



**Cast ALNICO  
Permanent Magnets**



# ALNICO PERMANENT MAGNETS

## Introduction

For over 50 years an acknowledged leader in the field of permanent magnets, Arnold Engineering continues its tradition of superior quality and value with the full line of Alnico products presented in this catalog.

One of the oldest members of our magnet family, Alnico remains the workhorse of the permanent magnet industry and can be relied upon to deliver impressive flux density at an economical price. Alnico also boasts the lowest temperature coefficient of any commercial magnet material (.02% per degree centigrade) allowing for excellent stability over a wide temperature range.

Alnico has experienced renewed interest in recent years in such temperature-sensitive applications as hall-effect and MR-based automotive and electronic sensors, in addition to the traditional magnetron, TWT amplifiers, actuators, motors and instruments applications that have long relied upon Alnico.

Call Arnold Engineering today for applications engineering assistance, samples or pricing.

## General characteristics

Alnico permanent magnets form a family of alloys whose major constituents are iron, aluminum, nickel and cobalt, though other elements (e.g., copper and titanium) may be included in minor amounts. Grades of Alnico vary in cobalt content, which ranges from zero (Alnico 3) to 40% (Alnico 8).

Lower grades (2, 3 and 4) are unoriented—magnetic properties are isotropic and equal in all directions. Their magnetic output is relatively low. Anisotropic grades (Alnico 5, 6, 8 and 9) are designed to produce high magnetic output in a specified direction. Orientation is achieved during heat treatment, by cooling the product from a temperature of about 2000° F (1093° C) at a controlled rate, within a magnetic field which conforms to the preferred direction of magnetization.

Alnico 5, the most widely used grade, can usually be depended upon to deliver energy to a magnetic circuit more economically than

any of the other Alnico grades. Alnico 8 possesses the highest coercive force of all Alnico grades, as well as excellent energy per unit volume and a low temperature coefficient. It is recommended for applications exposed to strong demagnetizing fields, or where space considerations dictate a short magnetic length.

ArKomax® 800 and Alnico 9 are premium grades of Alnico 5 and 8, respectively. The superior magnetic output of these grades is produced by crystal orientation from the molten state in the desired direction of magnetization.

## Manufacturing processes

Alnico magnets can be produced in a wide variety of shapes and sizes, ranging in weight from less than one ounce (28 grams) to over 80 pounds (36 kilograms).

The majority of magnets are cast in sand molds, following melting in a high-frequency induction furnace.

Magnets weighing less than an ounce (28 grams) may be produced by sintering. In this process, the desired mix of metal powders is pressed to shape and size in a die, and then sintered at a temperature of approximately 2300° F (1260° C) in a hydrogen atmosphere. The sintering process is well suited to large volume production and results in parts which are structurally stronger than cast magnets. Relatively close tolerances can be achieved without grinding.

## Stock items and tooling

A variety of shapes and sizes in selected grades of Alnico have become standard over the years. A partial list of these parts is provided later in this manual. Arnold maintains the required tooling for these parts and in many cases has quantities of them in stock, ready for immediate shipment.

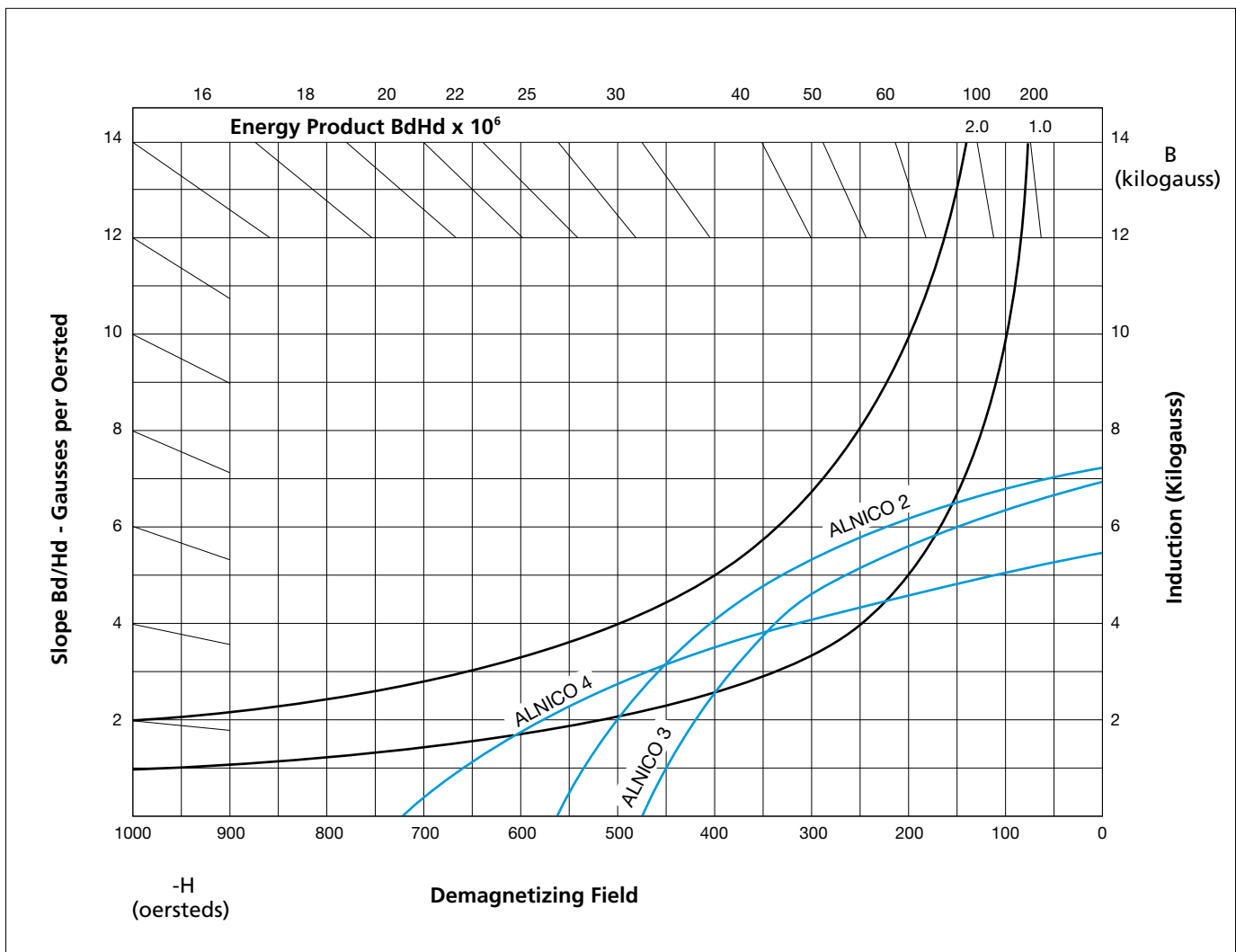
The use of stock items, especially on small quantity orders, can result in substantial savings to the user because the need for costly production tooling is eliminated.

# Alnico 2, 3, 4

## Magnetic and Physical Properties (Typical Values)

	Max. Energy Product $B_d \times H_d$		Residual Induction $B_r$		Required Magnetizing Field		Coersive Force $H_c$		Recoil Permeability		Permeance Coefficient $B/H$ @ $(B_d H_d)$ Max.		Induction at Maximum Energy Product	
	MGOe	KJ/m <sup>3</sup>	G	mT	Oe	KA/m	Oe	KA/m	G/Oe	10 <sup>-3</sup> Tm/KA	G/Oe	10 <sup>-3</sup> Tm/KA	G	mT
Alnico 2	1.60	12.7	7200	720	2000	160	560	45	6.2	7.8	12.0	15.0	4400	440
Alnico 3	1.40	11.1	7000	700	2000	160	475	38	5.1	6.4	14.0	17.5	4450	445
Alnico 4	1.35	10.7	5500	550	3000	240	720	57	4.1	5.2	7.0	9.0	3100	310

## Typical Demagnetization Curves



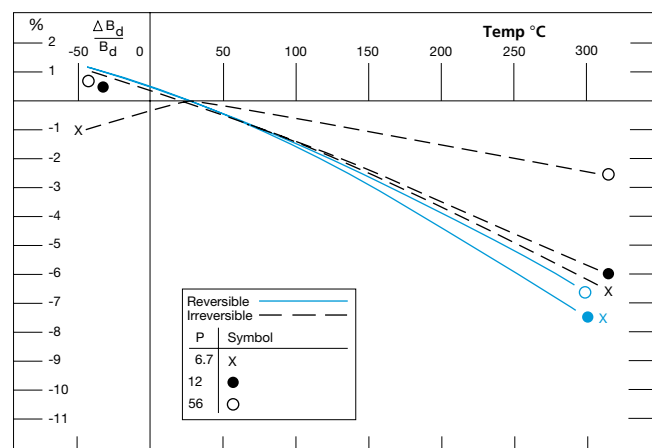
# Alnico 2, 3, 4

## Magnetic and Physical Properties (Typical Values)

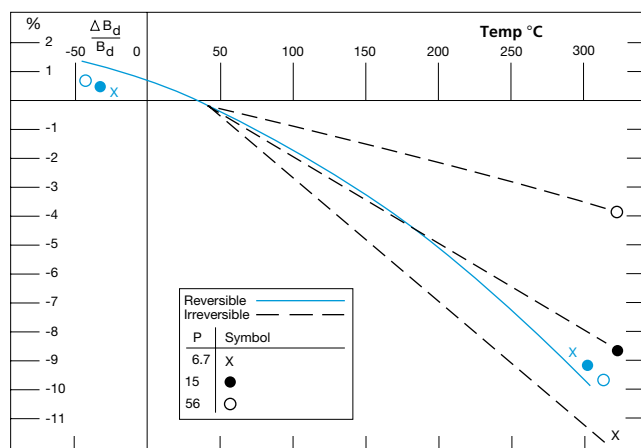
	Density		Electrical Resistivity	Tensile Strength		Transverse Modulus of Rupture		Coefficient of Thermal Expansion	Hardness Rockwell C
	lb./in. <sup>3</sup>	gr/cm <sup>3</sup>	25° C (μΩ cm)	PSI	N/mm <sup>2</sup>	PSI	N/mm <sup>2</sup>	per ° C x 10 <sup>6</sup>	
<b>Alnico 2</b>	0.257	7.11	65	3000	20	7200	50	12.4	45
<b>Alnico 3</b>	0.249	6.89	60	12000	80	23000	160	13.0	45
<b>Alnico 4</b>	0.253	7.00	65	9000	60	24000	165	13.1	45

## Temperature Effects

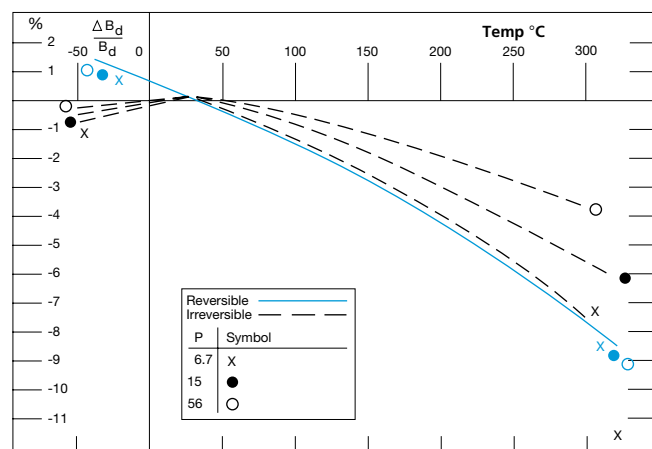
**Alnico 2**



**Alnico 3**



**Alnico 4**

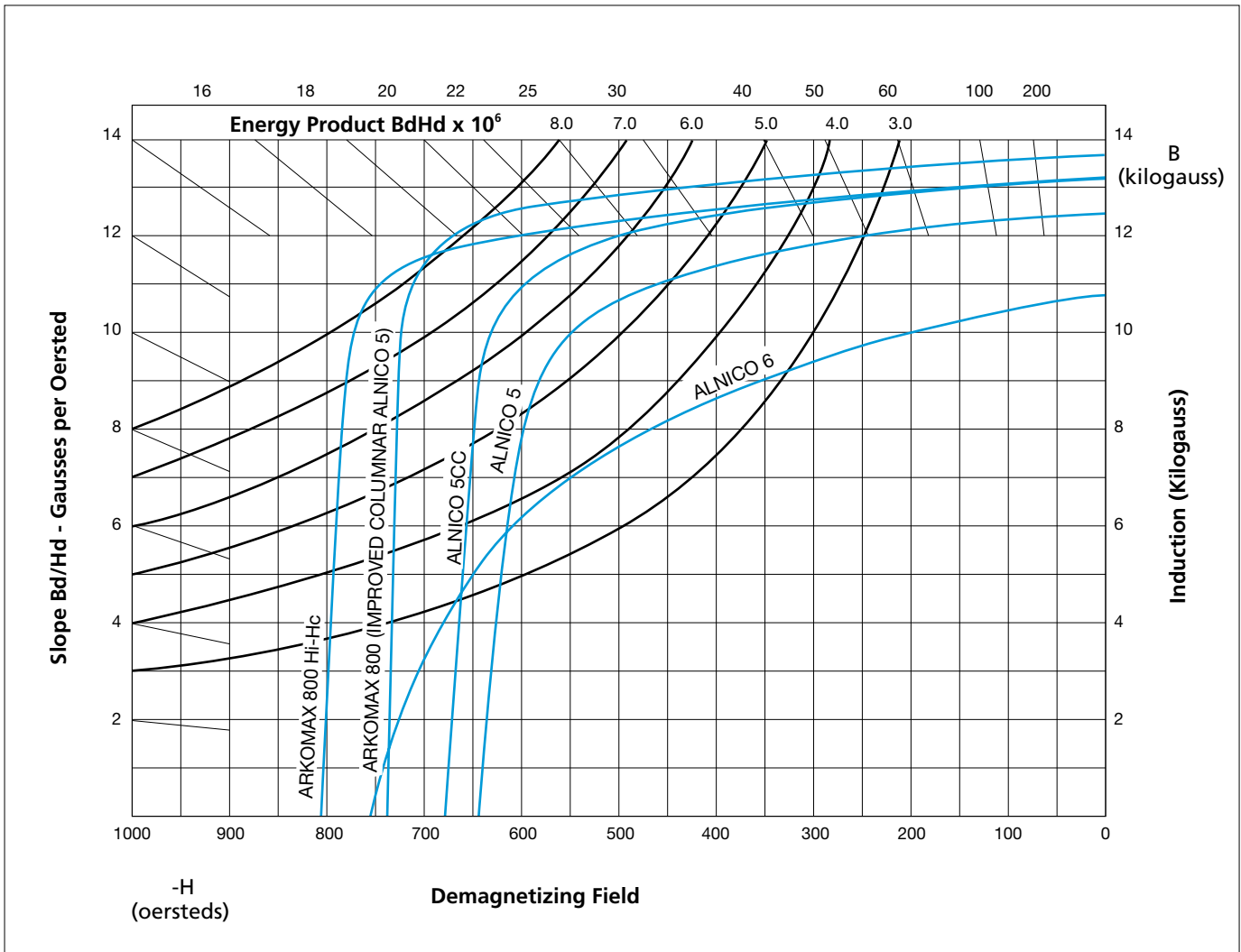


# Alnico 5, 5cc, 6 & ArKomax® 800, 800 Hi-Hc

## Magnetic and Physical Properties (Typical Values)

	Max. Energy Product $B_d \times H_d$		Residual Induction $B_r$		Required Magnetizing Field		Coersive Force $H_c$		Recoil Permeability		Permeance Coefficient $B/H$ @ $(B_d H_d)$ Max.		Induction at Maximum Energy Product	
	MGOe	KJ/m <sup>3</sup>	G	mT	Oe	KA/m	Oe	KA/m	G/Oe	10 <sup>-3</sup> Tm/KA	G/Oe	10 <sup>-3</sup> Tm/KA	G	mT
Alnico 5	5.50	43.8	12500	1250	3000	240	640	51	3.7	4.6	19.0	24.0	10000	1000
Alnico 5cc	6.50	51.7	13200	1320	3000	240	675	54	2.4	3.0	18.5	23.0	11000	1100
Alnico 6	3.90	31.0	10800	1080	3000	240	750	60	5.6	7.0	14.0	17.5	7400	740
ArKomax® 800	8.10	64.5	13700	1370	3000	240	740	59	2.0	2.5	18.0	22.5	12000	1200
ArKomax® 800 Hi-Hc	8.10	64.5	13200	1320	3000	240	810	64	2.0	2.5	15.5	19.5	11200	1120

## Typical Demagnetization Curves



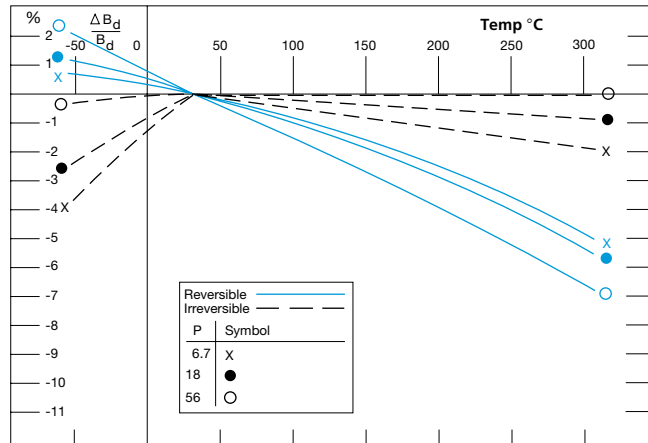
# Alnico 5, 5cc, 6 & ArKomag® 800, 800 Hi-Hc

## Magnetic and Physical Properties (Typical Values)

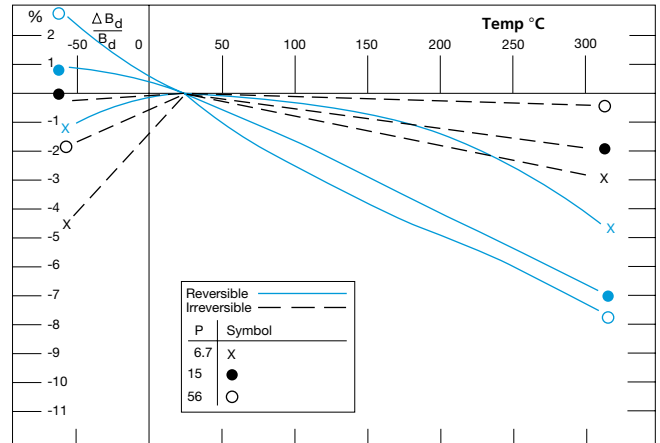
	Density		Electrical Resistivity	Tensile Strength		Transverse Modulus of Rupture		Coefficient of Thermal Expansion	Hardness Rockwell C
	lb./in. <sup>3</sup>	gr/cm <sup>3</sup>	25° C (μΩ cm)	PSI	N/mm <sup>2</sup>	PSI	N/mm <sup>2</sup>	per ° C x 10 <sup>6</sup>	
<b>Alnico 5</b>	0.264	7.31	47	5500	40	10000	70	11.5	50
<b>Alnico 5cc</b>	0.264	7.31	47	5200	35	9000	60	11.5	50
<b>Alnico 6</b>	0.265	7.34	50	23000	160	45000	310	11.4	50
<b>ArKomag® 800</b>	0.264	7.31	47	5000	35	8000	55	11.5	50
<b>ArKomag® 800 Hi-Hc</b>	0.264	7.31	47	5000	35	8000	55	11.5	50

## Temperature Effects

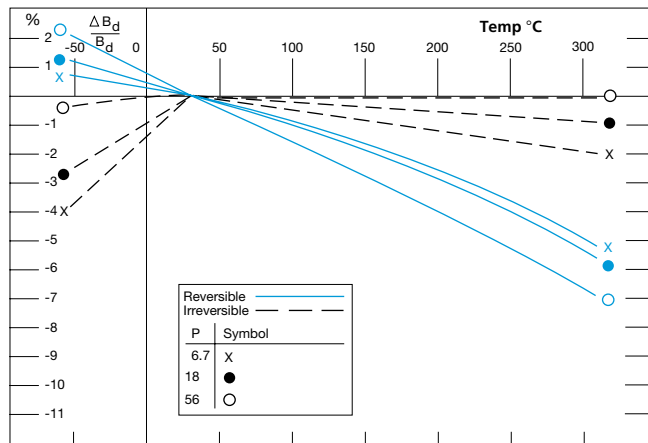
Alnico 5 Alnico 5cc



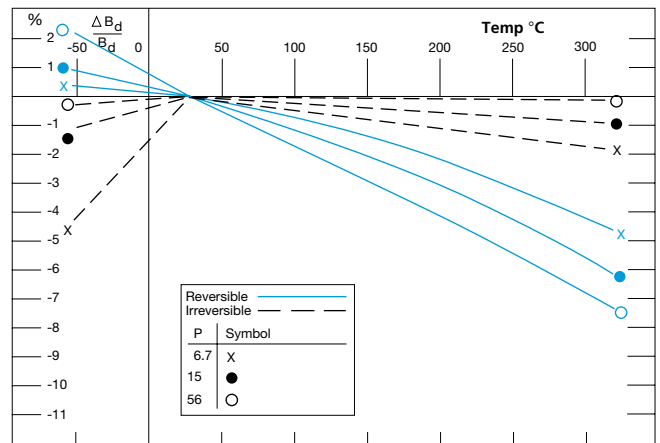
Alnico 6



ArKomag® 800



ArKomag® 800 Hi-Hc

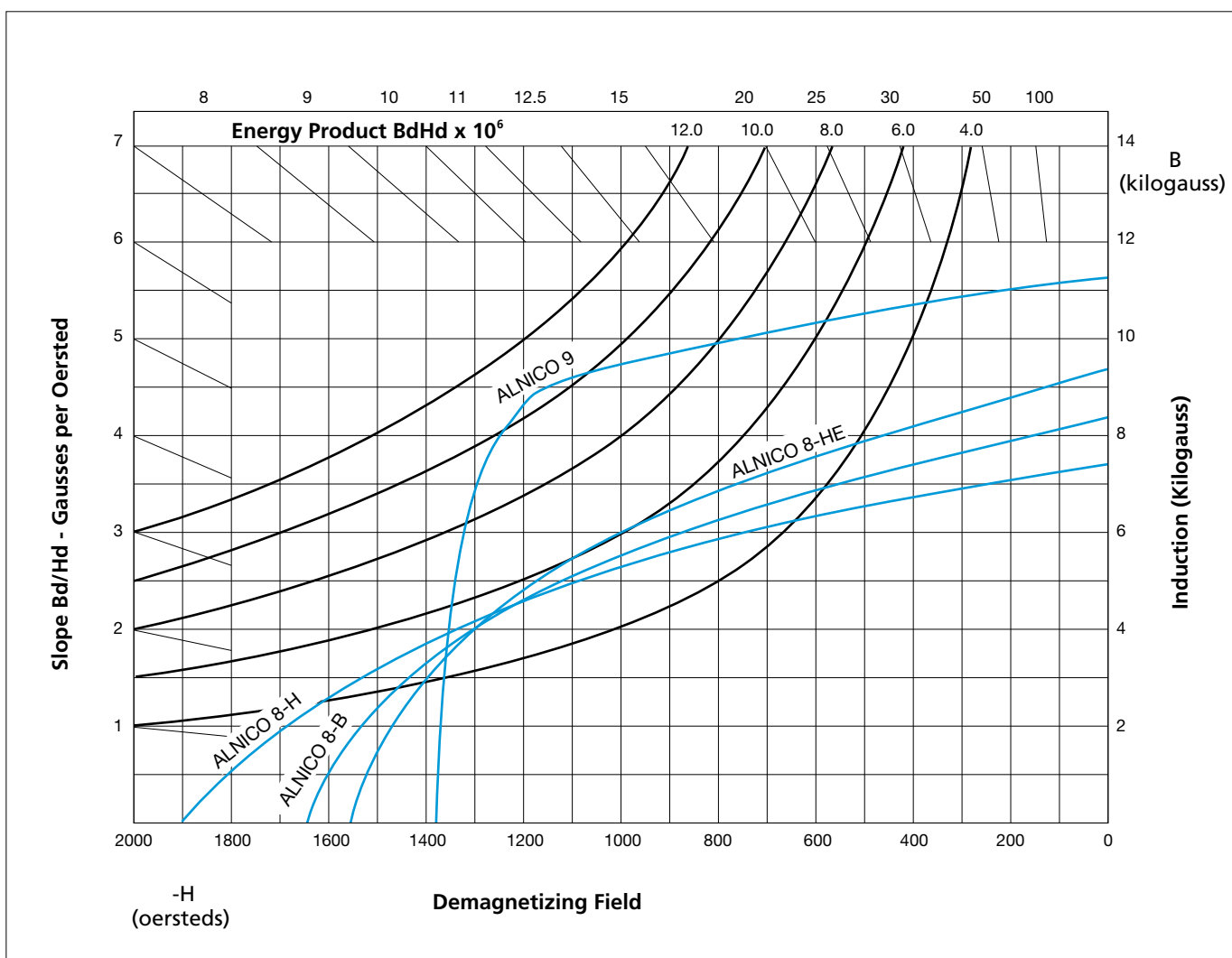


# Alnico 8B, 8HE, 8H, 9

## Magnetic and Physical Properties (Typical Values)

	Max. Energy Product $B_d \times H_d$		Residual Induction $B_r$		Required Magnetizing Field		Coersive Force $H_c$		Recoil Permeability		Permeance Coefficient $B/H$ @ $(B_d H_d)$ Max.		Induction at Maximum Energy Product	
	MGOe	KJ/m <sup>3</sup>	G	mT	Oe	KA/m	Oe	KA/m	G/Oe	10 <sup>-3</sup> Tm/KA	G/Oe	10 <sup>-3</sup> Tm/KA	G	mT
Alnico 8B	5.50	43.8	8300	830	6000	480	1650	131	2.0	2.5	4.5	5.5	5000	500
Alnico 8HE	6.00	47.7	9300	930	6000	480	1550	123	2.0	2.5	5.5	7.0	5750	575
Alnico 8H	5.50	43.8	7400	740	6000	480	1900	151	2.0	2.5	3.5	4.5	4400	440
Alnico 9	10.50	83.6	11200	1120	6000	480	1375	109	1.3	1.6	7.5	9.5	8900	890

## Typical Demagnetization Curves



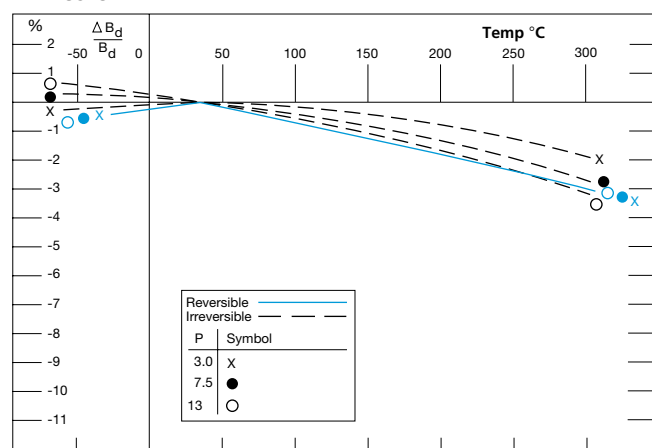
# Alnico 8B, 8HE, 8H, 9

## Magnetic and Physical Properties (Typical Values)

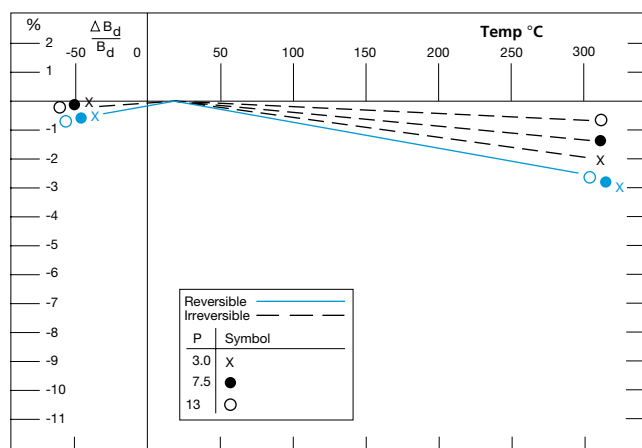
	Density		Electrical Resistivity	Tensile Strength		Transverse Modulus of Rupture		Coefficient of Thermal Expansion	Hardness Rockwell C
	lb./in. <sup>3</sup>	gr/cm <sup>3</sup>	25° C (μΩ cm)	PSI	N/mm <sup>2</sup>	PSI	N/mm <sup>2</sup>	per ° C x 10 <sup>6</sup>	
<b>Alnico 8B</b>	0.262	7.25	50	9000	60	30000	205	11.0	56
<b>Alnico 8HE</b>	0.262	7.25	50	10000	70	30000	205	11.0	56
<b>Alnico 8H</b>	0.262	7.25	50	8500	60	30000	205	11.0	56
<b>Alnico 9</b>	0.262	7.25	50	7000	50	8000	55	11.0	56

## Temperature Effects

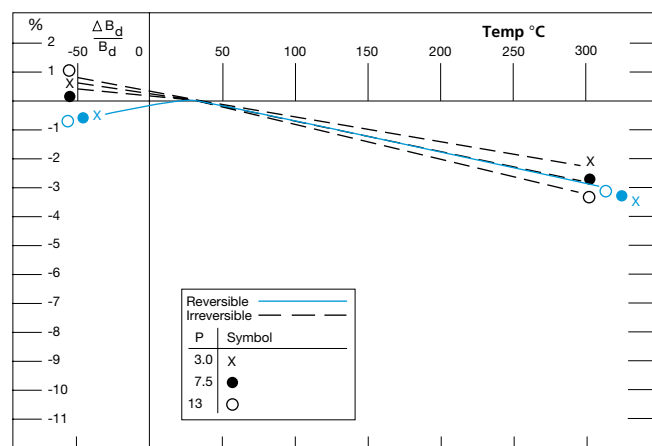
**Alnico 8B**



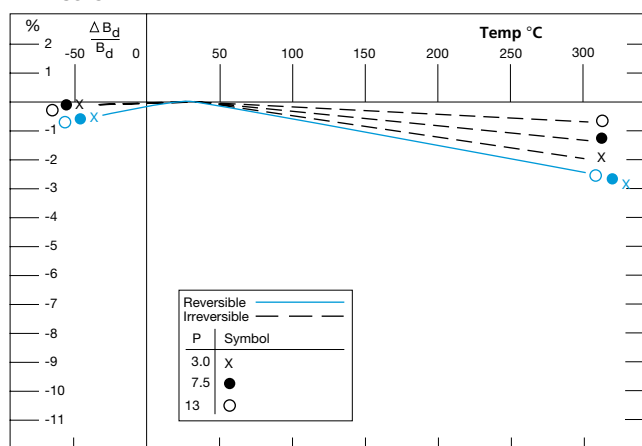
**Alnico 8HE**



**Alnico 8H**



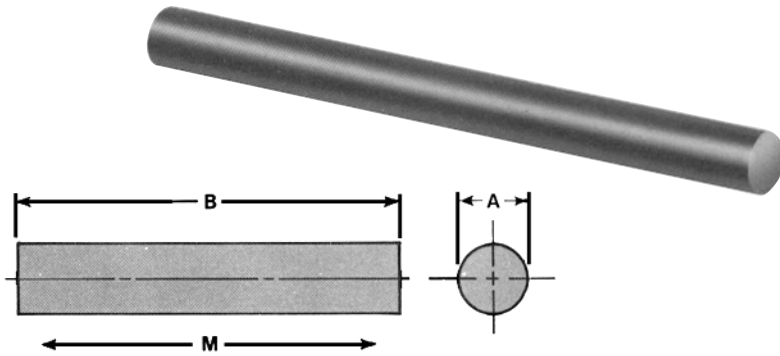
**Alnico 9**





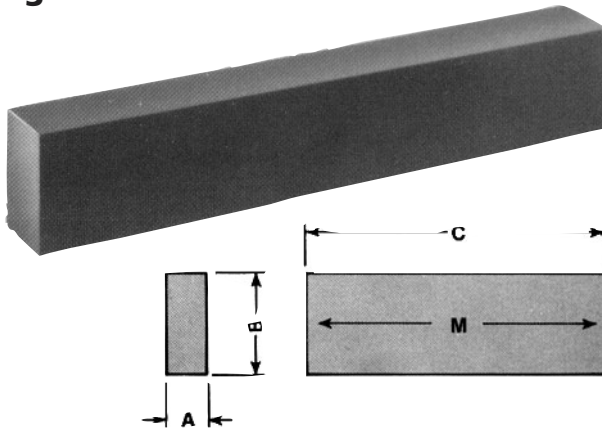
# Cast Alnico 5 Bar & Cylinder Magnets

## Round Bars



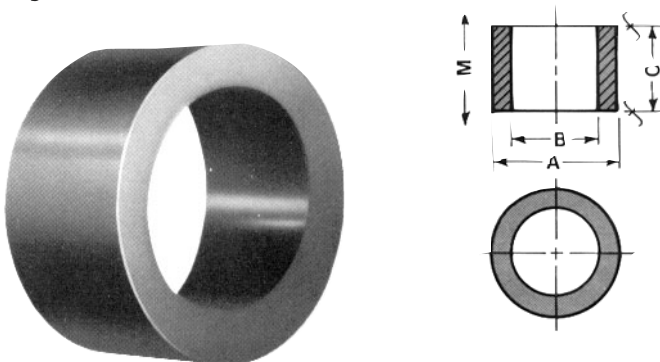
CAT. NO.	WT.		DIMENSIONS			
	LBS.	GRAMS	A		B	
			IN.	MM	IN.	MM
5A1	.013	5.90	.125	3.18	4	101.60
5A2	.037	16.80	.188	4.78	5	127.00
5A3	.081	36.77	.250	6.35	6	152.40
5A4	.151	68.55	.300	7.62	8	203.20
5A5	.244	110.78	.375	9.53	8	203.20
5A6	.416	188.86	.500	12.70	8	203.20
5A7	.529	240.17	.563	14.30	8	203.20
5A8	.799	362.75	.689	17.50	8	203.20
5A9	.948	430.39	.759	19.28	8	203.20
5A10	1.175	533.45	.840	21.34	8	203.20
5A11	1.389	630.61	.908	23.06	8	203.20
5A12	1.664	755.46	.998	25.35	8	203.20

## Rectangular Bars



CAT. NO.	WT.		DIMENSIONS					
	LBS.	GRAMS	A		B		C	
			IN.	MM	IN.	MM	IN.	MM
5B23	.033	14.98	.125	3.18	.250	6.35	4	101.60
5B24	.050	22.70	.125	3.18	.375	9.53	4	101.60
5B25	.066	29.96	.125	3.18	.500	12.70	4	101.60
5B26	.075	34.05	.187	4.75	.375	9.53	4	101.60
5B27	.100	45.40	.250	6.35	.250	6.35	6	152.40
5B28	.200	90.80	.250	6.35	.500	12.70	6	152.40
5B29	.300	136.20	.250	6.35	.750	19.05	6	152.40
5B30	.225	102.15	.375	9.53	.375	9.53	6	152.40
5B31	.398	180.69	.500	12.70	.500	12.70	6	152.40
5B32	.596	270.58	.500	12.70	.750	19.05	6	152.40
5B33	.796	361.38	.500	12.70	1.000	25.40	6	152.40
5B34	.895	406.33	.750	19.05	.750	19.05	6	152.40
5B35	1.590	721.86	1.000	25.40	1.000	25.40	6	152.40
5B36	3.578	1624.41	1.500	38.10	1.500	38.10	6	152.40
5B37	4.869	2210.53	1.750	44.45	1.750	44.45	6	152.40

## Cylinders

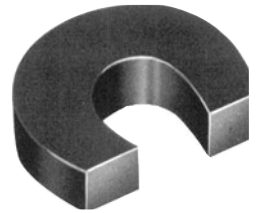
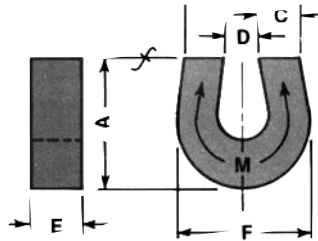


CAT. NO.	WT.		DIMENSIONS					
	LBS.	GRAMS	A		B		C	
			IN.	MM	IN.	MM	IN.	MM
5G130	.050	22.70	1.000	25.40	.750	19.05	.500	12.70
5G131	.100	45.40	.875	22.23	.375	9.53	.750	19.05
5G132	.150	68.10	1.500	38.10	1.125	3.18	.750	19.05
5G133	.365	165.71	2.000	50.80	1.500	38.10	1.000	25.40
5G134	.712	323.25	2.500	63.50	1.875	22.23	1.250	31.75
5G135	.883	400.88	2.000	50.80	.375	9.53	1.100	27.94
5G136	1.229	557.97	3.000	76.20	2.250	57.15	1.500	38.10
5G137	11.707	5314.98	5.000	127.00	2.500	63.50	2.950	74.93

# Cast Alnico 5 Horseshoe & Other Curved-Field Magnets

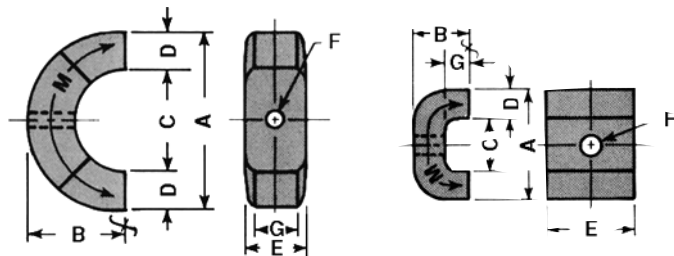
## Horseshoe Magnets

CAT. NO.	WT.		DIMENSIONS										HOLDING FORCE			
			A		B		C		D		E				F	
			IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM			IN.	MM
5K207	.063	28.60	1.218	30.94	.750	19.05	.187	4.75	.375	9.53	.250	6.35	1.250	31.75	6	2.72
5K208	.138	62.65	1.250	31.75	1.250	31.75	.437	11.10	.375	9.53	.437	11.10	1.500	38.10	15	6.80
5K209	.283	128.48	1.562	39.68	1.625	41.28	.625	15.88	.375	9.53	.625	15.88	1.812	46.03	29	13.15
5K210	.292	132.57	1.375	34.93	2.000	50.80	.625	15.88	.750	19.05	.609	15.47	2.000	50.80	22	9.98
5K211	.443	201.12	1.875	47.63	1.875	47.63	.625	15.88	.625	15.88	.675	17.15	1.875	47.63	33	14.97
5K212	.440	199.76	1.594	40.49	1.031	26.19	.375	9.53	.218	5.54	1.031	26.19	1.625	41.28	45	20.41
5K213	.540	245.16	1.437	36.50	2.375	60.33	.750	19.05	.875	22.23	.937	23.80	2.375	60.33	35	15.88
5K214	.922	418.59	2.500	63.50	2.500	63.50	.750	19.05	1.000	25.40	.750	19.05	3.000	76.20	60	27.22
5K215	2.370	1075.98	3.312	84.13	3.250	82.55	1.000	25.40	1.250	31.75	1.000	25.40	4.000	101.60	105	47.63
5K216	4.670	2120.18	4.125	104.78	4.000	101.60	1.250	31.75	1.500	38.10	1.250	31.75	5.000	127.00	230	104.33
5K217	7.480	3395.92	3.437	87.30	2.750	69.85	1.000	25.40	.750	19.05	3.000	76.20	4.000	101.60	210	95.26



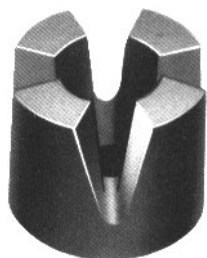
## Curved-Field Magnets

CAT. NO.	WT.		DIMENSIONS										HOLDING FORCE					
			A		B		C		D		E				F		G	
			IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM			IN.	MM	IN.	MM
5K251	.710	322.34	3.000	76.20	1.687	42.85	1.750	44.45	.625	15.88	1.000	25.40	.187	4.75	.750	19.05	50	22.68
5K229	.285	129.39	1.625	41.28	.843	21.41	.812	20.63	.406	10.31	1.125	28.58	.250	6.35	.375	9.53	20	9.07



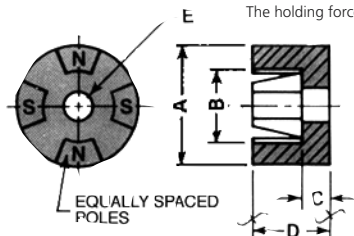
# Cast Alnico 5 Holding & Separator Magnets

## Holding Magnets



CAT. NO.	WT.		NO. OF POLES	DIMENSIONS										HOLDING FORCE		
	LBS.	GRAMS		A		B		C		D		E		LBS.	KGS.	
			IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM		
5H148	.042	19.07	2	.750	19.05	.375	9.53	.250	6.35	.500	12.70	.218	5.54	4	1.81	
5H153	.052	23.61	2	.687	17.45	.344	8.74	.344	8.74	.688	17.48	.187	4.75	5	2.27	
5H149	.117	53.12	2	.875	22.23	.375	9.53	.500	12.70	1.000	25.40	.250	6.35	9	4.08	
5H154	.101	45.85	2	.875	22.23	.406	10.31	.437	11.10	.875	22.23	.250	6.35	9	4.08	
5H155	.172	78.09	2	1.250	31.75	.500	12.70	.312	7.93	.750	19.05	.187	4.75	18	8.16	
5H150	.344	156.18	2	1.250	31.75	.531	13.49	.687	17.45	1.375	34.93	.312	7.93	23	10.43	
5H151	.630	286.02	2	1.500	38.10	.625	15.88	.875	22.23	1.750	44.45	.375	9.53	39	17.69	
5H152	1.440	653.76	2	2.125	53.98	.968	24.59	.938	23.83	2.062	52.38	.375	9.53	82	37.20	
5H166	.102	46.31	4	1.000	25.40	.500	12.70	.250	6.35	.750	19.05	.250	6.35	16	7.26	
5H177	.163	74.00	6	1.250	31.75	.625	15.88	.250	6.35	.750	19.05	.250	6.35	25	11.34	
5H178	.270	122.58	6	1.500	38.10	.750	19.05	.312	7.93	.875	22.23	.375	9.53	30	13.61	

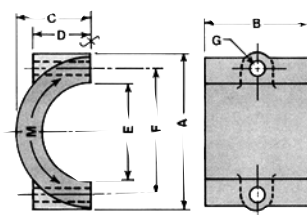
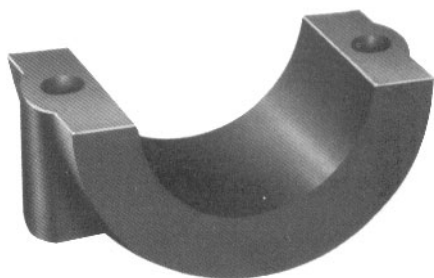
The holding force values listed are typical under ideal conditions; i.e. ground pole faces in direct contact with a smooth steel surface.



## Separator Magnets

CAT. NO.	WT.		DIMENSIONS										HOLDING FORCE					
	LBS.	GRAMS	A		B		C		D		E		F		G		LBS.	KGS.
			IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM		
5J189	1.50	681.00	3.500	88.90	2.375	60.33	1.687	42.85	1.250	31.75	2.125	53.98	2.750	69.85	.312	7.93	63	28.58
5J196*	1.45	658.30	3.500	88.90	2.375	60.33	1.687	42.85	1.312	33.33	2.125	53.98	2.812	71.43	.375	9.53	63	28.58
5J191	2.35	1066.90	4.437	112.70	2.000	50.80	2.187	55.55	1.687	42.85	2.750	69.85	3.625	92.08	.312	7.93	104	47.17
5J192	2.99	1357.46	3.750	95.25	2.375	60.33	1.625	41.28	1.625	41.28	1.750	44.45	2.750	69.85	.312	7.93	110	49.90
5J190	2.10	953.40	3.875	98.43	2.688	68.28	1.875	47.63	1.438	36.53	2.312	58.73	3.063	77.80	.312	7.93	116	52.62
5J193	4.73	2147.42	5.000	127.00	2.375	60.33	2.500	63.50	2.062	52.38	2.500	63.50	3.625	92.08	.312	7.93	160	12.58
5J194	7.25	3414.08	6.437	163.50	3.250	82.55	3.125	79.38	2.062	52.38	4.000	101.60	5.625	142.88	.312	7.93	240	108.86
5J195	14.80	6719.20	8.125	206.38	4.000	101.60	4.062	103.18	3.500	88.90	5.250	133.35	6.500	165.10	.437	11.10	460	208.66

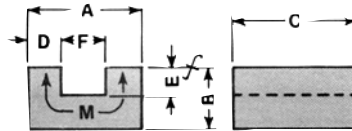
\*Catalog No. 5J196 has slots at the G dimensions in place of cored holes.



# Cast Alnico 5 Channel, Washer & Rotor Magnets

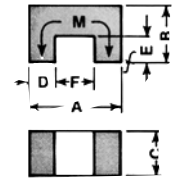
CAT. NO.	WT.		DIMENSIONS												HOLDING FORCE	
	LBS.	GRAMS	A		B		C		D		E		F		LBS.	KGS.
			IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM		
5C48	.210	95.34	.500	12.70	.312	7.93	5	127.00	.156	3.96	.125	3.18	.187	4.75	11	4.99
5C49	.322	146.19	.625	15.88	.375	9.53	5	127.00	.187	4.75	.125	3.18	.250	6.35	16	7.26
5C50	.522	236.99	.750	19.05	.500	12.70	6	152.40	.250	6.35	.187	4.75	.250	6.35	34	15.42
5C51	.845	383.63	1.000	25.40	.625	15.88	6	152.40	.312	7.93	.250	6.35	.375	9.53	41	18.60
5C52	1.317	597.92	1.250	31.75	.750	19.05	6	152.40	.406	10.31	.250	6.35	.437	11.10	64	29.03
5C53	1.839	834.91	1.500	38.10	.875	22.23	6	152.40	.500	12.70	.312	7.93	.500	12.70	60	27.22

The lengths listed for bar magnets are maximum as cast lengths. Shorter lengths may be cut and ground to size. The holding force values listed are typical under ideal conditions; i.e. ground pole faces in direct contact with a smooth steel surface.

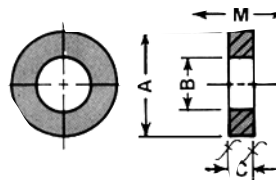


## Channel Bars

CAT. NO.	WT.		DIMENSIONS												HOLDING FORCE	
	LBS.	GRAMS	A		B		C		D		E		F		LBS.	KGS.
			IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM		
5K240	.007	3.18	.500	12.70	.312	7.93	.187	4.75	.156	3.96	.125	3.18	.187	4.75	.5	.23
5K241	.011	4.99	.625	15.88	.375	9.53	.187	4.75	.187	4.75	.125	3.18	.250	6.35	.87	.39
5K242	.021	9.53	.750	19.05	.500	12.70	.250	6.35	.250	6.35	.187	4.75	.250	6.35	2.00	.91
5K243	.044	19.98	1.000	25.40	.625	15.88	.312	7.93	.312	7.93	.250	6.36	.375	9.53	6.00	2.72
5K244	.089	40.41	1.250	31.75	.750	19.05	.406	10.31	.406	10.31	.250	6.35	.437	11.10	10.00	4.54
5K245	.153	69.46	1.500	38.10	.875	22.23	.500	12.70	.500	12.70	.312	7.93	.500	12.70	12.00	5.44
5K246	.300	136.20	1.750	44.45	1.062	26.98	.750	19.05	.500	12.70	.500	12.70	.750	19.05	25.00	11.34



CAT. NO.	WT.		DIMENSIONS					
	LBS.	GRAMS	A		B	C ± .005		
			IN.	MM	IN.	MM	IN.	MM
5F117	.020	9.08	1.000	25.40	.500	12.70	.125	3.18
5F118	.038	17.25	1.250	31.75	.625	15.88	.156	3.96
5F119	.067	30.42	1.500	38.10	.750	19.05	.187	4.75

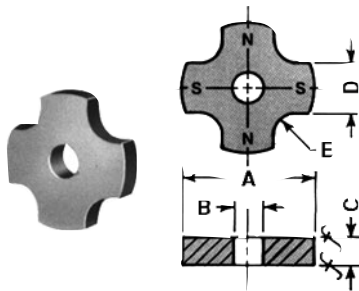


## Washers

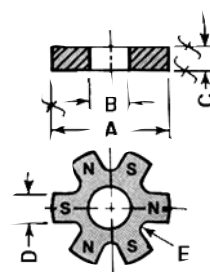
CAT. NO.	WT.		NO. OF POLES	DIMENSIONS											
	LBS.	GRAMS		A		B		C		D		E			
				IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM
5E84	.051	23.13	4	1.200	30.48	.281	7.14	.210	5.33	.500	12.70	.187	R.TYP.	4.75	
5E95	.067	30.39	6	1.156	29.36	.360	9.14	.330	8.38	.312	7.93	.062	R.TYP.	1.58	
5E106	.218	98.88	8	1.860	47.24	.375	9.53	.385	9.78	.312	7.93	.203	R.TYP.	5.16	

## Rotors

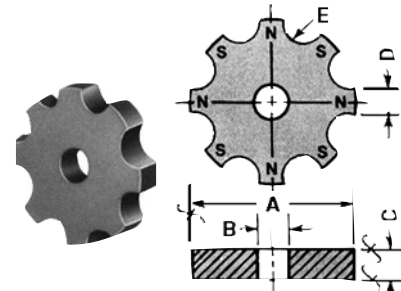
4 POLE ROTOR  
CAT. NO. 5E84



6 POLE ROTOR  
CAT. NO. 5E95



8 POLE ROTOR  
CAT. NO. 5E106

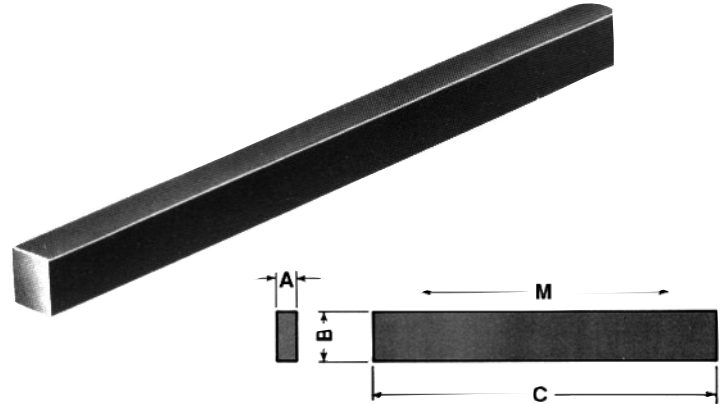


# Cast Alnico 8 Bars, Rods & Rings

The high coercive force and relatively high energy product of Alnico 8 offer distinct advantages over other permanent magnet materials in applications where a magnet must withstand strong demagnetizing fields and the space factor is limited.

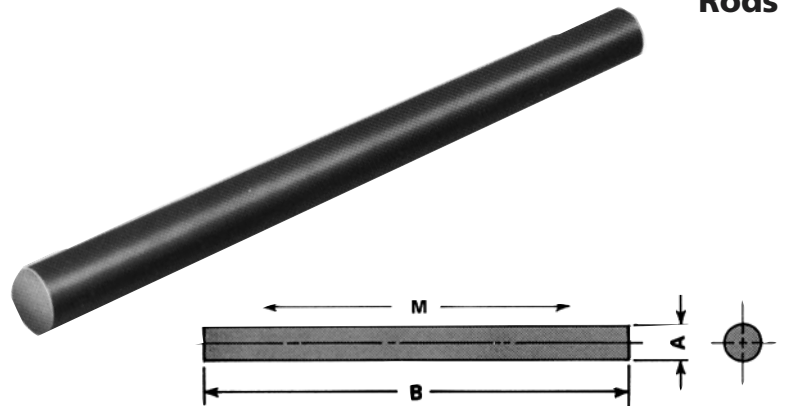
CAT. NO.	WT.		DIMENSIONS					
	LBS.	GRAMS	A		B		C	
			IN.	MM	IN.	MM	IN.	MM
8B472	.066	29.96	.250	6.35	.250	6.35	4	101.60
8B473	.133	60.38	.250	6.35	.500	12.70	4	101.60
8B474	.265	120.31	.500	12.70	.500	12.70	4	101.60
8B475	.398	180.69	.500	12.70	.750	19.05	4	101.60
8B476	.414	187.96	.625	15.88	.625	15.88	4	101.60
8B477	.596	270.58	.750	19.05	.750	19.05	4	101.60
8B478	.795	360.93	.750	19.05	1.000	25.40	4	101.60
8B479	1.060	481.24	1.000	25.40	1.000	25.40	4	101.60

## Bars



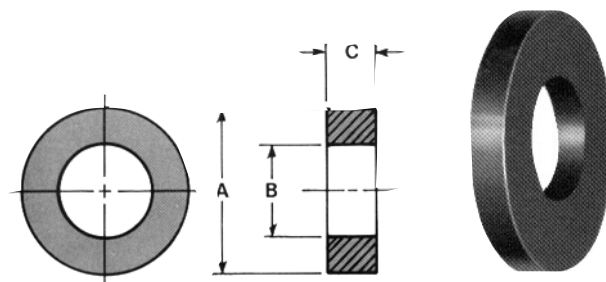
CAT. NO.	WT.		DIMENSIONS			
	LBS.	GRAMS	A		B	
			IN.	MM	IN.	MM
8A490	.052	23.61	.250	6.35	4	101.60
8A491	.117	53.12	.375	9.53	4	101.60
8A492	.208	94.43	.500	12.70	4	101.60
8A493	.325	147.55	.625	15.88	4	101.60
8A494	.468	212.47	.750	19.05	4	101.60
8A495	.832	377.73	1.000	25.40	4	101.60

## Rods



CAT. NO.	WT.		DIMENSIONS					
	LBS.	GRAMS	A		B		C	
			IN.	MM	IN.	MM	IN.	MM
8F506	.006	2.72	.520	13.21	.250	6.35	.140	3.56
8F507	.015	6.18	.780	19.81	.375	9.53	.150	3.81
8F508	.034	15.44	.910	23.11	.475	12.07	.270	6.86
8F509	.048	21.79	1.040	26.42	.480	12.19	.270	6.86
8F510	.048	21.79	1.300	33.02	.570	14.48	.170	4.32
8F511	.161	73.09	1.940	49.28	.950	24.13	.270	6.86

## Rings



## Standard Alnico Tolerances

### Cast Alnico

Dimension		Tolerance	
Up to 1"	Up to 25.4 mm	±1/64"	.40 mm
1" to 3"	25.4 to 76.2 mm	±1/32"	.81 mm
3" to 5"	76.2 to 127.0 mm	±3/64"	1.19 mm
5" to 7"	127.0 to 177.8 mm	±1/16"	1.59 mm
7" to 9"	177.8 to 228.6 mm	±5/64"	1.98 mm

### Sintered Alnico

Dimension		Tolerance	
Up to .125"	Up to 3.18 mm	±.005"	.13 mm
.126" to .625"	3.20 to 15.88 mm	±.010"	.25 mm
.626" to 1.250"	15.90 to 31.75 mm	±.015"	.38 mm

### Concentricity

Concentricity between inside and outside as cast diameters: .031" (.79 mm) F.I.R. when hole diameter is greater than hole length. 1.5 X total O.D. tolerance F.I.R. when hole diameter is less than hole length.

### Squareness

Perpendicularity between one ground surface and an "as cast" surface is ±1-1/2 degrees.

### Finish

Permanent magnet materials can be finish ground when dimensional tolerances closer than the initial manufacturing tolerances are required.

Magnets with surfaces marked "f" will be furnished with these surfaces finish ground. All other surfaces will be "as cast" or "as sintered."

### Ground Surfaces

Normal tolerance between ground surface is ±.005" (.13 mm).

Perpendicularity between two ground surfaces is ±1/2 degree.

### Magnetization

Unless otherwise specified, stock magnets will be furnished in a magnetized condition. The direction of magnetization is designated by ← M →. On some parts, polarity is shown as N-S. Caution: Care should be taken in handling magnetized magnets. Magnets should not be placed in repelling positions or exposed to stray ac fields as these conditions will affect their performance.

## Design Considerations

Because Alnico magnets are coarse-grained, hard and brittle, they cannot be drilled or conventionally machined.

Given these mechanical properties, Alnico parts are not used as structural members. Where a choice exists, select simple shapes. Slots are preferred over holes. Cross sections of less than .125" (3.18 mm) should be avoided. Finished surfaces, when required, may be produced by grinding; however, for many applications, the "as cast" or "as sintered" surface yields a satisfactory result at a significantly lower cost.

To facilitate mounting and give adequate protection to the magnet, special assemblies such as rotors and magnetron magnets may be supplied with an aluminum jacket. Additionally, low carbon steel pole pieces may be attached to magnet pole faces by adhesive bonding or with studs or bolts. Plastisol or paint can be applied for improved appearance.

### Magnetization

The most efficient use of Alnico requires that it be magnetized after the magnet has been assembled with its pole pieces into the final magnetic circuit. (Shipping the product non-magnetized also eliminates the need for special packaging, and prevents contamination by stray iron-chips, etc.)

Magnetic saturation at the end-use location requires the application of a magnetizing force 4 to 5 times greater than the coercive force of the material. For Alnico 5, 3000 oersteds (240 KA/M) are recommended. For Alnico 8, the force should be at least 7000 oersteds (560 KA/M).

The magnetizing force need be applied only momentarily. Thus, impulse magnetizers employing a capacitor discharge are commonly used. Direct current apparatus are also effective.

### Stability and temperature effects

Alnico magnets offer excellent stability with respect to temperature changes: reversible change is 0.02% per degree Centigrade. Heating may produce an irreversible loss of magnet strength. The magnitude of loss depends upon the dimensions of the magnet and its composition, but is usually less than 5%, and may be recovered by remagnetization.

At temperatures exceeding 1000°F (538°C), a metallurgical change takes place which causes magnetic strength to reduce rapidly. This change will not be recovered by remagnetization.

External magnetic fields can also induce partial demagnetization. In some critical applications, it is desirable to stabilize the magnet by intentionally reducing magnetic output by 5% to 10%. Such stabilization may reduce, or even eliminate, the effect of stray external fields.



# Alnico Ordering Information

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Please refer to Alnico Product Specification Sheets when ordering standard Alnico permanent magnets. The magnets listed on these specification sheets, however, represent only a small percentage of the wide variety of shapes and sizes available in the various grades of Alnico. We invite your inquiries concerning magnet designs other than those listed. These inquiries should be submitted to Arnold Engineering, Marengo, Illinois, or to the nearest Arnold sales office.

It is our desire to respond to your inquiries rapidly and accurately. In order to do this, your requests should contain certain magnetic, mechanical, and general information to better serve you. Please use the Request for Quotation Form on the back of this sheet to speed the processing of your inquiry. Photocopy this form, fill it in with the necessary information, and then fax or mail to The Arnold Engineering Company.

All inquiries should include:

Inquiry reference number; part number; quantity of parts required; annual part usage; the address and person to whom the quotation should be submitted.

If a design has already been determined, your inquiry should include:

A sketch or print of the part or assembly; all dimensions and tolerances; material grade required; direction of orientation; whether the part is to be magnetized.

If you require design assistance, our staff of engineers will be happy to assist you. In addition to all of the information mentioned previously, the following would be helpful in making recommendations:

Operating point of the magnet; required flux density; physical stress placed on the magnet; demagnetizing forces; temperature range; a description of the magnetic circuit; proposed method of mounting; any application information available.

In many instances, Arnold will already have adequate tooling available to make parts to your specifications. This could result in substantial savings. It is always our goal to provide the customer with the most efficient and economical part for a given application. Detailed inquiry information will help us to achieve this.

## Limited Warranty and Exclusive Remedy

The Arnold Engineering Company warrants that these products conform to industry standards specific herein and will be free from defects in material and workmanship. THIS WARRANTY IS EXPRESSLY GIVEN IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND IN LIEU OF ANY OTHER OBLIGATION ON THE PART OF THE ARNOLD ENGINEERING COMPANY. The Arnold Engineering Company will, at its option, repair or replace free of charge (excluding all shipping and handling costs) any products which have not been subject to misuse, abuse, or modification and which in its sole determination were not manufactured in compliance with the warranty given above.

THE REMEDY PROVIDED FOR HEREIN SHALL BE THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY OR ANY CLAIM ARISING IN ANY WAY OUT OF THE MANUFACTURE, SALE, OR USE OF THESE PRODUCTS. In no event shall The Arnold Engineering Company and its parent company, SPS Technologies, Inc., be liable for consequential, incidental or any other damages of any nature whatsoever except those specifically provided herein for any breach of warranty or any claim arising in any way out of the manufacture, sale, or use of these products. No other person is authorized by The Arnold Engineering Company to give any other warranty, written or oral, pertaining to the products.

# Request for Quotation

For 24-hour turn-around on quotations:

MAIL TO:

Customer Service  
**THE ARNOLD ENGINEERING COMPANY**  
Alnico Products Division  
300 North West Street  
Marengo, IL 60152

FAX TO:

**(815) 568-2376**

Company: \_\_\_\_\_

Inquiry No.: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Reply Requested By:

- Fax       Phone  
 Mail       E-mail

Phone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Arnold Part No.: \_\_\_\_\_

E-mail: \_\_\_\_\_

Material: \_\_\_\_\_

Reply To: \_\_\_\_\_

Magnetized: \_\_\_\_\_

Application and General Information: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Direction of Orientation: \_\_\_\_\_

Delivery Requested: \_\_\_\_\_

Quantity/Estimated Annual Usage: \_\_\_\_\_

**Print or sketch** — Please include description: all dimensions and tolerances; material; magnetic requirements and material grade required; type of coating and color.





770 Linden Ave. • Rochester, NY 14625-2764 USA  
Tel: 800-593-9127 • (+1) 585-385-9010 • Fax: (+1) 585-385-5625  
Email: [info@arnoldmagnetics.com](mailto:info@arnoldmagnetics.com)

[www.arnoldmagnetics.com](http://www.arnoldmagnetics.com)