

THE STANDARD
OF
COLD ROLLED GRAIN ORIENTED ELECTRICAL STEEL
PRODUCED BY
BAOSTEEL, CHINA
FOR
INTERNATIONAL MARKET

PRESENTED BY



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ENTERPRISE STANDARD OF BAOSHAN IRON & STEEL CO., LTD.
**COLD-ROLLED GRAIN-ORIENTED ELECTRICAL STEEL SHEET
 DELIVERED IN THE FULLY-PROCESSED STATE** Q/BQB 485—2007

1 Scope

This standard is intended to briefly present the features of cold-rolled grain-oriented electrical steel sheet delivered in the fully-processed state in nominal thickness of 0.23mm, 0.27mm, 0.30mm and 0.35mm: definition, classification and code name, dimension, shape, weight, technical requirement such as magnetic ability, inspection and examination, packing, symbol, as well as quality certificate, etc.

This Standard applies to Goss textured grain-oriented electrical steel sheet supplied in the final annealed condition in sheets (shorted for sheets hereinafter), and intended for the construction of magnetic circuits.

2 Normative references

The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. Any revised paper (corrigenda not included) or revised edition to the dated citation is not applicable to this standard. However, parties that come to agreement in accordance with this standard are encouraged to work out whether the lasted versions of the standards shall be applied.

GB/T235-1999	Metallic materials-Sheet 3mm thick or less-Reverse bend test
GB/T 3102.5-1993	Measurement and unit of electromagnetism and magnetism
GB/T 3655-2000	Methods of determination of the magnetic properties of magnetic sheet by means of an Epstein frame
GB/T 8170-1987	Rules for rounding off numerical values
GB/T 9637-2001	Electrotechnical Vocabulary: Magnetic materials and components
GB/T 13789-1992	Methods of measurement of the magnetic properties of magnetic sheet by means of a single sheet tester
GB/T 19289-2003	Methods of measurement of density, resistivity and stacking factor of electrical steel sheet

Q/BQB 400	Packing, symbol and quality certificate of cold-rolled products
Q/BQB 401	Dimensions, shapes, weights and tolerances of continuous cold strip steel
JIS C 2550-2000	Test methods of electrical steel plate

3 Terms and definition

3.1 Core loss (Specific Total Loss)

Core loss is the energy loss that occurs in magnetization of samples under AC magnetic field. When magnetizing under given frequency and maximum magnetic flux density, core loss is indicated by P(10Bm/f), with W/kg as unit.

Ex: P17/50 means the core loss of sample by unit of kg, when the magnetic flux density is 1.7T and frequency is 50Hz

3.2 Characteristic of Magnetization (Magnetic Flux Density)

Characteristic of magnetization is often indicated by magnetic characteristic curves to describe certain magnetic flux density (magnetic polarization) under certain magnetic field intensity.

Ex: B₈ means the magnetic flux density when the magnetic field intensity is 800A/m.

3.3 Number of bends

Number of bends means the number of alternate bends before the appearance of the first crack in the base metal visible to the naked eye; it constitutes an indication of the ductility of the material.

3.4 Other terms and definition shall comply with the requirements specified in GB/T 9637.

4 Type and Code

4.2 Type and Code of Insulating Coating should be as specified in Table 1.

Type of Insulation Coating	Code
Inorganic Coating	S

5 Information to be supplied

The purchaser shall include the following information in his enquiry or order.

a) number of this Standard;

- b) grade;
- c) dimensions;
- d) weight;
- e) way of packing;
- f) end use;
- g) others.

6 Dimensions, shapes, weights and tolerances

6.1 The extension of nominal dimensions of steel sheets shall be as specified in Table 2.

Table 2

Unit: mm

Thickness	Width	Diameter
0.23、0.27、0.30、0.35	700~1260	508

6.2 Tolerances of Dimensions

Tolerances on thickness, deviations of thickness in transverse direction and tolerance on width shall be as specified in Table 3.

Table 3

Unit: mm

Thickness	Tolerance on thickness	Deviation of thickness in longitudinal direction	Deviation of thickness in transverse direction	Tolerance on width
0.23	±0.025	≤0.030	≤0.020	0~+2
0.27	±0.030			
0.30				
0.35				

6.3 Flatness (Wave Factor) of steel sheet shall not exceed 1.5%.

6.4 Edge camber of steel sheet shall not exceed 1.0mm for a length of 2mm.

6.5 Measurement of dimensions and shapes

6.5.1 Measurement of dimensions and shapes shall be taken at any position not less than 3m from the beginning and end of the steel sheet.

6.5.2 Measurement of thickness shall be taken anywhere at least 15mm from the edge. The deviation of thickness in longitudinal direction means the difference between the maximum and the minimum thickness measured in transverse direction (parallel to rolling direction) at any position on a 2 m long steel sheet. Deviation of thickness in transverse direction means the difference between the maximum and the minimum thickness measured in a

direction parallel to the longitudinal direction (vertical to rolling direction) of the steel sheet.

6.5.3 Measurement of Flatness (Wave Factor)

The flatness shall be calculated by measuring the maximum height (h) and wave length (L) of the steel sheet (ratio of wave height to wave length).

$(h/L) \times 100\%$, as specified in Table 1.

6.5.4 Method of measurement of Edge Camber shall comply with Q/BQB401.

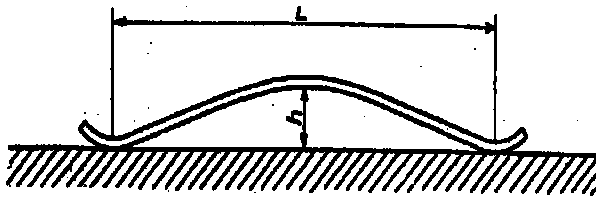


Table 1 Measurement of Flatness (Wave Factor)

6.6 Delivery shall be made in compliance with the actual weight of the steel sheet.

7 Technological requirements

7.1 Making process and chemical composition of steel shall be decided by the supplier.

7.2 Steel sheets shall be delivered in the state of ultimately annealed and coated with insulation coating on both sides.

7.3 Magnetic properties (Magnetic Flux Density B_8 , core loss $P_{17/50}$) shall be as specified in Table 4, Table 5 and Table 6 accordingly. The requirements of the magnetic properties shall also be applicable to the aging samples.

7.4 Lamination Factor shall be as specified in Table 4, Table 5 and Table 6 accordingly.

7.5 Theoretical density to calculate magnetic properties and lamination factor is 7.65 kg/dm^3 .

7.6 Number of bends shall not be less than 1 time. This test shall be ignored if the supplier guarantees.

7.7 Any other special requirements about residual curvature, internal stresses, mechanical properties and process properties that required by the buyer shall be negotiated at the time of ordering and indicated in contracts.

Table 4

Type	Grade	Thickness mm	Core Loss $P_{17/50}$ W/kg Not more than	Magnetic Flux Density ^a B_8 T Not less than	Lamination Factor % Not less than
Regular	B23G110	0.23	1.10	1.80	94.5
	B23G120		1.20	1.80	
	B27G120	0.27	1.20	1.80	95.0
	B27G130		1.30	1.80	
	B30G120	0.30	1.20	1.80	95.5
	B30G130		1.30	1.80	
	B30G140		1.40	1.80	
	B35G135	0.35	1.35	1.80	96.0
	B35G145		1.45	1.80	
	B35G155		1.55	1.80	

^a It has been common practice for many years to give values of magnetic flux density. In fact the Epstein frame is used to determine magnetic polarization, which is defined as follows:

$$J=B-\mu_0H$$

where

J is the magnetic polarization;

B is the magnetic flux density;

μ_0 is the magnetic constant: $4\pi \times 10^{-7}$ H/m

H is the magnetic field strength;

in accordance with GB/T 3102.5-1993.

Table 5

Type	Grade	Thickness mm	Core Loss $P_{17/50}$ W/kg Not more than	Magnetic Flux Density ^a B_8 T Not less than	Lamination Factor % Not less than
High Permeability	B23P090	0.23	0.90	1.87	94.5
	B23P095		0.95	1.87	
	B23P100		1.00	1.87	
	B27P095 ^a	0.27	0.95	1.88	95.0
	B27P100		1.00	1.88	
	B27P110		1.10	1.88	
	B30P100	0.30	1.00	1.88	95.5
	B30P105		1.05	1.88	

	B30P110		1.10	1.88	
	B30P120		1.20	1.88	
	B35P115	0.35	1.15	1.88	96.0
	B35P125		1.25	1.88	
	B35P135		1.35	1.88	

^a It has been common practice for many years to give values of magnetic flux density. In fact the Epstein frame is used to determine magnetic polarization, which is defined as follows:

$$J=B-\mu_0H$$

where

J is the magnetic polarization;

B is the magnetic flux density;

μ_0 is the magnetic constant: $4\pi\times 10^{-7}$ H/m

H is the magnetic field strength;

in accordance with GB/T 3102.5-1993.

Table 6

Type	Grade	Thickness mm	Core Loss $P_{17/50}$ W/kg Not more than	Magnetic Flux Density ^b B_8 T Not less than	Lamination Factor % Not less than
High Permeability, Domain Refined ^a	B23R080	0.23	0.80	1.87	94.5
	B23R085		0.85	1.87	
	B23R090		0.90	1.87	
	B27R090	0.27	0.90	1.87	95.0
	B27R095		0.95	1.87	

^a The guaranteed core loss of high permeability, domain refined steel shall only apply to the samples not being stress-relieve annealed or measured in accordance with GB/T 13789.

^b It has been common practice for many years to give values of magnetic flux density. In fact the Epstein frame is used to determine magnetic polarization, which is defined as follows:

$$J=B-\mu_0H$$

where

- J is the magnetic polarization;
- B is the magnetic flux density;
- μ_0 is the magnetic constant: $4\pi \times 10^{-7}$ H/m
- H is the magnetic field strength;

in accordance with GB/T 3102.5-1993.

7.9 Insulation Coating

The insulation coating shall be sufficiently adherent so that it does not become detached during cutting operations or heat treatment under conditions specified by the supplier. However, the slight chipping of the coating at the shearing edges shall be tolerated. The insulation coating shall be resistant to materials such as insulating varnish, transformer oil and motor oil etc. The coating type shall be as specified in Table 7. Any special requirement of the resistance of the insulation coating by the buyer shall be negotiated by at the time of ordering and indicated in the contract.

Table 7

Type	Characteristic
Inorganic Coating(S)	Thin layer, high interlaminar resistance, sufficiently resistant to rust and high temperature

7.10 Surface condition

7.10.1 The surfaces shall be smooth and clean, without any defect that may

by detrimental to the correct use of the supplied material. Dispersed defects such as scratches, blisters, cracks, etc. are permitted if they are within the limits of thickness tolerances, and if they are not detrimental to the correct use of the supplied material.

7.10.2 Some parts with defects shall be allowed, for they cannot be cut off from the steel sheet. However, the parts with defects shall not exceed 6% of the total length of the coil.

8 Inspections and Testing

8.1 Appearance is checked by visual inspection.

8.2 Dimensions and shape shall be inspected by suitable survey tools.

8.3 Steel sheets shall be divided into acceptance units for inspection. Each acceptance unit shall comprise 3 t of steel sheets of same grade, same specification, with same heat treatment, and same surface insulation resistance. For coils of more than 3 t, each coil shall constitute an acceptance unit.

8.4 Quantity of test samples, dimensions of samples and methods of test shall be as specified in Table 8. Samples shall be taken at any position not less than 3 m from the beginning and end of steel sheet. Number, direction and dimensions of test samples and test methods shall comply with Table 8. Samples shall be taken at not less than 3 m from the beginning and end of steel sheet.

8.5 Samples shall be subjected to a stress relief heat treatment before the magnetic properties are tested by Epstein frame in accordance with GB/T 3655 or JIS C 2550. Arrange of annealing temperature shall be $780^{\circ}\text{C} \sim 820^{\circ}\text{C}$ with a duration of 2 h. Samples shall not be subjected to a stress relief heat treatment when tested by single sheet tester in accordance with GB/T 13789.

8.6 In the case of measurements of specific total loss on aged test pieces, these shall be aged by heating at $225^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for a duration of 24 h and shall be cooled to ambient temperature.

8.7 The radius of bending chosen shall be 5 mm on a bending test.

Table 8

Serial Number	Test Item	Specimen Quality	Specimen Direction	Dimensions	Test Method
1	Core Loss ^a 、 Magnetic Flux Density ^a	1 set/coil	Longitudinal	Length: 320 mm Width: 320 mm	GB/T 13789
2				Length : 280 ~ 320 mm Width : 30 mm	GB/T 3655 or JIS C 2550
3	Lamination Factor			GB/T 19289	
	Number of Bends	5		Width : 20 mm	GB/T 235
<p>^aIn the case of arbitration, GB/T 3655 or JIS C 2550 is adopted for materials except for steel grades with high permeability.</p> <p>^bThe specimen quantity can be otherwise chosen by the agreement between the concerned parties.</p>					

8.8 In case of one test result not meeting this Standard, double quantity specimens from the same lot shall be resampled and retested. Once all the results (including all the properties required by the specimen) meet the requirement, the whole lot shall be accepted. In case that one single result (including all the properties required by the specimen) fails, the retest fails. In that case, the failed test unit shall be discarded, and the remained units in the lot shall be retested one by one for approval.

9 Packing, Marking and Inspection Certificate

The packing, marking and Inspection Certificate shall be in accordance with the requirements specified in Q/BQB400. Any special requirement shall be noted in the order.

10 Rules for rounding off numerical values

Numerical value rounding off rules shall be in accordance with GB/T 8170.

Annex A
(informative)

Comparable steel grade with this Standard

Table A.1

Q/BQB 480-2007	GB/T 2521-1996	IEC 60404-8-7: 1998	JIS C 2553-2000	ASTM A876M-03	EN 10107: 1996
B23G110	23Q110	—	23G110	—	—
B23G120	23Q115	M120-23S 5	—	23H070	<i>M120-23S</i>
B27G120	27Q120	—	27G120	—	—
B27G130	27Q130	M130-27S 5	27G130	27H074	<i>M130-27S</i>
B30G120	30Q120	—	—	—	—
B30G130	30Q130	—	30G130	—	—
B30G140	30Q140	M140-30S 5	30G140	30H083	<i>M140-30S</i>
B35G135	35Q135	—	—	—	—
B35G145	35Q145	—	35G145	—	—
B35G155	35Q155	M150-35S 5	35G155	35H094	<i>M150-35S</i>
B23P090	23QG090	M90-23P 5	23P090	—	—
B23P095	23QG095	M95-23P 5	23P095	—	—
B23P100	23QG100	M100-23P 5	23P100	23P060	<i>M100-23P</i>
B27P095	27QG095	—	—	—	—
B27P100	27QG100	M103-27P 5	27P100	—	<i>M103-27P</i>
B27P110	27QG110	M110-27P 5	27P110	27P066	—
B30P100	30QG100	—	—	—	—
B30P105	30QG105	M105-30P 5	30P105	—	<i>M105-30P</i>
B30P110	30QG110	M111-30P 5	30P110	—	<i>M111-30P</i>
B30P120	30QG120	M117-30P 5	30P120	—	<i>M117-30P</i>
B35P115	—	—	35P115	—	—
B35P125	—	M125-35P 5	35P125	—	—
B35P135	—	M135-35P 5	35P135	—	—
B23R080	—	—	—	—	—
B23R085	—	—	23R085	—	—
B23R090	—	—	23R090	23Q054	—
B27R090	—	—	27R090	—	—
B27R095	—	—	27R095	27Q057	—

Additional notes:

This Standard does not correspond to IEC 60404-8-7: 1998 and JIS C2553: 2000 equivalently.

Table A is an informative Annex.

This Standard is proposed by Technical Quality Management Dept. of Baoshan Iron and Steel Co., Ltd.

This Standard is drafted by Technical Quality Management Dept. of Baoshan Iron and Steel Co., Ltd.

Draftsman

This is the first publication.