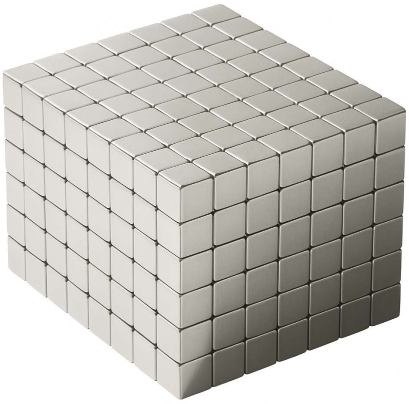
MAGNET APPLICATIONS
A Division of BUNTING

Neodymium (NdFeB)

DATA SHEET

Heavy Rare Earth Free Range



NEODYMIUM (NdFeB) are the most powerful magnets available. They are the first choice for maximum performance from minimum size. This data sheet covers the standard range of NdFeB magnets that are commonly used in all industries. All Neodymium NdFeB is REACH and ROHS compliant and does not contain SVHC's whilst licensed grades are produced to ISO9001 and ISO14001 Quality Control Standards. Certificates of Conformity, SDS and PPAP's can be supplied on request.

Neodymium NdFeB grades exist with maximum recommended temperature ratings - from +60°C up to +230 °C but these ratings are GUIDELINE values only. The actual maximum temperature rating depends on the shape of the magnet and the design of the application. Exceeding the actual maximum temperature results in a permanent demagnetisation (a permanent weakening of magnetic output) which is only recoverable by re-magnetisation. All Neodymium NdFeB grades require a protective coating to prevent and minimise corrosion. The coating is usually a Ni-Cu-Ni plating although other coatings/finishes exist. Neodymium NdFeB magnets can be made in blocks, discs, rings, arcs, spheres, triangles, trapezoids and many other shapes. Certificates of Conformity, SDS's and PPAP's can be provided on request.

Neodymium HRE Free Grades

Commonly used globally. Minimum Values only

Material		Br		Hc (Hcb)		Hci (Hcj)		BHmax	
		mT	G	kA/m	Oe	kA/m	Oe	kJ/m³	MGOe
N27		1,030	10,300	796	10,000	955	12,000	199	25
N30		1,080	10,800	796	10,000	955	12,000	223	28
N33		1,130	11,300	836	10,500	955	12,000	247	31
N35		1,170	11,700	867	10,900	955	12,000	263	33
N38		1,210	12,100	899	11,300	955	12,000	287	36
N40		1,240	12,400	923	11,600	955	12,000	302	38
N42		1,280	12,800	923	11,600	955	12,000	318	40
N45		1,320	13,200	875	11,000	955	12,000	342	43
N48		1,380	13,800	836	10,500	875	11,000	366	46
N50		1,400	14,000	796	10,000	875	11,000	382	48
N52		1,430	14,300	796	10,000	875	11,000	398	50
N27	M	1,030	10,300	796	10,000	1,114	14,000	199	25
N30	M	1,080	10,800	796	10,000	1,114	14,000	223	28
N33	M	1,130	11,300	836	10,500	1,114	14,000	247	31
N35	M	1,170	11,700	867	10,900	1,114	14,000	263	33
N38	M	1,210	12,100	899	11,300	1,114	14,000	286	36
N40	M	1,240	12,400	923	11,600	1,114	14,000	302	38
N42	M	1,280	12,800	923	11,600	1,114	14,000	318	40
N45	M	1,320	13,200	875	11,000	1,114	14,000	342	43
N48	M	1,370	13,700	1,035	13,000	1,114	14,000	366	46
N50	M	1,400	14,000	1,035	13,000	1,114	14,000	382	48
N27	H	1,030	10,300	796	10,000	1,353	17,000	199	25
N30	H	1,080	10,800	796	10,000	1,353	17,000	223	28
N33	H	1,130	11,300	836	10,500	1,353	17,000	247	31
N35	H	1,170	11,700	867	10,900	1,353	17,000	263	33
N38	H	1,210	12,100	899	11,300	1,353	17,000	286	36
N40	H	1,240	12,400	923	11,600	1,353	17,000	302	38

Material		Br		Hc (Hcb)		Hci (Hcj)		BHmax	
		mT	G	kA/m	Oe	kA/m	Oe	kJ/m³	MGOe
N42	H	1,280	12,800	955	12,000	1,353	17,000	318	40
N45	H	1,320	13,200	995	12,500	1,353	17,000	342	43
N48	H	1,370	13,700	995	12,500	1,353	17,000	366	46
N27	SH	1,030	10,300	804	10,100	1,592	20,000	199	25
N30	SH	1,080	10,800	804	10,100	1,592	20,000	223	28
N33	SH	1,130	11,300	844	10,600	1,592	20,000	247	31
N35	SH	1,170	11,700	875	11,000	1,592	20,000	263	33
N38	SH	1,210	12,100	907	11,400	1,592	20,000	286	36
N40	SH	1,240	12,400	939	11,800	1,592	20,000	302	38
N42	SH	1,280	12,800	963	12,100	1,592	20,000	318	40
N45	SH	1,320	13,200	1,003	12,600	1,592	20,000	342	43

Direction of Magnetisation

A letter "A" is often used to denote the dimension that the direction of magnetisation (DoM) runs parallel with. The A usually means Alignment, although (shared/common) Axis is also used. e.g. D5mm x 30mmA is an axially magnetised rod magnet. If an arrow is present on the drawing, the arrow shows the direction of magnetisation and it points to the North pole face. The North poleface of a permanent magnet is a North seeking pole (it seeks the geographic North). By scientific definition of unlike poles attracting, the Earth's geographic North pole is actually a magnetic South pole. We use this definition for DoM.

Temperature Ratings

MAGNET TYPE SUFFIX	Rev. Temp. Coeff. %/°C (20-100°C)		Max. Working Temperature
	Br (α)	Hci (β)	
	-0.120	-0.70	80°C = 176 °F *
M	-0.115	-0.65	100°C = 212 °F*
H	-0.110	-0.60	120°C = 248 °F
SH	-0.105	-0.55	150°C = 302 °F

Physical Properties

Characteristic	Symbol	Unit	Value
Density	D	g/cm^3	7.5
Vickers Hardness	Hv	D.P.N	570
Compression Strength	C.S	N/mm^2	780
Coeff. of Thermal Expansion	C//	10^{-6}/°C	3.4
	C⊥	10^{-6}/°C	-4.8
Electrical Resistivity	ρ	μ Ω.cm	150
Temp. coeff. of resistivity	α	10^{-4}/°C	2
Electrical Conductivity	σ	10^6S/m	0.667
Thermal Conductivity	k	kCal/(m.h.°C)	7.7
Specific Heat Capacity	c	kCal/(kg.°C)	0.12
Tensile Strength	σ_{UTS}, S_U	kg/mm^2	8
Young's Modulus	λ / E	$10^{11}N/m^2$	1.6
Flexural Strength	β	$10^{-12}m^2/N$	9.8
Compressibility	σ	$10^{-12}m^2/N$	9.8
Rigidity	E.I	N/m^2	0.64
Poisson's Ratio	υ		0.24
Curie Temperature	Tc	°C	310

Examples of Coatings Available

NdFeB should always be given a protective coating to reduce any risk of corrosion. Please advise us of your requirements.			
Nickel-Copper-Nickel (Ni-Cu-Ni) [this is the standard coating]	Everlube (6102G)	Nickel (Ni)	Epoxy (Black, Grey)
Nickel-Copper plus Black Nickel	Zinc (Zn)	White Zinc and Black Zinc	Copper (NiCu or NiCuNiCu)
Gold (Au) [this is actually NiCuNi plus Gold]	Tin (Sn)	Parylene C	Titanium (Ti)
Silver (Ag) [this is actually NiCuNi plus Silver]	Ni-Cu-Ni plus Rubber	Zn plus Rubber	Ni-Cu-Ni plus Parylene C
PTFE ("Teflon®") in black	PTFE ("Teflon®") in white	PTFE ("Teflon®") in silvery	PTFE ("Teflon®") in grey
Coloured (red, green, blue, pink, purple, etc.)	Titanium Nitride (TiN)	Chrome (bright/standard, black)	Ni-Cu-Ni plus PTFE
Zn plus Everlube	Ni-Cu-Ni plus Everlube	Ni-Cu-Ni plus Epoxy	Tin (Sn) plus Parylene C
Phosphate Passivation	Ni-Cu-Ni-Au-Parylene C	Zinc Chromate	Rhodium

Relative Coating Performance - Examples with Realistic Timescale Figures for 6 commonly used Coatings

"PLATING APPLIED	Overall Thickness	Pressure Test (PCT) 2 Bar, 120°C, 100% RH	Salt Spray Test 5% NaCl Sol., 35°C
Nickel Copper Nickel (NiCuNi)	15-21 microns	48 hours	Up to 24 hours
NiCu + Black Nickel	15-21 microns	48 hours	Up to 24 hours
NiCuNi + Black Epoxy	20-28 microns	72 hours	Up to 48 hours
NiCuNi + Gold	16-23 microns	72 hours	Up to 36 hours
NiCuNi + Silver	16-23 microns	48 hours	Up to 24 hours
Zinc	7-15 microns	24 hours	Up to 12 hours
Nickel Copper Nickel (NiCuNi)	15-21 microns	48 hours	Up to 24 hours

Tolerances

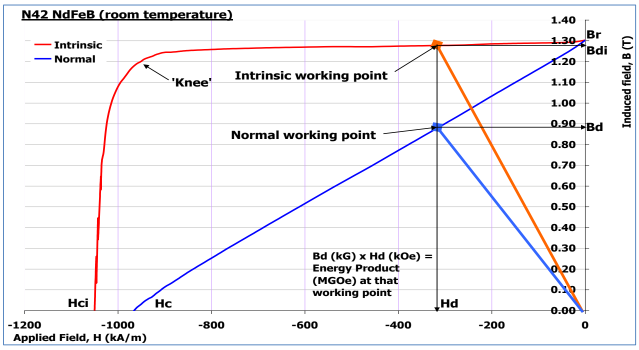
The standard magnet tolerances are +/-0.1mm. For a small additional fee +/- 0.05mm is possible for virtually all the magnet shapes.

Our Precision Magnetics range offers tolerances down to as small as +/-0.005mm but is subject to minimum production runs of 100k pieces and we will state the tolerances achievable.

The shape and finish determines the tolerances that can be achieved.

Please feel free to contact us for a free and without obligation quotation.

Example of a BH curve (second quadrant demagnetisation)



Additional Notes

How the magnet is used affects the working point of the magnet (shape, magnetic circuit, temperature, and humidity). When determining suitability, use the Intrinsic curve during analysis, not the Normal curve. Optimum performance is obtained by keeping the intrinsic working point above the 'knee' and ideally at the BHmax working point.
When using glue, you are bonding onto the plating and not the material itself. If the plating fails, the magnet may be free to move.

If in any doubt, please contact us for technical assistance. www.magnetapplications.com, sales@magnetapplications.com. We reserve the right to change any of the above information without notice and cannot accept any responsibility or liability for errors or problems caused by using any of the above information.