Full Process Cold Rolled Oriented Electrical Steel Strip

2 Normative References

The contents of the following documents are incorporated by reference as an integral part of this document. For dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB T 228.1-2021 Tension Test of Metal Materials Part 1: Room temperature test method

GB/T 247 General provisions for packaging, marking and quality certificates of steel plates and steel strips

GB/T 2521.2 Full process cold rolled electrical steel Part 2: grain oriented steel strips (plates)

GB/T 2522 Test method for surface insulation resistance and coating adhesion of electrical steel sheet (with)

GB/T 2900.60 Electrical terminology Electromagnetism

GB/T 3655 A method for measuring magnetic properties of electrical steel sheets (with) with Epstein square circle

GB/T 4340.1 Test of Vickers hardness of metal materials Part 1: Test methods

GB/T 8170 Rules of numerical rounding and representation and determination of limit values

GB/T 9637 Electrical terminology Magnetic materials and components

GB/T 13789 Method for measuring magnetic properties of electrical steel sheet (belt) with single chip tester

GB/T 17505 General technical requirements for delivery of steel and steel products

GB/T 18253 Types of inspection documents for steel and steel products

GB/T 19289 Methods for measuring the density, resistivity and stacking coefficient of electrical steel sheets (with)

YB/T 4292 Test method for geometric characteristics of electrical steel strip (sheet)

YB/T 4731 Method for repeated bending test of electrical steel strip (sheet)

Q/BQB 400 Cold rolled product packaging, marking and inspection documents

IEC 60404-8-7 Specifications for individual materials - Cold-rolled grain-oriented Magnetic materials electrical steel strip and sheet delivered in the fully-processed state

IEC/TR 62581-2010 Methods of measurement of the magnetostriction characteristics by means of single sheet and Epstein test specimens

3 Terms and Definitions

GB T 2521.2, GB T 2900.60, GB T 9637 and YB T 4292 defined as well as the following terms are applicable to this document.

3.1 Specific Total Loss (iron Loss)

The total loss ratio refers to the total power absorbed per unit mass of material when the magnetic polarization intensity varies sinusoidally with a specific value of peak and frequency. The total loss ratio is expressed by the symbol P (J_m/f) and the unit is W/kg(or W/lb).

Example: $P_{1.7/50}$ indicates the unit kg (or lb) of the total specific loss measured at magnetic polarization strength of 1.7T and frequency of 50Hz;

$P_{1.7/60}$ indicates the total specific loss per kg(or lb) measured at magnetic polarization strength of 1.7T and frequency of 60Hz.

3.2 Magnetic Polarization (magnetic Induction)

Magnetic polarization intensity refers to the peak magnetic polarization intensity of a specific magnetic field intensity when the sample is magnetized by an alternating magnetic field. Its symbol is ***J*** (H) and its unit is T (Tesla).

Example: $\boldsymbol{J}_{800}$ corresponds to the magnetic polarization strength at a magnetic field strength of H 800 A/m (peak).

3.3 Specific Apparent Power

For the set magnetic polarization intensity and frequency value, the total power consumption of alternating current power supply per unit mass of iron core is called apparent power ratio, which is denoted as ***S*** *s*, and its unit is VA/kg.

Example: $\boldsymbol{Ss}_{7/50}$ indicates the unit of the specific visible power of a sample in kg measured at magnetic polarization strength of 1.7T and frequency of 50Hz.

3.4 A-Weighted Magnetostrictive Velocity Level A-Weighted Magnetostriction Velocity Level, $\boldsymbol{L}_{VA}$

When the magnetic polarization intensity varies with time according to a sinusoidal law, its peak value is a certain calibration value, and the variation frequency is a certain calibration frequency, the surface vibration sound pressure level caused by magnetostriction along the magnetization direction of the electric steel sheet (belt) per unit length is the A-weighted magnetostriction velocity level.

3.5 Surface Insulation Resistance

The DC resistance measured under specified conditions refers to the resistance corresponding to the leakage current flowing through the surface of the strip (sheet) after a certain time of polarization process when the product is applied with a DC voltage. Its symbol is ***C*** and its unit is ***Ω*** ·mm^2/plane or ***Ω*** ·cm^2/plane.

3.6 Layer to Layer Resistance Inter-Lamination Resistance

The insulation resistance between the upper and lower surfaces of the product, that is, the interlayer resistance between the product laminations, is called the interlayer resistance, which is denoted by R_A. Theoretically, it is twice the surface insulation resistance, and its unit is ***Ω*** ·mm^2/piece or ***Ω*** ·cm^2/piece.

4 Classify

The classification of materials in this document is determined by three parameters: maximum specific total loss at 1.7T magnetic polarization strength and 50Hz frequency $\boldsymbol{P}_{1\,7/50}$ (W/kg), and nominal thickness. These factors establish the base grades. Based on product characteristics and specialized applications, the materials are further categorized into eight types: Standard Type, High Magnetic Polarity Strength Type, Domain Refining Type, Heat-Resistant Domain Refining Type, Low Noise Type, Distribution Transformer Specialized Type, Ultra-High Voltage Transformer Specialized Type, and Uncoated Type.

5 Symbols and Designations

5.1 Symbols and Notes

The symbols and corresponding explanations for this document are shown in Table 1.

Greater than 1. 10W/kg;

Example 2: B30P105 indicates that the nominal thickness of high magnetic polarization strength oriented electrical steel is 0.30 mm, and the guaranteed value of the total loss nominal value of the grade is not $P_{1.7/50}$ It is not greater than 1.05W/kg;

Example 3: B27R090 indicates the magnetic domain refined type oriented electrical steel with nominal thickness of 0.27 mm, and the guaranteed value of the total loss nominal value of the grade is not $P_{1.7/50}$ not more than 0.90W/kg;

Example 4: B23HS080 indicates the heat-resistant engraved magnetic domain refined type oriented electrical steel with nominal thickness of 0.23mm, and the guaranteed value of the specific loss ratio is not more than 0.80W/kg $P_{1.7/50}$

Example 5: B23RD080 indicates the magnetic domain refined oriented electrical steel for distribution transformers with nominal thickness of 0.23mm, and the guaranteed value of the total loss ratio is not greater than 0.80W/kg $P_{1.7/50}$

Example 7: B27RT090 indicates the magnetic domain refined oriented electrical steel for ultra-high voltage transformers with nominal thickness of 0.27mm, and the guaranteed value of $P_{1\,7/50}$ is not greater than 0.90W/kg;

Example 7: B27P100-LM indicates the nominal thickness of 0.27mm high magnetic polarization strength low noise series oriented electrical steel, the grade is not greater than 1.00W/kg of the guaranteed value of the total loss nominal value $P_{1.7/50}$

Example 8: B27G140-NC indicates the nominal thickness of 0.27mm of ordinary uncoated series oriented electrical steel, the guarantee value of the nominal value of total loss $P_{1.7/50}$ is not greater than 1.40W/kg

5.3 The Classification and Code of the Insulation Coating Shall Comply With the Provisions of Table 2.

Table 2 Types and Characteristics of Surface Coatings for Directional Electrical Steel Products

Type of insulation coating	code name	feature
Non-Inorganic Coatings	S	The coating is a mixture of inorganic components, mainly phosphate and silica. The coating has high heat resistance and can withstand 850℃ stress relief annealing in dry nitrogen or dry nitrogen-hydrogen mixed protective atmosphere. High corrosion resistance to insulating oil, varnish, mechanical oil, refrigeration gas, etc.
No Cr eco-protective coating	H	The coating does not contain Cr
No coating	—	There is no glass film layer and insulation coating on the surface, which is suitable for direct rolling of extremely thin strips of grain oriented electrical steel.

6 General Requirements

6.1 Production Engineering

The manufacturing process and chemical composition of the product are determined by the manufacturer.

6.2 Form of Supply

The product is supplied in rolls, referred to as steel coils. When the edge status is not specified in the order contract, the product is supplied according to the cutting edge status.

6.2.1 The Weight of Steel Coil Should Meet the Order Requirements, and the Weight of Coil Is Generally 2.00 ~ 6.00 Tons.

6.2.2 Steel Coils Are Usually Delivered With Edge Cutting. If the User Has Special Requirements, They Can Be Delivered Without Edge Cutting Through Agreement.

6.2.3 The Inner Diameter of Steel Coil Should Be Within the Range of 500mm ~ 520mm, and the Recommended Inner Diameter Value Is 508±5mm.

6.2.4 The steel coil shall be wound continuously and closely from the same width of steel strip. The side of the coil shall be as straight as possible and shall not collapse under its own weight.

7.1.6 For Products With a Thickness of Not Less than 0.23mm in the Domain Refinement Type, the 50Hz and 60Hz Conditions Measured According to the Method of GB/T 13789-2022

For conversion to square method data based on the relationship formula D.1 specified in Appendix D of GB/T 13789-2022, the resulting values of $P_{1.7/50}$, $P_{1.7/60}$, $P_{1.5/50}$ and $P_{1.5/60}$ shall comply with the requirements of Tables 5, 7, and 9.

7.1.7 Under Other Test Conditions, the Conversion Coefficient Fc Can Be Determined by the Supplier and the User Through Negotiation.

7.1.8 When the Magnetization Curve Needs to Be Provided, the Data Measured by the Single Chip Method According to GB/T 13789 Shall Refer to the Relationship Formula in Appendix C of GB/T 13789-2008

change 。

Note 1: Although magnetic flux density has been conventionally used for many years, the Epstein square and single-chip testers actually measure magnetic polarization intensity. The relationship between magnetic flux density and magnetic polarization intensity is expressed as: $J = B - \mu_0 H$. *Under conditions where* H = 800 A/m, the difference between $\boldsymbol{B}$ and $\boldsymbol{J}$ is approximately 0.001T .

Table 3 Magnetic Properties and Technical Characteristics of Ordinary Oriented Electrical Steel Products (magnetic Properties Are Tested According to GB/T 3655)

type	Ordinary Type G designation	Ordinary Type Q	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization intensity T	Minimum stack coefficient
				$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
common steel type	B23G110	23Q110	0.23	1.10	1.08	1.41	0.73	0.96	1.85	0.955
	B27G120	27Q120	0.27	1.20	1.15	1.51	0.80	1.07	1.85	0.960
	B30G120	30Q120	0.30	1.20	1.15	1.52	0.80	1.07	1.86	0.965
	B30G130	30Q130		1.30	1.20	1.58	0.85	1.12	1.85	
	B35G135	35Q135	0.35	1.35	1.20	1.61	0.91	1.23	1.86	0.965
	B35G145	35Q145		1.45	1.25	1.67	0.95	1.27	1.86	
	B35G155	35Q155		1.55	1.35	1.80	1.02	1.37	1.85	

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

Note: The standard Q plate can be used until the end of 2025.

Table 4 Magnetic Properties and Technical Characteristics of High Magnetic Polarization Intensity Oriented Electrical Steel Products (magnetic Properties Are Tested According to GB/T 3655)

type	High magnetic polarity Chemically intensive P the name of a shop	High magnetic polarization intensity type QG	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization intensity T	Minimum stack coefficient
				$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
High magnetic polarization intensity type	B18P070	18QG070	0.18	0.70	0.70	0.91	0.52	0.67	1.90	0.950
	B18P075	18QG075		0.75	0.75	0.98	0.55	0.72	1.90	
	B18P080	18QG080		0.80	0.79	1.03	0.58	0.76	1.89	
	B18P085	18QG085		0.85	0.83	1.08	0.61	0.80	1.89	
	B20P075	20QG075	0.20	0.75	0.75	0.98	0.55	0.73	1.90	0.950
	B20P080	20QG080		0.80	0.80	1.04	0.59	0.78	1.90	
	B20P085	20QG085		0.85	0.84	1.09	0.61	0.81	1.89	

Table 4 Magnetic Properties and Technical Characteristics of High Magnetic Polarization Intensity Oriented Electrical Steel Products (magnetic Properties Are Tested According to GB/T 3655) (continued)

type	High magnetic poles Chemically intensive P the name of a shop	High magnetic polarization intensity type QG	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	Minimum stack coefficient
				$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
High magnetic polarization intensity type	B23P080	23QG080	0.23	0.80	0.80	1.08	0.60	0.79	1.90	0.955
	B23P085	23QG085		0.85	0.85	1.12	0.64	0.84	1.90	
	B23P090	23QG090		0.90	0.88	1.15	0.65	0.87	1.89	
	B23P095	23QG095		0.95	0.92	1.20	0.68	0.90	1.89	
	B23P100	23QG100		1.00	0.96	1.25	0.70	0.93	1.88	
	B27P085	27QG085	0.27	0.85	0.85	1.13	0.64	0.85	1.90	0.960
	B27P090	27QG090		0.90	0.89	1.18	0.67	0.89	1.90	
	B27P095	27QG095		0.95	0.93	1.23	0.69	0.93	1.90	
	B27P100	27QG100		1.00	0.96	1.27	0.72	0.96	1.90	
	B27P110	27QG110		1.10	1.03	1.36	0.76	1.01	1.89	
	B27P120	27QG120		1.20	1.10	1.45	0.82	1.09	1.88	
	B30P090	30QG090	0.30	0.90	0.90	1.20	0.68	0.92	1.90	0.965
	B30P095	30QG095		0.95	0.95	1.25	0.72	0.97	1.90	
	B30P100	30QG100		1.00	0.98	1.30	0.74	1.00	1.90	
	B30P105	30QG105		1.05	1.01	1.34	0.76	1.02	1.90	
	B30P120	30QG120		1.20	1.05	1.39	0.79	1.05	1.89	
	B35P115	35QG115	0.35	1.15	1.12	1.50	0.85	1.15	1.90	0.965
	B35P125	35QG125		1.25	1.15	1.53	0.87	1.17	1.90	
	B35P135	35QG135		1.35	1.20	1.58	0.91	1.20	1.89	

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

Note: The high magnetic polarization strength type QG can be used until the end of 2025.

Table 5 Magnetic Properties and Technical Characteristics of Magnetically Refined Oriented Electrical Steel Products (magnetic Properties Are Tested According to GB/T 13789)

type	Magnetic domain refined type R the name of a shop	Magnetic domain refined type RK	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	Minimum stack coefficient
				$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
Magnetic zooming type	B18R055	18RK055	0.18	0.55	0.55	0.71	0.41	0.53	1.89	0.950
	B18R060	18RK060		0.60	0.60	0.78	0.45	0.59	1.89	
	B18R065	18RK065		0.65	0.64	0.83	0.47	0.62	1.89	
	B18R070	18RK070		0.70	0.69	0.90	0.51	0.67	1.88	
	B18R075	18RK075		0.75	0.74	0.95	0.54	0.70	1.88	

Table 5 Magnetic Properties and Technical Characteristics of Magnetically Refined Oriented Electrical Steel Products (Magnetic Properties Are Tested According to GB/T 13789) (continued)

type	Magnetic domain refined type R the name of a shop	Magnetic domain refined type RK	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	Minimum stack coefficient
				$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
Magnetic zoom type	B20R060	20RK060	0.20	0.60	0.60	0.77	0.45	0.60	1.89	0.950
	B20R065	20RK065		0.65	0.65	0.83	0.48	0.64	1.89	
	B20R070	20RK070		0.70	0.69	0.88	0.51	0.67	1.89	
	B20R075	20RK075		0.75	0.74	0.95	0.54	0.71	1.88	
	B20R080	20RK080		0.80	0.78	1.00	0.56	0.74	1.88	
	B20R085	20RK085		0.85	0.82	1.05	0.60	0.80	1.88	
	B23R070	23RK070	0.23	0.70	0.70	0.93	0.54	0.71	1.90	0.955
	B23R075	23RK075		0.75	0.75	0.99	0.56	0.74	1.89	
	B23R080	23RK080		0.80	0.79	1.04	0.59	0.78	1.88	
	B23R085	23RK085		0.85	0.82	1.08	0.61	0.81	1.88	
	B23R090	23RK090		0.90	0.88	1.15	0.65	0.85	1.88	
	B27R080	27RK080	0.27	0.80	0.80	1.06	0.61	0.81	1.90	0.960
	B27R085	27RK085		0.85	0.84	1.11	0.64	0.84	1.89	
	B27R090	27RK090		0.90	0.87	1.15	0.66	0.87	1.89	
	B27R095	27RK095		0.95	0.92	1.22	0.69	0.91	1.88	
	B30R090	30RK090	0.30	0.90	0.89	1.18	0.68	0.91	1.90	0.965
	B30R095	30RK095		0.95	0.92	1.22	0.71	0.94	1.90	
	B30R100	30RK100		1.00	0.96	1.26	0.73	0.98	1.89	
	B30R105	30RK105		1.05	1.00	1.32	0.76	1.01	1.89	

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

Note: The magnetic domain refined RK series can be used until the end of 2025.

Table 6 Magnetic Properties and Technical Characteristics of Heat-Resistant Engraved Magnetic Domain Refined Oriented Electrical Steel Products (magnetic Properties Are Tested According to GB/T 3655)

type	the name of a shop	nominal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization intensity T	minimum overstow coefficient
			$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
heat-resisting nick magnetic domain Refined	B18HS065	0.18	0.65	0.65	--	--	--	1.88	0.950
	B18HS070		0.70	0.69	--	--	--	1.88	
	B18HS075		0.75	0.74	--	--	--	1.88	

Table 6 Magnetic Properties and Technical Characteristics of Heat-Resistant and Scored Magnetic Domain Refined Oriented Electrical Steel Products (Magnetic Properties Are Tested According to GB/T 3655) (continued)

type	the name of a shop	nominal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization intensity T	minimum overstow coefficient
			$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
Thermal resistant, engraved, domain refined type	B20HS065	0.20	0.65	0.65	--	--	--	1.89	0.950
	B20HS070		0.70	0.69	--	--	--	1.88	
	B20HS075		0.75	0.74	0.98	0.56	0.73	1.88	
	B20HS080		0.80	0.78	1.04	0.60	0.78	1.88	
	B20HS085		0.85	0.83	1.08	0.64	0.83	1.88	
	B23HS070	0.23	0.70	0.70	--	--	--	1.89	0.955
	B23HS075		0.75	0.74	0.99	0.57	0.75	1.88	
	B23HS080		0.80	0.79	1.05	0.61	0.80	1.88	
	B23HS085		0.85	0.84	1.10	0.65	0.85	1.88	
	B23HS090		0.90	0.88	1.15	0.68	0.87	1.88	

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

Table 7 Magnetic Properties and Technical Characteristics of Low Noise Series Oriented Electrical Steel Products

type	the name of a shop	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	minimum overstow coefficient	Maximum A weighting Magnetic extension speed level dB (A)
			$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1,5/50}$[a]	$P_{1,5/60}$[a]	J_{800}	f	$L_{VA,1.7/50}$
High magnetic polarization intensity type	B27P085-LM	0.27	0.85	0.85	1.13	0.64	0.85	1.90	0.960	58
	B27P090-LM		0.90	0.89	1.18	0.67	0.89			
	B27P095-LM		0.95	0.93	1.23	0.69	0.93			
	B27P100-LM		1.00	0.96	1.27	0.72	0.96			
	B27P110-LM		1.10	1.03	1.36	0.76	1.01			
	B27P120-LM		1.20	1.10	1.45	0.82	1.09			
	B30P090-LM	0.30	0.90	0.90	1.20	0.68	0.92	1.90	0.965	60
	B30P095-LM		0.95	0.95	1.25	0.72	0.97			
	B30P100-LM		1.00	0.98	1.30	0.74	1.00			
	B30P105-LM		1.05	1.01	1.34	0.76	1.02			
	B30P120-LM		1.20	1.05	1.39	0.79	1.05			
Magnetic domain refined type	B23R070-LM	0.23	0.70	0.70	0.93	0.54	0.71	1.90	0.955	58
	B23R075-LM		0.75	0.75	0.99	0.56	0.74			
	B23R080-LM		0.80	0.79	1.04	0.59	0.78			
	B23R085-LM		0.85	0.82	1.08	0.61	0.81			
	B23R090-LM		0.90	0.88	1.15	0.65	0.85			

Table 7 Magnetic Properties and Technical Characteristics of Low Noise Series Oriented Electrical Steel Products (continued)

type	the name of a shop	normal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	minimum overstow coefficient	Maximum A weighting Magnetic extension speed level dB (A)
			$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f	$L_{VA,1.7/50}$
Magnetic domain refined type	B27R080-LM	0.27	0.80	0.80	1.06	0.61	0.81	1.90	0.960	58
	B27R085-LM		0.85	0.84	1.11	0.64	0.84			
	B27R090-LM		0.90	0.87	1.15	0.66	0.87			
	B27R095-LM		0.95	0.92	1.22	0.69	0.91			
	B30R090-LM	0.30	0.90	0.89	1.18	0.68	0.91	1.90	0.965	60
	B30R095-LM		0.95	0.92	1.22	0.71	0.94			
	B30R100-LM		1.00	0.96	1.26	0.73	0.98			
	B30R105-LM		1.05	1.00	1.32	0.76	1.01			

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

Table 8 Magnetic Properties and Technical Characteristics of Uncoated Series Oriented Electrical Steel Products

type	the name of a shop	nominal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	minimum overstow coefficient
			$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1.5/50}$[a]	$P_{1.5/60}$[a]	J_{800}	f
conventional type	B27G140-NC	0.27	1.40	1.38	1.76	1.09	1.40	1.90	0.960

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

Table 9 Magnetic Properties and Technical Characteristics of Special Series Oriented Electrical Steel Products for Distribution Transformers

type	the name of a shop	nominal thickness mm	Compared with the nominal value of total loss W/kg	Maximum ratio to total loss W/kg				Minimum magnetic polarization strength T	minimum overstow coefficient
			$P_{1.7/50}$	$P_{1.7/50}$	$P_{1.7/60}$	$P_{1,5/50}$[a]	$P_{1,5/60}$[a]	J_{800}	f
High magnetic polarization intensity type	B20PD080	0.20	0.80	0.79	1.04	0.58	0.78	1.88	0.955
	B23PD085	0.23	0.85	0.84	1.10	0.62	0.83	1.88	0.960
	B23PD090		0.90	0.87	1.14	0.64	0.86		
Magnetic domain refined type	B20RD065	0.20	0.65	0.64	0.84	0.47	0.63	1.88	0.955
	B20RD070		0.70	0.69	0.91	0.51	0.68		
	B23RD070	0.23	0.70	0.70	0.93	0.53	0.71	1.88	0.960
	B23RD075		0.75	0.74	0.97	0.55	0.73		
	B23RD080		0.80	0.78	1.02	0.58	0.77		
	B23RD085		0.85	0.81	1.06	0.60	0.80		
	B23RD090		0.90	0.87	1.14	0.64	0.86		

[a] can be used as a reference value and can also be used as a supply standard according to user needs.

7.2 Coating Properties

At the request of the purchaser and through mutual agreement between both parties, coating characteristic testing may be conducted, with guaranteed values specified in the contract. If heat treatment is required for the product, it shall be performed under conditions specified by the manufacturer, and the contract shall specify that coating characteristics are tested either before or after heat treatment.

The insulation coating shall be able to withstand the erosion of insulation paint, transformer oil, mechanical oil and other media.

7.2.1 Coating Adhesion

The coating adhesion grade of products with thickness specifications less than 0.23mm shall be D grade or above, and the coating adhesion grade of products with thickness specifications greater than 0.23mm shall be E grade or above.

When heat treatment is carried out during the shear process and under the heat treatment conditions specified by the supplier, the coating shall not be removed in large areas, but slight cracking of the coating is allowed on the shear edge.

7.2.2 Coating Insulation Resistance

The test of coating insulation resistance shall be carried out according to GB/T 2522, or the two parties may negotiate and carry out the test according to the agreed method. The relevant technical requirements shall be specified in the contract.

According to the surface insulation coating resistance measured according to GB/T2522, the average value of five single-sided measurements should not be less than 30 Ω·cm²/surface, and the minimum value of a single measurement should not be less than 5 Ω·cm²/surface. If the supplier can guarantee this, the test may be omitted.

7.3 Geometric Features and Tolerances

7.3.1 Thickness

The nominal thickness of the product is 0.18mm, 0.20mm, 0.23mm, 0.27mm, 0.30m,0.35mm. The thickness allowable deviation includes the following three categories, including:

--The allowable deviation of nominal thickness in the same acceptance batch, referred to as the allowable deviation of nominal thickness;

-The deviation between the actual thickness of each point in the longitudinal direction of the product within a certain length (2000mm± 200mm) parallel to the rolling direction (i.e., the length direction of the product), hereinafter referred to as longitudinal thickness deviation;

-The deviation between the actual thickness of each point perpendicular to the rolling direction (that is, along the product width direction), not less than 15mm from the edge and at the middle position of the transverse width of the product, hereinafter referred to as the transverse thickness deviation.

The thickness deviation of the product shall comply with the provisions of Table 10, and the steel strip is allowed to deliver with negative thickness deviation.

Table 10 Product Thickness Allowable Deviation Unit Is Mm

normal thickness	Allowance of thickness [c] by nominal value	Vertical thickness deviation [b]	Lateral thickness deviation [c]
0.18	+0.010 −0.015	+0.012 0	+0.010 0
0.20	+0.010 −0.015	+0.012 0	+0.010 0
0.23	+0.010 −0.020	+0.012 0	+0.010 0
0.27	+0.010 −0.020	+0.015 0	+0.012 0
0.30	+0.010 −0.025	+0.015 0	+0.012 0
0.35	+0.010 −0.025	+0.015 0	+0.012 0
The added thickness at the [a] weld should not exceed 0.050mm; Thickness deviation on [any] 2000mm long product or on a steel sheet; It [c] is only applicable to products with a width greater than 150mm. For narrow bands, an additional agreement is required.			

7.3.2 Width

The nominal width W of the product ranges from 750mm to 1270mm. The permissible deviation of the master roll width for products supplied with edge cutting should be $^{+}_{0}{}^{0.5}$ mm. If users have special requirements, they can be delivered in the rough edge state according to the agreement, and the permissible deviation of the width shall be separately agreed by both parties through the agreement.

7.3.3 Camber

The detection of the sickle bend of the product is suitable for the cutting material with a width of no less than 150mm. For any product with a length of 1000mm, the sickle bend should not exceed 0.50mm. If the supplier can guarantee it, this test can be omitted.

7.3.4 Gross Height and Wave Height

The detection of product unevenness is suitable for materials with a width not less than 150mm, the unevenness should not exceed 1. 0%, and the wave height should not exceed 2. 5mm.

7.3.5 Residual Curvature

According to the requirements of the customer and stated in the contract, the residual curvature of products with a width of not less than 150mm can be tested. The distance between the bottom edge of the test steel sheet and the support plate should not exceed 10mm. If the supplier can guarantee this, the test can be omitted.

7.3.6 Height of Hair Cut

The height of the shear burr of the edge product should not exceed 0. 020mm.

7.4 Technical Characteristics

7.4.1 Density

The agreed density used to calculate magnetic properties and stacking coefficients is 7.65×10^{3} kg/m^{3}.

7.4.2 Stacking Coefficient

The minimum stacking coefficient of the product shall comply with the provisions of Table 3, Table 4, Table 5, Table 6, Table 7, Table 8 and Table 9.

7.4.3 Number of Bends

The minimum number of bends parallel to the rolling direction of the product shall not be less than 1. If the supplier can guarantee this, the test may not be carried out.

7.4.4 Deviation of Shear Edge Caused by Internal Stress

The product shall avoid internal stress as much as possible. As required by the customer and specified in the contract, for materials with a width of no less than 500mm (after longitudinal cutting), the shear edge deviation caused by internal stress can be tested, and the gap measurement value should not exceed 1mm. If the supplier can guarantee this, the test may be waived.

8 Inspection and Testing

8.1 General Requirements

8.1.1 When the Order Agreement Is Signed in Accordance With This Document, the User May Conduct Prescribed Inspection and Test or Non-Prescribed Inspection and Test According to the Provisions of GB/T 17505. However, for non-specified tests and tests, the manufacturer shall provide the total loss value and magnetic polarization strength value of the product required.

8.1.2 When Ordering Inspection and Test in Accordance With the Provisions, the User Shall Specify the Type of Inspection Documents in GB/T 18253.

8.1.3 Steel coils shall be batched according to the coil, generally with one coil as a batch for acceptance.

8.5 Magnetic Performance Test

8.5.1 Epstein Square Measurements

When measuring with a 25cm Epstein square ring, follow the testing method GB/T 3655 (IEC 60404-2, IDT). A sample set must contain no fewer than 24 specimens. The specimen should be cut along the length direction parallel to the product's rolling direction, with a deviation angle from the rolling direction within ±1 °. The specimen should cover as much of the product's full width as possible. The sampling method, dimensions, and permissible deviations for specimens shall comply with the provisions of GB/T 3655.

Prior to testing, the sample shall undergo stress-relief annealing under conditions provided by the manufacturer. For aging test specimens of the product, when maximum total loss ratio is achieved, the specimen shall be maintained at a temperature of 225℃±5℃ for 24 hours, then air-cooled to ambient temperature.

8.5.2 Single Pass Method (SST) Measurement

When using a single-piece testing instrument, the sampling method, dimensions, and permissible deviations of the sample shall comply with the provisions of GB/T 13789 (IEC 60404-3, IDT). To ensure the magnetic test results represent the magnetic properties of the steel strip, when cutting large single-piece samples, the deviation between the longitudinal centerline position and the width direction center position of the product should be ≤50mm. The angle of deviation between the sample's longitudinal direction and the rolled direction of the template should be within ±1 °.

Samples measured by the single-stage method do not require stress elimination annealing and are not allowed to undergo aging tests.

8.6 Sampling Quantity, Sampling Direction, Sample Size and Test Method

8.6.1 The Sampling Quantity, Sampling Direction, Sample Size and Test Method of the Product Inspection Project Shall Comply With the Provisions of Table 11.

8.6.2 Tensile Tests Should Be Carried out in Accordance With Method B of GB/T 228.1-2021. In Order to Improve the Reproducibility of the Measurement Results, It Is Recommended to Use Beam Displacement Control method, the rate of measurement of yield strength is 5%Lc/ minute or 0. 00083/s, the rate of measurement of yield strength after measurement is 40%Lc/ minute (Lc is the parallel length of the sample) or 0. 0067/s. The position of the sample from the edge should not be less than 50mm.

Table 11 Sampling Quantity, Sample Direction, Sample Size and Test Method of Test Items

inspecting item	Number of samples	Test sample direction	specimen size	experimental method
Compared with total loss and magnetic polarization intensity	1 Group/batch	direction	Length: 500mm Width: 500mm	GB T 13789 (Magnetic domain refinement products)
			Length: 280mm～320mm Width: 30mm	GB/T 3655
Stacking coefficient				GB/T 19289
Coating adhesion	1 Group/batch	direction	Length: 280mm～320mm Width: 30mm	GB/T 2522
inequality	1 per batch	direction	Full board width × 1000mm length	YB/T 4292
Height of hair cut	1/ batch	direction	Full board width × 1000mm length	YB/T 4292
Surface insulation resistance	—	broadwise	≥400mm×≥50mm strip steel longitudinal	GB/T 2522
A Weighted magnetostrictive velocity level		direction	100㎜×500㎜	IEC/TR 62581-2010
Number of bends		direction	Width: 30mm	YB/T 4731
Vickers hardness (HV1)		/	≥12㎜×≥30㎜	GB/T 4340.1
tensile property		direction	Parallel section 25mm×60mm (50mm spacing)	GB/T 228.1-2021
camber		direction	Full board width × 2000mm length	YB/T 4292
Residual curvature		direction	Full board width × 500mm length	YB/T 4292
Deviation of shear edge caused by internal stress		direction	Full board width × 1000mm length	YB/T 4292

8.7 other

The supplier may adopt different inspection and test methods for acceptance testing. In case of any dispute, the inspection and test methods and relevant technical requirements specified in these Technical conditions shall be used for testing.

9 Determination and Retest Rules

The rules for product determination and reinspection shall comply with the provisions of GB/T 17505.

If any test result fails to meet the standard requirements, double the quantity of samples from the same batch shall be retested for the non-conforming item. If the retest results (including all required indicators) are qualified, the entire batch is deemed qualified. However, if even one indicator in the retest results (including all required indicators) is non-compliant, the entire batch is deemed unqualified. Should the retest fail, the individual sample that has undergone testing and yielded non-compliant results cannot be accepted. Nevertheless, untested samples within the same batch may be individually resubmitted for retesting and acceptance.

10 Packaging, Marking and Inspection Documents

The packaging, labeling, and inspection documentation of the products shall comply with the provisions of Q/BQB 400. Unless otherwise specified, steel coils shall be packaged horizontally as detailed in Figure 7 of Q/BQB 400. For any special packaging requirements from the client, such terms may be negotiated during order placement and explicitly stated in the contract.

The basic items listed in the quality certificate of directional electric steel products are $P_{1.7/50}$, $P_{1.7/60}$, J_{800}, overlapping coefficient. If the buyer has special requirements, it can be negotiated when ordering and indicated in the contract.

11 Rules for Numerical Rounding

The numerical judgment adopts the rounding value comparison method, and the numerical rounding should comply with the provisions of GB/T 8170.

12 Other Notes

Due to external environmental factors, storage conditions, and packaging requirements, directional electrical steel products may develop surface corrosion risks during prolonged storage. Under standard packaging, transportation, handling, and storage conditions, the supplier must ensure that no rust formation occurs on product surfaces within 12 months from the date of manufacturing completion.

Note: The issue date in the product inspection document is usually defined as the completion date of the product.

13 Information Required for Order

Users shall provide the following information when ordering according to this part:

1) Document number;
2) the name of a shop；
3) specification and dimension；
4) boundary situation；
5) weight；
6) manner of packing；
7) use；
8) For refined magnetic domain products, the refined magnetic domain treatment method (heat resistant or non-heat resistant) should be specified;
9) Other special requirements.

appendix C

(informative annex)

Technical differences between this document and the national standard GB/ T 2521. 2. 2016 are shown in Table C.1 and Table C.2.

Technical differences between this document and the national standard GB/T 2521.2-2016

order number	project		GB/T 2521.2 - 2016	Q/BQB 485 - 2023
1	product line		General type, high magnetic polarization intensity type, and domain refinement type	Standard type, high magnetic polarization intensity type, domain refinement type, heat-resistant domain refinement type, distribution transformer series, low-noise series, uncoated series
2	Ranking of cards		——	Low-end grades such as 27Q130,23Q120,23QH 100,27QH100,30QH110, B18P095 and B20P095 were deleted, and high-end grades such as B23R 075, B27R080, B30R090, B30P100, B30P095 and B23RD070 were added.
3	geometrical features	Location of thickness detection	Not less than 30mm from the edge	Not less than 15mm from the edge of the product
		Vertical thickness difference	≤0.025mm	0.27、0.30、0.35mm：≤0.015mm 0.23、0.20、0.18mm：≤0.012mm
		Lateral thickness difference	≤0.015mm	0.27、0.30、0.35mm：≤0.012mm 0.23、0.20、0.18mm：≤0.010mm
		Width tolerance allowed	0～2mm	0～0.5mm
		Inclination (steepness)	≤1.5%	≤1.0%
		wave height	——	≤3.0mm
		Height of hair cut	≤0.025mm	≤0.020mm
		camber	≤0.9mm	≤0.9mm
		Stacking coefficient	0.23mm：0.945 0.27mm：0.950 0.30mm：0.955 0.35mm：0.960	0.23mm：0.955 0.27mm：0.960 0.30mm：0.965 0.35mm：0.965
		Residual curvature	≤35mm	≤5mm
		innerstress	——	≤1mm
4	Coating properties	Coating adhesion	——	Not inferior to grade E
		Surface insulation coating resistance		The average of five measurements on a single surface should not be less than 30 Ω ·cm²/surface, and the minimum of one measurement on a single surface should not be less than 5 Ω ·cm²/surface
5	magnetic performance	Maximum $P_{1.7/50}$	See table C.2	The standard values and typical values of some grades shall be determined according to the actual level of baosteel products, and the standard values and typical values of some grades shall be improved. See Table C.2 for details.
		Maximum $P_{1.7/60}$	See table C.2	
		Maximum $P_{1.5/50}$	——	
		Maximum $P_{1.5/60}$	——	
		Minimum J_{800}	See table C.2	
6	Method for cutting test specimens of adhesion of directional electric steel insulation coating and magnetic properties of large single pieces		——	Normative Appendix A

Table C.2 Differences between this document and the national standard GB/T 2521.2-2016 Magnetic properties of typical grades

breed	thick-ness mm	the name of a shop	GB/T 2521.2 - 2016		Q/BQB 485 - 2023	
			$P_{1.7/50}$	J_{800}	$P_{1.7/50}$	J_{800}
			W/kg	T	W/kg	T
conventional type	0.23	B23G110	1.10	1.82	1.08	1.85
	0.27	B27G120	1.20	1.82	1.15	1.85
	0.30	B30G120	1.20	1.82	1.15	1.86
		B30G130	1.30	1.82	1.20	1.85
	0.35	B35G145	1.45	1.82	1.25	1.86
		B35G155	1.55	1.82	1.35	1.85
High magnetic polarization intensity type	0.23	B23P085	0.85	1.88	0.85	1.90
		B23P090	0.90	1.88	0.88	1.89
		B23P095	0.95	1.88	0.92	1.89
		B23P100	1.00	1.88	0.96	1.88
	0.27	B27P090	0.90	1.88	0.89	1.90
		B27P095	0.95	1.88	0.93	1.90
		B27P100	1.00	1.88	0.96	1.90
		B27P110	1.10	1.88	1.03	1.89
	0.30	B30P105	1.05	1.88	1.01	1.90
		B30P120	1.20	1.88	1.05	1.89
	0.35	B35P115	1.15	1.88	1.12	1.90
		B35P125	1.25	1.88	1.15	1.90
		B35P135	1.35	1.88	1.20	1.89
Magnetic domain refinement High magnetic polarization intensity type	0.23	B23R080	0.80	1.88	0.79	1.89
		B23R085	0.85	1.88	0.82	1.88
		B23R090	0.90	1.88	0.88	1.88
	0.27	B27R085	0.85	1.88	0.84	1.89
		B27R090	0.90	1.88	0.87	1.89
		B27R095	0.95	1.88	0.92	1.88
	0.30	B30R095	0.95	1.88	0.92	1.90
		B30R100	1.00	1.88	0.96	1.89

appendix D

(informative annex)

This Document Shows the Typical Values of Technical Performance Indexes of Representative Grades of Electrical Steel

Table D.1 Typical Values of Main Magnetic Properties of General Grades of Electrical Steel in This Document

Type	Representative symbol	magnetic performance				
		$P_{1.7}$ W/kg		$P_{1.5}$ W/kg		J_{800} T
		50Hz	60Hz	50Hz	60Hz	
conventional type	B23G110	0.99	1.29	0.71	0.93	1.89
	B27G120	1.03	1.34	0.75	0.99	1.89
	B30G120	1.08	1.43	0.79	1.05	1.89
	B30G130	1.13	1.49	0.81	1.08	1.88
	B35G135	1.18	1.58	0.90	1.21	1.89
	B35G145	1.23	1.64	0.93	1.25	1.89
	B35G155	1.30	1.73	0.98	1.32	1.89
High magnetic polarization intensity type	B18P070	0.69	0.90	0.51	0.66	1.90
	B18P075	0.74	0.96	0.55	0.73	1.89
	B18P080	0.79	1.02	0.58	0.76	1.89
	B20P075	0.74	0.97	0.55	0.73	1.90
	B20P080	0.79	1.03	0.59	0.78	1.89
	B20P085	0.83	1.08	0.60	0.80	1.91
	B23P080	0.79	1.04	0.58	0.78	1.92
	B23P085	0.83	1.09	0.62	0.81	1.92
	B23P090	0.87	1.14	0.64	0.85	1.91
	B23P095	0.90	1.18	0.66	0.86	1.91
	B23P100	0.93	1.21	0.67	0.88	1.91
	B27P085	0.84	1.12	0.62	0.84	1.91
	B27P090	0.88	1.16	0.66	0.88	1.91
	B27P095	0.92	1.21	0.68	0.91	1.91
	B27P100	0.94	1.24	0.69	0.92	1.91
	B27P110	0.97	1.28	0.72	0.95	1.91
	B30P090	0.89	1.19	0.67	0.91	1.92
	B30P095	0.94	1.25	0.71	0.95	1.92
	B30P100	0.97	1.29	0.73	0.98	1.92
	B30P105	0.99	1.31	0.74	0.99	1.91
	B30P120	1.02	1.35	0.76	1.01	1.91
	B35P115	1.11	1.48	0.85	1.14	1.92
	B35P125	1.14	1.52	0.86	1.16	1.91
	B35P135	1.18	1.55	0.89	1.18	1.91
Magnetic domain refined type	B18R055	0.54	0.70	0.40	0.52	1.91
	B18R060	0.59	0.77	0.44	0.58	1.91
	B18R065	0.64	0.83	0.48	0.63	1.91
	B18R070	0.68	0.88	0.50	0.65	1.90
	B18R075	0.73	0.94	0.52	0.68	1.88
	B20R060	0.59	0.76	0.44	0.59	1.91
	B20R065	0.64	0.82	0.47	0.62	1.91
	B20R070	0.68	0.89	0.51	0.67	1.90
	B20R075	0.73	0.95	0.53	0.70	1.90
	B20R080	0.77	0.99	0.55	0.72	1.89

Table D.1 (continued)

Type	Representative symbol	magnetic performance				
		$P_{1.7}$ W/kg		$P_{1.5}$ W/kg		J_{800} T
		50Hz	60Hz	50Hz	60Hz	
Magnetic domain refined type	B23R070	0.69	0.91	0.52	0.69	1.92
	B23R075	0.74	0.97	0.56	0.74	1.91
	B23R080	0.77	1.01	0.57	0.76	1.91
	B23R085	0.80	1.04	0.59	0.78	1.91
	B23R090	0.85	1.11	0.62	0.81	1.90
	B27R080	0.78	1.02	0.59	0.78	1.92
	B27R085	0.82	1.08	0.62	0.82	1.91
	B27R090	0.86	1.13	0.64	0.86	1.90
	B27R095	0.89	1.17	0.66	0.88	1.90
	B30R090	0.88	1.16	0.68	0.90	1.92
	B30R095	0.91	1.20	0.70	0.93	1.92
	B30R100	0.94	1.24	0.71	0.95	1.91
	B30R105	0.97	1.28	0.74	0.98	1.90
Thermal resistant, engraved, domain refined type	B18HS065	0.64	--	--	--	1.89
	B18HS070	0.68	--	--	--	1.89
	B18HS075	0.73	--	--	--	1.89
	B20HS065	0.64	--	--	--	1.90
	B20HS070	0.68	--	--	--	1.90
	B20HS075	0.73	--	--	--	1.89
	B20HS080	0.78	--	--	--	1.89
	B20HS085	0.83	--	--	--	1.89
	B23HS070	0.69	--	--	--	1.90
	B23HS075	0.73	0.98	0.55	0.73	1.90
	B23HS080	0.78	1.02	0.58	0.78	1.90
	B23HS085	0.83	1.07	0.60	0.80	1.89
	B23HS090	0.87	1.11	0.63	0.83	1.89
Note: The typical value of technical performance index of representative brand number is the reference data, not as the delivery guarantee value.						

Table D.2 Typical Values of Main Properties of Low Noise Series Oriented Electrical Steel in This Document

Representative symbol	magnetic performance					A Weighted magnetostrictive velocity level
	$P_{1.7}$ W/kg		$P_{1.5}$ W/kg		J_{800} T	$L_{VA,1.7/50}$ dB(A)
	50Hz	60Hz	50Hz	60Hz		
B23R075-LM	0.73	0.97	0.56	0.74	1.92	53
B23R080-LM	0.77	1.01	0.57	0.76	1.91	
B23R085-LM	0.80	1.04	0.59	0.78	1.91	
B27R090-LM	0.85	1.12	0.63	0.85	1.91	55
B27R095-LM	0.90	1.19	0.68	0.90	1.91	
B30R100-LM	0.93	1.22	0.70	0.94	1.91	
B27P100-LM	0.92	1.21	0.68	0.91	1.91	55
B30P100-LM	0.97	1.29	0.73	0.98	1.92	
B30P105-LM	1.01	1.34	0.76	1.01	1.91	
B30P120-LM	1.04	1.38	0.78	1.04	1.91	
Note: The typical value of technical performance index of representative brand number is the reference data, not as the guarantee value of delivery.						

Table D.3 Typical values of main properties of the series of oriented electrical steel for distribution transformers in this document

Representative symbol	magnetic performance					Stacking coefficient
	$P_{1.7}$ W/kg		$P_{1.5}$ W/kg		J_{800}	
	50Hz	60Hz	50Hz	60Hz	T	
B23RD075	0.73	0.95	0.55	0.73	1.92	0.97
B23RD080	0.76	0.98	0.57	0.76	1.92	
B23RD085	0.78	1.01	0.59	0.78	1.92	
B23RD090	0.83	1.07	0.61	0.80	1.91	
Note: The typical value of technical performance index of representative brand number is the reference data, not as the delivery guarantee value.						

Table D.4 Typical values of mechanical properties, stacking coefficient and resistivity of electrical steel in this document

thickness mm	Tensile strength (MPa)		Yield strength (MPa)		Extension rate [d] (%)		Number of repeated bending times (2)		Vickers hardness	Stacking coefficient	Resistance [e] (10^{-8} Ω·m)
	L[b]	C[c]	L[b]	C[c]	L[b]	C[c]	L[b]	C[c]	HV1		
0.18	345	402	324	342	13	42	44	14	201	0.953	52
0.20	349	405	326	346	13	42	41	12	202	0.958	52
0.23	354	401	331	346	14	42	32	11	205	0.963	53
0.27	378	438	360	380	10	39	30	9	220	0.968	54
0.30	372	408	346	367	14	44	23	7	208	0.973	53
0.35	369	405	347	365	13	42	20	6	209	0.980	53

The typical value of technical performance index of [a] representative brand is for users to use as reference, and is not the guarantee value of delivery.

[b] indicates that the test direction is vertical.

[c] indicates that the test direction is transverse

The [d] stretched specimen is the No.5 specimen specified in JIS Z 2241.

The [e] resistivity detection method is referred to GB/T 351-1995.

Table D.5 Typical values of main magnetic properties of oriented electrical steel in this document Q, high magnetic polarization intensity type QG, and domain refinement type RK

Type	Representative symbol	magnetic performance				
		$P_{1.7}$ W/kg		$P_{1.5}$ W/kg		J_{800}
		50Hz	60Hz	50Hz	60Hz	T
conventional type	23Q110	0.99	1.29	0.71	0.93	1.88
	27Q120	1.06	1.38	0.77	1.01	1.88
	30Q120	1.08	1.40	0.78	1.02	1.89
	30Q130	1.13	1.48	0.81	1.07	1.88
	35Q145	1.23	1.64	0.92	1.24	1.87
	35Q155	1.30	1.73	0.98	1.32	1.86
High magnetic polarization intensity type	18QG080	0.78	1.00	0.58	0.74	1.90
	18QG085	0.83	1.08	0.61	0.79	1.90
	18QG095	0.93	1.20	0.64	0.83	1.89
	20QG080	0.78	1.02	0.59	0.76	1.90
	20QG085	0.84	1.09	0.62	0.81	1.90
	20QG095	0.93	1.20	0.65	0.85	1.89
	23QG085	0.84	1.09	0.62	0.81	1.92
	23QG090	0.87	1.15	0.64	0.85	1.91
	23QG095	0.90	1.18	0.66	0.86	1.91
	23QG100	0.93	1.21	0.67	0.88	1.90
	27QG090	0.89	1.18	0.67	0.87	1.92
	27QG095	0.93	1.22	0.69	0.91	1.92
	27QG100	0.95	1.25	0.70	0.92	1.91
	27QG120	1.00	1.31	0.73	0.96	1.90
	30QG100	0.98	1.29	0.73	0.98	1.92
	30QG105	1.00	1.31	0.75	0.99	1.91
	30QG120	1.03	1.36	0.76	1.00	1.91
	35QG135	1.16	1.53	0.87	1.17	1.90

Table D.5 (continued)

Type	Representative symbol	magnetic performance				
		$P_{1.7}$ W/kg		$P_{1.5}$ W/kg		J_{800} T
		50Hz	60Hz	50Hz	60Hz	
Magnetic domain refined type	18RK065	0.64	0.85	0.48	0.64	1.90
	18RK070	0.68	0.88	0.50	0.64	1.91
	18RK075	0.73	0.93	0.51	0.67	1.88
	18RK085	0.83	1.06	0.56	0.73	1.88
	20RK070	0.68	0.88	0.50	0.66	1.91
	20RK075	0.74	0.95	0.52	0.68	1.90
	20RK085	0.84	1.08	0.57	0.74	1.89
	23RK075	0.75	0.98	0.55	0.74	1.92
	23RK080	0.78	1.03	0.57	0.76	1.91
	23RK085	0.81	1.06	0.58	0.77	1.91
	23RK090	0.85	1.11	0.62	0.81	1.90
	23RK100	0.90	1.18	0.64	0.85	1.89
	27RK085	0.84	1.10	0.63	0.83	1.92
	27RK090	0.87	1.14	0.64	0.86	1.91
	27RK095	0.90	1.18	0.66	0.88	1.90
	27RK100	0.95	1.25	0.69	0.91	1.89
	30RK095	0.92	1.21	0.68	0.90	1.91
	30RK100	0.94	1.24	0.70	0.95	1.90
	30RK105	0.97	1.27	0.72	0.96	1.89
Note: The typical value of technical performance index of representative brand number is the reference data, not as the delivery guarantee value.						