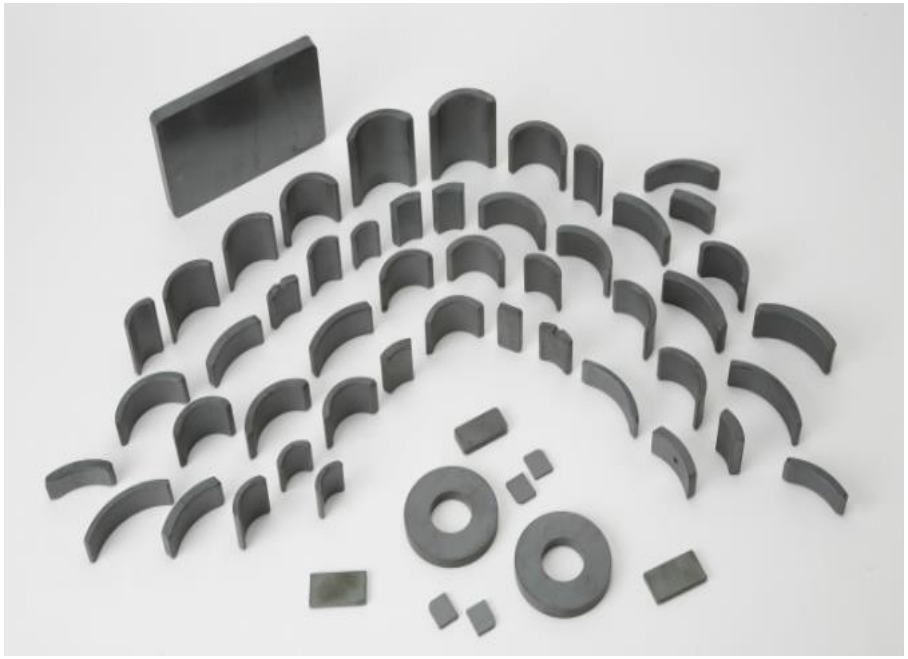
Mahindra CIE Automotive Ltd.
Magnetic Products Division

Products

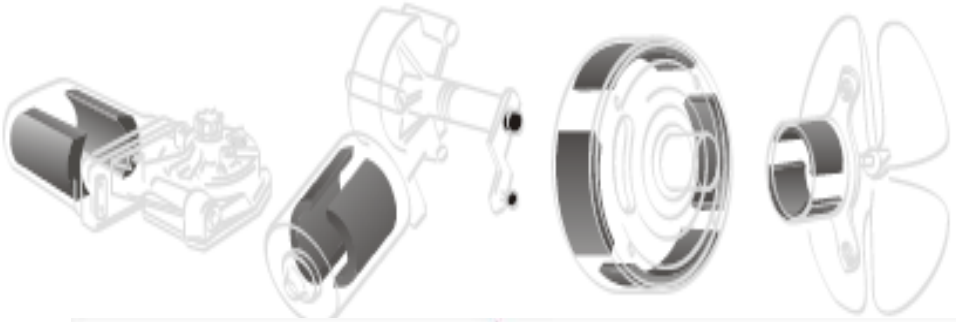
Magnet

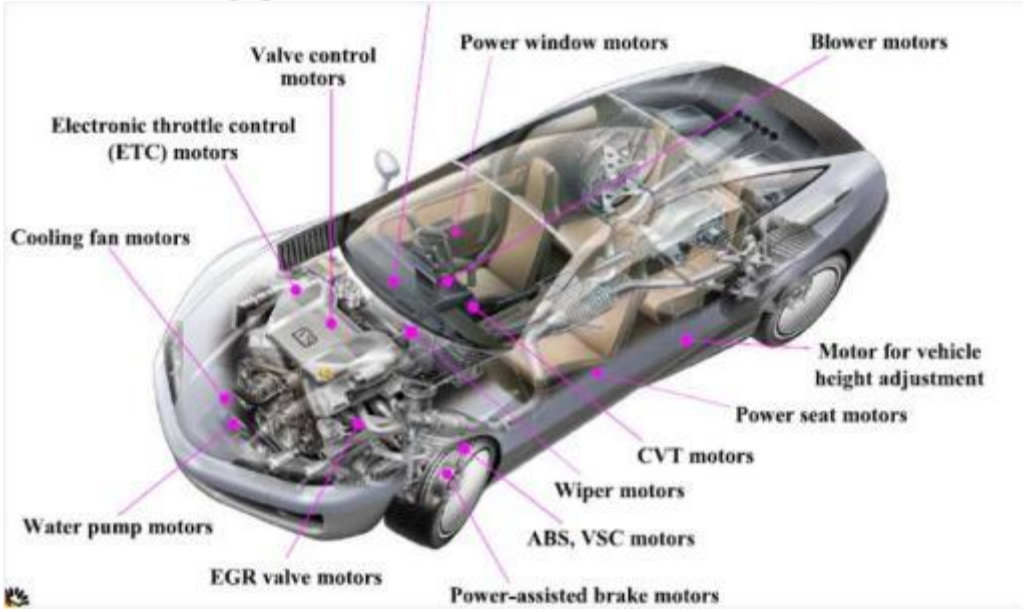


Ferrite Cores

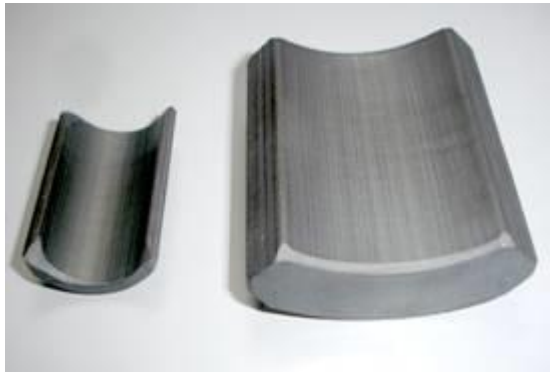
Product: Magnet

Application
Passenger Cars
Starter motors
Power Window motors
HVAC/Blower motors
Wiper motors
Engine Cooling fan motors
Sun Roof motors
ETC/EGR motors
Power steering
Two Wheelers
Starter motors
A/C Generators (Magnetos)



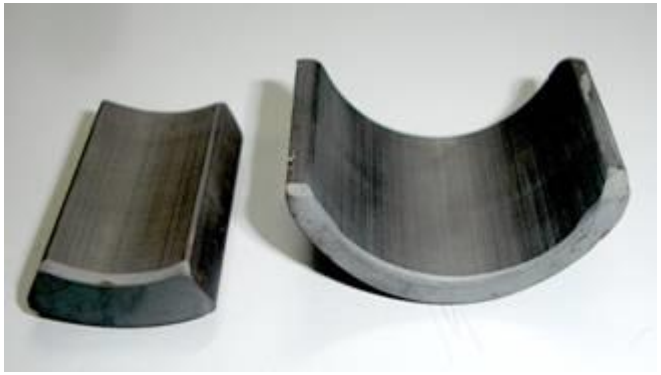


Magnet Variety: Product Range



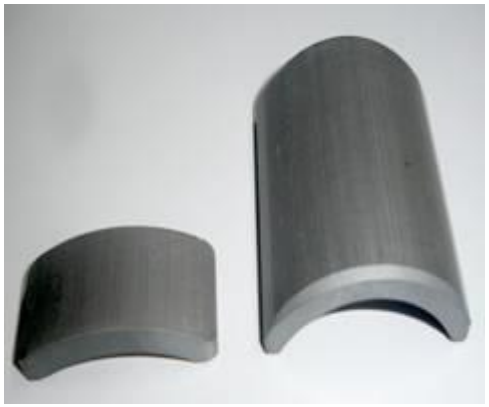
Light to Heavy Weight

Thin to Thick

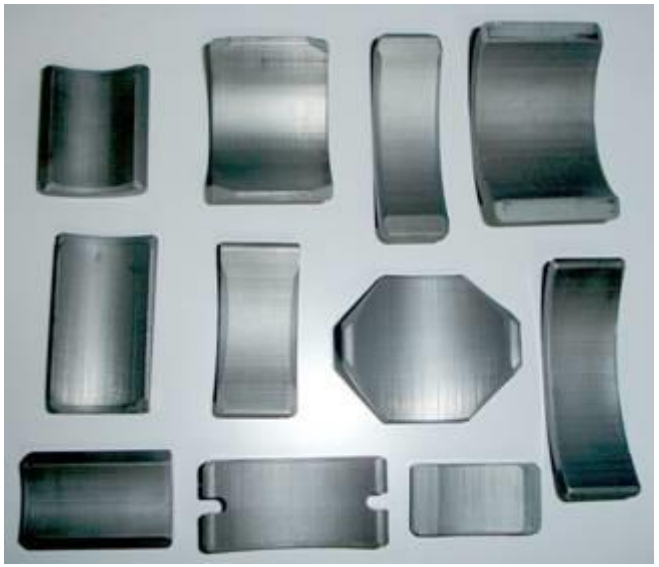


Flat to Deep Arc

Small to Wide Arc



Short to Long Arc



Variety of Foot Shapes

Magnet: Material Grades

Type: Wet Anisotropic Strontium Ferrite

Grade	Residual Flux Density		Coercive Force				Max Energy Product	
	Br		Hc / bHc / Hcb		iHc / jHc / Hcj		BHmax	
	kGauss	Tesla	kOersted	kA/m	kOersted	kA/m	MGOe	kJ/m³
CS 2BA	4.15 - 4.25	0.415 - 0.425	2.2 - 2.6	175 - 207	2.2 - 2.8	175 - 223	4.15 - 4.45	33.03 - 35.42
CS 2BB	4.1 - 4.2	0.41 - 0.43	2.7 - 3.2	214 - 255	2.7 - 3.6	214 - 286	4.00 - 4.40	31.84 - 33.43
CS 2BD	3.7 - 4.0	0.37 - 0.40	3.10 min	246 min	3.4 - 3.9	270 - 311	3.20 - 3.80	25.47 - 30.25
CS 2BDH	3.8 - 4.1	0.38 - 0.41	3.15 min	251 min	3.5 min	278 min	3.60 - 4.10	28.66 - 32.66
CS 2BR	3.3 - 3.9	0.33 - 0.39	2.8 - 3.4	223 - 286	3.0 - 3.5	238 - 278	2.60 -3.60	20.70 - 28.66
CS 2BE	3.6 - 4.0	0.36 - 0.4	3.3 - 3.8	262 - 303	3.9 min	310 min	3.00-3.80	23.88 - 30.25
CS 2BF	3.6 - 3.9	0.36 - 0.39	3.3 - 3.8	262 - 303	4.8 min	381 min	3.00-3.60	23.88 - 28.66
CS 5B	4.2 - 4.3	0.42 - 0.43	2.7 - 3.0	214 - 239	2.7 - 3.1	214 - 247	4.20 - 4.40	33.43 -35.02
CS 5D	4.0 - 4.1	0.4 - 0.41	3.2 - 3.7	254 - 297	3.4 - 3.8	270 - 303	3.80 - 4.00	30.25 - 31.84
CS 5E	3.9 - 4.0	0.39 - 0.40	3.5 - 3.9	278 - 311	3.9 - 4.2	310 - 334	3.60 - 4.00	28.66 - 31.84
CS 5F	3.8 - 3.9	0.38 - 0.39	3.5 - 3.8	278 - 303	4.4 - 4.8	350 - 380	3.40 -3.80	27.06 - 30.25

Magnet: Material Grades

Type: Wet Anisotropic Strontium Ferrite

Grade	Residual Flux Density		Coercive Force				Max Energy Product	
	Br		Hc / bHc / Hcb		iHc / jHc / Hcj		BHmax	
	kGauss	Tesla	kOersted	kA/m	kOersted	kA/m	MGOe	kJ/m³
CS 6B	4.2 - 4.3	0.42 - 0.43	2.9- 3.3	230 - 263	3.0 - 3.4	238 - 270	4.20 - 4.40	33.43 -35.02
CS 6D	4.1 - 4.2	0.41 - 0.42	3.2 - 3.7	254 - 295	3.4 - 3.8	270 - 303	4.00 - 4.20	31.84 - 33.43
CS 6E	4.0 - 4.1	0.40 - 0.41	3.5 - 3.9	278 - 310	3.9 - 4.2	310 - 334	3.80 - 4.20	30.25 -33.43
CS 6F	3.9 - 4.0	0.39 - 0.40	3.5 - 3.8	278 - 303	4.4 - 4.8	350 - 380	3.60 - 3.80	28.66 - 30.25
CS 6G	3.7 - 3.8	0.37 - 0.38	3.3 - 3.8	262 - 302	4.8 min	382 min	3.40 - 3.80	27.06 - 30.25
CS 8B	4.3 - 4.4	0.43 - 0.44	2.9 - 3.3	230 - 263	3.0 - 3.4	238 - 270	4.40 - 4.60	35.02 - 36.62
CS 8D	4.2 - 4.3	0.42 - 0.43	3.2 - 3.7	254 - 294	3.4 - 3.8	270 - 302	4.20 - 4.40	33.43 - 35.02
CS 8E	4.1 - 4.2	0.41 - 0.42	3.5 - 3.9	279 - 310	3.9 - 4.2	310 - 334	4.00 - 4.20	31.84 - 33.43
CS 9E*	4.25 - 4.35	0.425 - 0.435	3.75 - 3.85	298 - 306	4.15 - 4.25	330 - 338	4.40 - 4.60	35.02 - 36.62
CS 9G*	4.00 - 4.10	0.40 - 0.41	3.70 -3.85	294 - 306	4.80 - 5.00	382 - 398	3.90 - 4.10	31.04 - 32.64

*: Grades are developed in Lab Scale, with absolutely no Patent Infringement.

Magnet: Dimensional Range

Existing Products: Dimensional Range			
Parameter	**Unit**	**Minimum**	**Maximum**
Outer Radius	mm	14.2	82.5
Inner Radius	mm	10.6	74.8
Thickness	mm	3.0	12.0
Arc width	mm	19.0	79.0
Arc length	mm	18.0	74.0
Arc height	mm	7.5	31.5
Weight per piece	grams	2.5	999.0

Technical Agreement:

Approval required from customer on Technical Feasibility sheet as well as MCIE drawing for prototype samples as well as mass production

Prototype Development:

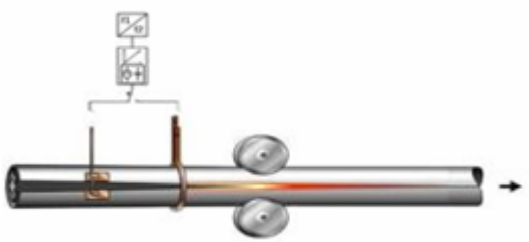
If the required part is fitting in dimensional as well magnetic property range, then prototype samples can be made by make-shift arrangement or complete new soft tool method with some investment depending on the availability of nearby part

Product: Soft Ferrite (Core)

Application

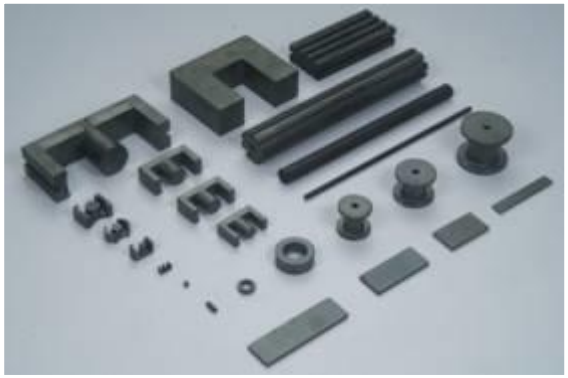
- Automotive Applications
- Lighting
- High Frequency Tube Welding
- Telecommunication Application
- Solar Energy
- Consumer Products
- Various catalogue products

i.e. EE, EER, EFD, EP, Planar, RM, Large U/I cores, OWD Cores , Small Toroids and Impeder Cores.



High Frequency Welding

Telecom Applications



Induction Cook Top

Lighting

Laptop Chargers

Passive Keyless Entry

Soft Ferrites: Material Grades

Magnetic Characteristics of Soft Ferrites

Property	Symbol	Unit	Test condition	MSB-7C	HP400	HP-380	HP-300	HPT-450	HPT-400	HB-040	HM-030	HM-040	HM-045	GQ5C	HM-060	HM-070	HM-100**	HT-08	HT-020	HT-35	HR-4	HR-4B	HQ-023
Initial permeability (±25%)	μi	----	10kHz, 0.1mT, 25°C	2400	2200	2200	2200	2400	3000	3800	3000	4000	4500	5000	6000	7000	10000	800	2000	3400	1200	2000	2300
Flux density (min)	Bs	mT	1200A/m, 25°C	500	500	490	510	510	500	550	480	470	470	450	400	400	430	430	470	510	440	500	420
			1200A/m, 100°C	380	400	390	420	410	390	435	330	330	330	300	240	240	240	320	330	390	350	400	290
Relative loss factor (max)	tanδ/μi	10^{-6}	0.25mT, 10kHz, 25°C	2	3	2	3		2		3	3	3	3	5	5	3	10	6	3	4	3	4
Relative loss factor (max)			0.25mT, 100kHz, 25°C	5	8	3	4		3	4	6	10	10	15	40	60	20	10	10	10	4	5	6
Coercive Field (max)	Hc	A/m	10KHz, 25°C	10	4	11	11	8	10	15	15	3	3	3	5	4	4	20	14	10	10	10	25
Hysteris material Coefficient (max)	η_B	10^{-6}/mT	25°C	1.2	1.2	1	1	1.1	1.2	0.3	0.3	0.8	1	0.8	0.6	0.5	0.2		2	1	-1	1.34	
Curie Temperature (min)	Tc	°C	----	220	210	210	210	200	220	205	180	170	170	140	130	120	120	190	170	200	240	210	170
Density (min)	d	kg/m³	25°C	4800	4850	4850	4850	4850	4800	4900	4900	4900	4900	4900	4900	4900	4900	4850	4850	4800	4800	4800	4700
Temperature Coeff. of permeability (max)	α_F	10^{-6}/°C	-40 to 85°C	4	4	4	4	2.5	1.5	1.2	1.2	3	2.5	3	2	2	2	±3	±0.4	2	8	13	3
Resistivity (min)	ρ	Ωm	25°C	5	5	5	8	3	7	2	1	1	1	1	0.6	0.5	0.5	10	1	1	4	4	

MCIE INDIA

Your global partner at home

CIE Automotive

MANAGING HIGH VALUE ADDED PROCESSES

Thank You