

# 冷轧无取向硅钢

Cold-rolled Non-oriented Electrical Steel





BAOSTEEL

BeCOREs





## 前言 Preface

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硅钢通常是指冷轧硅钢，分晶粒取向硅钢和晶粒无取向硅钢两大类。无取向硅钢晶粒方向随机分布，电磁性能各向均匀，广泛应用于电机、压缩机和汽车等行业领域。

作为发电及决定电力应用效率的关键功能材料，无取向硅钢对于产业链节能减排，支撑国家“双碳”战略，具有重要的经济技术价值。

本手册综合介绍了宝钢股份无取向硅钢牌号、品种、规格、应用、电磁性能、力学性能、尺寸板形公差，并提供了典型牌号的电磁性能数据和曲线图，作为用户使用宝钢无取向硅钢时重要的参考工具书，充分利用宝钢无取向硅钢产品特性，设计、制造出更加优良的电气产品。

Electrical steel, usually referring to cold rolled electrical steel, can be divided into two major categories including grain-oriented electrical steel and non-oriented electrical steel. Non-oriented electrical steel is widely used in the field of motor, compressor, automobile and other industries because of its random grain distribution and uniform electromagnetic properties.

As a key functional material for power generation and determining the efficiency of power application, non-oriented electrical steel has important economic and technological value for energy saving and emission reduction in the industrial chain and supporting the national "carbon peaking & carbon neutrality" strategy.

This brochure presents the overview of Baoshan Iron & Steel Co.,Ltd. non-oriented electrical steel grade specification,application,mechanical properties,magnetic properties,magnetization data and curves. Customers can take this brochure as an important reference handbook when using our non-oriented electrical steel products. We believe it will be helpful for customers to make full use of our products so as to design and manufacture excellent electrical products.

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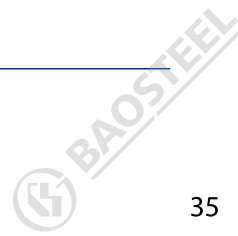
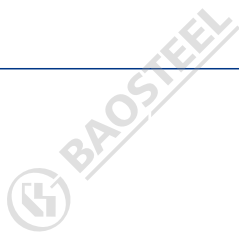
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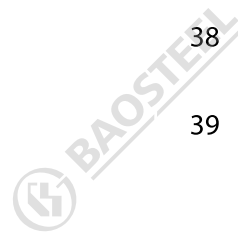
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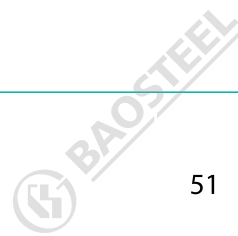
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# 宝钢股份简介

## PROFILE OF BAOSTEEL

宝山钢铁股份有限公司（简称“宝钢股份”）是全球领先的现代化钢铁联合企业，是《财富》世界500强中国宝武钢铁集团有限公司的核心企业。宝钢股份以“成为全球最具竞争力的钢铁企业和最具投资价值的上市公司”为愿景，致力于为客户提供超值的产品和服务，为股东和社会创造最大价值，实现与相关利益主体的共同发展。

2000年2月，宝钢股份由上海宝钢集团公司独家创立；同年12月，在上海证券交易所上市（证券代码：600019）。2017年2月，完成吸收合并武钢股份后，宝钢股份拥有上海宝山、武汉青山、湛江东山、南京梅山等主要制造基地，在全球上市钢铁企业中粗钢产量排名第二、无取向硅钢产量排名第一、取向硅钢产量排名第一、汽车板产量排名第一，是全球碳钢品种最为齐全的钢铁企业之一。

宝钢股份坚持走“创新、协调、绿色、开放、共享”的发展之路，拥有享誉全球的品牌、世界一流的制造水平和服务能力。公司注重创新能力的培育，积极开发应用先进制造和节能环保技术，建立了覆盖全国、遍及世界的营销和加工服务网络。公司自主研发的新一代汽车高强度钢、硅钢、高等级家电用钢、能源海工用钢、桥梁用钢等高端产品处于国际先进水平。

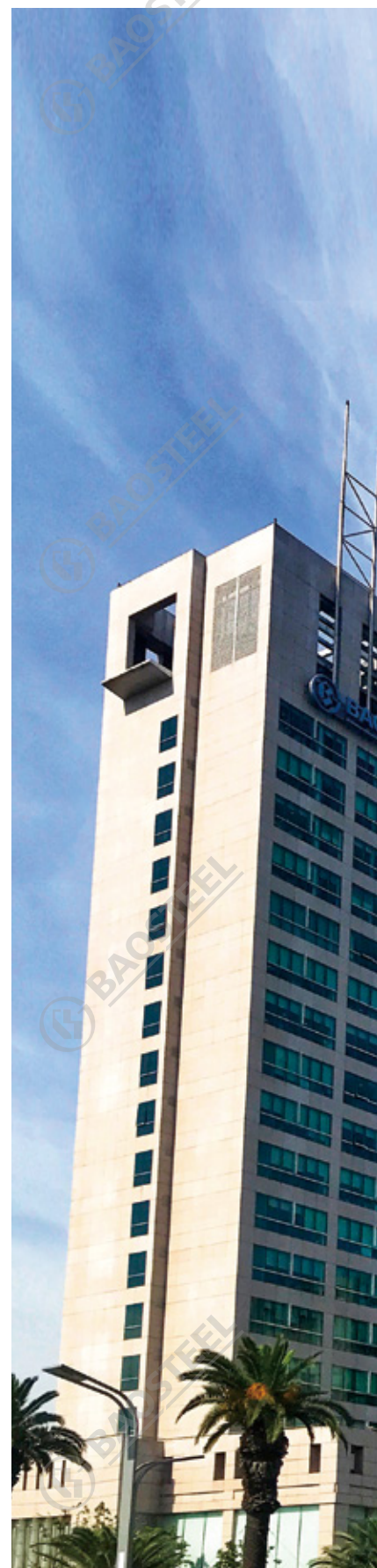
展望未来，宝钢股份将秉承和落实中国宝武“成为全球钢铁业引领者”的愿景和“共建高质量钢铁生态圈”的使命，坚持精品发展、绿色转型和智慧升级，深入探索钢铁企业与现代都市的共融共生之道，积极与员工、用户、投资者和社会公众共享企业发展所收获的丰硕成果，奋力书写新时代钢铁报国、钢铁强国的崭新篇章。

Baoshan Iron & Steel Co., Ltd. (hereinafter referred to as "Baosteel"), is a globally leading modernized integrated iron and steel company and the core enterprise of China Baowu Steel Group Corporation, which is listed in Fortune's Global 500. With a strategic objective to build itself into the most globally competitive iron and steel enterprise and a listed company with the greatest investment value, Baosteel devotes to providing prominent products and services to customers, creating best value for shareholders and the society, and achieving the joint development with stakeholders.

In February 2000, Baosteel was founded by Shanghai Baosteel Group Corporation, and was listed on Shanghai Stock Exchange (stock code: 600019) in December of the same year. In February 2017, Baosteel merged Wuhan Iron & Steel by absorption, which turns Baosteel into a company that owns such main manufacturing bases as Shanghai Baoshan, Wuhan Qingshan, Nanjing Meishan and Zhanjiang Dongshan. The company ranks 2nd in the crude steel production, 1st in the non-oriented electrical steel output, 1st in the oriented electrical steel output and 1st in the automotive sheet output among all the global listed steel companies. The company is also one of the global steel enterprises with the most complete carbon steel products.

Baosteel Co., Ltd. sticks to the development road of "innovation, coordination, green, openness and inclusiveness", and possesses the world-renowned brands and the world first class manufacturing and service capability. The company attaches great emphasis to cultivating its innovation capacity, actively develops and deploys advanced technologies of manufacturing, energy-conservation and environmental protection, and has established the marketing, processing and service network with nationwide coverage and worldwide involvement. Its independently developed high-end products, such as the new generation high strength automotive steel, electrical steel, high grade steel for household appliances, steel for energy and marine engineering, steel for bridges, hot-rolled heavy rail and etc, all reached the world's advanced level.

Facing the future, Baosteel will inherit and carry out China Baowu's vision of "becoming a leader in global steel industry" and mission of "building a high-quality steel ecosphere". Adhering to quality development, green transformation and intelligent upgrade, Baosteel thoroughly explores the joint growth of steel companies and modern cities, actively shares fruitful achievement with employees, customers, investors and the public, and courageously writes the new chapter of a stronger steel industry and steel country.







# 无取向硅钢简介

## NON-ORIENTED ELECTRICAL STEEL PROFILE

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## 无取向硅钢简介

■ 宝山、东山  
Baoshan, Dongshan

■ 青山  
Qingshan

■ 硅钢事业部  
Silicon steel business unit

## 1978

青山基地(原武钢)引进日本NSC(新日铁)无取向硅钢技术,设计产能约4.2万吨。

Wuhan Qingshan base (formerly WISCO) introduced the technology of non-oriented electrical steel from Japan's NSC (Nippon Steel), with a designed production capacity of approximately 42,000 metric tons.

## 2007

“国家硅钢工程技术研究中心”落户青山基地。

The National Engineering Research Center for Silicon Steel was settled down at Wuhan Qingshan.

## 2009

青山基地三分厂投产,无取向硅钢产能达到134万吨。

No. 3 electrical steel plant was put into operation. The total annual production capacity had increased to 1.34 million metric tons.

## 2011

采用青山基地50W250制造的三峡地下电站32号机组成功并网发电。

50W250 was applied to No. 32 generator unit at the underground power station of Three Gorge Project. The generator unit was successfully connected to the power grid.

## 2012

青山基地高牌号无取向硅钢成功应用于溪洛渡770MW水轮发电机组,向家坝800MW水轮发电机组,广东台山1750MW核电机组。

High grade non-oriented electrical steel was successfully applied to a number of projects including Xiluodu 770MW turbine generator, Xiangjiaba 800MW turbine generator and Guangdong Taishan 1750MW nuclear power generator.

## 1996

宝山基地引进日本JFE(川崎制铁)无取向硅钢14个牌号制造技术,设计产能35万吨。

Shanghai Baoshan base introduced the manufacturing technology of 14 grades of non-oriented electrical steel from JFE (Kawasaki Steel), with a designed production capacity of 350,000 tons.

## 2011

宝山基地B50A270-C6涂层产品实现上海电气1000MW及以上火电机组试用认证供货。B50A250供货溪洛渡工程。

B50A270-C6 product has achieved trial certification and supplied to the thermal power units of 1000MW and above by Shanghai Electric Group. B50A250 was successfully applied to the Xiluodu Project.

## 2010

宝山基地《无取向电工钢退火涂层机组工艺装备自主集成与创新》项目荣获2009年冶金科学奖一等奖。

“Independent Integration and Innovation of Process Equipment for Annealing & Coating Units for Non-Oriented Electrical Steel” won the first prize of the 2009 China Metallurgical Science Award.



## 2015

青山基地新能源驱动电机用钢,形成WGP/WGH两个系列牌号。

WGP and WGH series non-oriented electrical steel were developed for the application to traction motors for new energy vehicles.

## 2017

产能重置后,青山基地无取向硅钢产能为120万吨。

By eliminating backward production capacity, the annual production capacity of non-oriented electrical steel was 1.2 million metric tons in Qingshan base.

## 2020

宝钢股份将宝山基地、青山基地的硅钢相关的制造、销售、服务、研发整合,于2020年4月29日正式挂牌成立硅钢事业部。

Baosteel integrated the manufacturing, sales, service and R & D of silicon steel products (Baoshan and Qingshan), and officially established the silicon steel business unit on April 29, 2020.

## 2016

宝山基地1#、2#硅钢退火涂层机组迁移至湛江东山基地,并于次年投产。0.20mm、0.15mm规格AHV系列产品在无人机等领域获得应用。

Shanghai Baoshan base No.1 & No.2 electrical steel annealing lines stopped production, moved to Zhanjiang Dongshan base, and began operation in the following year. AHV series non-oriented electrical steel of 0.20mm, 0.15mm thickness was applied to the drones and other fields.

## 2021

宝钢50W250广泛应用于白鹤滩水电站1000MW水轮发电机组。宝山基地和青山基地硅钢产品企业标准实现统一。

Baosteel 50W250 is widely used in Baihetan Hydropower Station 1000MW hydro-generator unit. The enterprise standards for silicon steel products in Baoshan Base and Qingshan Base have been unified.

## 2013

无取向硅钢5#硅钢退火机组投产,无取向年生产能力达到140万吨,高牌号硅钢年生产能力达到20万吨。

中频无取向硅钢AV和AHV系列0.27、0.30、0.35mm规格产品实现量产,并供应国内主流新能源汽车用户。

No.5 non-oriented electrical steel annealing line was put into operation. The total annual production capacity increased to 1.40 million metric tons. The annual output of high grade reached 200,000 metric tons.

AV and AHV series non-oriented electrical steel of 0.27mm, 0.30mm, 0.35mm thickness for the application to traction motors for new energy vehicles were put into mass production.

## 2017

宝钢股份吸收合并武钢股份后,成为世界最大无取向硅钢生产企业。

Baosteel merged Wuhan Iron & Steel by absorption, which turned Baosteel into a company, ranking the first in the non-oriented electrical steel output.

## BeCOREs 宝钢硅钢

BeCOREs是宝钢股份硅钢产品注册商标。

商标注册证, 第 53897675 号。

BeCOREs is a registered trademark of Baosteel's silicon steel products.

Trademark Registration Certificate, No. 53897675.

宝钢硅钢助力电器设备运行更经济, 更高效。

Baosteel silicon steel plays a vital role in giving the electrical apparatus a economical and high efficient running .

# BeCOREs



**B**

宝钢  
Baosteel

**e**

环保  
Eco-friendly

**CORE**

电机铁芯  
motor iron core

变压器铁芯  
transformer iron core

**S**

全系列  
Series

**BeCORES**



## 牌号表示方法

### DESIGNATION METHOD







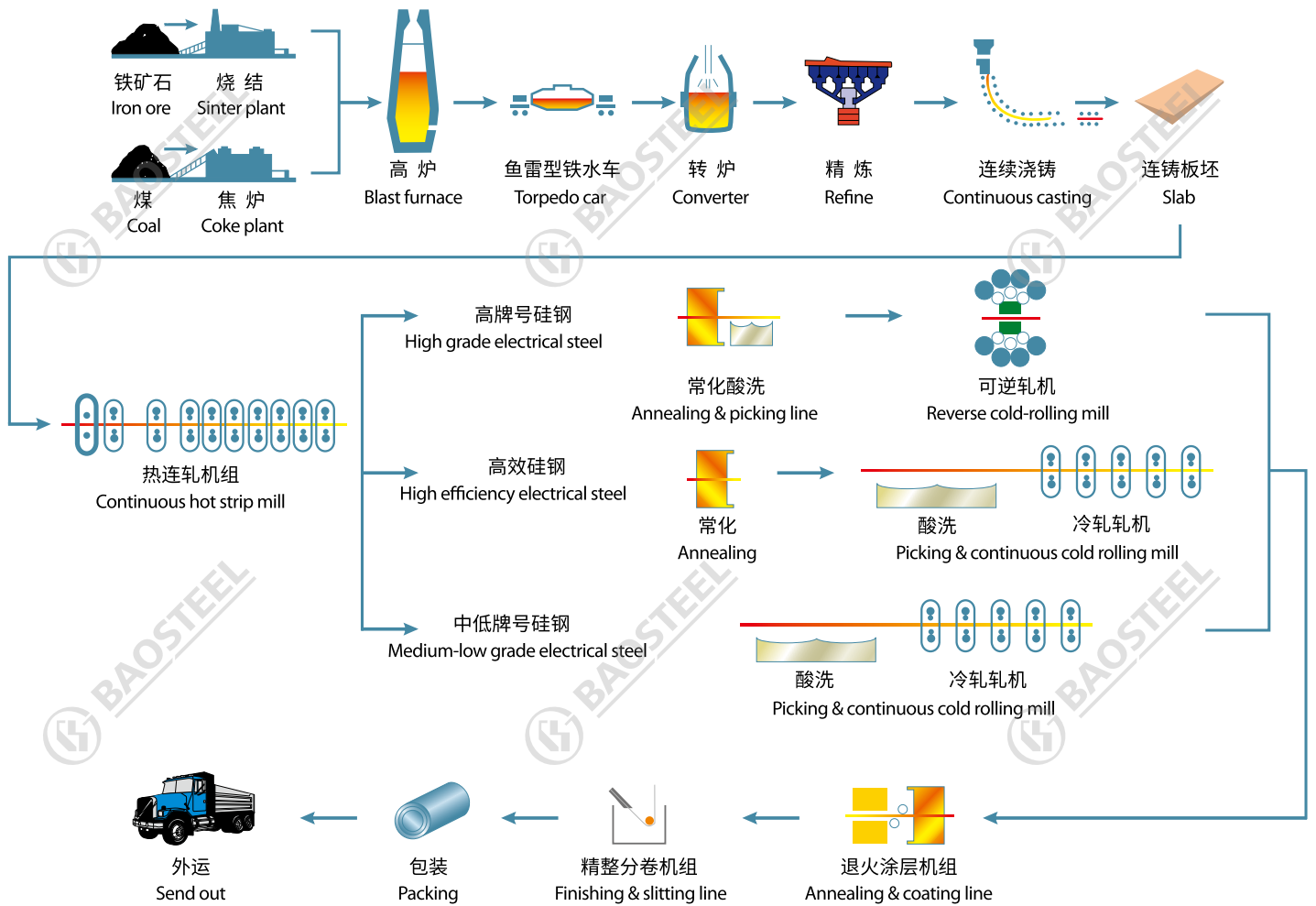
## 示例:

## Examples:

- B35A210表示公称厚度为0.35mm的普通型无取向硅钢，最大比总损耗名义值 $P_{1.5/50}$ 为2.10W/kg。
  - B35AH230表示公称厚度为0.35mm的高效型无取向硅钢，最大比总损耗名义值 $P_{1.5/50}$ 为2.30W/kg。
  - B35AR300表示公称厚度为0.35mm的消除应力退火型无取向硅钢，消除应力退火后的最大比总损耗名义值 $P_{1.5/50}$ 为3.00W/kg。
  - 35WW230表示青山基地生产公称厚度为0.35mm的普通型无取向硅钢，最大比总损耗名义值 $P_{1.5/50}$ 为2.30W/kg。
  - 50WH470表示青山基地生产公称厚度为0.50mm的高效型无取向硅钢，最大比总损耗名义值 $P_{1.5/50}$ 为4.70W/kg。
- B35A210 means conventional type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss  $P_{1.5/50}$  of 2.10 W/kg , nominal thickness is 0.35 mm, supplied in the fully processed state.
  - B35AH230 means high efficiency type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss  $P_{1.5/50}$  of 2.30 W/kg , nominal thickness is 0.35 mm, supplied in the fully processed state.
  - B35AR300 means stress relief annealing type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss  $P_{1.5/50}$  of 3.00 W/kg , nominal thickness is 0.35 mm, supplied in the fully processed state.
  - 35WW230 means conventional type cold rolled non-oriented electrical steel strip produced in qingshan base , with a nominal maximum specific total loss  $P_{1.5/50}$  of 2.30 W/kg , nominal thickness is 0.35 mm, supplied in the fully processed state
  - 50WH470 means high efficiency type cold rolled non-oriented electrical steel strip produced in qingshan base , with a nominal maximum specific total loss  $P_{1.5/50}$  of 4.70 W/kg , nominal thickness is 0.50 mm, supplied in the fully processed state.

生产工艺流程

PRODUCTION  
FLOW



以上仅为典型工艺路径

The above is a typical production process





## 产品特点

### FEATURES OF PRODUCTS

#### □ 优异的电磁性能

一流的设备、先进的制造工艺以及严格的管理确保了宝钢无取向硅钢电磁性能的优良、稳定。

#### □ 出色的加工性能

高精度尺寸与优异的力学性能便于用户分条、冲压与叠片。

#### □ 卓越的尺寸精度

宝钢先进的设备和制造技术，确保无取向硅钢良好的板形，表面平滑、厚度均匀、同板差小、叠片系数高。

#### □ 优良的涂层性能

宝钢无取向硅钢具有均匀的表面涂层，良好的附着性，防止加工时的涂层脱落；层间绝缘性能良好。

#### □ 更多的宽度选择

宝钢无取向硅钢的板宽700-1260mm，用户可以从中选择，提高材料的利用率。

#### □ Excellent electromagnetic properties

First class equipment, leading manufacturing process and strict management ensure the excellent and stable electromagnetic properties of Baosteel non-oriented electrical steel.

#### □ Excellent processing performance

High accuracy dimension and excellent mechanical property are convenient for the users to slit, punch and laminate.

#### □ Preminent dimensional accuracy

Leading equipment and manufacturing technology ensure the good shape, smooth surface, uniform thickness, small transverse thickness deviation and high lamination factor.

#### □ Excellent surface coating properties

Baosteel non-oriented electrical steel has uniform surface coating with good adhesion, which can prevent peeling off coating during processing. The interlaminar insulation property is good.

#### □ More width options

The width of Baosteel non-electrical steel is 700-1260mm, and users can choose from them to improve material utilization.

# 无取向硅钢产品特性

## PRODUCTS CHARACTERISTICS

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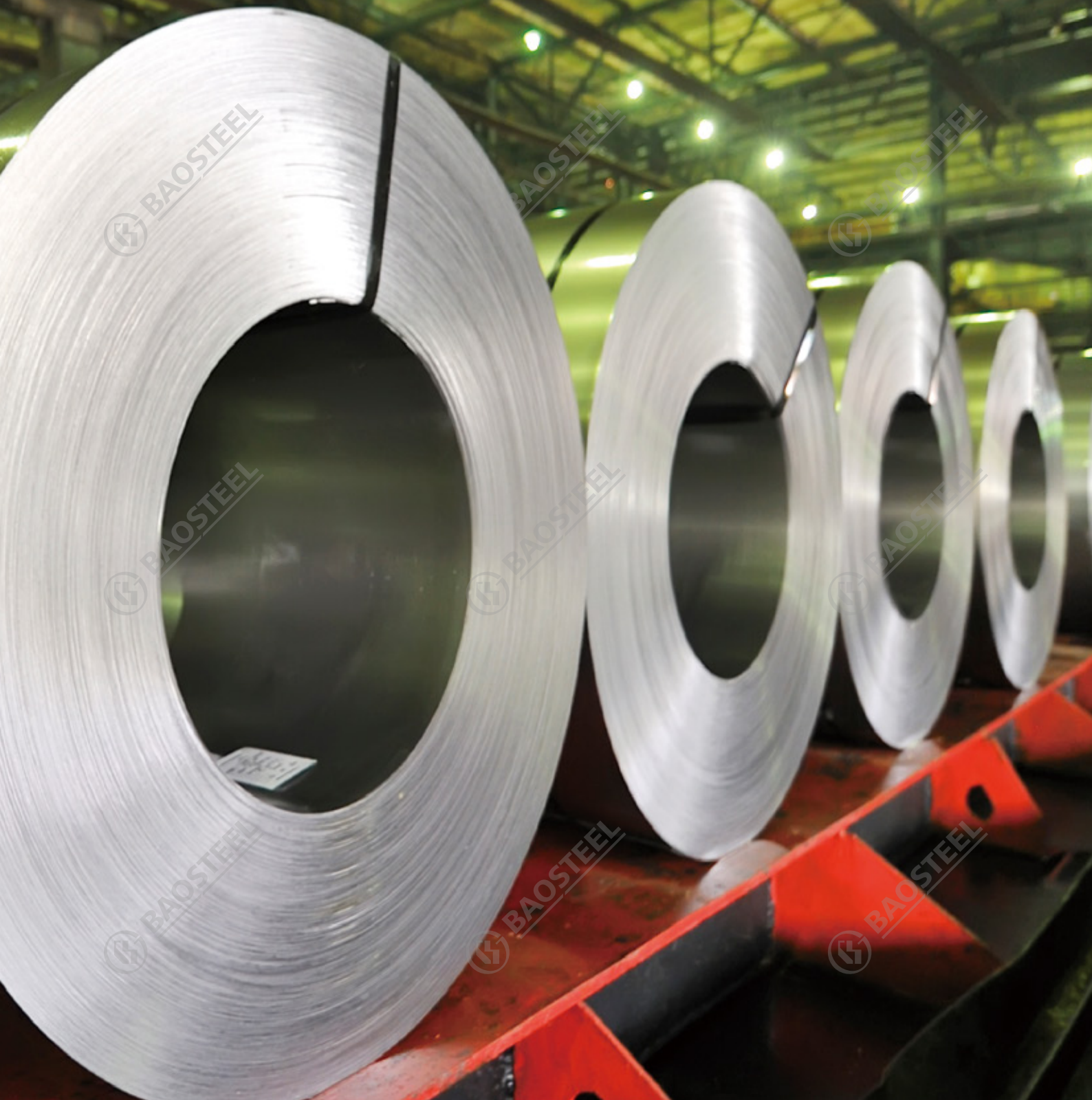






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全基地产品性能  
PROPERTIES



## 普通型A系列产品

### CONVENTIONAL TYPE A SERIES PRODUCTS

电磁性能标准 Standard of electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	最大铁损 Max. Core loss $P_{1.5/50}$ (W/kg)	最小磁极化强度 Min. Magnetic Polarization $J_{5000}$ (T)	最小叠装系数 Min. Stacking Factor	最小弯曲次数 Min. Number of Bends	约定密度 Conventional Density (kg/dm <sup>3</sup> )		
B35A200	0.35	2.00	1.62	0.95	2	7.60		
B35A210		2.10	1.62		2	7.60		
B35A230		2.28	1.64		2	7.60		
B35A250		2.45	1.64		2	7.60		
B35A270		2.65	1.64		2	7.65		
B35A300		2.90	1.64		3	7.65		
B35A360		3.20	1.65		3	7.65		
B35A440		3.40	1.67		3	7.70		
B50A230		0.50	2.30		1.64	0.97	2	7.60
B50A250			2.48		1.64		2	7.60
B50A270	2.65		1.64	2	7.60			
B50A290	2.85		1.64	2	7.60			
B50A310	3.00		1.65	3	7.65			
B50A350	3.20		1.65	5	7.65			
B50A400	3.30		1.66	5	7.70			
B50A470	4.20		1.67	10	7.70			
B50A600	4.70		1.68	10	7.75			
B50A700	5.50		1.71	10	7.80			
B50A800	5.80	1.71	10	7.80				



电磁性能标准 Standard of electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	最大铁损 Max.Core loss $P_{1.5/50}$ (W/kg)	最小磁极化强度 Min. Magnetic Polarization $J_{5000}$ (T)	最小叠装系数 Min.Stacking Factor	最小弯曲次数 Min. Number of Bends	约定密度 Conventional Density (kg/dm <sup>3</sup> )
B50A1000	0.50	6.00	1.74	0.97	10	7.85
B50A1300		7.00	1.74		10	7.85
B65A310	0.65	3.05	1.64	0.97	2	7.60
B65A350		3.45	1.65		2	7.60
B65A400		3.95	1.66		2	7.65
B65A470		4.60	1.67		5	7.65
B65A530		5.20	1.68		10	7.70
B65A600		5.90	1.68		10	7.75
B65A700		6.90	1.69		10	7.75
B65A800		7.90	1.71		10	7.80
B65A1000		9.90	1.71		10	7.80
B65A1300		12.90	1.72		10	7.85

## 典型电磁性能 Typical electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	约定密度 Conventional Density (kg/dm <sup>3</sup> )	比总损耗 Specific Total Loss (W/kg)				磁极化强度 Magnetic Polarization (T)			
			P <sub>1.0/50</sub>	P <sub>1.5/50</sub>	P <sub>1.0/60</sub>	P <sub>1.5/60</sub>	J <sub>1000</sub>	J <sub>2500</sub>	J <sub>5000</sub>	J <sub>10000</sub>
B35A200	0.35	7.60	0.85	1.98	1.02	2.45	1.46	1.55	1.65	1.76
B35A210		7.60	0.85	2.05	1.04	2.54	1.47	1.56	1.66	1.77
B35A230		7.60	0.88	2.10	1.09	2.63	1.47	1.57	1.66	1.78
B35A250		7.60	0.95	2.25	1.22	2.78	1.48	1.57	1.66	1.78
B35A270		7.65	1.00	2.40	1.26	2.95	1.48	1.58	1.67	1.79
B35A300		7.65	1.10	2.55	1.40	3.18	1.51	1.59	1.68	1.80
B35A360		7.65	1.25	2.80	1.55	3.44	1.51	1.60	1.68	1.80
B35A440		7.70	1.35	3.00	1.66	3.69	1.53	1.62	1.70	1.82
B50A230		0.50	7.60	0.96	2.25	1.23	2.93	1.48	1.57	1.66
B50A250	7.60		1.00	2.37	1.30	3.08	1.48	1.57	1.66	1.78
B50A270	7.60		1.05	2.50	1.35	3.18	1.48	1.57	1.67	1.80
B50A290	7.60		1.10	2.60	1.41	3.25	1.49	1.58	1.67	1.79
B50A310	7.65		1.18	2.70	1.57	3.38	1.50	1.59	1.68	1.80
B50A350	7.65		1.25	2.85	1.60	3.60	1.50	1.60	1.68	1.80
B50A400	7.70		1.32	3.00	1.68	3.84	1.52	1.61	1.69	1.81
B50A470	7.70		1.71	3.82	2.15	4.77	1.52	1.60	1.69	1.80
B50A600	7.75		1.76	4.00	2.22	5.01	1.53	1.62	1.71	1.82
B50A700	7.80		2.30	4.95	2.86	6.16	1.56	1.65	1.73	1.84
B50A800	7.80		2.42	5.20	3.01	6.47	1.56	1.65	1.73	1.84
B50A1000	7.85		2.68	5.69	3.39	7.16	1.59	1.68	1.76	1.87
B50A1300	7.85		2.84	5.98	3.59	7.52	1.59	1.68	1.76	1.87

典型电磁性能 Typical electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	约定密度 Conventional Density (kg/dm <sup>3</sup> )	比总损耗 Specific Total Loss (W/kg)				磁极化强度 Magnetic Polarization (T)			
			P <sub>1.0/50</sub>	P <sub>1.5/50</sub>	P <sub>1.0/60</sub>	P <sub>1.5/60</sub>	J <sub>1000</sub>	J <sub>2500</sub>	J <sub>5000</sub>	J <sub>10000</sub>
B65A310	0.65	7.60	1.15	2.70	1.43	3.32	1.49	1.57	1.67	1.80
B65A350		7.60	1.28	2.99	1.64	3.74	1.51	1.58	1.67	1.79
B65A400		7.65	1.43	3.21	1.83	4.04	1.51	1.59	1.68	1.80
B65A470		7.65	1.69	3.70	2.19	4.75	1.51	1.61	1.70	1.81
B65A530		7.70	2.16	4.83	2.77	6.14	1.51	1.61	1.70	1.81
B65A600		7.75	2.20	4.91	2.81	6.24	1.52	1.62	1.71	1.82
B65A700		7.75	2.40	5.37	3.11	6.85	1.52	1.62	1.71	1.82
B65A800		7.80	2.69	5.90	3.42	7.52	1.56	1.66	1.74	1.85
B65A1000		7.80	2.85	6.40	3.67	8.17	1.57	1.67	1.75	1.86
B65A1300		7.85	3.25	7.40	4.22	8.52	1.59	1.68	1.77	1.88



## 典型机械性能 Typical mechanical properties

牌号 Grade	公称厚度 Thickness (mm)	屈服强度 Yield Strength (MPa)		抗拉强度 Tensile Strength (MPa)		延伸率 Elongation (%)		硬度 Hardness	反复弯曲 Number of Bends		叠装系数 Stacking Factor
		L	C	L	C	L	C	HV1	L	C	
B35A200	0.35	454	465	556	568	18	20	236	4	4	0.985
B35A210		446	459	560	578	17	19	224	5	5	0.985
B35A230		405	422	518	535	20	22	208	8	8	0.985
B35A250		409	424	537	550	22	24	216	9	9	0.985
B35A270		395	411	528	544	24	25	210	12	10	0.985
B35A300		385	401	526	543	26	27	203	17	16	0.985
B35A360		362	375	508	520	29	30	188	≥20	≥20	0.985
B35A440		294	304	446	457	31	32	166	≥20	≥20	0.985
B50A230		0.50	456	472	578	594	20	21	227	5	5
B50A250	428		443	562	578	20	21	222	5	5	0.988
B50A270	411		429	548	567	23	25	220	5	5	0.988
B50A290	400		418	538	555	26	28	211	5	5	0.988
B50A310	395		408	533	545	27	28	203	8	7	0.988
B50A350	385		396	526	538	28	30	202	12	9	0.988
B50A400	333		345	477	490	29	31	187	15	12	0.988
B50A470	248		256	402	410	37	38	142	≥20	≥20	0.990
B50A600	248		260	405	416	37	38	142	≥20	≥20	0.990
B50A700	247		256	382	390	38	39	126	≥20	≥20	0.990
B50A800	254		264	387	397	38	39	125	≥20	≥20	0.990
B50A1000	241	243	366	370	40	40	113	≥20	≥20	0.990	
B50A1300	239	247	352	360	41	41	108	≥20	≥20	0.990	

典型机械性能 Typical mechanical properties

牌号 Grade	公称厚度 Thickness (mm)	屈服强度 Yield Strength (MPa)		抗拉强度 Tensile Strength (MPa)		延伸率 Elongation (%)		硬度 Hardness HV1	反复弯曲 Number of Bends		叠装系数 Stacking Factor
		L	C	L	C	L	C		L	C	
B65A310	0.65	415	429	545	560	25	26	221	≥20	≥20	0.990
B65A350		400	418	535	553	27	28	201	≥20	≥20	0.990
B65A400		378	393	517	530	29	30	199	≥20	≥20	0.990
B65A470		311	325	461	477	33	34	175	≥20	≥20	0.992
B65A530		242	251	402	410	36	37	137	≥20	≥20	0.992
B65A600		248	256	408	415	36	37	138	≥20	≥20	0.992
B65A700		258	270	410	423	37	38	138	≥20	≥20	0.992
B65A800		251	260	387	396	39	40	124	≥20	≥20	0.992
B65A1000		249	259	385	395	40	41	122	≥20	≥20	0.992
B65A1300		232	241	358	369	41	42	112	≥20	≥20	0.992

注：  
以上为典型值，仅作参考不作保证。  
L 表示试验方向为纵向。  
C 表示试验方向为横向。  
叠装系数是试样视为无涂层下检测值

Note:  
The above values are typical values, only for reference and not guaranteed.  
L represents the test piece shall be taken longitudinal to the rolling direction.  
C represents the test piece shall be taken transverse to the rolling direction.  
Stacking factor shall be test with the test pieces without coating.

## 高效型AH系列产品

## HIGH EFFICIENCY TYPE AH SERIES PRODUCTS

### 电磁性能标准 Standard of electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	最大铁损 Max. Core loss $P_{1.5/50}$ (W/kg)	最小磁极化强度 Min. Magnetic Polarization $J_{5000}$ (T)	最小叠装系数 Min. Stacking Factor	最小弯曲次数 Min. Number of Bends	约定密度 Conventional Density (kg/dm <sup>3</sup> )
B35AH230	0.35	2.28	1.66	0.95	2	7.65
B35AH250		2.45	1.67		2	7.65
B35AH300		2.80	1.69		5	7.70
B50AH300	0.50	2.90	1.68	0.97	5	7.65
B50AH350		3.00	1.71		5	7.70
B50AH470		3.50	1.72		10	7.75
B50AH600		4.00	1.72		10	7.75

### 典型电磁性能 Typical electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	约定密度 Conventional Density (kg/dm <sup>3</sup> )	铁损 Core Loss (W/kg)				磁极化强度 Magnetic Polarization (T)			
			$P_{1.0/50}$	$P_{1.5/50}$	$P_{1.0/60}$	$P_{1.5/60}$	$J_{1000}$	$J_{2500}$	$J_{5000}$	$J_{10000}$
B35AH230	0.35	7.65	0.97	2.15	1.19	2.70	1.51	1.61	1.68	1.81
B35AH250		7.65	1.03	2.30	1.28	2.90	1.52	1.61	1.70	1.83
B35AH300		7.70	1.07	2.45	1.33	3.06	1.53	1.62	1.71	1.83
B50AH300	0.50	7.65	1.18	2.70	1.51	3.37	1.53	1.62	1.70	1.82
B50AH350		7.70	1.38	2.85	1.75	3.85	1.56	1.65	1.73	1.84
B50AH470		7.75	1.43	3.20	1.84	4.07	1.56	1.66	1.74	1.85
B50AH600		7.75	1.69	3.70	2.15	4.64	1.56	1.66	1.74	1.85



典型机械性能 Typical mechanical properties

牌号 Grade	公称厚度 Thickness (mm)	屈服强度 Yield Strength (MPa)		抗拉强度 Tensile Strength (MPa)		延伸率 Elongation (%)		硬度 Hardness HV1	反复弯曲 Number of Bends		叠装系数 Stacking Factor
		L	C	L	C	L	C		L	C	
B35AH230	0.35	400	410	512	522	23	24	205	10	10	0.985
B35AH250		337	349	471	473	25	26	185	≥20	≥20	0.985
B35AH300		300	310	443	455	28	29	176	≥20	≥20	0.985
B50AH300	0.50	336	346	477	490	29	30	182	≥20	≥20	0.990
B50AH350		302	313	445	446	28	29	175	≥20	≥20	0.990
B50AH470		244	253	399	408	36	37	142	≥20	≥20	0.990
B50AH600		262	273	425	435	37	38	145	≥20	≥20	0.990

注：  
 以上为典型值，仅作参考不作保证。  
 L 表示试验方向为纵向。  
 C 表示试验方向为横向。  
 叠装系数是试样视为无涂层下检测值

Note:  
 The above values are typical values, only for reference and not guaranteed.  
 L represents the test piece shall be taken longitudinal to the rolling direction.  
 C represents the test piece shall be taken transverse to the rolling direction.  
 Stacking factor shall be test with the test pieces without coating.

## 消除应力退火型AR系列产品

### STRESS RELIEF ANNEALING TYPE AR SERIES PRODUCTS

电磁性能标准 Standard of electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	最大铁损 Max.Core loss $P_{1.5/50}$ (W/kg)	最小磁极化强度 Min. Magnetic Polarization $J_{5000}$ (T)	最小叠装系数 Min.Stacking Factor	最小弯曲次数 Min. Number of Bends	约定密度 Conventional Density (kg/dm <sup>3</sup> )
B35AR300	0.35	2.98	1.73	0.95	10	7.80
B50AR300	0.50	2.98	1.72	0.97	10	7.75
B50AR350		3.48	1.74		10	7.80
B50AR500		4.90	1.72		10	7.85
B50AR600		5.50	1.72		10	7.85

注：  
消除应力退火型无取向硅钢的磁特性  
保证值仅适用于在中性气氛750°C±10°C下，  
经2小时消除应力退火后的试样。

Note:  
The guaranteed magnetic properties for stress relief annealing materials  
only apply to 750 °C±10°C,2 hours under neutral atmosphere.  
stress relief annealed test piece.

典型电磁性能 Typical electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	约定密度 Conventional Density (kg/dm <sup>3</sup> )	铁损 Core Loss (W/kg)				磁极化强度 Magnetic Polarization (T)			
			P <sub>1.0/50</sub>	P <sub>1.5/50</sub>	P <sub>1.0/60</sub>	P <sub>1.5/60</sub>	J <sub>1000</sub>	J <sub>2500</sub>	J <sub>5000</sub>	J <sub>10000</sub>
B35AR300	0.35	7.80	1.17	2.75	1.48	3.45	1.60	1.68	1.75	1.86
B50AR300	0.50	7.75	1.21	2.68	1.56	3.45	1.59	1.66	1.74	1.86
B50AR350		7.80	1.39	3.00	1.78	3.97	1.61	1.69	1.76	1.87
B50AR500		7.85	1.70	3.93	2.15	4.95	1.55	1.65	1.73	1.84
B50AR600		7.85	1.88	4.23	2.38	5.32	1.56	1.66	1.74	1.85

典型机械性能 Typical mechanical properties

牌号 Grade	公称厚度 Thickness (mm)	屈服强度 Yield Strength (MPa)		抗拉强度 Tensile Strength (MPa)		延伸率 Elongation (%)		硬度 Hardness HV1	反复弯曲 Number of Bends		叠装系数 Stacking Factor
		L	C	L	C	L	C		L	C	
B35AR300	0.35	252	260	381	390	39	40	123	≥20	≥20	0.985
B50AR300	0.50	250	262	402	413	36	37	151	≥20	≥20	0.990
B50AR350		250	271	382	383	38	39	125	≥20	≥20	0.990
B50AR500		265	265	376	387	40	41	124	≥20	≥20	0.990
B50AR600		262	271	374	384	41	42	122	≥20	≥20	0.990

注：  
以上为典型值，仅作参考不作保证。  
L 表示试验方向为纵向。  
C 表示试验方向为横向。  
叠装系数是试样视为无涂层下检测值

Note:  
The above values are typical values, only for reference and not guaranteed.  
L represents the test piece shall be taken longitudinal to the rolling direction.  
C represents the test piece shall be taken transverse to the rolling direction.  
Stacking factor shall be test with the test pieces without coating.



## 涂层性能

### PROPERTIES OF COATINGS

用户可根据层间电阻、耐蚀性、耐热性、冲片性以及其它特性，选择符合使用要求的表面绝缘涂层。

Different insulation coatings are available to meet a range of customer requirements according to interlaminar resistance, corrosion resistance, punchability, weldability and so on.

绝缘涂层种类 Insulation coating type	代号 Symbol	特征 Characteristics
半有机薄涂层 Semi-organic thin film coating	A	改善冲片性，并具有良好的焊接性，含铬 Improved punchability, good weldability, with Cr
半有机厚涂层 Semi-organic heavy film coating	H	冲片性好，层间电阻高，含铬 Good punchability, high interlaminar resistance, with Cr
半有机无铬薄涂层 Semi-organic thin film coating, Cr free	K/D	涂层中不含铬，具有良好的焊接性 Good weldability, Cr free
半有机无铬厚涂层 Semi-organic heavy film coating, Cr free	M/E	涂层中不含铬，具有良好的绝缘性能 Good insulation resistance, Cr free
半有机无铬极厚涂层 Semi-organic ultra heavy film coating	J	涂层中不含铬，具有极好的绝缘性能 Ultra good insulation resistance, Cr free
半有机无铬超厚涂层 Semi-organic super ultra heavy film coating	L	涂层中不含铬，具有极高的绝缘性能 Super ultra good insulation resistance, Cr free
自粘接涂层 Self-adhesive coating	Z	涂层中不含铬，固化后具有良好的自粘接性能，铁心固定强度大 After curing, it has good post-adhesion performance, and the iron core has high fixing strength, Cr free

A和H涂层中的Cr<sup>6+</sup>含量符合相关法令要求。  
D和E涂层适用于点胶工艺。

Cr<sup>6+</sup> content in A and H coatings meets the requirements of relevant regulations.  
D and E coatings are suitable for glueing process.

无取向硅钢涂层的特性表 Products characteristics

涂层代码 Coating type symbol	常规(含铬) Conventional(with Cr)		环保(无铬) Environmental friendly (Cr free)					备注 Remarks	
	A	H	K/D	M/E	J	L	Z		
ASTM 属性 Comparable to ASTM coating	C-5	C-5	C-5	C-5	C-5	C-6	C-3		
涂层种类 Coating type	半有机涂层 Semi organic coating						有机涂层 organic coating		
干膜厚度 (μm / 面) Coating thickness (μm/side)	0.2~0.5	0.6~1.0	0.3~0.7	0.7~1.2	2~4	3~7	3~7		
涂层绝缘电阻(Ω·cm <sup>2</sup> /片) Coating insulation resistance(Ω.cm <sup>2</sup> /sheet)	≥1	≥3	≥1	≥3	≥20	≥50	≥25	表中数值为层间电阻 (10个触头,总面积为 6.45cm <sup>2</sup> ) Interlaminar resistance(10 contact buttons,total contact area:6.45cm <sup>2</sup> )	
附着性 Adhesion	A	B	A	B	A	A	A		
冲片性(×1000) 毛刺达到50μm的冲片次数 Punchability(×1000) quantity with punched piece burr height exceed 50μm	1000	1500	1000	1200	暂无数据 Not available	暂无数据 Not available	暂无数据 Not available	模具钢材质: 冲制Φ15mm圆片 间隙为板厚的5% 使用冲压油 Material of die:tool steel Shape of punch:Φ15mm dia Gap:5% of sheet thickness Punch oil:applied	
耐湿热性 Resistant to humidity	表面变化 Appearance change	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	50°C, 95%相对湿度 14天 50°C,95% relative humidity 14days
耐冷媒性 Resistant to refrigerator	表面变化 Appearance change	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	暂无数据 Not available	暂无数据 Not available	R-134a/R22:Oil=(1.5~9):1 (密封室内80°C, 10天, 20bar压力) (sealed chamber, 80°C, 10days, 20 bar pressure)
	质量变化 Weight change	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized			

涂层代码 Coating type symbol		常规(含铬) Conventional(with Cr)		环保(无铬) Environmental friendly (Cr free)					备注 Remarks
		A	H	K/D	M/E	J	L	Z	
焊接性 (cm/min): 焊道气泡<7个的 最大焊接速度 Weldability(cm/min) maximum welding speed with numbers of blow holes less than 7		80~100	20~60	80~100	20~60	10~60	不适用 Not applicable	不适用 Not applicable	氩气保护焊 焊接电流120A 电极Th-W 2.4mm Φ 焊枪间隔1.5 mm 加压100 kg/cm <sup>2</sup> Welding method:TIG Welding current:120A Electrode:Th-W 2.4mm Φ Gap between electrode: 1.5 mm Clamping pressure: 100 kg/cm <sup>2</sup>
耐热性 Resistant to heat	长期/空气 Permanently in air	180°C	180°C	180°C	180°C	270°C	180°C	150°C	DIN IEC 60404-12
	短期/空气 Short time in air	210°C ×2500hr 600°C ×30min	210°C ×2500hr 600°C ×30min	210°C ×2500hr 600°C ×30min	210°C ×2500hr 600°C ×30min	300°C ×2500hr 600°C ×30min	不适用 Not applicable	不适用 Not applicable	

以上数据均为一定条件下的实验室测量数据,反映了涂层产品的相关典型性能,但不应视为保证值。

These above values are obtained under the certain conditions in our laboratory, reflected some typical properties of the coating,for reference only.

## 电磁性能曲线

### TYPICAL ELECTROMAGNETIC PROPERTY CURVES



上述牌号电磁性能曲线均可通过扫描二维码查阅

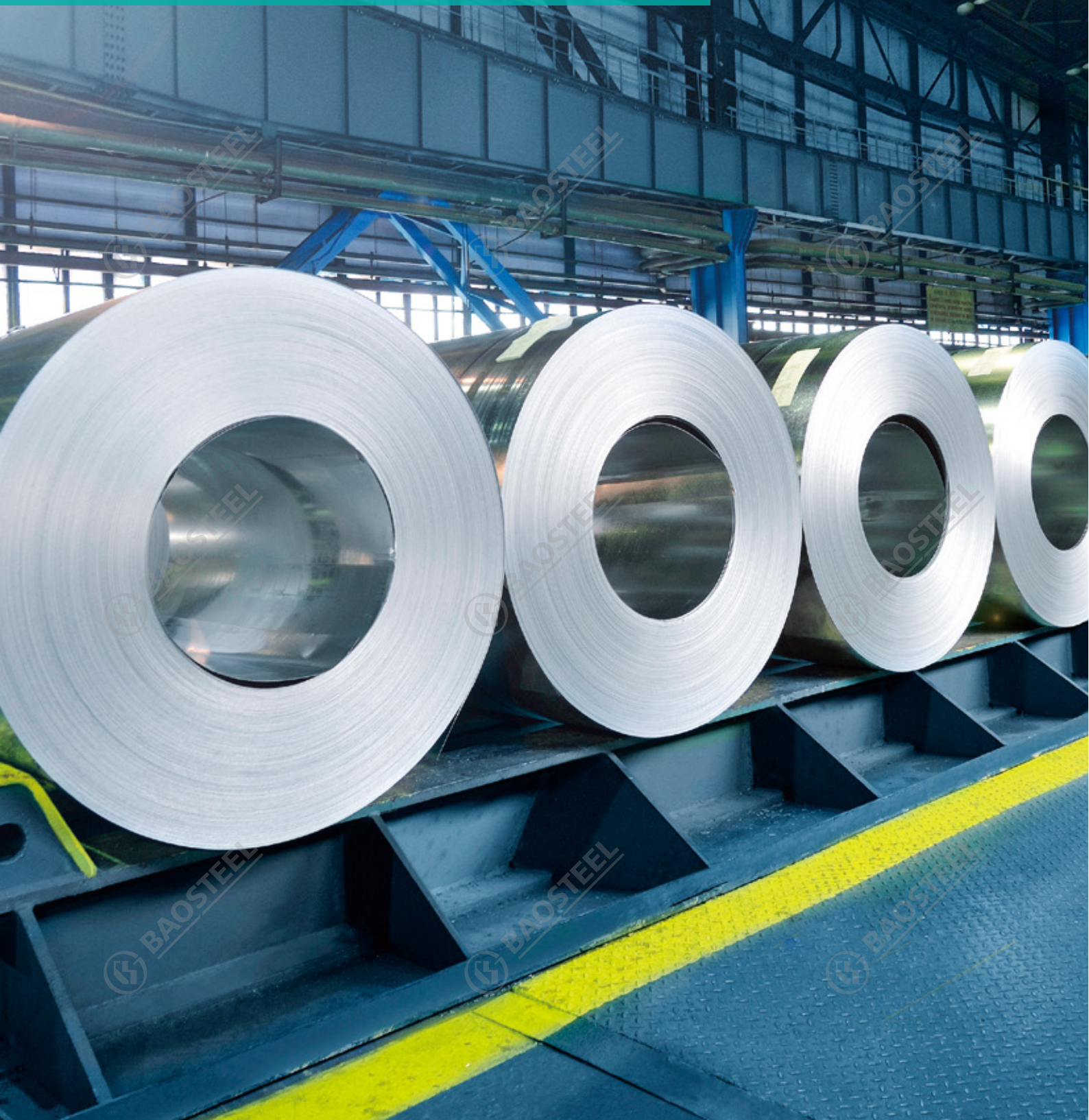
The electromagnetic performance curves of the above grades can be viewed by scanning the QR code



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青山基地产品性能

PROPERTIES OF PRODUCTS  
IN QINGSHAN BASE





## 普通型WW系列产品

CONVENTIONAL TYPE  
WW SERIES PRODUCTS

## 电磁性能标准 Standard of electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	最大铁损 Max.Core loss $P_{1.5/50}$ (W/kg)	最小磁极化强度 Min. Magnetic Polarization $J_{5000}$ (T)	最小叠装系数 Min.Stacking Factor	最小弯曲次数 Min. Number of Bends	约定密度 Conventional Density (kg/dm <sup>3</sup> )
35WW230	0.35	2.10	1.62	0.95	2	7.60
35WW250		2.28	1.64		2	7.60
35WW270		2.45	1.64		2	7.60
35WW300		2.65	1.64		2	7.65
35WW360		3.20	1.65		3	7.65
35WW440		3.40	1.67		3	7.70
50WW250	0.50	2.30	1.64	0.97	2	7.60
50WW270		2.48	1.64		2	7.60
50WW290		2.65	1.64		2	7.60
50WW310		2.85	1.64		2	7.60
50WW350		3.00	1.65		3	7.65
50WW400		3.20	1.65		5	7.65
50WW470		3.30	1.70		5	7.70
50WW600		4.20	1.68		10	7.75
50WW700		4.70	1.70		10	7.80
50WW800		5.50	1.71		10	7.80
50WW1000	6.00	1.74	10	7.85		
50WW1300	7.00	1.74	10	7.85		

典型电磁性能 Typical electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	约定密度 Conventional Density (kg/dm <sup>3</sup> )	比总损耗 Specific Total Loss (W/kg)				磁极化强度 Magnetic Polarization (T)			
			P <sub>1.0/50</sub>	P <sub>1.5/50</sub>	P <sub>1.0/60</sub>	P <sub>1.5/60</sub>	J <sub>1000</sub>	J <sub>2500</sub>	J <sub>5000</sub>	J <sub>10000</sub>
35WW230	0.35	7.60	0.85	2.06	1.08	2.61	1.48	1.57	1.67	1.79
35WW250		7.60	0.92	2.20	1.16	2.74	1.48	1.58	1.67	1.78
35WW270		7.60	1.00	2.33	1.25	2.92	1.47	1.58	1.67	1.78
35WW300		7.65	1.00	2.45	1.26	3.07	1.49	1.60	1.68	1.80
35WW360		7.65	1.16	2.69	1.44	3.35	1.50	1.60	1.69	1.80
35WW440		7.70	1.20	2.82	1.51	3.53	1.53	1.64	1.72	1.83
50WW250		0.50	7.60	0.94	2.26	1.24	3.01	1.47	1.59	1.67
50WW270	7.60		1.01	2.45	1.27	3.05	1.48	1.59	1.67	1.79
50WW290	7.60		1.07	2.49	1.36	3.20	1.47	1.59	1.67	1.79
50WW310	7.60		1.16	2.68	1.47	3.44	1.50	1.59	1.69	1.80
50WW350	7.65		1.18	2.70	1.51	3.45	1.50	1.61	1.69	1.81
50WW400	7.65		1.23	2.83	1.56	3.62	1.49	1.61	1.69	1.80
50WW470	7.70		1.35	3.15	1.74	4.06	1.52	1.65	1.72	1.83
50WW600	7.75		1.71	3.79	2.16	4.82	1.53	1.64	1.72	1.83
50WW700	7.80		2.02	4.28	2.32	5.03	1.53	1.64	1.72	1.83
50WW800	7.80		2.10	4.67	2.41	5.49	1.56	1.66	1.74	1.85
50WW1000	7.85		2.44	5.32	3.09	6.85	1.57	1.67	1.74	1.85
50WW1300	7.85		2.49	5.51	3.16	7.06	1.57	1.68	1.75	1.86

## 典型机械性能 Typical mechanical properties

牌号 Grade	公称厚度 Thickness (mm)	屈服强度 Yield Strength (MPa)		抗拉强度 Tensile Strength (MPa)		延伸率 Elongation (%)		硬度 Hardness	反复弯曲 Number of Bends		叠装系数 Stacking Factor
		L	C	L	C	L	C	HV5	L	C	
35WW230	0.35	415	435	520	540	16	18	195	5	5	0.980
35WW250		415	435	520	540	16	18	195	6	6	0.980
35WW270		415	435	520	540	16	18	195	8	8	0.980
35WW300		395	410	510	530	25	26	185	12	10	0.980
35WW360		380	400	490	505	27	29	170	17	16	0.980
35WW440		270	280	415	435	30	32	140	≥20	≥20	0.980
50WW250	0.50	420	440	520	540	16	17	195	5	5	0.985
50WW270		420	440	520	540	16	18	195	5	5	0.985
50WW290		420	440	520	540	16	18	195	6	6	0.985
50WW310		390	410	510	530	25	27	185	8	8	0.985
50WW350		390	410	510	530	25	27	185	12	9	0.985
50WW400		380	400	490	510	27	30	170	15	13	0.985
50WW470		265	275	420	440	30	32	140	≥20	≥20	0.985
50WW600		280	295	410	425	40	42	130	≥20	≥20	0.985
50WW700		270	285	400	415	40	42	125	≥20	≥20	0.985
50WW800		255	265	380	390	45	48	105	≥20	≥20	0.985
50WW1000	230	240	350	360	50	50	100	≥20	≥20	0.985	
50WW1300	230	240	350	360	50	50	100	≥20	≥20	0.985	

注:

以上为典型值, 仅作参考不作保证。

L 表示试验方向为纵向。

C 表示试验方向为横向。

叠装系数是试样视为无涂层下检测值

Note:

The above values are typical values, only for reference and not guaranteed.

L represents the test piece shall be taken longitudinal to the rolling direction.

C represents the test piece shall be taken transverse to the rolling direction.

Stacking factor shall be test with the test pieces without coating.



## 高效型WH系列产品

## HIGH EFFICIENCY TYPE WH SERIES PRODUCTS

### 电磁性能标准 Standard of electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	最大铁损 Max.Core loss $P_{1.5/50}$ (W/kg)	最小磁极化强度 Min. Magnetic Polarization $J_{5000}$ (T)	最小叠装系数 Min.Stacking Factor	最小弯曲次数 Min. Number of Bends	约定密度 Conventional Density (kg/dm <sup>3</sup> )
35WH230	0.35	2.28	1.66	0.95	2	7.65
35WH250		2.45	1.67		2	7.65
35WH270		2.65	1.68		5	7.70
35WH300		2.80	1.69		5	7.70
50WH350	0.50	2.90	1.68	0.97	5	7.70
50WH470		3.00	1.71		5	7.70
50WH600		3.50	1.72		10	7.75
65WH600	0.65	4.50	1.72	0.97	10	7.75

### 典型电磁性能 Typical electromagnetic properties

牌号 Grade	公称厚度 Thickness (mm)	约定密度 Conventional Density (kg/dm <sup>3</sup> )	铁耗 Core Loss (W/kg)				磁极化强度 Magnetic Polarization (T)			
			$P_{1.0/50}$	$P_{1.5/50}$	$P_{1.0/60}$	$P_{1.5/60}$	$J_{1000}$	$J_{2500}$	$J_{5000}$	$J_{10000}$
35WH230	0.35	7.65	0.98	2.18	1.20	2.73	1.51	1.61	1.67	1.81
35WH250		7.65	1.02	2.27	1.26	2.87	1.51	1.61	1.67	1.81
35WH270		7.70	1.05	2.36	1.31	2.95	1.52	1.62	1.71	1.81
35WH300		7.70	1.11	2.57	1.38	3.21	1.52	1.62	1.71	1.81
50WH350	0.50	7.70	1.22	2.78	1.55	3.53	1.53	1.63	1.72	1.82
50WH470		7.70	1.27	2.86	1.61	3.63	1.54	1.65	1.73	1.83
50WH600		7.75	1.42	3.21	1.79	4.06	1.54	1.66	1.73	1.84
65WH600	0.65	7.75	1.78	3.90	2.24	4.93	1.55	1.67	1.74	1.84

## 典型机械性能 Typical mechanical properties

牌号 Grade	公称厚度 Thickness (mm)	屈服强度 Yield Strength (MPa)		抗拉强度 Tensile Strength (MPa)		延伸率 Elongation (%)		硬度 Hardness HV5	反复弯曲 Number of Bends		叠装系数 Stacking Factor
		L	C	L	C	L	C		L	C	
35WH230	0.35	390	405	510	525	20	21	200	10	10	0.980
35WH250		390	405	510	525	20	21	200	10	10	0.980
35WH270		325	340	480	482	31	33	170	16	14	0.980
35WH300		320	335	460	472	33	34	160	16	14	0.980
50WH350	0.50	320	335	460	472	33	34	160	14	12	0.985
50WH470		300	315	440	452	33	34	150	15	12	0.985
50WH600		265	275	420	435	38	39	135	≥20	≥20	0.985
65WH600	0.65	265	275	420	435	38	39	135	≥20	≥20	0.985

注:

以上为典型值, 仅作参考不作保证。

L 表示试验方向为纵向。

C 表示试验方向为横向。

叠装系数是试样视为无涂层下检测值

Note:

The above values are typical values, only for reference and not guaranteed.

L represents the test piece shall be taken longitudinal to the rolling direction.

C represents the test piece shall be taken transverse to the rolling direction.

Stacking factor shall be test with the test pieces without coating.

## 涂层性能

### PROPERTIES OF COATINGS

用户可根据层间电阻、耐蚀性、耐热性、冲片性以及其它特性，选择符合使用要求的表面绝缘涂层。

Different insulation coatings are available to meet a range of customer requirements according to interlaminar resistance, corrosion resistance, punchability, weldability and so on.

绝缘涂层种类 Insulation coating type	代号 Symbol	特征 Characteristics
半有机薄涂层 Semi-organic thin film coating	T4	改善冲片性，并具有良好的焊接性，含铬 Improved punchability, good weldability, with Cr
半有机厚涂层 Semi-organic heavy film coating	T4H	冲片性好，层间电阻高，含铬 Good punchability, high interlaminar resistance, with Cr
半有机无铬极厚涂层 Semi-organic ultra heavy film coating	C5	涂层中不含铬，具有极好的绝缘性能 Ultra good insulation resistance, Cr free

T4和T4H涂层中的Cr<sup>6+</sup>含量符合相关法令要求。

Cr<sup>6+</sup> content in T4 and T4H coatings meets the requirements of relevant regulations.

#### 无取向硅钢涂层的特性表 Characteristics of Insulation coatings

涂层代码 Coating type symbol	常规(含铬) Conventional(with Cr)		环保(无铬) Environmental friendly (Cr free)	备注 Remarks
	T4	T4H	C5	
ASTM 属性 Comparable to ASTM coating	C-5	C-5	C-5	
涂层种类 Coating type	半有机涂层 Semi organic coating			
干膜厚度 (μm / 面) Coating thickness (μm/side)	0.2~0.5	0.6~1.0	2~4	
涂层绝缘电阻(Ω·cm <sup>2</sup> /片) Coating insulation resistance(Ω.cm <sup>2</sup> /sheet)	≥1	≥3	≥20	表中数值为层间电阻 (10个触头, 总面积为6.45cm <sup>2</sup> ) Interlaminar resistance(10 contact buttons, total contact area:6.45cm <sup>2</sup> )
附着性 Adhesion	A	B	A	



涂层代码 Coating type symbol		常规(含铬) Conventional(with Cr)		环保(无铬) Environmental friendly (Cr free)	备注 Remarks
		T4	T4H	C5	
冲片性(×1000) 毛刺达到50μm的冲片次数 Punchability(×1000) quantity with punched piece burr height exceed 50μm		1000	1500	暂无数据 Not available	模具钢材质: 冲制Φ15mm圆片 间隙为板厚的5% 使用冲压油 Material of die:tool steel Shape of punch:Φ15mm dia Gap:5% of sheet thickness Punch oil:applied
耐湿热性 Resistant to humidity	表面变化 Appearance change	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	50°C, 95%相对湿度, 14天 50°C, 95% relative humidity, 14days
耐冷媒性 Resistant to refrigerator	表面变化 Appearance change	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	R-134a/R22:Oil=(1.5~9):1 (密封室内80°C, 10天, 20bar压力) (sealed chamber, 80°C, 10days, 20 bar pressure)
	质量变化 Weight change	未变化 Not recognized	未变化 Not recognized	未变化 Not recognized	
焊接性(cm/min): 焊道气泡<7个的 最大焊接速度 Weldability(cm/min) maximum welding speed with numbers of blow holes less than 7		80~100	20~60	10~60	氩气保护焊 焊接电流120A 电极Th-W 2.4mm Φ 焊枪间隔1.5 mm 加压100 kg/cm <sup>2</sup> Welding method:TIG Welding current:120A Electrode:Th-W 2.4mm Φ Gap between electrode:1.5 mm Clamping pressure:100 kg/cm <sup>2</sup>
耐热性 Resistant to heat	长期/空气 Permanently in air	180°C	180°C	270°C	DIN IEC 60404-12
	短期/空气 Short time in air	210°C×2500hr 600°C×30min	210°C×2500hr 600°C×30min	300°C×2500hr 600°C×30min	

以上数据均为一定条件下的实验室测量数据,反映了涂层产品的相关典型性能,但不应视为保证值。

These above values are obtained under the certain conditions in our laboratory, reflected some typical properties of the coating for reference only.

## 电磁性能曲线

### TYPICAL ELECTROMAGNETIC PROPERTY CURVES



上述牌号电磁性能曲线均可通过扫描二维码查阅

The electromagnetic performance curves of the above grades can be viewed by scanning the QR code

## 产品规格

## SPECIFICATIONS OF PRODUCTS

## 产品标准尺寸

## STANDARD DIMENSIONS

公称厚度 Nominal Thickness(mm)	公称宽度 Nominal Width(mm)	内径 Inner Diameter(mm)
0.35、0.50、0.65	700~1260	508 <sup>+12</sup> <sub>-8</sub>

## 尺寸及板形公差

## DIMENSION AND SHAPE TOLERANCES

公称厚度 Nominal Thickness (mm)	公称厚度允许偏差 Nominal Thickness Tolerance (mm)	纵向厚度偏差 Longitudinal Thickness Deviation (mm)	横向厚度偏差 Transverse Thickness Deviation (mm)	
			切边 Cut edge	毛边 Mill edge
0.35	+0.020	+0.010	+0.012	+0.015
	-0.025	0	0	0
0.50	+0.020	+0.015	+0.012	+0.015
	-0.035	0	0	0
0.65	+0.020	+0.020	+0.020	+0.025
	-0.040	0	0	0

公称宽度 Nominal Width (mm)	宽度允许偏差 Width Tolerance (mm)		不平度 (波浪度) Flatness (%)	2m内镰刀弯 Camber within 2m (mm)
	切边 Cut edge	毛边 Mill edge		
$700 \leq L \leq 1000$	0~+1.0	0~+5	$\leq 1.5$	$\leq 2.0$
$1000 < L \leq 1260$	0~+1.5			

注:

- 纵向厚度偏差是指平行于轧制方向（即钢带长度方向）的一定长度（2000±200mm）范围内，钢带纵向上各点的实际厚度之间的偏差。
- 横向厚度偏差是指垂直于轧制方向（即沿着钢带宽度方向），钢带上距离钢带边部不小于15mm及横向宽度中间位置，各点的实际厚度之间的偏差。
- 对于有特殊要求的用户可以标准+α供货。

Note:

- Longitudinal thickness deviation refers to the difference in thickness within a length of strip(2000±200mm) in a direction parallel to the direction of rolling.
- Transverse thickness deviation refers to the difference in thickness in a direction perpendicular to the direction of rolling, the measurements shall be made at least 15 mm from the edges.
- Please consult us if you have special requirements.







# 宝钢股份无取向硅钢应用实绩

## APPLICATION PERFORMANCE OF BAOSTEEL NON-ORIENTED ELECTRICAL STEEL

- 应用领域 43  
Application fields
- 应用实绩 44  
Application performance









## 应用领域

### APPLICATION FIELDS

应用 Applications		普通型 Conventional			高效型 High efficiency	消除应力退火型 Stress relief annealing
		A200~400	A440~700	A800~1300	AH230~600	AR300~600
旋转机 Rotating machines	大型电机 Large rotating machines	★				
	中型电机 Medium rotating machines	★	★			
	压缩机电机 Hermetical motors	★	★	★	★	★
	通用电机 General use A.C.motors	★	★	★	★	★
	小型精密电机 Small precision motors	★	★		★	★
	车载电机 Vehicle-mounted motor	★		★	★	
静止器 Static machines	小型电源变压器 Small transformers	★	★	★	★	★
	仪器用变压器 Current and potential transformers	★				
	电抗器及磁放大器 Reactors and magnetic amplifiers	★				
	焊接用变压器 Welding transformers		★	★		
	稳压器 ballast	★	★	★	★	★



---

## 应用实绩

### APPLICATION PERFORMANCE

#### 兰州重离子研究装置

—我国能量最高的大型重离子研究装置

#### Lanzhou heavy ion research facility

- China's largest heavy ion research facility with the highest energy.



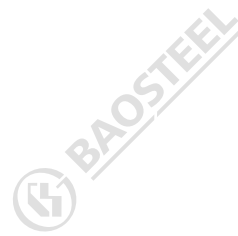
#### 沪杭高铁“和谐号”CRH380A

—世界上运营速度最快的动车组

#### Shanghai-Hangzhou high-speed railway "Harmony" CRH380A

- The fastest train in the world





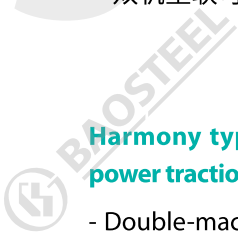
3

### 和谐1型八轴大功率牵引机车

—双机重联可担负2万吨货物运输

#### Harmony type 1 eight-axle high-power traction locomotive

- Double-machine reconnection can be used to transport 20,000 tons of goods

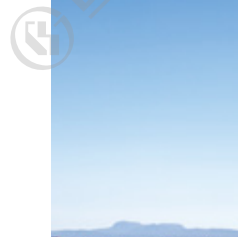


### 上海东海大桥100兆瓦海上风力发电示范工程

—亚洲首座海上风力发电场

#### Shanghai Donghai bridge 100 MW offshore wind power demonstration project

- Asia's first offshore wind farm



## 5 白鹤滩水电站1000MW水轮发电机组

—全球单机容量最大的水轮发电机组

### Baihetan hydropower station 1000MW hydro-generator unit

- The world's largest single-unit capacity hydro-generator unit



## 1000MW系列超超临界火电机组

1000MW series ultra-supercritical thermal power units



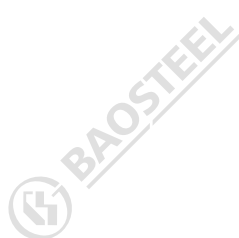




7

**一级能效 (IE5) 工业电机**

**Class I energy efficiency (IE5)  
industrial motor**



8

**一级能效空调用CO<sub>2</sub>冷媒涡旋压缩机**

**CO<sub>2</sub> refrigerant Scroll compressor  
for class 1 air conditioners**





高速磁悬浮列车长定子

High-speed maglev train long stator



# 无取向硅钢产品服务指南

## SERVICE GUIDE

- 产品包装 51  
Product packing
- 产品标签 53  
Product label
- 产品质量证明书 54  
Product inspection certificate
- 近似牌号对照表 55  
Comparable steel grades table
- 常用单位及换算表 57  
Units commonly used and conversion table





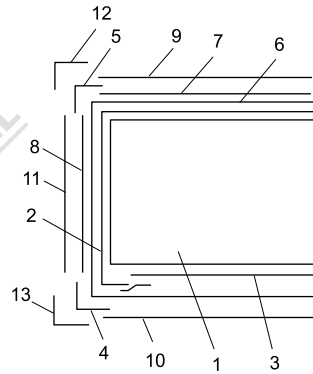
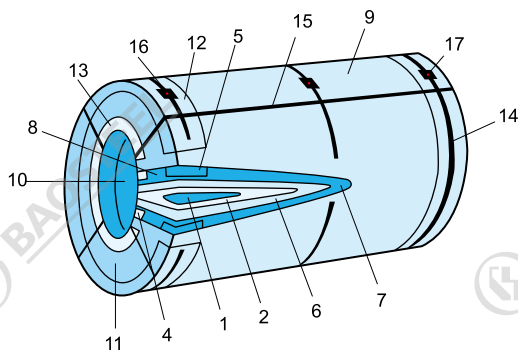




产品包装

PRODUCT PACKING

卧式包装 Horizontal packing



- |          |          |          |
|----------|----------|----------|
| 1. 钢卷    | 2. 外周防锈纸 | 3. 内芯防锈纸 |
| 4. 纸内护角  | 5. 纸外护角  | 6. 塑料套   |
| 7. 外周平板纸 | 8. 圆护平板纸 | 9. 外周包板  |
| 10. 内周护板 | 11. 铁圆护板 | 12. 铁外护角 |
| 13. 铁内护角 | 14. 周向捆带 | 15. 径向捆带 |
| 16. 锁扣垫片 | 17. 锁扣   |          |

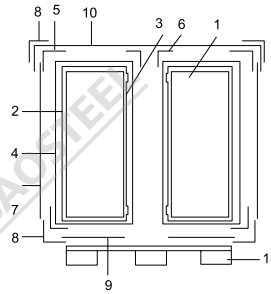
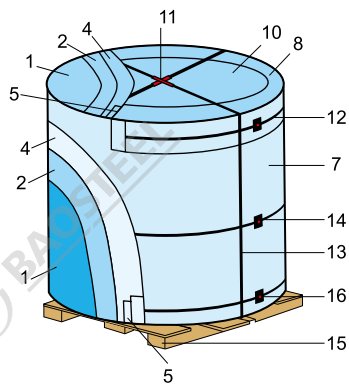
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|--|--|--------------------------------------|
| 1-Steel coil                           | 2-external peripheral rust-proof paper | 3-inner core rust-proof paper        |
| 4-paper inner corner guard             | 5-paper external corner guard          | 6-Plastic sleeve                     |
| 7-external peripheral corrugated paper | 8-round corrugated paper guard         | 9-external peripheral wrapping plate |
| 10-inner peripheral guard plate        | 11-iron round cover                    | 12-iron external corner guard        |
| 13- iron inner corner guard            | 14-circumferential banding strip       | 15-radial banding strip              |
| 16-shim for lock                       | 17-lock                                |                                      |

以上为典型卧式包装示意图

The above is a schematic diagram of a typical horizontal packaging



## 立式包装 Vertical packaging



- |          |          |           |
|----------|----------|-----------|
| 1. 钢卷    | 2. 外周防锈纸 | 3. 内芯防锈纸  |
| 4. 塑料套   | 5. 纸外护角  | 6. 纸内护角   |
| 7. 外周包板  | 8. 铁外护角  | 9. 铁圆护板   |
| 10. 圆盒盖  | 11. 十字锁扣 | 12. 周向捆带  |
| 13. 十字捆带 | 14. 锁扣垫片 | 15. 立式木托架 |
| 16. 锁扣   |          |           |




- |                                       |  |                                  |
|---------------------------------------|--|----------------------------------|
| 1-Steel coil                          | 2-external Peripheral rust-proof paper | 3-Inner core rust-proof paper    |
| 4-Plastics leeve                      | 5-paper external corner guard          | 6-paper inner corner guard       |
| 7-externa peripheral corrugated paper | 8-iron external corner guard           | 9-iron round cover               |
| 10-roundcompartment cover             | 11-lock                                | 12-circumferential banding strip |
| 13-Cross lock                         | 14-shim for lock                       | 15-Vertical wooden pallets       |
| 16-lock                               |  |                                  |

以上为典型立式包装示意图

The above is a schematic diagram of a typical vertical packaging

## 产品标签

## PRODUCT LABEL


		<b>宝山钢铁股份有限公司</b> BAOSHAN IRON & STEEL CO., LTD.		总部 CORE BASE	 怡湿 KEEP DRY
品名 PRODUCT				日期 DATE	
标准 SPECIFICATION				计重方式 WEIGHT ARKER	
规格 SIZE	(规格条码打印处)		净重 kg NET WEIGHT	毛重 kg GROSS WEIGHT	
捆包号 COIL/PACK NO.	(捆包号条码打印处)		(净重条码打印处)	(毛重条码打印处)	
			涂层种类 COATING TYPE		
用户合同号 CONTRACT NO.		张数 SHEETS	炉号 HEAT NO.	 (二维码打印处)	
到站港 DESTINATION					
收货单位 PURCHASER					
		(捆包号条码打印处)	库号	批号	

以上产品标签以宝山基地产品示例

The above product label is an example of Baoshan base products

产品质量证明书

PRODUCT INSPECTION CERTIFICATE

 <b>宝山钢铁股份有限公司</b> BAOSHAN IRON & STEEL CO., LTD.		<b>产品质量证明书</b> INSPECTION CERTIFICATE			上海市宝山区富锦路885号 邮编 201900 No 885 Fujin ROAD, BAOSHAN DISTRICT SHANGHAI, P. R. CHINA 201900 电话 TEL: +86 21 26649104 传真 FAX: +86 21 26648896	
制造厂: 总部 Manufacturer: CORE BASE						
订货单位 CUSTOMER				产品名称 PRODUCT	无取向电工钢带	
采购单位 PURCHASER				代号 CUSTOMER'S NO.		
标准 SPECIFICATION				客户订单编号 CUSTOMER ORDER NO.	证书号 CERTIFICATE NO. <b>BeCOREs</b> <b>宝钢硅钢</b>	
				签发日期 DATE OF ISSUE		
				许可证号 LICENSE NO.	合同号 MILL'S NO.	
序 号 NO.	钢卷号/捆包号 COIL / PACK NO.	件 数 QTY	炉 号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION		
				厚度 THICK mm	宽度 WIDTH mm	长度 LENGTH m
				卷数 NO.	重量 MASS kg	重量 Wt/g
				比总损耗 PL5/50 %	磁感饱和 M.P. T	磁感无磁 M.P. T
						磁感无磁 M.P. T
					屈服强度 Yield Point L Re MPa	抗拉强度 T. Strength L Rm MPa
					伸长率 Elongation L A %	洛氏硬度 VICKERS HVN0.05 FV1
合计 Total						
备注 REMARKS						
注释 NOTES						
Y.S.= YIELD STRENGTH    T.S.= TENSILE STRENGTH    E.L.= ELONGATION    G.L.= GAUGE LENGTH    L1= 50MM    L2= 80MM    L3= 5.65SQRT(F0)    L4= 11.3SQRT(F0)						
0: SHEETS    M.P.= MAGNETIC POLARIZATION						
会验者 SURVEYOR TO					质量负责人 QUALITY MANAGER	
本产品已按上述要求进行制造和检验, 其结果符合要求, 特此证明。 WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS MANUFACTURED AND TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE ABOVE MATERIAL SPECIFICATION. INSPECTION CERTIFICATE ACCORDING TO EN10204 3.1.B					Page    of	

以上质量证明书以宝山基地产品示例

The above inspection certificate is an example of Baoshan base products



## 近似牌号对照表

## COMPARABLE STEEL GRADES TABLE

Q/BQB 480-2021	GB/T 2521.1-2016	IEC 60404-8-4:2013	JIS C 2552:2014	ASTM A677-12	IS 648:2006	EN 10106:2015
B35AR300 ~600	—	—	—	—	—	—
B35AH230 ~300	35WH230~ 300	—	—	—	—	—
B50AH300 ~600	50WH300~ 600	—	—	—	—	—
B35A200	—	—	—	—	—	—
B35A210	35WW230	—	M210-35A 5	35A210	—	M210-35A
B35A230	35WW250	35W230	M230-35A 5	35A230	—	35C230
B35A250	35WW270	35W250	M250-35A 5	35A250	36F145	35C250
B35A270	35WW300	35W270	M270-35A 5	35A270	36F155	35C270
B35A300	-	35W300	M300-35A 5	35A300	36F165	35C300
B35A360	35WW360	35W360	M360-35A 5	35A360	36F195	35C360
B35A440	35WW440	35W440	—	35A440	36F205	—
B50A230	50WW250	50W230	M230-50A 5	50A230	—	-
B50A250	50WW270	50W250	M250-50A 5	50A250	—	50C250
B50A270	50WW290	50W270	M270-50A 5	50A270	—	50C270
B50A290	50WW310	50W290	M290-50A 5	50A290	47F165	50C290
B50A310	50WW350	50W310	M310-50A 5	50A310	47F180	50C310
B50A350	50WW400	50W350	M350-50A 5	50A350	47F200	50C330
B50A400	50WW470	50W400	M400-50A 5	50A400	47F210	50C400
B50A470	50WW600	50W470	M470-50A 5	50A470	47F240	50C470

Q/BQB 480-2021		GB/T 2521.1-2016	IEC 60404-8-4:2013	JIS C 2552:2014	ASTM A677-12	IS 648:2006	EN 10106:2015
B50A600	50WW700	50W600	M600-50A 5	50A600	—	50C630	M600-50A
B50A700	50WW800	—	M700-50A 5	50A700	47F400	50C700	M700-50A
B50A800	—	50W800	M800-50A 5	50A800	47F450	50C800	M800-50A
B50A1000	50WW1000	50W1000	M1000-50A 5	50A1000	—	50C1000	—
B50A1300	50WW1300	—	—	50A1300	—	—	—
B65A310	—	—	M310-65A 5	65A310	—	65C310	M310-65A
-	—	—	M330-65A 5	65A330	64F200	65C330	M330-65A
B65A350	—	—	M350-65A 5	65A350	64F210	65C350	M350-65A
B65A400	—	—	M400-65A 5	65A400	64F235	65C400	M400-65A
B65A470	—	—	M470-65A 5	65A470	64F250	65C470	M470-65A
B65A530	—	—	M530-65A 5	—	—	65C530	M530-65A
B65A600	—	65W600	M600-65A 5	65A600	64F320	65C600	M600-65A
B65A700	—	—	M700-65A 5	—	—	65C700	M700-65A
B65A800	—	65W800	M800-65A 5	65A800	64F500	65C800	M800-65A
B65A1000	—	—	M1000-65A5	65A1000	64F550	65C1000	M1000-65A
B65A1300	—	—	—	65A1300	—	—	—

## 常用单位及换算表

UNITS COMMONLY USED AND  
CONVERSION TABLE

单位 Units	初值 Multiply	倍数 by	结果 to obtain
磁场强度 Magnetizing Force	奥斯特 Oersted (Oe)	$7.985 \times 10$	安培/米 Ampere per meter (A/m)
	奥斯特 Oersted (Oe)	2.021	安培/英寸 Ampere per inch (A/in)
	安培/米 Ampere per meter (A/m)	$1.257 \times 10^{-2}$	奥斯特 Oersted (Oe)
	安培/米 Ampere per meter (A/m)	$2.540 \times 10^{-2}$	安培/英寸 Ampere per inch (A/in)
	安培/英寸 Ampere per inch (A/in)	$4.947 \times 10^{-1}$	奥斯特 Oersted (Oe)
	安培/英寸 Ampere per inch (A/in)	$3.937 \times 10$	安培/米 Ampere per meter (A/m)
	安培/厘米 Ampere per centimeter (A/cm)	$10^2$	安培/米 Ampere per meter (A/m)
磁感 Magnetic induction	特斯拉 Tesla (T)	$10^4$	高斯 Gauss (Gs)
	特斯拉 Tesla (T)	1	韦伯/平方米 Weber per square meter (Wb/m <sup>2</sup> )
	高斯 Gauss (Gs)	$10^{-4}$	韦伯/平方米 Weber per square meter (Wb/m <sup>2</sup> )
	高斯 Gauss (Gs)	6.452	磁通量/平方英寸 Lines per square inch (Line/in <sup>2</sup> )
	韦伯/平方米 Weber per square meter (Wb/m <sup>2</sup> )	$10^4$	高斯 Gauss (Gs)
	韦伯/平方米 Weber per square meter (Wb/m <sup>2</sup> )	1	特斯拉 Tesla (T)
	韦伯/平方米 Weber per square meter (Wb/m <sup>2</sup> )	$6.452 \times 10^4$	磁通量/平方英寸 Lines per square inch (Line/in <sup>2</sup> )
	磁通量/平方英寸 Lines per square inch (Line/in <sup>2</sup> )	$1.550 \times 10^{-1}$	高斯 Gauss (Gs)
	磁通量/平方英寸 Lines per square inch (Line/in <sup>2</sup> )	$1.550 \times 10^{-5}$	韦伯/平方米 Weber per square meter (Wb/m <sup>2</sup> )
铁损 Core loss	瓦特/千克 Watt per kilogram (W/Kg)	$4.536 \times 10^{-1}$	瓦特/磅 Watt per pound (W/lb)
	瓦特/磅 Watt per pound (W/lb)	2.204	瓦特/千克 Watt per kilogram (W/Kg)



单位 Units	初值 Multiply	倍数 by	结果 to obtain
磁导率 Permeability	CGS电磁单位 CGS electro-magnetic unit (emu)	1	高斯/奥斯特 Gauss per Oersted (G/Oe)
	CGS电磁单位 CGS electro-magnetic unit (emu)	$1.257 \times 10^{-6}$	亨利/米 Henry per meter (H/m)
	CGS电磁单位 CGS electro-magnetic unit (emu)	$1.257 \times 10^{-6}$	韦伯/安培-米 Weber per Ampere-meter (Wb/A-m)
	CGS电磁单位 CGS electro-magnetic unit (emu)	$3.192 \times 10^{-8}$	韦伯/安培-英寸 Weber per Ampere-inch (Wb/A-in)
	CGS电磁单位 CGS electro-magnetic unit (emu)	3.192	磁通量/安培-英寸 Lines per Ampere-inch (Line/A-in)
	亨利/米 Henry per meter (H/m)	$7.958 \times 10^5$	CGS电磁单位 CGS electro-magnetic unit (emu)
	亨利/米 Henry per meter (H/m)	$7.958 \times 10^5$	高斯/奥斯特 Gauss per Oersted (G/Oe)
	亨利/米 Henry per meter (H/m)	$2.540 \times 10^{-2}$	韦伯/安培-英寸 Weber per Ampere-inch (Wb/A-in)
	亨利/米 Henry per meter (H/m)	$2.540 \times 10^6$	磁通量/安培-英寸 Lines per Ampere-inch (Line/A-in)
长度 Length	米 Meter(m)	$3.937 \times 10$	英寸 Inch (in)
	英寸 Inch (in)	$2.540 \times 10^{-2}$	米 Meter(m)
	米 Meter(m)	3.281	英尺 Feet (ft)
	英尺 Feet (ft)	$3.048 \times 10^{-1}$	米 Meter(m)
重量 Weight	千克 Kilogram (Kg)	2.204	磅 Pound (lb)
	磅 Pound (lb)	$4.536 \times 10^{-1}$	千克 Kilogram (Kg)

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