

Samarium Cobalt Magnets

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⚠ The details can be found by referring to the appended individual delivery specifications. All specifications are subject to change without notice.

Samarium Cobalt (SmCo) Magnets

Introduction

Samarium cobalt (SmCo) magnets are the first commercially viable rare earth permanent magnet material since 1960s and considered to still be the premium material for many high performance



applications today. SmCo magnets have particularly high coercivities with simultaneous high saturation polarization and excellent temperature and corrosion stability. Additionally, the corrosion resistance of SmCo magnet is significantly high, usually no coating necessary.

SmCo magnets can be divided to two categories sintered SmCo and bonded SmCo by processing technology. There are two generations of SmCo magnets, the first is 1:5 SmCo (SmCo_5) and the second is 2:17 SmCo ($\text{Sm}_2\text{Co}_{17}$). Ductibility of SmCo_5 magnets is excellent. It is easy to be machined into disc, ring and complex shapes. $\text{Sm}_2\text{Co}_{17}$ have a low temperature coefficient. The change of flux density can be lower than 2% per 100 °C.

SmCo magnets are widely used in high-performance motors, machinery, pumps, medical devices and other equipment for automotive, aerospace, medical, military and industrial automation industries etc.

Samarium Cobalt (SmCo) Magnets

Features of samarium cobalt magnets

1. Typical magnetic properties of samarium cobalt magnets

There are differences in magnetic properties among different manufacturers.

Following data are only for reference when designing and selecting materials, not as product acceptance standards.

Grade	Residual magnetic flux density B_r		Intrinsic coercive force H_{cJ}		Coercive force H_{cB}		Maximum energy product $(BH)_{max}$		
	T	kGs	kA/m	kOe	kA/m	kOe	kJ/m ³	MGOe	
SmCo ₅	XG16	0.81-0.85	8.1-8.5	1194-1830	15-23	620-660	7.8-8.3	110-127	14-16
	XG16H	0.79-0.84	7.9-8.4	≥1830	≥23	612-652	7.7-8.2	118-135	15-17
	XG18	0.85-0.90	8.5-9.0	1194-1830	15-23	660-700	8.3-8.8	127-143	16-18
	XG18H	0.84-0.89	8.4-8.9	≥1830	≥23	644-684	8.1-8.6	135-151	17-19
	XG20	0.90-0.94	9.0-9.4	1194-1830	15-23	676-725	8.5-9.1	150-167	19-21
	XG20H	0.89-0.93	8.9-9.3	≥1830	≥23	684-724	8.6-9.1	150-167	19-21
	XG22	0.92-0.96	9.2-9.6	1194-1830	15-23	710-748	8.9-9.4	160-175	20-22
	XG22H	0.92-0.96	9.2-9.6	≥1830	≥23	710-748	8.9-9.4	167-183	21-23
	XG24	0.96-1.00	9.6-10.0	1194-1830	15-23	730-770	9.2-9.7	175-190	22-24
	XG24H	0.96-1.00	9.6-10.0	≥1830	≥23	740-780	9.3-9.8	183-199	23-25
Sm ₂ Co ₁₇	XGS24	0.95-1.02	9.5-10.2	≥1433	≥18	692-764	8.7-9.6	175-191	22-24
	XGS24H	0.95-1.02	9.5-10.2	≥1990	≥25.0	692-764	8.7-9.6	175-191	22-24
	XGS26M	1.02-1.05	10.2-10.5	955-1433	12-18	676-780	8.5-9.8	191-207	24-26
	XGS26	1.02-1.05	10.2-10.5	≥1433	≥18	748-796	9.4-10.0	191-207	24-26
	XGS26H	1.02-1.05	10.2-10.5	≥1990	≥25.0	748-796	9.4-10.0	191-207	24-26
	XGS28M	1.03-1.08	10.3-10.8	955-1433	12-18	676-796	8.5-10.0	207-220	26-28
	XGS28	1.03-1.08	10.3-10.8	≥1433	≥18	756-812	9.5-10.2	207-220	26-28
	XGS28H	1.03-1.08	10.3-10.8	≥1990	≥25.0	756-812	9.5-10.2	207-220	26-28
	XGS30M	1.08-1.10	10.8-11.0	955-1433	12-18	676-835	8.5-10.5	220-240	28-30
	XGS30	1.08-1.10	10.8-11.0	≥1433	≥18	788-835	9.9-10.5	220-240	28-30
XGS30H	1.08-1.10	10.8-11.0	≥1990	≥25.0	788-835	9.9-10.5	220-240	28-30	

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XGS32M	1.10-1.13	11.0-11.3	955-1433	12-18	676-844	8.5-10.6	230-255	29-32
XGS32	1.10-1.13	11.0-11.3	≥1433	≥18	812-851	10.2-10.7	230-255	29-32
XGS32H	1.10-1.13	11.0-11.3	≥1990	≥25.0	812-844	10.2-10.6	230-255	29-32

Grade	Residual magnetic flux density B_r		Intrinsic coercive force H_{cJ}		Coercive force H_{cB}		Maximum energy product $(BH)_{max}$		
	T	kGs	kA/m	kOe	kA/m	kOe	kJ/m ³	MGOe	
Bonded SmCo	BSC-4	0.4	4.0	800	10.0	280	3.5	32	4.0
	BSC-6	0.5	5.0	800	10.0	320	4.0	48	6.0
	BSC-8	0.6	6.0	800	10.0	360	4.5	64	8.0
	BSC-10	0.7	7.0	400	5.0	320	4.0	80	10.0
	BSC-10H	0.7	7.0	800	10.0	400	5.0	80	10.0

The above mentioned data of magnetic properties are given at room temperature (20°C). Magnetic properties of materials depend on shape and size. The max working temperature of magnet is changeable due to length-diameter ratio, coating thickness and another environment factors.

2. Other characteristic physical properties

Following data are only for reference when designing and selecting materials, not as product acceptance standards.

Item	Unit	SmCo ₅	Sm ₂ Co ₁₇		
Temperature Coefficients	of B_r	α_{Br}	%/K	-0.05	-0.035
	of H_{cJ}	α_{HcJ}	%/K	-0.3	-0.3
Curie Temperature T_c	T_c	°C	700~750	800~850	
Work Temperature T_w	T_w	°C	250	300-350	
Recoil Permeability μ_{rac}	μ_{rec}	—	1.00-1.05	1.00~1.10	

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Electrical Resistivity	ρ	$\Omega \cdot m$	5.3×10^{-5}	8.5×10^{-5}
Density	D	g/cm^3	8.1~8.5	8.3~8.5
Vickers Hardness (HV)	Hv	MPa	400~500	500~600
Compressive Strength		MPa	420-680	700-830

Precautions regarding safety and use

1. When a magnet is magnetized, strong attractive force or repulsive force arises between the magnet and other magnetic materials (magnet, yoke, rotor, stator, jig fixture, tool, etc.). A user's hand or finger may be sandwiched between the magnet and other magnetic materials during the handling or the assembling. Also, you may be injured by loss of balance of the body due to the attractive or repulsive force. Use appropriate jigs and take special care in handling the magnetized magnet. A magnetized magnet should be covered with a non-magnetic material such as wood or thick plastics and labeled as magnetized.
2. Sharp edge of a magnet may injure your finger. Protect fingers when needed.
3. When a magnet is magnetized in the winding coil, the magnet may fly out from the inside of the winding coil unexpectedly. It can be the cause of injury. Use a proper jig fixture and keep a magnet inside of the winding coil for safety.
4. When magnetized magnets are stacked, it is difficult to peel off, and chipping or a crack may occur. It is recommended to use spacers between the magnets. The stacked magnetized magnets are similar to one big magnet.
5. When a magnetized magnet is placed near the direct or alternating magnetic field, the demagnetization may occur.
6. A mechanical impact may be a cause of a fracture, a crack and a chipping of a magnet. Take special care during the handling of a magnetized magnet. Such a crack or a chipping may deteriorate the magnetic characteristic, the mechanical strength or the corrosion resistance. A broken piece of magnet may hurt your eyes or body.
7. Store magnets in the place without a mechanical impact. Keep the packaging materials of magnets to be dry. Keep the temperature above the dew point to prevent rust during the storage. Avoid water (rain, water used in the factory, etc.) to be splashed on the packaging material.

About MagnetSearcher


Founded in 2018, MagnetSearcher aims to provide buyers around the world with an innovative and robust one-stop magnet sourcing platform through close cooperation with domestic suppliers in China. Now we partner with more than 1000 rare earth permanent magnet suppliers from across China.

Our mission is to connect the world's buyers with Chinese magnet suppliers and make sourcing easier, more efficient and cost-effective.

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