




PROCESS FLOW

General Information

Excellent temperature stability, high residual induction, and relatively high energies characterize Alnico materials, composed primarily of alloys of Aluminum, Nickel, and Cobalt. They are manufactured through either a casting or sintering process. Cast magnets may be manufactured in complex shapes, such as horseshoes, not possible with other magnet materials. Sintered Alnicos offer slightly lower magnetic properties but better mechanical characteristics than cast Alnicos.

Cast Alnico 5 is the most commonly used of all the cast Alnicos. This material is used extensively in rotating machinery, meters, instruments, sensing devices, and holding applications, to name a few.

Alnico is hard and brittle. Machining or drilling cannot therefore be accomplished by ordinary methods. Holes are usually cored in at the foundry, and magnets are cast close to final size and then finish machined to closer tolerances.

Alnico has a low coercive force, and is easily demagnetized if not handled with care. For optimum performance of Alnico 5, the magnetic length should be approximately 5 times the pole diameter or equivalent diameter. For example, a 0.250" diameter magnet should be about 1.250" long.

Because of its higher coercivity, Alnico 8 may be used in shorter lengths and in disc shapes.

Manufacturing Methods

Alnico magnets are manufactured through either casting or sintering processes.

Cast magnets are manufactured by pouring a molten metal alloy into a mold and then further processing it through various heat-treat cycles. The resulting magnet has a dark gray exterior appearance, and may have a rough surface. Machined surfaces have a shiny appearance similar to steel.

Sintered magnets are manufactured by compacting fine Alnico powder in a press, and then sintering the compacted powder into a solid magnet.

Assemblies

We are able to manufacture metal and other components of finished sub assemblies using our CNC machining facilities.

Assemblies can be fabricated by adhering magnets with adhesives to suit a range of environments, by mechanically fastening magnets, or by a combination of these methods. Due to the relatively brittle nature of these magnet materials, press fits are not recommended.

Surface Treatments

The corrosion resistance of Alnico is considered excellent, and no surface treatments are required. However, Alnico magnets are easily plated for cosmetic reasons if required.

Machining

Alnico is hard and brittle, and prone to chipping and cracking. Special machining techniques must be used to machine this material. Holes must be made by EDM methods. We are fully equipped to machine these materials to your blueprint specifications.

Magnetizing and Handling

Alnico magnets require magnetizing fields of about 3 kOe. Because of their relatively low coercivities, special care should be taken to assure that these magnets are not subjected to adverse repelling fields, since these could partially demagnetize the magnets. Magnetized magnets should be stored with keepers to reduce the possibility of partial demagnetization. If Alnicos are partially demagnetized, they may be easily remagnetized.

Temperature Effects

Up to about 1,000 F, changes in magnetization are largely reversible and re-magnetizable, while changes above this are largely structural and not fully reversible or re-magnetizable. Approximately 90% of room temperature magnetization is retained at temperatures of up to 1,000 F.

铸造铝镍钴的磁性能
Magnetic Properties of Cast AlNiCo

牌号 Grade	剩磁 Remanence		矫顽力 Normal Coercivity		内禀矫顽力 Intrinsic Coercivity		最大磁能积 Max. Energy Product (BH)Max		密度 Density ρ
	Br		Hcb		Hcj				
	mT	Gs	K.A/m	Oe	K.A/m	Oe	KJ/m ³	MG Oe	g/cm ³
CLN9	680	6800	30	380	32	400	9.0	1.13	6.9
CLN10	600	6000	40	500	43	540	9.6	1.02	6.9
CLNG12	700	7000	40	500	43	540	12.0	1.50	7.0
CLNG16	780	7800	52	650	54	680	16.0	2.00	7.0
CLNG34	1200	12000	44	550	45	560	34.0	4.30	7.3
CLNG37	1200	12000	48	600	49	610	37.0	4.63	7.3
CLNG40	1250	12500	48	600	49	610	40.0	5.00	7.3
CLNG44	1250	12500	52	650	53	660	44.0	5.50	7.3
CLNG52	1300	13000	56	700	57	710	52.0	6.50	7.3
CLNGT28	1300	13000	58	720	59	740	28.0	3.50	7.3
CLNGT32	1000	10000	100	1250	102	1280	32.0	4.00	7.3
CLNGT38	800	8000	110	1380	112	1400	38.0	4.75	7.3
CLNGT60	900	9000	110	1380	112	1400	60.0	7.50	7.3
CLNGT72	1050	10500	112	1400	114	1430	72.0	9.00	7.3
CLNGT36J	700	7000	140	1750	148	1850	36.0	4.50	7.3

铸造铝镍钴的物理性能
Physical properties of Cast AlNiCo

居里温度 Curie Temperature Tc	860 °C
最高工作温度 Maximum Operating Temp.	525-550 °C
电阻率 Specific Resistance	47-54 $\Omega \cdot \text{cm}$
硬度 Hardness	520-630
回复磁导率 Recoil Permeability	1.70-4.70 Gs/Oe
剩磁温度系数 Temp. Coefficient	-0.025 ~ -0.02% °C ⁻¹
内禀矫顽力温度系数 Temp.Coefficient of Inturensic Coerrence Induction	+0.01 ~ +0.03 °C ⁻¹