BAOSTEEL 宝钢股份

BeCOREs 宝钢硅钢

中频冷轧无取向硅钢

Cold-rolled Non-oriented Electrical Steel for Use at Medium Frequencies

前言 Preface

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中频无取向硅钢牌号、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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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


BAOSTEEL
BeCOREs

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.

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.

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 metrictons.

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.

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 gird.

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.

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.

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 WGPH 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 .

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 >>

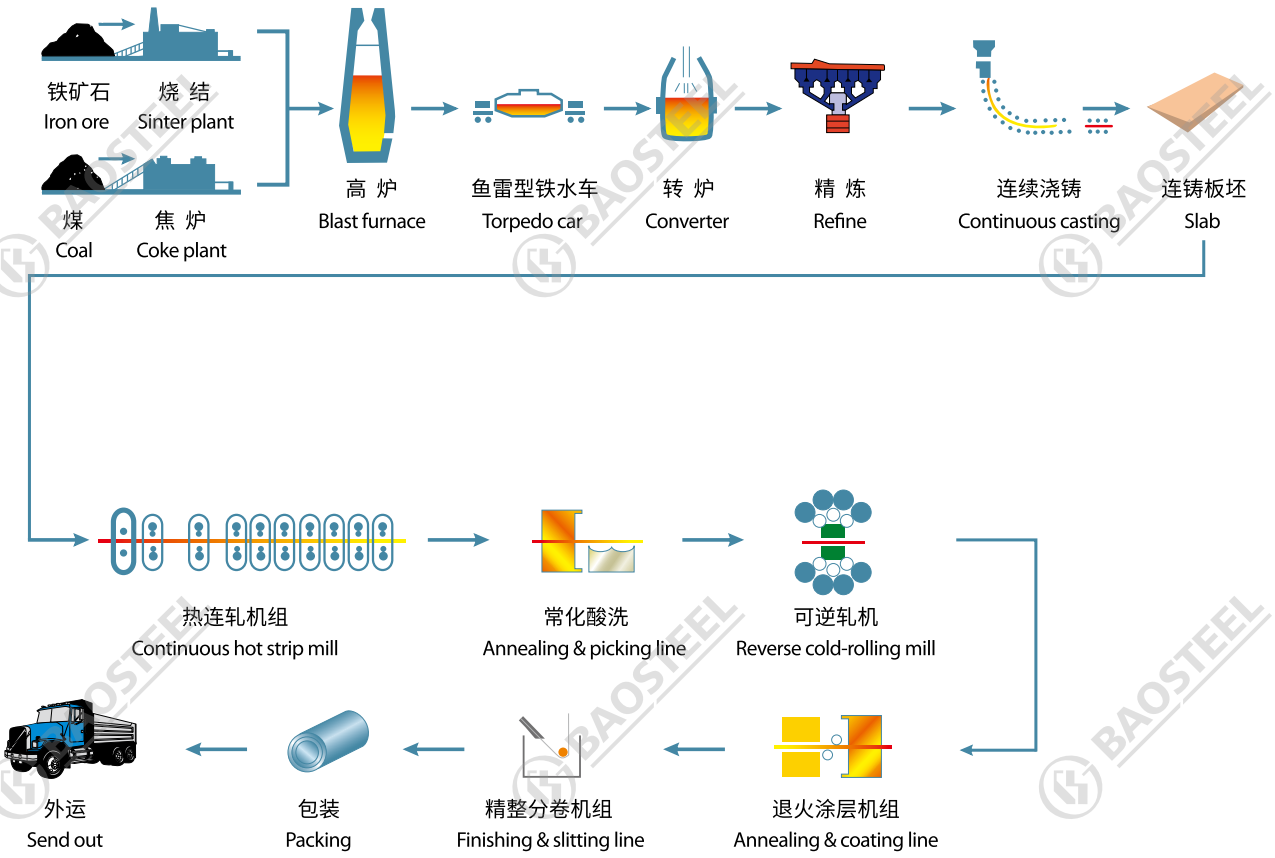
B □□□□□□□□□

最大比总损耗$P_{1.0/400}$ (W/kg)的100倍。 最小屈服强度（限于高强度型产品）	100 times of nominal maximum $P_{1.0/400}$(W/kg) Minimum yield strength (only for AHS)
用于表示无取向硅钢的类型的字符，其中 AV：普通型 AHV：高效型 AHV-M：高效高强度型 APV：高磁感型 AHS：高强度型	Character of steel grade type, such as: AV : conventional AHV : high efficiency AHV-M : high efficiency-higher strength APV : high permeability AHS : high strength
公称厚度（mm）的100倍	100 times the nominal thickness , in millimeters
宝钢英文名称Baosteel的首字母	Initial of Baosteel

示 例：	Examples:
B20AV1300表示公称厚度为0.20mm的普通型无取向硅钢，最大比总损耗$P_{1.0/400}$为13W/kg。	B20AV1300 means conventional type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss $P_{1.0/400}$ of 13 W/kg , nominal thickness is 0.20 mm, supplied in the fully processed state.
B27AHV1400表示公称厚度为0.27mm的高效型无取向硅钢，最大比总损耗$P_{1.0/400}$为14W/kg。	B27AHV1400 means high efficiency type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss $P_{1.0/400}$ of 14W/kg , nominal thickness is 0.27 mm, supplied in the fully processed state.
B30APV1500表示公称厚度为0.30mm的高磁感型无取向硅钢，最大比总损耗$P_{1.0/400}$为15W/kg。	B30APV1500 means high permeability type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss $P_{1.0/400}$ of 15 W/kg , nominal thickness is 0.30 mm, supplied in the fully processed state.
B25AHV1300M表示公称厚度为0.25mm的高效高强度型无取向硅钢钢，最大比总损耗$P_{1.0/400}$为13W/kg。	B25AHV1300M means high efficiency-higher strength type cold rolled non-oriented electrical steel strip with a nominal maximum specific total loss $P_{1.0/400}$ of 13 W/kg , nominal thickness is 0.25 mm, supplied in the fully processed state.
B35AHS500表示公称厚度为0.35mm的高强度型无取向硅钢，最小屈服强度500MPa。	B35AHS500 means high strength type cold rolled non-oriented electrical steel strip with a Minimum yield strength of 500 MPa , nominal thickness is 0.35 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。

更高的机械强度
提高宝钢无取向硅钢产品的机械强度以满足高速电机安全需求。

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。

种类多样的涂层
宝钢可以根据用户的加工方式、环保要求和绝缘性能提供合适的涂层。

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800-1250mm，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.

Higher mechanical strength
Improving the mechanical strength of non - oriented electrical steel to meet the safety requirements of high speed drive motor.

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

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

More kinds of coatings
Baosteel can provide appropriate coating according to the user ' s processing methods, environmental requirements and insulation performance.

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 800-1250mm, and users can choose from them to improve material utilization.

无取向硅钢产品特性
PRODUCTS CHARACTERISTICS

产品性能
Properties

>>

普通型AV系列产品
Conventional type AV 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 $P_{1.0/400}$ (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/dm³)
B15AV1000	0.15	10.00	1.60	0.92	2	7.60
B20AV1200	0.20	12.00	1.61	0.93	2	7.60
B20AV1300	0.20	13.00	1.63	0.93	2	7.65
B25AV1300	0.25	13.00	1.62	0.94	2	7.60
B27AV1400	0.27	14.00	1.63	0.94	2	7.60
B30AV1500	0.30	15.00	1.63	0.94	2	7.60
B35AV1700	0.35	17.00	1.64	0.95	2	7.60
B35AV1800	0.35	18.00	1.64	0.95	2	7.60
B35AV1900	0.35	19.00	1.65	0.95	2	7.65
B35AV2000	0.35	20.00	1.65	0.95	3	7.65
B35AV2100	0.35	21.00	1.66	0.95	3	7.65

典型电磁性能 Typical electromagnetic properties

牌号 Grade	比总损耗 Specific Total Loss (W/kg)						磁极化强度 Magnetic Polarization (T)			
	$P_{1.0/50}$	$P_{1.5/50}$	$P_{1.0/60}$	$P_{1.5/60}$	$P_{1.0/400}$	$P_{1.0/800}$	J_{1000}	J_{2500}	J_{5000}	J_{10000}
B15AV1000	0.84	2.00	1.03	2.46	9.50	23.80	1.43	1.52	1.62	1.74
B20AV1200	0.85	2.02	1.04	2.49	10.60	28.70	1.44	1.53	1.63	1.75
B20AV1300	0.93	2.35	1.21	2.87	12.00	31.50	1.45	1.54	1.64	1.76
B25AV1300	0.86	2.01	1.05	2.48	12.00	33.15	1.44	1.53	1.63	1.75
B27AV1400	0.86	2.03	1.05	2.50	13.20	37.50	1.45	1.54	1.64	1.76
B30AV1500	0.89	2.12	1.11	2.63	14.20	41.00	1.46	1.55	1.64	1.76
B35AV1700	0.91	2.20	1.14	2.77	16.20	47.50	1.47	1.57	1.66	1.78
B35AV1800	0.98	2.25	1.25	2.75	17.20	50.50	1.47	1.57	1.66	1.78
B35AV1900	1.06	2.42	1.34	3.01	17.50	52.50	1.48	1.58	1.67	1.79
B35AV2000	1.14	2.55	1.45	3.18	18.50	54.80	1.51	1.59	1.68	1.80
B35AV2100	1.25	2.80	1.55	3.44	19.50	57.10	1.51	1.60	1.68	1.80

典型机械性能 Typical mechanical properties

牌号 Grade	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	
B15AV1000	425	440	546	563	15	16	221	≥20	≥20	0.965
B20AV1200	425	440	546	563	15	16	221	≥20	≥20	0.975
B20AV1300	395	410	515	529	18	19	210	≥20	≥20	0.975
B25AV1300	430	443	547	560	16	17	225	≥10	≥10	0.980
B27AV1400	429	443	547	561	18	19	228	≥10	≥10	0.980
B30AV1500	435	448	555	568	19	20	230	≥10	≥10	0.980
B35AV1700	438	448	561	574	20	21	232	5	5	0.985
B35AV1800	413	425	540	553	22	23	223	10	10	0.985
B35AV1900	400	415	534	548	25	26	214	19	19	0.985
B35AV2000	380	394	518	532	27	28	205	20	20	0.985
B35AV2100	355	370	500	515	28	29	190	≥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AHV系列产品
High efficiency type AHV 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/dm³)
B20AHV1200	0.20	12.00	1.64	0.93	2	7.65
B20AHV1300	0.20	13.00	1.64	0.93	2	7.65
B27AHV1400	0.27	14.00	1.65	0.94	2	7.65
B30AHV1500	0.30	15.00	1.66	0.94	2	7.65
B35AHV1700	0.35	17.00	1.66	0.95	2	7.65

典型电磁性能 Typical electromagnetic properties

牌号 Grade	比总损耗 Specific Total Loss (W/kg)						磁极化强度 Magnetic Polarization (T)			
	$P_{1.0/50}$	$P_{1.5/50}$	$P_{1.0/60}$	$P_{1.5/60}$	$P_{1.0/400}$	$P_{1.0/800}$	J_{1000}	J_{2500}	J_{5000}	J_{10000}
B20AHV1200	0.83	2.05	1.02	2.52	10.80	29.40	1.47	1.57	1.65	1.77
B20AHV1300	0.97	2.28	1.20	2.80	12.15	32.50	1.49	1.58	1.67	1.79
B27AHV1400	0.85	2.07	1.06	2.56	13.30	38.40	1.47	1.58	1.66	1.78
B30AHV1500	0.90	2.09	1.11	2.59	14.20	40.80	1.49	1.58	1.67	1.79
B35AHV1700	0.93	2.08	1.14	2.57	16.00	47.00	1.50	1.60	1.68	1.80

典型机械性能 Typical mechanical properties

牌号 Grade	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	
B20AHV1200	395	405	500	512	15	16	215	⩾20	⩾20	0.975
B20AHV1300	360	374	470	485	17	18	193	⩾20	⩾20	0.975
B27AHV1400	390	403	510	524	20	21	205	⩾20	⩾20	0.980
B30AHV1500	395	408	515	530	20	21	205	⩾20	⩾20	0.980
B35AHV1700	397	410	518	533	19	20	210	10	10	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.

高效高强度型AHV-M系列产品
High efficiency-higher strength AHV-M 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^3)
B25AHV1300M	0.25	13.00	1.65	0.94	2	7.60
B27AHV1400M	0.27	14.00	1.65	0.94	2	7.60
B30AHV1500M	0.30	15.00	1.65	0.94	2	7.60

机械性能标准 Standard of mechanical properties

牌号 Grade	最小屈服强度 Min. Yield strength (MPa)	最小抗拉强度 Min. Tensile strength (MPa)	最小延伸率 Min Elongation (%)
B25AHV1300M	420	520	10
B27AHV1400M	420	520	10
B30AHV1500M	420	520	10

典型电磁性能 Typical electromagnetic properties

牌号 Grade	比总损耗 Specific Total Loss (W/kg)						磁极化强度 Magnetic Polarization (T)			
	$P_{1.0/50}$	$P_{1.5/50}$	$P_{1.0/60}$	$P_{1.5/60}$	$P_{1.0/400}$	$P_{1.0/800}$	J_{1000}	J_{2500}	J_{5000}	J_{10000}
B25AHV1300M	0.80	1.91	0.99	2.36	12.00	34.10	1.47	1.57	1.66	1.78
B27AHV1400M	0.82	1.99	1.02	2.47	13.05	37.20	1.47	1.57	1.66	1.78
B30AHV1500M	0.85	1.95	1.06	2.44	13.70	39.40	1.47	1.57	1.67	1.79

典型机械性能 Typical mechanical properties

牌号 Grade	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	
B25AHV1300M	442	455	545	558	18	19	238	⩾10	⩾10	0.980
B27AHV1400M	441	454	545	558	18	19	238	⩾10	⩾10	0.980
B30AHV1500M	440	454	548	562	20	21	238	⩾10	⩾10	0.980

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.

高磁感型APV系列产品
High permeability type APV 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 $P_{1.0/400}$ (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/dm³)
B15APV1000	0.15	10.00	1.68	0.90	2	7.65
B20APV1200	0.20	12.00	1.68	0.93	2	7.65
B25APV1300	0.25	13.00	1.68	0.94	2	7.65
B27APV1400	0.27	14.00	1.68	0.94	2	7.65
B30APV1500	0.30	15.00	1.68	0.94	2	7.65
B35APV1700	0.35	17.00	1.68	0.95	2	7.65

典型电磁性能 Typical electromagnetic properties

牌号 Grade	比总损耗 Specific Total Loss (W/kg)						磁极化强度 Magnetic Polarization (T)			
	$P_{1.0/50}$	$P_{1.5/50}$	$P_{1.0/60}$	$P_{1.5/60}$	$P_{1.0/400}$	$P_{1.0/800}$	J_{1000}	J_{2500}	J_{5000}	J_{10000}
B15APV1000	0.81	1.96	1.00	2.41	9.63	24.30	1.50	1.59	1.69	1.81
B20APV1200	0.81	1.92	1.00	2.37	10.60	28.90	1.50	1.59	1.69	1.81
B25APV1300	0.80	1.87	0.98	2.31	12.20	33.80	1.51	1.60	1.69	1.81
B27APV1400	0.81	1.90	0.99	2.35	13.10	37.00	1.51	1.60	1.69	1.81
B30APV1500	0.84	1.93	1.05	2.39	13.80	40.80	1.51	1.60	1.69	1.81
B35APV1700	0.85	2.03	1.06	2.48	15.80	45.90	1.51	1.60	1.69	1.81

典型机械性能 Typical mechanical properties

牌号 Grade	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	
B15APV1000	390	400	503	515	14	15	210	⩾20	⩾20	0.965
B20APV1200	395	405	500	512	15	16	215	⩾20	⩾20	0.975
B25APV1300	383	396	488	500	20	21	215	⩾20	⩾20	0.975
B27APV1400	385	398	490	503	20	21	215	⩾20	⩾20	0.980
B30APV1500	390	402	500	514	20	21	215	⩾20	⩾20	0.980
B35APV1700	395	410	510	515	20	21	218	8	8	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.
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C represents the test piece shall be taken transverse to the rolling direction.
Stacking factor shall be test with the test pieces without coating.

高强度型AHS系列产品
High strength type AHS 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^3)
B35AHS500	0.35	25.00	1.64	0.95	2	7.60
B35AHS550	0.35	32.00	1.63	0.95	2	7.60
B35AHS600	0.35	35.00	1.60	0.95	2	7.60

机械性能标准 Standard of mechanical properties

牌号 Grade	最小屈服强度 Min. Yield strength (MPa)	最小抗拉强度 Min. Tensile strength (MPa)	最小延伸率 Min Elongation (%)
B35AHS500	500	570	10
B35AHS550	550	620	10
B35AHS600	600	670	10

典型电磁性能 Typical electromagnetic properties

牌号 Grade	比总损耗 Specific Total Loss (W/kg)	磁极化强度 Magnetic Polarization (T)			
	$P_{1.0/400}$	J_{1000}	J_{2500}	J_{5000}	J_{10000}
B35AHS500	23.00	1.48	1.58	1.66	1.78
B35AHS550	30.00	1.48	1.58	1.66	1.78
B35AHS600	33.00	1.47	1.57	1.65	1.77

典型机械性能 Typical mechanical properties

牌号 Grade	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	
B35AHS500	532	547	622	636	25	26	240	⩾15	⩾15	0.985
B35AHS550	575	590	665	680	22	23	245	⩾15	⩾15	0.985
B35AHS600	636	650	722	736	20	21	245	⩾15	⩾15	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、冲片性以及其他特性，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
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^{6+}含量符合相关法令要求。
D和E涂层适用于点胶工艺。

Cr^{6+} content in A and H coatings meets the requirements of relevant decrees.
D and E coatings are suitable for glueing process.

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
		A	H	K/D	M/E	Z	
ASTM 属性 Comparable to ASTM coating		C-5	C-5	C-5	C-5	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)		0.2～0.5μm	0.6～1.0μm	0.3～0.7μm	0.7～1.2μm	3～7μm	
涂层绝缘电阻(Ω·cm²/片) Coating insulation resistance(Ω.cm²/sheet)		⩾1	⩾3	⩾1	⩾3	⩾25	表中数值为层间电阻(10个触头，总面积为6.45cm²) Interlaminar resistance(10 contact buttons,total contact area:6.45cm²)
附着性 Adhesion		A	B	A	B	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	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	表观变化 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	50°C，95%相对湿度 14天 50°C,95% relative humidity 14days
耐冷媒性 Resistant to refrigerator	表观变化 Appearance change	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	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		

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	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	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/cm² Welding method:TIG Welding current:120A Electrode:Th-W 2.4mm Φ Gap between electrode: 1.5 mm Clamping pressure: 100 kg/cm²
耐热性 Resistant to heat	长期/空气 Permanently in air	180°C	180°C	180°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	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

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)
0.15、0.20、0.25 0.27、0.30、0.35	900～1250	508^{+12}_{-8}

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 Longitudinal Thickness Deviation (mm)	横向厚度偏差 Transverse Thickness Deviation (mm)
0.15 0.20	+0.010 -0.015	+0.006 0	+0.008 0
0.25 0.27	+0.010 -0.020	+0.008 0	+0.010 0
0.30	+0.010 -0.025	+0.009 0	+0.012 0
0.35	+0.015 -0.025	+0.010 0	+0.012 0

公称宽度 L Nominal Width (mm)	宽度允许偏差 Width Tolerance (mm) 切边 Cut edge	不平度 (波浪度) Flatness (%)	2m内镰刀弯 Camber within 2m (mm)
900 ≤ L ≤1000	0～+1.0	≤1.5	≤2.0
1000 < L ≤1250	0～+1.5		

注：

a. 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。

b. 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。

c. 对于有特殊要求的用户可以标准+α供货。

Note:

a. 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.

b. 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.

c. Please consult us if you have special requirements.

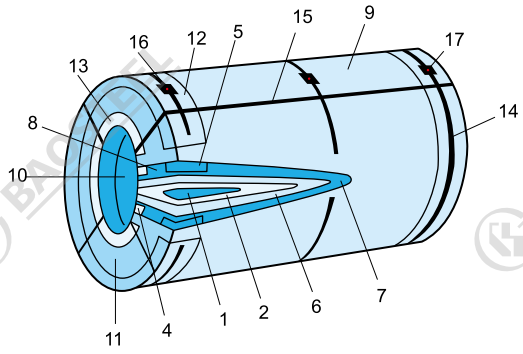
无取向硅钢产品服务指南

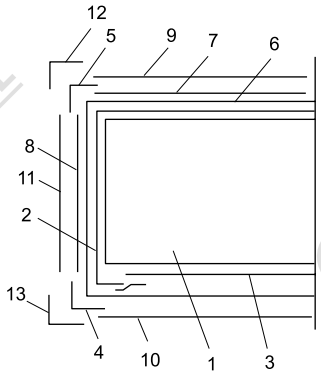
SERVICE GUIDE

产品包装
Product packing

>>

卧式包装 Horizontal packing





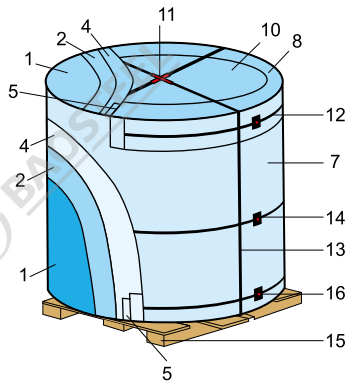
1. 钢卷
2. 外周防锈纸
3. 内芯防锈纸
4. 纸内护角
5. 纸外护角
6. 塑料套
7. 外周平板纸
8. 圆护平板纸
9. 外周包板
10. 内周护板
11. 铁圆护板
12. 铁外护角
13. 铁内护角
14. 周向捆带
15. 径向捆带
16. 锁扣垫片
17. 锁扣

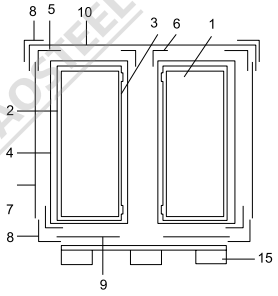
1-steel coil
2-external peripheral rust-proof paper
3-inner core rust-proof paper
4-paper inner corner guard
5-paper external corner guard
6-plastic sleeve
7-external peripheral corrugated paper
8-round corrugated paper guard
9-external peripheral wrapping plate
10-inner peripheryal guard plate
11-iron 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

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宝钢®

宝山钢铁股份有限公司
BAOSHAN IRON & STEEL CO., LTD.

总部
CORE BASE

怕湿
KEEPDRY

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.	
到站港 DESTINATION				
收货单位 PURCHASER				

（二维码打印处）

（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

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宝钢® 宝山钢铁股份有限公司 BAOSHAN IRON & STEEL CO., LTD.

制造厂：总部
Manufacturer: CORE BASE

产品质量证明书
INSPECTION CERTIFICATE

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订货单位 CUSTOMER		产品名称 PRODUCT	无取向电工钢带
收货单位 PURCHASER		代 号 CUSTOMER'S NO.	证书号 CERTIFICATE NO.
标 准 SPECIFICATION		客户订单编号 CUSTOMER ORDER NO.	BeCOREs 宝钢硅钢
		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	宽度 WIDTH	长度 LENGTH	张数 *'0	重量 MASS (Kg)	P1.5/50 W/kg	J2500 T	J5000 T	J10000 T	Yield Point L Re MPa	T. Strength L Rm MPa	Elongation L A %	HV1	
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) *0:0-EETS M.P. = MAGNETIC POLARIZATION
会检者 SURVEYOR TO	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 EN 10204 3.1.B 质量负责人 QUALITY MANAGER

Page of

服务热线 400-820-8500 021-26648888

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

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)	7.985×10	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)	1.257×10^{-2}	奥斯特	Oersted (Oe)
	安培/米	Ampere per meter (A/m)	2.540×10^{-2}	安培/英寸	Ampere per inch (A/in)
	安培/英寸	Ampere per inch (A/in)	4.947×10^{-1}	奥斯特	Oersted (Oe)
	安培/英寸	Ampere per inch (A/in)	3.937×10	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^2)
	高斯	Gauss (Gs)	10^{-4}	韦伯/平方米	Weber per square meter (Wb/m^2)
	高斯	Gauss (Gs)	6.452	磁通量/平方英寸	Lines per square inch ($Line/in^2$)
	韦伯/平方米	Weber per square meter (Wb/m^2)	10^4	高斯	Gauss (Gs)
	韦伯/平方米	Weber per square meter (Wb/m^2)	1	特斯拉	Tesla (T)
	韦伯/平方米	Weber per square meter (Wb/m^2)	6.452×10^4	磁通量/平方英寸	Lines per square inch ($Line/in^2$)
	磁通量/平方英寸	Lines per square inch ($Line/in^2$)	1.550×10^{-1}	高斯	Gauss (Gs)
	磁通量/平方英寸	Lines per square inch ($Line/in^2$)	1.550×10^{-5}	韦伯/平方米	Weber per square meter (Wb/m^2)
铁损 Core loss	瓦特/千克	Watt per kilogram (W/Kg)	4.536×10^{-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)	1.257×10^{-6}	亨利/米	Henry per meter (H/m)
	CGS电磁单位	CGS electro-magnetic unit (emu)	1.257×10^{-6}	韦伯/安培-米	Weber per Ampere-meter (Wb/A-m)
	CGS电磁单位	CGS electro-magnetic unit (emu)	3.192×10^{-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)	7.958×10^{5}	CGS电磁单位	CGS electro-magnetic unit (emu)
	亨利/米	Henry per meter (H/m)	7.958×10^{5}	高斯/奥斯特	Gauss per Oersted (G/Oe)
	亨利/米	Henry per meter (H/m)	2.540×10^{-2}	韦伯/安培-英寸	Weber per Ampere-inch (Wb/A-in)
	亨利/米	Henry per meter (H/m)	2.540×10^{6}	磁通量/安培-英寸	Lines per Ampere-inch (Line/A-in)
长度 Length	米	Meter(m)	3.937×10	英寸	Inch (in)
	英寸	Inch (in)	2.540×10^{-2}	米	Meter(m)
	米	Meter(m)	3.281	英尺	Feet (ft)
	英尺	Feet (ft)	3.048×10^{-1}	米	Meter(m)
重量 Weight	千克	Kilogram (Kg)	2.204	磅	Pound (lb)
	磅	Pound (lb)	4.536×10^{-1}	千克	Kilogram (Kg)

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