Properties of Magnets

Magnet
Round

■Features

Neodymium Magnet	Capable of highest magnetic force of all materials currently available. High forces can be obtained from small volume. One of the disadvantages is tendency to rust easily. Called "Rare Earth Magnets" along with the cobalt magnets.
Samarium-Cobalt Magnet	Full name is Samarium-Cobalt Magnet, and is second in strength following the Neodymium Iron Boron magnets. Advantage is its resistance to rusting and high temperatures. Brittle and mechanically low in strength, requiring careful handling.
Ferrite Magnet	This material has low magnetic force but has relatively high coercive force, thus suffers little demagnetization. Brittle and mechanically low in strength, requiring careful handling.
Alnico Magnet	It has superior property against temperature and mechanical strength. Disadvantage is its likeliness to demagnetize.

■Characteristic Values

Item	Increment	Powerful Neodymium Magnet	Neodymium Magnet	Heat-resistant Neodymium Magnets	Samarium-Cobalt Magnet	Ferrite Magnet	Alnico Magnet
Residual Flux Density	T	1.42 or More	1.26 or More	1.23 or More	1.03 or More	0.385 or More	1.25 or More
Coercive Force bHC	KA/m	796 or More	859 or More	923 or More	640 or More	230 or More	47.7 or More
Coercive Force iHC	KA/m	875 or More	955 or More	1592 or More	1190 or More	235 or More	47.7 or More
Max. Energy Product	kJ/m³	400 or More	260 or More	287 or More	140 or More	27.9 or More	38.2 or More
Density	g/cm³	7.3~7.5	7.3~7.5	7.3~7.5	8.3	4.8~5.0	7.3~7.4
Curie Temperature	°C	310	310	340~400	710	450~460	850
Vickers Hardness	HV	500~600	500~600	500~600	600	480~580	650
* Max. Operating Temp.	°C	60	80	150	200	300	400

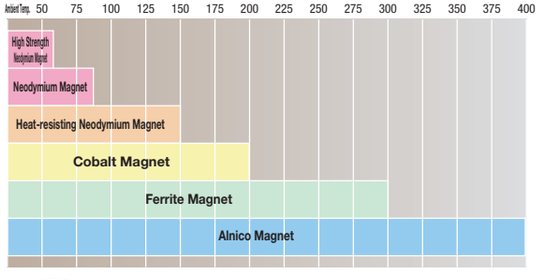
Listed values are for reference, not guaranteed.

When L/D=0.7

■Property Order

Item	Reference Characteristic Values	Weak ← → Strong			
Magnetic Force	Residual Flux Density Max. Energy Product	Ferrite	Alnico	Cobalt	Neodymium Heat-resisting Neodymium
Repeated Attractions	Attraction Force	Alnico	Ferrite	Cobalt	Neodymium Heat-resisting Neodymium
Mechanical Strength	—	Cobalt	Ferrite	Neodymium Heat-resisting Neodymium	Alnico
Corrosion Resistance	—	Neodymium Heat-resisting Neodymium	Alnico	Cobalt	Ferrite
High Temperature Stability	Curie Temperature Max. Operating Temp.	Neodymium Heat-resisting Neodymium	Cobalt	Ferrite	Alnico

■Comparison of Heat Resistance

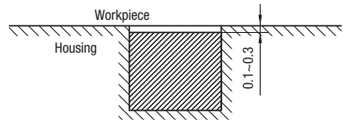


When L/D=0.7

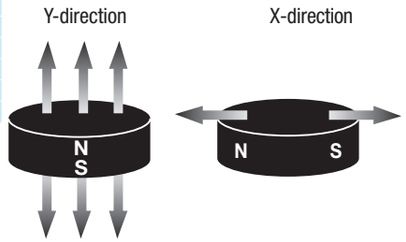
* Maximum operating temperature for magnets alone.

■Cautions

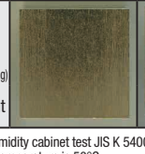
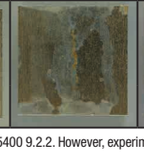
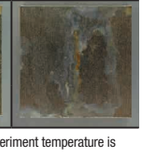
- Since these materials are very fragile, no alteration is available.
- Magnet is susceptible to impact. Be careful during installation.
- Magnetic fields may cause negative effects on items listed below. Electronic devices such as cellular phones, PCs and watches,Medical electronics such as pacemakers
- The magnetic force may deteriorate when used at above maximum operating temperature.
- Strong impact or alteration on magnets may cause magnetic force losses.
- To prevent direct impacts on magnets, keep 0.1 ~ 0.3mm distance from the body.



■Magnetization Direction



■Comparison on Corrosion Resistance

	Before test	24 hrs	72 hrs
Neodymium Magnet (No Surface Treatment) Corrosion Resistance: Inferior			
Neodymium Magnet (Surface Treatment: Nickel Plating) Corrosion Resistance: Excellent			
Samarium-Cobalt Magnet (No Surface Treatment) Corrosion Resistance: Good			
Samarium-Cobalt Magnet (Surface Treatment: Nickel Plating) Corrosion Resistance: Excellent			

In compliance with humidity cabinet test JIS K 5400 9.2.2. However, experiment temperature is 70°C, while standard temperature is 50°C.
The spot pattern seen on cobalt magnets is of water drops.

■Features of Magnets

Load {kgf} = Load Nx0.101972

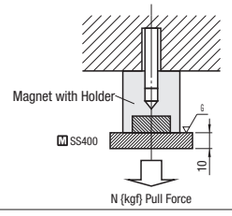
Don't apply alterations on magnets to avoid possible damage.

Strong impact on magnets may cause damages.

Magnets with Holders have 0.1 ~ 0.3mm steps to protect the magnet surface from impacts.

The magnet and holder are fixed by adhesive.

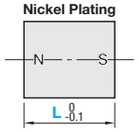
* "Attraction Force" indicates the power of lifting the material EN 1.0038 Equiv. (polished surface of 10mm thick plate).

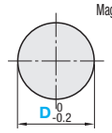


■Round

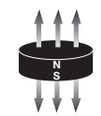
Type	Material	Surface Treatment	Heat Resistant Temperature
HXNN	Powerful Neodymium Magnet	Nickel Plating	60°C
HXN	Neodymium Magnet		80°C
HXNH	Heat-resistant Neodymium Magnets		150°C
HXMS	Samarium-Cobalt Magnet		200°C

Nickel Plating





Magnetization Direction: Y-direction



Powerful Neodymium Magnet has attraction force stronger than Neodymium Magnet by 30%. May crack when pulled and struck by other magnetic substances. Please handle with care in unpacking.

Part Number Type	D	L	Attraction Force N{kgf} HXNN	HXN HXNH	HXMS	Surface Magnetic Flux Density Gauss [G] HXNN	HXN HXNH	HXMS	Unit Price HXNN	HXN	HXNH	HXMS
HXNN (Powerful Neodymium) HXN (Neodymium) HXNH (Heat-resistant Neodymium) HXMS (Samarium-Cobalt)	1	2	0.08 {0.008}	0.06 {0.006}	0.04 {0.004}	1900~2100	1100~1300	900~1100				
		3	-	0.07 {0.007}	0.05 {0.005}	-	1200~1400	1000~1200	-			
		5	0.10 {0.010}	0.08 {0.008}	0.06 {0.006}	2100~2300	1300~1500	1100~1300				
	2	2	0.77 {0.08}	0.59 {0.06}	0.39 {0.04}	3500~3700	2400~2600	2000~2200				
		3	0.90 {0.09}	0.69 {0.07}	0.49 {0.05}	3700~3900	3100~3300	2600~2800				
		4	0.93 {0.09}	0.72 {0.07}	-	3700~3900	3400~3600	-			-	-
		5	1.01 {0.10}	0.78 {0.08}	0.49 {0.05}	4100~4300	3100~3300	2600~2800				
	3	1	1.39 {0.14}	1.07 {0.11}	-	2700~2900	2000~2400	-			-	-
		2	2.04 {0.21}	1.57 {0.16}	1.08 {0.11}	3700~4000	3100~3300	2600~2800				
		3	2.55 {0.26}	1.96 {0.20}	1.37 {0.14}	4200~4500	3300~3500	2800~3000				
		4	2.93 {0.30}	2.25 {0.23}	1.47 {0.15}	4400~4700	3400~3600	2900~3100				
		5	3.06 {0.31}	2.35 {0.24}	1.57 {0.16}	4500~4800	3500~3700	2900~3100				
		6	3.60 {0.37}	2.82 {0.29}	-	4600~4800	4100~4300	-				-
	4	1	-	1.47 {0.15}	-	-	2000~2200	-	-		-	-
		2	3.69 {0.38}	2.84 {0.29}	1.86 {0.19}	4100~4300	3100~3300	2600~2800				
		3	4.97 {0.51}	3.82 {0.39}	2.55 {0.26}	4200~4500	3600~3800	3100~3300				
		4	5.60 {0.57}	4.31 {0.44}	2.94 {0.30}	4500~4800	3800~4000	3200~3400				
		5	6.11 {0.62}	4.70 {0.48}	3.14 {0.32}	4800~5100	4000~4200	3400~3600				
		8	8.50 {0.87}	6.82 {0.69}	-	5100~5400	4500~4700	-				-
		10	9.04 {0.92}	6.96 {0.72}	-	5200~5500	4500~4700	-				-
	5	1	-	1.45 {0.16}	-	-	1800~2000	-	-		-	-
		2	5.10 {0.52}	3.92 {0.40}	2.65 {0.27}	3500~3700	3000~3200	2500~2700				
		3	7.51 {0.77}	5.78 {0.59}	3.82 {0.39}	4200~4500	3800~4000	3200~3400				
		4	8.92 {0.91}	6.86 {0.70}	4.61 {0.47}	4600~4900	4000~4200	3400~3600				
		5	9.93 {1.01}	7.64 {0.78}	5.10 {0.52}	4900~5100	4300~4500	3600~3800				
		6	10.57 {1.08}	8.13 {0.83}	5.39 {0.55}	5100~5400	4300~4500	3600~3800				
		8	11.64 {1.19}	8.96 {0.92}	-	5200~5500	4700~4900	-			-	-
		10	12.74 {1.30}	9.80 {1.00}	-	5400~5700	4800~5000	-				-
	6	2	6.50 {0.66}	5.00 {0.51}	3.33 {0.34}	3100~3400	2900~3100	2400~2600				
		3	9.93 {1.01}	7.64 {0.78}	5.10 {0.52}	4000~4300	3700~3900	3100~3300				
		4	12.48 {1.27}	9.60 {0.98}	6.47 {0.66}	4600~4900	3900~4100	3300~3500				
		5	-	10.88 {1.11}	7.25 {0.74}	-	4300~4500	3600~3800	-			
		6	15.29 {1.56}	11.76 {1.20}	7.84 {0.80}	5100~5400	4400~4600	3700~3900				
		8	15.34 {1.66}	11.80 {1.28}	-	5400~5600	4700~4900	-				-
		10	15.39 {1.69}	11.84 {1.30}	-	5500~5800	4800~5000	-			-	-
	8	2	-	6.66 {0.68}	4.41 {0.45}	-	2400~2600	2000~2200	-			
		3	14.01 {1.43}	10.78 {1.10}	7.45 {0.76}	3500~3800	3200~3400	2700~2900				
		5	23.31 {2.38}	17.93 {1.83}	11.96 {1.22}	4700~5000	4200~4400	3500~3700				
		6	26.76 {2.73}	20.59 {2.10}	-	5100~5400	4700~4900	-			-	-
		8	29.94 {3.06}	23.03 {2.35}	15.39 {1.57}	5400~5700	4600~4800	3900~4100				
		10	31.23 {3.19}	24.02 {2.45}	-	5600~5900	5000~5200	-			-	-
	10	2	-	7.84 {0.80}	5.29 {0.54}	-	2000~2200	1700~1900	-			
		3	18.34 {1.87}	14.11 {1.44}	9.41 {0.96}	3100~3400	2800~3000	2400~2600				
		5	32.23 {3.29}	24.79 {2.53}	16.56 {1.69}	4300~4600	3800~4000	3200~3400				
		8	-	34.3 {3.50}	23.03 {2.35}	-	4700~4900	4000~4200	-			
		10	49.43 {5.04}	38.02 {3.88}	25.48 {2.60}	5500~5800	4900~5100	4100~4300				
	12	2	-	9.02 {0.92}	5.98 {0.61}	-	1600~1800	1300~1500	-			
		3	-	16.46 {1.68}	11.07 {1.13}	-	2500~2700	2100~2300	-			
		5	-	31.16 {3.18}	20.87 {2.13}	-	3600~3800	3000~3200	-			
		8	-	46.55 {4.75}	31.07 {3.17}	-	4500~4700	3800~4000	-			
		10	-	52.72 {5.38}	35.28 {3.60}	-	4800~5000	4000~4200	-			
	15	2	-	10.58 {1.08}	7.06 {0.72}	-	1400~1600	1100~1300	-			
		3	-	19.6 {2.00}	13.13 {1.34}	-	2300~2500	1900~2100	-			
		5	-	39.59 {4.04}	26.46 {2.70}	-	3100~3300	2600~2800	-			
		8	-	64.39 {6.57}	43.02 {4.39}	-	4200~4400	3500~3700	-			
		10	-	75.85 {7.74}	50.67 {5.17}	-	4600~4800	3800~4000	-			
	20	3	-	34.32 {3.50}	-	-	1700~1900	-	-		-	-
		10	-	98.06 {10.00}	-	-	4200~4400	-	-		-	-

Attraction Force and Surface Flux Density are reference values for magnets alone.
N pole side is colored. (HXNN: Green, HXN: Red, HXNH: Black, HXMS: Blue)

Ordering Example

Part Number	-	L
HXNN3	-	3
HXN8	-	5