

Magnetic Properties of SmCo Magnets (Samarium Cobalt)

Material	Grade	Remanence		Coercivity		Intrinsic Coercivity		Max. Energy Product	
		Br(mT)	Br(kGs)	bHc(kA/m)	bHc(kOe)	iHc (kA/m)	iHc (kOe)	(BH)max (KJ/m ³)	(BH)max (MGOe)
SmCo ₅	S16	790 - 840	7.9 - 8.4	612 - 660	7.7 - 8.3	1830	23	118 - 135	15 - 17
	S18	840 - 890	8.4 - 8.9	644 - 692	8.1 - 8.7	1830	23	135 - 151	17 - 19
	S20	890 - 930	8.9 - 9.3	684 - 732	8.6 - 9.2	1830	23	150 - 167	19 - 21
	S22	920 - 960	9.2 - 9.6	710 - 756	8.9 - 9.5	1830	23	167 - 183	21 - 23
	S24	960 - 1000	9.6 - 10.0	740 - 788	9.3 - 9.9	1830	23	183 - 199	23 - 25
Sm ₂ Co ₁₇	S220	930 - 970	9.3 - 9.7	676 - 740	8.5 - 9.3	1433	18	160 - 183	20 - 23
	S240	950 - 1020	9.5 - 10.2	692 - 764	8.7 - 9.6	1433	18	175 - 191	22 - 24
	S260	1020 - 1050	10.2 - 10.5	748 - 796	9.4 - 10.0	1433	18	191 - 207	24 - 26
	S280	1030 - 1080	10.3 - 10.8	756 - 812	9.5 - 10.2	1433	18	207 - 220	26 - 28
	S300	1080 - 1100	10.8 - 11.0	788 - 835	9.9 - 10.5	1433	18	220 - 240	28 - 30
	S320	1100 - 1130	11.0 - 11.3	812 - 860	10.2 - 10.8	1433	18	230 - 255	29 - 32

HARD FERRITE (CERAMIC MAGNETS)

As important parts of magnetic materials, hard ferrite (ceramic) magnets play an important role in electrical, electronic information, car, motorcycle industries etc. They are also widely used in medical treatment, mining and metallurgy, industrial automation, oil energy and civil industries.

Ceramic magnets are composed of iron oxide, barium and strontium elements. This class of magnets has a higher magnetic flux density, higher coercive force, and higher resistance to demagnetization and oxidation compared to other non-rare earth permanent magnets. The biggest advantage of such magnets is the low cost, which makes the hard ferrite magnets very popular in many permanent magnet applications. Due to their ceramic nature, ferrite magnets are very hard and brittle. Special machining techniques must be utilized for these magnets. Ceramic or hard ferrite magnets come in discs, cylinders, rings, blocks and arcs and are charcoal grey.

Widely used in electrical appliances, educational instruments, magnetic assemblies, toys etc.



Material Information

- Produced by powder metallurgical method with chemical composition of Ba/SrO.6 Fe2 O3.
- Relatively brittle & hard.
- Good resistance to demagnetization.
- Excellent corrosion resistance.
- Raw material is readily available and low in cost.
- Good temperature stability.
- high coercive force and high electric resistance.
- Most widely used permanent magnets.

Typical Physical Properties

Curie Temperature (°C)	450
Maximum Operating Temperature (°C)	250
Hardness (Hv)	480-580
Density (g/cm ³)	4.8 - 4.9
Relative Recoil Permeability (µrec)	1.05 - 1.20
Saturation Field Strength, kOe (kA/m)	10 (800)
Temperature Coefficient of Br (%/°C)	-0.2
Temperature Coefficient of iHc (%/°C)	0.3
Tensile Strength (N/mm)	<100
Transverse Rupture Strength (N/mm)	300

Dimension Range / Nominal Tolerance of Ceramic / Hard Ferrite Magnets

Ring Magnet	Outer Diameter (mm)	Inner Diameter (mm)	Thickness (mm)
Maximum	220	110	40
Minimum	2.6	1.8	0.5
Tolerance	±0.2	±0.15	±0.1
Block Magnet	Length (mm)	Width (mm)	Thickness (mm)
Maximum	220	200	40
Minimum	2.0	1.5	0.5
Tolerance	±0.2	±0.15	±0.1
Disc/Cylinder Magnet	Diameter (mm)	Thickness (mm)	±0.1
Maximum	220	40	
Minimum	1.2	0.5	
Tolerance	±0.2	±0.1	

Magnetic Properties of Hard Ferrite (Ceramic) Magnets

Material	Remanence		Coercivity		Intrinsic Coercivity		Max. Energy Product	
	Br (mT)	Br (kGs)	bHc (kA/m)	bHc (kOe)	iHc (kA/m)	iHc (kOe)	(BH) _{max} (KJ/m ³)	(BH) _{max} (MGOe)
Y10	200-235	2.00-2.35	125-160	1.57-2.01	210-280	2.64-3.52	6.5-9.5	0.8-1.2
Y10T	>200	>2.00	128-160	1.60-2.00	128-160	1.60-2.00	6.4-9.6	0.8-1.2
Y20	320-380	3.20-3.80	135-190	1.70-2.38	140-195	1.76-2.45	18.0-22.0	2.3-2.8
Y22H	310-360	3.10-3.60	220-250	2.77-3.14	280-320	3.52-4.02	20.0-24.0	2.5-3.0
Y23	320-370	3.20-3.70	170-190	2.14-2.38	190-230	2.39-2.89	20.0-25.5	2.5-3.2
Y25	360-400	3.60-4.00	135-170	1.70-2.14	140-200	1.76-2.51	22.5-28.0	2.8-3.5
Y25BH	360-390	3.60-3.90	176-216	2.20-2.70	215-231	2.70-2.90	23.9-27.1	3.0-3.4
Y26H	360-390	3.60-3.90	220-250	2.77-3.14	225-255	2.83-3.21	23.0-28.0	2.9-3.5
Y27H	370-400	3.70-4.00	205-250	2.58-3.14	210-255	2.64-3.21	25.0-29.0	3.1-3.7
Y28	370-400	3.70-4.00	175-210	2.20-2.64	180-220	2.26-2.77	26.0-30.0	3.3-3.8
Y30	385-405	3.85-4.05	176-224	2.20-2.80	184-226	2.30-2.84	27.5-30.5	3.45-3.95
Y30BH	380-400	3.80-4.00	230-275	2.89-3.46	235-290	2.95-3.65	27.0-32.5	3.4-4.1
Y32	400-420	4.00-4.20	160-190	2.01-2.38	165-195	2.07-2.45	30.0-33.5	3.8-4.2
Y33	410-430	4.10-4.30	220-250	2.77-3.14	225-255	2.83-3.21	31.5-35.0	4.0-4.4
Y35	400-420	4.00-4.20	160-190	2.01-2.38	165-195	2.07-2.45	30.0-33.5	3.8-4.2
Y35H1	395-415	3.95-4.15	251-259	3.15-3.25	255-271	3.20-3.40	29.6-32.8	3.7-4.1
Y35H2	390-410	3.90-4.10	236-295	3.30-3.70	275-299	3.45-3.75	28.8-32.0	3.6-4.04
Y35H3	405-425	4.05-4.25	223-247	2.80-3.10	231-255	2.90-3.20	30.2-35.4	3.8-4.4
Y35H-4H	370-390	3.70-3.90	270-302	3.40-3.80	326-358	4.10-4.50	25.6-28.8	3.2-3.6
Y38B	410-430	4.10-4.30	251-275	3.15-3.45	255-279	3.20-3.50	31.8-35.0	4.0-4.4
Y38H	395-415	3.95-4.15	287-309	3.60-3.90	311-333	3.90-4.20	29.5-32.7	3.7-4.1
Y40E	370-390	3.70-3.90	279-301	3.50-3.80	382-414	4.80-5.20	25.6-29.4	3.2-3.6
Y40B	410-430	4.10-4.30	290-324	3.65-3.95	307-329	3.85-4.15	32.6-34.4	4.0-4.4
Y45E	420-440	4.20-4.40	318-342	4.00-4.30	386-410	4.85-5.15	33.5-36.5	4.2-4.6
Y45B	430-450	4.30-4.50	247-271	3.10-3.40	251-275	3.15-3.45	35.1-38.3	4.4-4.8