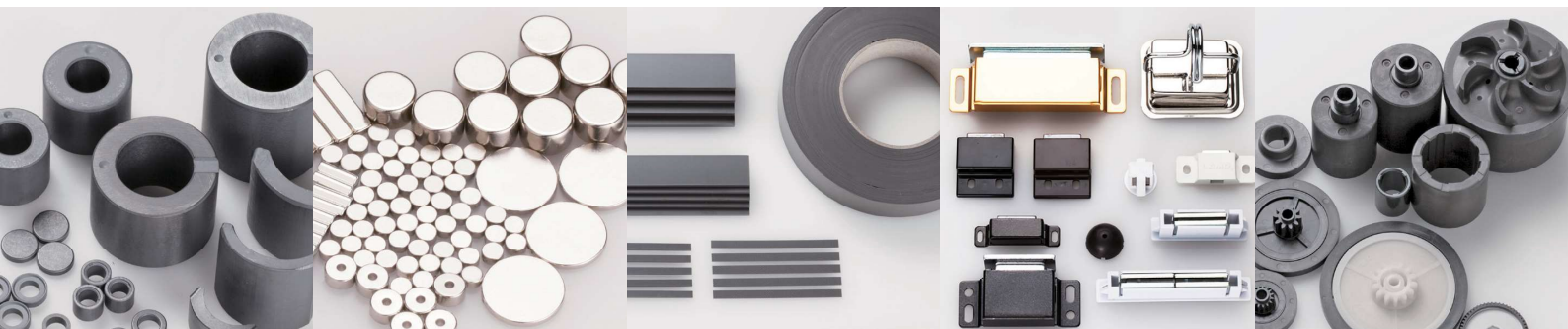


# TOKYO FERRITE

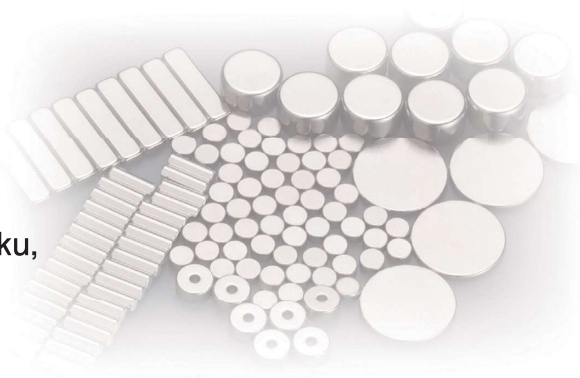


*Magnets of JAPAN Quality*



# Corporate Profile

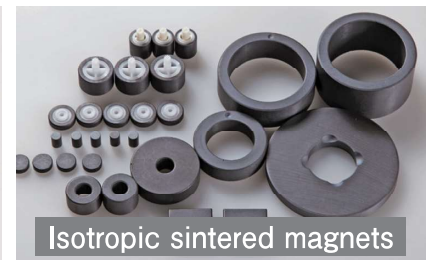
Company Name	Tokyo Ferrite Mfg. Co., Ltd.
Founded	August 6, 1959
Headquarters	1-1-14 Tabata-shinmachi, Kita-ku, Tokyo 114-8528, Japan Tel: +81-3-3893-9501 Fax: +81-3-3810-4661
Capital	98 million yen
Representative Director and President	Akio Masui
Employees	250
Offices	Osaka Business Office (sale of magnets) Ibaraki Factory (sintered magnets) Chiba Factory No.1 (plastic magnets) Chiba Factory No.2 (rubber magnets & raw materials)
Outline of Businesses	<p>(1) Ferrite magnets Isotropic magnets, anisotropic magnets, polar anisotropic magnets, rubber magnets, plastic magnets</p> <p>(2) Rare earth magnets Neodymium magnets, samarium-cobalt magnets, alnico magnets, plastic bonded neodymium magnets</p> <p>(3) Manufacture and sales of magnet-applied products</p> <p>(4) Manufacture and sales of injection molding dies (resin and magnet)</p>
Correspondent Banks	MUFG Bank, Mizuho Bank, Sumitomo-Mitsui Bank
Major Clients	<p>MinebeaMitsumi Group Canon Group Sony Group Panasonic Group Nidec Group Toyota Motor Group Nissan Motor Group Mazda Motor Group Mitsubishi Motors Group Mitsubishi Electric Group Toshiba Group Hitachi Group (Listed in random order)</p>



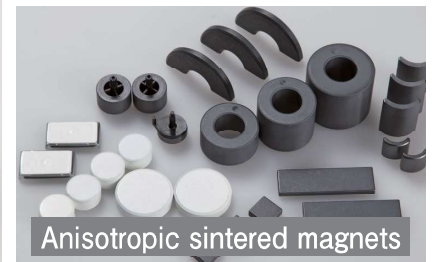


# Sintered Magnets

Sintered magnets are high cost-performance magnets made from ferric oxide ( $\text{Fe}_2\text{O}_3$ ), barium carbonate ( $\text{BaCO}_3$ ) or strontium carbonate ( $\text{SrCO}_3$ ). We produce both Isotropic magnets and anisotropic magnets. Anisotropic magnets are press-formed (dry or wet pressing) in a magnetic field to get crystals lined up in a desirable direction to enhance the performance of the magnets. We produce multiple polar ring magnets, radially polarized magnets, vertically polarized magnets following the specific requirements of our clients. Our flexible production system enables us to take small volume orders which helps our customers to start up new products smoothly.



Isotropic sintered magnets



Anisotropic sintered magnets

# Plastic Magnets

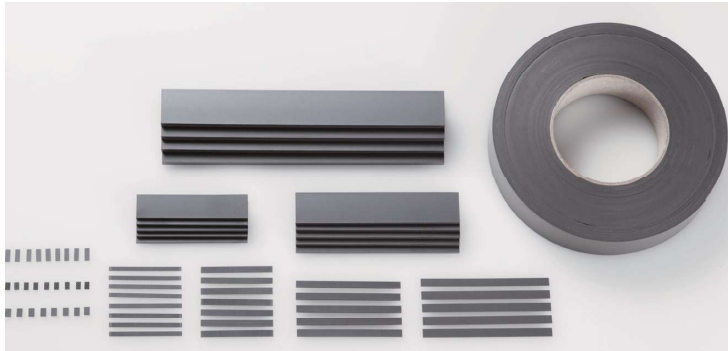
Plastic magnets are manufactured by injection or compression molding process, using pellets which comprise thermoplastic resin and magnet powder. They hardly crack or chip. Complex shaped magnets can be molded. By overmolding other mechanical parts with plastic magnets, production efficiency can be drastically improved in the assembly stage. We also design and manufacture the molds within the factory premises, which enables us to provide high quality plastic magnets in a short lead time.



Water pump  
used in a hybrid vehicle

## Rubber Magnets

Rubber magnets are anisotropic, flexible magnets that are supple and elastic, made by blending ferrite/rare-earth magnet powder with synthetic rubber or polymer resin. They are widely used for motors, sensors, switches and other equipments. Our flexible production system enables us supply a huge variety of products in the thickness, width, and length. We can also take small volume orders.



## Magnetic Raw Powders

We manufacture our magnets using the premium quality raw powder produced in-house. We also provide the magnetic raw powder, both Ba-ferrite and Sr-ferrite, to some magnet manufacturers in Japan and overseas which appreciates the stable and premium quality of our raw powder.



## Rare Earth Magnets and Assembled Magnets

There are two types of rare-earth magnets (REM) known as neodymium magnets and samarium-cobalt magnets. They are essential in the next generation technology. We supply high-quality plated REM by sourcing from reliable manufacturers. In addition, various types of assembled magnets are also supplied according to customer request.



## Metallic Mold Tools

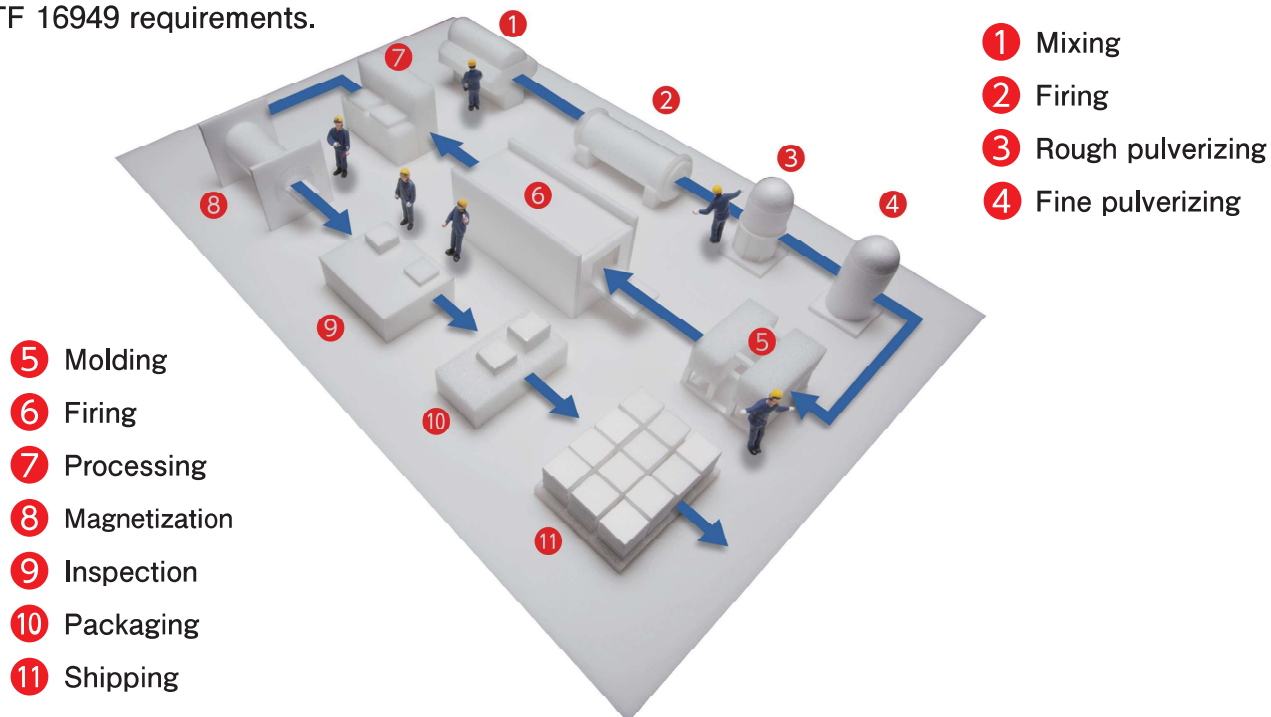
We manufacture our metallic molds and dies in-house, which is a key in supplying quality magnets on a timely basis. Recently we started providing the molds and dies to other magnet manufacturers. They are finely designed and finished by our experienced engineers and skilled workers.





## Production System

We produce our ferrite magnets in an integrated system covering all processes from raw material preparation to final product finishing. We also possess our own mold producing facilities, giving us the advantage of quick and precise production of the molds. Thus, we can provide our magnets that fully meet the requirements of our customers within a short lead time. We deliver high reliability and high performance products to both small lot and mass production orders. Our quality control system is certified by the DQS to comply with the ISO 9001 and IATF 16949 requirements.



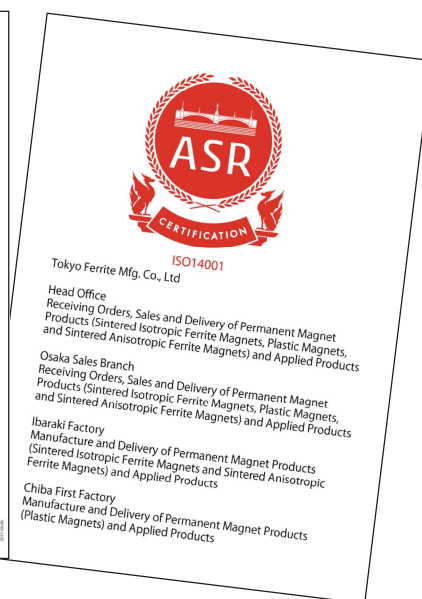
## Status of ISO Certification



**ISO 9001:2015**  
**< 50300389 QM15 >**



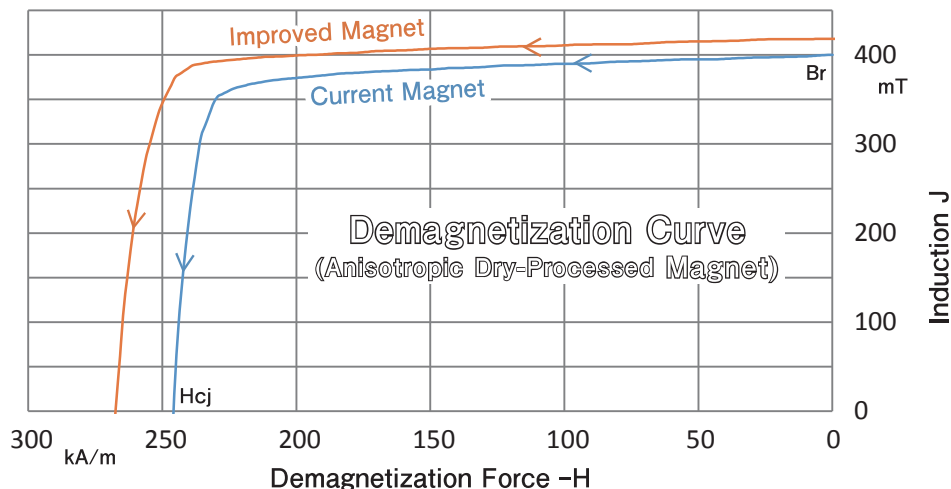
**IATF 16949:2016**  
**< IATF-No.0309056 >**



**ISO 14001:2015**  
**< E1086 >**

## Research & Development

Now under development in our laboratory is an anisotropic sintered magnet improved by adding dopants (La and Co) into raw powder. At this moment, the sintered test pieces exhibit improvement by ca.5% of Br (Residual Induction) and ca.10% of Hcj (Coercive Force) respectively as compared with our current products. Mass production of this new lineup is expected in early 2019.



## Contact from overseas

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FAX: +81-3-3810-4661 Tel: +81-3-3893-9501

## When Making Inquiries (Placing Orders)

1. Preferred magnet and its material
2. Dimensions, shape and dimensional tolerance
3. Magnetization direction
4. Finishing standard and any post-processing
5. Use
6. Magnetic force specifications (magnitude of the magnetic force in a standalone condition and when incorporated into a magnetic circuit)
7. Any magnetization during delivery (magnetized delivery or non-magnetized delivery)
8. Structure of magnetic circuit including the magnets, securing method of the magnets
9. Acceptance method of magnets
10. Usage conditions (temperature, surrounding magnetic field situation, etc.)
11. Quantity and delivery
12. Other preferences



# Catalogue: Ferrite Magnets (1)

Material Code			TF	THD3G		THD3N		
Composition			Ba ferrite	Sr ferrite				
Orientation			Isotropic	Anisotropic				
Press			Dry / Wet	Dry				
			Aspect	Granule	Powder	Granule	Granule	
			Orientation	---	Axial	Radial	Radial	Multiple
Magnetic properties [min/max]	Test piece		as pressed granule	as pressed powder				
	Residual induction Br	[mT]	220 / 240	375 / 400		380 / 410		
		[G]	2,200 / 2,400	3,750 / 4,000		3,800 / 4,100		
	Coercive force Hcb	[kA/m]	127 / 160	238 / 271		222 / 263		
		[Oe]	1,600 / 2,000	3,000 / 3,400		2,800 / 3,300		
	Intrinsic coercive force Hcj	[kA/m]	254 / 287	254 / 291		234 / 279		
		[Oe]	3,200 / 3,600	3,200 / 3,650		2,950 / 3,500		
Maximum energy product (BH)max	[kJ/m³]	7.1 / 9.6	26.2 / 30.3		27.0 / 31.9			
	[MG·Oe]	0.9 / 1.2	3.3 / 3.8		3.4 / 4.0			
Physical properties [min/max]	Specific heat		[cal/g·°C]	0.15 / 0.20	0.15 / 0.20		0.15 / 0.20	
	Density		[g/cm³]	4.70 / 5.10	4.70 / 5.10		4.70 / 5.10	
	Isotropic thermal expansion coefficient		[10 <sup>-6</sup> °C]	9 / 12	---		---	
	Anisotropic thermal expansion coefficient	// [10 <sup>-6</sup> °C]	---	14 / 15		14 / 15		
		⊥ [10 <sup>-6</sup> °C]	---	9 / 10		9 / 10		
	Flexural strength	[kgf/mm²]	5 / 9	5 / 9		5 / 9		
		[MPa]	50 / 90	50 / 90		50 / 90		
	Compressive strength	[kgf/mm²]	> 70	> 70		> 70		
		[MPa]	> 690	> 690		> 690		
	Recoil relative permiability		[μ <sub>rec</sub> ]	1.05 / 1.20	1.05 / 1.20		1.05 / 1.20	
	Temperature coefficient	ΔBr/Br [%/°C]	-0.18 / -0.19	-0.18 / -0.19		-0.18 / -0.19		
ΔHc/Hc [%/°C]		+0.35 / +0.50	+0.35 / +0.50		+0.35 / +0.50			
Curie temperature		[°C]	450 / 460	450 / 460		450 / 460		

## Catalogue: Ferrite Magnets (2)

Material Code			THD4	THW5B	THW6B
Composition			Sr ferrite		
Orientation			Anisotropic		
Press	Dry / Wet		Dry	Wet	
	Aspect		Powder	Slurry	
	Orientation		Axial		
Magnetic properties [min/max]	Test piece		as pressed powder		
	Residual induction Br	[mT]	390 / 410	410 / 430	410 / 430
		[G]	3,900 / 4,100	4,100 / 4,300	4,100 / 4,300
	Coercive force Hcb	[kA/m]	222 / 259	242 / 275	286 / 311
		[Oe]	2,800 / 3,250	3,050 / 3,450	3,600 / 3,900
	Intrinsic coercive force Hcj	[kA/m]	230 / 271	250 / 283	302 / 327
		[Oe]	2,900 / 3,400	3,150 / 3,550	3,800 / 4,100
	Maximum energy product (BH)max	[kJ/m³]	28.6 / 31.9	31.8 / 35.1	31.8 / 35.1
[MG·Oe]		3.6 / 4.0	4.0 / 4.4	4.0 / 4.4	
Physical properties [min/max]	Specific heat	[cal/g·°C]	0.15 / 0.20	0.15 / 0.20	0.15 / 0.20
	Density	[g/cm³]	4.80 / 5.10	4.80 / 5.10	4.80 / 5.10
	Isotopic thermal expansion coefficient	[10 <sup>-6</sup> °C]	---	---	---
	Anisotropic thermal expansion coefficient	// [10 <sup>-6</sup> °C]	14 / 15	14 / 15	14 / 15
		⊥ [10 <sup>-6</sup> °C]	9 / 10	9 / 10	9 / 10
	Flexural strength	[kgf/mm²]	5 / 9	5 / 9	5 / 9
		[MPa]	50 / 90	50 / 90	50 / 90
	Compressive strength	[kgf/mm²]	> 70	> 70	> 70
		[MPa]	> 690	> 690	> 690
	Recoil relative permiability	[μ <sub>rec</sub> ]	1.05 / 1.20	1.05 / 1.20	1.05 / 1.20
	Temperature coefficient	ΔBr/Br [%/°C]	-0.18 / -0.19	-0.18 / -0.19	-0.18 / -0.19
		ΔHc/Hc [%/°C]	+0.35 / +0.50	+0.35 / +0.50	+0.35 / +0.50
Curie temperature	[°C]	450 / 460	450 / 460	450 / 460	



## Catalogue: Ferrite Magnets (3)

Material Code		THD5D	
Composition		LaCo-doped Sr ferrite (under development)	
Orientation		Anisotropic	
Press	Dry / Wet	Dry	
	Aspect	Powder	Granule
	Orientation	Axial	Multiple
Magnetic properties [min/max]	Test piece		as pressed powder
	Residual induction Br	[mT]	405 / 425
		[G]	4,050 / 4,250
	Coercive force Hcb	[kA/m]	234 / 275
		[Oe]	2,950 / 3,450
	Intrinsic coercive force Hcj	[kA/m]	246 / 287
		[Oe]	3,100 / 3,600
Physical properties [min/max]	Maximum energy product (BH)max	[kJ/m <sup>3</sup> ]	31.0 / 34.3
		[MG·Oe]	3.9 / 4.3
	Specific heat	[cal/g·°C]	0.15 / 0.20
	Density	[g/cm <sup>3</sup> ]	4.9 / 5.1
	Isotopic thermal expansion coefficient	[10 <sup>-6</sup> °C]	---
	Anisotropic thermal expansion coefficient	// [10 <sup>-6</sup> °C]	14 / 15
		⊥ [10 <sup>-6</sup> °C]	9 / 10
	Flexural strength	[kgf/mm <sup>2</sup> ]	5 / 9
		[MPa]	50 / 90
	Compressive strength	[kgf/mm <sup>2</sup> ]	> 70
		[MPa]	> 690
	Recoil relative permeability	[μ <sub>rec</sub> ]	1.05 / 1.20
	Temperature coefficient	ΔBr/Br [%/°C]	-0.18 / -0.19
		ΔHc/Hc [%/°C]	+0.20 / +0.30
	Curie temperature	[°C]	450 / 460

# Catalogue: Rubber Magnets

Material Code			RMS-21Z	RMS-24
Composition			Sr ferrite / Chlorinated polyethylene	
Orientation			Anisotropic	
Magnetic properties [min / max]	Test piece		as sheet	
	Residual induction Br	[mT]	250 / 270	255 / 275
		[G]	2,500 / 2,700	2,550 / 2,750
	Coercive force Hcb	[kA/m]	167 / 183	167 / 183
		[Oe]	2,100 / 2,300	2,100 / 2,300
	Intrinsic coercive force Hcj	[kA/m]	207 / 247	191 / 231
		[Oe]	2,600 / 3,100	2,400 / 2,900
Physical properties [min / max]	Maximum energy product (BH)max	[kJ/m <sup>3</sup> ]	11.1 / 12.7	11.5 / 13.1
		[MG·Oe]	1.4 / 1.6	1.5 / 1.7
	Tensile Strength	TD [MPa]	8 / 9	8 / 9
		MD [MPa]	4 / 6	4 / 6
	Expansion	TD [%]	25 / 35	25 / 35
		MD [%]	300 / 600	300 / 600
	Thermal expansion coefficient	[10 <sup>-5</sup> °C]	8.8	8.8
	Hardness (SHORE D)		35 / 45	40 / 50
	Density	[g/cm <sup>3</sup> ]	3.70 / 3.80	3.75 / 3.85
	Loss by heating [%]		< 2.0	< 2.0
	Usage temperature range [°C]		-40 / +85	-40 / +85
Chemical resistance	Flame retardance UL-94		V-0	V-0
	Ozone	80ppm × 25°C × 72hr	Very good	Very good
	Heat	100°C × 72hr	Good	Good
	Cold	-40°C × 72hr	Very good	Very good
	Humidity	60°C × 90%RH × 72hr	Good	Good
	Thermal shock -40°C ↔ 100°C × 0.5hr, 25times		Good	Good
	Weather 60°C × 100hr, Rain 12min/60min		Very good	Very good
	Salt spray 5% × 72hr		Very good	Very good
	Detergent 23°C × 72hr		Very good	Very good
	Motor oil 23°C × 72hr		Acceptable	Acceptable
	Alcohol 23°C × 72hr		Acceptable	Acceptable
	Ketones, thinners 23°C × 72hr		No good	No good
	Aromatic hydrocarbons 23°C × 72hr		No good	No good
	Water 23°C × 72hr		Very good	Very good

# Catalogue: Plastic Magnets

Material Code		PMF-06N20	PMF-06N02	PMF-12N20
Composition		Sr ferrite / PA6 (Injection)	Ba ferrite / PA12 (Injection)	Sr ferrite / PA12 (Injection)
Orientation		Anisotropic	Isotropic	Anisotropic
Magnetic properties [min/max]	Test piece	as block		
	Residual induction $B_r$	[mT] [G]	283 / 293 2,830 / 2,930	88 / 108 880 / 1080
	Coercive force $H_{cb}$	[kA/m] [Oe]	175 / 198 2,200 / 2,500	48 / 95 600 / 1,200
	Intrinsic coercive force $H_{cj}$	[kA/m] [Oe]	203 / 243 2,550 / 3,050	143 / 207 1,800 / 2,600
	Maximum energy product (BH)max	[kJ/m <sup>3</sup> ] [MG·Oe]	15.5 / 17.2 2.0 / 2.2	0.9 / 2.5 0.1 / 0.3
Physical properties [min/max]	Density	[g/cm <sup>3</sup> ]	3.77	2.76 / 2.86
	Temperature coefficient $\Delta B_r / B_r$	[%/°C]	-0.18	-0.18
	Flexural strength	[kgf/mm <sup>2</sup> ] [MPa]	17 160	12 110
	Tensile strength	[kgf/mm <sup>2</sup> ] [MPa]	9.5 93	5.0 49
	Thermal expansion coefficient	[10 <sup>-5</sup> /°C]	3.70	5.42 (-30 / 35°C)
	Heat distortion temperature	[°C]	172	126



PMF-PPS16	PMN-12N40	PMN-12N90	PMS-12N40	PMS-12N140
Sr ferrite / PPS (Injection)	NdFeB / PA12 (Injection)		SmFeN / PA12 (Injection)	
Anisotropic	Isotropic		Anisotropic	
as block				
250 / 264	400 / 460	630 / 666	400 / 450	760 / 810
2,500 / 2,640	4,000 / 4,600	6,300 / 6,660	4,000 / 4,500	7,600 / 8,100
≥ 167	231 / 342	≥ 390	260 / 300	485 / 510
≥ 2,100	2,900 / 4,300	≥ 4,900	3,300 / 3,800	6,100 / 6,700
≥ 191	≥ 517	≥ 653	530 / 610	660 / 755
≥ 2,400	≥ 6,500	≥ 8,200	6,700 / 7,700	8,300 / 9,500
12.3 / 13.8	28.6 / 36.6	63.4 / 71.4	28 / 35	107 / 115
1.5 / 1.7	3.6 / 4.6	8.0 / 9.0	3.5 / 4.4	13.5 / 14.5
3.54	4.35 / 4.65	5.68	3.7 / 3.9	4.7 / 4.9
-0.18	-0.11	-0.11	-0.11	-0.07
10	12	8	5	5
100	120	80	50	50
5.5	---	3.5	3.3	3.6
54	---	34	32	35
2.14	---	2.07	6.94	5.80
208	132 / 145	132 / 145	---	---

# Catalogue: Rare Earth & Other Magnets

Material Code			MBN-10B	MBN-11A	MBN-11B	LNG40	LNG44
Composition			NdFeB / Epoxy (Compression)			AlNiCo 5	
Orientation			Isotropic			Anisotropic	
Magnetic properties [min/max]	Test piece		as block				
	Residual induction Br	[mT]	650 / 750	670 / 770	700 / 800	1,220	1,225
		[G]	6,500 / 7,500	6,700 / 7,700	7,000 / 8,000	12,200	12,250
	Coercive force Hcb	[kA/m]	438 / 485	450 / 505	370 / 426	48	52
		[Oe]	5,500 / 6,100	5,650 / 6,350	4,650 / 5,350	600	650
	Intrinsic coercive force Hcj	[kA/m]	716 / 812	700 / 780	517 / 597	---	---
		[Oe]	9,000 / 10,200	8,800 / 9,800	6,500 / 7,500	---	---
	Maximum energy product (BH)max	[kJ/m³]	72 / 88	80 / 96	76 / 92	40	44
		[MG·Oe]	9.0 / 11.0	10.0 / 12.0	9.5 / 11.5	5.0	5.5
Physical properties [min/max]	Heat resistance [°C]		150	150	150	500	500
	Temperature coefficient ΔBr/Br [%/°C]		-0.10 / -0.13	-0.10 / -0.13	-0.10 / -0.13	-0.02	-0.02
	Curie temperature [°C]		350 / 360	350 / 360	350 / 360	890	890

N35	N40	N45H	N48M	YXG-24	YXG-28
NdFeB				SmCo	
Anisotropic				Anisotropic	
as block					
1,170 / 1,220	1,250 / 1,280	1,320 / 1,380	1,360 / 1,430	950 / 1,020	1,030 / 1,080
11,700 / 12,200	12,500 / 12,800	13,200 / 13,800	13,600 / 14,300	9,500 / 10,200	10,300 / 10,800
≥ 870	≥ 910	≥ 955	≥ 1,030	690 / 750	760 / 800
≥ 10,900	≥ 11,400	≥ 12,000	≥ 12,900	8,700 / 9,400	9,500 / 10,000
≥ 960	≥ 960	≥ 1,350	≥ 1,110	≥ 1,430	≥ 1,430
≥ 12,000	≥ 12,000	≥ 17,000	≥ 14,000	≥ 18,000	≥ 18,000
260 / 290	300 / 330	340 / 370	370 / 390	175 / 190	210 / 220
33 / 36	38 / 41	43 / 46	46 / 49	22 / 24	26 / 28
80	80	120	100	300	300
-0.10 / -0.12	-0.10 / -0.12	-0.10 / -0.12	-0.10 / -0.12	-0.03	-0.03
300 / 330	300 / 330	300 / 330	300 / 330	800	800





<http://www.tokyoferrite-ho.co.jp/en/>



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