首钢智新电磁材料(迁安)股份有限公司
SHOUGANG ZHIXIN ELECTROMAGNETIC MATERIALS (QIAN'AN) CO., LTD.

无取向电工钢
产品手册

NON-ORIENTED ELECTRICAL STEEL

首钢智新电磁材料（迁安）股份有限公司
Shougang Zhixin Electromagnetic Materials (Qian'an) Co., Ltd.

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第一章 公司介绍

首钢智新电磁材料（迁安）股份有限公司
Shougang Zhixin Electromagnetic Materials（Qian'an）Co.,LTD.

首钢智新电磁材料（迁安）股份有限公司（简称首钢智新）是首钢股份公司于 2018 年 3 月 22 日在河北省迁安市设立的全资子公司，集电工钢研发、制造、销售和服务于一体，坚持“高端高效、绿色环保”的产品定位，不断推进电工钢工艺技术研发及产品更新换代，为电力、电子及交通等领域提供解决方案。首钢智新是全球第 4 家掌握低温高磁感取向电工钢技术的制造厂家，产品广泛应用于 500kV 及以上超、特高压变压器生产制造，实现国网交流“双百万”变压器应用突破，薄规格产品成功应用于中国高铁首套智能化变电站，跻身变压器材料世界第一阵营，是国际上少数几家具备全系列新能源产品供应能力的厂家之一。无取向电工钢涵盖了国内外一流钢厂的所有牌号产品，产品质量达国际先进水平，正在成长为“全球领先的电工钢制造商”。

Shougang Zhixin Electromagnetic Materials（Qian'an）Co.,LTD.(hereinafter referred to as Zhixin company) is a wholly-owned subsidiary of Shougang Co., Ltd. established in Qian'an City, Hebei Province on March 22, 2018. It integrates research and development, manufacturing, sales and service of electrical steel, adheres to the product positioning of "high-end, efficient, green and environmental protection", constantly promotes the research and development of electrical steel process technology and product upgrading, and provides solutions for the fields of power, electronics and transportation. We have independently developed and mastered the technology of producing high magnetic induction oriented electrical steel by low temperature slab heating process, and become the fourth enterprise in the world with all low temperature process industrialization. Our products are widely used in the production and manufacture of 500kV and above ultra-high voltage transformers, realizing the breakthrough of "double million" transformer application in State Grid AC, and the thin specification products have been successfully applied to the first set of intelligent substation in China's high speed railway, Among the first camp of transformer materials in the world. It is one of the few manufacturers with a full series of new energy products in the world. Non-oriented electrical steel covers all brands of domestic and foreign first-class steel mills. The product quality has reached the international advanced level, and the market share is the second in the country,it is growing into a "Global leading electrical steel manufacturer".

首钢电工钢发展历程 --Developing History of Shougang Electrical Steel

2005 首钢与钢铁研究总院成立电工钢联合研发平台
2008 冷轧电工钢项目动工
2010 第一条连续退火线热试投产，第一卷无取向电工钢下线
2011 酸连轧线投产，产品板形及厚度控制水平达到国际先进行列
2012 无取向高牌号生产流程全线贯通
2013 无取向电工钢在大电机、家电等行业实现全面推广应用
2014 无取向电工钢年产 115 万吨，达到设计产能
2015 无取向电工钢年产 118 万吨，无取向电工钢产量实现全球单体生产工厂第一
2016 新能源汽车驱动电机用无取向产品全系列覆盖
2017 无取向极薄规格 0.10/0.15mm 产品下线
2018 建成工信部首个冷轧智能工厂示范项目
2019 硅钢应用技术研究实验室建设完成并运行，通过 CNAS 认证
2020 建立欧洲、亚太技术服务办事处，技术服务范围覆盖全球
2022 建成世界首条面向新能源汽车用电工钢专业化生产线，两款新能源汽车用电工钢全球首发
2023 新能源电工钢实现全球前十汽车品牌批量供货
2024 突破自粘结涂层、极厚涂层产品生产瓶颈，产能达到 200 万吨
2025 极薄带产品批量稳定供货

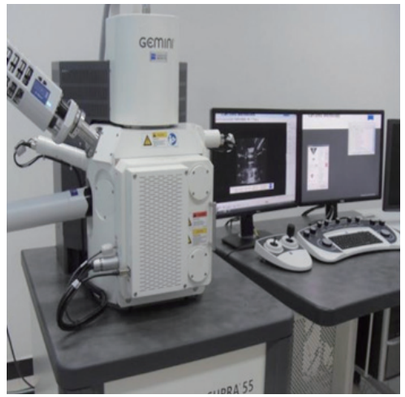
2005 The United R&D Center of Electrical Steels was established.
2008 The Project of Shougang Electrical Steel began to construct.
2010 the first continuous annealing line put into operation, and the first coil of NGO was produced.
2011 PL-TCM put into operation, the flatness and thickness of Shougang electric steel reached the international advanced level.
2012 HNGO production process through the whole line.
2013 NGO has been widely applied in large motor and home appliance
2014 NGO with an annual output of 1.15 million tons, reach design capacity.
2015 NGO with an annual output of 1.18 million tons, NGO production to achieve the world's first monomer production plant
2016 The whole series of NGO for new energy vehicle drive motors are fully covered
2017 Extremely thin size 0.10/0.15mm product of NGO output
2018 The demonstration project of the first intelligent cold rolling plant of the Ministry of Industry and Information Technology
2019 The construction of the silicon steel application technology research laboratory has been completed and put into operation, which has passed the CNAS accreditation
2020 Set up technical service offices in Europe and Asia Pacific, technical service scope covering the world
2022 The world's first specialized production line of electrical steel and two types of electrical steel for new energy vehicles have been launched globally.
2023 New energy electrical steel achieves mass supply to the top ten global automotive brands
2024 Breakthrough the production bottleneck of self-adhesive coatings and extremely thick coatings, with a production capacity of 2 million tons
2025 Stable supply of ultra-thin strip products in bulk

检测系统 - Testing System

电工钢全自动分析中心是国内冶金行业最先进的实验室之一，配备有自动直读光谱分析系统、自动 X 荧光分析系统、自动渣样检测分析系统；理化检测中心具有中国合格评定国家认可委员会颁发的 CNAS 国家实验室认可资质证书，成为具有对外承担独立检测能力的第三方认可实验室， 检测范围包括金属与合金、矿石与矿物、燃料、水、金属与金属制品、铁磁材料等， 检测数据具有行业权威性和法律效力。

理化检测中心配置检验设备 600 余台套，其中包含磁性测量仪、直读光谱仪、碳硫分析仪、 定硫分析仪、定氢分析仪和氧氮分 析 仪、全自动冲击试验机、全自动拉伸试验机、低倍试验专用设备电解腐蚀机、落锤撕裂试验机、全自动电子万能材料试验机、金相光学显微镜、X 射线荧光光谱仪、等离子体发射光谱仪等先进检验设备。

首钢智新建立有研发实验室、应用技术实验室、太仓实验室，具备家电、新能源、无人机及变压器测试仿真能力，全力打造从选材、加工到应用的全生命周期服务能力。拥有伺服中走丝线切割机、全自动激光割机、电机定子铁心测试设备、AVL 新能源汽车电机测试系统等先进设备。



Electric Steel automatic analysis center is one of the most advanced laboratories in the domestic metallurgical industry, equipped with automatic direct reading spectrum analysis system, automatic X-ray fluorescence analysis system, automatic slag sample detection and analysis system;The Physical and Chemical Testing Center has CNAS National Laboratory Accreditation Certificate issued by The China National Accreditation Service for Qualification Assessment, and has become a third-party accredited laboratory with independent testing capabilities. The testing scope includes metals and alloys, ores and minerals, fuels, water, metals and metal products, ferromagnetic materials, etc.The test data has the authority of the industry and legal effect.

The physical and chemical testing center is equipped with more than 600 sets of testing equipment.Containing magnetic measuring instrument, direct reading spectrometer, carbon sulfur analyzer, oxygen and sulfur analyzer, hydrogen analyzer nitrogen analysis instrument, automatic impact testing machine, tensile testing machine, automatic low power test special equipment for electrolytic etching machine, drop weight tear test machine, automatic electronic universal material testing machine, metallographic optical microscope, X-ray fluorescence spectrometer, plasma emission spectrometer and other advanced testing equipment.

Shougang has established the application technology laboratory, has the home appliances, new energy, uav and transformer test and simulation capabilities, to create a full life cycle service capacity from material selection, processing to application.It has advanced equipment such as wire cutting machine, automatic laser cutting machine, motor stator core testing equipment, AVL new energy vehicle motor testing system and so on.

质量体系 -- Quality System

- ISO9001 质量管理体系
- IATF16949 汽车供应商质量管理体系
- ISO14001 环境管理体系
- ISO45001 职业健康安全管理体系
- ISO10012 测量管理体系
- ISO50001 能源管理体系
- SGS 国际环保认证
- 电工钢理化检验室、新能源汽车实验室通过 CNAS 认证

- ISO9001 Quality Management System
- IATF16949 Automotive Supplier Quality Management System
- ISO14001 Environmental Management System
- ISO45001Occupational Health and Safety Management System
- ISO10012 Measurement Management System
- ISO50001 Energy Management System
- SGS International Environmental Certification
- CNAS Authentication
- Electrical steel physical and chemical testing laboratory and new energy vehicle laboratory have passed CNAS certification


证 书


证 书


环境管理体系认证证书
ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATE


职业健康安全管理体系认证证书
OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM CERTIFICATE


能源管理体系认证证书
CERTIFICATE OF MANAGEMENT SYSTEM FOR ENERGY

Chapter 2 Products for NGO

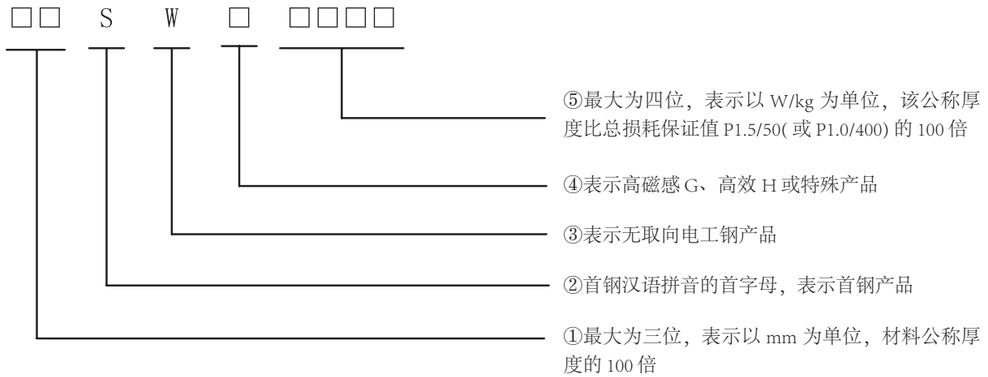
第二章 首钢无取向电工钢产品介绍

自从 2010 年 7 月份第一卷下线以来，经过近几年的产品研发和市场开拓，目前形成了通用产品、高效产品、去应力退火产品、新能源汽车用产品、极薄带产品五大系列的无取向产品体系，产品质量稳步提升，广泛应用于家电和电机行业，得到广大客户的高度认可，形成了无取向电工钢全系列产品的生产能力。

Since the first coil of non-oriented electrical steel was produced in July 2010, Shougang has developed a comprehensive product system over the years through continuous product development and market expansion. This system now includes five major series: general-purpose products, high-efficiency products, stress-relief annealed products, products for new energy vehicles, and ultra-thin strip products. Product quality has steadily improved and the products are widely used in the home appliance and motor industries, earning high recognition from customers. A full production capability covering the entire range of non-oriented electrical steel products has been established.

牌号表示方法 --Designation Method

首钢电工钢牌号由 5 部分组成，最大使用位数为 9 位。对于为个性化需求用户提供的电工钢牌号命名规则另行规定。



Shougang electrical steel grade designation consists of 5 parts, with a maximum of nine characters. For the individual needs of users of electrical steel grades naming rules shall be specified separately.

Notes:

① 100 times of nominal thickness (mm)

② Shougang

③ NGO electrical steel

④ High magnetic induction electrical steel

⑤ 100 times of core loss guaranteed value P1.5/50（W/kg）

产品系列 --Product Series

产品的主要规格 Product main specifications

产品系列 Product series	主要规格 The main specifications
通用系列 General series	0.27mm、0.30mm、0.35mm、0.50mm、0.65mm
高效系列 High efficient series	0.35mm、0.50mm、0.65mm
去应力退火系列 Stress relief annealing series	0.35mm、0.50mm
新能源汽车用系列 New energy vehicle series	0.15mm、0.20mm、0.25mm、0.27mm、0.30mm、0.35mm
极薄带系列 Ultra-thin series	0.10mm、0.12mm、0.15mm、0.17mm、0.20mm

产品的适用行业 Product main features

产品系列 Product series	适用行业 Applicable industry
通用系列 General series	常规要求的电机企业 Motor Company general requirements
高效系列 High efficient series	高效电机、高效压缩机、变频电机等 High efficient motor, high efficient compressor motor, frequency conversion motor etc.
去应力退火系列 Stress relief annealing series	适合高速冲床加工产品、EI 变压器、空调电机等 High speed stamping products, EI transformer, air conditioner motor etc.
新能源汽车用系列 New energy vehicle series	汽车驱动电机、变压器、电抗器等 Automobile motor, transformer, reactor etc
极薄带系列 Ultra-thin series	氢燃料电池空压机、电主轴、超高速电机 Hydrogen fuel cell air compressor, electric spindle, ultra high speed motor, etc

产品规格 --Product Specification

公称厚度 Nominal Thickness （mm）	公称宽度 Nominal Width （mm）	内径 Inner Diameter （mm）	外径 Outer Diameter （mm）	卷重 Coil Weight （t）
0.10-0.65	1000~1250mm	508	800-1600	3-9 15-21

尺寸公差 -- Dimensional Tolerances

公称厚度 Nominal Thickness (mm)	厚度允许偏差 Nominal Thickness Tolerance (mm)	纵向厚差 Longitudinal Thickness Deviation (mm)	横向厚差 Transverse Thickness Deviation (mm)
	不大于 Be not more than		
⩽ 0.35	±0.028	+0.018	+0.020
＞ 0.35 ～ 0.50	±0.035	+0.025	+0.020
＞ 0.50	±0.040	+0.035	+0.030

注：a. 焊缝处厚度增加值应不超过 0.10mm。
b. 任意 2000mm 长钢带或一张钢片上厚度偏差。
c. 仅适用于宽度大于 150mm 的钢带，对于窄带，需另签协议。
Attention:
a. The increase in thickness at the weld shall not exceed 0.10mm
b. Thickness deviation on any 2000mm long steel strip or a steel sheet
c. The thickness deviation of any 2000mm long steel strip or one steel sheet is only applicable to the steel strip whose width is greater than 150mm. For narrow strips, a separate agreement must be signed.

宽度公差 –Width Tolerances

公称宽度 Nominal Width (mm)	允许宽度偏差 Allowable Width Tolerance (mm)
⩽ 150	+0.20
＞ 150~300	+0.30
＞ 300~600	+0.50
＞ 600~1000	+1.00
＞ 1000~1250	+1.50

注： 经协议，可为负偏差。
Attention: By agreement, it can be negative deviation

电磁性能标准值 --Standard Value of Electromagnetic Property

通用系列 --General series

牌号 Grade	公称厚度 Nominal·Thickness (mm)	理论密度 Nominal·Density (kg/dm^3)	最大铁损 $P_{1.5}$ Max loss (W/kg)		最小磁感 Min.Magnetic induction (T)		
			50Hz	60Hz	J_{2500}	J_{5000}	J_{10000}
27SW230	0.27	7.60	2.30	2.90	1.49	1.62	1.70
30SW230	0.30	7.65	2.30	2.90	1.49	1.62	1.70
35SW210	0.35	7.60	2.10	2.65	1.49	1.62	1.70
35SW230	0.35	7.60	2.28	2.90	1.49	1.64	1.70
35SW250	0.35	7.60	2.45	3.14	1.49	1.64	1.70
35SW270	0.35	7.65	2.65	3.36	1.49	1.64	1.70
35SW300	0.35	7.65	2.95	3.74	1.49	1.64	1.70
35SW330	0.35	7.65	3.30	4.12	1.50	1.64	1.71
35SW360	0.35	7.65	3.40	4.55	1.51	1.65	1.72
35SW400	0.35	7.65	3.90	5.10	1.53	1.65	1.74
35SW440	0.35	7.70	4.00	5.60	1.53	1.67	1.74
35SW550	0.35	7.75	5.10	6.50	1.54	1.67	1.74
50SW230	0.50	7.60	2.30	3.00	1.49	1.64	1.70
50SW250	0.50	7.60	2.48	3.21	1.49	1.64	1.70
50SW270	0.50	7.60	2.65	3.47	1.49	1.64	1.70
50SW290	0.50	7.60	2.85	3.71	1.49	1.64	1.70
50SW310	0.50	7.65	3.00	3.95	1.49	1.64	1.70
50SW330	0.50	7.65	3.20	4.20	1.49	1.64	1.70
50SW350	0.50	7.65	3.40	4.45	1.50	1.64	1.70
50SW400	0.50	7.65	3.90	5.10	1.53	1.65	1.73
50SW470	0.50	7.75	4.20	5.90	1.54	1.66	1.74
50SW530	0.50	7.75	4.80	6.66	1.56	1.66	1.75
50SW600	0.50	7.75	5.00	7.55	1.57	1.68	1.76
50SW700	0.50	7.80	6.00	8.80	1.60	1.70	1.77
50SW800	0.50	7.80	6.00	10.10	1.60	1.70	1.78
50SW1000	0.50	7.85	6.50	12.60	1.62	1.74	1.81
50SW1300	0.50	7.85	9.50	16.40	1.62	1.74	1.81
65SW350	0.65	7.65	3.45	4.57	1.49	1.64	1.70
65SW400	0.65	7.65	3.95	5.20	1.52	1.66	1.72
65SW530	0.65	7.70	5.20	6.80	1.54	1.66	1.74
65SW600	0.65	7.75	5.90	7.71	1.56	1.68	1.76
65SW700	0.65	7.75	6.90	8.89	1.57	1.68	1.76
65SW800	0.65	7.80	7.90	10.26	1.60	1.71	1.78

高效系列 --High Efficient Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	最大铁损 $P_{1.5/50}$ Max. loss (W/kg)	最小磁感 J_{5000} Min. Magnetic induction (T)
35SWH210	0.35	7.65	2.10	1.65
35SWH250	0.35	7.65	2.45	1.67
35SWH360	0.35	7.75	3.60	1.70
50SWH470	0.50	7.70	4.20	1.70
50SWG470	0.50	7.75	4.20	1.72
50SWH600	0.50	7.75	5.00	1.72
50SWH800	0.50	7.80	7.00	1.74
50SWH1300	0.50	7.85	12.90	1.76
50SWG1300	0.50	7.85	12.90	1.77
65SWG470	0.65	7.75	4.70	1.67

去应力退火系列 --Stress Reliefannealing Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	最大铁损 $P_{1.5/50}$ Max. loss (W/kg)	最小磁感 J_{5000} Min. Magnetic induction (T)
35SWR300	0.35	7.80	2.95	1.73
50SWR350	0.50	7.80	3.40	1.74
50SWR450	0.50	7.85	4.40	1.72

极薄系列 --Ultra-thin series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	最大铁损 Max.loss(W/kg)			最小磁感 J_{5000} Min.Magnetic Induction
			$P_{1.0/400}$	$P_{1.0/1k}$	$P_{1.0/2k}$	(T)
USWH35080H	0.10	7.60	9.5	35	80	1.64
10SWH950	0.10	7.65	9.5	35	85	1.67
10SWG1300	0.10	7.75	13	45	110	1.71
USWG55140	0.10	7.85	16	55	140	1.74
USWH40100H	0.15	7.60	10	40	100	1.64
15SW1200	0.15	7.65	12	40	110	1.62
15SWH1000	0.15	7.65	10	40	105	1.67
20SWG1200	0.20	7.65	12	50	135	1.68
20SWG1500	0.20	7.75	15	60	170	1.74
20SWG2000	0.20	7.85	20	85	240	1.78

新能源汽车用系列 --New Energy Vehicle Series

系列 Series	牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	最大铁损 $P_{1.0/400}$ Max. loss [W/kg]	最小磁感 Min.Magnetic induction	屈服强度 Yield strength [MPa]
低铁损 Low Iron Loss (SW)	20SW1100	0.20	7.60	⩽ 11.0	⩾ 1.61	⩾ 430
	20SW1200	0.20	7.60	⩽ 12.0	⩾ 1.61	⩾ 420
	25SW1250	0.25	7.60	⩽ 12.5	⩾ 1.62	⩾ 420
	25SW1300	0.25	7.60	⩽ 13.0	⩾ 1.62	⩾ 420
	27SW1400	0.27	7.60	⩽ 14.0	⩾ 1.62	⩾ 420
	30SW1500	0.30	7.60	⩽ 15.0	⩾ 1.64	⩾ 420
	35SW1700	0.35	7.60	⩽ 17.0	⩾ 1.64	⩾ 420
	35SW1900	0.35	7.65	⩽ 19.0	⩾ 1.65	⩾ 390
高磁感 High Induction (SWH)	27SWH1400	0.27	7.65	⩽ 14.0	⩾ 1.64	⩾ 390
	30SWH1500	0.30	7.65	⩽ 15.0	⩾ 1.65	⩾ 390
	35SWH1900	0.35	7.65	⩽ 19.0	⩾ 1.67	⩾ 340
高强度 & 低铁损 High Strength & Low Iron Loss (SW-H)	20SW1200H	0.20	7.60	⩽ 12.0	⩾ 1.61	⩾ 470
	25SW1250H	0.25	7.60	⩽ 12.5	⩾ 1.65	⩾ 430
	27SW1400H	0.27	7.60	⩽ 13.0	⩾ 1.65	⩾ 430
高强度 High Strength (SWYS)	25SWYS480N	0.25	7.60	⩽ 12.5*	⩾ 1.59*	⩾ 480
	25SWYS700	0.25	7.60	⩽ 40.0	⩾ 1.53	⩾ 700
	25SWYS900	0.25	7.60	⩽ 60.0	⩾ 1.50	⩾ 900
	35SWYS500	0.35	7.60	⩽ 28.0	⩾ 1.64	⩾ 500
	35SWYS900	0.35	7.60	⩽ 70.0	⩾ 1.50	⩾ 900
电动汽车专用产品 Especially For EV (ESW)	ESW1020	0.10	7.60	⩽ 10.0	⩾ 1.64	⩾ 470
	ESW1021	0.15	7.60	⩽ 10.0	⩾ 1.64	⩾ 470
	ESW9020	0.15	7.60	⩽ 9.0	⩾ 1.64	⩾ 470
	ESW1025R	0.19	7.60	⩽ 10.0*	⩾ 1.55*	⩾ 700
	ESW1125	0.20	7.60	⩽ 11.0	⩾ 1.61	⩾ 470
	ESW1333	0.25	7.60	⩽ 12.5	⩾ 1.62	⩾ 430

典型电磁性能 --Typical Magnetic Properties

通用系列 --General Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	铁损 Core loss (W/kg)	磁感 Magnetic induction (T)
			$P_{1.5/50}$	J_{5000}
27SW230	0.27	7.60	2.15	1.64
30SW230	0.30	7.65	2.20	1.66
35SW210	0.35	7.60	2.00	1.65
35SW230	0.35	7.60	2.15	1.65
35SW250	0.35	7.60	2.25	1.67
35SW270	0.35	7.65	2.30	1.67
35SW300	0.35	7.65	2.55	1.68
35SW330	0.35	7.65	2.60	1.68
35SW360	0.35	7.65	2.80	1.68
35SW400	0.35	7.65	2.85	1.69
35SW440	0.35	7.70	2.90	1.69
35SW550	0.35	7.75	3.60	1.70
50SW230	0.50	7.60	2.27	1.65
50SW250	0.50	7.60	2.35	1.65
50SW270	0.50	7.60	2.45	1.68
50SW290	0.50	7.60	2.55	1.68
50SW310	0.50	7.65	2.70	1.69
50SW330	0.50	7.65	2.80	1.69
50SW350	0.50	7.65	2.90	1.69
50SW400	0.50	7.65	3.00	1.69
50SW470	0.50	7.75	3.50	1.70
50SW530	0.50	7.75	3.60	1.71
50SW600	0.50	7.75	3.80	1.71
50SW700	0.50	7.80	4.40	1.72
50SW800	0.50	7.80	4.60	1.73
50SW1000	0.50	7.85	5.30	1.75
50SW1300	0.50	7.85	5.60	1.76
65SW350	0.65	7.65	3.15	1.70
65SW400	0.65	7.65	3.60	1.71
65SW530	0.65	7.70	4.30	1.69
65SW600	0.65	7.75	4.40	1.69
65SW700	0.65	7.75	5.30	1.73
65SW800	0.65	7.80	5.70	1.73

高效系列 --High Efficient Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	铁损 Core loss (W/kg)	磁感 Magnetic Induction (T)
			$P_{1.5/50}$	J_{5000}
35SWH210	0.35	7.65	1.97	1.70
35SWH250	0.35	7.65	2.30	1.69
35SWH360	0.35	7.75	2.50	1.75
50SWH470	0.50	7.70	3.05	1.72
50SWG470	0.50	7.75	3.10	1.74
50SWH600	0.50	7.75	3.40	1.74
50SWH800	0.50	7.80	4.40	1.76
50SWH1300	0.50	7.85	5.60	1.78
50SWG1300	0.50	7.85	5.60	1.80
65SWG470	0.65	7.75	3.90	1.74

去应力退火系列 --Stress Relief Annealing Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	铁损 Core loss (W/kg)	磁感 Magnetic Induction (T)
			$P_{1.5/50}$	J_{5000}
35SWR300	0.35	7.80	2.80	1.75
50SWR350	0.50	7.80	3.20	1.76
50SWR450	0.50	7.85	4.20	1.74

极薄带系列：Ultra-thin series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	铁损 Core loss (W/kg)			磁感 Magnetic Induction (T)
			$P_{1.0/400}$	$P_{1.0/1k}$	$P_{1.0/2k}$	J_{5000}
USWH35080H	0.10	7.60	9.0	28.3	72.7	1.66
10SWH950	0.10	7.65	9.1	29.2	76.2	1.69
10SWG1300	0.10	7.75	11.8	39.1	103.3	1.73
USWG55140	0.10	7.85	15.0	51.4	137.5	1.76
USWH40100H	0.15	7.60	9.5	33.3	93.2	1.66
15SW1200	0.15	7.65	10.1	35.7	100.6	1.64
15SWH1000	0.15	7.65	9.8	34.8	97.4	1.69
20SWG1200	0.20	7.65	11.2	43.2	128.5	1.70
20SWG1500	0.20	7.75	14.0	54.7	164.3	1.76
20SWG2000	0.20	7.85	19.5	77.0	231.8	1.80

新能源汽车用系列 New energy vehicle series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	铁损 $P_{1.0/400}$ Core loss [W/kg]	磁感 Magnetic induction	屈服强度 Yield strength MPa
20SW1100	0.20	7.60	10.5	1.63	460
20SW1200	0.20	7.60	11.2	1.63	450
25SW1250	0.25	7.60	12.3	1.63	450
25SW1300	0.25	7.60	12.5	1.64	450
27SW1400	0.27	7.60	13.2	1.64	450
30SW1500	0.30	7.60	14.2	1.65	450
35SW1700	0.35	7.60	16.5	1.66	450
35SW1900	0.35	7.65	17.0	1.67	410
27SWH1400	0.27	7.65	13.5	1.66	410
30SWH1500	0.30	7.65	14.5	1.67	410
35SWH1900	0.35	7.65	17.5	1.69	360
20SW1200H	0.20	7.60	11.5	1.63	490
25SW1250H	0.25	7.60	11.9	1.67	460
27SW1400H	0.27	7.60	12.3	1.67	460
25SWYS480N	0.25	7.60	11.0*	1.61*	510
25SWYS700	0.25	7.60	36.0	1.57	750
25SWYS900	0.25	7.60	46.0	1.53	950
35SWYS500	0.35	7.60	24.5	1.66	530
35SWYS900	0.35	7.60	60.0	1.53	980
ESW1020	0.10	7.60	9.0	1.66	490
ESW1021	0.15	7.60	9.5	1.66	490
ESW9020	0.15	7.60	8.7	1.66	490
ESW1025R	0.19	7.60	9.6*	1.57*	750
ESW1125	0.20	7.60	10.3	1.63	500
ESW1333	0.25	7.60	12.0	1.64	460

典型力学性能 --Typical mechanical properties

通用系列—General Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm^3)	屈服强度 Yield strength	抗拉强度 Tensile strength	硬度 Hardness	延伸率 (%) Elongation (%)
			MPa	MPa	HV1	
27SW230	0.27	7.60	450	560	210	15
30SW230	0.30	7.65	420	530	200	17
35SW210	0.35	7.60	470	570	220	16
35SW230	0.35	7.60	450	570	210	17
35SW250	0.35	7.60	420	535	200	18
35SW270	0.35	7.65	415	520	200	19
35SW300	0.35	7.65	370	500	185	25
35SW330	0.35	7.65	375	500	185	26
35SW360	0.35	7.65	325	470	165	30
35SW400	0.35	7.65	285	430	153	30
35SW440	0.35	7.70	280	425	150	30
35SW550	0.35	7.75	260	422	142	37
50SW230	0.50	7.60	470	575	234	16
50SW250	0.50	7.60	430	530	220	15
50SW270	0.50	7.60	410	515	200	15
50SW290	0.50	7.60	410	515	200	15
50SW310	0.50	7.65	375	510	185	30
50SW330	0.50	7.65	370	510	185	32
50SW350	0.50	7.65	370	510	185	35
50SW400	0.50	7.65	320	460	165	35
50SW470	0.50	7.75	265	420	140	36
50SW530	0.50	7.75	270	425	135	38
50SW600	0.50	7.75	260	420	133	40
50SW700	0.50	7.80	220	379	113	37
50SW800	0.50	7.80	230	379	113	37
50SW1000	0.50	7.85	240	370	110	46
50SW1300	0.50	7.85	245	380	115	48
65SW350	0.65	7.65	385	515	175	29
65SW400	0.65	7.65	330	470	160	27
65SW530	0.65	7.70	255	410	137	28
65SW600	0.65	7.75	260	415	138	30
65SW700	0.65	7.75	265	405	120	32
65SW800	0.65	7.80	280	410	125	35

高效系列—High Efficient Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm³)	屈服强度 Yield strength	抗拉强度 Tensile strength	硬度 Hardness	延伸率 Elongation (%)
			MPa	MPa	HV1	
35SWH210	0.35	7.65	410	520	200	10
35SWH250	0.35	7.65	370	490	180	22
35SWH360	0.35	7.75	252	409	135	30
50SWH470	0.50	7.70	285	430	150	32
50SWG470	0.50	7.75	245	395	135	35
50SWH600	0.50	7.75	260	415	138	36
50SWH800	0.50	7.80	245	375	115	39
50SWH1300	0.50	7.85	255	380	115	42
50SWG1300	0.50	7.85	260	390	115	42
65SWG470	0.65	7.75	260	415	140	35

去应力退火系列—StressReliefannealing Series

牌号 Grade	公称厚度 Nominal Thickness (mm)	理论密度 Nominal Density (kg/dm³)	屈服强度 Yield strength	抗拉强度 Tensile strength	硬度 Hardness	延伸率 Elongation (%)
			MPa	MPa	Hv1	
35SWR300	0.35	7.80	240	390	135	28
50SWR350	0.50	7.80	250	380	115	40
50SWR450	0.50	7.85	245	380	115	45

绝缘涂层 --Insulation Coating

涂层种类 Coating Types

涂层种类 Coating type	组分类别 Composition Type	涂层厚度 Coating thickness range (μm)	附着性 Adhesion	耐热性 Heat resistance	耐腐蚀性 Corrosion resistance	冲片性 Stamping ability	叠片系数 Lamination factor	焊接性 Weldability
M4	半有机 Semi-organic	0.4-1.2	很好 Well	在非氧化环境下，可耐 800°C去应力退火 In non- oxidation environment the coating is normal through 800°C stress relieving annealing.	很好 Well	很好 Well	高 High	很好 Well
M1	环保涂层 Eco-friendly coating	0.4-1.2	很好 Well	在非氧化环境下，可耐 800°C去应力退火 In non- oxidation environment the coating is normal through 800°C stress relieving annealing.	很好 Well	好 Well	高 High	很好 Well
M5	环保厚涂层 Thick Eco-friendly coating	2.0-5.0	很好 Well	在非氧化环境下，可耐 800°C去应力退火 In non- oxidation environment the coating is normal through 800°C stress relieving annealing.	很好 Well	好 Well	高 High	很好 Well
M3/M7	自粘结涂层 Self-bonding coating	1.0-5.0	很好 Well	在空气环境下，可长期耐高温 180°C In air environment the coating maintains integrity through long-term 180°C thermal exposure.	很好 Well	很好 Well	高 High	不适用 Not suitable
M6	环保超厚涂层 Ultra thick Eco-friendly coating	3.0-8.0	很好 Well	在空气环境下，可长期耐高温 180°C In air environment the coating maintains integrity through long-term 180°C thermal exposure.	很好 Well	很好 Well	高 High	不适用 Not suitable

注：如用户对涂层无特殊要求，默认选择 M4 涂层。
Attention: if users have no special requirements, M4 is the default coating .
首次使用自粘结涂层材料，建议与首钢技术人员沟通确认热压参数。
For initial use of self-bonding coating, consult Shougang technicians to confirm hot-press parameters.
有害物质限定承诺 Hazardous substances limited commitment
首钢电工钢产品符 合 Rohs 、REACH 等有害物质限定要求。
Shougang electrical steel products meet the limited requiremt of Rohs, REACH and other harmful substances.

去应力退火 --Stress Relief Annealing

对于首钢全工艺电工钢产品，通常不要求退火，但由于钢板在剪切、冲压工程中总会产生应力，从而恶化电工钢磁性，如铁损、导磁率等，因此，通常通过消除应力退火来恢复由金属加工等造成的磁性恶化。

此外，通过去应力退火还可以使电工钢晶粒继续长大，有进一步降低电工钢铁损的作用。

Usually,annealing is not required for fully processed electrical steel. However, by stress relief annealing, the stress, caused by shearing and punching the steel plate which will deteriorate the magnetic properties such as causing higher core loss and worse magnetic permeability, will be eliminated, and magnetic properties will be restored or even improved.

Moreover, through stress relief annealing, core loss is lower by grain growth.

注意事项 Attention

退火时间 --Annealing Time

有效退火温度范围 650°C -820°C，升温速度以 6.5°C /s 较为合适。退火温度应低于 800°C，高于此温度可能导致涂层的破坏。

Effective annealing temperature should be controlled within from 650°C to 820°C，and appropriate heating rate is 6.5°C /s. Annealing temperature should keep below 800°C，or coating may be damaged.

退火气氛 --Annealing atmosphere

渗氮及氧化气氛必须避免，因为这会导致钢板磁性的恶化，因此，必须合理控制退火气氛， 要求低的露点（DP<0°C）以保证在退火过程中，不降低绝缘性能。

Nitriding and oxidizing atmosphere which lead magnetic deterioration of plate must be avoided. Therefore, it is reasonable to control annealing atmosphere，requiring low dew point (DP<0°C) to ensure insulation during annealing.

热压参数 --Hot-pressing Parameters

M3/M7：加热温度范围 200-240°C，保温时间范围 5-8min，施加压力范围 1-3MPa，实际生产需要依据设备特性调整热压参数。

M3/M7: heating temperature range 200-240 °C , holding time range of 5-8min, applied pressure range 1-3MPa, The hot-pressing parameters should be adjusted according to the characteristics of the actual production equipment.

其它 Others

为防止粘片，冲片不能堆垛太高。

必须消除冲压或者剪切过程中残留的冲压油。

In order to prevent sticking, stamping sheets should not be stacked too high.

The residual stamping oil generated by stamping or cutting must be thoroughly removed.

Chapter 3 Application

第三章 首钢无取向电工钢产品应用

应用领域 --Application Field

首钢电工钢在广大客户的支持下，产品研发及产品质量取得很大的突破，客户群体不断扩大，从最初的几家客户试用，到目前为止的 300 多家客户使用，市场占有率逐步提高，首钢电工钢品牌已经树立。建立有应用技术实验室，具备家电、新能源、无人机及变压器测试仿真能力，全力打造从选材、加工到应用的全生命周期服务能力。

With strong support from a wide range of customers, Shougang has achieved significant breakthroughs in both product R&D and quality of its electrical steel. The customer base has expanded from just a few initial trial users to more than 300 customers, and market share continues to grow steadily. The Shougang electrical steel brand is now well established.An Application Technology Laboratory has been set up, equipped with simulation and testing capabilities for home appliances, new energy, unmanned aerial vehicles (UAVs), and transformers. Shougang is committed to building a full life-cycle service system, covering material selection, processing, and application support.

产品特点 --Product Characteristic

首钢无取向产品进入市场以来，以优良的产品磁性能和出色的加工性能赢得了众多客户的青睐，产品特点主要体现在以下几个方面：

低铁损高磁感

电机能耗主要包括电工钢铁芯的铁损和绕组的铜耗。电工钢片铁损的降低、磁感的提高一方面可降低能耗，另一方面可提高设计磁密使电机励磁电流降低，从而降低铜耗并省铜。因此，电工钢片铁损的降低、磁感的提高能够达到高效并降低用户生产成本的目的。首钢迁钢产品以优良的铁损水平得到了用户的广泛认可。

出色的加工性能

电工钢出色的加工性能可以提升产品冲片性，提高冲模寿命，保证冲片尺寸精确以及减小冲切毛刺，最终保证成品电机的性能。首钢迁钢产品根据用户的不同使用需求设计了满足不同模具要求的差异化产品。

高的尺寸精度

充分发挥新上设备和先进控制系统的后发优势，主要产品实物质量尺寸精度已经达到或超过了国内先进企业水平。减少用户生产过程的切片数，保证了电机铁芯叠装后的高度差，提高了生产效率和产品效率。

优良的表面绝缘性能

涂层的种类、工艺和质量将对电工钢片间相互绝缘性、冲片性、焊接性及耐油性等产生重大影响，从而进一步影响电工钢本身的铁损水平乃至产品的性能。迁钢产品的涂层特性主要是涂层均匀性好，耐温高，附着性和绝缘性能优。

Product Characteristic

Since non oriented products launched, because of excellent magnetic properties and machinability, Shougang have won the favor of many customers, product characteristics are mainly embodied in the following aspects.

Low core loss and high magnetic induction

The energy consumption of the motor includes electrical steel core loss and winding copper loss. Reducing the core loss and improving magnetic induction can effectively lower overall energy consumption.

Moreover, higher magnetic induction allows for reduced excitation current, which in turn lowers copper usage.

Therefore, low core loss and high magnetic induction not only improve motor efficiency but also help users reduce manufacturing costs. Shougang products with good iron levels have been widely recognized by users.

Excellent machinability

Excellent machinability of electrical steel can enhance product stamping, increase the service life of the equipment, ensures dimensional accuracy decrease the punching blanking burr, and ultimately ensure the properties of finished motor. According to different requirements of the user’s, Shougang design to meet the different requirements of differentiated products.

High dimensional accuracy

Giving full play to the new equipment and advanced control system to the advantage, the main product quality and size precision have reached or exceeded the domestic advanced level of enterprises. Those has reduced the number of user slice production process, ensures uniform lamination stacking，improves the production and product efficiency.

Excellent surface insulation performance

The variety, process, and quality of the coating significantly affect the interlaminar insulation, punchability, weldability, and oil resistance of electrical steel sheets, which in turn impact the core loss and overall performance of the electrical steel. The coatings used in Qian'an Steel's products are characterized by excellent uniformity, high temperature resistance, strong adhesion, and superior insulation performance.

应用案例 -- Application Case

电磁性能是电工钢材料最重要的性能指标之一，优良的电磁性能是制造高效率电机产品的保证。用户使用实绩告诉我们首钢无取向电工钢在同行业中一直处于较为领先的水平。

Magnetic properties of electrical steel is one of the most important performance indicators, Excellent electromagnetic performance is essential for producing high-efficiency motor products. User feedback and application results indicate that Shougang’s non-oriented electrical steel has consistently maintained a leading position within the industry.

某高效冰箱制冷压缩机电机产品 COP 值情况（50WH600）
A high-efficient refrigerator compressor motor product COP value (50WH600)

厂家 Factory	电压（V） Voltage（V）	频率（HZ） Frequency（HZ）	制冷量（W） Refrigerating capacity（W）	COP
对标钢厂 1 steel mill 1	220-240	50	171.3	1.810
对标钢厂 2 Steel mill 2	220-240	50	171.5	1.813
对标钢厂 3 Steel mill 3	220-240	50	172.5	1.816
首钢 50SWH600 Shougang 50SWH600	220-240	50	174.1	1.828

某空调电机产品电机效率情况（30W230）
Motor efficiency of an air conditioner motor product（30W230）

厂家 Factory	电机效率 Motor efficiency
对标钢厂 Reference steel mill	94.00%
首钢 30W230 ShouGang 30W230	95.20%

用户服务 --Customer service

为用户提供优质快捷的服务是首钢电工钢一贯的宗旨，我们的技术人员通过贴心服务了解用户的产品需求，开发更有竞争力的产品；我们的客户代表致力于为客户提供高效、便捷的售前、售中及售后服务。

High quality and convenient service for users are always the purpose of Shougang electrical steel. Through intimately service, our technical personnel understand the customer's demand, and develop more competitive products; Our customer representativesare committed to provide customers with efficient, convenient pre-sale, sale and after sale service.

1、产品策划 Product planning

为了更好的满足用户的需求，在售前，充分调研用户的产品使用需求，根据用户的要求设计满足用户需要的产品。

To better meet customer needs, Shougang conducts thorough pre-sales research into product application requirements, and designs customized products based on user specifications.

2、精益制造 Lean manufacturing

推进一贯制质量管理，即将一贯制质量管理的标准化、定量化、程序化、信息化先进经验推广到服务工作的每一个环节，提升精准化管理水平，形成多层面有机协同的持续改进体系；快速对需求响应、可靠的交货保证、全程合同与物流跟踪、高效的运输通道、建立起以“全面相应、管理统一、分类细化、快捷高效、持续改进”为主要特征的产品投诉和异议处理制度。

To promote consistent system of quality management, expand of every aspect of standardization, quantification, program, information advanced experience of consistent system , the precision management level enhances, and a multi-level organic synergy of continuous improvement system forms; Shougang has have fast demand response, reliable delivery guarantee, the contract and logistics tracking, efficient transport channel, and set up a "comprehensive response, unified management, classification, efficient, continuous improvement" as the main characteristics of the product complaint and objection handling system.

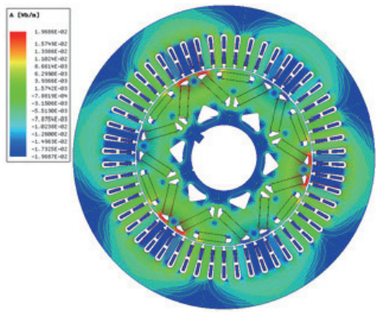
3、个性化服务 Personalized service

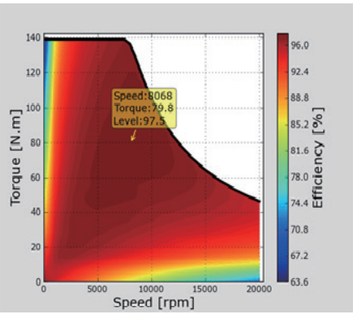
为不同细分客户制定个性化营销模式，根据客户需求，为客户量身定做服务产品，例如打破业务流程中的信息沟通壁垒，提高快速响应能力，缩短业务各环节的处理周期，降低管理成本。同时与各行业龙头客户建立更为紧密的战略合作伙伴关系，集中首钢优势力量和资源，满足大客户临时需求，此外还为客户提供专业定制化的配套材料以及个性化的物流服务。

According to customers’ demands，Shougang develops the personalized marketing modes, such as a breakup in the business process of information communication barriers, the rapid response capability, the short processing cycle of each section of the business, and the low cost of management. At the same time, Shougang establishes closer strategic partnership with the leading customers, uses the advantage of centralized power and resources to meet the customers’ temporary demands. Shougang also provides materials and professionally customized transportation service for customers.

设计仿真 -- Design and Simulation

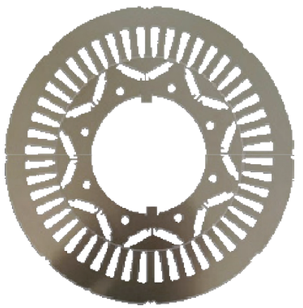
电磁仿真 | Electromagnetic Simulation



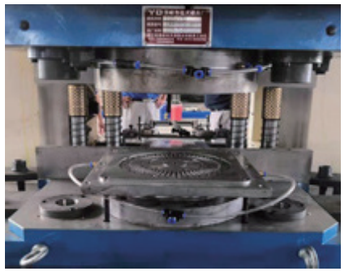


加工制造 -- Manufacture

定转子加工制造 | Manufacture of Stator and Rotor

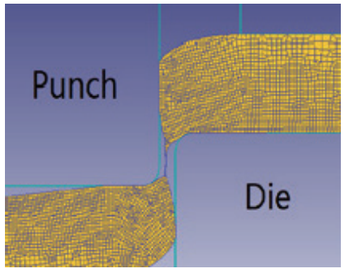


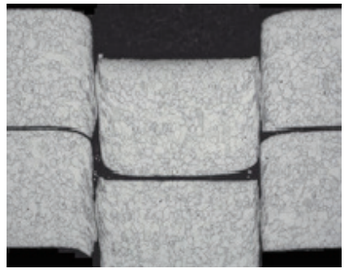
制造技术研究 | Manufacture Technology Research



冲片 | Stamping

叠铆 | Interlock





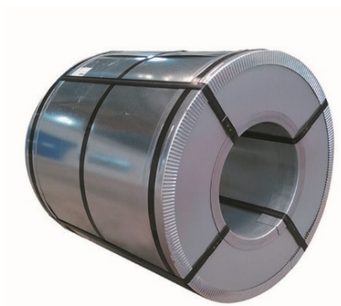
电机测试 --Motor Test

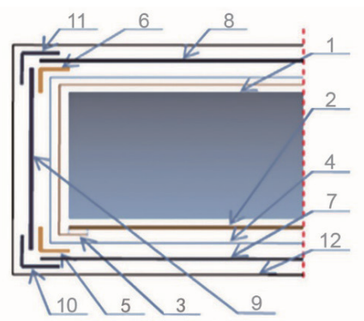
测试台架 | Test Bench

Chapter 4 Order and Service

第四章 订货及服务

产品包装 Product Packing





1/4剖面视图

1. 钢卷	7. 内钢护板	1.Rolled silicon steel	7.Inner iron plate guard
2. 内芯防锈纸	8. 外钢护板	2.Inner rusty-resisted paper	8.Outside iron plate guard
3. 外周防锈纸	9. 端部钢护板	3.Outside anti-rust paper	9.End iron plate guard
4. 塑料盒	10. 内钢护角	4.Plastic seal	10.Inner iron corner guard
5. 纸内护角	11. 外钢护角	5. Inner paper corner guard	11.Outside iron corner guard
6. 纸外护角	12. 径向钢捆带	6.Outside paper corner guard	12.Radial iron banding strip

拆包注意事项　Notice of unpacking

冬季由于南北方温度、湿度差异较大，建议库存 36 小时后拆包，防止结露生锈。

Due to the difference of temperature and humidity in the South and North in winter, it is recommended to open the package after 36 hours in stock to prevent condensation and rust.

通常的包装、运输、装卸和储存条件下，自制造完成之日起 12 个月内使用，以防止表面锈蚀。

Under normal packaging, transportation, on loading and reloading, and storage conditions, use within 12 months from the date of manufacture to prevent surface rust.

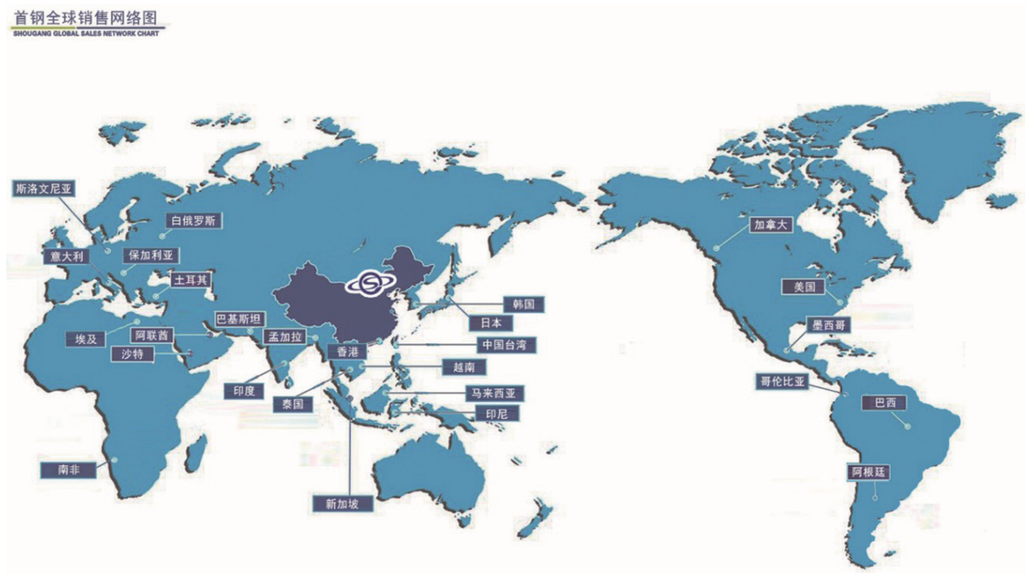
无取向电工钢牌号比照 Grade comparison of different enterprises

产品牌号比照 --Product grades match up

类型 Type	公称厚度 Thickness(mm)	首钢 Shougang	新日铁 NSC	JFE	蒂森克虏伯 TKS	浦项 Posco	新利佩茨克 NI&Sco	阿姆可 AK
通用系列 General series	0.35	35SW230	35H230	35JN230	M235-35A	35PN230		
		35SW250	35H250	35JN250	M250-35A	35PN250	2413	M-15
		35SW270	35H270	35JN270	M270-35A	35PN270	2412	M-19
		35SW300	35H300	35JN300	M300-35A	35PN300	2411	M-22/M-27
		35SW360	35H360	35JN360		35PN360		
		35SW440	35H440	35JN440		35PN455		
		35SW550				35PN560		
	0.50	50SW230	50H230	50JN230	M230-50A	50PN230		
		50SW250	50H250	50JN250	M250-50A	50PN250		
		50SW270	50H270	50JN270	M270-50A	50PN270	2414	
		50SW290	50H290	50JN290	M290-50A	50PN290	2413	M-15
		50SW310	50H310	50JN310	M310-50A	50PN310	2412	M-19
		50SW350	50H350	50JN350	M350-50A	50PN350		M-22
		50SW400			M400-65A	50PN400		M-27/M-36
		50SW470	50H470	50JN470	M470-50A	50PN445	2214	
		50SW600	50H600	50JN600	M600-50A	50PN595	2212	
		50SW700	50H700	50JN700	M700-50A	50PN760		M-47
		50SW800	50H800	50JN800	M800-50A	50PN890	2011	
		50SW1000	50H1000	50JN1000	M940-50A	50PN1015		
		50SW1300	50H1300	50JN1300	M1100-50A	50PN1270		
	0.65	65SW400				65PN400		
		65SW800		65JN800	M800-65A	65PN890		M-47
		65SW1000		65JN1000	M1000-65A	65PN1015		
		65SW1300		65JN1300	M1300-65A	65PN1270		
高效系列 High efficient series	0.35	35SWH250						
		35SWH300						
	0.50	50SWH470		50JNE470				
		50SWH600						
		50SWH800						
		50SWH1300						
去应力退火系 Stress relief annealing series	0.50	50SWR350		50JNA350				
		50SW450				50PNR450		

首钢智慧营销平台 Shougang Intelligent Marketing Platform

首钢全球销售网络图 Shougang global sales network chart



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Shougang for WeChat

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