacturers in order to satisfy any specific request choosing the most suitable productive process.

Upon request, we can provide the complete characterization of a permanent magnet or soft ferromagnetic material, not only as regards the magnetic properties, important but not exhaustive for the device performance in which they are applied: in fact it is often necessary also to provide a characterization of the mechanical properties, traction / repulsion, thermal behaviour, dimensions and a detection of the final performance of the magnetic material or electromagnetic device where such material is applied.

Our lab instrumentation is regularly certified by Metrological Institutes with International recognition

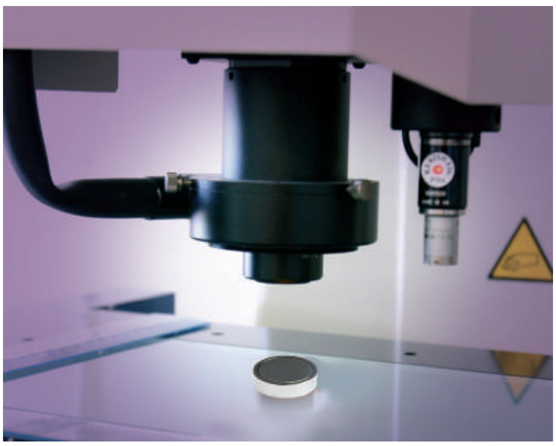
and thanks to them we can obtain the measurement of all magnetic materials and soft ferromagnetic. Measurement by BH loop tracer of permanent magnets, flux density and magnetic field strength measurement, mechanical, dimensional, thermal measurements help our customers to better characterize the type of material they need.

Through the partnership with Spin Srl Magnetic Applications we can provide design support at all levels, through the use of the most advanced design tools.

We continue to invest in research and cooperate, in Italy and abroad, with prestigious academic institutions and centers of excellence to be at the forefront in our field and put all the latest resources available to our customers.

In our department of magnetization and calibration we use an automatic equipment to provide, on request, lots of material inspected piece by piece.

Our attention is focused not only to the magnets we supply, as we also reserve a special attention to production processes from the environmental point of view: MPI considers this an essential factor in the choice of partners. Producing without pollution means to be ready to the great challenge with future. We believe that continuous innovation is essential to respect the environment, improve efficiency and ensure safety in our activities.



GLOSSARY

Up to the middle of nineteenth century magnetism was considered a physical phenomenon separated by the electric ones. But the processes that rule the magnetism are strongly tied up to the electric phenomenon by mean of the Maxwell equations. For a better understanding of magnets behaviour we bring here some technical terms: they are presented in a precise form also comprehensible to those who approach to this matter for the first time.

Anisotropy
It is the preferred direction along which a magnet can be oriented. Some magnets have high anisotropy (anisotropic magnets), some others not (isotropic). The anisotropic orientation can arise from the production process but in many cases it is due to the material structure. In anisotropic magnets the best properties can be obtained along the anisotropy direction.

B
(See Magnetic Induction).

Barium
Chemical elements of 2nd group (alkaline earthy). The most important mineral is barite: it is added as barium carbonate to produce barium BaFe12O19 (barium ferrite).

(B•H) max
It is the maximum energy product in a permanent magnet: more in detail, it is the maximum of the BH values in 2nd quadrant of hysteresis loop. BH product represents the energy density per volume unit: in general we can state that increasing the (B • H) max value we get a decrease of the magnet volume useful to obtain the same performance.

Calibration (magnetic)
Specific magnetizing and demagnetizing procedure by which it is possible to minimize the magnetic tolerances. Calibration is more and more frequently needed to tune the magnetic flux in more strict range than usual (ex. in specific electric motors, sensors, electromechanical relays).

Hysteresis cycle
It can be produced by tracing the induction B versus magnetic strength field H, first with H positive (magnetization loop-1st quadrant of hysteresis loop), then switching to H negative (2nd quadrant loop, in demagnetization loop). It can be performed for B or J.

Magnetic circuit
Magnetic flux path through soft ferromagnetic parts, air gaps and permanent magnet: in analogy with electric circuits the first ones can be compared to conductors, the second to resistances, the third to generators.

Temperature coefficient
In magnetic materials the variation of residual induction or coercive force may be related with temperature changes: it is a very important parameter as magnets are very sensitive to temperature value.

Demagnetization curve
Is the part of hysteresis loop in 2nd quadrant, where H value is negative. The main properties deducible from this curve are: Br (remanence), Hc (coercive force) and BHmax (maximum Energy product). The DIN 17410 definition consists in 2 numbers, where the first one is the minimum value of energy product, the second the minimum coercive force divided by 10, in SI unit system. For ex. 28/26 means: (B • H)max > 28 kj/m^3 , jHc > 26 • 10 - 260 KA/m.

Density (weight)
Density weight in Kg/m^3, in g/cm^3 or Kg/dm^3 (1 g/cm^3 = 1 Kg/dm^3 =10^3 Kg/m^3)

Flux density
Flux density of the magnetic induction B. In case B is crossing uniformly surface A, it's equal to the ratio between the flux and the cross section area A.

Preferential direction of magnetization
The direction of magnetization along which the magnet reaches the best values in terms of Br, Hc and BHmax (see also anisotropy). It is due to the magnetic preorientation or structure of the material. Often in magnets with circular symmetry it is axial. In magnets with rectangular section it is often through the minimum thickness. In segments of arc is the diametrical direction (that is the parallel lines to the diameter) or radial.

Stored energy (B·H)
Multiplying the values of induction B by the intensity of field H we get a range tied up to the energy density for volume unit. See also the (B • H)max value.

Factor of demagnetization (N)
It is a factor mainly depending on magnet geometry and expresses the possibility to get good performance from the magnet geometry or magnetic circuit. If the working point of magnet is linked with the origin of coordinates system B-H, a straight line is obtained (load line). The demagnetisation factor N is linked to such line and it is a non-dimensional quantity, assuming values between 0 (closed magnetic circuit) and 1 (magnetic circuit completely open). It's tied up to the permeance from the relation: $P=1-1/N$

Hard Ferrite
Barium ferrite and strontium ferrite, with chemical formula MeO • 6Fe_2O_3 where MeO represents a metallic oxide. All the permanent magnets in hard ferrite are hexagonal for ex. BaO • 6Fe_2O_3 or SrO • 6Fe_2O_3.

Ferromagnetis
Materials with permeability much higher than 1. Their behaviour can be described as joined action of magnetic domains, each with its magnetic elementary moment. Permanent magnet as permeability slighly higher than 1, while soft ferromagnetic materials have relative permeability much higher than 1 (from 10^2 to 10^6).

Magnetic flux
Flux of the magnetic induction B through a surface A. If B is homogenous across A then is equal to B*A, otherwise it is the mathematical integral of B on surface A. Unity of measure in SI system: 1 Wb (Weber) = 1 Vs (Volt*second).

Fluxmeter
Measuring instrument of the magnetic flux: the measure is obtained by integrating electronically or digitally the voltage at the measuring coil.

Flux useful
Part of the total magnetic flux that passes through a useful gap of a magnetic circuit; the remaining part of the total flux is said "leakage flux".

Coercive strength
It is the value of magnetizing field H during whose action the induction B of a ferromagnetic material previously magnetized to saturation, was set to 0. The coercive strengths HcJ (intrinsic) and HcB (extrinsic) can be found: this distinction is technically important for magnets with high coercive strength. You can have the coercive strength HcJ from the J hysteresis loop, while HcB is got from B hysteresis loop. The SI unity of coercive strength is given in kA/m or in Oersted.

Gaussmeter
Also called magnetometer. Instrument to measure the flux density: it usually works with the Hall effect in semiconductor of the sensor. It directly shows the density of magnetic flux without movement of the measuring probe.

H
Intensity of the magnetic field: this property establishes how a material is magnetically strained. H depends on the current circulating into a winding set in proximity of the material submitted to H.

Magnetic Induction (B)
It's the property that shows the state of magnetization of a magnetic material: its main original definition is founded on the effect that an induction field equal to 1 Wb/m^2 creates on a conductor crossed by current. Unity Tesla ($T=Wb/m^2$). $B = \mu_0 H + J$.

Magnetization
To magnetize a magnet, an external strength field some times higher its coercive strength is employed. The duration of the magnetization is generally very brief, from few microseconds to some seconds.

Maxwell
Measurement unity of the magnetic flux in the CGS system (see also the magnetic flux) and it is equal to 10^{-8} Tesla · m^2.

Oersted
Measurement unit of coercive strength field H in CGS. It comes from the name of Danish Physicist Hans Christian Oersted.

Irreversible losses
Losses of the magnet properties to high temperature, not recoverable by returning to the initial temperature (normally this is the room temperature). For ferrite the remanence decays at low temperatures.

Permeability (μ)
It is the ratio between the magnetic induction B and the magnetic field H. It can be explained as a sort of magnetic "transmissibility" or "conductibility". In vacuum it is a constant: μ_0 = 1,256 H/m (T / A/m). In diamagnetic materials $\mu_r < 1$, while in paramagnetic materials $\mu_r > 1$; in ferromagnetic material $\mu_r >> 1$ (from 10^2 to 10^6). It is often used the relative permeability, defined as $\mu_r = \mu / \mu_0 = B / \mu_0 H$.

Recoil permeability (μ_p)
Permanent magnet permeability in the second quadrant of hysteresis loop.

Permeance
Ratio between the induction B and the product between μ_0 and H: in a magnetic circuit the higher is the permeance module, the closer is the magnetic circuit (no flux leakages).

Magnetic polarization (J)
Also called intrinsic induction. Contribution of the material to the flux density: $J = B — \mu_0 H$.

Magnetic pole
Surface of permanent magnet from which the magnetic flux goes out or enters: it can be Norh or South.

Working point
Point of the demagnetization curve that gives the values of the flux density B and of the coercive field H in the working point. The greater is the length of the magnet in the direction of magnetization, the closer is B to Br. In a closed magnetic circuit, the working point corresponds to the value of Br.

Ratio h/D
Ratio between the height of a magnet and its diameter; it is a very important ratio especially in open circuit magnets (without soft ferromagnetic parts). In demagnetization curves the values h/D can be plotted so that the induction can be computed at the working point. On this ratio depends the magnetic performances of a magnet of given size.

Reversible
Reversible o repeatable. A magnet behaviour is thermally reversible when it returns to its original magnetic properties after a heating or cooling process.

Remanence (Br)
It's the value of induction Br in a closed magnetic circuit (no air gaps), when H is equal to 0. In SI is given in tesla (T) or in millitesla (mT); in CGS is given in Gauss(G).

Saturation
Condition in which the induction B increases in the material with an inclination equal to μ_0, as consequence of an increase of H; after reaching the condition of saturation, the magnet can get the maximum values of magnetic properties.

Sintering
Process of high pressure powder compacting at high temperature, with the purpose to get material compacted and homogenized. The temperatures of Sintering are, approximalety: for hard ferrite around 1200°C - 1250°C, for rare earths magnets around 1050°C - 1200°C.

Demagnetization
Decrease of magnetization condition (that is of B) in a magnet which also means decrease of its performances, by mean of strength field H opposed to its magnetization direction: to get a complete demagnetization it is required a oscillating strength field. A partial or total demagnetization can also happen at very high (or low for ferrite magnets) temperature: it will be a partial and irreversible demagnetization when temperature is between max working temperature and Curie temperature, total if Curie temperature is passed. Max working temperature is linked to material properties, to magnet and magnetic circuit geometry while Curie temperature is characteristic of the material itself.

Stabilization (magnetic)
To stabilize a magnet it is possible to raise it to a defined temperature, near to the maximum working temperature of the magnet or to dip it in an oscillating magnetic field and produce light demagnetization of the same magnet. This should prevent possible small demagnetisation produced by inside and external factors.

Strontium
Chemical element of the II group (alkaline-earthy metals). It comes from the minerals stronzianites and celestine. The strontium is added in the form strontium carbonate instead of barium carbonate and confers to hard ferrite magnets a particularly elevated coercive strength.

Susceptibility (magnetic)
It describes the dependence between magnetization and magnetic field. The relation with the Magnetization is: $M = X \cdot \mu_t H$ e $\mu r = X+1$

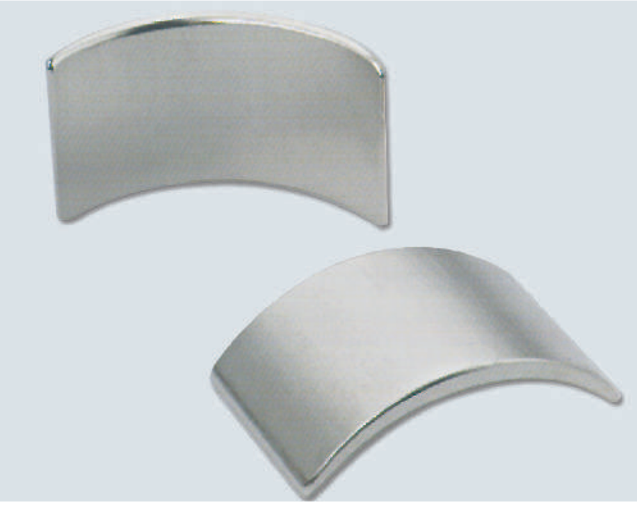
Curie Temperature
The temperature at which a ferromagnetic material becomes paramagnetic and looses its magnetic properties. Name derived from M.me Curie, physicist and chemist of early '900.

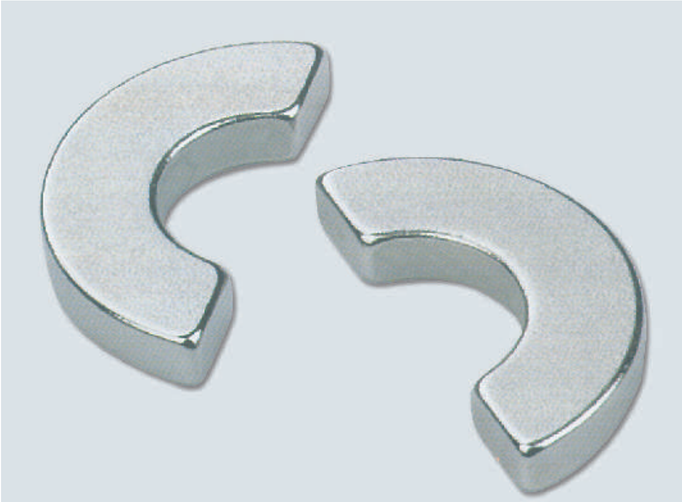
Working Temperature
The most elevated temperature at which a magnet can be maintained without irreversible flux losses. The working temperature also depends on the magnetic circuit in which the magnet is employed: it produces more easily effects of demagnetization in case of low permeance, that is in case of the magnetic circuit is close to the condition of open circuit. The most unfavourable case will be therefore a single magnet with very small L/D ratio (for instance 0,3 or smaller).

Tesla
Measuring unit of the magnetic flux density, also called magnetic induction. 1 T = 1 Vs/m^2 = or 10.000 Gausses. It comes from the name of the Serbian physicist Nicola Tesla (1856-1943).

Air gap
Distance from a non magnetic material laid between the elements of a magnetic circuit: it can be seen as a obstacle to the magnetic flux flow so if no useful to the device, it should be minimized. To increase the magnetic induction and its homogeneity it is necessary to minimize the air gap.

Weber
Measuring unit of the magnetic flux 1 Wb = 1 V s = 10^8 Maxwell. Name derived from Mr. Miby Wilhelm Weber





MPN Neodymium Iron Boron

Neodymium Iron Boron (NdFeB) is the magnetic material with highest energy density available today: it means that it can guarantee the best performances, when torque, force, magnetic induction are required. It is obtained from rare earth intermetallic (Neodymium) and transition metal (Iron).
Development of NdFeB started at beginning of 80's. It was first used in the computer industry (voice coil motors), to spread later in many different industrial markets as brushless PM servomotors, linear motors, loudspeakers, sensor systems, sputtering systems (magnetron), magnetic resonance equipment, rotating coupling.
It is produced by sintering but, unlike ceramic ferrite, the process is performed in inert gas atmosphere: magnet then can be pressed isostatically in an oil bath or in a die, giving to the product an axial or diametral orientation. Pieces will be then opportunely processed, ground by diamond tools and refined.

The high energy density allows to produce very high residual flux density (Br), so high performances but also high coercive force which means high resistance to demagnetization effects. It also has a good thermal behavior, as it can be used at more than 200 °C.
Corrosion resistance is guaranteed by electrochemical process (Nickel, Zinc plating) or by other products like resin, as well as food compatible materials.

Application fields are very different: from automotive (electric traction, cooling system, setting devices, sensors, loudspeakers), house appliance (motors, pumps compressors, sensors), railway transportation (electric motors, magnetic levitation), military and aerospace, automation equipment, packaging, electromedical systems, food industry (magnetic coupling, moving systems, motors), sensors systems, instrumentation gauge, switches and heavy mechanics (lifting systems, magnetic bearing, magnetic levitation).

Coating	Terms of salt spray test (NaCl)			
	Duration	Thickness coating	Temperature	Humidity
NiCuNi	≥ 48h	≥ 8 µm	35 ± 2°C	100% RH
Zn	≥ 48h	≥ 5 µm	35 ± 2°C	100% RH
Ni Multilayer (2-5 layers)	≥ 96h	≥ 15 µm	35 ± 2°C	100% RH
NiCuNi+Sn (Ni+Sn)	≥ 36h	≥ 8 µm	35 ± 2°C	100% RH
NiCuNi+Au (Ni+Au)	≥ 48h	≥ 8 µm	35 ± 2°C	100% RH
NiCuNi+Ag (Ni+Ag)	≥ 48h	≥ 8 µm	35 ± 2°C	100% RH
Epoxy	≥ 48h	≥ 15 µm	35 ± 2°C	100% RH
Passivation	≥ 2h	≥ 3 µm	35 ± 2°C	100% RH

Grade	Loss coefficients in temperature %/°C (20°C~150 °C)		Reduction Standard weight mg/cm³
	Br	HcJ	
Grade "normal"	-(0,11~0,12)	-(0,58~0,70)	≤80
Grade "T" (1)	-(0,095~0,115)	-(0,46~0,59)	≤15
Grade "L" (Hast Material) (2)	-(0,10~0,12)	-(0,55~0,65)	≤5
Grade "TL" (3)	-(0,095~0,115)	-(0,46~0,59)	≤5

1) The products of the "T" series have a better temperature behavior and can be produced from degrees "H".

2) The products of the "L" series have a better behavior against weight loss and against oxidation. The standard test is performed in the following conditions: 120°C, 2 atm, 95% humidity, 168 hours.

3) The products of the series "TL" have the advantages of the series "T" and "L".

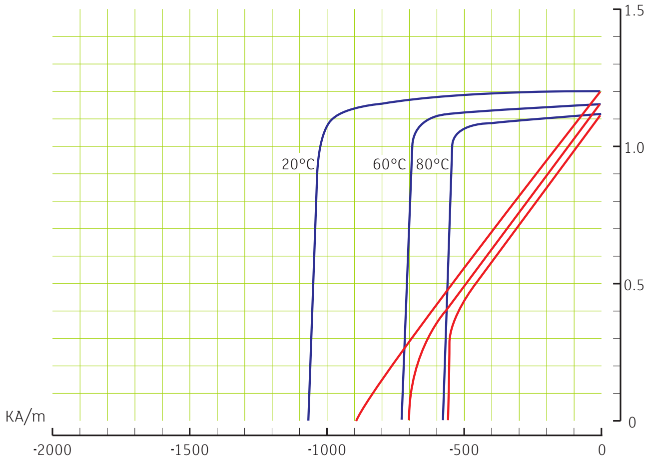
Grade	Remanence Br				Coercivity HcB		Intrinsic Coercivity HcJ		Max Energy Product (BH)max				Max Operating Temp.
	G		mT		Oe	kA/m	Oe	kA/m	MGOe		KJ/m³		°C
	min	typ	min	typ					min	typ	min	typ	
MPN 35	11.700	12.100	1.170	1.210	≥ 10.900	≥ 860	≥ 12.000	≥ 955	33	35	263	279	80
MPN 38	12.200	12.600	1.220	1.260	≥ 11.300	≥ 899	≥ 12.000	≥ 955	36	38	287	302	80
MPN 40	12.600	12.900	1.260	1.290	≥ 11.400	≥ 907	≥ 12.000	≥ 955	38	40	302	318	80
MPN 42	12.900	13.200	1.290	1.320	≥ 11.500	≥ 915	≥ 12.000	≥ 955	40	42	318	334	80
MPN 45	13.300	13.600	1.330	1.360	≥ 11.600	≥ 923	≥ 12.000	≥ 955	43	45	342	358	80
MPN 48	13.700	14.000	1.370	1.400	≥ 11.600	≥ 923	≥ 12.000	≥ 955	46	48	366	382	80
MPN 50	14.000	14.300	1.400	1.430	≥ 10.000	≥ 796	≥ 11.000	≥ 875	48	50	382	398	80
MPN 52	14.200	14.600	1.420	1.460	≥ 10.000	≥ 796	≥ 11.000	≥ 875	50	52	398	414	80
MPN 35 M	11.700	12.100	1.170	1.210	≥ 10.900	≥ 860	≥ 14.000	≥ 1.114	33	35	263	279	100
MPN 38 M	12.200	12.600	1.220	1.260	≥ 11.300	≥ 899	≥ 14.000	≥ 1.114	36	38	287	302	100
MPN 40 M	12.600	12.900	1.260	1.290	≥ 11.600	≥ 923	≥ 14.000	≥ 1.114	38	40	302	318	100
MPN 42 M	12.900	13.200	1.290	1.320	≥ 12.000	≥ 955	≥ 14.000	≥ 1.114	40	42	318	334	100
MPN 45 M	13.300	13.600	1.330	1.360	≥ 12.600	≥ 995	≥ 14.000	≥ 1.114	43	45	342	358	100
MPN 48 M	13.700	14.000	1.370	1.400	≥ 12.900	≥ 1.019	≥ 14.000	≥ 1.114	46	48	366	382	100
MPN 50 M	14.000	14.300	1.400	1.430	≥ 12.900	≥ 1.035	≥ 14.000	≥ 1.114	48	50	382	398	100
MPN 35 H	11.700	12.100	1.170	1.210	≥ 10.900	≥ 860	≥ 17.000	≥ 1.353	33	35	263	279	120
MPN 38 H	12.200	12.600	1.220	1.260	≥ 11.300	≥ 899	≥ 17.000	≥ 1.353	36	38	287	302	120
MPN 40 H	12.600	12.900	1.260	1.290	≥ 11.600	≥ 923	≥ 17.000	≥ 1.353	38	40	302	318	120
MPN 42 H	12.900	13.200	1.290	1.320	≥ 12.000	≥ 955	≥ 17.000	≥ 1.353	40	42	318	334	120
MPN 45 H	13.300	13.600	1.330	1.360	≥ 12.300	≥ 979	≥ 17.000	≥ 1.353	43	45	342	358	120
MPN 48 H	13.700	14.000	1.370	1.400	≥ 12.500	≥ 995	≥ 17.000	≥ 1.353	46	48	366	382	120
MPN 30 SH	10.800	11.200	1.080	1.120	≥ 10.100	≥ 804	≥ 20.000	≥ 1.595	28	30	223	239	150
MPN 33 SH	11.400	11.700	1.140	1.170	≥ 10.600	≥ 844	≥ 20.000	≥ 1.595	31	33	247	263	150
MPN 35 SH	11.700	12.100	1.170	1.210	≥ 10.900	≥ 876	≥ 20.000	≥ 1.595	33	35	263	279	150
MPN 38 SH	12.200	12.600	1.220	1.260	≥ 11.300	≥ 907	≥ 20.000	≥ 1.595	36	38	287	302	150
MPN 40 SH	12.600	12.900	1.260	1.290	≥ 11.600	≥ 939	≥ 20.000	≥ 1.595	38	40	302	318	150
MPN 42 SH	12.900	13.200	1.290	1.320	≥ 12.000	≥ 963	≥ 20.000	≥ 1.595	40	42	318	334	150
MPN 45 SH	13.300	13.600	1.330	1.360	≥ 12.300	≥ 987	≥ 20.000	≥ 1.595	43	45	342	358	150
MPN 30 UH	10.800	11.200	1.080	1.120	≥ 10.100	≥ 804	≥ 25.000	≥ 1.990	28	30	223	239	180
MPN 33 UH	11.400	11.700	1.140	1.170	≥ 10.600	≥ 844	≥ 25.000	≥ 1.990	31	33	247	263	180
MPN 35 UH	11.700	12.100	1.170	1.210	≥ 10.900	≥ 876	≥ 25.000	≥ 1.990	33	35	263	279	180
MPN 38 UH	12.200	12.600	1.220	1.260	≥ 11.300	≥ 907	≥ 25.000	≥ 1.990	36	38	287	302	180
MPN 40 UH	12.600	12.900	1.260	1.290	≥ 11.600	≥ 939	≥ 25.000	≥ 1.990	38	40	302	318	180
MPN 42 UH	12.900	13.200	1.290	1.320	≥ 12.000	≥ 963	≥ 25.000	≥ 1.990	40	42	318	334	180
MPN 30 EH	10.800	11.200	1.080	1.120	≥ 10.100	≥ 804	≥ 30.000	≥ 2.388	28	30	223	239	200
MPN 33 EH	11.400	11.700	1.140	1.170	≥ 10.600	≥ 844	≥ 30.000	≥ 2.388	31	33	247	263	200
MPN 35 EH	11.700	12.100	1.170	1.210	≥ 10.900	≥ 876	≥ 30.000	≥ 2.388	33	35	263	279	200
MPN 38 EH	12.200	12.600	1.220	1.260	≥ 11.300	≥ 907	≥ 30.000	≥ 2.388	36	38	287	302	200
MPN 40 EH	12.600	12.900	1.260	1.290	≥ 11.600	≥ 939	≥ 30.000	≥ 2.388	38	40	302	318	200
MPN 30 AH	10.800	11.200	1.080	1.120	≥ 10.100	≥ 804	≥ 35.000	≥ 2.786	28	30	223	239	220
MPN 33 AH	11.400	11.700	1.140	1.170	≥ 10.600	≥ 844	≥ 35.000	≥ 2.786	31	33	247	263	220
MPN 35 AH	11.700	12.100	1.170	1.210	≥ 10.900	≥ 876	≥ 35.000	≥ 2.786	33	35	263	279	220

Temp. Coeff. of Br	%/°C	-(0,11-0,12) (20÷150°C)
Temp. Coeff. of HcJ	%/°C	-(0,58-0,70) (20÷150°C)
Curie Temp.	°C	310/380
Hardness	Hv	550
Density	g/cm³	7,4 - 7,6

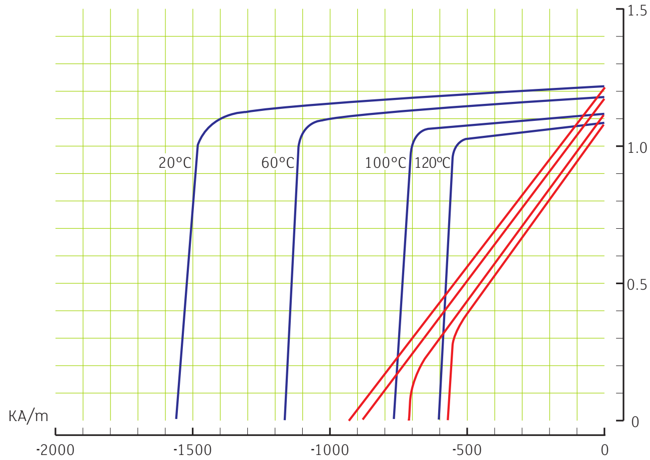
1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/dimension and to the circuit where magnet is operating in.

N35



N35H



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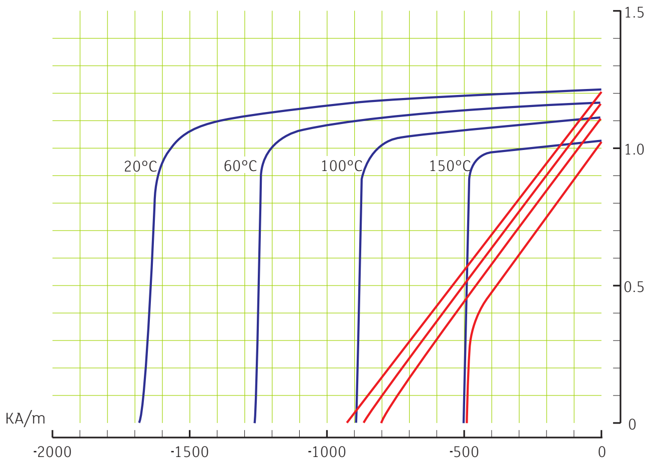

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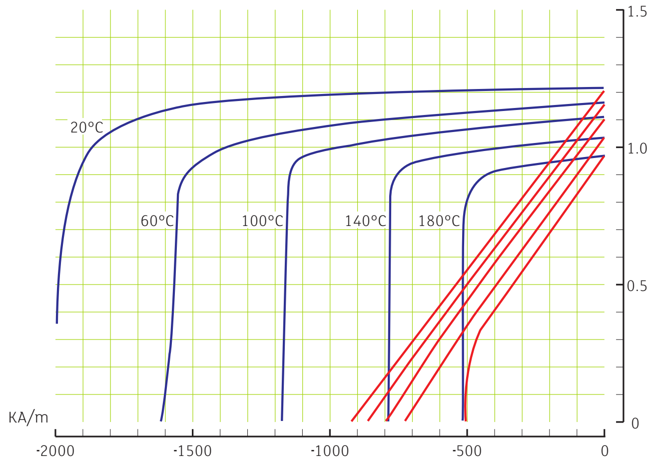

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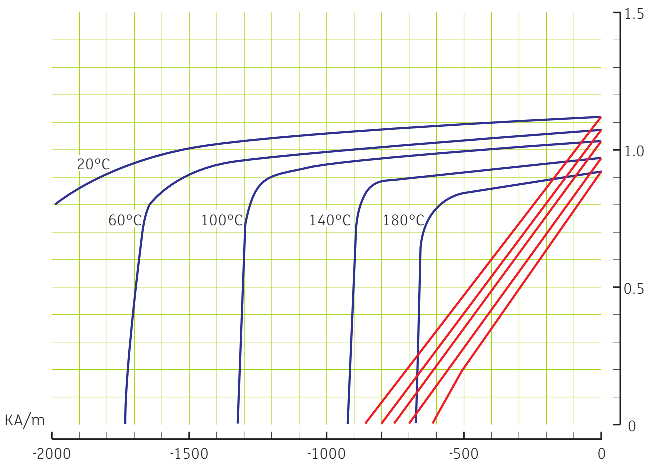
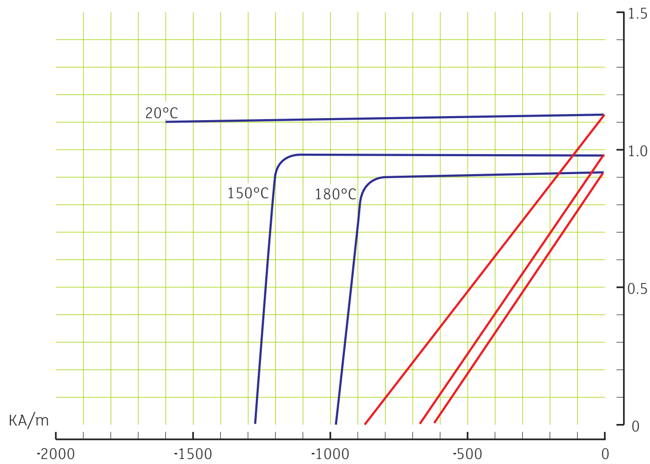
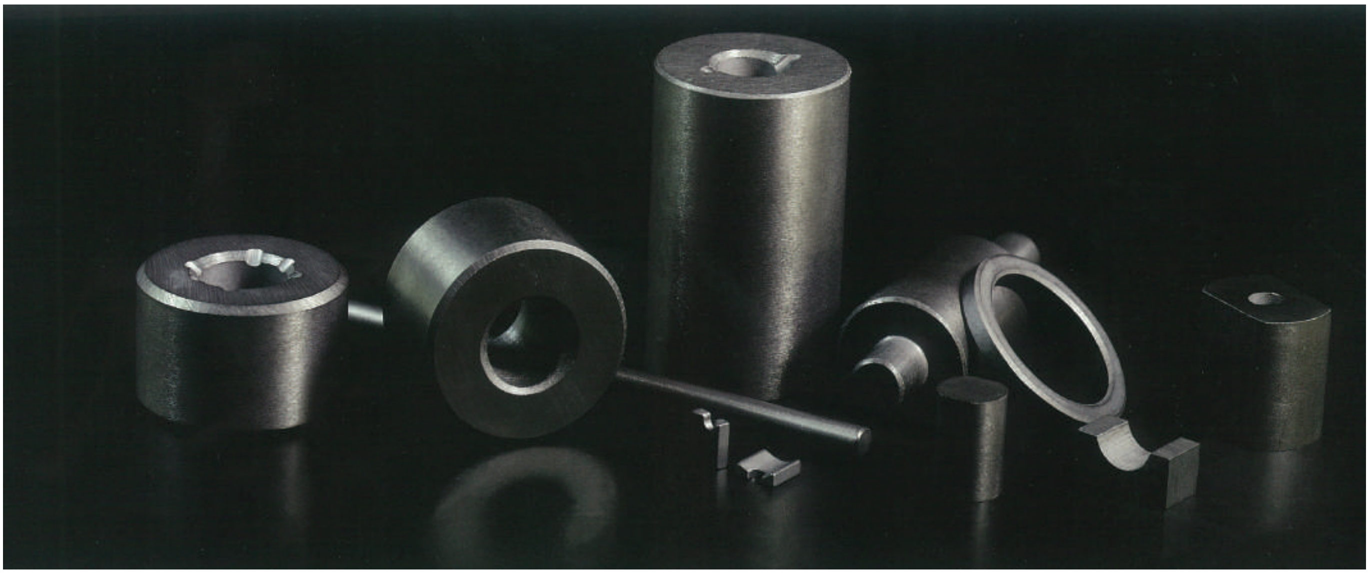


N30 AH





FERRIMAX Ferrite or ceramic magnet

FERRIMAX

First development of ferrite magnets started in the 40's, but they have been offering in the market since the 50's.
Ferrite magnets are obtained from iron oxides and from strontium or barium carbonate: these raw materials are generous on Earth, so availability of ferrite is rather high.
The raw materials are mixed together, granulated and thermally treated to get finally hexaferrite phase ($SrFe_{12}O_{19}$ or $BaFe_{12}O_{19}$). This granulate is then ground to a powder.
Pressing can be performed under magnetic field (to maximize anisotropy of the magnet) or not (isotropic magnets) and can be wet or dry;
The great change of ferrite magnets, which makes these magnets very popular still today, was not the high remanence or high energy product but the reversible behaviour of B versus H in 2nd quadrant of hysteresis loop.
The 2nd quadrant is the part of the hysteresis loop where magnets usually "work" in a device, that is where they supply energy: to perform a reversible B versus H loop means that in such part of the loop the magnet can be partially remagnetized or demagnetized, events which usually occur in a device without loosing properties.
It can be now understood the reason of ferrite success in the 50's when only Alnico magnet, with its strongly reversible behaviour, was predominant in industry.
Another important peculiarity of this material is its water resistance, being obtained from oxides.
Furthermore its coercive force dependence is very peculiar as it is increasing up to 180 °C, opposite to all other hard magnetic materials whose coercive force strongly decreases over room temperature. Due to this special behaviour we underline that special care must be taken for temperatures under RT.
Ferrite magnets can be applied in a very wide range of products: electric motors, loudspeakers, sensor applications, instrumentation, toys, holding systems.

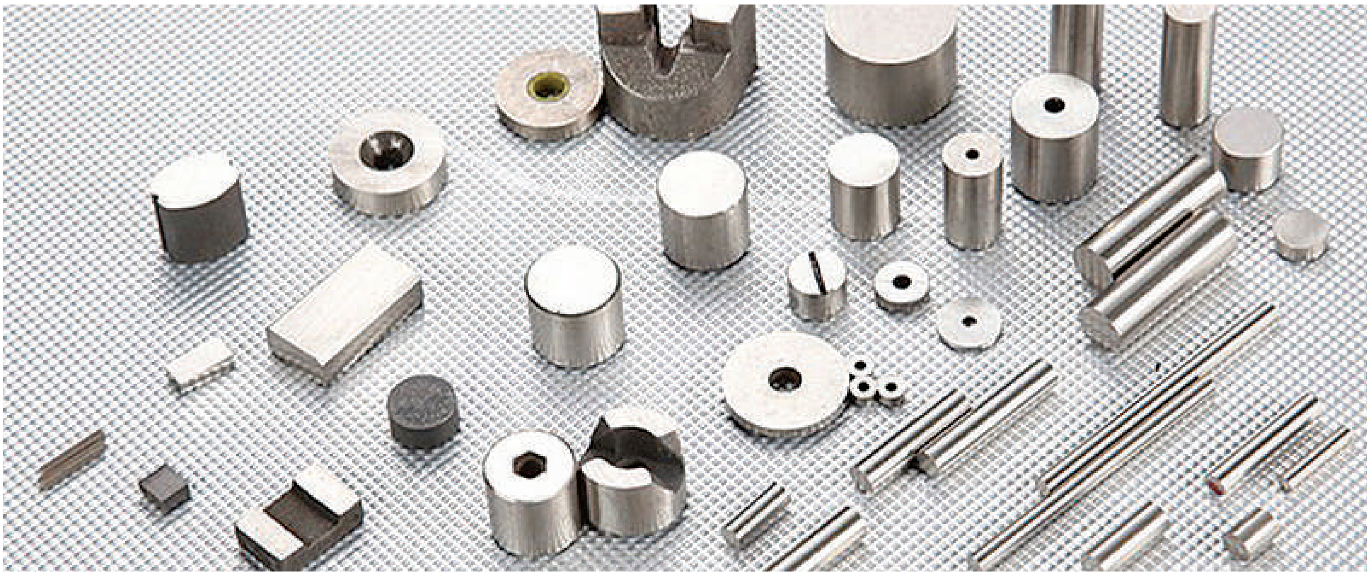
Grade	Remanence				Coercivity				Intrinsic Coercivity				Max Energy Product			
	Br				HcB				HcJ				(BH) max			
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m³	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Ferrimax 10T (C1)*	2.000	2.300	200	230	1.700	2.000	135	159	2.800	3.300	222	262	0,9	1,1	7,1	8,7
Ferrimax 25	3.700	3.900	370	390	1.800	2.000	143	159	1.900	2.100	151	167	3,1	3,6	24,6	28,6
Ferrimax 30 (C5)	3.800	4.000	380	400	2.450	2.750	194	218	2.550	2.850	202	226	3,5	3,9	27,8	31,0
Ferrimax 30H	3.700	3.900	370	390	2.400	2.600	191	206	2.900	3.100	230	246	3,5	3,7	27,8	29,4
Ferrimax 30H-1	3.800	4.000	380	400	2.890	3.450	230	274	2.950	3.650	234	290	3,4	4,0	27,0	31,8
Ferrimax 30H-2	3.950	4.150	395	415	3.460	3.770	275	300	3.900	4.200	310	334	3,6	4,0	28,6	31,8
Ferrimax 30BH (C8)	3.800	4.000	380	400	2.800	3.000	222	238	2.900	3.150	230	250	3,4	3,9	27,0	31,0
Ferrimax 35	4.000	4.200	400	420	2.800	3.000	222	238	2.900	3.100	230	246	3,9	4,1	31,0	32,5
Ferrimax 35H	3.900	4.100	390	410	3.000	3.200	238	254	3.100	3.400	246	270	3,6	3,9	28,6	31,0
Ferrimax 35H-1	3.700	3.900	370	390	3.300	3.500	262	278	3.600	3.800	286	302	3,5	3,8	27,8	30,2
Ferrimax 35H-2	3.400	3.600	340	360	3.200	3.600	254	286	4.200	4.400	334	350	3,1	3,6	24,6	28,6
Ferrimax 42B	4.000	4.200	400	420	2.200	2.600	175	206	2.300	2.700	183	214	3,8	4,2	30,2	33,4
Ferrimax 44	4.000	4.400	400	420	3.100	3.600	246	286	3.300	3.800	262	302	3,8	4,3	30,2	34,1
Ferrimax 44H	4.000	4.400	400	440	3.400	3.800	270	302	3.600	4.000	286	318	4,0	4,4	31,8	34,9

1) The above mentioned data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/ dimension and to the circuit where magnet is operating in.

* Isotropic

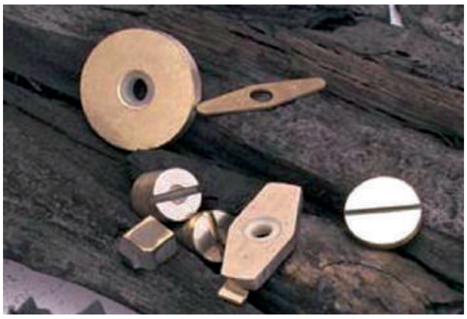
Max Operating Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ	Curie Temp.	Hardness	Density
°C	%/°C	%/°C	°C	Hv	g/cm³
300	-0,2 (0~100°C)	+ 0,2/+ 0,5 (0~100)°C	460/480	480/580	4,5 ~ 5,1



ALNICO Cast and sintered alnico

ALNICO

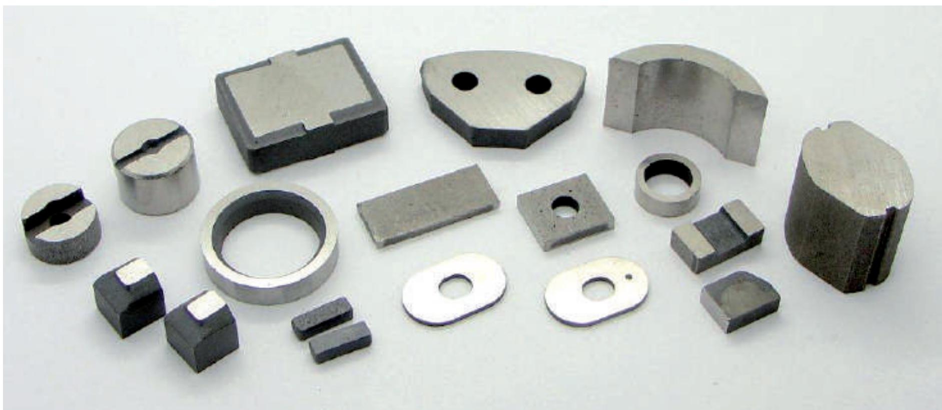
Alnico is an alloy of Fe-Al-Ni-Co to which other components in small quantities may be added. Magnets can be obtained both by melting, in medium frequency induction furnaces and by casting in sand (shell) molds or by sintering. Final magnetic properties are obtained by a special heat treatment. In case of anisotropic Alnico type the thermal treatment occurs in presence of strong magnetic fields. The purpose of these fields is to orientate particles of a highly magnetic phase, precipitated during heat treatment, thus increasing magnetic properties in the magnetic field direction during treatment. Final magnetization and application must perform in the same direction in order to have best results. These magnets are called oriented or anisotropic.
Alnico magnets have high remanence (Br) and high value of energy product combined with the lowest temperature coefficient of whatever permanent magnetic materials. Thanks to these characteristics they particularly fit for electric measurement instruments and in all other equipments where high precision and thermal stability are required.

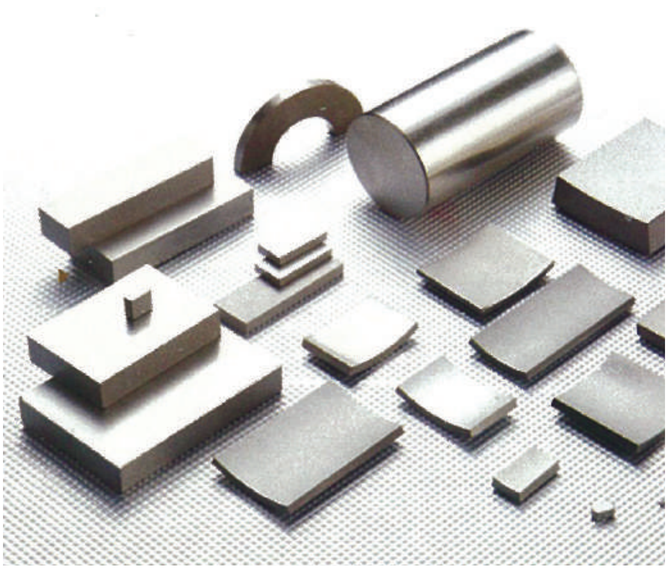


Grade	Remanence		Coercivity		Intrinsic Coercivity		Max Energy Product		Max Operat. Temp.	Temp Coeff. of Br	Temp Coeff. of HcJ	Curie Temp.	Hardness	Density
	Br		HcB		HcJ		(BH) max							
	G	mT	Oe	KA/m	Oe	KA/m	MGOe	KJ/m³	°C	%/°C	%/°C	°C	Hv	g/cm³
ISOTROPIC CAST ALNICO														
Alnico 3 (LN10)	6.500	650	480	38	500	40	1,25	10	450	-0,035	-0,025	760	446	7,0
Alnico 2 (LNG12)	7.500	750	560	45	580	46	1,5	12	450	-0,030	-0,020	810	446	6,9
Alnico 8 (LNGT18)	5.500	550	1.130	90	1.210	97	2,25	18	550	-0,025	-0,010	860	595	7,3
ANISOTROPIC CAST ALNICO														
Alnico 5 (LNG34)	11.000	1.100	630	50	650	52	4,25	34	525	-0,020	0,01	860	513	7,3
Alnico 5 (LNG37)	11.800	1.180	610	49	640	51	4,63	37	525	-0,020	0,01	860	513	7,3
Alnico 5 (LNG40)	12.000	1.200	630	50	650	52	5	40	525	-0,020	0,01	860	513	7,3
Alnico 5 (LNG44)	12.500	1.250	650	52	680	54	5,5	44	525	-0,020	0,01	860	513	7,3
Alnico 6 (LNGT28)	11.500	1.150	730	58	750	60	3,5	28	525	-0,020	0,03	860	513	7,3
Alnico 5DG (LNG52)	13.000	1.300	700	56	730	58	6,5	52	525	-0,020	0,03	860	513	7,3
Alnico 5-7 (LNG60)	13.500	1.350	730	58	750	60	7,5	60	525	-0,020	0,03	860	513	7,3
Alnico 8 (LNGT38)	8.000	800	1.380	110	1.400	112	4,75	38	550	-0,025	0,01	860	595	7,3
Alnico 8 (LNGT40)	8.500	850	1.440	115	1.460	117	5	40	550	-0,025	0,01	860	595	7,3
Alnico 8 (LNGT44)	9.000	900	1.440	115	1.460	117	5,5	44	550	-0,025	0,01	860	595	7,3
Alnico 8HC (LNGT36J)	7.200	720	1.880	150	1.900	152	4,5	36	550	-0,025	0,01	860	595	7,3
Alnico 9 (LNGT60)	10.000	1.000	1.380	110	1.400	112	7,5	60	550	-0,025	0,01	860	595	7,3
Alnico 9 (LNGT72)	10.500	1.050	1.440	115	1.460	117	9	72	550	-0,025	0,01	860	595	7,3
Alnico 9 (LNGT80)	10.800	1.080	1.500	120	1.530	122	10	80	550	-0,025	0,01	860	595	7,3
ISOTROPIC SINTERED ALNICO														
Alnico 3 (FLNG10)	6.500	650	500	40	530	42	1,25	10	450	-0,030	-0,020	760	446	6,9
Alnico 2 (FLNG12)	7.500	750	560	45	580	46	1,5	12	450	-0,035	-0,025	810	446	6,9
Alnico 8 (FLNGT18)	6.000	600	1.190	95	1.230	98	2,25	18	550	-0,025	-0,010	860	446	7,0
Alnico 8 (FLNGT20)	6.200	620	1.250	100	1.310	105	2,5	20	550	-0,025	-0,010	860	446	7,0
ANISOTROPIC SINTERED ALNICO														
Alnico 5 (FLNG34)	11.500	1.150	600	48	630	50	4,25	34	525	-0,020	0,01	860	446	6,9
Alnico 6 (FLNGT28)	11.000	1.100	730	58	750	60	3,5	28	525	-0,020	0,03	860	446	6,9
Alnico 8HC (FLNGT36J)	7.200	720	1.880	150	1.900	152	4,5	36	550	-0,025	0,01	860	446	7,0
Alnico 8 (FLNGT38)	8.000	800	1.380	110	1.400	112	4,75	38	550	-0,025	0,01	860	446	7,0
Alnico 8 (FLNGT44)	8.500	850	1.500	120	1.530	122	5,5	44	550	-0,025	0,01	860	446	7,0
Alnico 8 (FLNGT48)	9.200	920	1.560	125	1.590	127	6	48	550	-0,025	0,01	860	446	7,0

1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/ dimension and to the circuit where magnet is operating in.





MPS Samarium Cobalt

MPS

Samarium Cobalt was the first rare earth magnet on the market. Its magnetic properties are not too far from Neodymium Iron Boron magnets but due to the cost and strategic value of Cobalt, it never had the commercial success and diffusion as NdFeB.
Being a rare earth magnet it is an intermetallic compound of rare earth metal (samarium) and transition metal (cobalt). The production process consists in milling, pressing, and sintering in an inert-atmosphere: magnets are then pressed in an oil bath (isostatically) or in a die (axially or diametrically). SmCo is processed by grinding with diamond tools. As mentioned SmCo can provide high magnetic performances, with maximum energy product around 240 KJ/m^3: it can be divided in two different grades, Sm1Co5 and Sm2Co17, each one with its specific magnetic behaviour (nucleation for the first, pinning in Sm2Co17). Sm2Co17 shows the highest magnetic performances but on opposite side needs much higher intensitive of magnetization (4000 kA/m) than Sm1Co5 (2000 kA/m).
The two main advantages of SmCo grades versus NdFeB are the corrosion resistance and the good thermal behaviour; Curie temperature is around 700 °C for Sm1Co5 and 800 °C for Sm2Co17.
Furthermore the magnetic properties decrease is rather slow by increasing the temperature.
SmCo grades are quite appreciated in military and aerospace industry, as well as in electromedical field; they should be chosen when oxidation or thermal issues could affect the device.
Industrial applications are similar to the ones of NdFeB: sensors, loudspeakers, electric motors, instruments, switches.

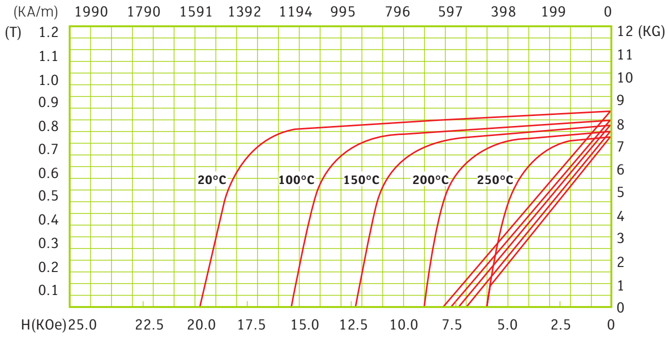
Grade	Remanence				Coercivity				Intrinsic coercivity				Max Energy product			
	Br				HcB				HcJ				(BH) max			
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m^3	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
MPS 1/5-16	8.100	8.500	810	850	7.800	8.300	620	660	15.000	23.000	1.194	1.830	14	16	110	127
MPS 1/5-20	9.000	9.400	900	940	8.500	9.100	680	725	15.000	23.000	1.194	1.830	19	21	150	167
MPS 1/5-22	9.200	9.600	920	960	8.900	9.400	710	750	15.000	23.000	1.194	1.830	20	22	160	175
MPS 1/5-24	9.600	10.000	960	1.000	9.200	9.700	730	770	15.000	23.000	1.194	1.830	22	24	175	190
MPS 2/17-26	10.200	10.500	1.020	1.050	9.400	9.800	750	780					24	26	191	207
MPS 2/17-28	10.300	10.800	1.030	1.080	9.500	10.000	756	796	≥ 18.000		≥ 1.433		26	28	207	220
MPS 2/17-30	10.800	11.000	1.080	1.100	9.900	10.500	788	835					28	30	220	240

Grade	Max. Operat. Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ	Curie Temp.	Hardness	Density
	°C	%/°C	%/°C	°C	Hv	g/cm^3
MPS 1/5-16	250	- 0,05	[illegible]0.30	700	450-500	8,3
MPS 1/5-20	250	- 0,05	[illegible]0.30	700	450-500	8,3
MPS 1/5-22	250	- 0,05	[illegible]0.30	700	450-500	8,3
MPS 1/5-24	250	- 0,05	[illegible]0.30	700	450-500	8,3
MPS 2/17-26	300	- 0,03	- 0.20	800	550-600	8,4
MPS 2/17-28	300	- 0,03	- 0.20	800	550-600	8,4
MPS 2/17-30	300	- 0,03	- 0.20	800	550-600	8,4

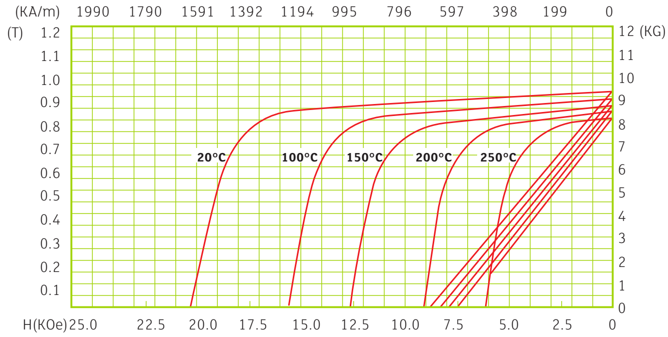
1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/dimension and to the circuit where magnet is operating in.

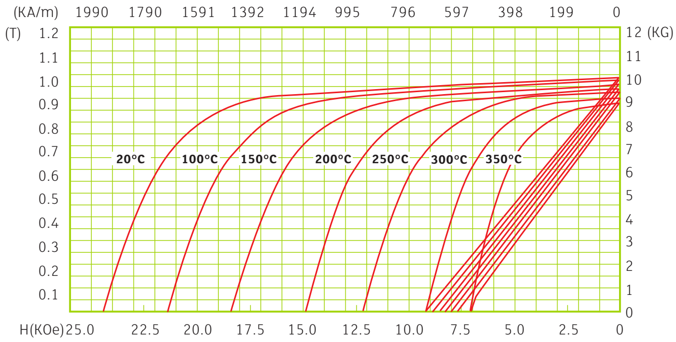
MPS 1/5–16



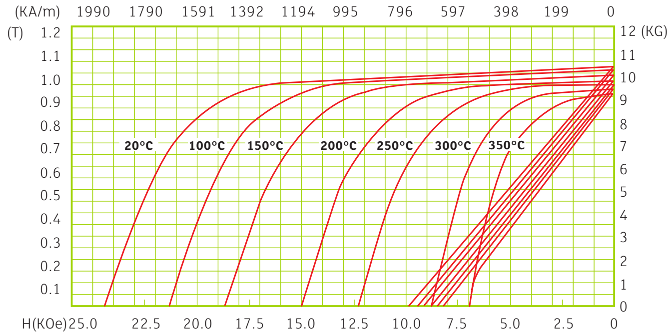
MPS 1/5–20



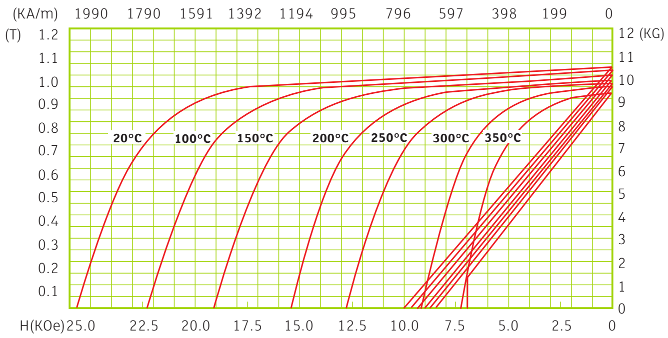
MPS 2/17 - 24



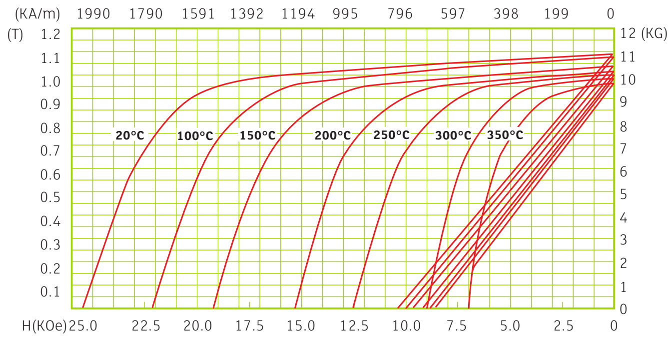
MPS 2/17–26

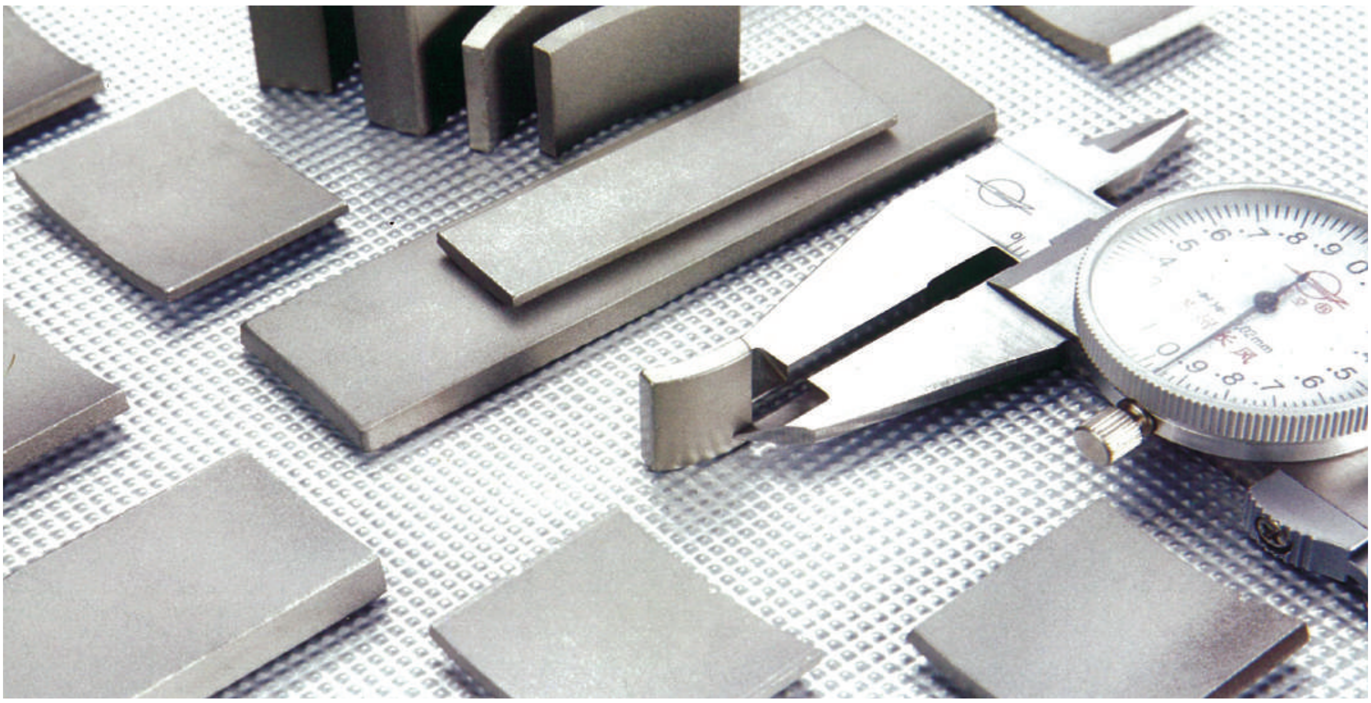


MPS 2/17–28



MPS 2/17–30





NEOPLAST Bonded Neodymium Iron Boron (Isotropic)

NEOPLAST

Bonded NdFeB is produced by mixing plastic binders with NdFeB powder: these allow the merging of high rare earth performances and bonded magnets potentialities.
The process to obtain this NdFeB powder was born in the same age of sintered NdFeB process but only during the last years it started to live an increasing market spreading mainly thanks to the high variety of shapes, geometries and material combination it can allow, by mean of compression and injection moulding.
It means advantages in minimizing assembling processes of a complete device, as well as in its miniaturization.
Furthermore parts can also be moulded with high accuracy, reducing tolerances of final device; magnetization of the magnet can be obtained in a wide variety of configurations.
These magnets are applied in electric motors, rotating and linear motors, sensor systems, magnetic couplings.
The max working temperature, for some grades, is over 150°C allowing to meet most of the requests from different fields: automotive, automation, instrumentation, house appliances.

INJECTION MOULDED NEOPLAST

Grade	Remanence				Coercivity				Intrinsic Coercivity				Max Energy Product				Max. Operat. Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ	Curie Temp.	Tensile Strenght	Density
	Br				HcB				HcJ				(BH) max									
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m³		°C	%/°C	%/°C	°C	MPa	g/cm³
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max						
Neoplast 11	3.500	4.100	350	410	3.000	3.800	238	302	8.700	9.700	692	772	2,9	3,9	23,0	31,0	< 120	-0,14	-0,36	350	60,0	4,05
Neoplast 12	4.100	4.700	410	470	3.400	4.200	270	334	8.400	9.400	668	748	3,7	4,7	29,4	37,4	< 120	-0,14	-0,36	350	62,5	4,69
Neoplast 13	4.850	5.150	485	515	3.800	4.600	302	366	8.300	9.300	660	740	4,7	5,7	37,0	46,0	< 120	-0,12	-0,40	350	59,7	5,01
Neoplast 21	5.350	5.650	535	565	3.700	5.300	294	422	8.500	9.500	676	756	5,6	6,7	45,3	53,3	< 120	-0,14	-0,36	350	54,0	5,37
Neoplast 22	5.400	6.000	540	600	4.300	5.100	342	406	8.500	9.500	676	756	6,4	7,4	51,0	59,0	< 120	-0,13	-0,37	350	60,3	5,28
Neoplast 23	6.000	6.600	600	660	4.600	5.400	366	430	8.500	9.500	676	756	7,5	8,5	59,7	67,6	< 120	-0,13	-0,37	350	36,3	5,54
Neoplast 31	4.600	5.200	460	520	3.900	4.700	310	374	8.200	9.800	652	780	4,6	5,6	36,6	44,6	< 180	-0,13	-0,37	350	77,0	4,87
Neoplast 32	5.000	5.600	500	560	3.900	4.700	310	374	8.000	9.600	636	764	5,4	6,4	43,0	53,9	< 180	-0,13	-0,37	350	63,4	5,08
Neoplast 33	5.000	5.600	500	560	4.100	4.900	326	390	10.000	12.000	796	955	5,4	6,4	43,0	50,9	< 180	-0,13	-0,40	350	48,9	5,03

COMPRESSION MOULDED NEOPLAST

Grade	Remanence				Coercivity				Intrinsic Coercivity				Max Energy Product				Max. Operat. Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ	Curie Temp.	Tensile Strenght	Density
	Br				HcB				HcJ				(BH) max									
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m³		°C	%/°C	%/°C	°C	MPa	g/cm³
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max						
Neoplast 101	6.800	7.300	680	730	5.500	6.000	440	480	8.500	10.000	680	800	10,0	11,0	80	88	160	-0,11	-0,39	350	80-120	5,8-6,0
Neoplast 102	6.900	7.100	690	710	5.400	5.800	430	460	9.800	10.800	780	864	9,4	10,2	72,2	81,6	160	-0,13	-0,40	350	80-120	5,8-6,0
Neoplast 103	7.100	7.600	710	760	5.000	5.600	397	446	8.000	8.900	636	708	10,0	11,0	79	88	160	-0,11	-0,39	350	80-120	5,8-6,0
Neoplast 111	6.700	7.200	670	720	5.200	5.900	416	472	8.500	10.000	680	800	9,2	10,2	73,6	81,6	160	-0,11	-0,36	350	80-120	5,8-6,0
Neoplast 131	5.900	6.300	590	630	5.000	5.500	400	440	15.000	18.000	1.200	1.440	8,0	9,0	64	72	160	-0,07	-0,40	350	80-120	5,8-6,0
Neoplast 161	6.800	7.500	680	750	5.000	5.500	400	440	6.500	7.500	520	580	9,5	10,5	76	84	150	-0,11	-0,39	350	80-120	5,8-6,0
Neoplast 171	6.000	6.500	600	650	5.000	5.500	400	440	8.000	10.000	640	800	8,0	9,0	64	72	160	-0,12	-0,43	350	80-120	5,8-6,0
Neoplast 181	7.000	8.000	700	800	5.000	5.500	400	440	6.500	7.500	520	600	10,0	12,0	80	96	150	-0,11	-0,39	350	80-120	5,8-6,0
Neoplast 191	6.500	6.900	650	690	5.200	6.200	416	496	11.000	13.500	880	1.080	9,0	10,0	72	80	180	-0,14	-0,36	350	80-120	5,8-6,0
Neoplast 271	6.000	6.400	600	640	5.000	5.400	400	430	9.000	10.000	720	800	7,0	8,0	56	64	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 272	5.500	6.000	550	600	4.000	5.000	400	430	9.000	10.000	720	800	6,0	7,0	48	56	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 273	5.000	5.500	500	550	4.000	5.000	360	400	9.000	10.000	720	800	5,0	6,0	40	48	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 274	4.500	5.000	450	500	3.000	4.000	360	400	9.000	10.000	720	800	4,0	5,0	32	40	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 275	4.000	4.500	400	450	3.000	4.000	320	360	9.000	10.000	720	800	3,0	4,0	24	32	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 276	3.000	4.000	300	400	2.500	3.000	200	240	8.000	10.000	640	800	2,0	3,0	16	24	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 277	2.000	3.000	200	300	2.000	2.500	160	200	8.000	10.000	640	800	1,0	2,0	8	16	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 278	1.500	2.000	150	200	1.500	2.000	120	160	8.000	10.000	640	800	0,5	1,0	4	8	160	-0,10	-0,42	300	80-120	6,0-6,4
Neoplast 291	6.400	6.800	640	680	5.200	6.200	416	496	11.000	13.500	880	1.080	8,0	9,0	64	72	180	-0,14	-0,36	300	80-120	6,0-6,4
Neoplast 292	6.000	6.400	600	640	4.500	5.500	416	496	11.000	13.500	880	1.080	7,0	8,0	56	64	180	-0,14	-0,36	300	80-120	6,0-6,4
Neoplast 293	5.400	6.000	540	600	4.500	5.500	360	440	11.000	13.500	880	1.080	6,0	7,0	48	56	180	-0,14	-0,36	300	80-120	6,0-6,4
Neoplast 294	5.000	5.400	500	540	3.500	4.500	360	440	11.000	13.500	880	1.080	5,0	6,0	40	48	180	-0,14	-0,36	300	80-120	6,0-6,4
Neoplast 295	4.500	5.000	450	500	3.000	4.000	320	400	11.000	13.500	880	1.080	4,0	5,0	32	40	180	-0,14	-0,36	300	80-120	6,0-6,4

1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/dimension and to the circuit where magnet is operating in.

FERPLASTIC
Bonded Ferrite

Grade	Density	Hardness	Curie Temp.
	g/cm³	Hv	°C
Ferplastic 3*	3,20	45	450
Ferplastic 10	3,35	45	450
Ferplastic 15	3,75	45	450

1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/ dimension and to the circuit where magnet is operating in.

Grade	Remanence		Coercivity		Intrinsic Coercivity		Max Energy Product		Max. Operat. Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ
	Br		HcB		HcJ		(BH) max				
	G	mT	Oe	KA/m	Oe	KA/m	MGOe	KJ/m³	°C	%/°C	%/°C
Ferplastic 3*	1.400 - 1.600	140 - 160	1.100 - 1.440	88 - 115	1.250 - 1.750	100 - 140	0,40 - 0,60	3,2 - 4,8	<120	- 0,19	+ 0,3
Ferplastic 10	2.400 - 2.600	240 - 260	2.000 - 2.260	160 - 180	2.100 - 2.760	170 - 220	1,30 - 1,60	10,3 - 12,7	<120	- 0,19	+ 0,3
Ferplastic 15	2.850 - 2.950	285 - 295	2.260 - 2.380	180 - 190	2.760 - 2.950	220 - 235	1,88 - 2,10	15,0 - 16,8	<120	- 0,19	+ 0,3

* Isotropic

FERPLASTIC Bonded Ferrite

Bonded ferrites are produced by mixing plastic matrix and ferrite oxides. Production process was known since 50's, mainly injection moulding and compression: the main advantage versus sintered ferrite is the wide variety of shapes, miniaturization possibilities, minimization or assembling process, robustness, tooling process.
Assembling process and miniaturization of devices using these kind of magnets are optimized thanks to the overmoulding process; magnet postprocessing is usually not necessary.
Magnetizing configuration can be optimized to the need of the final device application.
This magnet offers high resistance to oxidation and in general to chemical aggression: it makes bonded ferrite magnets particularly suited to application where contact with liquid or aggressive environment is familiar.
Thermal behaviour is acceptable for many applications as its coercive force is not reduced by rising the working temperature (120°C).

PLASTIMAG Ferrite Rubber Magnet

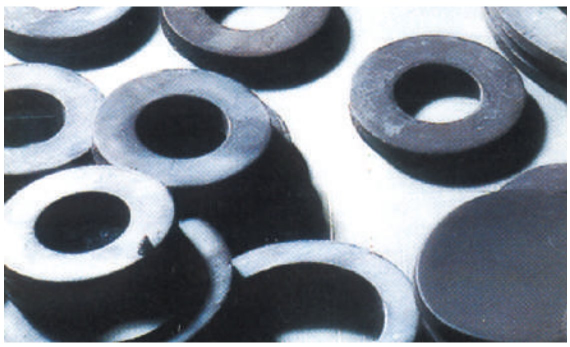
Magnetic rubber is obtained by mixing synthetic rubber and ferrite oxides: final parts are then achieved in desired shapes by calendering or extrusion.
The product provides an extreme flexibility and mechanical robustness, making it suitable in many different situations and environments. Designers can satisfy different needs with so many different geometries, also with final postprocessing including cutting, punching, fitting on curved surfaces or gluing on metals or wooden parts. Magnetization is usually axial multi-poles on surface to maximize the performances.
They are applied in lifting or holding systems, gadget, magnetotherapy, motors, generators, sensors.

PLASTIMAG Ferrite Rubber Magnet

Grade	Remanence				Coercivity				Intrinsic Coercivity				Max Energy Product			
	Br				HcB				HcJ				(BH) max			
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m³	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Plastimag 1*	1.850	2.000	185	200	1.130	1.380	90	110	1.570	1.885	125	150	0,74	0,93	6,0	7,0
Plastimag 5	2.500	2.700	250	270	2.200	2.400	175	190	2.500	2.900	200	230	1,42	1,80	11,5	14,5
Plastimag 8	≥2.700		≥270		2.200	2.400	175	190	2.500	2.900	200	230	≥1,80		≥14,50	

* Isotropic

Grade	Max. Operat. Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ	Hardness	Density
	°C	%/°C	%/°C	Shore D	g/cm³
Plastimag 1*	80	-0,2	+0,2/+0,5	30-50	3,6-3,7
Plastimag 5	80	-0,2	+0,2/+0,5	30-50	3,6-3,7
Plastimag 8	80	-0,2	+0,2/+0,5	30-50	3,6-3,7

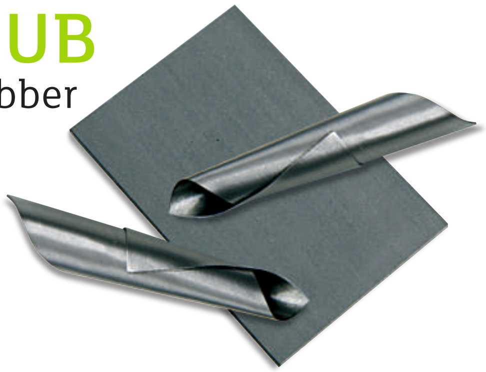


1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/ dimension and to the circuit where magnet is operating in.

NEORUB

NdFeB Rubber Magnet



Grade	Max Operat. Temp.	Temp. Coeff. of Br	Temp. Coeff. of HcJ	Hardness	Density
	°C	%/°C	%/°C	Shore D	g/cm^3
Neorub 2	120	-0,11	-0,3/-0,4	30-80	3,30-3,90
Neorub 5	120	-0,11	-0,3/-0,4	30-80	4,65-5,25
Neorub 8	120	-0,11	-0,3/-0,4	30-80	5,10-5,70

1) The above mentionated data are given at room temperature on laboratory test samples and they can differ by +/- 5% from the measured values on the standard magnets production.

2) The above values also have relationship to products' shape/ dimension and to the circuit where magnet is operating in.

Grade	Remanence				Coercivity				Intrinsic Coercivity				Max Energy Product			
	Br				HcB				HcJ				(BH) max			
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m^3	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Neorub 2	2.500	3.500	250	350	1.500	2.500	120	200	2.000	4.000	150	320	1,5	2,5	12	20
Neorub 5	4.300	5.300	430	530	3.200	4.200	250	340	7.800	9.800	620	780	4,5	5,5	36	44
Neorub 8	5.700	6.700	570	670	4.500	5.500	350	440	8.500	11.000	670	880	7,5	8,5	60	68

NEORUB NdFeB Rubber Magnet

This type of magnetic compound joins the high energy density of rare earth powder with the wide choice of possible shapes and with easy workability and robustness of magnetic rubber.
Neorub is obtained by mixing Neodymium Iron Boron powder with synthetic rubber: thanks to its higher performance, this magnet compound is more and more attracting the attention of designers as alternative to rubber ferrite.
This can be used in lifting systems, gadgets, magnetotherapy, motors, generators, sensors.

OXIDES POWDER

The powder used in manufacturing various kinds of flexible permanent magnets has good compatibility with many composite materials such as PVC and rubber.
Our strict quality control system ensures the uniform stability of the magnetic properties.
We can also, according to customer demands, produce specific products.

OXIDES POWDER

Grade	Remanence				Coercivity				Intrinsic Coercivity				Max Energy Product			
	Br				HcB				HcJ				(BH) max			
	G		mT		Oe		KA/m		Oe		KA/m		MGOe		KJ/m^3	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
PSF/BH 0,8 not oriented	1.900	2.100	190	210	≥ 1500		≥ 119		2.000	2.300	159	183	≥ 0,80		≥ 6,37	
PSF/BH 1,6 oriented	2.600	2.800	260	280	2.200	2.500	174	198	2.600	3.000	206	238	≥ 1,60		≥ 12,74	
PSF/BH 1,7 oriented	2.600	2.800	260	280	2.300	2.500	182	198	2.700	3.000	214	238	≥ 1,70		≥ 13,54	

MAGNETIC POLE INDICATOR

MAGNETIC VIEW FILM

RUBBER JACKET

With MPN 35 (NdFeB)

These Neodymium magnets (MPN35 grade) are completely coated with rubber granting them to be waterproof and therefore well protected against corrosion. The rubber layer also increases the resistance to lateral sliding. At the center of the magnet a pin allows the simple clamping of any object.

A

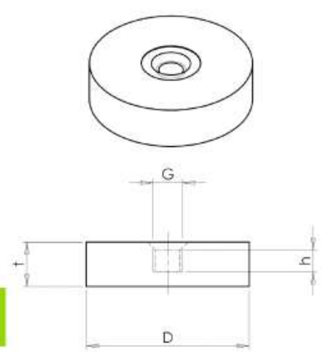
Code	D	t	h	G	Weight (g)	Attractive force (N)	Max Operating Temp. (°C)
RJ/P/N/22/6/M4	22	6	4	M4	22	40	60
RJ/P/N/43/6/M4	43	6	4	M4	43	85	60
RJ/P/N/66/8.5/M5	66	8,5	6,5	M5	66	180	60
RJ/P/N/88/8.5/M8	88	8,5	6,5	M8	88	420	60

B

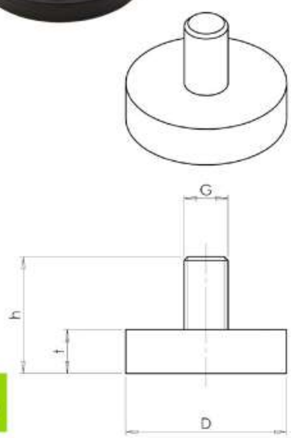
Code	D	t	h	G	Weight (g)	Attractive force (N)	Max Operating Temp. (°C)
RJ/N/66/8.5/M8x15	66	8,5	23,5	M8x15	105	180	60
RJ/N/66/8.5/M8x15	88	8,5	23,5	M8x15	105	420	60

C

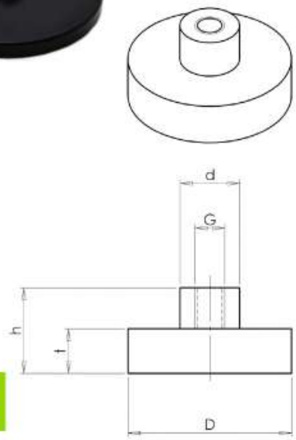
Code	D	t	h	d	G	Weight (g)	Attractive force (N)	Max Operating Temp. (°C)
RJ/N/43/6/M4	43	6	10,5	8	M4	30	85	60
RJ/N/66/8.5/M5	66	8,5	15	10	M5	105	180	60
RJ/N/88/8.5/M8	88	8,5	17	12	M8	190	420	60



A



B



C

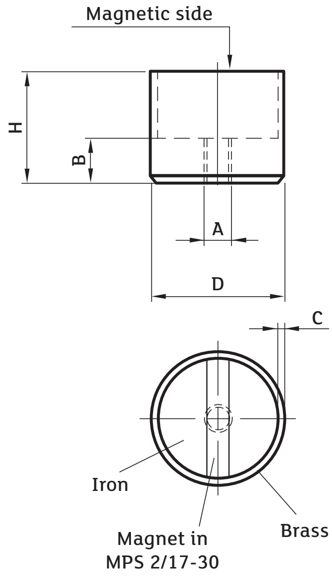
POTMAX

With MPS 2/17-30 (SmCO)

They consist in a brass casing with an inner magnet and two iron pieces.
Despite the small size they have a very high attractive force.

Code	D	H	A	B	C	Attractive Force (Kg)	Weight (g)
POTMAX/S217-30/10	10±0,1	10±0,1	M3	3	1	2,0	6,29
POTMAX/S217-30/15	15±0,1	15±0,1	M3	3	1,5	12,0	21,57
POTMAX/S217-30/20	20±0,1	20±0,1	M4	4	2	14,0	51,22

Max Operating Temp. 250°C



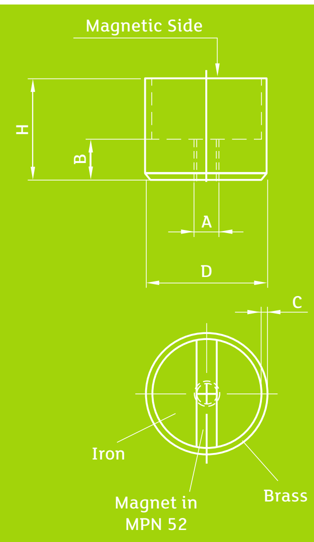
POTMAX

With MPN52 (NdFeB)

They consist in a brass casing with an inner magnet and two iron pieces.
Despite the small size they have a very high attractive force.

Code	D	H	A	B	C	Attractive Force (Kg)	Weight (g)
POTMAX/N52/10	10±0,1	10±0,1	M3	3	1	5,0	6,14
POTMAX/N52/15	15±0,1	15±0,1	M3	3	1,5	14,0	21,09
POTMAX/N52/20	20±0,1	20±0,1	M4	4	2	26,0	50,35

Max Operating Temp. 80°C



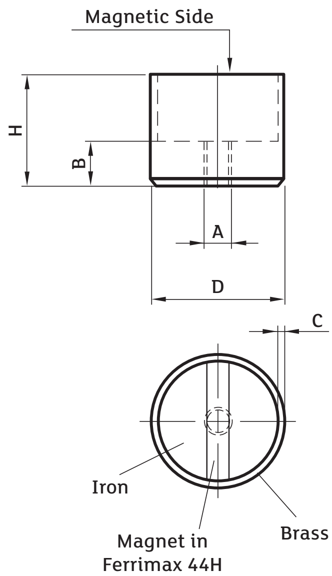
POTMAX

With Ferrimax 44H (Ferrite)

They consist in a brass casing with an inner magnet and two iron pieces.
Despite the small size they have a very high attractive force.

Code	D	H	A	B	C	Attractive Force (Kg)	Weight (g)
POTMAX/F44H/10	10±0,1	10±0,1	M3	3	1	1	5,65
POTMAX/F44H/15	15±0,1	15±0,1	M3	3	1,5	4,5	19,61
POTMAX/F44H/20	20±0,1	20±0,1	M4	4	2	7,5	47,67

Max Operating Temp. 250°C

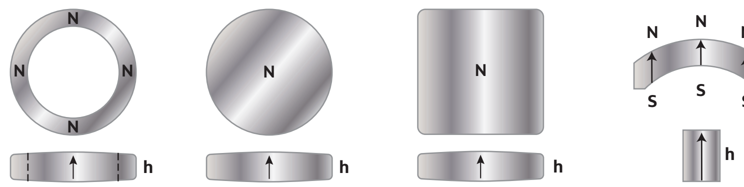


UNITS CONVERTION

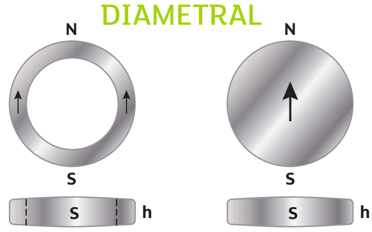
Property	Symbols	Unit SI	Unit CGS	Conversion
Magnetic flux density (induction)	B	T (Tesla)	G (Gauss)	1 T = 10.000 G 1 G = 0,0001 T
Magnetic field strenght	H	A/m	Oe	1 kA / m = 12,57 Oe 1 KOe = 79,5 KA / m
Max magnetic energy density	(BH) max	kJ/m^3	MGOe	1 kJ / m^3 = 0,1257 MGOe 1 MGOe = 7,95 kJ / m^3

MAGNETIZATION PATTERNS

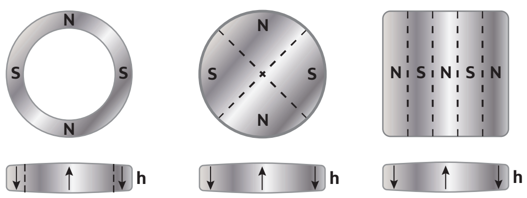
AXIAL



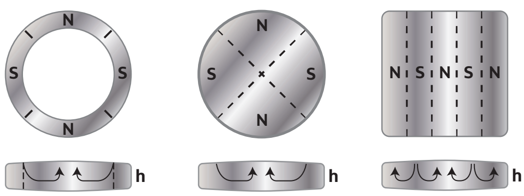
DIAMETRAL



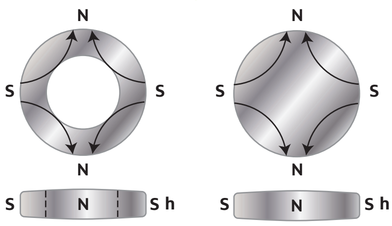
MULTIPOLAR ON BOTH SIDES



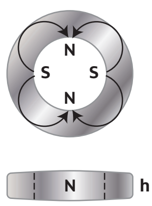
MULTIPOLAR ON ONE SIDE



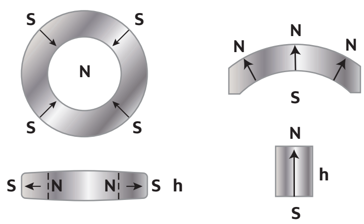
EXTERNAL MULTIPOLAR



INTERNAL MULTIPOLAR



RADIAL



Our Partners

Magnetic Systems

was established in 1999 as a consequence of the reorganization process of MPI company, with the aim of rationalize the operational aspect of its activity and in agreement with the new economic tendency, by making the industrial section independent.

SPIN

Applicazioni Magnetiche Srl

www.spinmag.it

MAGNETIC SYSTEMS

www.magneticsystems.it

SPIN Applicazioni Magnetiche

operates in the design of electromagnetic devices, computer simulation and mechatronics.

SPIN
Applicazioni Magnetiche Srl
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A TRUSTED PARTNER

SPIN Applicazioni Magnetiche is specialized in the design of electromagnetic devices, simulation programs and industrial automation.

Design and prototyping of electrical machines

For over 15 years the company has been working with important companies of many different sectors:

ELECTRIC ROTARY MACHINES: automation, automotive, ventilation, railway traction, aerospace, generators, machines with levitating motor.

MOTORSPORT: hybrid drive, sensors, linear actuators, Kers systems.

MAGNETIC COUPLING: handling, entrainment, mixing, magnetic gearboxes, brake systems, systems to hysteresis and eddy currents.

SENSORS: electromedical, the automotive and aviation (aerospace) motor control, rail, position control of pneumatic cylinders; magnetic signature of the ship.

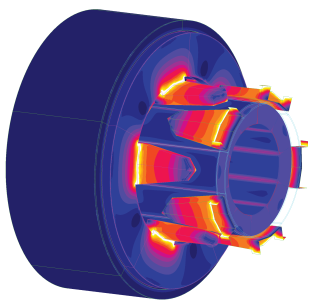
ACTUATORS: linear motors, electromagnets for solenoid valves, electromagnets for lifting and for the generation of magnetic fields.

TRANSFORMERS: calculation of benefits, Joule losses, eddy current and dispersed magnetic flows, thermal analysis and computational thermal and fluid dynamics.

ENERGY: connection and distribution systems.

SIMULATION SOFTWARE

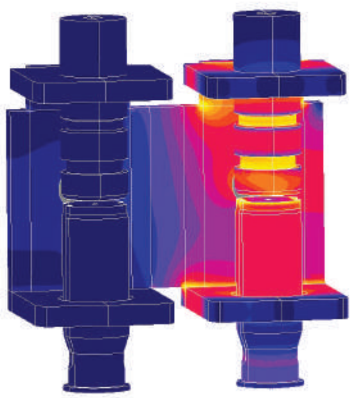
Spin Applicazioni Magnetiche is the Italian distributor of the most advanced software products for the design of electromagnetic, magnetothermal and automation components, used by the major electromechanical industries:



ELECTROMAGNETIC AND THERMAL ANALYSIS

Flux2D© - Flux3D©

It is a finite element software for electromagnetic and thermal analysis, produced by Cedrat company. It allows to perform the design and virtual prototyping of:
electric motors, generators, linear actuators, electrostatic component, transformers, induction heating treatment, electromagnets, permanent magnets coupling, sensors, microdevices and micromotors (MEMS).



FLUX SOFTWARE CHARACTERISTICS:

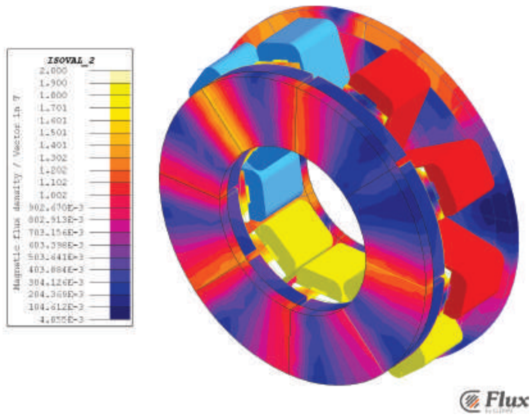
- Specific module for electric motors Fluxmotor©
- Interface adapted to each application
- Direct import from all formats CAD: Pro-E, Catia,
- Autocad, Inventor, Solid Works, Step, Sat, Dxf, Igs, Stl.
- Noise and Vibration analysis
- Combined analysis with Simulink and Portunus for designing control systems
- Multiphysics Analysis

Design of electric motors

SPEED© It is a software tool devoted to electromechanical design of rotating machine. Conceived and developed by Prof. Tim Miller of Glasgow University to compute in short time the machine behaviour, as well as to determinate all details: nominal and peak torque, Joule and magnetic losses, torque ripple, weight and costs, control parameters, reactances, inductance, resistance…).
"Short time" means that it is possible to compute hundred of machine models in less than few seconds!
The Speed models can be easily exported and modified in Flux©.

BCS© It is the optimization program developed by Spin Magnetic Applications: enables, using advanced optimization algorithms, an automated search engine that best suits the needs, from initial specification and setting design constraints.

MOTORCAD© It is the only commercial program dedicated to thermal analysis of rotating machines. Manufactured by Motor Design Ltd, it is reliable and fast in setting patterns: as in the case of Flux and Speed© who created it, Dr. Dave Staton of Design of Motor, is an accomplished designer of electric motors and deep has a knowledge of the thermal problems of rotating machines.



Since over 15 years SPIN provides its expertise to important companies in many different sectors:

MECHATRONICS

PORTUNUS©

It is the latest of Cedrat's products family, it is a modern system simulator for mechatronics, power electronics and motor drivers. It is important to design in advance also the control system as it allows to know since the beginning the final performance of a device and eventually to optimize its whole behaviour, but also to minimize the engineering and the time to market of the product.
It can be linked with Flux2D© e Flux3D© for an accurate simulation of the device and it can also exchange information and data with all the electric and system software used.

ELECTRIC POWER TRANSMISSION

PSCAD©

It is the reference program for the analysis of the distribution and transmission of energy. It allows to build, simulate and model the electrical systems, even complex, through user-friendly interfaces. It includes a complete library of models of systems described by simple passive elements, control functions, electrical machines and other complex devices.

ELECTRIC CONNECTIONS

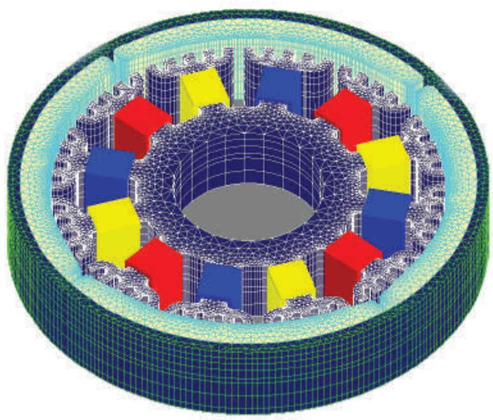
InCa3D©

It is a tool for the power electronics, the analysis of the power connections and electromagnetic compatibility.
Based on PEEC method (Partial Element Equivalent Circuit), is dedicated to the simulation of electric power connections, finalized the analysis of thermal effects and maximizing efficiency.
Application areas: circuit boards and printed circuit boards (PCBs), inverter, EMC, electrical panels, power distribution bars (DBC).

PERMANENT MAGNET COMPUTATION

PEMAPS©

To size a permanent magnet systems of magnetic attraction or a sensor making use of permanent magnets, you can use the program in PEMAPS alternatives to complex numerical analysis. PEMAPS allows the quick calculation of the magnetic field generated around a permanent magnet, evaluate the effectiveness of a magnetic sensor or calculating the force generated by a system with permanent magnets.



MAGNETIC SYSTEMS

Magnetic Systems

was established in 1999 as a consequence of the reorganization process of MPI company

with the aim of rationalize the operative aspect

of its activity and in according to with the new economic tendency,

by making the industrial section independent.

Our customers' confidence and co-operation give us the opportunity of adding experience to the solution of everyday issues relevant to the transformation and realization of magnetic systems.

Collaboration with skilled workshop specialized in the single materials' processing, our personnel's laboriousness and the co-operation with our technical agents allow us to guarantee a prompt reaction to our customers' needs.

The market demand, more and more focused to the environmental protection, is helping us to develop products which can guarantee a future to natural resources and high quality standard of living.

MAGNETIC SYSTEMS

Magnetic conveyors

Magnetic heads

Magnetic heads consist of steel structures where suitable supports are applied. On such supports, permanent magnets are assembled.

Our heads are emploied on palletizing and depalletizing systems. A release system, moved by pneumatic pistons, allows the smooth attachment and detachment of the whole magnetic surface located on the pallet without damaging cans and lids.

The result is working-time saving. This allows faster loading and unloading operations and guarantees precision and safety avoiding production damages (cans' fall, pallets' moving, etc.). The employment of Neodymium magnets allows the realization of smaller and lighter magnetic heads if compared with Ferrite ones. Furthermore, the use of Neodymium Iron Boron magnets ensures a valuable increase of the attraction force. The perimeter protection guarantees the perfect functionality of the head by avoiding infiltrations which could damage the magnets.

Magnetic tracks

Magnetic tracks generate a steady and powerful magnetic field even through belts of remarkable thickness. In this way, they can solve a lot of handling problems concerning the conveying of ferrous shapes, plates, cans and lids.

A good combination of magnetic tracks and pulleys allows both vertical and horizontal conveying system.

The choice of a particular kind of track depends on many factors: dimensions, working angle (0-90°), belt's thickness and the kind of can (diameter, height, weight).

Our standard tracks are made up with Ferrite magnets.

Magnetic pulleys

Magnetic pulleys are suitable for the transportation of profiles, pipes, cans, lids and any other iron products.

Their application field is very wide even if, in many cases, our pulleys are combined with our magnetic tracks in the realization of magnetic transports, conveyors etc.

Our magnetic pulleys are easy to install, do not need any specific maintenance procedure and keep their magnetic power unchanged over the time. Magnetic pulleys are assembled with iron structures, where magnets are inserted.

In case of pulleys for elevators, magnets are covered with resin or aluminium disks which allow the realization of conical shapes or particular processing. Our magnetic pulleys are mainly produced with Ferrite or Neodymium Iron Boron magnets. Anyway, if high temperature resistance is required, we can also provide pulleys made up with AlNiCo magnets.

MAGNETIC GRADING MACHINE

Magnetic grading machines are provided with a stainless steel structure where granulated and thin materials are conveyed on a separator drum. Once material has been properly separated, it runs through two different exits. The drum rotation is trasmitted by the motorization located outside the structure. As regards the separation of very thin granulometries, we suggest to employ grading machines with Neodymium Iron Boron magnets. They find their best application in milling and ceramic industries.

Magnetic separation

COMPOUND MAGNETIC ROLLERS

Compound magnetic rollers are placed ahead conveyor belts in order to separate small and medium size of iron pieces. Their magnetic power is very strong, anyhow if higher separation is needed we suggest to combine rollers with plates. These rollers do not need any specific maintenance procedure and their attraction force is permanent in time.

BELT SEPARATORS

Belt separators (overbelts) have a leading role in the automatic extraction of ferrous parts from inert materials which are transported by plane or concave conveyors. Located on the conveyor itself, overbelts attract the ferrous parts which are dragged by a rubber belt to a lateral area. Overbelts are employed in inert material shattering systems, in the selection of municipal solid wastes, in the recycling of wood, plastic and other materials. The requested maintenance is really minimal and mostly related to mechanical parts. The motorization, either hydraulic or electric, enables the belt movement. Their main advantage is permanent magnetic power along with extremely deep magnetic field without energy-waste

MAGNETIC SEPARATING PLATES

Magnetic separating plates are used for the separation of ferrous parts in order to protect shattering and milling systems.
Moreover, where higher powerful is needed, they can be combined with a roller. Magnets, which are protected by a watertight stainless steel structure, allows the application of the plate in whatever environmental condition. Their magnetic field is steady and maintenance is practically unnecessary.

"POT" MAGNET WITH ALNICO CORE

"POT" magnetic bases are made up of an Alnico core and screened by a non magnetic material ring. They are inserted into a chrome coated iron housing which ensures shock-resistance. The hole opposite to the attractive surface allows the piece to be fixed. This range of magnets is known as the best solution to various problems related to working conditions in small areas. Moreover, working temperature is up to 450°C.

"GOLDEN" MAGNETS WITH NEODYMIUM IRON BORON CORE

"GOLDEN" magnetic bases are made up of a Neodymium core inserted in a ferrous housing. They ensure a high attraction force despite the small dimensions.

Magnetic bases

"SILVER" MAGNETS WITH FERRITE CORE

"SILVER" magnetic bases consist of a Ferrite core inserted into a chrome coated iron casing. The assembly to non-magnetic parts is ensured by a hole or screwed shank.

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