SmCo

Samarium Cobalt Magnet Material

Sintered Samarium Cobalt (SmCo) was the first of the Rare Earth family of permar
magnet materials. Developed in the 1960's, it revolutionised magnetic design
offering substantial improvements in energy product to that of other materials at the
time, such as Alnico and Ceramic Ferrite.

There are two main groups of grades available in SmCo; 1:5 and 2:17. The 2:17 gr
SmCo grades offer the highest energy product (BHmax), ranging from 22 MGOe to
MGOe. SmCo not only offers grades that can rival Neodymium-Iron-Boron (NdFeB
performance but has the added advantage of excellent temperature and corrosion
resistance. Its maximum working temperature is up to 350°C and displays low levels of losses during its temperature climb.

SmCo is considered to be the magnet material of choice for many engineers looking for a material that offers high energy in harsh
challenging environments. It is often used in high temperature motors and drives, marine application, Oil and Gas, Aerospace, Mec
and Vacuum industries.

Magnet Sales and Service offers a wide range of standard sizes from stock and offers rapid prototyping for bespoke components a
assembly work.

Design Considerations

The working environment is often the determining reason for choosing SmCo. Although it is more costly than other high
materials such as NdFeB, it is able to work in some very difficult environments.

SmCo 2:17 has excellent resistance to corrosion, which allows it to work in areas of high humidity, often without coating. SmCo 2:1
ability to withstand the influences of temperature is its greatest strength and the level of temperature losses compared to NdFeB is
far less, therefore SmCo can operate continuously and at a greater range of temperatures.

SmCo downfall is it its brittleness, it is very prone to chipping and must not be used as a structural component. SmCo also requires
extremely high fields to magnetise it, which can influence size and shape of component.

Summary

- Excellent resistance to corrosion
- High temperature performance
- High resistance to demagnetisation
- Standard stock sizes available
- Rapid Prototyping and assembly available

Grade and Magnetic Characteristics SmCo 2:17

2:17	Br		Hci	(BH)max	Density ^{3}	Max working ^{0}C
22/25			25			
24/25	10.3+/-0.3	9.2	25			
26/16	10.8+/-0.3	8.5	14	25	8.4	300
28/16	11.0 +/-0.3	9.8	13	27	8.4	300
30/12	11.3 +/-0.3	8.0	10	29	8.4	
32/12	11.5+/-0.3	8.0	10	31	8.4	300

* = MSS Standard 2:17 grade for raw material

SmCo 1:5

1:5	Br		Hci	(BH)max	Density ^{3}	Max working ^{0}C
18/18			16			
20/18			16			
22/15			14			
	10.0 +/-0.3	9.2		23	8.3	250

Physical and Mechanical Characteristics

Composition			SmCo2:17 32 30 28 26 24 22	SmCo1:5 24 22 20 18
Physical characteristics				
Curie	^{0}C		800 to 850	700 to 750
	(K)		(1073 to 1123)	(973 to 1023)
Thermal	C//	1^0C	8×10^6	6×10^6
		(1K)	(8×10^6)	(6×10^6)
	C	1^0C	11×10^6	13×10^6
		(1K)	(11×10^6)	(13×10^6)
Thermal	Kcal/mh^{0}C		10	11
	(W/mK)		(12)	(13)
Specific heat	Cal/g^{0}C		8×10^2	9×10^2
	(J/kgK)		(335)	(377)
Specific	- cm		8.6×10^5	5.3×10^5
Mechanical characteristics				
Deflection	Kg/mm^2		15	18
	(N/m^2)		(1.5×10^8)	(1.8×10^8)
Compressive	Kg/mm^2		82	102
	(N/m^2)		(8×10^8)	(10×10^8)
Tensile strength	Kg/mm^2		3.6	4.1
	(N/m^2)		(3.5×10^7)	(4×10^7)
Young's	Kg/mm^2		1.2×10^4	1.6×10^4
	(N/m^2)		(1.2×10^{11})	(1.6×10^{11})
Vickers hardness			500 to 600	450 to 500

Saturation Magnetisation

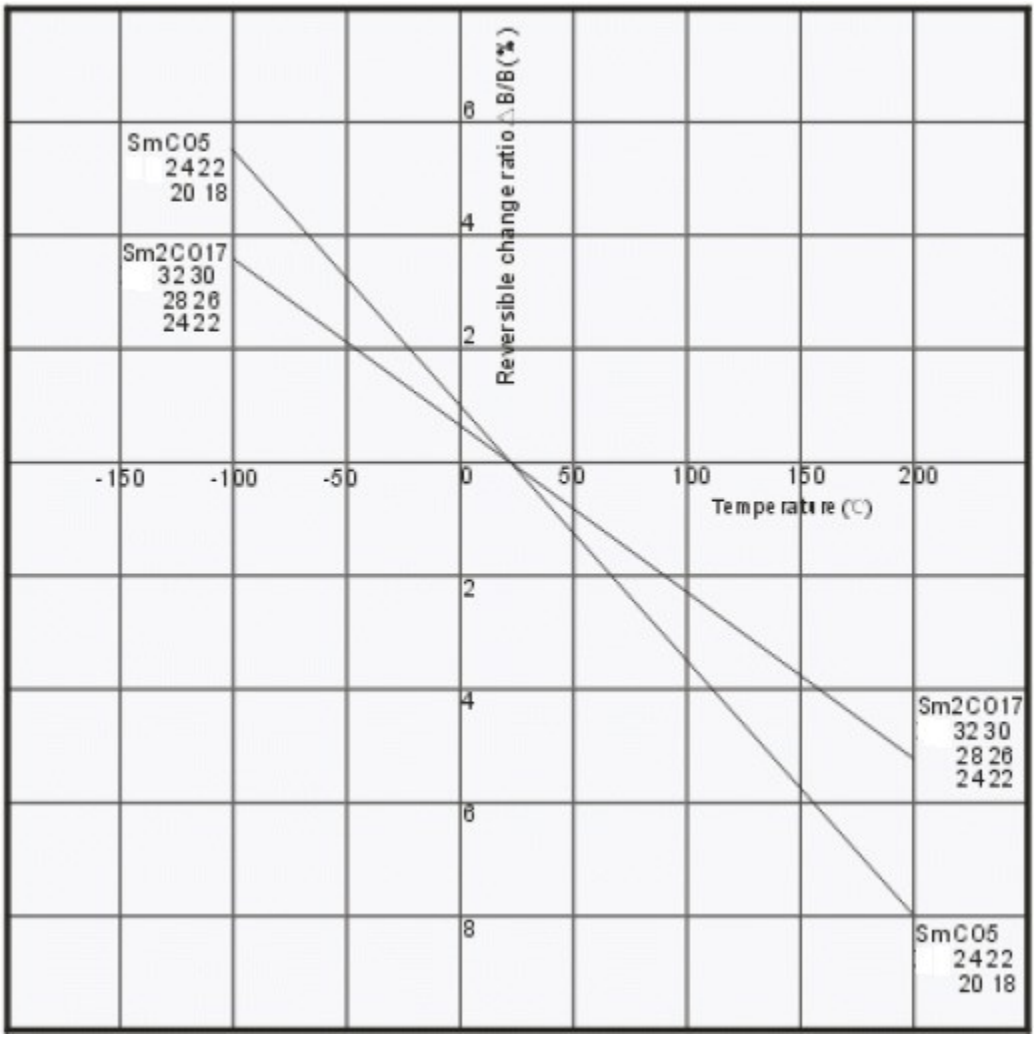
Material	Magnetic Field Strength H(min) KA/m	
SmCo 1:5	2400 (Hcj<1600)	4000 (Hcj>1600)
SmCo 2:17	4000 (Hcj<1000)	8000 (Hcj>1000)

Temperature Characteristics

Reversible Temperature Coefficient at -100 to 200°C

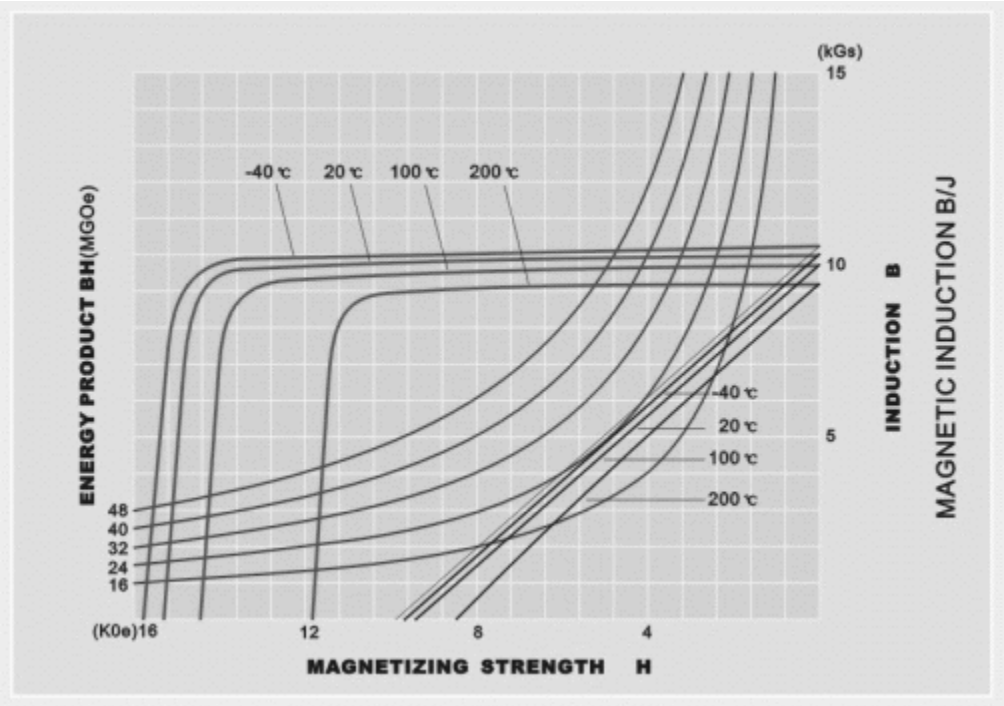
Temperature	-100°C to 20°C	20°C to 100°C	100°C to 200°C
	-0.045 % /°C	-0.045 % /°C	-0.050 % /°C
	-0.030% /°C	-0.030% /°C	-0.035% /°C

Reversible Temperature Change

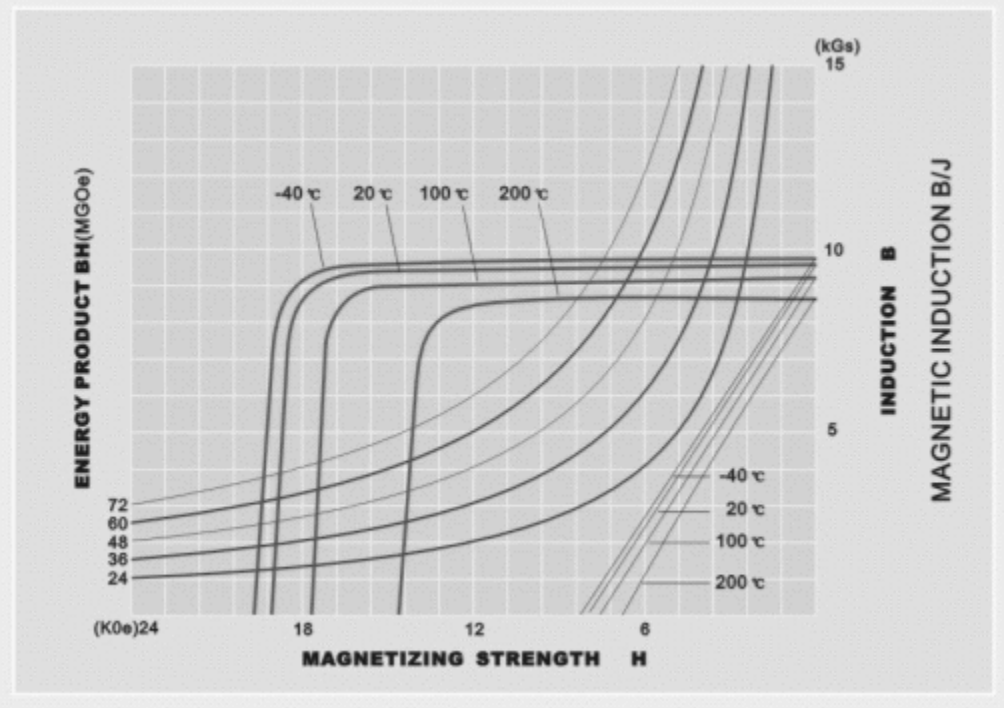


Demagnetisation Curve - SmCo 1:5 Grades

24/15



22/20



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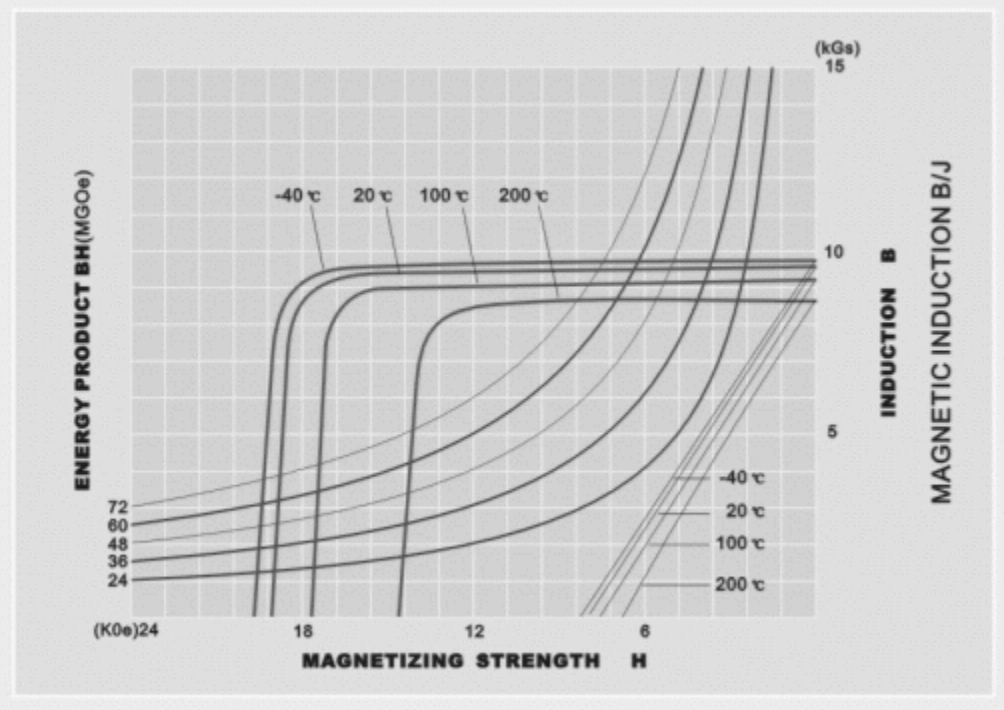
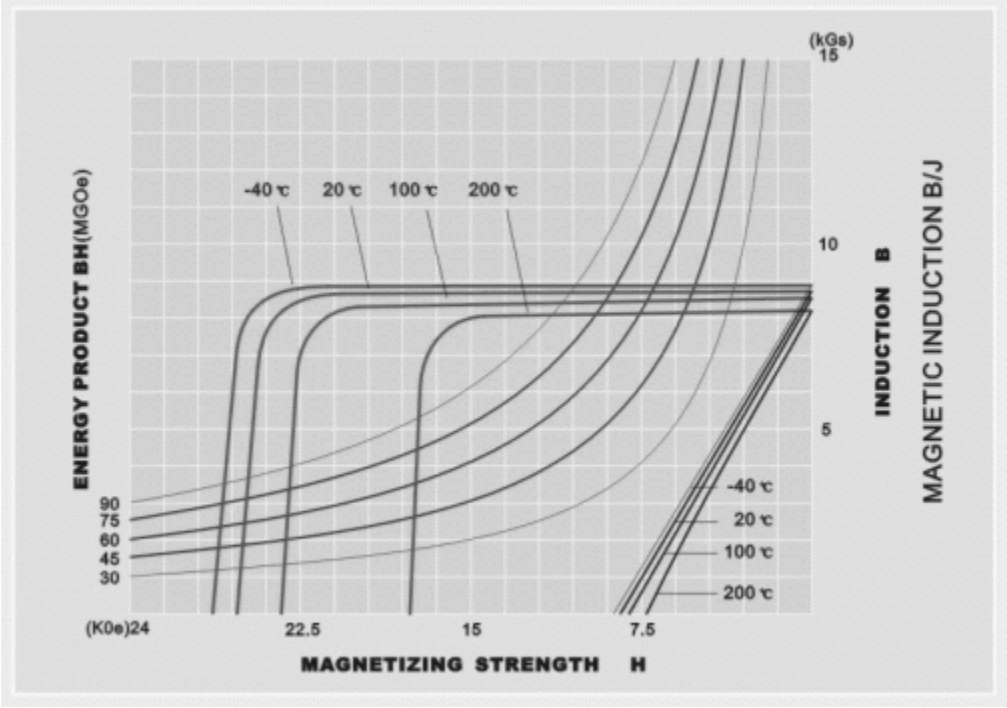
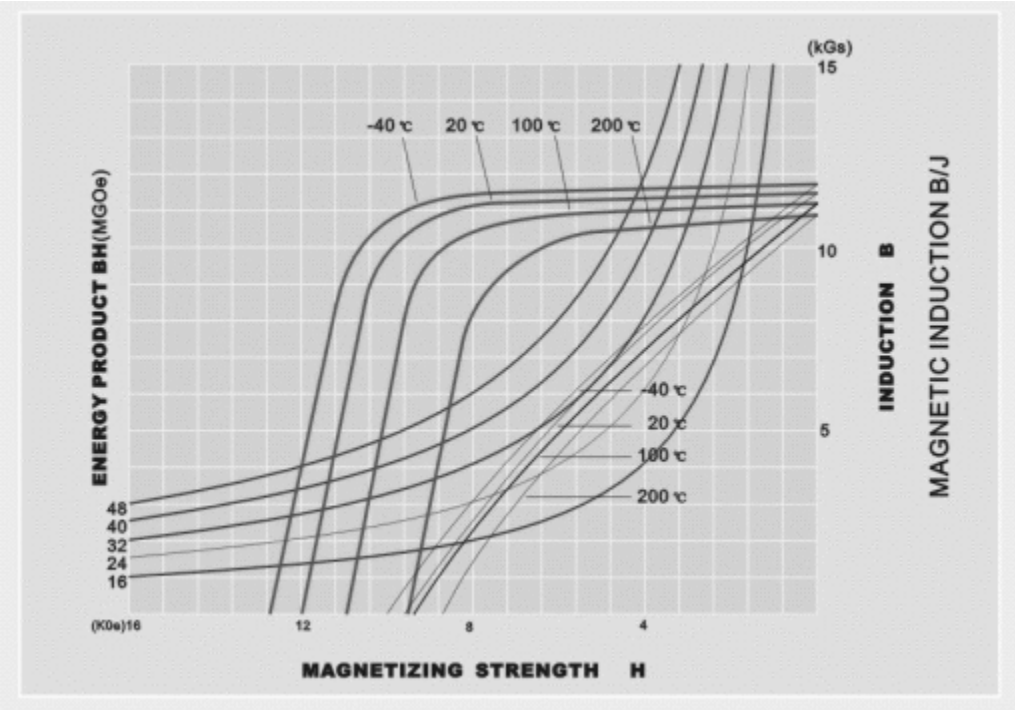

(kGs)
15
10
5
-40 ℃
20 ℃
100 ℃
200 ℃
ENERGY PRODUCT BH(MGOe)
72
60
48
36
24
(K0e)24
18
12
6
MAGNETIZING STRENGTH H
INDUCTION B
MAGNETIC INDUCTION B/J

18/25

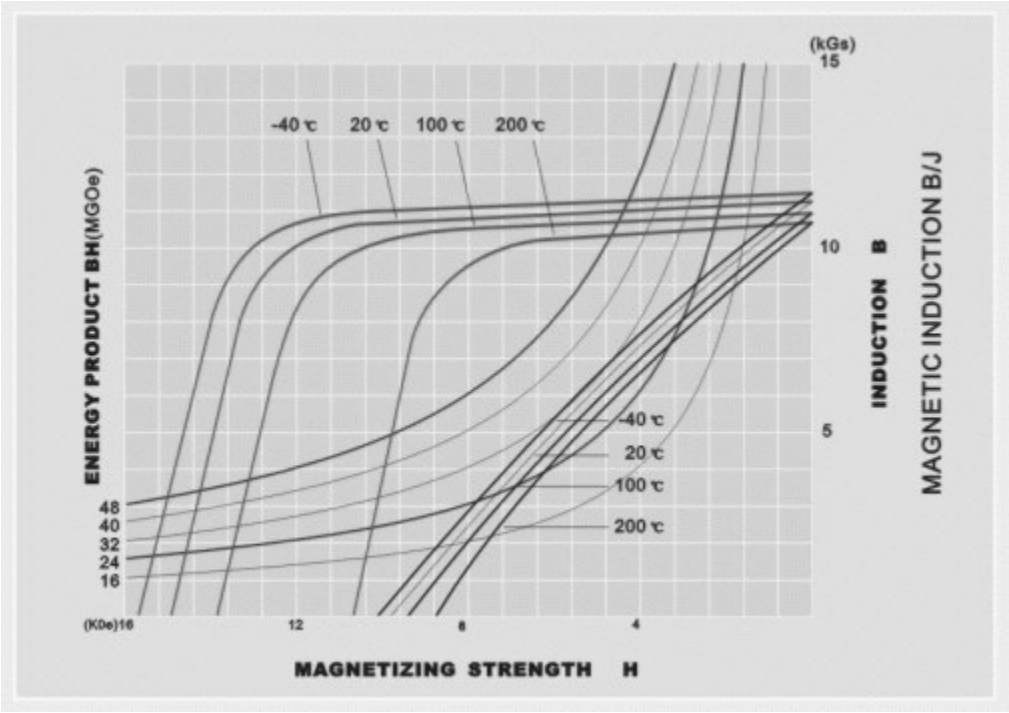

(kGs)
15
10
5
-40 ℃
20 ℃
100 ℃
200 ℃
ENERGY PRODUCT BH(MGOe)
90
75
60
45
30
(K0e)24
22.5
15
7.5
MAGNETIZING STRENGTH H
INDUCTION B
MAGNETIC INDUCTION B/J

Demagnetisation Curve - SmCo 2:17 Grades

32/12



30/15



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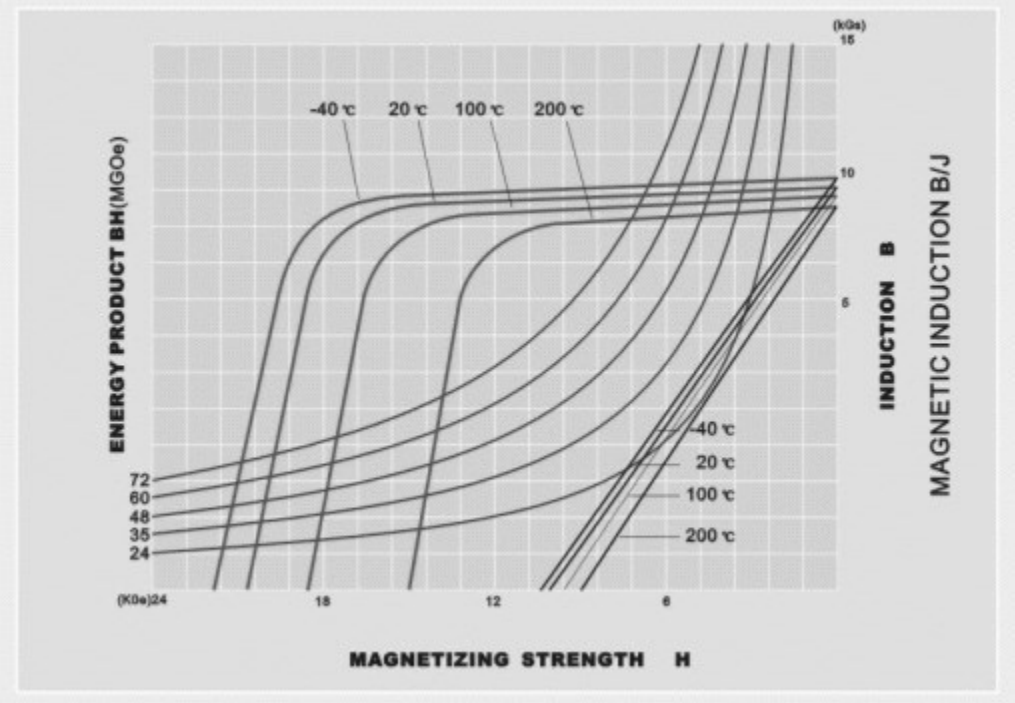
(kGs)
15
10
5
-40 ℃
20 ℃
100 ℃
200 ℃
ENERGY PRODUCT BH(MGOe)
72
60
48
35
24
(K0e)24
18
12
6
INDUCTION B
MAGNETIC INDUCTION B/J
-40 ℃
20 ℃
100 ℃
200 ℃
MAGNETIZING STRENGTH H