

福建省长汀卓尔科技股份有限公司 *Fujian Changting Zorr Technology Co., Ltd.*

Dedicated to be the world-class SmCo magnet and assembly manufacturer!



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1 Company Profile

Fujian Changting Zorr Technology Co., Ltd., affiliated with Xiamen Tungsten Co. (XTC), is mainly engaged in rare earth permanent magnet development, production and service, focusing on SmCo magnets and magnetic assemblies. The products have been widely used in military, aerospace, industry automation, automotive, communication, sensor, oil & gas, instruments and etc.

Situated in one of the two most beautiful mountain cities in China, Changting, Zorr Technology has an annual capacity of 300 tons and is expected to expand the annual capacity to 1000 tons before 2020.

Xiamen Tungsten Co. (XTC) is one of the Six Rare Earth Groups in China, owning a complete chain of rare earth industrial system, which covers from rare earth mining, rare earth smelting & separation, to rare earth functional material (such as rare earth permanent magnetic material, luminescent material, and storage material). XTC cooperated with Chinese Academy of Science and Xiamen Government to invest 500 million CNY to build the Chinese Academy of Science West Coast RE Research Institute, and independently invested 200 million CNY to build Rare Earth and Energy New Material Engineering Technology Center.

Zorr Technology integrates industry resource, brings in industry professionals, and applies the tremendous experience of scale production, advanced technology, and equipment R&D capability of XTC to provide customized products and first-class material application solution for customers. Adhering to "Customer First, Market Orientation", Zorr Technology is dedicating to be the leading professional and reliable manufacturer of SmCo magnets and magnetic assemblies.

Sharing XTC's excellent core values, Zorr Technology forms healthy and competitive mechanism, and is dedicating to consistently delivering the best quality products and services for our customers! We are willing to shoulder the social responsibility, and sustainably grow and thrive together with our partners!



2 Core Values

Enable Employee to Achieve Personal Value

Enable Shareholders to Gain Returns

Enable End Users to Receive Satisfactory Service

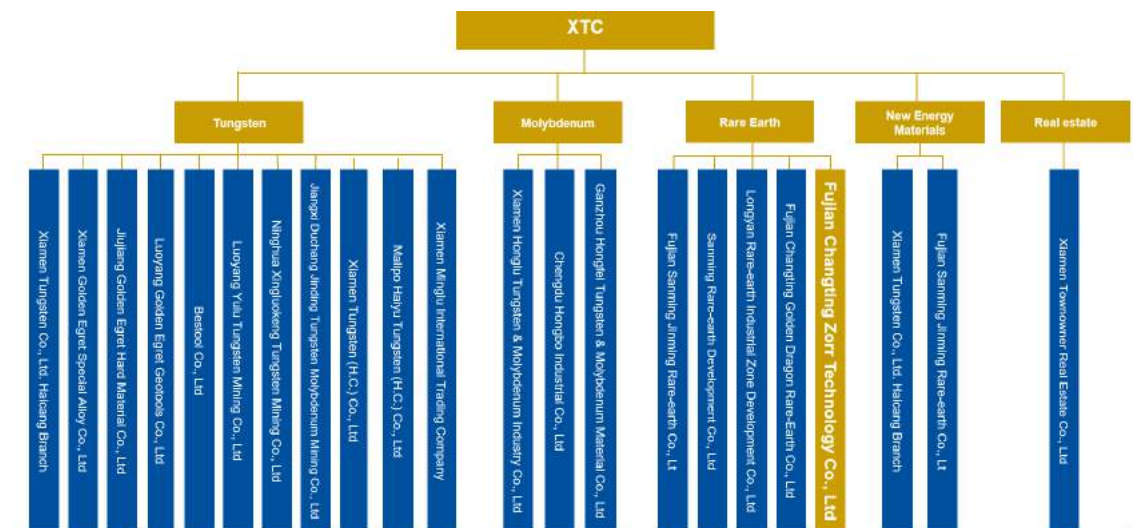
Enable Harmonious Society Development

Business Philosophy

Customer Centric, Market Orientation

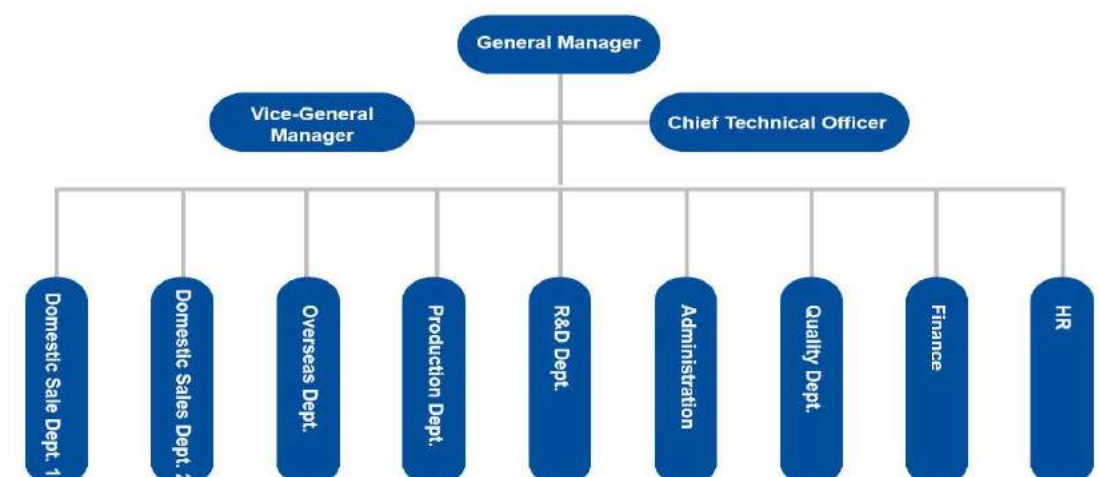
3 Corporate Structure

Corporate Structure



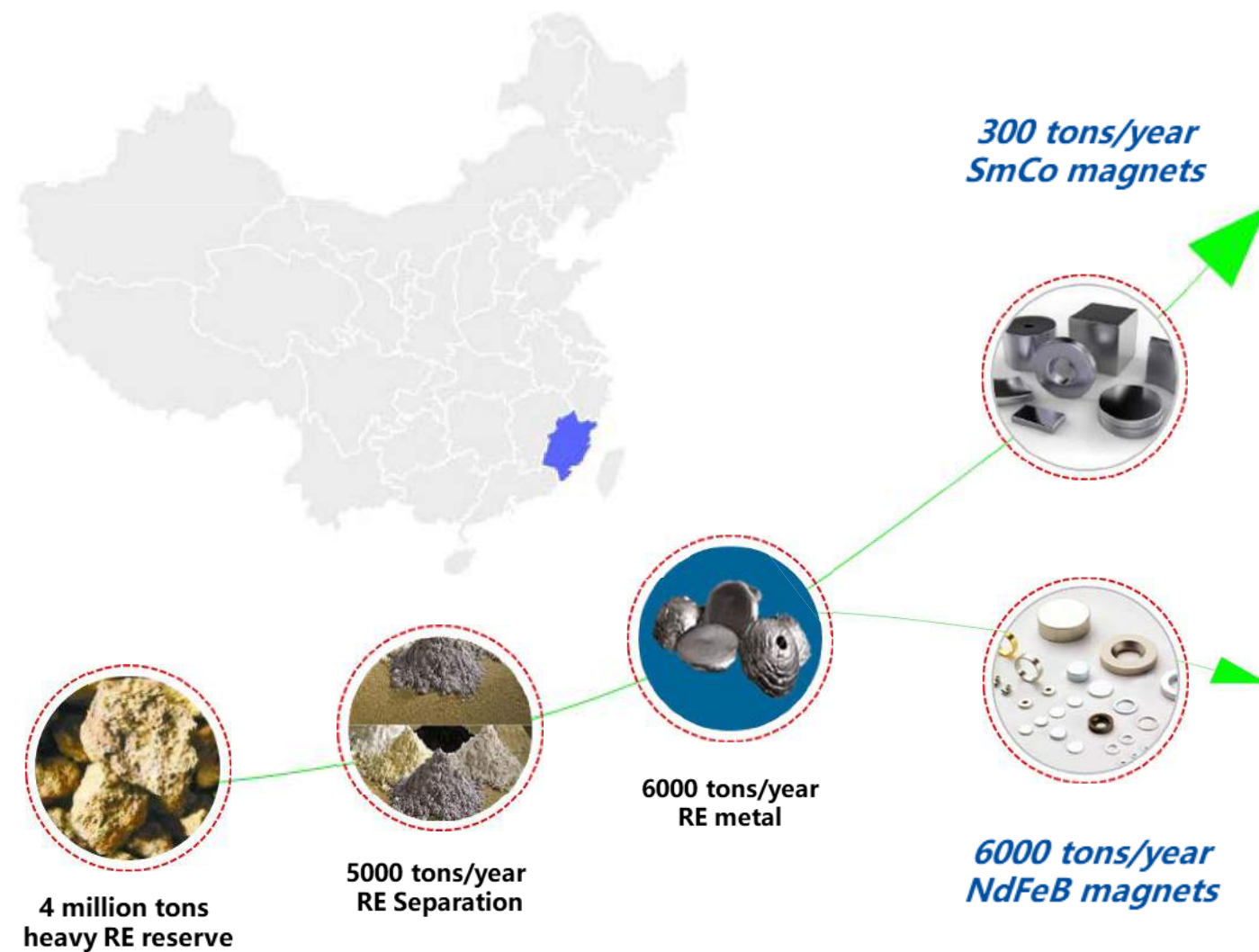
By the end of 2017, XTC owns 20+ subsidiaries, 1 branches; 1 National R&D Center for Tungsten Technology and 1 Rare Earth & Energy New Materials R&D center. 2 post-doctoral working stations.

Zorr Structure



4 Industry Chain Advantage

Xiamen Tungsten Co. owns complete chain of rare earth industrial system, which covers rare earth mining, smelting and separation, rare earth functional material (rare earth permanent magnet, luminescent material, and storage material), research, application, and etc.



5 Product Quality and Equipment R&D

Product Introduction

Samarium Cobalt was the first rare-earth transition-metal magnet to be developed. It was a quantum leap in energy product and made it possible to put a large amount of stable flux in a small package. SmCo₅ and Sm₂Co₁₇ have low temperature coefficients and chemically stable. SmCo is very hard and fragile: if you drop it, it will break.



Quality and R&D

Zorr Technology brings in industry veteran with nearly 50 years' experience of SmCo production, and is capable of developing customized SmCo magnet for customers. Adhering to the excellent corporate culture and advanced quality management system, Zorr Technology establish complete SmCo magnet production system, which ensures the product quality consistency.

With 600 million CNY investment, XTC owns national level technology center, intelligent equipment institute, and two post-doctor stations. Technology Center attracts a number of rare earth talents, forming a professional R&D team. Large amount of money has been invested to establish advanced lab, and equip advanced test equipment, which ensures the continuous development and good quality of products.

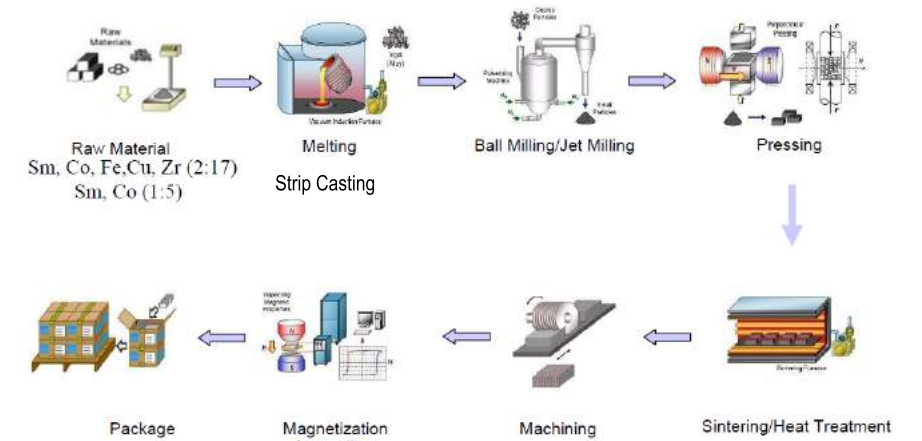
CAS, Xiamen Government, allied with XTC to build the Chinese Academy of Science West Coast (Xiamen) RE Research Institute.





Production Equipment

Production Flow Chart



ONS Analyzer



XRF



PM Non-destructive Testing System



Surface Treatment Line



Particle Size Distribution Analyzer



SEM



Automatic Thermal Demagnetization Detection System



ICP



PBH



FE-EPMA

6 Product Grade

Sintered SmCo Magnet Grade

Grade		Residual Induction Br				Coercivity Hcb				Intrinsic Coercivity Hcj		Maxium Energy Product (BH) max				Densit y ρ	RTC of Br α(Br) 20-150℃	Curie Temp.	Maximum Operating Temp.
		Max		Min		Max		Min				Max		Min					
		[KGs]	[T]	[KGs]	[T]	[KOe]	[kA/m]	[KOe]	[kA/m]	[KOe]	[kA/m]	[MGOe]	[kJ/m³]	[MGOe]	[kJ/m³]	[g/cm³]	[%/℃]	[℃]	[℃]
RECo ₅	ZR-10Tc	6.8	0.68	6.0	0.60	6.6	525	5.8	462	≥20	≥1593	11	88	9	72	8.3-8.5	-0.002	700-750	250
SmCo ₅	ZR-18	9.0	0.90	8.3	0.83	8.8	700	8.0	637	≥20	≥1593	20	159	16	127	8.1-8.3	-0.040	700-750	250
	ZR-22	9.6	0.96	9.2	0.92	9.4	748	8.9	709	≥20	≥1593	24	191	20	159	8.1-8.3	-0.040	700-750	250
RE ₂ [Co,Cu,Fe,Zr] ₁₇	ZR-22Tc	9.6	0.96	9.2	0.92	9.4	748	8.0	637	≥20	≥1593	24	191	20	159	8.4-8.6	-0.001	800-850	300
Sm ₂ [Co,Cu,Fe,Zr] ₁₇	ZR-24L	10.2	1.02	9.6	0.96	9.2	732	6.0	478	≥6.2	≥495	25	199	23	183	8.3-8.5	-0.035	800-850	300
	ZR-26L	10.4	1.04	10.2	1.02	9.4	748	6.0	478	≥6.2	≥495	27	215	25	199	8.3-8.5	-0.035	800-850	300
	ZR-28L	10.8	1.08	10.4	1.04	9.6	764	6.0	478	≥6.2	≥495	29	231	27	215	8.3-8.5	-0.035	800-850	300
	ZR-30L	11.4	1.14	10.8	1.08	10.0	796	6.0	478	≥6.2	≥495	31	247	29	231	8.3-8.5	-0.035	800-850	300
	ZR-32L	12.0	1.20	11.2	1.12	10.2	812	6.0	478	≥6.2	≥495	34	271	30	239	8.3-8.5	-0.035	800-850	250
	ZR-24	10.2	1.02	9.6	0.96	10.0	796	8.5	677	≥12	≥956	25	199	23	183	8.3-8.5	-0.035	800-850	300
	ZR-26	10.4	1.04	10.2	1.02	10.2	812	8.5	677	≥12	≥956	27	215	25	199	8.3-8.5	-0.035	800-850	300
	ZR-28	10.8	1.08	10.4	1.04	10.4	828	8.5	677	≥12	≥956	29	231	27	215	8.3-8.5	-0.035	800-850	300
	ZR-30	11.4	1.14	10.8	1.08	10.6	844	8.5	677	≥12	≥956	31	247	29	231	8.3-8.5	-0.035	800-850	300
	ZR-32	12.0	1.20	11.2	1.12	10.8	860	8.5	677	≥12	≥956	34	271	30	239	8.3-8.5	-0.035	800-850	300
	ZR-24H	10.2	1.02	9.6	0.96	10.0	796	8.8	701	≥25	≥1992	25	199	23	183	8.3-8.5	-0.035	800-850	300
	ZR-26H	10.4	1.04	10.2	1.02	10.2	812	9.4	749	≥25	≥1992	27	215	25	199	8.3-8.5	-0.035	800-850	300
	ZR-28H	10.8	1.08	10.4	1.04	10.4	828	9.5	757	≥25	≥1992	29	231	27	215	8.3-8.5	-0.035	800-850	300
	ZR-30H	11.4	1.14	10.8	1.08	10.6	844	10.0	797	≥25	≥1992	31	247	29	231	8.3-8.5	-0.035	800-850	300
	ZR-32H	12.0	1.20	11.2	1.12	10.8	860	10.2	813	≥25	≥1992	34	271	30	239	8.3-8.5	-0.035	800-850	300
Typical Reversible Temperature coefficient (RTC) Note: For the above mentiond magnet grade, magnetic parameters could be customized for specific requirements; Curie Temp. RTC is only for reference.																			

6 Product Grade

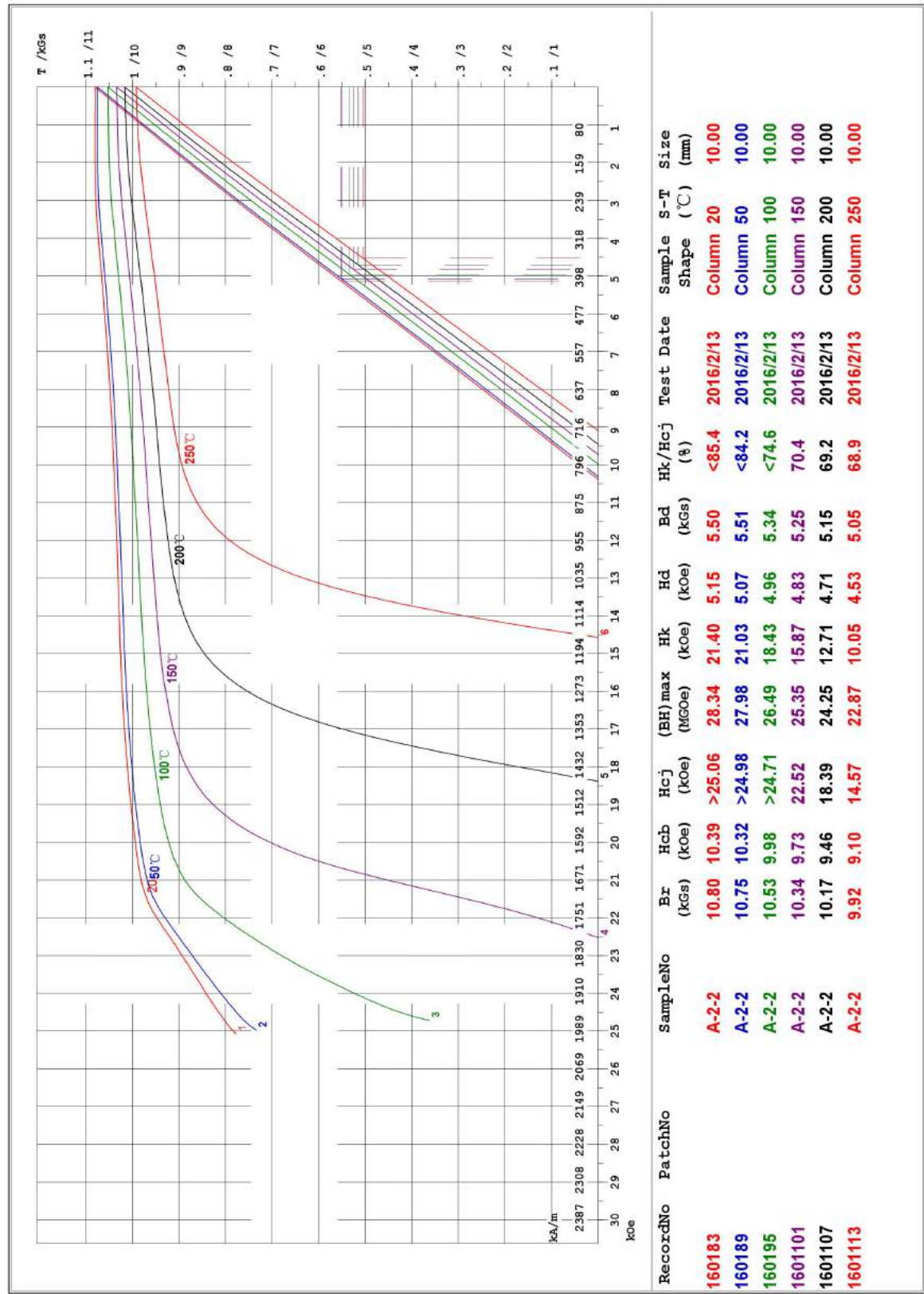
Bonded SmCo Magnet Grade

Grade	Residual Induction Br				Coercivity Hcb				Intrinsic Coercivity Hcj				Maxium Energy Product (BH) max				Density ρ	RTC of Br α(Br) 20-150°C	Maximum Operating Temp.	Molding Method	Magnetic orientation
	Max		Min		Max		Min		Max		Min		Max		Min						
	[KGs]	[T]	[KGs]	[T]	[KOe]	[kA/m]	[KOe]	[kA/m]	[KOe]	[kA/m]	[KOe]	[kA/m]	[MGOe]	[kJ/m³]	[MGOe]	[kJ/m³]					
ZRZ-4	4.5	0.45	3.5	0.35	4.0	320	3.0	240	13.0	1040	9.0	720	4.5	36	3.0	24	6.6-7.2	-0.035	-0.25	Compression	Isotropic
ZRZ-5	5.0	0.50	4.5	0.45	4.5	360	3.5	280	13.0	1040	9.0	720	5.5	44	4.5	36	6.6-7.2	-0.035	-0.25	Compression	Isotropic
ZRZ-6	6.0	0.60	5.0	0.50	5.0	400	4.0	320	13.0	1040	9.0	720	6.5	52	5.5	44	6.6-7.2	-0.035	-0.25	Compression	Axial (vertical) Anisotropic
ZRZ-12	7.5	0.75	6.5	0.65	6.5	520	5.5	440	13.0	1040	9.0	720	12.0	96	10.0	80	6.6-7.2	-0.035	-0.25	Compression	Axial (vertical) Anisotropic
ZRZ-8	6.5	0.65	5.5	0.55	6.0	480	5.0	400	13.0	1040	9.0	720	8.5	68	6.5	52	5.6-6.2	-0.035	-0.25	Injection	Axial (vertical) Anisotropic
ZRZ-12	7.5	0.75	6.5	0.65	6.5	520	5.5	440	13.0	1040	9.0	720	12.0	96	10.0	80	5.6-6.2	-0.035	-0.25	Injection	Axial (vertical) Anisotropic
Note: For the above mentioend magnet grade, magnetic parameters could be customized for specific requirements;																					

Magnetic Parameter and Conversion Table

Unit and Symbol	SI-Units	Conversion Table
Flux Density B	T (Tesla)	1 T = 1 Vs/m² = 10KGs
Magnetic Polarization Intensity J	T (Tesla)	1 T =1 Vs/m² = 10KGs
Magnetic Field Intensity H	A/m	1 KA/m = 4πOe ≈ 12.57Oe
Energy Product (BH)	J/m3	1 KJ/m3 = 0.126MGOe
Magnetic Flux Φ	Wb (Weber)	1 Wb = 1Vs = 10 ⁸ Mx

Demagnetization curve of sintered magnet $\text{Sm}_2\text{Co}_{17}$ (ZR-30H) at different temperature

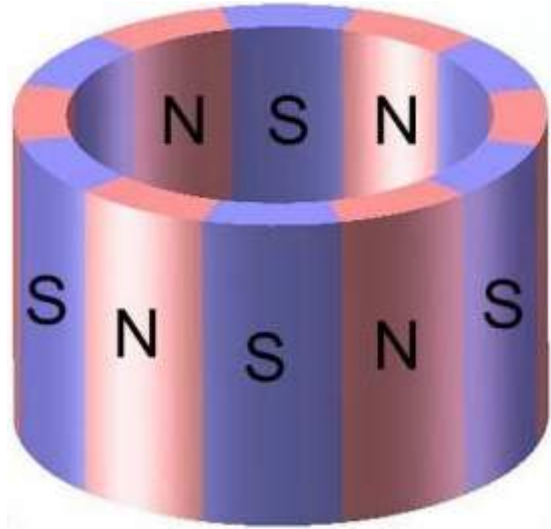
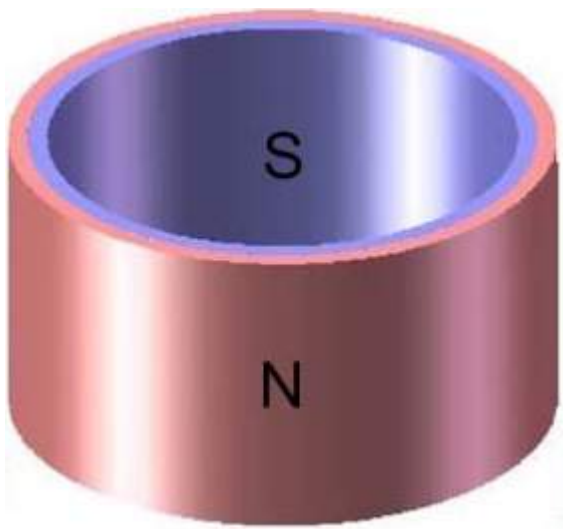


AUTOMATIC HYSTERSIGRAPH MODE AMT-4 SJ LTD.



Multipole Magnetized SmCo Magnets

Zorr Technology is capable of manufacturing multipole magnetized SmCo magnets, which are mainly used in high performance motor and sensors. The multipole magnetized SmCo magnets demonstrates high accuracy, low noise, and are the optimum choice for the high speed and high precision motors. For more details, please contact Zorr's sales representative.



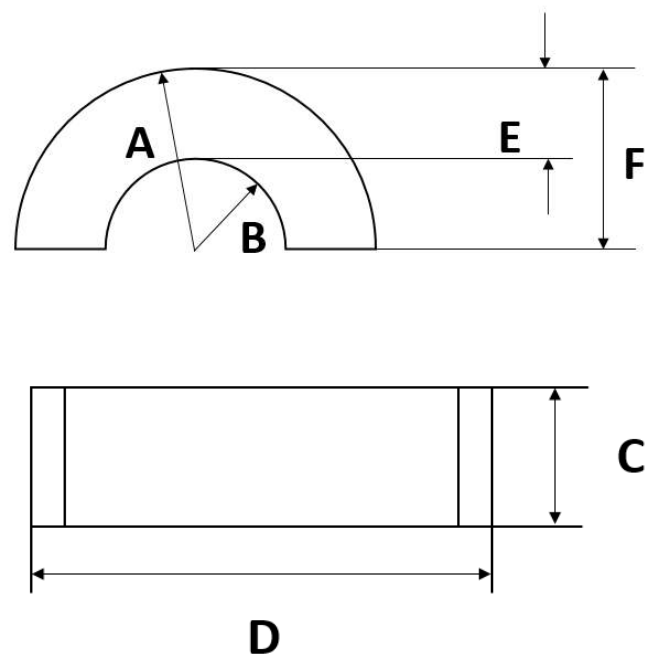
Proposed Dimension/mm	Tolerance/mm	Concentricity/mm	Cylindricity/mm
Outer Diameter < 65 Inner Diameter > 25 Height < Inner Diameter	±0.05	0.05	0.04

Physical Properties

Parameters	Unit	SmCo5	Sm2Co17
Recoil Permeability (μ_{rec})		1.00-1.05	1.00-1.1
Hardness	Hv	400-500	500-600
Electrical Resistivity	$\Omega \cdot \text{cm}$	$5-6 \times 10^{-5}$	$8-9 \times 10^{-5}$
Compressive Strength	Mpa	420-680	700-830
Coefficient of Thermal Expansion (C $\perp$)	$10^{-6}/^{\circ}\text{C}$	13	11
Coefficient of Thermal Expansion (C//)	$10^{-6}/^{\circ}\text{C}$	6	8
Saturation Field	KA/m	>1600	>3200

Machining Tolerance

Samarium Cobalt is made using powder metallurgy, and it is inevitable to encounter measurement errors and deformation. Therefore, grinding is a necessary process.



Item	Procedure	Tolerance/mm
A	Grinding	± 0.015
B	Grinding	± 0.015
C	Cut Off or Grinding	± 0.02
	No Machining	± 0.5
D	Cut Off	± 0.02
	No Machining	± 0.5
E	Grinding	± 0.02
F	Cut Off	± 0.02
	No Machining	± 0.5

7 Application

Industry Served: aerospace, industry automation, automotive, communication, oil & gas, sensors, instruments and etc.



Aerospace

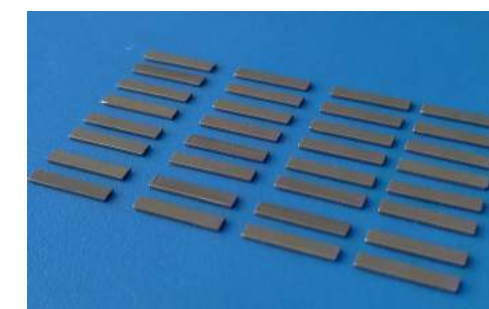
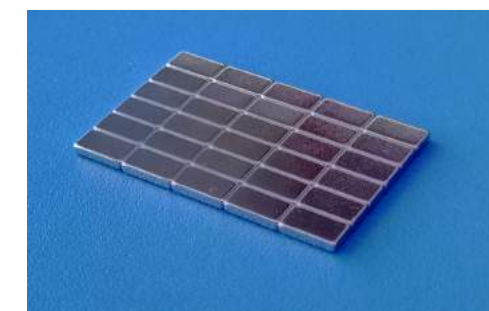


Oil & Gas

Defense



Automotive



Operation Instruction

For suggestion on the safe use of magnet, please follow the following instructions. Incorrect usage may result in functional faults or occupational health and safety accidents.

1. Special attention should be paid, in designing, to anisotropic magnet poles as the great difference between magnetization directions.
2. A sample should be confirmed before placing an order as magnetic properties listed in catalogue may vary at different sizes and shapes.
3. Hcb and Hcj indexs should be considered when the magnet is magnetized by your company. The magnetic field should be strong enough to meet the designing requirements. At the same time, great attention should be paid to prevent the magnetizing fixture from cracking and splashing of the magnets.
4. The magnetic properties might become inferior or demagnetized when being sheared or pulled apart.
5. The bonding strength between magnet and yoke should be noted when the magnet is used in high rotation speed or/and in vibration conditions. Due to the hard and inflexible properties of the magnet, it is necessary to consider, when in designing, to avoid cracking and splashing of the magnet.
6. It will cause unexpected serious harm to human body if put the hands or fingers in between the magnet or knives, metal chips and magnets placed nearby.
7. Magnet should be stored and applied in specified environment corrosion or strength inferiority by corrosive gas, high and low temperature or moisture.
8. Magnetized magnets should be carefully taken care of, be insulated with non-magnetic material from other magnets and iron debris, and be kept distance from magnetic field.

Magnetic Material Terms

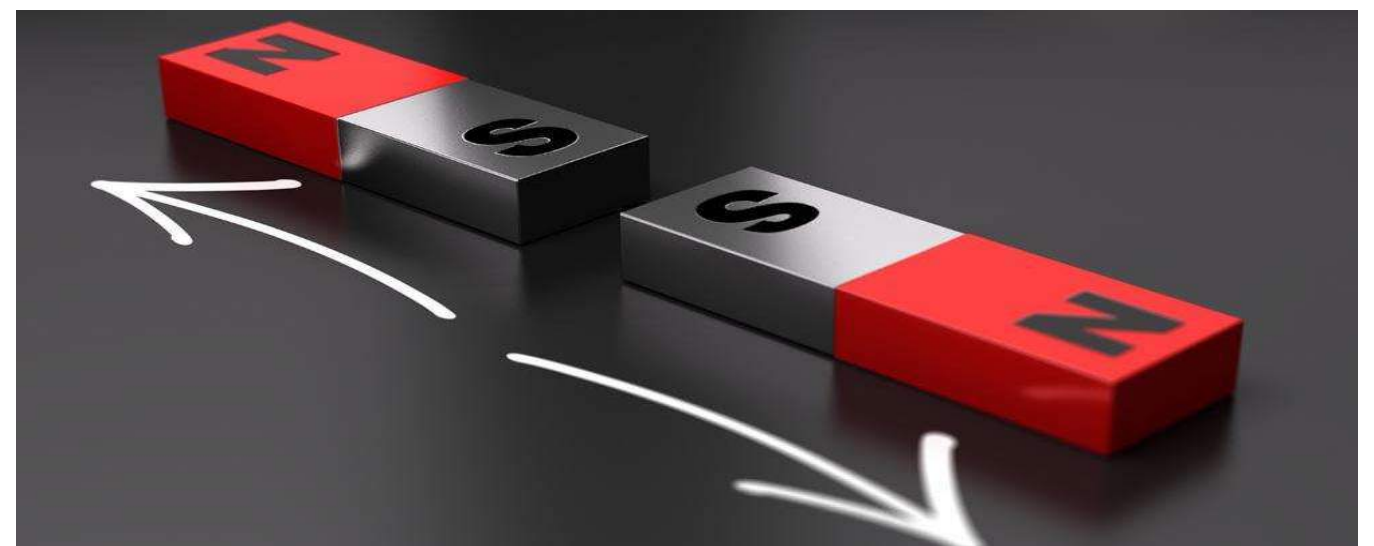
Rare Earth Permanent Magnet
Permanent magnet is a material that when magnetized will continue to exhibit a magnetic field once removed from the external magnetic field .

Br —Residual Magnetic Induction
After a magnet was magnetized to technical saturation under the action of external magnetic field, then the external magnetic field was removed, at this time, the magnet performed magnetic induction is residual magnetic induction, shortened form is remanence.

Hcb —Coercive Force
A magnet was magnetized by reverse magnetic field, making its magnetic induction reduce to zero, at this time, the reverse magnetic field strength value is magnetic induction coercive force.

Hcj —Intrinsic Coercive Force
A magnet was magnetized by reverse magnetic field, making magnetic polarization intensity reduce to zero, at this time, the reverse magnetic field strength value is intrinsic coercive force.

(BH)max —Maximum Energy Product
B and H multiplication of any point on the demagnetization curve (namely BH) we called magnetic energy product, the biggest BH value is the maximum energy product.



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