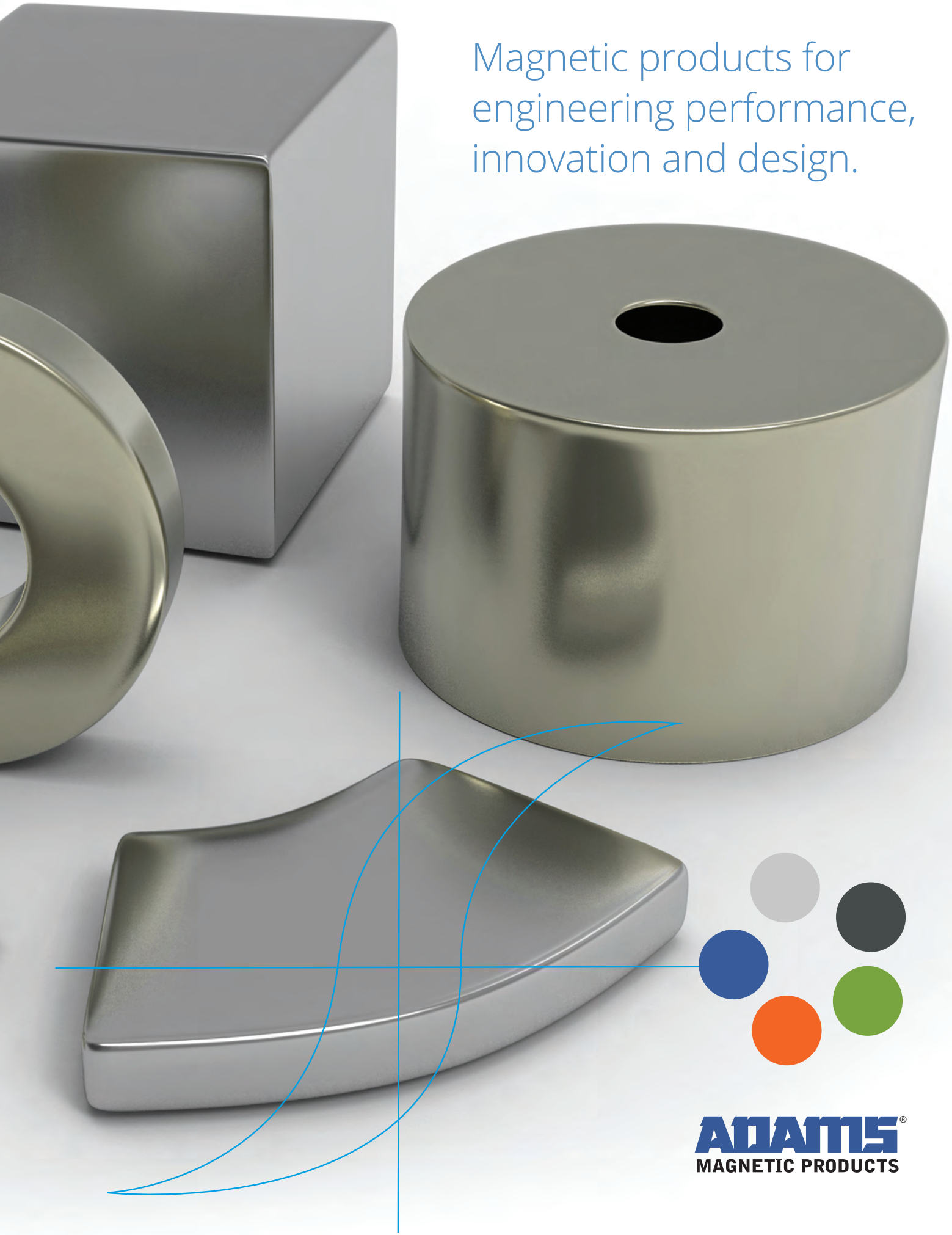
Magnetic products for engineering performance, innovation and design.



ADAMS®
MAGNETIC PRODUCTS

Magnetic products for engineering performance, innovation and design.

Founded in 1950, Adams Magnetic Products is a custom manufacturer, fabricator and distributor of all types of permanent magnets, magnetic assemblies and devices.

Our technical experts are ready to answer your questions and address your magnetic needs. Whether it's selecting a magnet to fit an application, choosing the most cost effective material or reviewing options from what is available in the market, we are here to help with:

- Application and Design Engineering Assistance
- Testing/Analysis of Magnetic Materials
- Magnetic Circuit Analysis/FEA
- Value Analysis/Value Engineering Support
- Inventory Management Programs

A Commitment to Value

We define value as having the right products available at the right time and delivering them as promised, defect-free, at competitive prices. Adams is committed to delivering outstanding value to customers at every opportunity.

Certified Quality Management

Adams maintains ISO 9001:2008 certification, reinforcing our strong operational processes and commitment to continual improvement. We have a standard of zero defects in everything we do.

Military and Defense Materials

Adams Magnetic Products has the knowledge, understanding and systems in place to fully comply with the Arms Export Control Act (AECA) and International Traffic in Arms Regulations (ITAR). We are your partner in fabricating magnets and magnetic products for the defense and military industries. As an ITAR registered supplier, you can rest assured your data and confidential information is safe with us. We are also your source for Defense Acquisition Regulations System (DFARS) compliant materials. Let our technical staff assist you in obtaining the right materials for your DoD needs.



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Magnet materials overview



Alnico

Temperature stability is one of the key benefits of Alnico magnets, which have been a mainstay of the industry since the 1930s. Composed of aluminum, nickel, and cobalt, and available in both cast and sintered forms, Alnico may withstand temperatures over 500°C with no permanent magnetic loss. Additional benefits include ease of demagnetization and high corrosion resistance. Alnico magnets exhibit high Br, but low Hc. Their energy product range is approximately 1.4-11 MGOe.

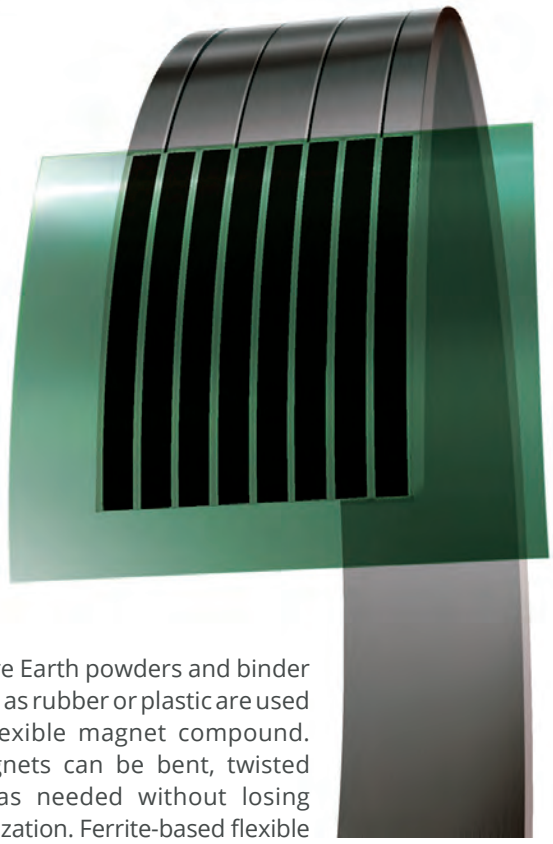
Neodymium Iron Boron

Among commercial magnet materials, the rare earth Neodymium Iron Boron magnet is the most powerful in the marketplace. Available in both sintered and bonded forms, this class of Rare Earth material possesses the highest Br, relatively high Hc and high BHmax. In many cases it is a more economical alternative to Samarium Cobalt, but is only suitable for certain applications because of its temperature sensitivity and susceptibility to oxidation. Neodymium iron boron has an approximate energy product range of 10-53 MGOe.



Samarium Cobalt

Like Neodymium Iron Boron, Samarium Cobalt is a class of Rare Earth material that is available in both sintered and bonded forms. The two materials share many of the same attributes, such as High Br, high Hc and relatively high BHmax. However, Samarium Cobalt is more resistant to corrosion than Neodymium iron boron. Samarium Cobalt has an approximate energy product range of 18-33 MGOe, and exhibits better temperature stability than Neodymium.



Ferrite (Ceramic)

Ferrite is the lowest cost magnet material currently available, which may be why sintered ferrite magnets are so commonly found in everyday consumer applications. Many automotive small motor applications are sintered ferrite magnets. Composed of Strontium Ferrite, these hard, brittle materials stand up well to demagnetization except in extreme cold environments. Ferrite has an approximate energy product range of 1.1-4.5 MGOe.



Flexible

Ferrite or Rare Earth powders and binder systems such as rubber or plastic are used to form a flexible magnet compound. Flexible magnets can be bent, twisted and coiled as needed without losing their magnetization. Ferrite-based flexible magnets are available from 0.6-1.8 MGOe, while those with Rare Earth-based materials can reach 6 MGOe. Grading varies by composition.

Glossary of magnetic terms

CLOSED CIRCUIT CONDITION: When the external flux path of a permanent magnet is confined with high permeability material, it creates what is known as closed circuit condition.

COERCIVITY: When an attempt is made to demagnetize a magnet, coercivity describes the measure of what is necessary to achieve this goal. It refers to the strength of the reverse magnetic field required for demagnetization of a permanent magnet.

COERCIVE FORCE (HC): Similar to coercivity, this is the specific demagnetizing force necessary to lower the residual induction (Br) of a fully magnetized magnet to zero

CURIE TEMPERATURE (TC): The temperature point beyond which magnetic materials lose their magnetic properties is known as the Curie temperature.

DEMAGNETIZATION CURVE: This is the specific term for the second (or fourth) quadrant of a major hysteresis loop. The points on this curve are designated by the coordinates Bd and Hd.

GAUSS (B): This is a unit of magnetic flux density equal to 1 maxwell per square centimeter.

HYSTERESIS LOOP: One way to learn more about a magnet's magnetic properties is to study its hysteresis loop. It is generated by measuring the magnetic flux while the magnetizing force is changed. Specifically, this is a closed curve obtained for a material by plotting (usually to rectangular coordinates) corresponding values of magnetic induction, B, for ordinates and magnetizing force, H, for abscissa when the material is passing through a complete cycle between definite limits of either magnetizing force, H, or magnetic induction, B.

INTRINSIC COERCIVE FORCE (HCI): A term to measure a magnetic material's ability to resist demagnetization. It is equal to the demagnetizing force which reduces the intrinsic induction, Bi, in the material to zero after magnetizing to saturation.

IRREVERSIBLE LOSSES: These are defined as partial demagnetization of the magnet, caused by any number of factors, from exposure to high and low temperatures, and to external magnetic fields. Despite the 'irreversible' name, such losses are recoverable through re-magnetization. Magnets can be stabilized against irreversible losses by partial demagnetization induced by temperature cycles or by external magnetic fields.

MAGNETIC POLES: The points where a magnet's strength is concentrated are called the magnetic poles. Most people are familiar with the commonly used "north" and "south" designations, which refer to how suspended magnets orient along north-south planes. On different magnets, like poles repel each other, opposite poles attract.

MAXIMUM ENERGY PRODUCT (BHMAX): This term refers to the quality index representing both the saturation magnetization and coercivity of a permanent magnet.

RESIDUAL INDUCTION (BR): Residual induction is the magnetic induction corresponding to zero magnetic force in a magnetic material after full magnetization in a closed circuit. It is also sometimes referred to as flux density, and can be measured in gauss or Tesla.

OERSTED (H): Named for the scientist heralded as the father of electromagnetism, an Oersted is the unit of magnetic field strength in the cgs system. One oersted equals a magnetomotive force of one gilbert per centimeter of flux path.

OPEN CIRCUIT CONDITION: This is a condition that exists in a magnetized magnet when it is free from any external flux path of high permeability material.

ORIENTATION DIRECTION: Also known as "easy axis" or just "axis," orientation direction refers to the preferred direction in which some magnets (called oriented or anisotropic magnets) should be magnetized to achieve maximum magnetism. Other magnets, called unoriented or isotropic magnets, can be magnetized in any direction.

PERMEANCE COEFFICIENT (Pc): Also referred to as the shear line, load line, unit permeance, or operating slope, is a straight line passing through the origin of the demagnetization curve with a slope of negative B_d/H_d. The permeance coefficient is calculated using the geometric parameters of the magnet or magnetic circuit. The primary purpose of calculating the permeance coefficient is to determine the operating point (B_d, H_d) of the magnet on the normal demagnetization curve. Considering two magnets of identical material grade and pole surface area, the longer of the two will have a greater permeance coefficient and therefore a greater B_d.

POLARITY OF A MAGNETIZED MAGNET: The North Pole of a magnet is that pole which is attracted to the geographic North Pole. Therefore, the North Pole of a magnet will repel the north-seeking pole of a magnetic compass.

TEMPERATURE COEFFICIENT: When temperature changes, there may be reversible changes in magnetic properties. The temperature coefficient is the factor that describes these changes, and is expressed as the % change per unit of temperature. The magnetic property spontaneously returns when the temperature is cycled to its original point.

Grade	Residual Induction Br-Gs	Intrinsic Coercive Hci-Oe	Coercive Force Hc-Oe	BHmax Energy MGOe	Max. Operating Temp. in °C/°F at an Operating Slope of 1	TC of Br % /°C	TC of Hci % /°C
ALNICO MATERIAL							
Cast Alnico 2	7500	580	560	1.7	550˚C/1020˚F	-0.02	-
Cast Alnico 3	7000	500	480	1.35	550˚C/1020˚F	-0.02	-
Cast Alnico 5	12800	640	640	5.5	550˚C/1020˚F	-0.02	-
Cast Alnico 5-7	13500	740	740	7.5	550˚C/1020˚F	-0.02	-
Cast Alnico 8	8200	1860	1650	5.3	550˚C/1020˚F	-0.02	-
Cast Alnico 9	10600	1500	1500	9.0	550˚C/1020˚F	-0.02	-
Sintered Alnico 2	7100	570	550	1.5	450˚C/840˚F	-0.02	-
Sintered Alnico 5	10900	630	620	3.9	450˚C/840˚F	-0.02	-
Sintered Alnico 8	7400	1690	1500	4.0	450˚C/840˚F	-0.02	-
above values are nominal properties							
CERAMIC MATERIAL							
Ceramic 1	2300	3000	1850	1.0	399°C/750°F	-0.2	0.2~0.5
Ceramic 5	3950	2500	2400	3.4	399°C/750°F	-0.2	0.2~0.5
Ceramic 8a	3900	3050	2950	3.5	399°C/750°F	-0.2	0.2~0.5
Ceramic 8b	4200	2950	2900	4.1	399°C/750°F	-0.2	0.2~0.5
Ceramic 8c	4300	2750	2700	4.2	399°C/750°F	-0.2	0.2~0.5
above values are nominal properties							
SAMARIUM COBALT MATERIAL							
1.5 SERIES							
SmCo 18	8,400~8,900	≥23,000	8,100~8,600	17-19	250°C/482°F	-0.040	-0.30
SmCo 20	8,900~9,300	≥23,000	8,600~9,100	19-21	250°C/482°F	-0.045	-0.30
SmCo 22	9,200~9,600	≥23,000	8,600~9,400	21-23	250°C/482°F	-0.045	-0.30
SmCo 24	9,600~10,000	≥23,000	9,300~9,800	22-24	250°C/482°F	-0.045	-0.30
SmCoLTC10	6,200~6,600	≥23,000	6,100~6,500	9.5-11	300°C/572°F	Temp.	Br%/°C
						20-100°C	+0.0156
						100-200°C	+0.0087
						200-300°C	+0.0007
2.17 SERIES							
SmCo2412	9500~10,200	8k/12k	6,800~9,000	22-24	250°C/482°F	-0.025	-0.20
SmCo2612	10,200~10,500	8k/12k	6,800~9,400	24-26	250°C/482°F	-0.035	-0.20
SmCo2812	10,300~10,800	8k/12k	6,800~9,600	26-28	250°C/482°F	-0.035	-0.20
SmCo3012	10,800~11,500	8k/12k	6,800~10,000	28-30	250°C/482°F	-0.035	-0.20
SmCo3212	11,000~11,500	8k/12k	6,800~10,200	29-32	250°C/482°F	-0.035	-0.20
SmCo2616	10,200~10,500	12k-18k	8,500~9,800	24-26	300°C/572°F	-0.035	-0.20
SmCo2816	10,300~10,800	12k-18k	8,500~10,000	26-28	300°C/572°F	-0.035	-0.20
SmCo3016	10,800~11,000	12k-18k	8,500~10,500	28-30	300°C/572°F	-0.035	-0.20
SmCo3216	11,000~11,300	12k-18k	8,500~10,600	29-32	300°C/572°F	-0.035	-0.20
SmCo2218	9300~9,700	≥ 18,000	8,500~9,300	20-23	300°C/572°F	-0.020	-0.20
SmCo2418	9500~10,200	≥ 18,000	8,700~9,600	22-24	300°C/572°F	-0.025	-0.20
SmCo2618	10,200~10,500	≥ 18,000	9,400~10,000	24-26	300°C/572°F	-0.030	-0.20
SmCo2818	10,300~10,800	≥ 18,000	9,500~10,200	26-28	300°C/572°F	-0.035	-0.20
SmCo3018	10,800~11,500	≥ 18,000	9,900~10,500	28-30	300°C/572°F	-0.035	-0.20
SmCo3218	11,000~11,500	≥ 18,000	10,200~10,700	29-32	300°C/572°F	-0.035	-0.20
SmCo2425	9500~10,200	≥ 25,000	8,700~9,600	22-24	350°C/662°F	-0.025	-0.20
SmCo2625	10,200~10,500	≥ 25,000	9,400~10,000	24-26	350°C/662°F	-0.030	-0.20
SmCo2825	10,300~10,800	≥ 25,000	9,500~10,200	26-28	350°C/662°F	-0.035	-0.20
SmCo3025	10,800~11,000	≥ 25,000	9,900~10,500	28-30	350°C/662°F	-0.035	-0.20
SmCo3225	11,000~11,300	≥ 25,000	10,200~10,700	29-32	350°C/662°F	-0.035	-0.20
SmCoLTC22	9400~9,800	15k-20k	8,400~9,000	22-24	300°C/572°F	Temp.	Br%/°C
						-50-25°C	+0.005
						20-100°C	-0.008
						100-200°C	-0.008
						200-300°C	-0.011

We offer additional grades with some properties added or improved upon request. Please consult our sales representative or technical personnel for more details.

Grade	Residual Induction Br-kGs	Intrinsic Coercive Hci-kOe	Coercive Force Hc-kOe	BHmax Energy MGOe	Max. Operating Temp. in °C/°F at an Operating Slope of 1	TC of Br % /°C	TC of HCi % /°C
NEODYMIUM MATERIAL							
Neo2825 (UH)	10.2~10.8	≥25	9.6	25~28	108/356	-0.12	-0.70
Neo2830 (EH)	10.4~10.9	≥30	9.8	25~28	200/392	-0.12	-0.70
Neo2834 (AH)	10.2~10.9	≥34	9.8	25~29	230/446	-0.12	-0.70
Neo3020 (SH)	10.8~11.3	≥20	10.1	28~31	150/302	-0.12	-0.70
Neo3025 (UH)	10.8~11.3	≥25	10.2	28~31	180/356	-0.12	-0.70
Neo3030 (EH)	10.8~11.3	≥30	10.2	28~31	200/392	-0.12	-0.70
Neo3034 (AH)	10.7~11.3	≥34	10.5	27~31	230/446	-0.12	-0.70
Neo3312 (N)	11.3~11.7	≥12	10.5	31~34	80/176	-0.12	-0.70
Neo3314 (M)	11.3~11.7	≥14	10.5	31~34	100/212	-0.12	-0.70
Neo3317 (H)	11.3~11.7	≥17	10.5	31~34	120/248	-0.12	-0.70
Neo3320 (SH)	11.3~11.7	≥20	10.6	31~34	150/302	-0.12	-0.70
Neo3325 (UH)	11.3~11.7	≥25	10.7	31~34	180/356	-0.12	-0.70
Neo3330 (EH)	11.3~11.7	≥30	10.3	31~34	200/392	-0.12	-0.70
Neo3333 (AH)	11.1~11.7	≥33	10.5	30~34	230/446	-0.12	-0.70
Neo3512 (N)	11.7~12.2	≥12	10.9	33~36	80/176	-0.12	-0.70
Neo3514 (M)	11.7~12.2	≥14	10.9	33~36	100/212	-0.12	-0.70
Neo3517 (H)	11.7~12.2	≥17	10.9	33~36	120/248	-0.12	-0.70
Neo3520 (SH)	11.7~12.2	≥20	11.0	33~36	150/302	-0.12	-0.70
Neo3525 (UH)	11.7~12.2	≥25	10.8	33~36	180/356	-0.12	-0.70
Neo3530 (EH)	11.7~12.2	≥30	10.5	33~36	200/392	-0.12	-0.70
Neo3533 (AH)	11.7~12.2	≥33	10.5	33~36	230/446	-0.12	-0.70
Neo3812 (N)	12.2~12.5	≥12	11.3	36~39	80/176	-0.12	-0.70
Neo3814 (M)	12.2~12.5	≥14	11.3	36~39	100/212	-0.12	-0.70
Neo3817 (H)	12.2~12.5	≥17	11.3	36~39	120/248	-0.12	-0.70
Neo3820 (SH)	12.2~12.5	≥20	11.4	36~39	150/302	-0.12	-0.70
Neo3825 (UH)	12.2~12.5	≥25	11.0	36~39	180/356	-0.12	-0.70
Neo3830 (EH)	12.0~12.5	≥30	11.5	35~39	200/392	-0.12	-0.70
Neo3833 (AH)	12.2~12.6	≥33	11.6	36~39	220/428	-0.12	-0.70
Neo4012 (N)	12.5~12.8	≥12	11.6	38~41	80/176	-0.12	-0.70
Neo4014 (M)	12.5~12.8	≥14	11.6	38~41	100/212	-0.12	-0.70
Neo4017 (H)	12.5~12.8	≥17	11.6	38~41	120/248	-0.12	-0.70
Neo4020 (SH)	12.5~12.8	≥20	11.8	38~41	150/302	-0.12	-0.70
Neo4030 (EH)	12.5~12.9	≥30	11.5	38~41	190/374	-0.12	-0.70
Neo4025 (UH)	12.5~12.8	≥25	11.5	38~41	180/356	-0.12	-0.70
Neo4212 (N)	12.8~13.2	≥12	11.6	40~43	80/176	-0.12	-0.70
Neo4214 (M)	12.8~13.2	≥14	12.0	40~43	100/212	-0.12	-0.70
Neo4217 (H)	12.8~13.2	≥17	12.0	40~43	120/248	-0.12	-0.70
Neo4220 (SH)	12.8~13.2	≥20	12.2	40~43	150/302	-0.12	-0.70
Neo4225 (UH)	12.7~13.2	≥25	12.2	40~43	170/338	-0.12	-0.70
Neo4229 (EH)	12.8~13.2	≥29	12.2	39~43	180/356	-0.12	-0.70
Neo4512 (N)	13.2~13.7	≥12	11.0	43~46	80/176	-0.12	-0.70
Neo4514 (M)	13.2~13.7	≥14	12.5	43~46	100/212	-0.12	-0.70
Neo4517 (H)	13.2~13.7	≥17	12.2	43~46	120/248	-0.12	-0.70
Neo4520 (SH)	13.2~13.7	≥20	12.3	43~46	140/284	-0.12	-0.70
Neo4525 (UH)	13.2~13.7	≥24	12.5	43~47	160/320	-0.12	-0.70
Neo4812 (N)	13.7~14.2	≥12	11.2	45~49	80/176	-0.12	-0.70
Neo4814 (M)	13.6~14.2	≥14	12.8	45~49	100/212	-0.12	-0.70
Neo4817 (H)	13.6~14.2	≥17	12.9	45~49	110/230	-0.12	-0.70
Neo4820 (SH)	13.6~14.2	≥20	12.5	45~49	130/266	-0.12	-0.70
Neo5012 (N)	13.9~14.4	≥12	10.5	47~51	60/132	-0.12	-0.70
Neo5014 (M)	13.9~14.4	≥14	13.0	47~51	90/194	-0.12	-0.70
Neo5016 (H)	13.9~14.4	≥16	13.0	47~51	100/212	-0.12	-0.70
Neo5211 (N)	14.3~14.8	≥11	10.5	49~53	60/140	-0.12	-0.70
Neo5213 (M)	14.2~14.7	≥13	12.5	49~53	80/176	-0.12	-0.70

Neodymium

Neodymium magnets are the strongest known type of permanent magnet.

Neodymium Magnetizing and Machining

Neodymium magnets cannot be machined with conventional drilling, turning or milling processes, and must be ground before they are magnetized. Large or complex assemblies are usually magnetized prior to assembly. Standard tolerances are +/-.005 on ground dimensions.

Neodymium requires high magnetizing fields, and offers substantial resistance to demagnetization. Sintered NdFeB magnets are manufactured with a preferred direction of magnetic orientation (anisotropic) prior to magnetizing. The following magnetization process must consider the anisotropy direction to achieve full magnetic specifications. In some configurations it is possible for multipole magnetization on a single magnet, however custom magnetizing fixtures must be utilized.

Temperature Considerations with Neodymium Magnets

Depending on the operating slope a low coercivity grade Neodymium magnet may begin to lose strength if heated above 176°F (80°C). High coercivity grade Neodymium Magnets can function at temperatures up to 428°F (220°C) with little irreversible loss. The need for low temperature coefficient in neodymium magnet applications has triggered several grades to be developed to meet specific operating requirements (see Magnetic Properties chart).

Corrosion Protection

While today's Neo magnets are more temperature and corrosion-resistant, a protective coating is still necessary for certain applications. NdFeB grades with higher corrosion resistance are available when required.

Neodymium Magnet Applications

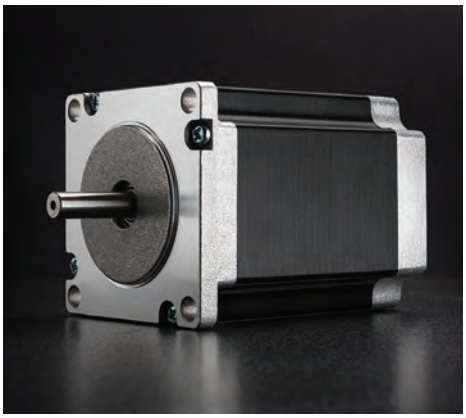
Neodymium magnets have replaced Alnico and ferrite magnets in many applications, including: head actuators for computer hard disks, magnetic resonance imaging (MRI),loudspeakers and headphones, magnetic bearings and couplings, cordless tools, servo motors, lifting and compressor motors, synchronous motors, spindle and stepper motors, electrical power steering, drive motors for hybrid and electric vehicles, and actuators.





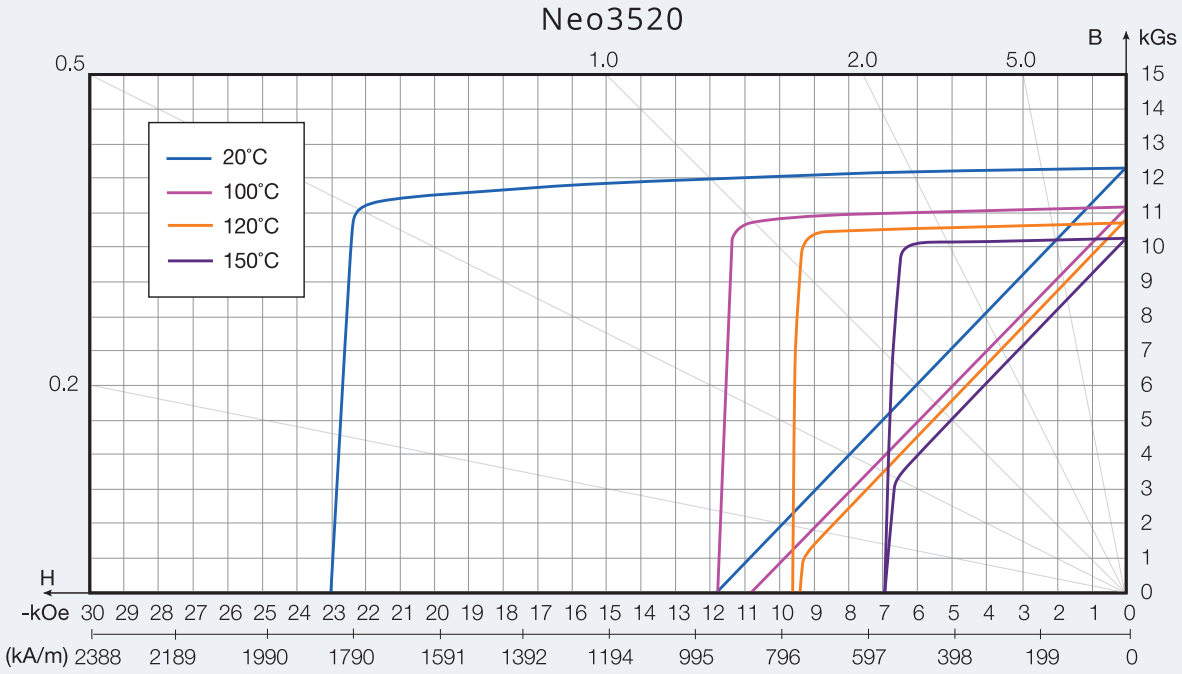


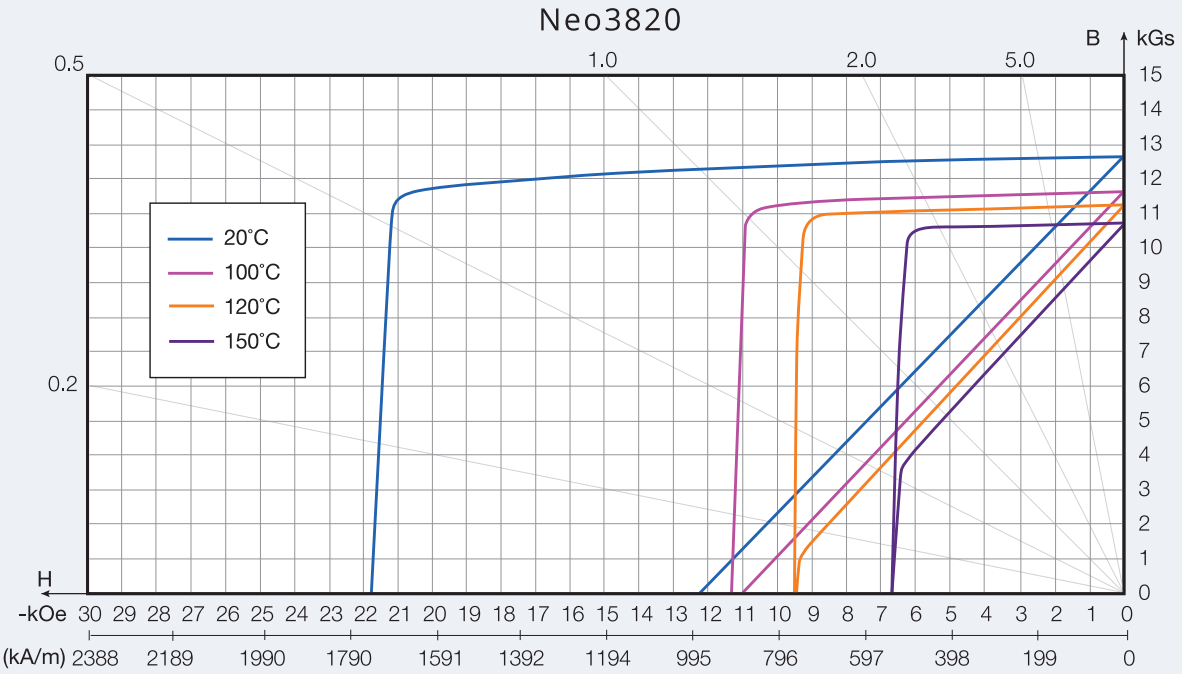




Neodymium demagnetization curves

Typical demagnetization curves B(H) and J(H) at various temperatures:

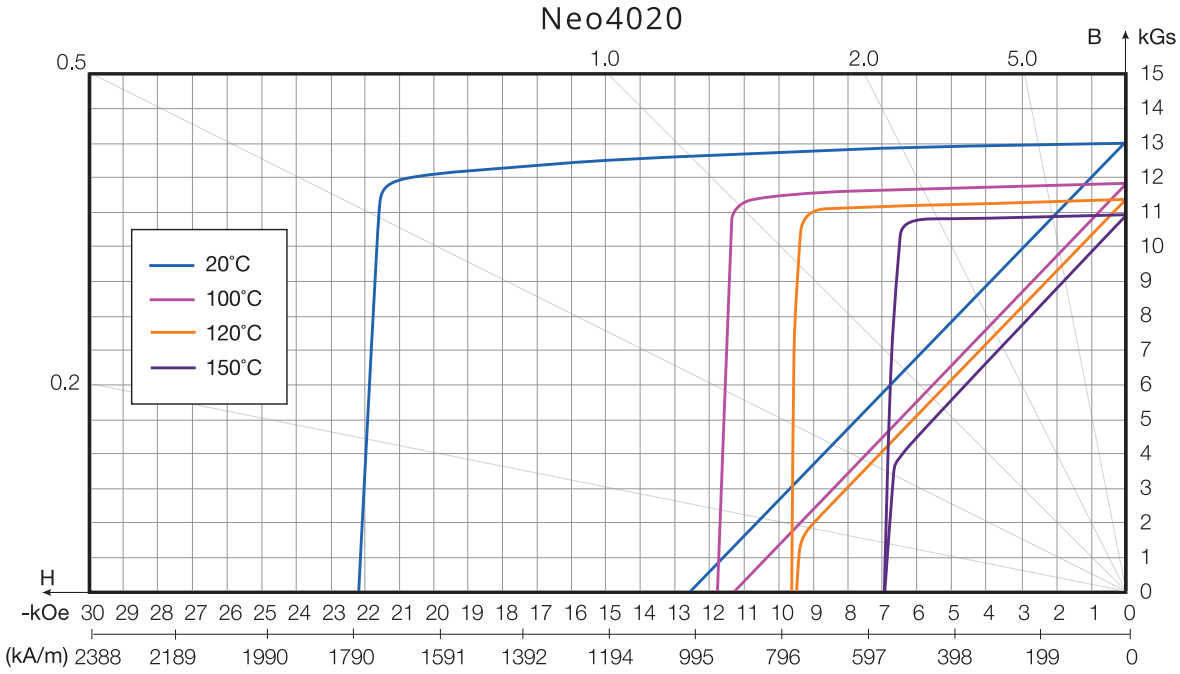


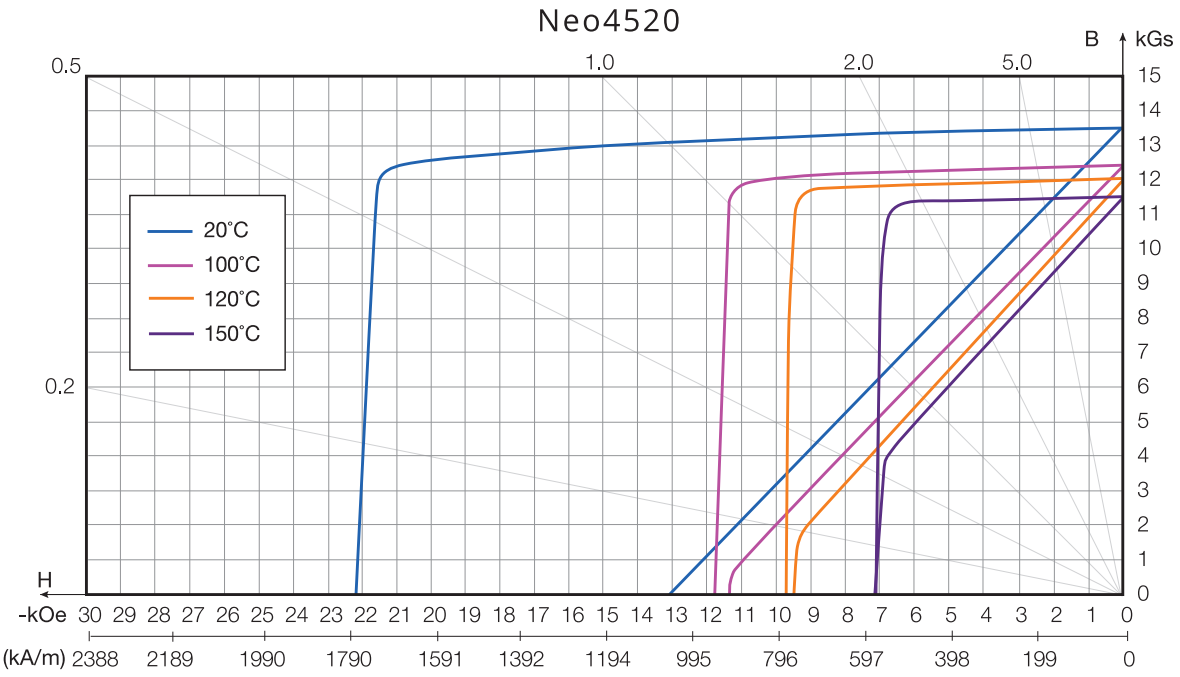


Curves for other material grades are available upon request.

Neodymium demagnetization curves

Typical demagnetization curves B(H) and J(H) at various temperatures:

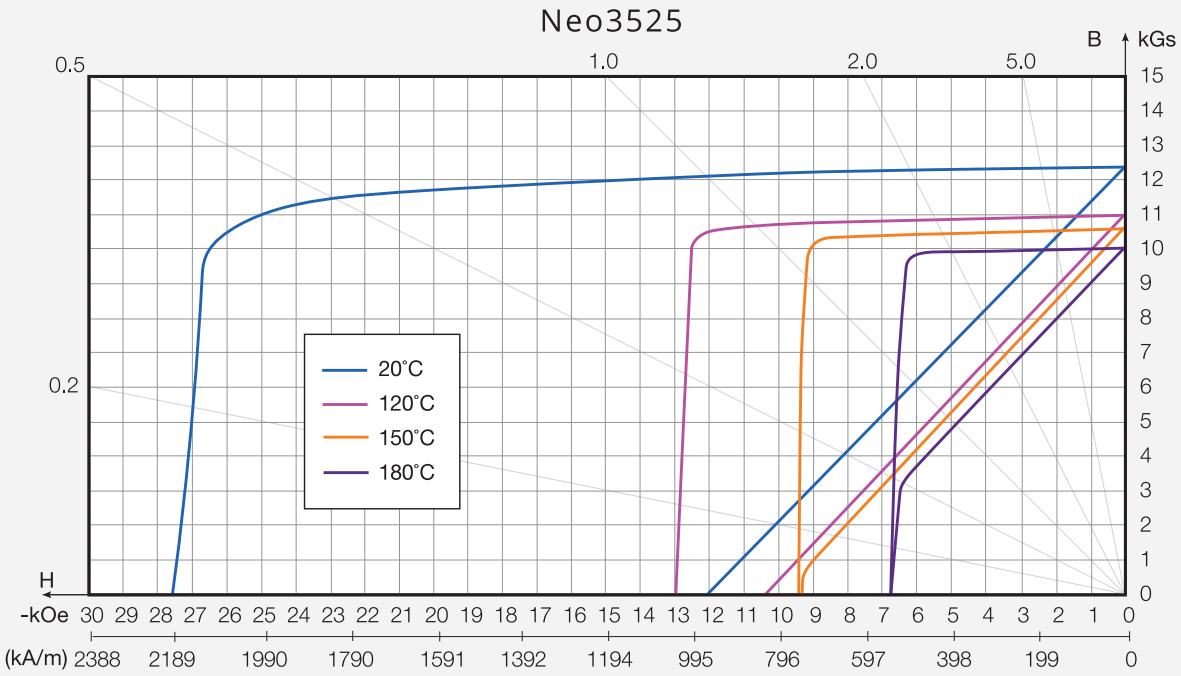


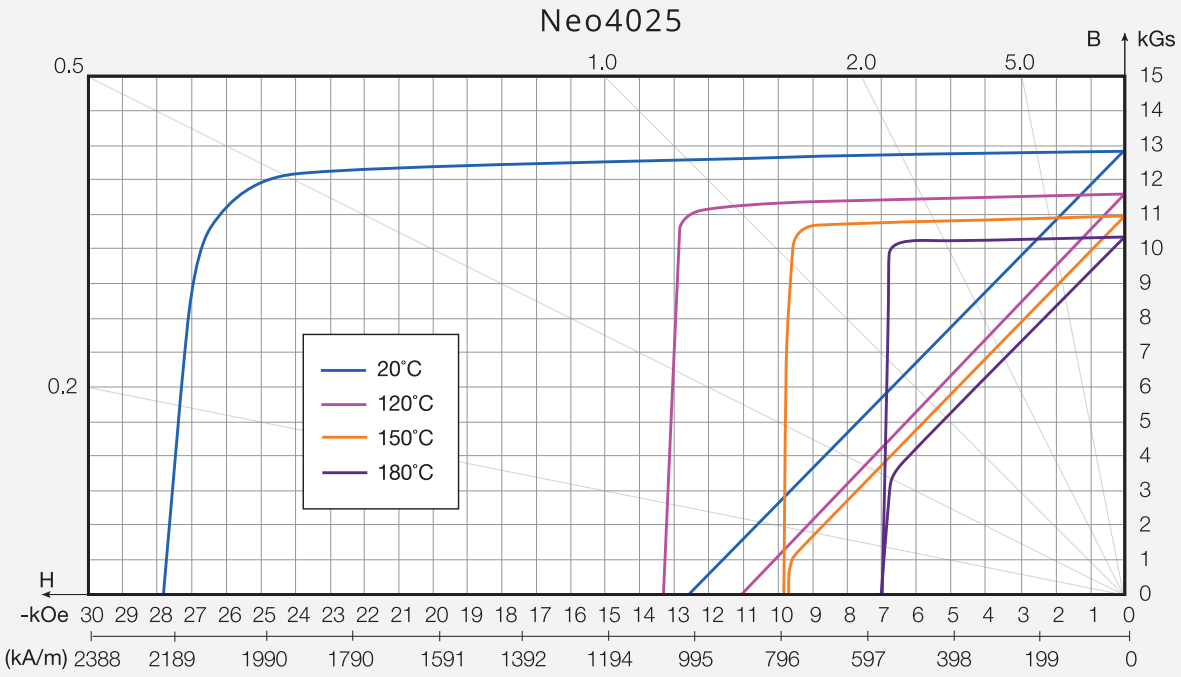


Curves for other material grades are available upon request.

Neodymium demagnetization curves

Typical demagnetization curves B(H) and J(H) at various temperatures:

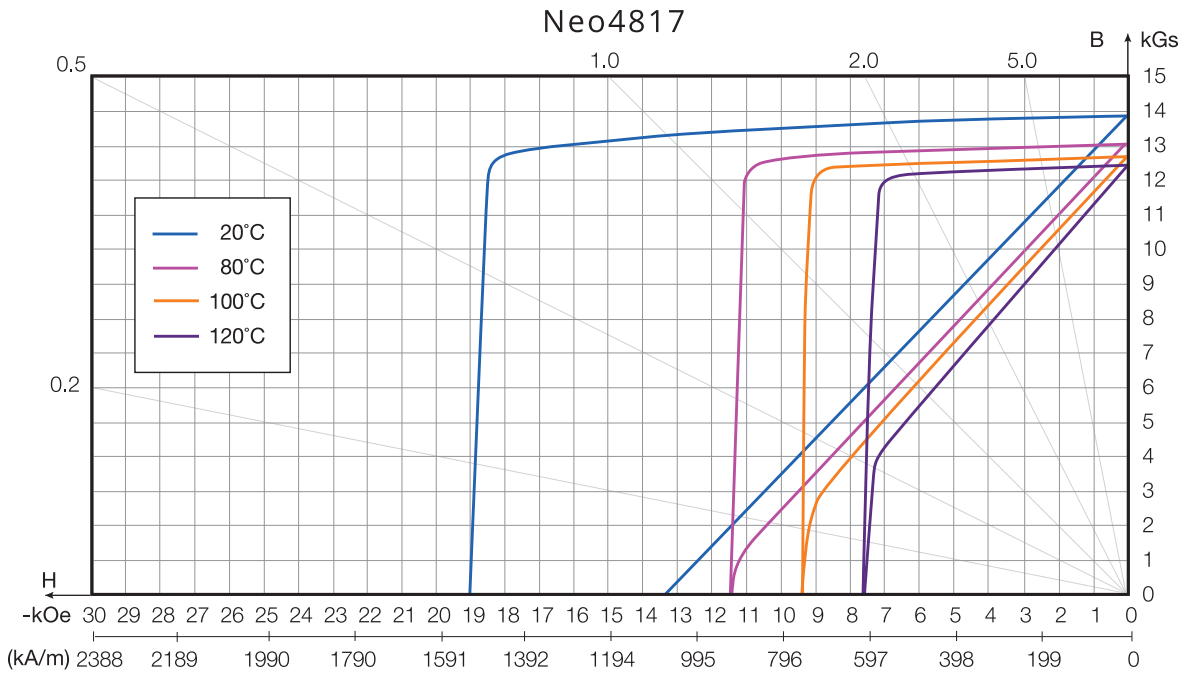


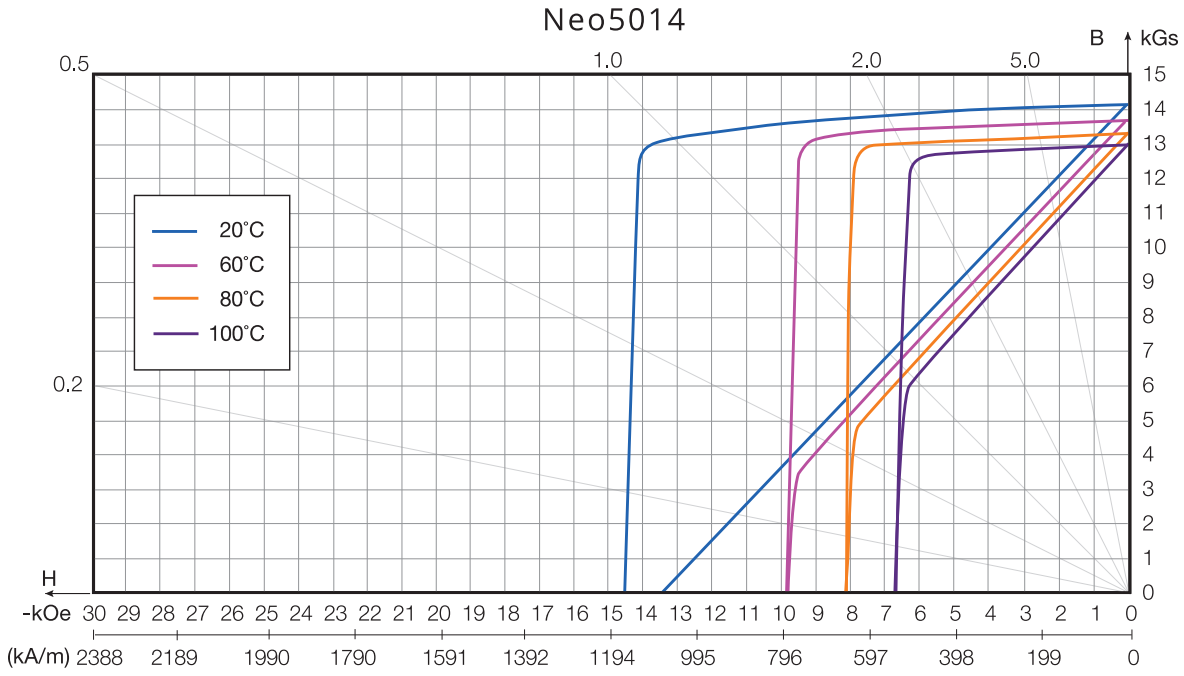


Curves for other material grades are available upon request.

Neodymium demagnetization curves

Typical demagnetization curves B(H) and J(H) at various temperatures:





Curves for other material grades are available upon request.

Samarium Cobalt

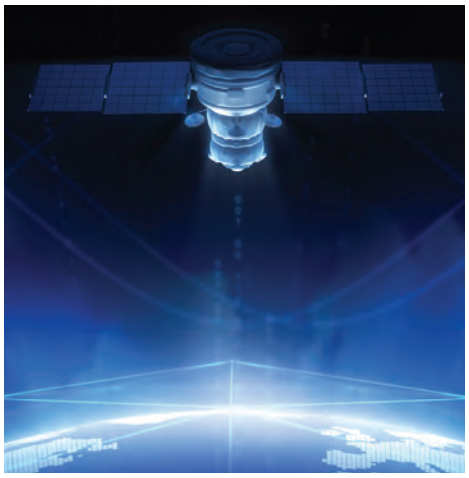
Samarium Cobalt (SmCo) permanent magnets are known for their high magnetic strength, exceptional temperature stability, and reliable performance. As a result, they rarely require coating to combat corrosion, and therefore are more suitable for certain applications than Neodymium.

Samarium cobalt magnets are often used when a wide range of operating temperatures is expected or if temperature effects must be mitigated, as when high accuracy or highly stable performance is desired. A potential challenge is their propensity to chip and crack, due to their brittle nature.



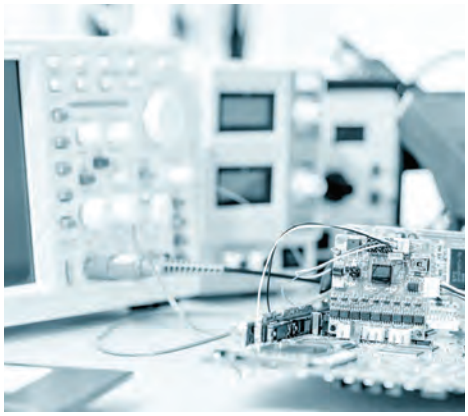
1:15 Alloy Material Characteristics

1:5 series SmCo provides an energy product between 16 and 22 MGOe and is made up of approximately 50% samarium and 50% cobalt. Considering an operating slope of one, a low coercivity grade 1:5 series may begin to experience permanent losses if heated above 482°F (250°C). High coercivity grade 1:5 SmCo can function at temperatures in excess of 752°F (400°C) with little to no irreversible loss. SmCo 1:5 magnets require lower field strengths than 2:17 materials to magnetize. In some instances, 1:5 material may be magnetized with multiple poles.



2:17 Alloy Material Characteristics

2:17 series SmCo provides an energy product between 24 and 32 MGOe and is composed of about 25% samarium, 5% copper, 18% iron and 2% hafnium or zirconium, with the remainder being cobalt. Considering an operating slope of one, a low coercivity grade 2:17 series SmCo may begin to experience permanent losses if heated above 482°F (250°C). High coercivity grade 2:17 SmCo can function at temperatures in excess of 932°F (500°C) with little to no irreversible loss. Specialized grades are available for even higher temperature requirements. SmCo 2:17 requires a higher magnetizing field when compared to SmCo 1:5. With the appropriate magnetizing fixture, multipole magnetization may be possible.



Applications

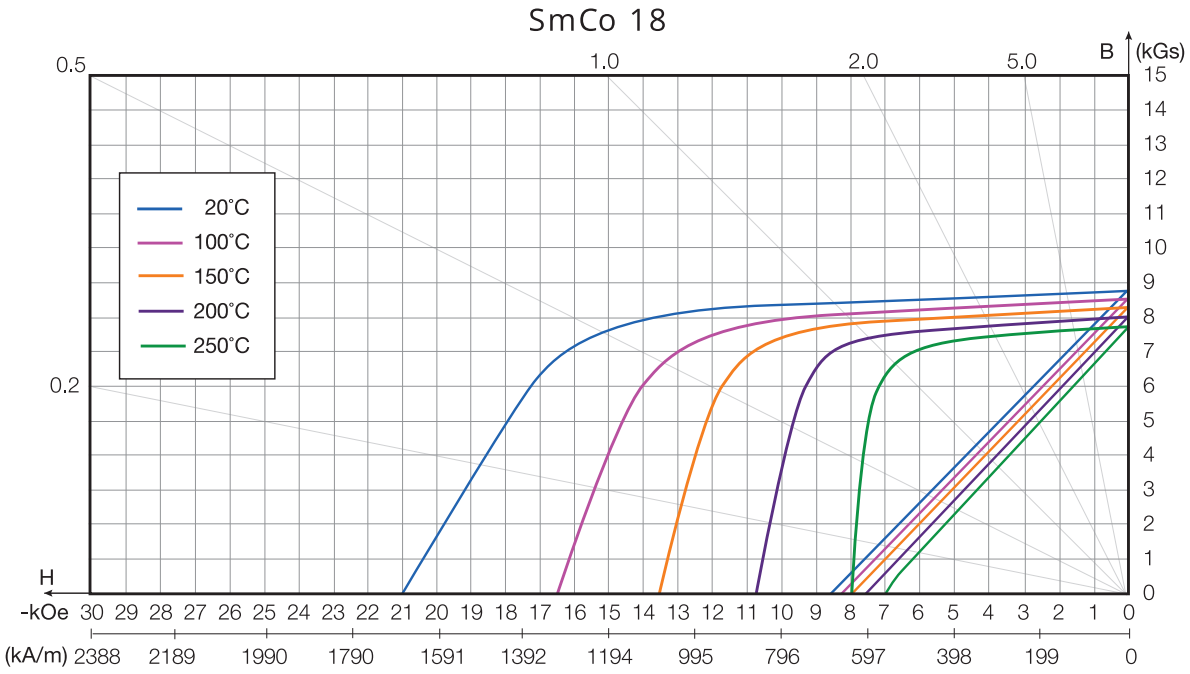
High performance permanent magnet motors, medical instruments, magnetic couplings, magnetic bearings, gyroscopes, accelerometers, voice coil motors, particle accelerators, sputtering deposition, Halbach arrays, magnetic separation devices, speakers, microphones, undulators, wigglers, particle beam focusing devices, and many others.

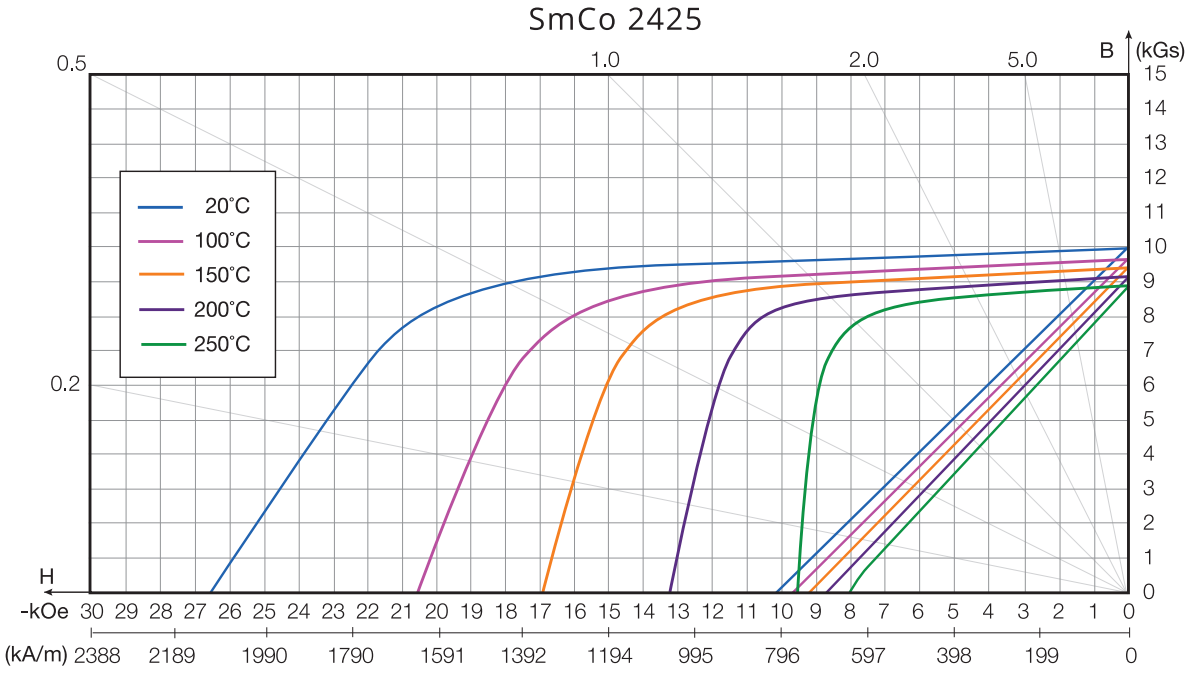




Samarium Cobalt demagnetization curves

Typical demagnetization curves B(H) and J(H) at various temperatures:

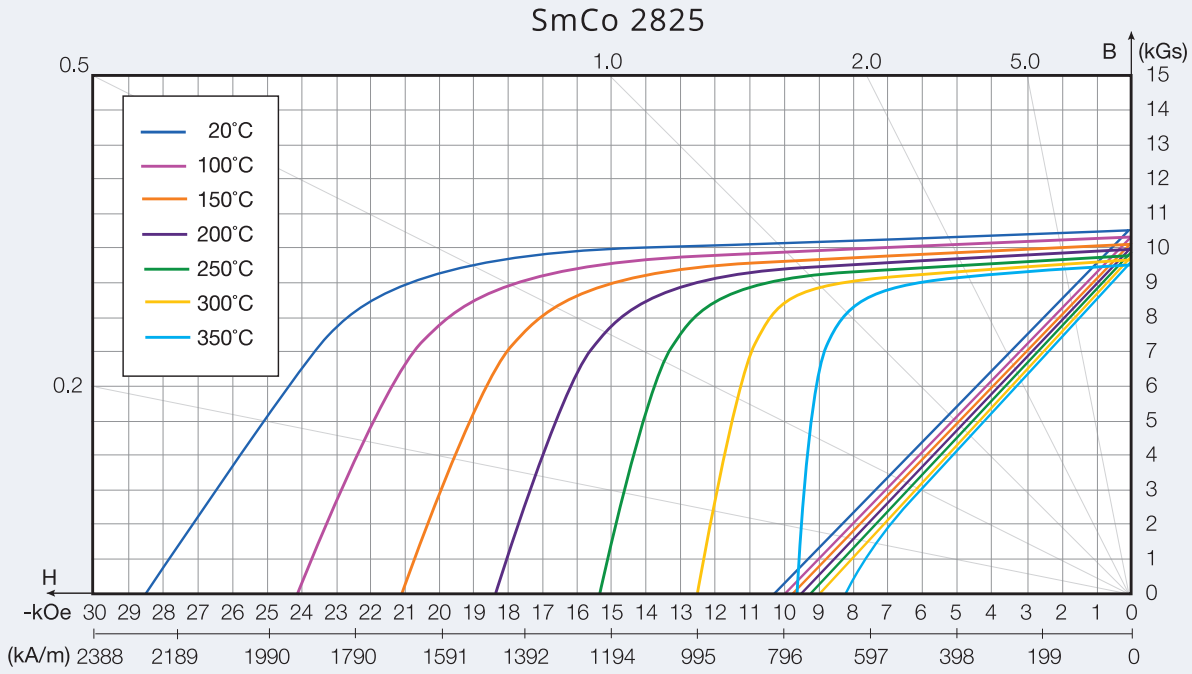


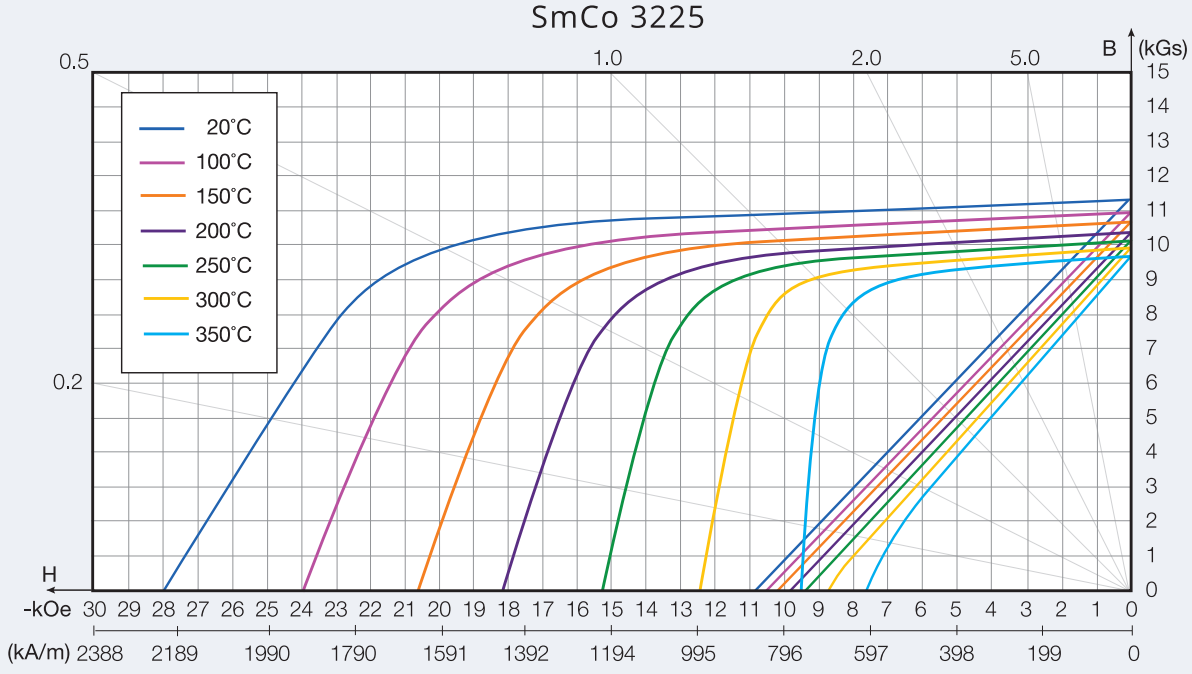


Curves for other material grades are available upon request.

Samarium Cobalt demagnetization curves

Typical demagnetization curves B(H) and J(H) at various temperatures:





Curves for other material grades are available upon request.

Ceramic

Ceramic magnets (also known as ferrite magnets) were developed in the 1960's as a low cost alternative to metallic magnets. While their hard, brittle quality and low energy exclude them from some applications, ceramic magnets have won wide acceptance due to their corrosion and demagnetization resistance, and low price per pound. Ferrite represents more than 75 percent of world magnet consumption (by weight). It is the first choice for most types of DC motors, magnetic separators, magnetic resonance imaging and automotive sensors.

Machining and tolerances

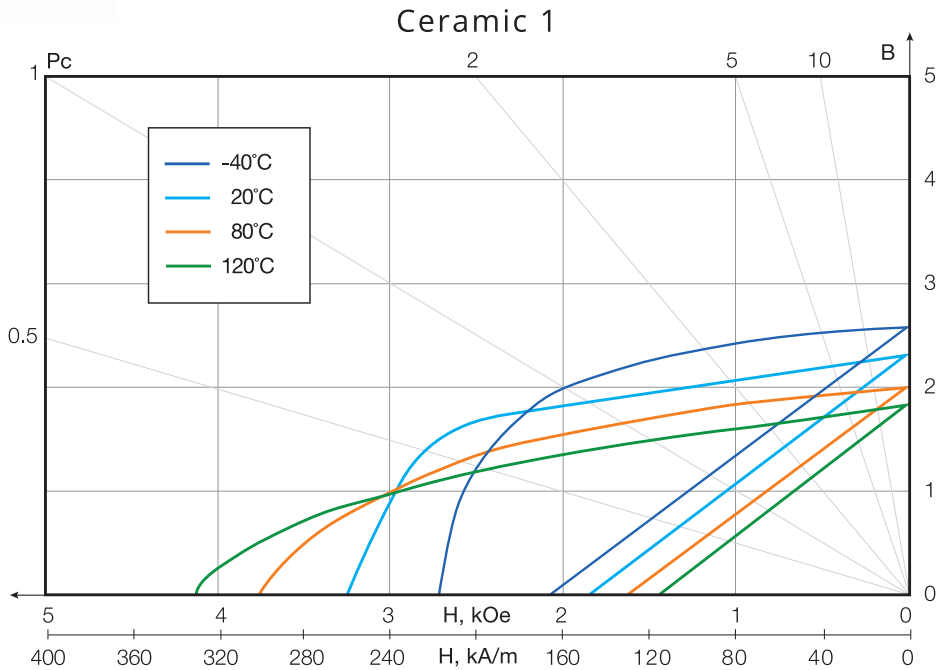
Machining must be performed with a diamond wheel, preferably prior to magnetization. Standard tolerances are +/-.005" for ground dimensions and +/- 2% of feature size for sintered dimensions. Due to their brittle nature these magnets will not withstand impact or flexing. They are also not recommended to be used as structural components in assembles. Ceramic magnets are chemically inert non-conductors, which is a benefit in many applications but eliminates the use of the EDM process to produce samples or special shapes.



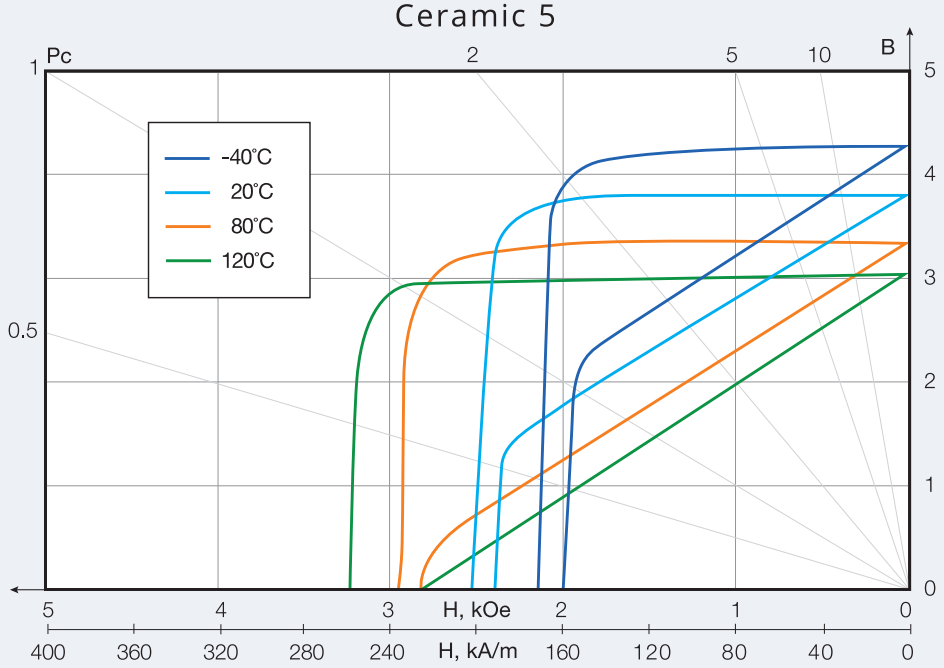
Temperature constraints and methods of magnetization

Due to Ceramic's positive temperature coefficient of Hci high temperatures are not generally a major concern with respect to irreversible magnetic loss. Low temperatures however pose a much greater risk for permanent demagnetization. For example a ceramic 5 grade with a permeance coefficient of 1 will start to experience permanent losses below -20°C.

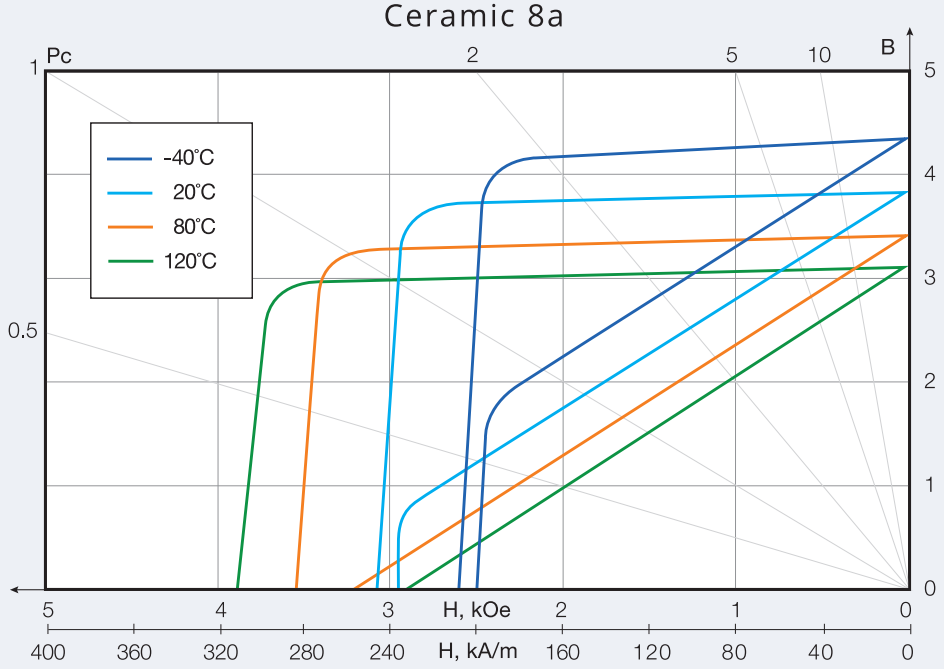
Magnetization: Isotropic ceramic grades can be magnetized in any direction, while anisotropic grades have a preferred direction of magnetization and will only meet their full magnetic potential when magnetized along the "easy axis".



Ceramic 5



Ceramic 8a



Alnico characteristics and curves

Most alnico magnets are manufactured using typical foundry casting techniques, where the molten alloy is poured into sand molds. Very small magnets, usually one ounce or less, are produced using press and sinter techniques. Sintered Alnico magnets have features which make them particularly effective in very small precision devices. It is possible to sinter magnets with small holes and intricate shapes. Sintered magnets are available in both isotropic and anisotropic form, with a wide range of unit properties. Their magnetic properties are similar but often slightly lower than cast magnets of equivalent grade.

Grinding and Tolerances

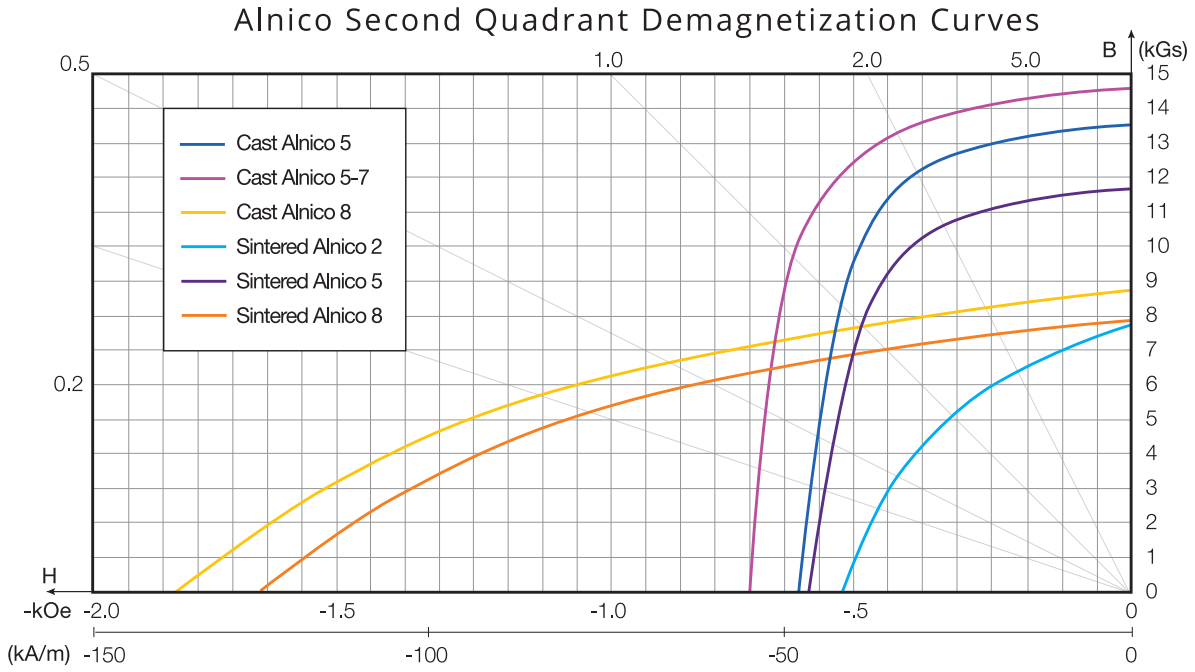
Alnico is hard and brittle (45-55 Rockwell C), and is not suitable for drilling, tapping or conventional machining operations. Close tolerances are attained by abrasive grinding and cutting. Adams provides in-house cutting and grinding to meet your application requirements.

Temperature Constraints and Magnetization

Alnico has the best temperature coefficient of any but the most advanced commercial magnet material, providing for excellent stability over a wide temperature range. A properly designed circuit using alnico magnets will have a stable flux output during temperature fluctuations.

Although Alnico displays considerable residual induction it conversely exhibits among the lowest coercivity of any magnetic material. A consequence of low coercivity is sensitivity to demagnetizing effects caused by external magnetic fields, shock, and application temperatures. For critical applications, Alnico magnets can be magnetically stabilized to minimize these effects. Alnico magnets can be partially demagnetized if like poles of magnets are brought together. Placing individual magnets in contact with ferrous materials can also partially demagnetize them. Care must be taken in handling magnetized magnets. Typical open circuit Alnico 5 applications require a long magnetic length to pole surface ratio (usually 4:1 or greater) to ensure good magnetic performance. Check with Adams' technical staff to confirm best ratio for your application.





Added value services

Surface Protection: Coating Rare Earth Magnets

Corrosion resistant coatings can be applied to magnets directly after production and cleaning, and prior to magnetization. Standard coatings include nickel, epoxy and aluminum spray coatings. Surface protection may also be applied to magnets in the finished product system. Contact Adams applications support to help you select the best coating for your application.

Magnet Fastening

The majority of magnets are assembled into magnet systems using adhesives. Such construction may require the adhesion of multiple magnets to one another or to support parts. But before doing so, several factors must be considered to assure the effective performance of the magnet, the adhesive and the resulting bond. These include the chemical and physical properties of the magnets and the surfaces to which they are affixed. Detailed coverage of all these factors, along with some adhesives to try, is covered in our white paper Gluing Magnets, which can be downloaded from our website.

Value Added Assemblies

At Adams we look beyond the magnet to the application, to drive cost savings opportunities for our customers. Our team of technical experts is ready to participate in KAIZEN events, LEAN activities, and other Value Analysis/Value Engineering (VAVE) programs. With foreign and domestic assembly operations, and years of in-depth magnet experience, you can rely on Adams Magnetic Products to be your partner in all things magnetic.

From the simple to the complex, let our team of experts evaluate your assembly process to see if outsourcing is a viable option. We offer assemblies of ferrous and non-ferrous materials, large to small and everything in between. From simple round base, channel, and sandwich assemblies, to highly technical electronic and electromechanical designs, Adams has the knowledge, expertise and procedures in place to meet even the most stringent of quality standards.



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