Ferrite Magnets

FB series

Issue date: June 2011

- All specifications are subject to change without notice.
- Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

FERRITE MAGNETS

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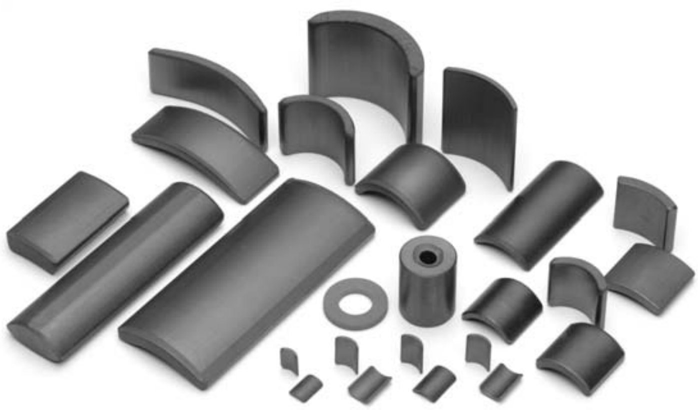
Ferrite Magnets FB Series

INTRODUCTION

From the development of the FB1A material grade in 1959, TDK's history of developing ferrite magnets has reflected with the progress of magnet application technology. Our technology departments faced many challenges, starting with the integration of physical properties, and including our efforts to reduce manufacturing costs by rationalizing our production lines and optimizing our material procurement practices to improve every product's performance to impart a "differentiating factor" for the applied product. Our pride and our passion as the first company to make ferrite materials commercially available to the industrial world have been the driving force behind our efforts. Our rapid and unerring response to changing needs, as well as our aggressive involvement in the development of new markets, is the essence of our over 50 years of history in the field of ferrite magnet development.
The fruits of our technological development and the unique expertise we have gained in this process are shared among the relevant divisions within the company.

TDK has established an "in-market" service system for responding quickly to orders and requests for technical services when customers contact one of our production or service offices. In addition to delivering high-quality magnets with excellent characteristics, we also actively support our customers' efforts to reduce design time and to optimize their designs based on our abundant expertise in the field of magnetic circuitry design.



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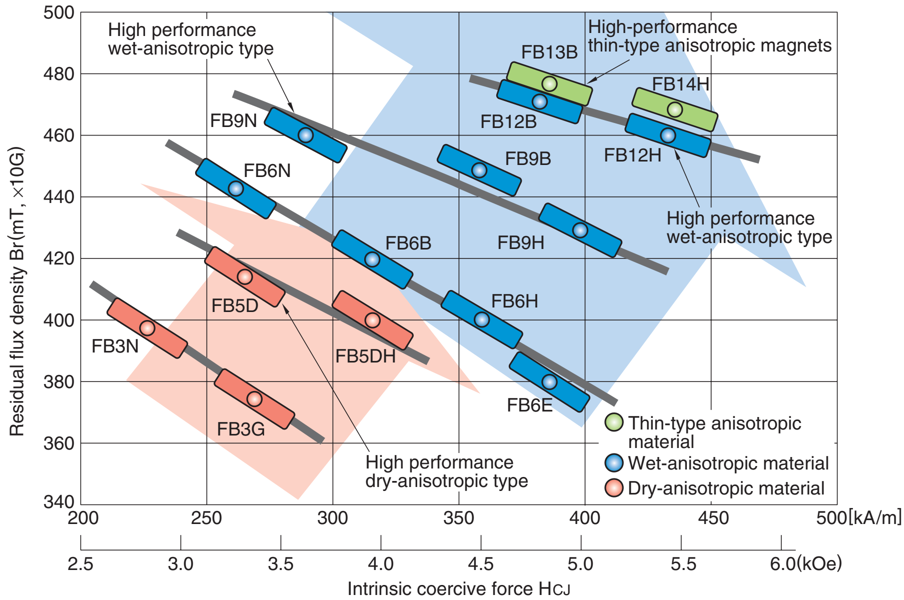
HIGH PERFORMANCE ANISOTROPIC MATERIALS SERIES

With new compositions and microstructures, these ferrite magnets deliver the best characteristics.

MATERIAL CHARACTERISTICS DISTRIBUTION



MAGNETIC CHARACTERISTICS

Material			Thin-type anisotropic		Wet-anisotropic		Dry-anisotropic	
			FB13B	FB14H	FB12B	FB12H	FB5D	FB5DH
Residual flux density	Br	[mT]	475±10	470±10	470±10	460±10	415±10	400±10
		(kG)	4.75±0.1	4.70±0.1	4.70±0.1	4.60±0.1	4.15±0.1	4.00±0.1
Coercive force	HCB	[kA/m]	340±20	355±20	340±12	345±15	254.6±12	278.6±12
		(kOe)	4.27±0.25	4.46±0.25	4.27±0.15	4.33±0.19	3.20±0.15	3.5±0.15
Intrinsic coercive force	HCJ	[kA/m]	380±20	430±20	380±12	430±15	262.6±16	318.3±16
		(kOe)	4.77±0.25	5.40±0.25	4.77±0.15	5.40±0.19	3.30±0.2	4.00±0.2
Maximum energy product	(BH)max	[kJ/m^3]	44.0±1.6	43.1±1.6	43.1±1.6	41.4±1.6	32.6±1.6	30.3±1.6
		(MGOe)	5.5±0.2	5.4±0.2	5.4±0.2	5.2±0.2	4.1±0.2	3.8±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

HIGH PERFORMANCE WET-ANISOTROPIC MATERIALS FB12 SERIES(FB12B • FB12H)

FEATURES

- This wet-molded anisotropic ferrite magnet has even greater superiority over the FB9 series and delivers the world's greatest magnetic force with an even further improved coercive force HCJ temperature coefficient.

APPLICATIONS

Electrical motors, actuators, appliance motors, medical equipment and other motors.

HIGH PERFORMANCE DRY-ANISOTROPIC MATERIALS FB5D SERIES(FB5D • FB5DH)

FEATURES

- These dry-molded ferrite magnets deliver magnetic characteristics that rival wet-molded magnets.
- These magnets can be made into small and complex shapes that are difficult to make as wet-molded magnets.
- Their coercive force HCJ temperature coefficient is also superior.

APPLICATIONS

Small motors for electric components, office computing and audio-visual equipment, household appliances and other motors.

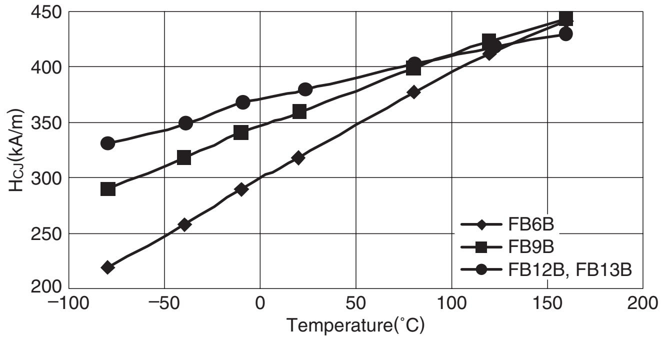
HIGH PERFORMANCE THIN-TYPE ANISOTROPIC MATERIALS FB13B/FB14H SERIES

TDK has established mass production technology for thin ferrite magnets, for which production was previously difficult, using its unique new method (NS1) while achieving the world's highest level in high-performance ferrite magnets. FB13B and FB14H are ferrite magnets that are suitable for size and weight reduction of motors.

FEATURES

- Contribute to compact in and lighter weight motor design by realizing thin-shape magnet production (Magnet’s thickness: 1.0 to 2.5mm).
- Excellent heat resistance, corrosion resistance, and ease of magnetization.
- Further improvement of irreversible demagnetization durability at lower temperature with FB12 material basis(Higher coercive force HcJ , and excellent temperature coefficient of HcJ) .
- Optimized grain orientation control improves the magnetic anisotropy to create ferrite magnets with the world’s highest performance.
- Support for specially-shaped configurations allows greater design freedom.

EXAMPLE OF MAGNETIC COERCIVE FORCE (HcJ) TEMPERATURE CHARACTERISTICS ACCORDING TO MATERIAL GRADE



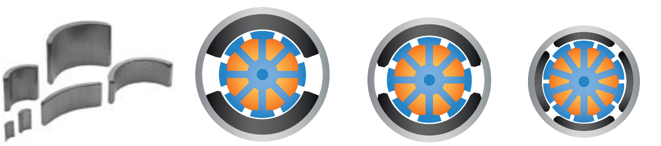
APPLICATIONS

Power windows, seat actuators, fuel pumps, other small motors and actuators

APPLICATION EXAMPLES

1. AN EXAMPLE OF SIZE AND WEIGHT REDUCTION OF A BRUSHED MOTOR

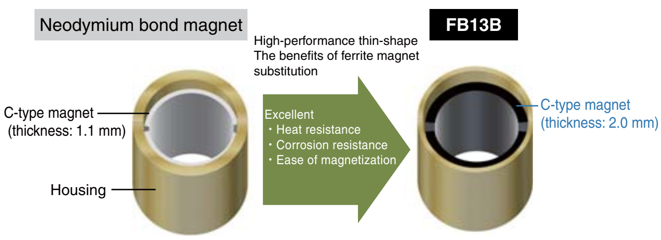
By adopting FB13B or FB14H in combination with a multipolar design of the motor in which the ferrite magnet is used, it will become possible to realize even further size and weight reduction of motors.



	FB6B	FB9B	FB13B
	2 poles	2 poles	4 poles
Motor diameter	ø40	ø37	ø33.4
Motor volume	100%	86%	70%
Magnet wall thickness	5.0	3.5	1.9
Total magnet weight	65	47	26
Total magnet weight ratio	100%	72%	40%

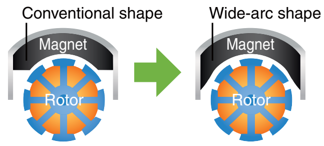
2. REPLACING A NEODYMIUM MAGNET WITH A HIGH-PERFORMANCE THIN-TYPE ANISOTROPIC FERRITE MAGNET(FB13B, FB14H)

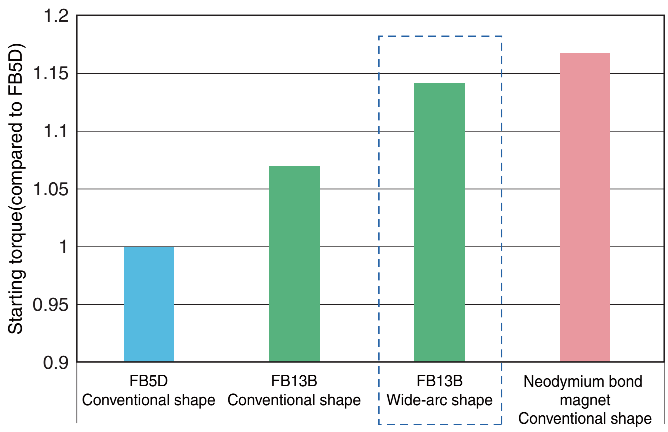
By adopting FB13B or FB14H, coating will be rendered unnecessary, allowing for easy magnetization after mounting.



3. TAKING ADVANTAGE OF CONFIGURATION FREEDOM TO IMPROVE MICROMOTOR PERFORMANCE

Nd-bonded magnets require coating when being applied in motors for which reliable thermal resistance and corrosion resistance are required.





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RECOMMENDED MATERIALS’ TABLE BY APPLICATION(TYPICAL)

AUTOMOTIVE, MOTOR-CYCLE

		Materials	FB series								
Application	Application product and function	Magnet’s shape	14H	13B	12B	12H	9N	9B	9H	5D	5DH
Motor	Fuel pump	C	●	●	●	●	●	●	●	●	●
	Power wind lift motor	C	●	●	●	●	●	●	●	●	●
	Motors for brake systems	C	●	●	●	●	●	●	●		
	Blower	C	●	●	●	●	●	●	●		
	Cooling fan motors	C	●	●	●	●	●	●	●		
	Window shield wiper	C	●	●	●	●	●	●	●		
	Power steering	C			●	●	●	●	●		
	Active suspension	C			●	●	●	●	●		
	Starter	C			●	●		●	●		
	Door lock	C								●	●
	Mirror actuator	C								●	●
	Electronic throttle motor	C	●	●	●	●	●	●	●		
	Power seats	C	●	●	●	●	●	●	●		
	Starter generators for two-wheeled vehicles	C			●	●	●	●	●		
Sensor	Current sensors, etc.	W,C,D	●	●						●	●
Others	Generator	C			●	●	●	●	●		

OA EQUIPMENT

		Materials	FB series								
Application	Application product and function	Magnet’s shape	14H	13B	12B	12H	9N	9B	9H	5D	5DH
Printer	Paper feeding	C								●	●
	Head actuator	C								●	●
Projector	Focusing motors for camera	C	●	●						●	●

HOME APPLIANCE

		Materials	FB series								
Application	Application product and function	Magnet’s shape	14H	13B	12B	12H	9N	9B	9H	5D	5DH
Air conditioner	Compressor	C	●	●	●	●	●	●	●		
	Fan	C			●	●	●	●	●	●	●
Washing machine	Main drive	C			●	●	●	●	●		
	Water supply pumps	C			●	●	●	●	●		
Refrigerator	Compressor	C			●	●	●	●	●		
Air filer	Fan	C								●	●
Mixer	Drive motor	C								●	●
Hair dryer	Fan	C								●	●
Shaver	Drive motor	C								●	●
Electric tool	Drive motor	C	●	●	●	●	●	●		●	●
Various pumps	Drive motor	C	●	●	●	●	●	●		●	●

MEDICAL/HEALTH CARE EQUIPMENT

		Materials	FB series								
Application	Application product and function	Magnet’s shape	14H	13B	12B	12H	9N	9B	9H	5D	5DH
Medical equipment	Dental instruments, Medical pump	C	●	●						●	●
Analysis equipment	Pump unit	C								●	
Magnetic health care equipment	Electric bed motors	C			●	●	●	●	●		

MAGNETIC, PHYSICAL AND MECHANICAL CHARACTERISTICS

WET-ANISOTROPIC MATERIALS

Material			FB13B	FB14H	FB12B	FB12H	FB9N
Composition			$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$
Residual flux density		[mT]	475±10	470±10	470±10	460±10	460±10
Br		(kG)	4.75±0.1	4.70±0.1	4.7±0.1	4.6±0.1	4.6±0.1
Coercive force		[kA/m]	340±20	355±20	340±12	345±15	278.5±12
H_{CB}		(kOe)	4.27±0.25	4.46±0.25	4.3±0.15	4.3±0.19	3.5±0.15
Intrinsic coercive force		[kA/m]	380±20	430±20	380±12	430±15	286.5±12
H_{CJ}		(kOe)	4.77±0.25	5.40±0.25	4.8±0.15	5.4±0.19	3.6±0.15
Maximum energy product		$[kJ/m^3]$	44.0±1.6	43.1±1.6	43.1±1.6	41.4±1.6	40.4±1.6
(BH)max		(MGOe)	5.5±0.2	5.4±0.2	5.4±0.2	5.2±0.2	5.1±0.2
Recoil permeability μ_{rec}			1.05 to 1.1	1.05 to 1.1	1.05 to 1.1	1.05 to 1.1	1.05 to 1.1
Temperature coefficient		[%/K]	–0.18	–0.18	–0.18	–0.18	–0.18
of Br ΔBr/Br/ΔT		(%/°C)	–0.18	–0.18	–0.18	–0.18	–0.18
Curie temperature		[K]	733	733	733	733	733
Tc		(°C)	460	460	460	460	460
Coefficient of thermal	C//*	[1/K](1/°C)	15×10^{-6}	15×10^{-6}	15×10^{-6}	15×10^{-6}	15×10^{-6}
expansion ΔL/L/ΔT	C⊥*	[1/K](1/°C)	10×10^{-6}	10×10^{-6}	10×10^{-6}	10×10^{-6}	10×10^{-6}
Specific heat		[J/kg • K]	837	837	837	837	837
		(cal/g • °C)	0.2	0.2	0.2	0.2	0.2
Density		$[kg/m^3]$	5.07 to 5.17×10^3	5.02 to 5.12×10^3	5.07 to 5.17×10^3	5.02 to 5.12×10^3	5.0 to 5.1×10^3
		(g/cm^3)	5.07 to 5.17	5.02 to 5.12	5.07 to 5.17	5.02 to 5.12	5.0 to 5.1
Deflection strength		$[N/m^2]$	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8
		(kgf/mm^2)	5 to 9	5 to 9	5 to 9	5 to 9	5 to 9
Compressive strength		$[N/m^2]$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$
		(kgf/mm^2)	>70	>70	>70	>70	>70
Tensile strength		$[N/m^2]$	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8
		(kgf/mm^2)	2 to 5	2 to 5	2 to 5	2 to 5	2 to 5

Material			FB9B	FB9H	FB6N	FB6B	FB6H
Composition			$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$
Residual flux density		[mT]	450±10	430±10	440±10	420±10	400±10
Br		(kG)	4.5±0.1	4.3±0.1	4.4±0.1	4.2±0.1	4.0±0.1
Coercive force		[kA/m]	342.2±12	330.2±12	258.6±12	302.4±12	302.4±12
H_{CB}		(kOe)	4.3±0.15	4.15±0.15	3.25±0.15	3.8±0.15	3.8±0.15
Intrinsic coercive force		[kA/m]	358.1±12	397.1±12	262.6±12	318.3±12	358.1±12
H_{CJ}		(kOe)	4.5±0.15	5.0±0.15	3.3±0.15	4.0±0.15	4.5±0.15
Maximum energy product		$[kJ/m^3]$	38.6±1.6	35.0±1.6	36.7±1.6	33.4±1.6	30.3±1.6
(BH)max		(MGOe)	4.9±0.2	4.4±0.2	4.6±0.2	4.2±0.2	3.8±0.2
Recoil permeability μ_{rec}			1.05 to 1.1	1.05 to 1.1	1.05 to 1.1	1.05 to 1.1	1.05 to 1.1
Temperature coefficient		[%/K]	–0.18	–0.18	–0.18	–0.18	–0.18
of Br ΔBr/Br/ΔT		(%/°C)	–0.18	–0.18	–0.18	–0.18	–0.18
Curie temperature		[K]	733	733	733	733	733
Tc		(°C)	460	460	460	460	460
Coefficient of thermal	C//*	[1/K](1/°C)	15×10^{-6}	15×10^{-6}	15×10^{-6}	15×10^{-6}	15×10^{-6}
expansion ΔL/L/ΔT	C⊥*	[1/K](1/°C)	10×10^{-6}	10×10^{-6}	10×10^{-6}	10×10^{-6}	10×10^{-6}
Specific heat		[J/kg • K]	837	837	837	837	837
		(cal/g • °C)	0.2	0.2	0.2	0.2	0.2
Density		$[kg/m^3]$	4.95 to 5.05×10^3	4.9 to 5.0×10^3	4.9 to 5.0×10^3	4.9 to 5.0×10^3	4.9 to 5.0×10^3
		(g/cm^3)	4.95 to 5.05	4.9 to 5.0	4.9 to 5.0	4.9 to 5.0	4.9 to 5.0
Deflection strength		$[N/m^2]$	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8
		(kgf/mm^2)	5 to 9	5 to 9	5 to 9	5 to 9	5 to 9
Compressive strength		$[N/m^2]$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$
		(kgf/mm^2)	>70	>70	>70	>70	>70
Tensile strength		$[N/m^2]$	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8
		(kgf/mm^2)	2 to 5	2 to 5	2 to 5	2 to 5	2 to 5

* C//: Measured values in the direction of the easy axis of magnetization
  C⊥: Measured values in the perpendicular direction to the easy axis of magnetization

• [ ]: in the unit of SI, ( ): in the unit of CGS

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WET-ANISOTROPIC MATERIALS

Material			FB6E	FB5B	FB5H
Composition			$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$
Residual flux density		[mT]	380±10	420±10	405±10
Br		(kG)	3.8±0.1	4.2±0.1	4.05±0.1
Coercive force		[kA/m]	290.5±12	262.6±12	298.4±12
H_{CB}		(kOe)	3.65±0.15	3.3±0.15	3.75±0.15
Intrinsic coercive force		[kA/m]	393.9±12	266.6±12	322.3±12
H_{CJ}		(kOe)	4.95±0.15	3.35±0.15	4.05±0.15
Maximum energy product		[kJ/m³]	27.5±1.6	33.4±1.6	31.1±1.6
(BH)max		(MGOe)	3.45±0.2	4.2±0.2	3.9±0.2
Recoil permeability μ_{rec}			1.05 to 1.1	1.05 to 1.1	1.05 to 1.1
Temperature coefficient		[%/K]	–0.18	–0.18	–0.18
of Br ΔBr/Br/ΔT		(%/°C)	–0.18	–0.18	–0.18
Curie temperature		[K]	733	733	733
Tc		(°C)	460	460	460
Coefficient of thermal	C//*	[1/K](1/°C)	15×10^{-6}	15×10^{-6}	15×10^{-6}
expansion ΔL/L/ΔT	C⊥*	[1/K](1/°C)	10×10^{-6}	10×10^{-6}	10×10^{-6}
Specific heat		[J/kg • K]	837	837	837
		(cal/g • °C)	0.2	0.2	0.2
Density		[kg/m³]	4.9 to 5.0×10^3	4.9 to 5.0×10^3	4.85 to 4.95×10^3
		(g/cm³)	4.9 to 5.0	4.9 to 5.0	4.85 to 4.95
Deflection strength		[N/m²]	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8
		(kgf/mm²)	5 to 9	5 to 9	5 to 9
Compressive strength		[N/m²]	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$
		(kgf/mm²)	>70	>70	>70
Tensile strength		[N/m²]	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8
		(kgf/mm²)	2 to 5	2 to 5	2 to 5

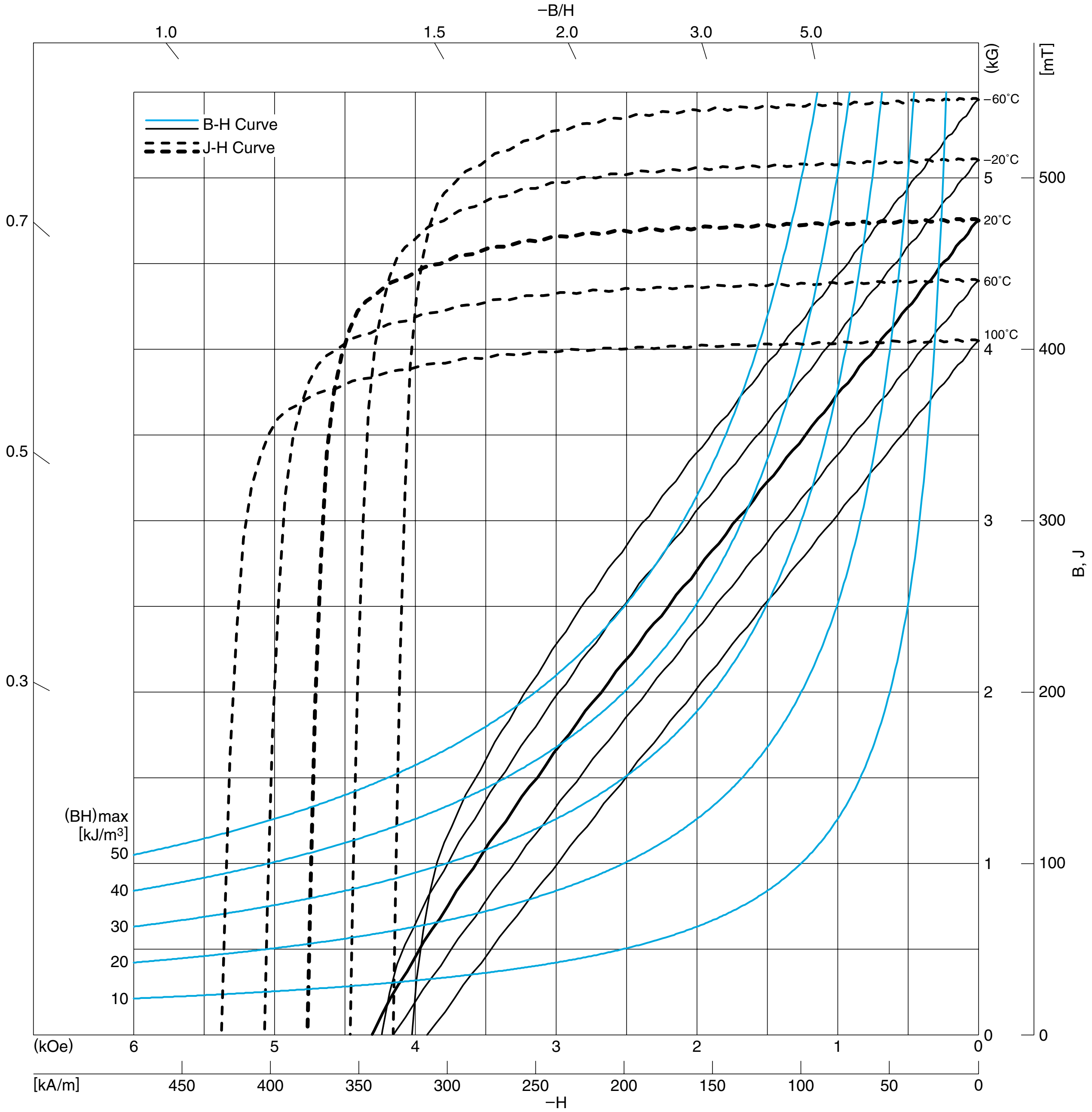
DRY-ANISOTROPIC AND DRY-ISOTROPIC MATERIALS

Material			FB5D	FB5DH	FB3N	FB3G
Composition			$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$	$SrO6Fe_2O_3$
Residual flux density		[mT]	415±10	400±10	395±15	375±15
Br		(kG)	4.15±0.1	4.00±0.1	3.95±0.15	3.75±0.15
Coercive force		[kA/m]	254.6±12	278.6±12	234.8±12	254.6±16
H_{CB}		(kOe)	3.2±0.15	3.5±0.15	2.95±0.15	3.2±0.2
Intrinsic coercive force		[kA/m]	262.6±16	318.3±16	238.7±16	270.6±16
H_{CJ}		(kOe)	3.3±0.2	4.0±0.2	3.0±0.2	3.4±0.25
Maximum energy product		[kJ/m³]	32.6±1.6	30.3±1.6	28.7±2.4	25.9±2.4
(BH)max		(MGOe)	4.1±0.2	3.8±0.2	3.6±0.3	3.25±0.3
Recoil permeability μ_{rec}			1.05 to 1.10	1.05 to 1.10	1.1 to 1.2	1.1 to 1.2
Temperature coefficient		[%/K]	–0.18	–0.18	–0.18	–0.18
of Br ΔBr/Br/ΔT		(%/°C)	–0.18	–0.18	–0.18	–0.18
Curie temperature		[K]	733	733	733	733
Tc		(°C)	460	460	460	460
Coefficient of thermal	C//*	[1/K](1/°C)	15×10^{-6}	15×10^{-6}	15×10^{-6}	15×10^{-6}
expansion ΔL/L/ΔT	C⊥*	[1/K](1/°C)	9×10^{-6}	9×10^{-6}	9×10^{-6}	9×10^{-6}
Specific heat		[J/kg • K]	837	837	837	837
		(cal/g • °C)	0.2	0.2	0.2	0.2
Density		[kg/m³]	5.0 to 5.1×10^3	5.0 to 5.1×10^3	4.7 to 4.9×10^3	4.6 to 4.9×10^3
		(g/cm³)	5.0 to 5.1	5.0 to 5.1	4.7 to 4.9	4.6 to 4.9
Deflection strength		[N/m²]	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8	0.5 to 0.9×10^8
		(kgf/mm²)	5 to 9	5 to 9	5 to 9	5 to 9
Compressive strength		[N/m²]	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$	$>6.9\times10^8$
		(kgf/mm²)	>70	>70	>70	>70
Tensile strength		[N/m²]	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8	0.2 to 0.5×10^8
		(kgf/mm²)	2 to 5	2 to 5	2 to 5	2 to 5

* C//: Measured values in the direction of the easy axis of magnetization
  C⊥: Measured values in the perpendicular direction to the easy axis of magnetization
• [ ]: in the unit of SI, ( ): in the unit of CGS

DEMAGNETIZATION CURVES/MAGNETIC CHARACTERISTICS

THIN-TYPE MATERIAL FB13B
DEMAGNETIZATION CURVE



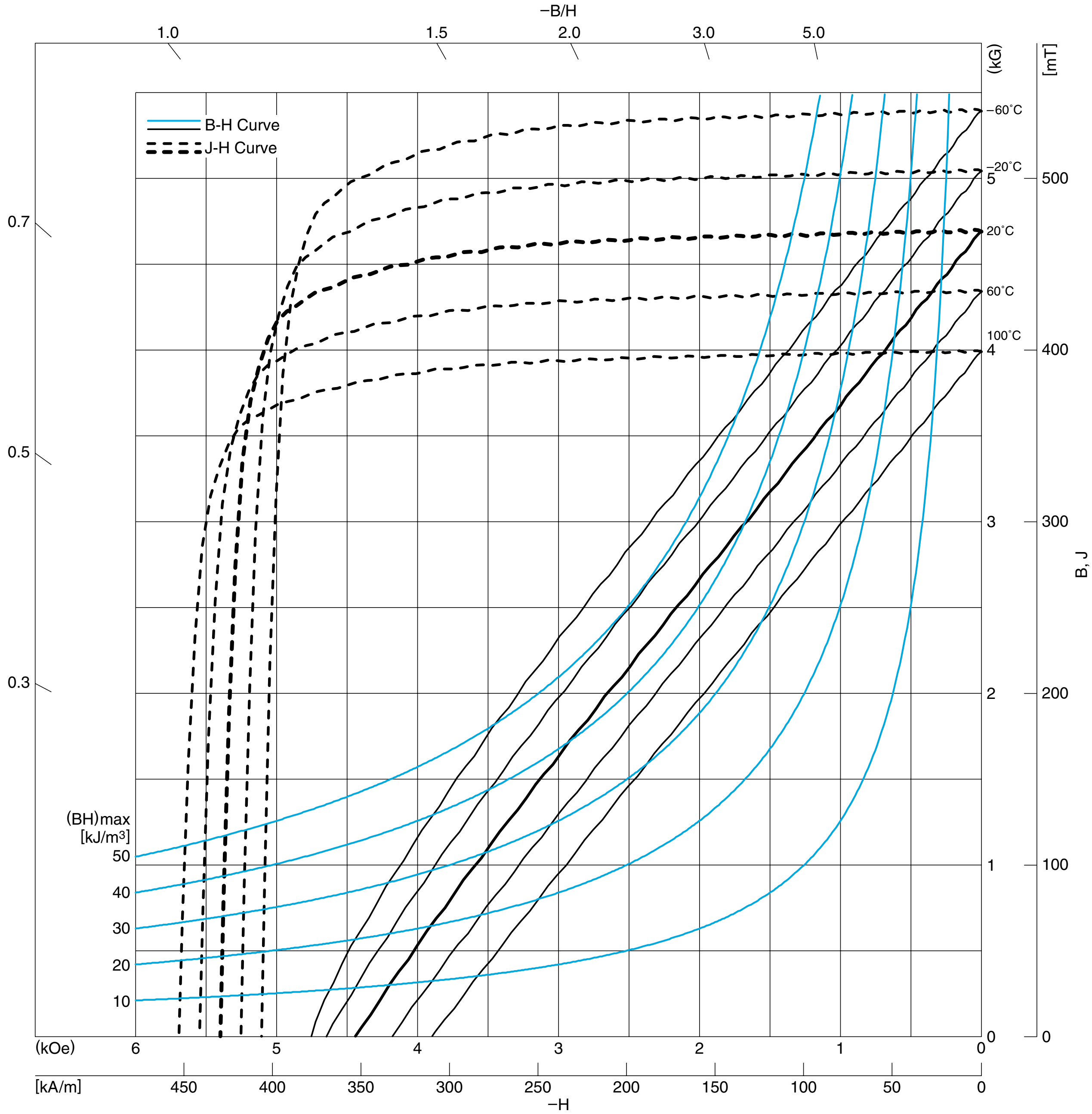
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	475±10
Br	(kG)	4.75±0.1
Coercive force	[kA/m]	340±20
HcB	(kOe)	4.27±0.25
Intrinsic coercive force	[kA/m]	380±20
HcJ	(kOe)	4.77±0.25
Maximum energy product	[kJ/m3]	44.0±1.6
(BH)max	(MGOe)	5.5±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

THIN-TYPE MATERIAL FB14H
DEMAGNETIZATION CURVE



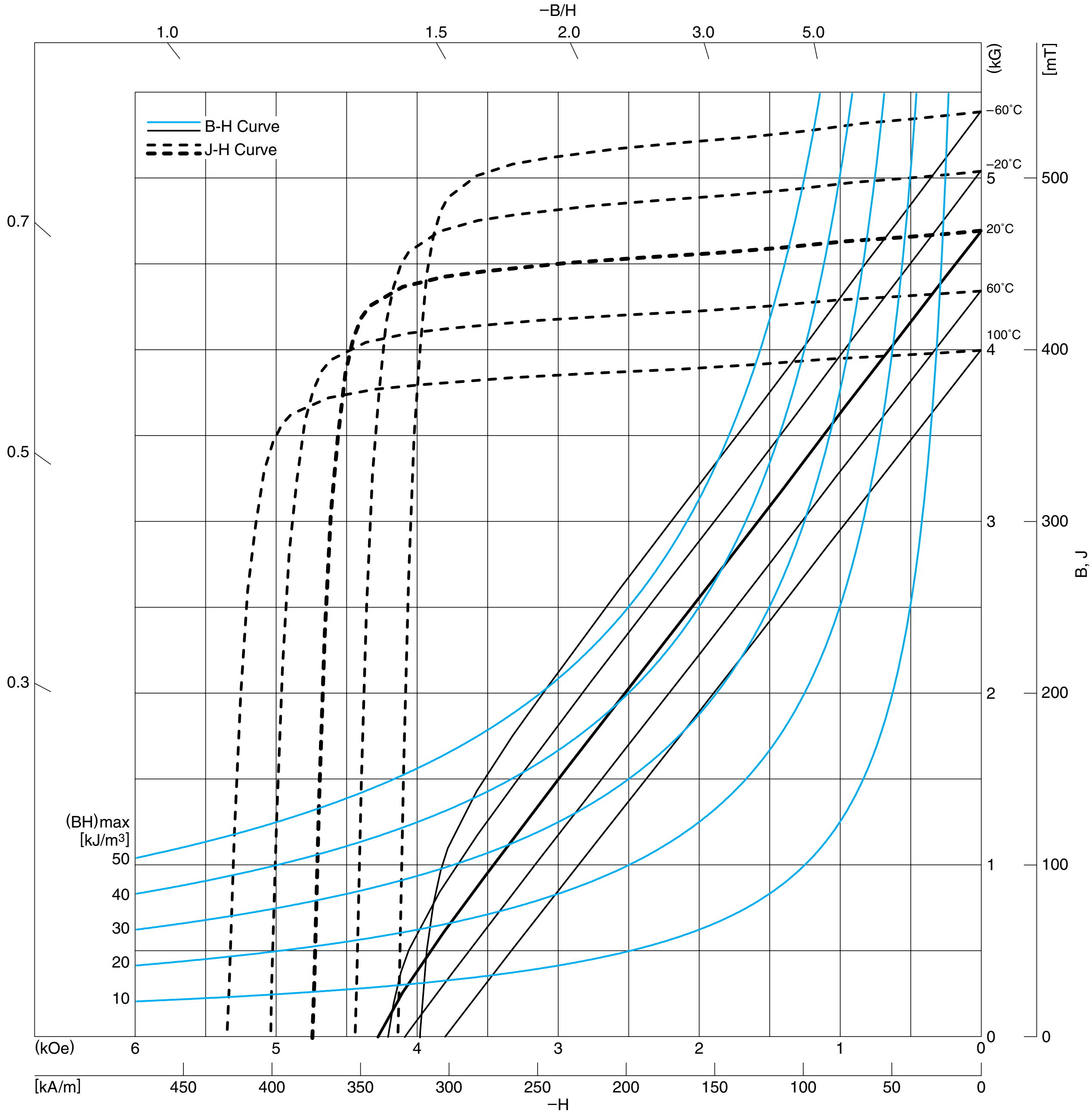
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	470±10
Br	(kG)	4.70±0.1
Coercive force	[kA/m]	355±20
HcB	(kOe)	4.46±0.25
Intrinsic coercive force	[kA/m]	430±20
HcJ	(kOe)	5.40±0.25
Maximum energy product	[kJ/m3]	43.1±1.6
(BH)max	(MGOe)	5.4±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

WET-ANISOTROPIC MATERIAL FB12B
DEMAGNETIZATION CURVE



MAGNETIC CHARACTERISTICS

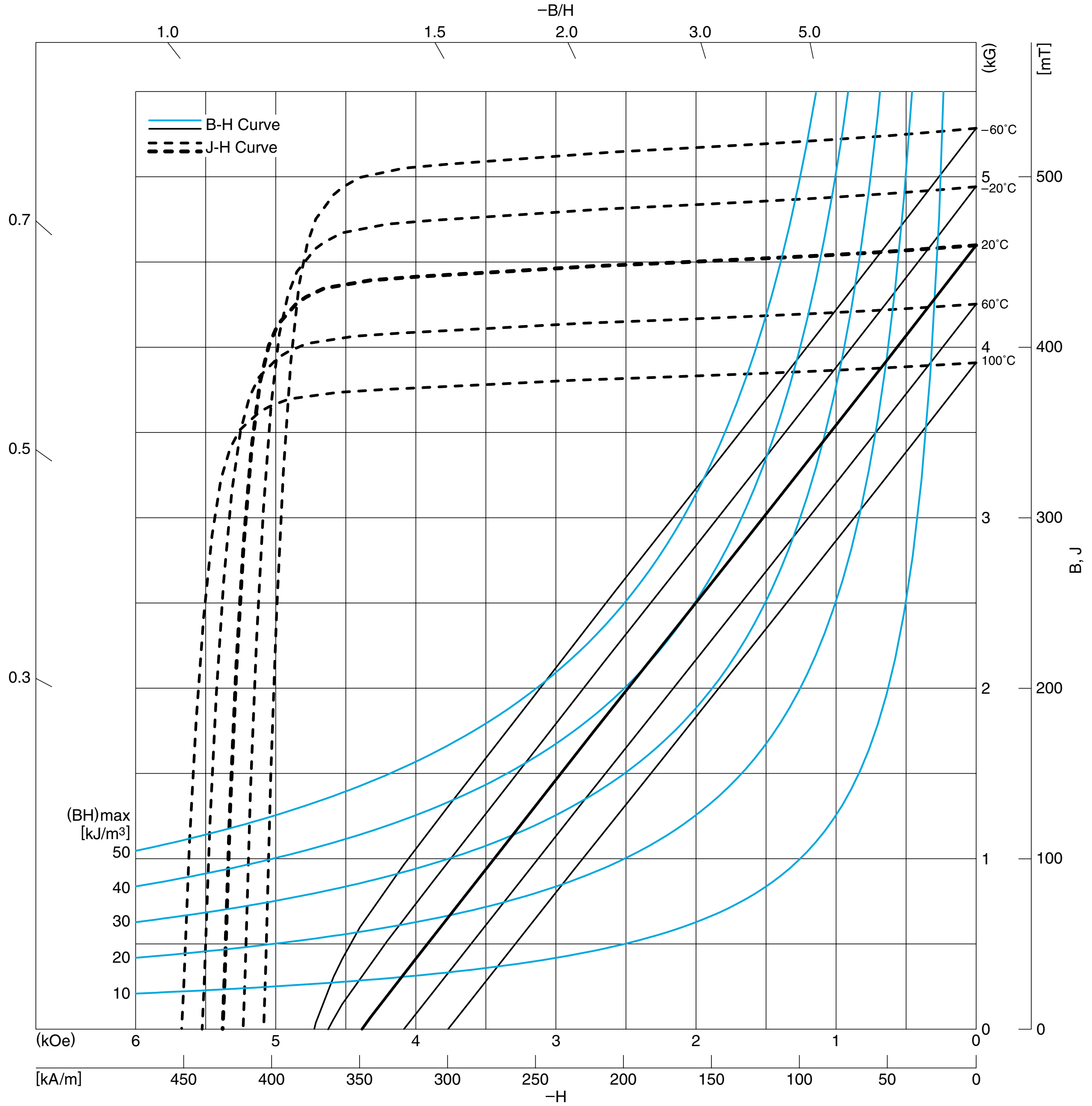
Residual flux density	[mT]	470±10
Br	(kG)	4.7±0.1
Coercive force	[kA/m]	340±12
HcB	(kOe)	4.3±0.15
Intrinsic coercive force	[kA/m]	380±12
HcJ	(kOe)	4.8±0.15
Maximum energy product	[kJ/m3]	43.1±1.6
(BH)max	(MGOe)	5.4±0.2

• [ ]: in the unit of SI
( ): in the unit of CGS

• All specifications are subject to change without notice.

TDK

WET-ANISOTROPIC MATERIAL FB12H
DEMAGNETIZATION CURVE



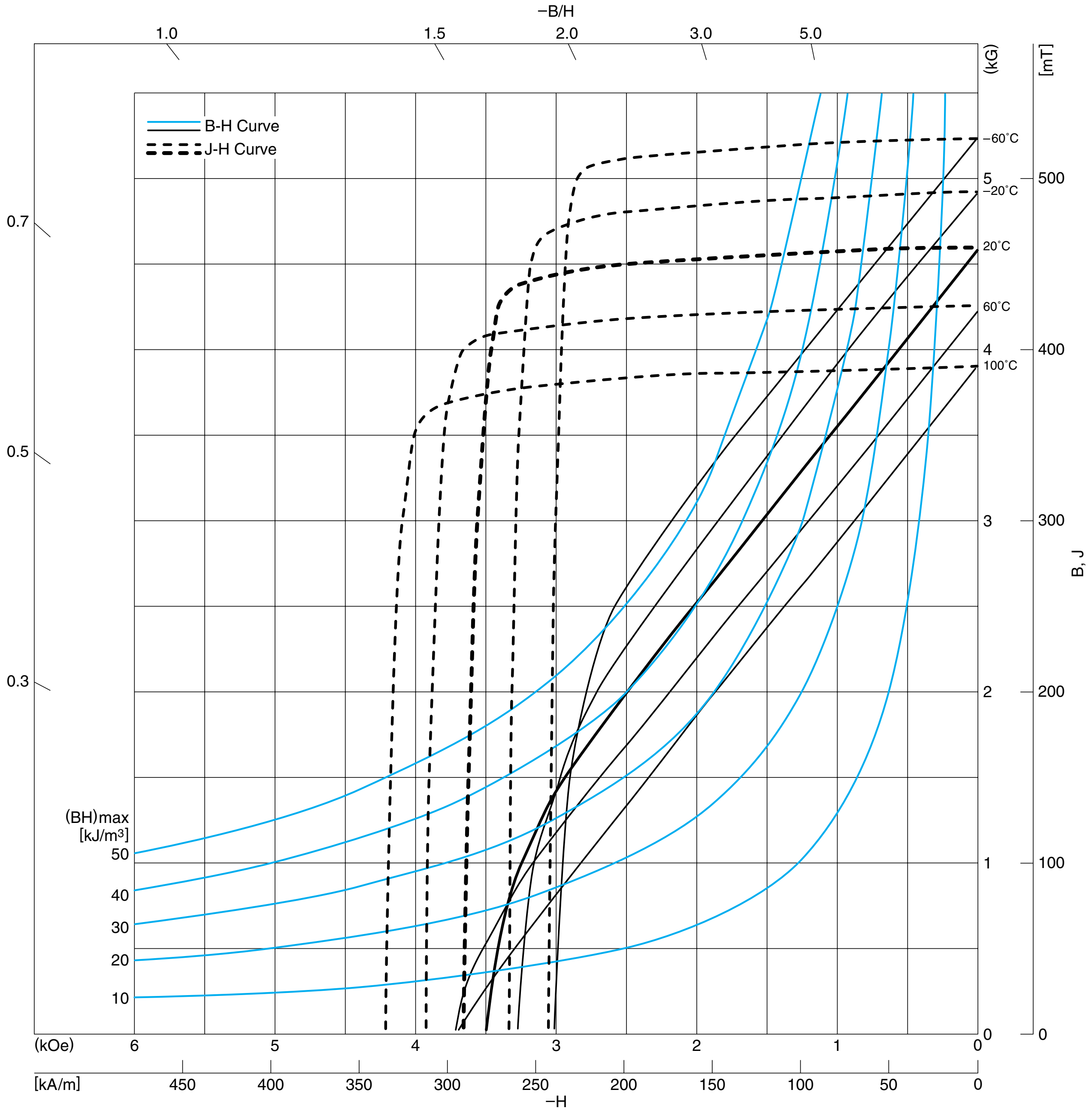
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	460±10
Br	(kG)	4.6±0.1
Coercive force	[kA/m]	345±15
HcB	(kOe)	4.3±0.19
Intrinsic coercive force	[kA/m]	430±15
HcJ	(kOe)	5.4±0.19
Maximum energy product	[kJ/m3]	41.4±1.6
(BH)max	(MGOe)	5.2±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

WET-ANISOTROPIC MATERIAL FB9N
DEMAGNETIZATION CURVE



MAGNETIC CHARACTERISTICS

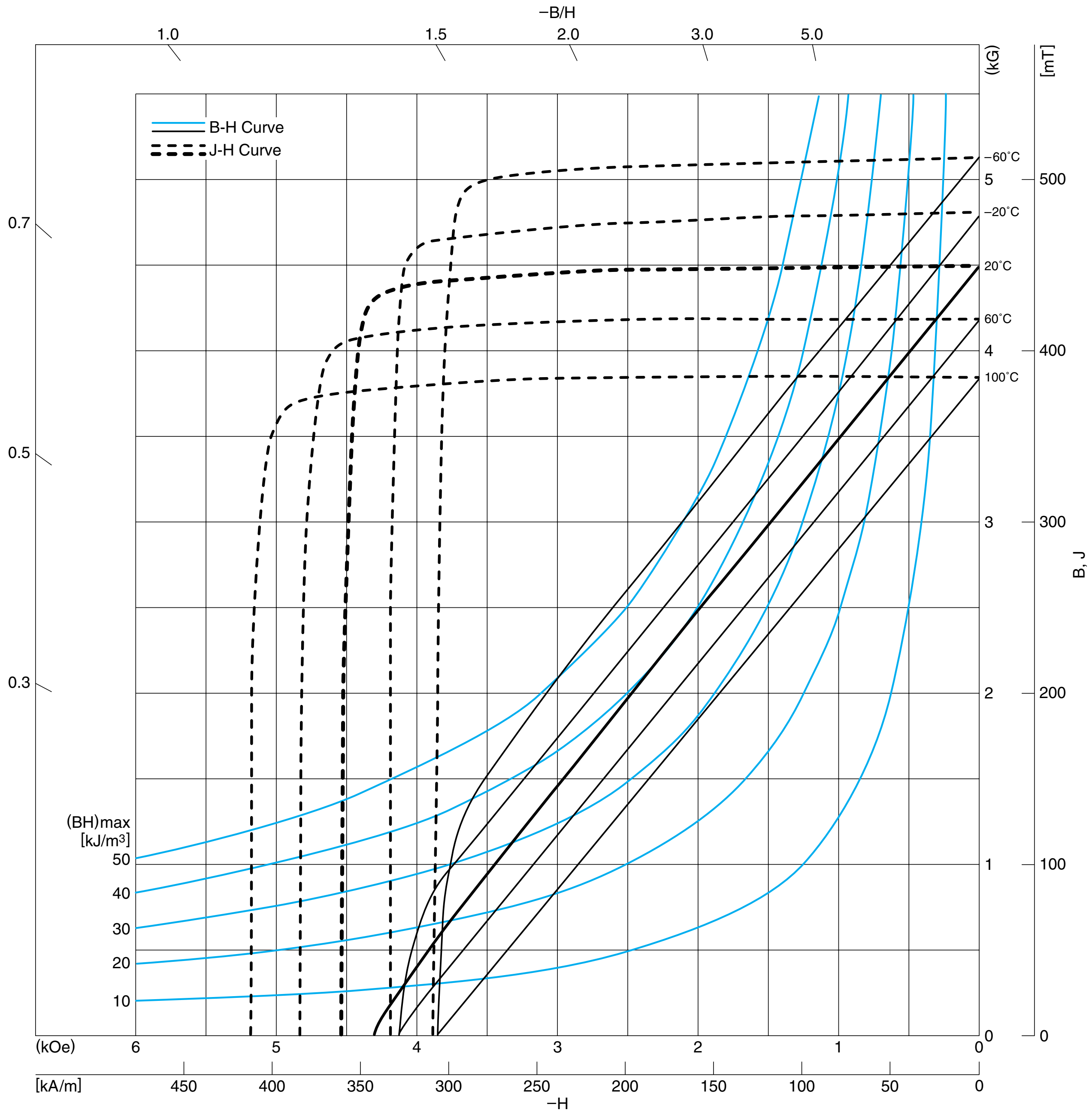
Residual flux density	[mT]	460±10
Br	(kG)	4.60±0.1
Coercive force	[kA/m]	278.5±12
HcB	(kOe)	3.5±0.15
Intrinsic coercive force	[kA/m]	286.5±12
HcJ	(kOe)	3.6±0.15
Maximum energy product	[kJ/m3]	40.4±1.6
(BH)max	(MGOe)	5.1±0.2

• [ ]: in the unit of SI
( ): in the unit of CGS

• All specifications are subject to change without notice.

TDK

WET-ANISOTROPIC MATERIAL FB9B
DEMAGNETIZATION CURVE



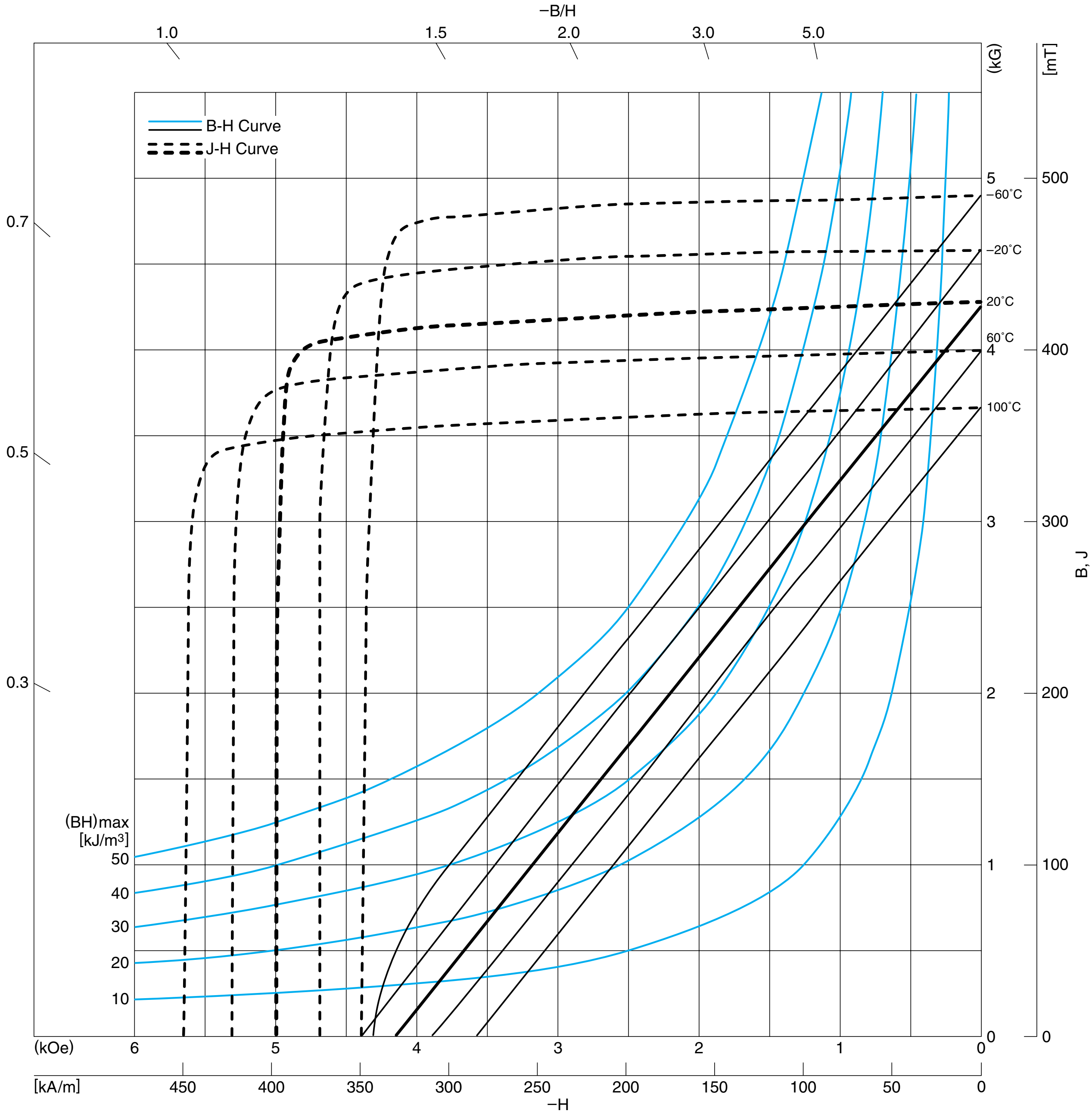
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	450±10
Br	(kG)	4.50±0.1
Coercive force	[kA/m]	342.2±12
HcB	(kOe)	4.3±0.15
Intrinsic coercive force	[kA/m]	358.1±12
HcJ	(kOe)	4.5±0.15
Maximum energy product	[kJ/m3]	38.6±1.6
(BH)max	(MGOe)	4.9±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

WET-ANISOTROPIC MATERIAL FB9H
DEMAGNETIZATION CURVE



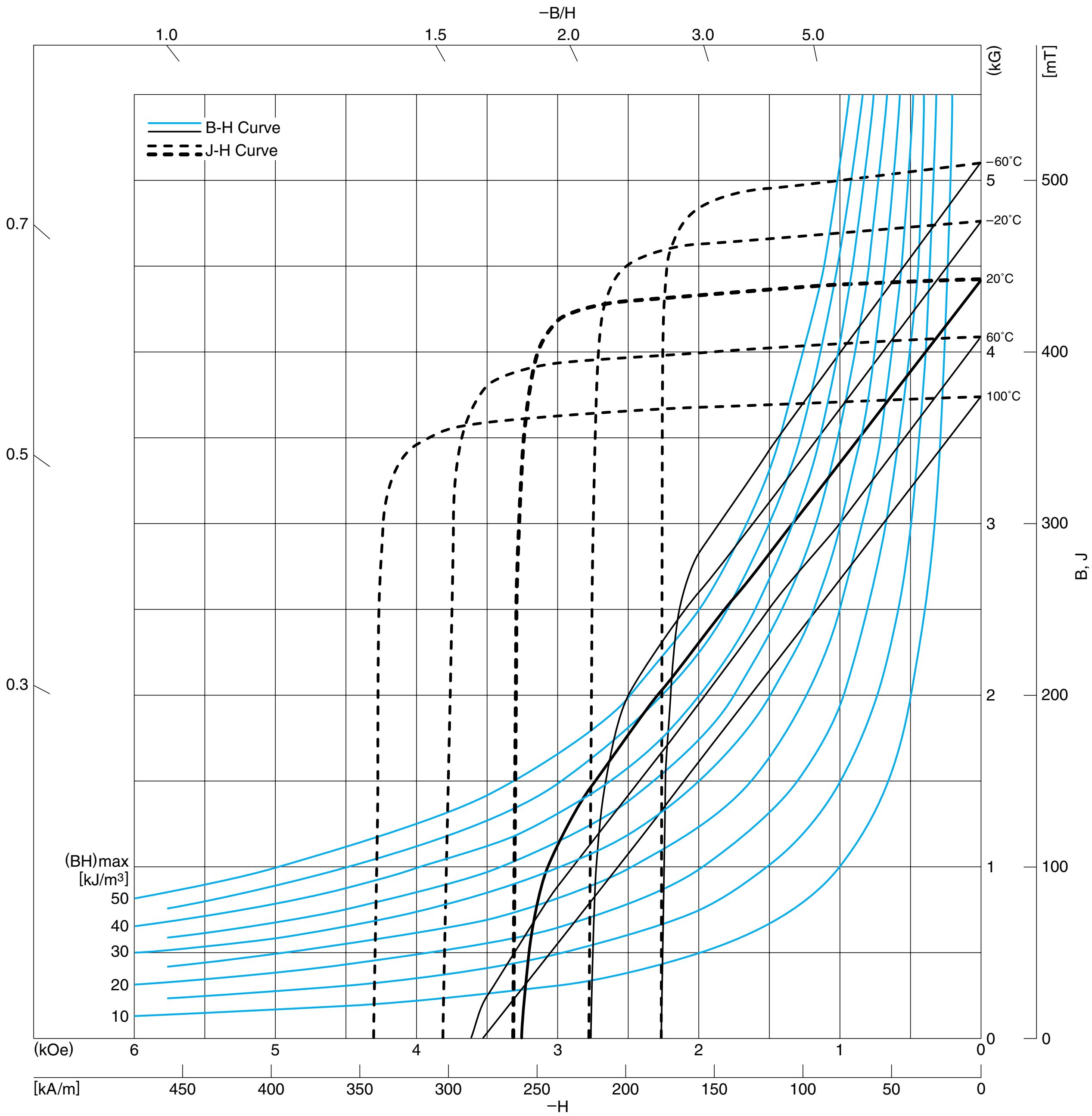
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	430±10
Br	(kG)	4.30±0.1
Coercive force	[kA/m]	330.2±12
HcB	(kOe)	4.15±0.15
Intrinsic coercive force	[kA/m]	397.9±12
HcJ	(kOe)	5.0±0.15
Maximum energy product	[kJ/m3]	35.0±1.6
(BH)max	(MGOe)	4.4±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

WET-ANISOTROPIC MATERIAL FB6N
DEMAGNETIZATION CURVE



FEATURES

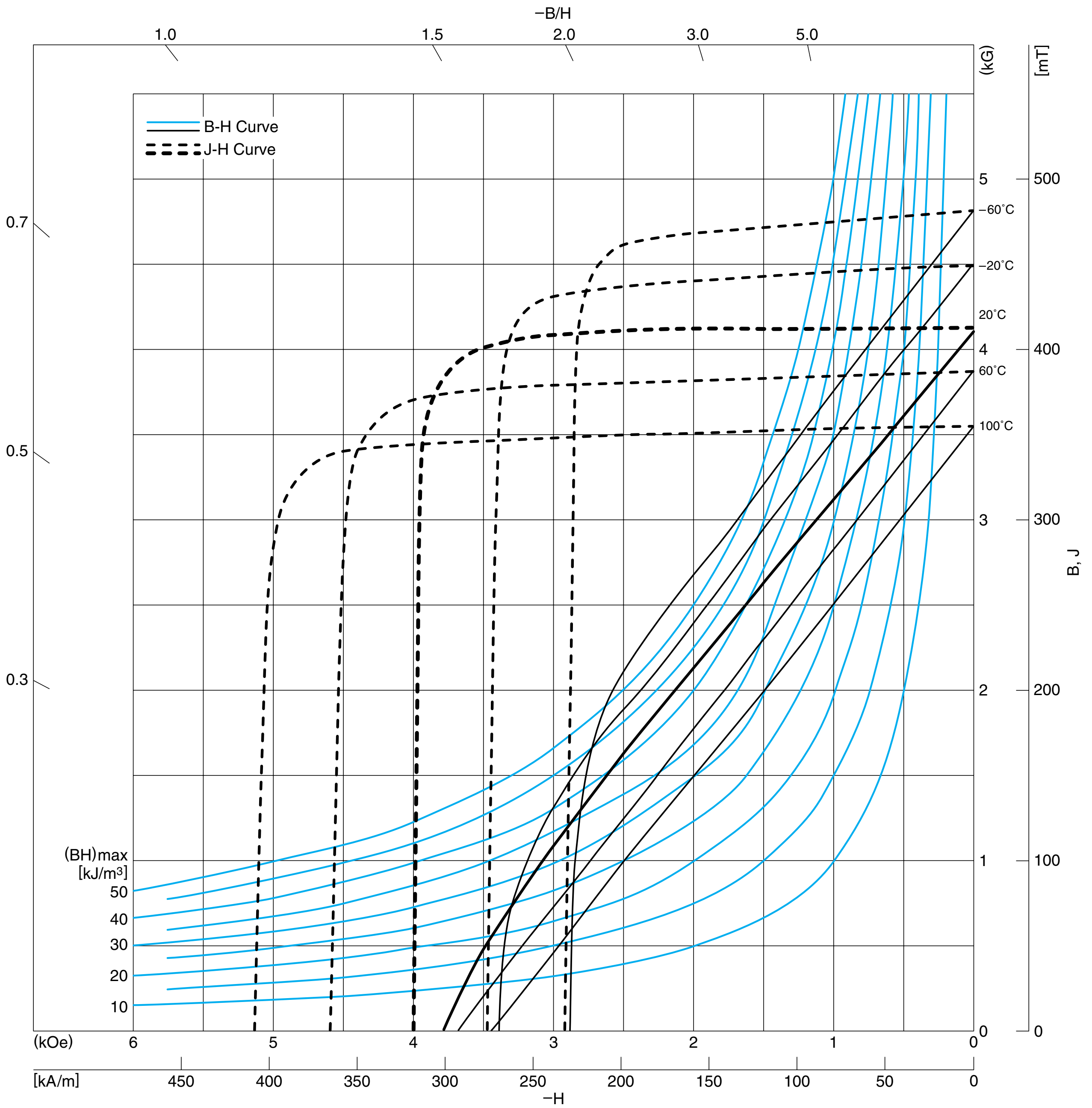
- FB6N has high Br-value and fits downsized high-performance motors or generators.

MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	440±10
Br	(kG)	4.4±0.1
Coercive force	[kA/m]	258.6±12
H_{CB}	(kOe)	3.25±0.15
Intrinsic coercive force	[kA/m]	262.6±12
H_{CJ}	(kOe)	3.3±0.15
Maximum energy product	[kJ/m³]	36.7±1.6
(BH)max	(MGOe)	4.6±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

WET-ANISOTROPIC MATERIAL FB6B
DEMAGNETIZATION CURVE



FEATURES

- FB6B is high Br with high Hc, and fits power motors which are required strong resistance to demagnetization.

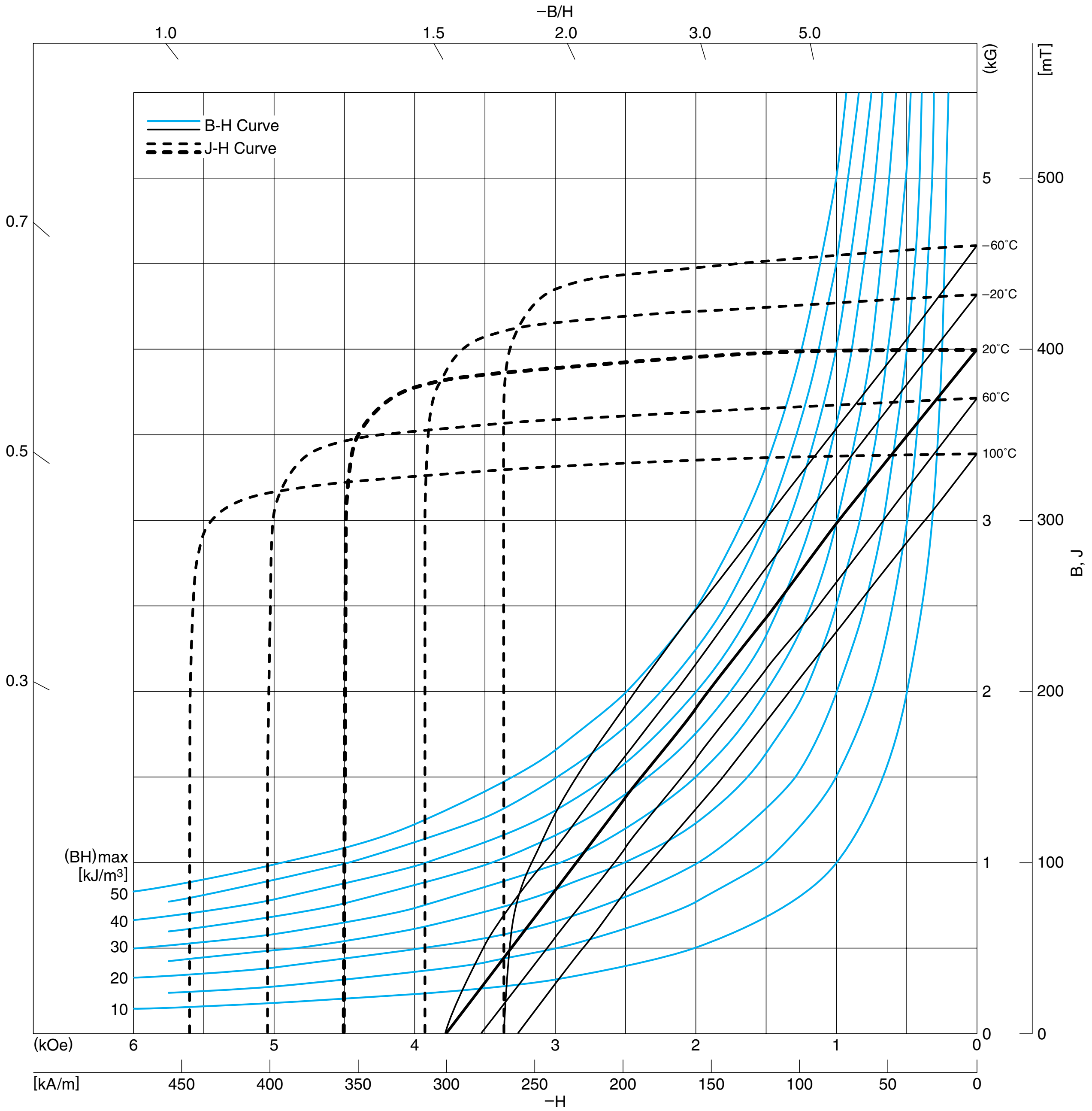
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	420±10
Br	(kG)	4.2±0.1
Coercive force	[kA/m]	302.4±12
HcB	(kOe)	3.8±0.15
Intrinsic coercive force	[kA/m]	318.3±12
HcJ	(kOe)	4.0±0.15
Maximum energy product	[kJ/m^3]	33.4±1.6
(BH)max	(MGOe)	4.2±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

WET-ANISOTROPIC MATERIAL FB6H
DEMAGNETIZATION CURVE



FEATURES

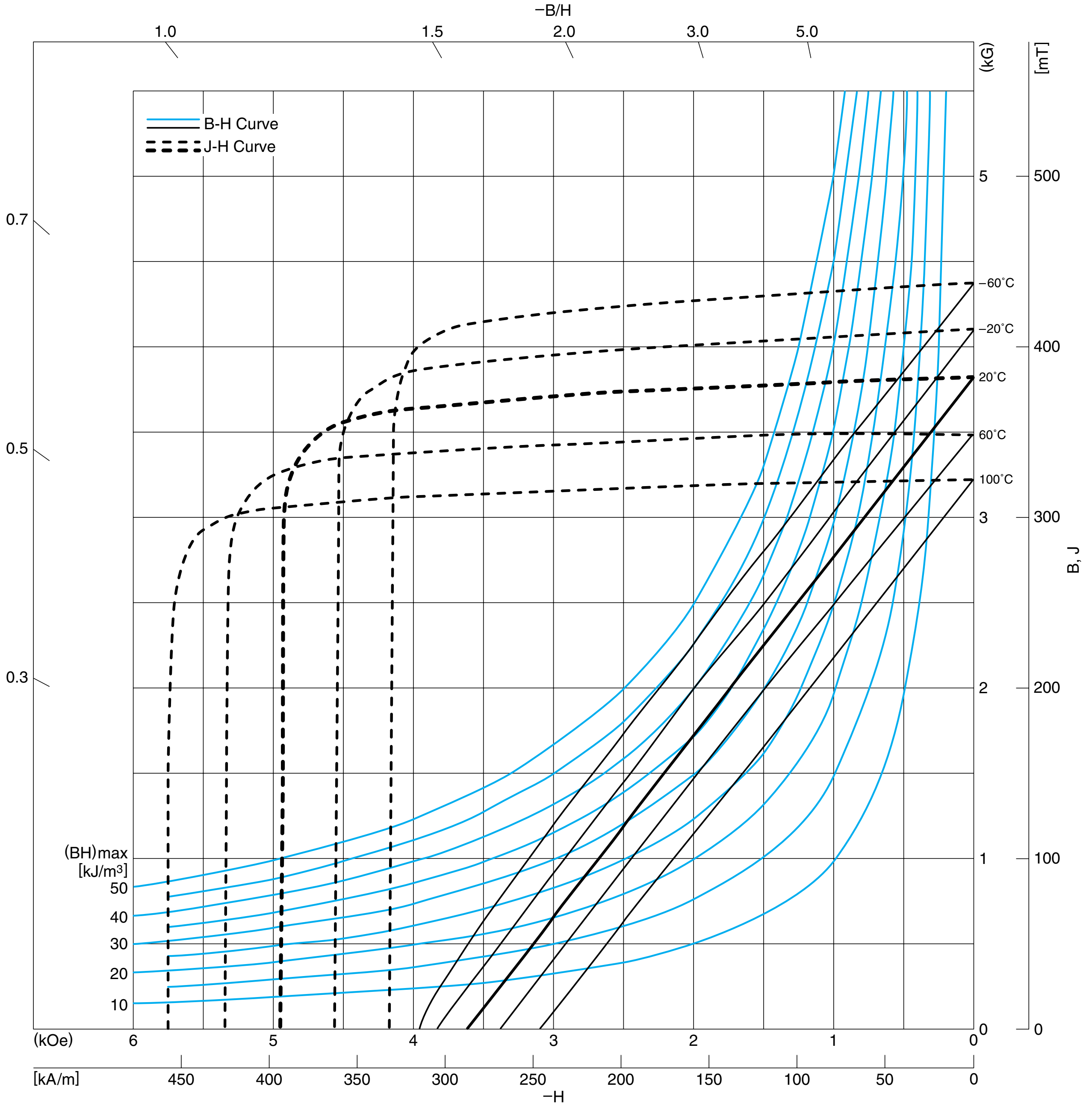
- FB6H is high Br with high Hc, and fits starter motors of automotive and motor cycle which are required strong resistance to demagnetization.

MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	400±10
Br	(kG)	4.0±0.1
Coercive force	[kA/m]	302.4±12
HcB	(kOe)	3.8±0.15
Intrinsic coercive force	[kA/m]	358.1±12
HcJ	(kOe)	4.5±0.15
Maximum energy product	[kJ/m3]	30.3±1.6
(BH)max	(MGOe)	3.8±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

WET-ANISOTROPIC MATERIAL FB6E
DEMAGNETIZATION CURVE



FEATURES

- FB6E has high HcJ, and fits starter motors of automotive and motor cycle which are required strong resistance to demagnetization.

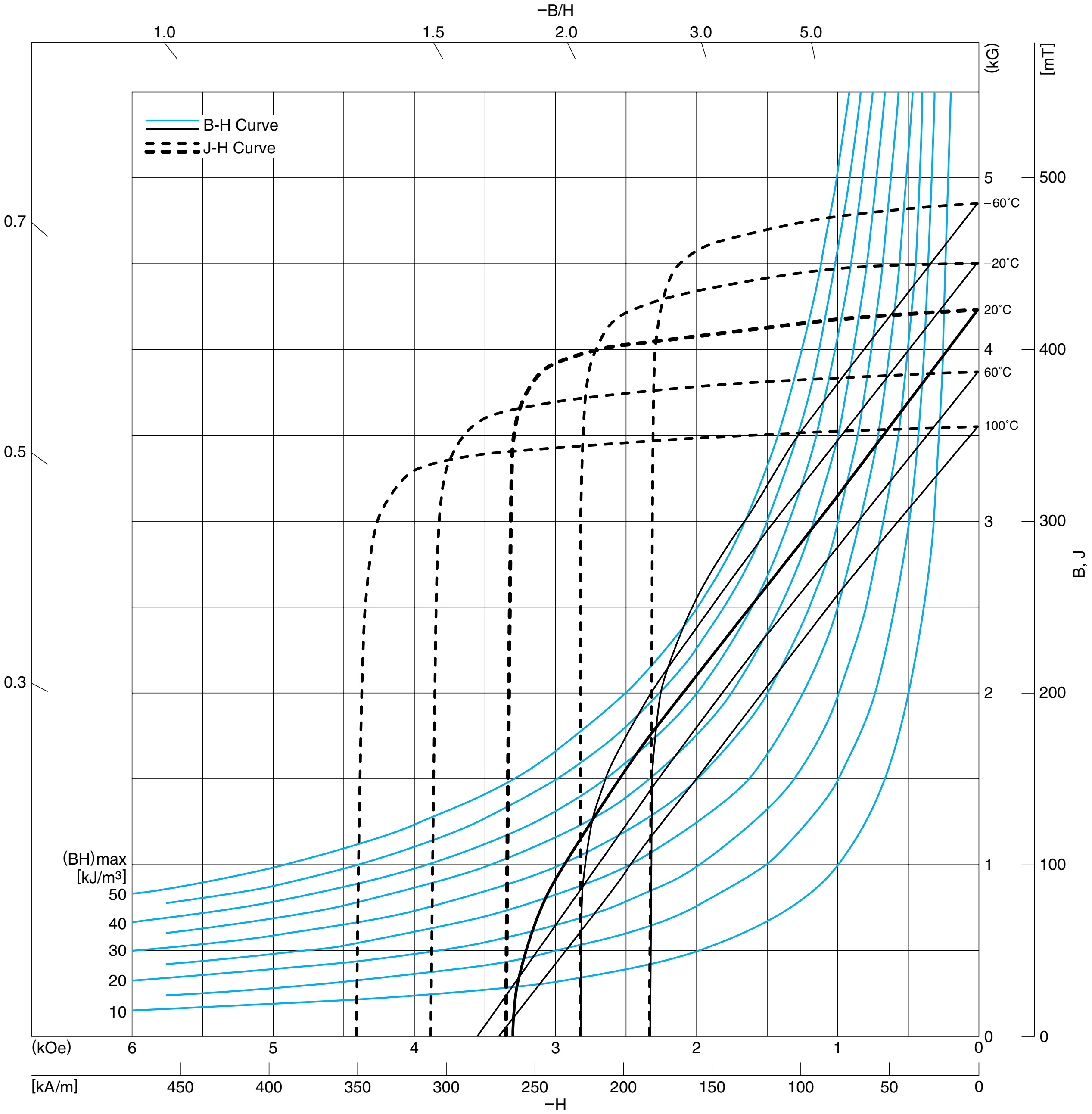
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	380±10
Br	(kG)	3.8±0.1
Coercive force	[kA/m]	290.5±12
HcB	(kOe)	3.65±0.15
Intrinsic coercive force	[kA/m]	393.9±12
HcJ	(kOe)	4.95±0.15
Maximum energy product	[kJ/m3]	27.5±1.6
(BH)max	(MGOe)	3.45±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

WET-ANISOTROPIC MATERIAL FB5B
DEMAGNETIZATION CURVE



FEATURES

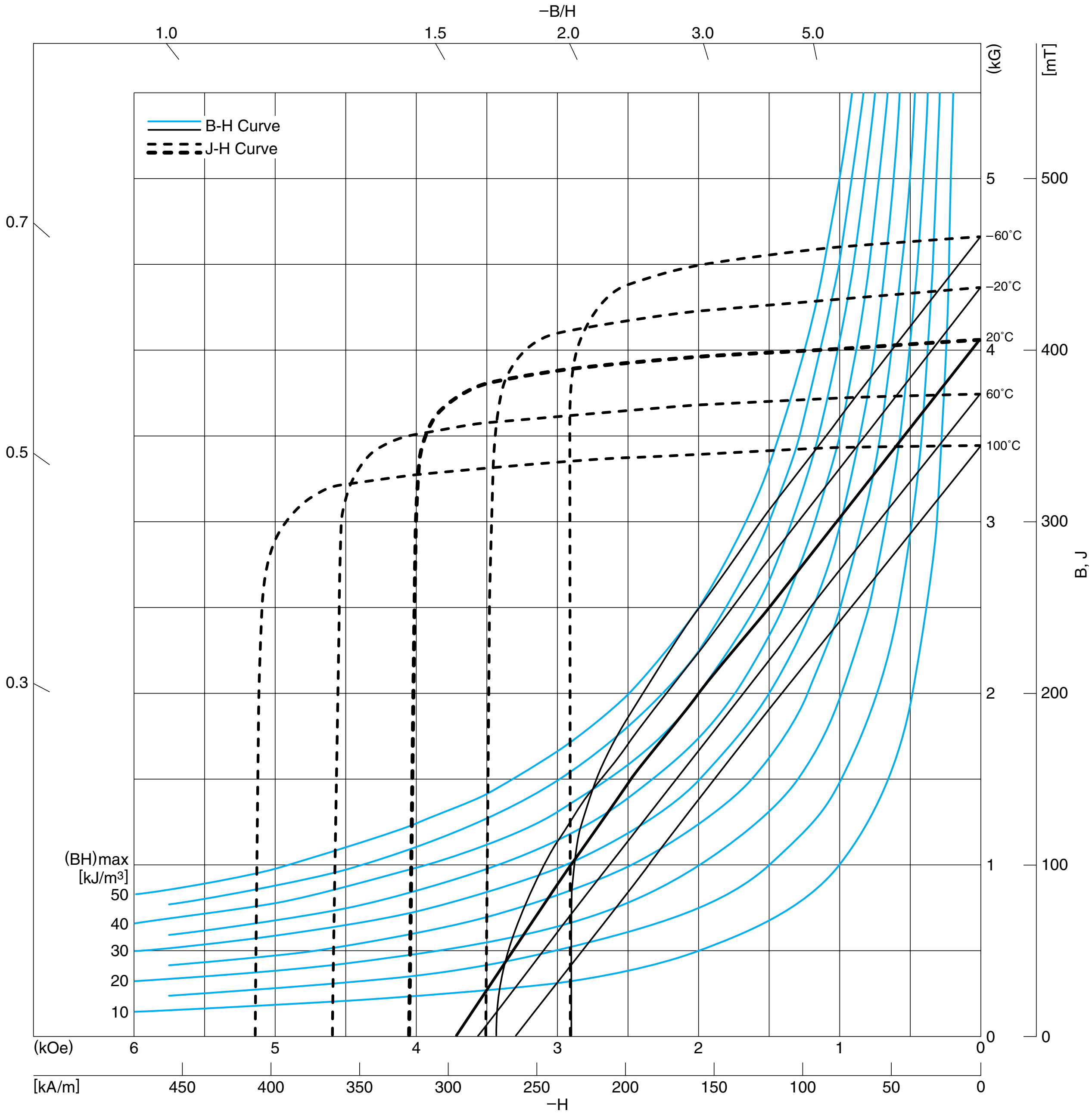
- FB5B is high cost-performance material with high Br- and relatively high HcJ-values, which fits a wide variety of motor applications.

MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	420±10
Br	(kG)	4.2±0.1
Coercive force	[kA/m]	262.6±12
HcB	(kOe)	3.3±0.15
Intrinsic coercive force	[kA/m]	266.6±12
HcJ	(kOe)	3.35±0.15
Maximum energy product	[kJ/m³]	33.4±1.6
(BH)max	(MGOe)	4.2±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

WET-ANISOTROPIC MATERIAL FB5H
DEMAGNETIZATION CURVE



FEATURES

- FB5H is high cost-performance material with high Br- and relatively high HcJ-values, which fits power motors with strong demagnetization resistance.

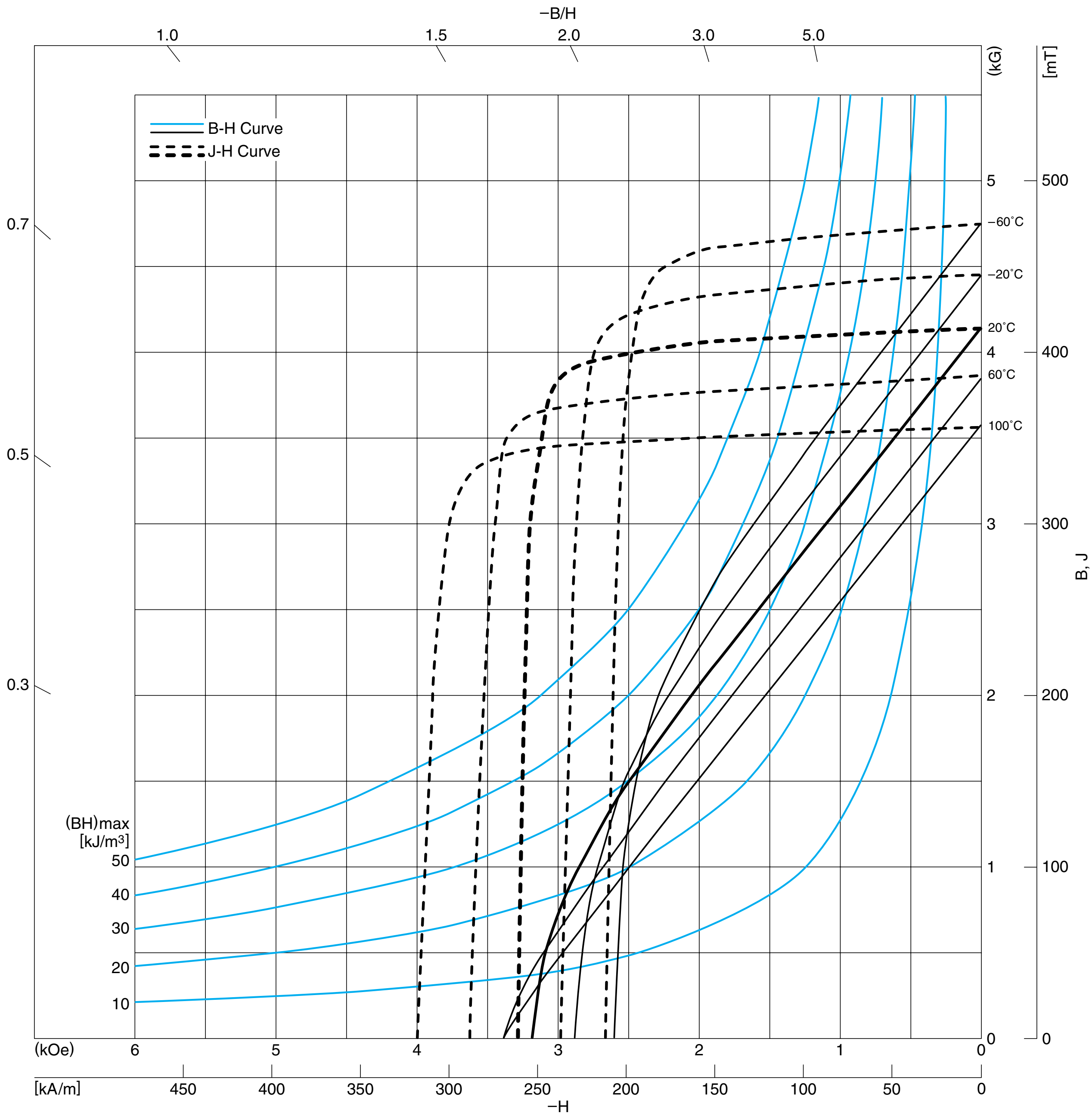
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	405±10
Br	(kG)	4.05±0.1
Coercive force	[kA/m]	298.4±12
HcB	(kOe)	3.75±0.15
Intrinsic coercive force	[kA/m]	322.3±12
HcJ	(kOe)	4.05±0.15
Maximum energy product	[kJ/m3]	31.1±1.6
(BH)max	(MGOe)	3.9±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

DRY-ANISOTROPIC MATERIAL FB5D
DEMAGNETIZATION CURVE



FEATURES

- Magnetic characteristics that rival wet-molded magnets.
- HcJ temperature characteristics have improved by 30%.
- Supports small sizes and complex shapes.

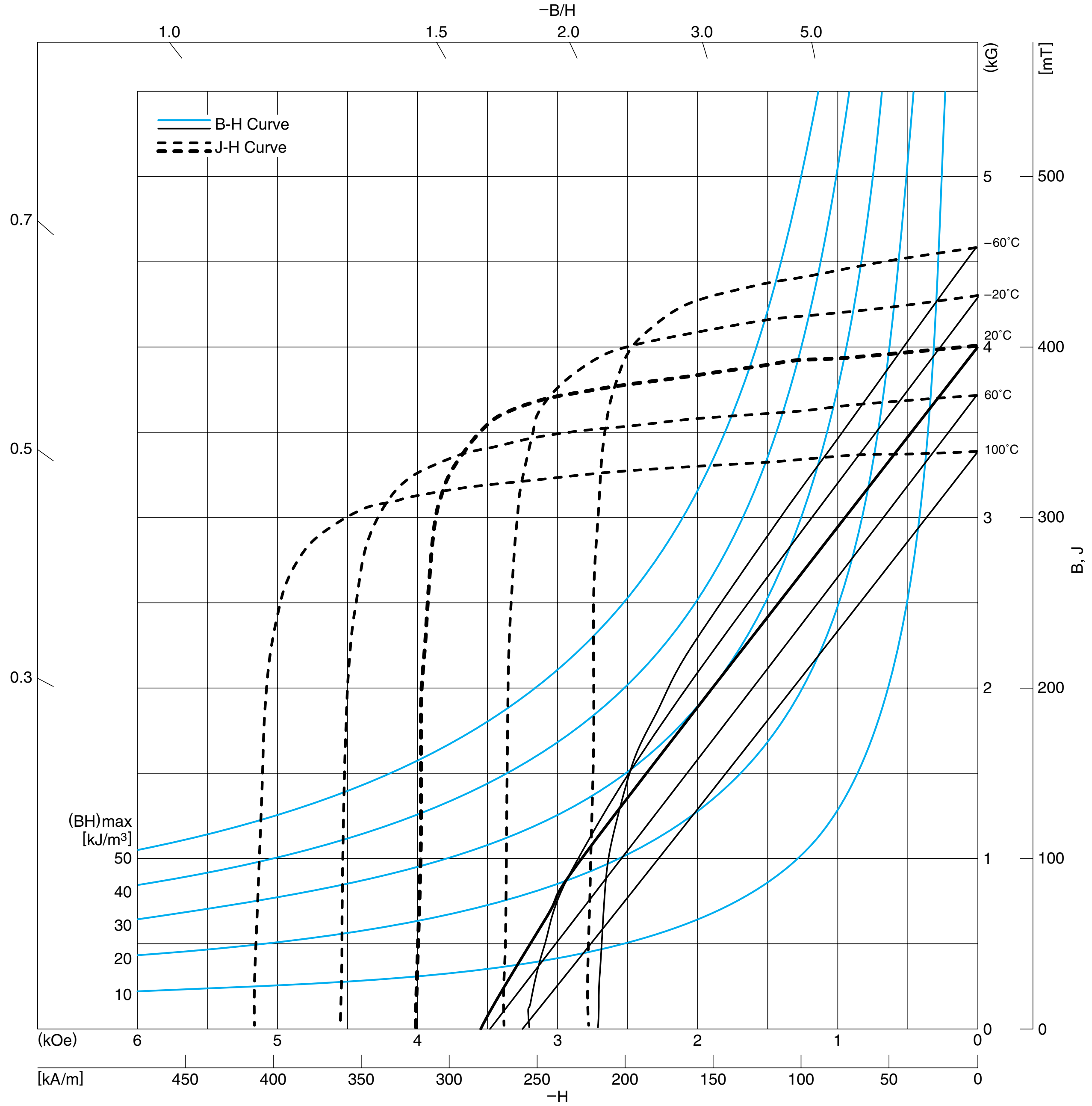
MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	415±10
Br	(kG)	4.15±0.1
Coercive force	[kA/m]	254.6±12
HcB	(kOe)	3.2±0.15
Intrinsic coercive force	[kA/m]	262.6±20
HcJ	(kOe)	3.3±0.2
Maximum energy product	[kJ/m3]	32.6±1.6
(BH)max	(MGOe)	4.1±0.2

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

DRY-ANISOTROPIC MATERIAL FB5DH
DEMAGNETIZATION CURVE

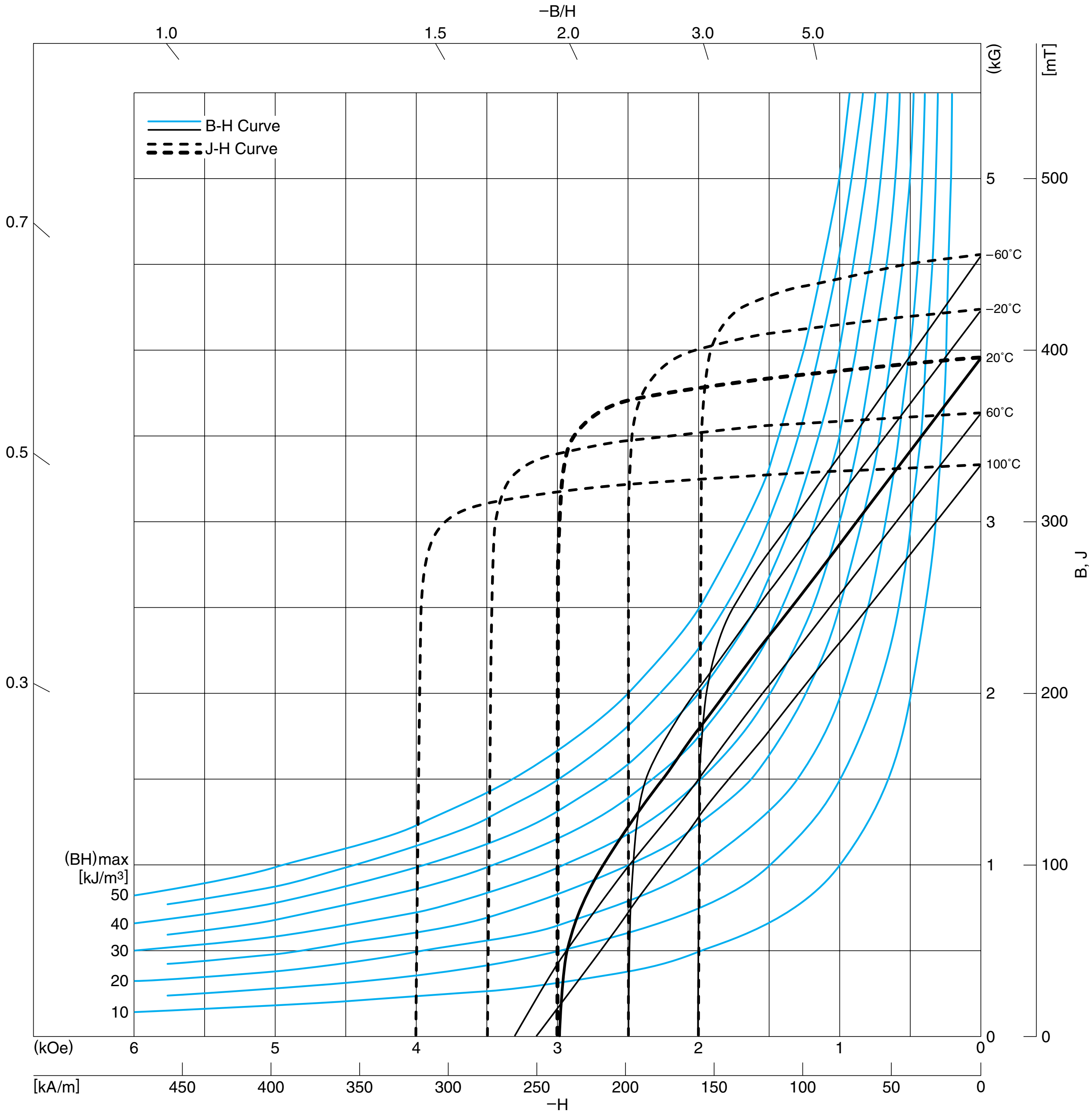


MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	400±10
Br	(kG)	4.00±0.1
Coercive force	[kA/m]	278.6±11.9
HcB	(kOe)	3.5±0.15
Intrinsic coercive force	[kA/m]	318.3±15.9
HcJ	(kOe)	4.0±0.2
Maximum energy product	[kJ/m3]	30.3±1.6
(BH)max	(MGOe)	3.8±0.2

• [ ]: in the unit of SI
( ): in the unit of CGS

DRY-ANISOTROPIC MATERIAL FB3N
DEMAGNETIZATION CURVE



FEATURES

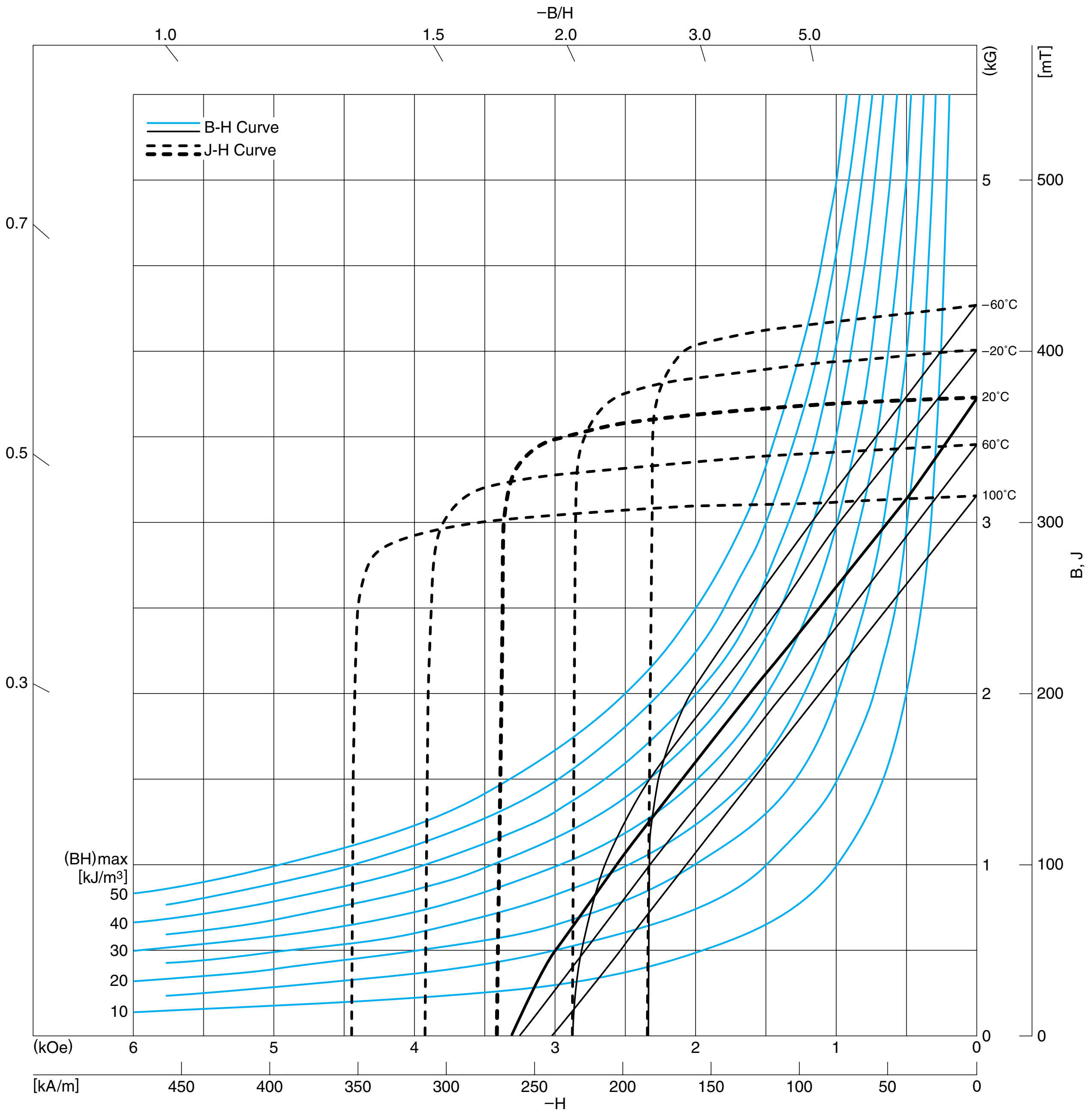
- FB3N is high Br dry-molded material with high HcJ-value, and fits various kinds of applications, which require small and complex shaped magnets with high performance.

MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	395±15
Br	(kG)	3.95±0.15
Coercive force	[kA/m]	234.8±12
HcB	(kOe)	2.95±0.15
Intrinsic coercive force	[kA/m]	238.7±16
HcJ	(kOe)	3.0±0.2
Maximum energy product	[kJ/m3]	28.7±2.4
(BH)max	(MGOe)	3.6±0.3

- [ ]: in the unit of SI
  ( ): in the unit of CGS

DRY-ANISOTROPIC MATERIAL FB3G
DEMAGNETIZATION CURVE



FEATURES

- These dry molded magnets with high Hc values and reduced low-temperature demagnetization deliver excellent characteristics in applications with large demagnetizing fields.

MAGNETIC CHARACTERISTICS

Residual flux density	[mT]	375±15
Br	(kG)	3.75±0.15
Coercive force	[kA/m]	254.6±16
H_{CB}	(kOe)	3.2±0.2
Intrinsic coercive force	[kA/m]	270.6±20
H_{CJ}	(kOe)	3.4±0.25
Maximum energy product	[kJ/m³]	25.9±2.4
(BH)max	(MGOe)	3.25±0.3

- [ ]: in the unit of SI
  ( ): in the unit of CGS

TDK

TYPICAL SHAPES AND PRODUCT IDENTIFICATIONS

We offer support for products with unusual and complex shapes, as well as for smaller or larger products in addition to the six standard shapes shown in the list. Please contact us for details.

PRODUCT IDENTIFICATIONS

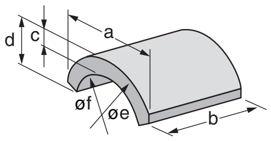
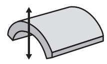
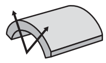
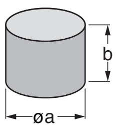
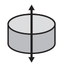
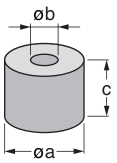
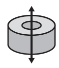
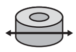
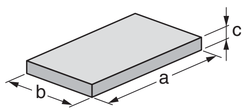
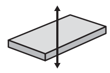
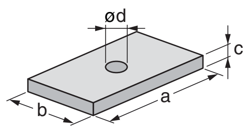
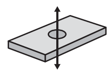
An example of a basic item

FB9B	C	38×30×40	S
(1)	(2)	(3)	(4)

(1) Material name
(2) Shape
(3) Size
(4) TDK internal code

An example of special items which have an "S" or other alphabetical letters added in front of the shape code (2).

Example FB9BC38×30×40S

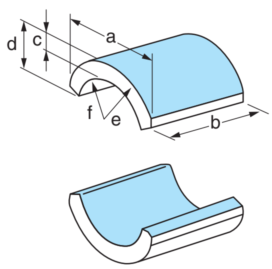
Shape	Condition to determine "Shape" code		Dimensional condition	Shape code	Expression method
Arc 	Anisotropic product: Magnetization direction c (Horizontally orientated)		—	C	Ce×f×b
	Anisotropic product: Magnetization direction Radial (Radial orientated)		—		
Cylindrical/Disk 	Anisotropic product: Magnetization direction b		—	D	Da×b
Ring/Disk with hole 	Anisotropic product: Magnetization direction c		—	DH	DHa×b×c
	Anisotropic product: Magnetization direction a		—	RH	RHa×b×c
Block 	Anisotropic product: Magnetization direction c		a ≧ b	W	Wa×b×c
Block with hole  (Dry material)	Anisotropic product: Magnetization direction c		a ≧ b	WH	WHa×b×c

• Shape codes for products of similar shapes are denoted by the direction of magnetization for anisotropic products.
↕: Magnetization direction ⬍: Compression direction

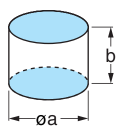
DIMENSIONAL TOLERANCES

Ferrite magnets contract by 40 to 50% in volume during the main baking process. To ensure a high degree of dimensional accuracy, we have optimized the manufacturing conditions in all of our processes, from raw material acceptance to baking, and have also implemented a stringent process management system. Even so, the contraction rates of individual products may vary. Therefore, if a baked product does not satisfy our standard dimensional tolerances, it undergoes a grinding process at the final stage of the standard process to ensure that all products meet our standards. We can also meet our customers' demands for high-precision products by applying various grinding processes in addition to our standard grinding process. However, because ferrite magnet grinding involves the use of expensive grinding tools such as diamond grinders, products with dimensional specifications that exceed our standard dimensional tolerances will cost more. If you are seeking to reduce the development cost of your applied product, we recommend that you adopt the general dimensional tolerances of the standard process as the standard for your design.

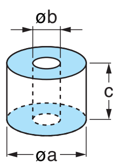
C TYPE (Anisotropic, arc type)

Shape	Item	Standard process	General dimensional tolerances in the standard process	Dimensional tolerances after grinding*2
	Width a	No grinding	±2% or ±0.3mm of standard dimension*1	±0.2mm
	Length b	No grinding	±2% or ±0.3mm of standard dimension*1	±0.2mm
	Thickness c	: Grinding	±0.15mm of standard dimension*2	———
	Height d		±0.3mm of standard dimension*2	———
	Outer diameter e (Radius)		±0.1mm of standard dimension*2	———
	Inner diameter f (Radius)		±0.1mm of standard dimension*2	———

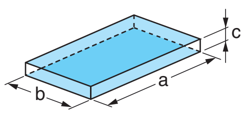
D TYPE

Shape	Item	Standard process	General dimensional tolerances in the standard process	Dimensional tolerances after grinding*2
	Diameter a	No grinding	Anisotropic: ±2% or ±0.3mm of standard dimension *1	±0.1mm
	Thickness (Height) b	: Grinding	Anisotropic: ±0.1mm of standard dimension*2	———

DH/RH TYPE

Shape	Item	Standard process	General dimensional tolerances in the standard process	Dimensional tolerances after grinding*2
	Outer diameter a	No grinding	Anisotropic: ±2% or ±0.3mm of standard dimension*1	±0.1mm
	Inner diameter b	No grinding	Anisotropic: ±2% or ±0.3mm of standard dimension*1	±0.1mm
	Thickness (Height) c	: Grinding	Anisotropic: ±0.1mm of standard dimension*2	———

W/WH TYPE

Shape	Item	Standard process	General dimensional tolerances in the standard process	Dimensional tolerances after grinding*2
	Length a/ Width b	No grinding	Anisotropic: ±2% or ±0.3mm of standard dimension*1	±0.1mm
	Thickness (Height) c	No grinding	Anisotropic: ±0.1mm of standard dimension*2	———

*1 The larger of the two values is applied.
*2 Reference values in a product with a standard size and shape.
- Values may differ from the above values depending on the size or shape; please contact us in each case concerning products with a size or shape other than the above.