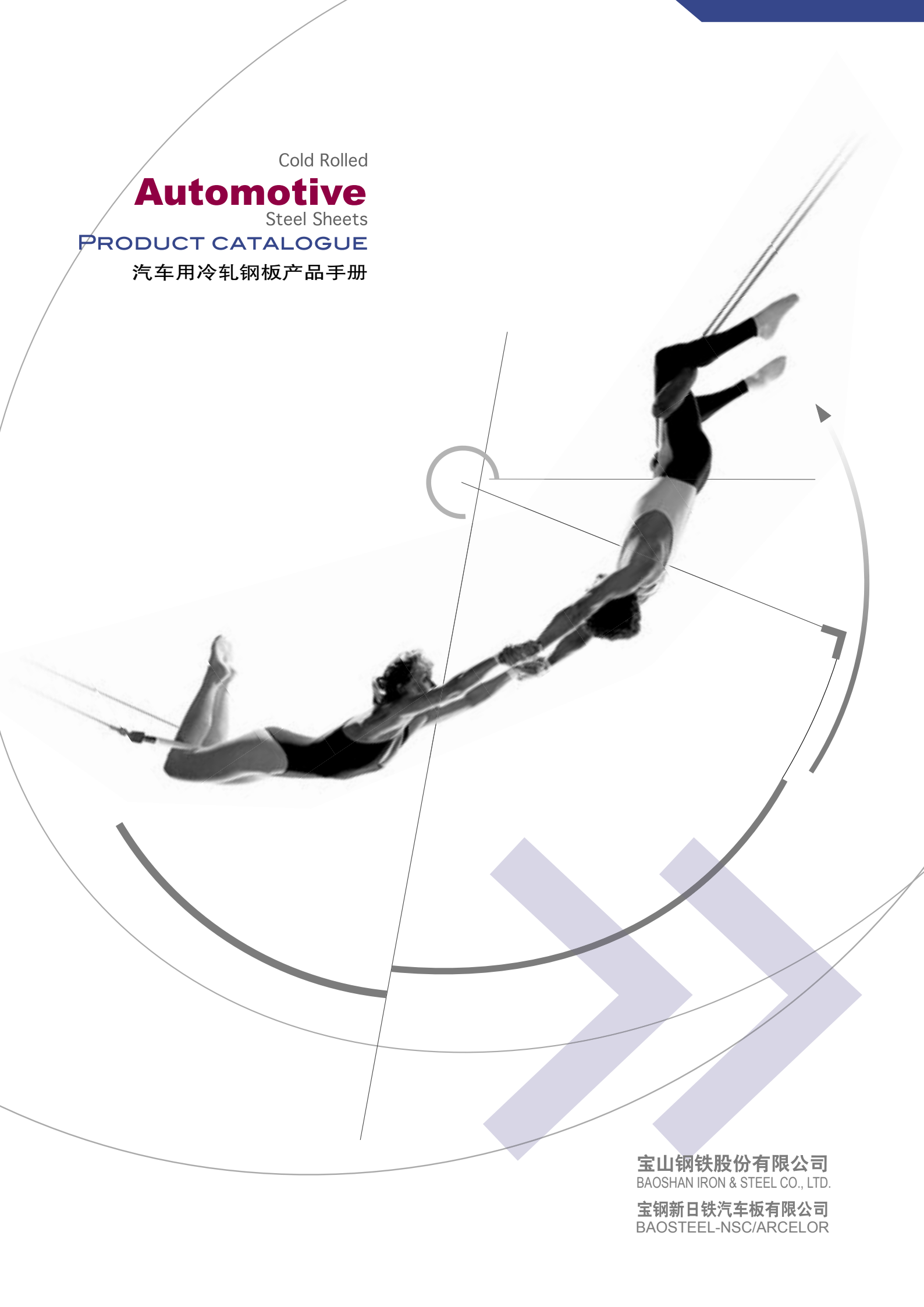


Cold Rolled  
**Automotive**  
Steel Sheets  
**PRODUCT CATALOGUE**  
汽车用冷轧钢板产品手册



宝山钢铁股份有限公司  
BAOSHAN IRON & STEEL CO., LTD.  
宝钢新日铁汽车板有限公司  
BAOSTEEL-NSC/ARCELOR

## 第一章 公司简介

About Us

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宝日汽车板公司由宝山钢铁股份有限公司、新日本制铁株式会社、阿赛洛三方合资组建而成。总投资65亿元，注册资本金为人民币30亿元。主要生产装备及核心技术，集中体现出当代世界钢铁制造业的一流水准。公司从2002年9月开始建设，预计2005年3月第一条机组将正式投产。

BNA is a joint venture with investments contributed by Baoshan Iron & Steel Co., Ltd., Nippon Steel Corporation and Arcelor. Its total investment counts RMB 6.5 billion and registered capital totals RMB 3 billion. Its main equipment and core technologies reflect the global state-of-the-art of iron & steel making industry in a centralized way. Beginning construction from September 2002, its first line is to come into stream in March 2005 as per the plan.

## 第二章 产线简介

Production Line Introduction

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宝钢有三个现代化的冷轧厂生产汽车板，包括一冷轧(2030冷轧厂)、三冷轧(1550冷轧厂)以及与新日铁、阿赛洛合资的1800冷轧。

In Baosteel, there are three modern cold rolling mill plants producing automotive sheets, i.e. No.1 cold rolling mill plant (2030mm), No.3 cold rolling mill plant (1550mm) and 1800mm cold rolling mill plant built jointly with NSC and Arcelor.

## 第三章 使用指南

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1992年开始,我们从钢铁行业实际出发,按照ISO9002标准的要求,建立和完善文件化的质量体系,并于1994年通过了英国BSI公司ISO9002(1995年转为ISO9001)认证,1999年和2003年分别通过了BSI公司QS9000和ISO/TS16949:2002版标准认证。

Since 1992, it has been building and improving its documentation quality system according to ISO9002 standard requirements in view of the actual situation of iron and steel industry. In 1994, it was awarded with ISO9002 certification (converted to ISO9001 in 1995) by BSI, UK. In addition, it passed the QS9000 certification in 1999 and ISO/TS16949:2000 standard certification in 2003.



第七章 完善的产品服务体系  
Perfect Product Service System

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宝钢秉承以用户为中心的经营理念，全面深化与用户的战略协作，在新品研发、材料选用、资源配置、拓展合作渠道等方面进行深层次合作。

Upholding the user-centered operation philosophy, Baosteel deepens strategic cooperation with users in an all-round way through carrying out deep-level cooperation in such aspects as new product research & development, material selection, resource configuration and expansion of cooperation channels.

第八章 产品订货指南  
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## Chapter 1 About Us

### 第一章 公司简介



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

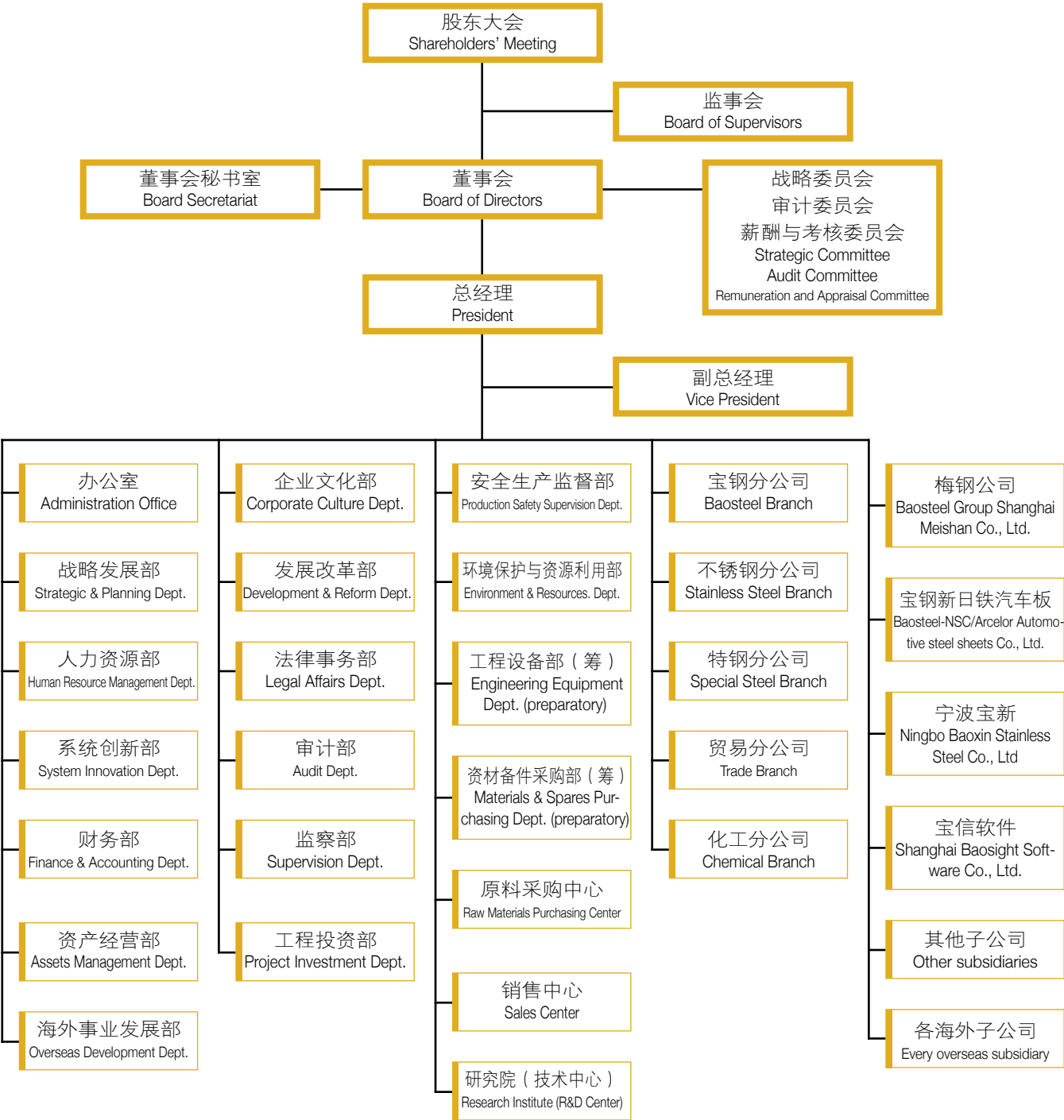
建成全球最具竞争力的钢铁企业

宝山钢铁股份有限公司(以下简称“宝钢股份”)成立于2000年2月3日,同年12月12日在上海证券交易所上市。宝钢股份是中国最大、最现代化的钢铁联合企业,也是全球最具竞争力的钢铁企业之一。在国内,宝钢股份在冷轧板卷、热轧板卷、无缝钢管等产品的制造和销售中始终处于业内领导地位,是汽车、家电、石油天然气开采等行业最大的钢铁供应商。2004年,宝钢以多年奋斗所形成的竞争实力,登上了国际经济的大舞台,在中国钢铁制造业中率先进入世界500强,2005年,宝钢名列世界500强第309位。

宝钢始终把汽车板作为企业的战略产品,而且一直致力于把宝钢建成我国生产规模最大、档次最高的汽车板生产基地,目前,宝钢汽车板已大量用于一汽大众奥迪A6、上海大众帕萨特、上海通用别克等国内高档轿车。2004年宝钢股份公司的汽车板销量已突破184万吨,轿车冷轧用钢国内市场占有率超过50%。在海外,宝钢股份跻身国际汽车制造供应商行列,批量出口Fiat、欧洲Ford等国际著名汽车企业。

2003年,宝钢股份着眼于未来竞争与发展态势,运筹帷幄之中频写公司发展新章,与新日本制铁株式会社、阿塞洛签订1800毫米冷轧合资合同,共同打造世界最优的汽车板生产厂,专业生产和销售高等级汽车用钢板,以满足中国汽车工业发展需求。

股份公司组织架构  
Baosteel Co., Ltd. Organization



Baoshan Iron & Steel Co., Ltd. (hereinafter referred to as Baosteel Co., Ltd.) was set up on February 3rd, 2000 and was listed at Shanghai Stock Exchange on December 12th, 2000. It is the largest and most modernized iron and steel complex in China and one of the most competitive steel complexes in the world. It stays as a leading company in the manufacture and sales of such products as cold coils, hot coils and seamless steel tubes in domestic fields and serves as the largest steel supplier in the industries such as automobile, household appliances, oil and natural gas extraction. With competitiveness gained after years of hardworking, Baosteel, parent company of Baosteel Co., Ltd., has come on the international economic stage and edged into Global 500, the first among steel makers in China, in 2004, and ranks 309 among Global 500 in 2005.

Baosteel keeps automotive sheets as its strategic products all the time and commits itself to building Baosteel into the largest-capacity production base for the highest grade automotive sheets in China all along. Currently, automotive sheets of Baosteel have been greatly applied to top grade sedans such as Audi A6 made by the First Auto and Volkswagen Corp, Passat by Shanghai Volkswagen and Buick by Shanghai GM. In 2004, Baosteel Co., Ltd. surmounted 1.84 million tons in sales of automotive sheets and occupied over 50% of the domestic market of cold rolled steel for sedans. Baosteel Co., Ltd. has edged into the global suppliers of automobile makers and exported its products in batches to global reputable automakers such as Fiat and Ford in Europe.

With a view to future competition and development tendency, Baosteel Co., Ltd. frequently made new corporate development achievements by devising strategies within a command tent in 2003. It concluded an 1800mm cold rolling mill joint venture contract with Nippon Steel Corporation and Arcelor for jointly building a global best automotive sheet production plant specializing in production and sales of superior automotive sheets to meet the development requirement of China's automobile industry.



**Build Baosteel Ltd. into  
the most competitive iron & steel enterprise  
in the world**

## About

### **Baoshan Iron & Steel Co., Ltd.**



Baosteel keeps automotive sheets as its strategic products all the time and commits itself to building Baosteel into the largest-capacity production base for the highest grade automotive sheets in China all along.



成为全球最具竞争力的专业汽车钢板制造和供应商  
Growing into a global most competitive  
manufacturer and supplier specialized  
in automotive sheets



### 宝钢新日铁汽车板有限公司

#### About

### **BAOSTEEL-NSC/ARCELOR AUTOMOTIVE STEEL SHEETS CO., LTD.**

宝钢新日铁汽车板有限公司（以下简称宝日汽车板公司），经国家商务部批准，于2004年7月30日成立。宝日汽车板公司由宝山钢铁股份有限公司、新日本制铁株式会社、阿赛洛三方合资组建而成，其中宝山钢铁股份有限公司占50%股份；新日本制铁株式会社、阿赛洛分别占38%和12%的股份，合资期限为20年。宝日汽车板公司选址于宝钢股份公司厂区内，生产规模为年产量170万吨，其中冷轧钢板90万吨，热镀锌钢板80万吨。主要生产装备及核心技术，集中体现出当代世界钢铁制造业的一流水准。2004年12月，公司第一条机组正式投产，其余机组2005年相继投产，为国内外汽车行业用户提供了大量高品质的产品和服务。

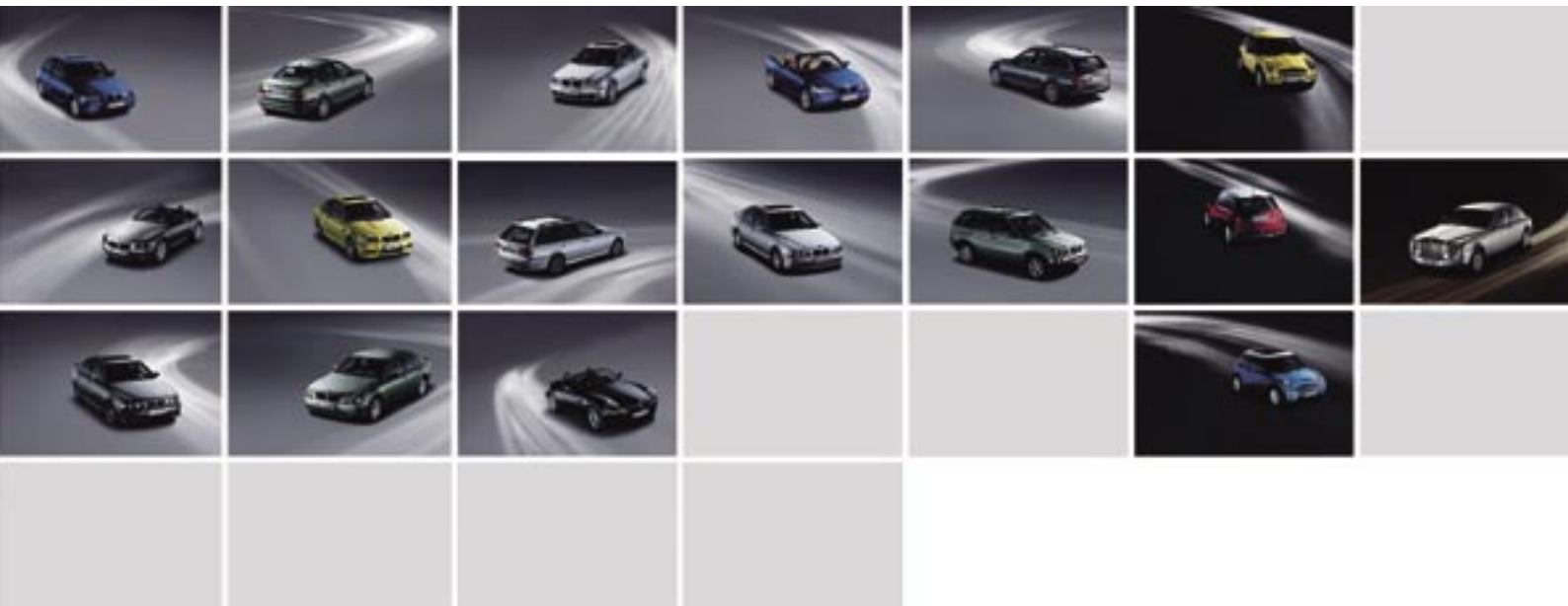
宝日汽车板公司集成了宝山钢铁股份有限公司、新日本制铁株式会社、阿赛洛集团三家世界知名企业在管理、技术、资源、成本等方面的综合优势。强强联手，为提升宝日汽车板公司在高档汽车板市场上的国际竞争力，将公司建设、经营成为世界一流的汽车用钢板生产厂，奠定了坚实的基础。

宝日汽车板公司将秉承、融合三家合资方的优势和特长，潜心致力于汽车板制造领域的研究与开发，立志成为世界专业汽车板生产的领头羊和引导者。

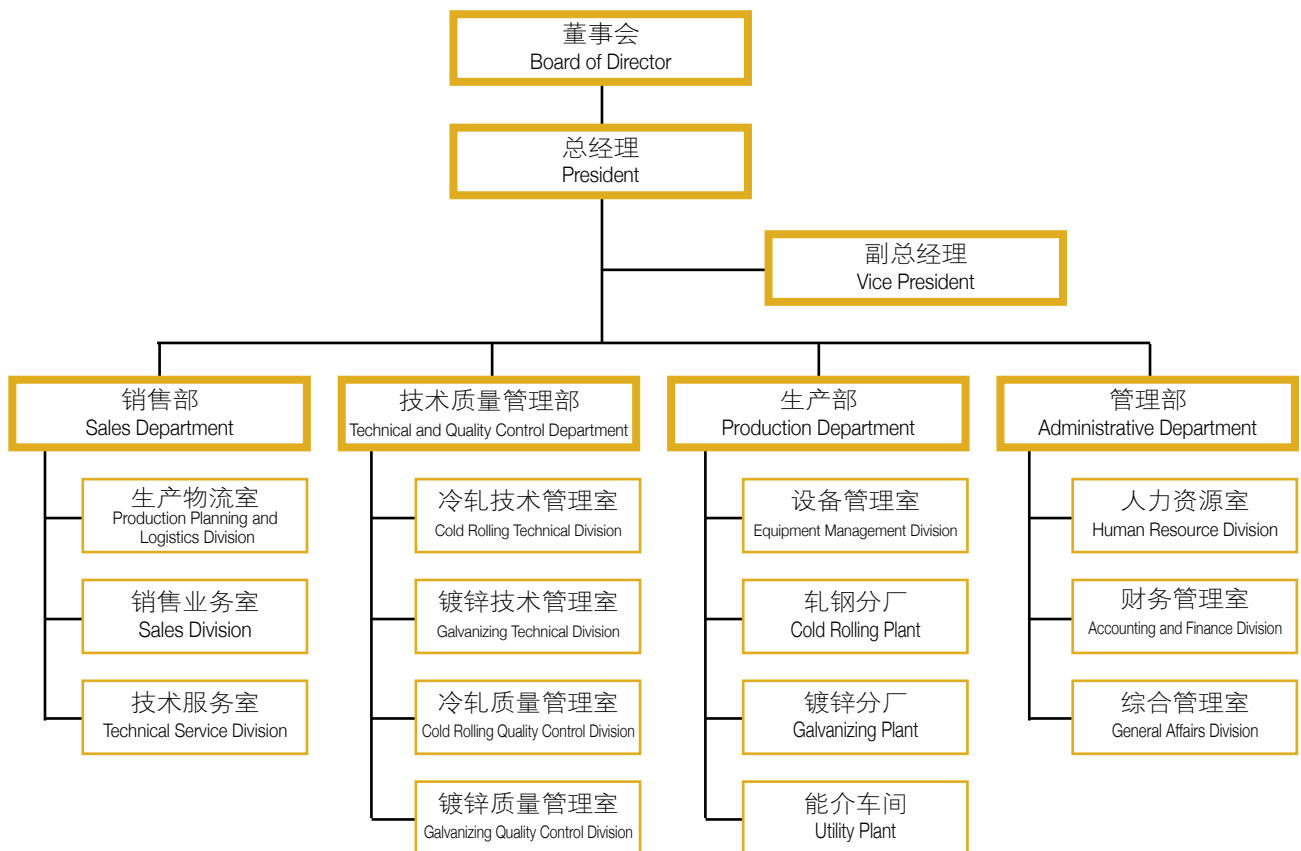
Baosteel-NSC/Arcelor Automotive Steel Sheets Co., Ltd. (hereinafter referred to as BNA) was set up on July 30th, 2004 with the approval of State Commerce Ministry. It is a joint venture with investments contributed by Baoshan Iron & Steel Co., Ltd., Nippon Steel Corporation and Arcelor, who respectively hold 50%, 38% and 12% of the JV shares, and with JV term of 20 years. Located in the plant area of Baosteel Co., Ltd., it has a production scale of 1.7 million t/a, including 0.9 million t/a cold rolled sheets and 0.8 million t/a hot dip galvanized sheets. Its main equipment and core technologies reflect the global state-of-the-art of iron & steel making industry in a centralized way. Its first line was put into production in December 2004 and the other lines started operation in 2005 in success. It has provided large volume high-quality products and services for automotive customers from home and abroad.

BNA integrates comprehensive advantages of Baoshan Iron & Steel Co., Ltd., Nippon Steel Corporation and Arcelor, three global well-known enterprises, in the aspects such as management, technology, resource and cost. Association among strong enterprises lays a solid foundation for enhancing global competitiveness of BNA in high-grade automotive sheet market and building and operating BNA into world top class production plant for automotive sheets.

BNA will take and interfuse advantages and speciality of the three contributors, commit itself with great concentration to research and development in automotive sheet manufacturing filed, and aims to become a global leader and guide in specialized production of automotive sheets.



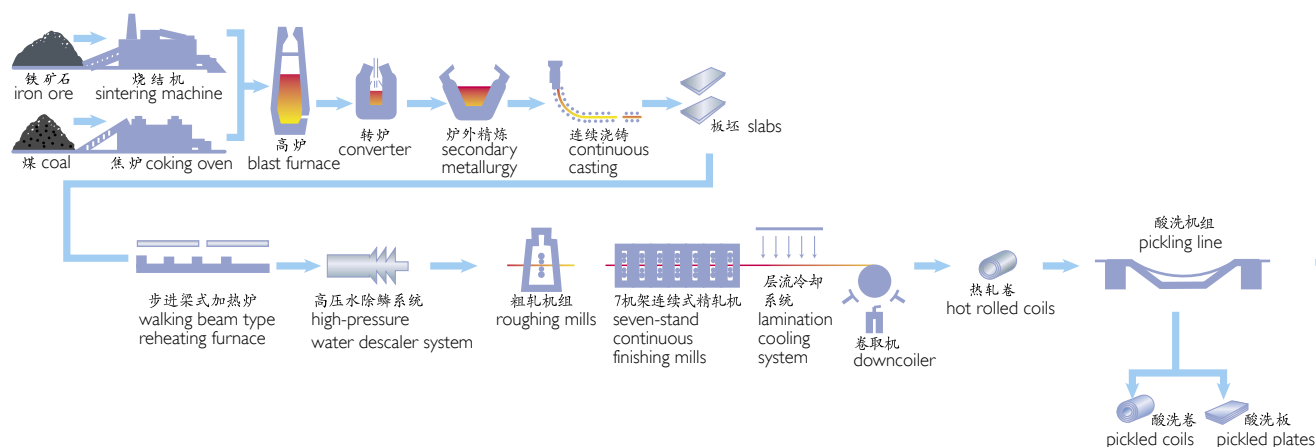
## 宝日汽车板公司组织架构 BNA Corporate Organization





## Chapter 2 Production Line Introduction

### 第二章 产线简介



宝钢有三个现代化的冷轧厂生产汽车板，包括一冷轧(2030冷轧厂)、三冷轧(1550冷轧厂)以及与新日铁、阿赛洛合资的1800冷轧。

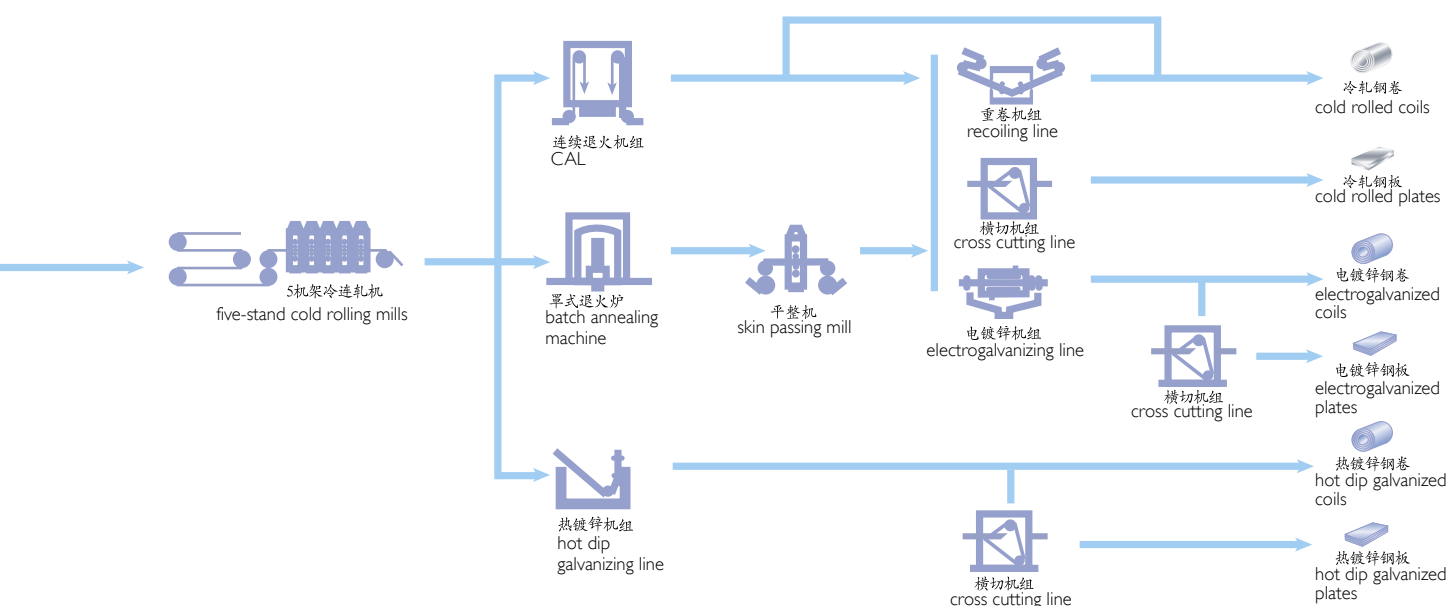
一冷轧主体设备从德国、日本和美国成套引进，包括酸洗机组、2030mm五架全连续冷轧机组、罩式退火炉、单机架四辊式平整机组、六段立式连续退火机组(CAPL)、横切、纵切及重卷机组、连续热镀锌机组、电镀机组等。酸洗机组采用盐酸浅槽酸洗，可有效清除热轧卷表面的氧化铁皮。轧机装有厚度自动控制(AGC)系统，并采用了最新的板型检测调节装置和轧辊凸度连续可变(CVC)技术，从而保证了厚度精度和板型。罩式炉可生产各种性能优良的产品。连续退火机组可一次完成清洗、再结晶退火和平整，降低了生产成本，提高了生产效率，可生产表面质量和性能优良的产品。所有机组均采用计算机控制。

三冷轧主体设备从日本、德国和奥地利引进，考虑到汽车板的一些特殊要求，在一冷轧的基础上进一步提升了装备和技术水平。配备了先进的酸洗—轧机联合机组，采用喷流式酸洗更有效地清除带钢表面氧化铁皮。新型6辊UCMW冷轧机更可精确地控制板厚、板型。辊冷式连续退火炉(CAL)可生产表面质量更高及各种不同性能的产品。此外新型连续镀锌和热镀锌机组，可生产各种规格的汽车用锌镍合金镀、厚镀锌层电镀产品及其合金化、零锌花热镀锌等产品。

1800冷轧以生产市场紧缺的高附加值汽车板、家电板等冷轧板带产品为目标，采用了当今世界成熟的先进工艺技术，设备配置先进、高效、可靠，其中主体机械设备技术分别从日本三菱—日立公司、新日铁公司、川崎制铁公司和德国乔格公司引进。1800工艺处理机组(连退及热镀锌机组)采取了诸多张力控制技术，如前馈控制、速度调节器(ASR)增益在线补偿控制、速度、电流双基准设定控制等，以实现快速稳定通板。热镀锌机组采用刷辊刷毛对带钢进行研磨的技术，特别是对GA产品，可以大大提高镀锌后锌层质量；采用两种退火制度，可有效防止炉内带钢产生瓢曲等缺陷；退火炉采用缓冷段和急冷段结合的两段冷却技术，可以防止带钢出均热段因带钢急冷造成的热瓢曲现象；设计有全自动缓慢加锌设备；炉鼻内浮渣自动抽取技术和沉渣控制技术。这些新技术的采用，确保了工艺机组能够稳定生产出高质量的汽车板。







In Baosteel, there are three modern cold rolling mill plants producing automotive sheets, i.e. No.1 cold rolling mill plant (2030mm), No.3 cold rolling mill plant (1550mm) and 1800mm cold rolling mill plant built jointly with NSC and Arcelor.

With principal equipment imported from Germany, Japan and U.S. in packages, the No.1 cold rolling mill plant comprises of a pickling line, a 2030mm five-stand continuous cold rolling line, batch annealing furnaces, a single-stand four-high skin pass mill line, a six-zone continuous annealing and pickling line, cross cutting, slitting and recoiling lines, a continuous hot dip galvanizing line and an electrogalvanizing line. The pickling line can effectively remove scales from hot rolled coil surfaces by means of shallow tank pickling with HCl. The cold rolling mills are attached with AGC system and the latest profile measuring & adjustment devices and applied with CVC technology, as ensures thickness accuracy and strip profile. The CAPL reduces its production cost, increases its production efficiency and is able to make products of excellent surface quality and performance by accomplishment of once-through cleaning, recrystallization annealing and skin passing. All lines adopt computer control.

With principal equipment imported from Japan, German and Austria, the No.3 cold rolling mill plant further got its equipment and technical level increased on the basis of No.1 cold rolling mill plant in view of some special requirements of automotive sheets. An advanced combined pickling-rolling line with jet flow pickling more effectively removing scales on strip surface is arranged in the plant. Its new type six-high UCMW cold rolling mills can control strip thickness and profile more precisely. Its roll cooling type CAL allows for making of higher surface quality products of various performances. On its new type continuous electrogalvanizing and hot dip galvanizing line, various Zn-Ni alloy and heavy electrogalvanizing products and Zn-Fe alloy and zero spangle hot-dip galvanized products are made for automobile use.

Aiming at making cold rolled strips in short supply such as high value added automotive sheets, household appliance plates, the 1800mm cold rolling mill plant adopts the state-of-the-art technologies and advanced, highly-efficient and reliable equipment. Its principal mechanical equipment technologies are respectively introduced from Mitsubishi – Hitachi, NSC and Kawasaki from Japan as well as Geogre from Germany. The 1800mm process treatment line (continuous annealing and hot dip galvanizing line) adopts many tension control technologies such as feedforward control, online compensation control of speed regulator gain (ASR) and speed-current double-benchmark setting and control for quick and stable strip passing. The hot dip galvanizing line may greatly enhance galvanizing coating thickness of galvanized products especially GA products by means of application of grinding technology with brush rolls, and effectively prevent defects such as buckles on strips inside the furnace with application of two annealing systems. The annealing furnace adopts the two-zone (slow cooling zone and quick cooling zone) combined cooling technology, which may prevent hot buckles due to quick cooling of strips after the soaking zone. Automatic slow zinc charging equipment is designed in the line and automatic sucking technology for floating slag and control technology for settled slag in furnace nose are taken. The application of these technologies ensures the process line for stable production of high-quality automotive sheets.



冷轧板

品 种	产品大类		标准号	牌 号	用途及特点
冷 轧	低碳及超低碳钢	CQ	Q/BQB 402－2003	SPCC	一般用，具有一定的延展性，适用于简单成形，弯曲或焊接加工
			Q/BQB 403－2003	DC01 (St12)	
			Q/BQB 408－2003	BLC	
		DQ	Q/BQB 402－2003	SPCD	冲压用，具有比一般级较大的延展性，适用于制造冲压成形及较复杂变形加工的零部件
			Q/BQB 403－2003	DC03 (St13)	
			Q/BQB 408－2003	BLD	
		DDQ	Q/BQB 402－2003	SPCE、SPCEN	深冲压用，具有比冲压级更大的延展性，适用于制造深冲压成形及复杂加工的零部件
			Q/BQB 403－2003	DC04 (St14, St15)	
			Q/BQB 408－2003	BUSD	
		EDDQ	Q/BQB 403－2003	DC05 (BSC2)	特深冲用，具有比深冲压级更大的延展性，适用于制造特深冲压成形及更复杂加工的零部件
			Q/BQB 408－2003	BUFD	
		SEDDQ	Q/BQB 403－2003	DC06 (St16, St14-T, BSC 3)	超深冲压用，具有比特深冲压级更大的延展性，深冲性及拉延性均优于EDDQ
			Q/BQB 408－2003	BSUFD	
	冷连轧碳素结构钢板及钢带		Q/BQB 410－2003	St37－2G	用于各种结构件
				St44－3G	
				St52－3G	用于各种结构件、加强件
	加磷高强度冷连轧钢板及钢带		Q/BQB 411－2003	B170P1	冲压用，具有良好的冲压性能同时有高的强度，对部件减薄有利，适用于对抗凹陷性能有较高要求的零部件
				B210P1	一般用，有高的强度，对部件减薄有利，适用于对抗凹陷性能有较高要求的零部件
				B250P1	结构用，有高的强度，对部件减薄有利，适用于制作抗凹陷性能有较高要求的零部件
				B180P2 (BP340)	一般用，具有一定的冲压性能和较高的强度，适用于制作抗凹陷性能有较高要求的零部件
				B220P2 (BP380)	结构用，具有高的强度，适用于对抗凹陷性能有较高要求的零部件
				注1：B170P1、B210P1和B250P1为超低碳钢，B180P2和B220P2为低碳钢。	
	烘烤硬化高强度冷连轧钢板及钢带		Q/BQB 416－2003	B140H1	深冲压用，冲压性能优良，经涂漆烘烤后，强度有一定提高
				B180H1	冲压用，经涂漆烘烤后，强度有一定提高
				B180H2 ( BH340 )	
				注1：B140H1和B180H1为超低碳钢，B180H2为低碳钢。	
	双相高强度冷连轧钢板及钢带		Q/BQB 418－2003	B340/590DP	用于各种结构件、加强件
				B400/780DP	用于各种加强件、防撞件
	低合金高强度冷连轧钢板及钢带		Q/BQB 419－2003	B340LA	用于各种结构件
				B410LA	用于各种结构件、加强件
	注：括号内的牌号可以使用至2005年年底。				

## Cold rolled plates

Variety	Product Category		Standard No.	Steel Grade	Application and Features	
Cold rolled plates	Low carbon and ultra-low carbon steel	CQ	Q/BQB 402–2003	SPCC	With some ductility, they are used for commercial purposes and suitable to simple forming, bending or welding.	
			Q/BQB 403–2003	DC01 (St12)		
			Q/BQB 408–2003	BLC		
		DQ	Q/BQB 402–2003	SPCD	With more ductility than the common ones, they are used for drawing purposes and suitable to manufacturing parts through drawing and relatively complicated deforming.	
			Q/BQB 403–2003	DC03 (St13)		
			Q/BQB 408–2003	BLD		
		DDQ	Q/BQB 402–2003	SPCE, SPCEEN	With more ductility than the drawing ones, they are used for deep drawing purposes and suitable to manufacturing parts through deep drawing and complicated processing.	
			Q/BQB 403–2003	DC04 (St14, St15)		
			Q/BQB 408–2003	BUSD		
		EDDQ	Q/BQB 403–2003	DC05 (BSC2)	With more ductility than the deep drawing ones, they are used for extra-deep drawing purposes and suitable to manufacturing parts through extra-deep drawing and more complicated processing.	
			Q/BQB 408–2003	BUFD		
		SEDDQ	Q/BQB 403–2003	DC06 (St16, St14 -T, BSC 3)	With more ductility, deep drawing capability and extension ability than the extra deep drawing ones, they are used for supreme extra deep drawing purposes.	
			Q/BQB 408–2003	BSUFD		
		Continuous cold rolled carbon structural steel plates and strips		Q/BQB 410–2003	St37–2G	They are used for various structural members.
					St44–3G	
	St52–3G				They are used for various structural members and reinforcements.	
	Continuous cold rolled high-strength phosphor steel plates and strips		Q/BQB 411–2003	B170P1	With excellent drawing capability, high strength and favorableness in part thickness reduction, they are used for drawing purposes and suitable to manufacturing parts with relatively high requirements for dinge-resistant performance.	
				B210P1	With high strength and favorableness in part thickness reduction, they are used for commercial purposes and suitable to manufacturing parts with relatively high requirements for dinge-resistant performance.	
				B250P1	With high strength and favorableness in part thickness reduction, they are used for structural purposes and suitable to manufacturing parts with relatively high requirements for dinge-resistant performance.	
				B180P2 (BP340)	With certain drawing capability and high strength, they are used for commercial purposes and suitable to manufacturing parts with relatively high requirements for dinge-resistant performance.	
				B220P2 (BP380)	With high strength, they are used for structural purposes and suitable to manufacturing parts with relatively high requirements for dinge-resistant performance.	
				Note 1: B170P1, B210P1 and B250P1 are ultra-low carbon steel, B180P2 and B220P2 are low carbon steel.		
	Continuous cold rolled high-strength bake hardening steel plates and strips		Q/BQB 416–2003	B140H1	With excellent drawing capability, they are used for deep drawing purposes and get enhanced in strength to some extent after paint coating and baking.	
				B180H1	They are used for drawing purposes and get enhanced in strength to some extent after paint coating and baking.	
				B180H2 (BH340)		
				Note 1: B140H1 and B180H1are ultra-low carbon steel, B180H2 is low carbon steel.		
	Continuous cold rolled high-strength dual-phase steel plates and strips		Q/BQB 418–2003	B340/590DP	They are used for various structural members and reinforcements.	
				B400/780DP	They are used for various reinforcements and collision prevention parts.	
	Continuous cold rolled high-strength low-alloy steel plates and strips		Q/BQB 419–2003	B340LA	They are used for various structural members.	
				B410LA	They are used for various structural members and reinforcements.	
	Note: the bracketed steel grades can be used till the end of 2005.					

电镀锌  
Electrogalvanizing

品 种 Variety	产品大类 Product Category	标准号 Standard No.	牌 号 Steel Grade	用途及特点 Application and Features
电镀锌 Electro galvanizing	低碳及超低碳钢 Low carbon and ultra-low carbon steel	Q/BQB 430-2003	SECC, BLCE+Z	一般用 Commercial purpose
			SECD, BLDE+Z	冲压用 Drawing
			SECE, BUSDE+Z	深冲用 Deep drawing
			BUFDE+Z	特深冲用 Extra-deep drawing
			SECIF, BSUFDE+Z	超深冲用 Supreme extra-deep drawing
	加磷高强度钢 High-strength phosphor steel		B170P1E+Z	冷成形用 Cold forming
			B210P1E+Z	
			B250P1E+Z	
			B180P2E+Z	
	烘烤硬化高强度钢 High-strength bake hardening steel		B220P2E+Z	
			B140H1E+Z	
			B180H1E+Z	
	双相高强度钢 High-strength dual-phase steel		B180H2E+Z	
			B340/590DPE+Z	
	低合金高强度钢 High-strength low-alloy steel		B400/780DPE+Z	
			B340LAE+Z	
			B410LAE+Z	



热镀锌  
Hot dip galvanizing

品 种 Variety	产品大类 Product Category	标准号 Standard No.	牌 号 Steel Grade	用途及特点 Application and Features
热镀锌 Hot dip galvanizing	低碳钢和/或超低碳钢 Low carbon steel and/or ultra-low carbon steel	Q/BQB 420-2003	DC51D+Z (St01Z, St02Z, St03Z) DC51D+ZF	一般用 Commercial purpose
			DC52D+Z (St04Z), DC52D+ZF	冲压用 Drawing
	超低碳钢 Ultra-low carbon steel		DC53D+Z (St05Z), DC53D+ZF	深冲用 Deep drawing
			DC54D+Z (St06Z), DC54D+ZF	特深冲用 Extra deep drawing
			DD54D+Z (St06ZR)	
			DC56D+Z (St07Z), DC56D+ZF	超深冲用 Supreme extra deep drawing
	碳素钢或低合金钢 Carbon steel or low alloy steel		S220GD+Z, S220GD+ZF S250GD+Z, S250GD+ZF S280GD+Z (StE280-2Z) S280GD+ZF S320GD+Z, S320GD+ZF S350GD+Z (StE345-2Z) S350GD+ZF S550GD+Z, S550GD+ZF	结构用 Structure
			H220PD+Z, H220PD+ZF	冷成形用 Cold forming
	加磷高强度钢 High-strength phosphor steel		H260PD+Z, H260PD+ZF	
	低合金高强度钢 High-strength low-alloy steel		H300LAD+Z, H300LAD+ZF H340LAD+Z (HSA340Z), H340LAD+ZF H380LAD+Z, H420LAD+Z (HSA410Z)	
			H180YD+Z, H180YD+ZF H220YD+Z, H220YD+ZF H260YD+Z, H260YD+ZF	
	超低碳高强度钢 High-strength ultra-low carbon steel		H180BD+Z, H180BD+ZF H220BD+Z, H220BD+ZF H260BD+Z, H260BD+ZF	
	烘烤硬化高强度钢 High strength bake hardening steel			



## Chapter 4 Products Instruction

### 第四章 产品介绍

#### 宝钢冷轧产品牌号命名方法

宝钢产品的牌号一部分直接使用国外标准的牌号，一部分采用自己的命名方式命名。现简要介绍宝钢自己命名的牌号的方法。

#### Nomenclature for grades of cold rolled products in Baosteel

For grades of cold rolled products in Baosteel, some of them directly use overseas standard grades and some are designated with its own nomenclature. Brief introduction on nomenclature of Baosteel is given below.



#### 冲压用钢 Drawing steel

B L C

宝 钢 (BAOSTEEL)  
低 碳 (Low Carbon)  
一般用 (Commercial)

B L D

宝 钢 (BAOSTEEL)  
低 碳 (Low Carbon)  
冲压用 (Drawing)

B U S D

宝 钢 (BAOSTEEL)  
超 级 (Ultra)  
拉 延 (Stain)  
冲 压 (Drawing)

B U F D

宝 钢 (BAOSTEEL)  
超 级 (Ultra)  
成 型 (Formability)  
冲 压 (Drawing)

B S U F D

宝 钢 (BAOSTEEL)  
超高级 (Super + Ultra)  
成 型 (Formability)  
冲 压 (Drawing)

#### 加磷钢，烘烤硬化钢 Phosphor steel, bake hardening steel

B □ □ □ □ □

宝 钢 (BAOSTEEL)  
最小屈服强度值 (Min. Yield Strength)  
强化方式 (Strengthening Method)  
(P: P强化; H: 烘烤硬化)  
(P: phosphor strengthening,  
H: bake hardening)  
1: 超低碳 (Ultra-low Carbon)  
2: 低 碳 (Low Carbon)

例: B210P1; B180H2

#### 双相钢 Dual-phase steel

B □ □ □ □ / □ □ □ □ D P

宝 钢 (BAOSTEEL)  
最小屈服强度值  
(Min. Yield Strength)  
最小抗拉强度值  
(Min Tensile Strength)  
双相的英文缩写  
(Dual Phase)

例: B340/590DP

#### 低合金钢 Low alloy steel

B □ □ □ □ L A

宝 钢 (BAOSTEEL)  
最小屈服强度值  
(Min. Yield Strength)  
低合金的英文缩写  
(Low Alloy)

例: B340LA





#### 连续电镀锌/锌-镍合金钢带 Continuous electrogalvanized/Zn-Ni alloy strips

□ □ □ □ E + □

对应的冷轧基板牌号 (Steel Grade of Relevant Base Plate)

电镀锌的英文缩写 (Electrogalvanized)

镀层种类 Z: 纯锌镀层 (Z: Zinc Coating)

Coating Variety ZN: 锌-镍合金镀层 (ZN: Zn-Ni Alloy Coating)

例: BUFDE+Z; BUFDE+ZN

#### 连续热镀锌及合金化热镀锌钢带 Continuous hot-dip galvanized and alloyed hot-dip galvanized strips

##### a. 冲压用钢 Drawing steel

D C □ □ D + □

冲压用钢 (Drawing)

C: 冷轧板 (Cold Rolled Plate)

特性符号 (Characteristic Symbol)

热镀锌的英文缩写  
(Hot Dip Galvanizing)

Z: 纯 锌 (Z: Zinc Coating)

ZF: 合金化 (ZF: Alloying)

例: DC51D+Z

##### b. 结构用钢 Structural steel

S □ □ □ □ D + □

结构用钢 (Structural Steel)

屈服强度下限值  
(Yield Strength Bottom Limit)

特性符号 (Characteristic Symbol)

热镀锌的英文缩写  
(Hot Dip Galvanizing)

Z: 纯 锌 (Z: Zinc Coating)

ZF: 合金化 (ZF: Alloying)

例: S350GD+ZF

##### c. 高强度冷成型用钢 High-strength cold forming steel

H □ □ □ □ D + □

高强度冷成型用钢 (High-strength Cold Forming Steel)

屈服强度下限值 (Yield Strength Bottom Limit)

B: 烘烤硬化 (B: Bake Hardening)

P: 含P强化 (P: Phosphor Strengthening)

Y: IF钢 (Y: IF Steel)

L: 低合金 (L: Low Alloy)

热镀锌的英文缩写 (Hot Dip Galvanizing)

Z: 纯 锌 (Z: Zinc Coating)

ZF: 合金化 (ZF: Alloying)

例: H220PD+ZF

汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
Common cold rolled automotive plates (strips)		
低碳和超低碳钢钢板及钢带		
Low carbon and ultra-low carbon steel plates and strips		



一、汽车用普冷钢板（带）

1. Common cold rolled automotive plates (strips)



1.1.1 低碳和超低碳钢钢板及钢带

冷轧低碳钢和超低碳钢按用途可分为一般用、冲压用、深冲压用、特深冲压用、超深冲压用，宝钢生产的低碳和超低碳冷轧钢板，由于具有良好的冲压性能、焊接性能以及较高的尺寸精度，因而被广泛用于制造各种汽车零部件。特别是无间隙原子钢（IF钢）因具有高的r值、n值和伸长率，目前已大量用于门内板、行李箱盖板、油底壳等极难冲件。用途特点如下表：

用 途	特 点	牌号示例
一般用（CQ）	具有足够的延展性，适用于简单成型、弯曲或焊接加工	DC01, SPCC, BLC
冲压级（DQ）	具有比一般用级较大的延展性，适用于制造冲压成型及较复杂变形的零部件	DC03, SPCD, BLD
深冲压用（DDQ）	具有比冲压级更大的延展性，更为均匀的性能；适用于制造深冲压成型及复杂变形的零部件	DC04, SPCE, BUSD
特深冲压用（EDDQ）	具有比深冲压级更大的延展性，更为均匀的性能，适用于制造特深冲压成型及更为复杂变形的零部件	DC05, BUFD
超深冲压用（SEDDQ）	具有比特深冲压级更为优异的冲压性能，适用于制造超深冲成型及极复杂的变形的零部件	DC06, BSUFD

汽车用普冷钢板（带）  
Common cold rolled automotive plates (strips)  
低碳和超低碳钢板及钢带  
Low carbon and ultra-low carbon steel plates and strips

汽车用电镀锌钢板（带）

汽车用热镀锌钢板（带）



### 1.1.1 Low carbon and ultra-low carbon steel plates and strips

According to application, the cold rolled low carbon steel and ultra-low carbon steel can be divided into common quality, drawing quality, deep drawing quality, extra-deep drawing quality and supreme extra-deep drawing quality. With excellent drawing and welding performance and relatively high dimensional accuracy, the cold rolled low carbon and ultra-low carbon steel plates of Baosteel have been widely applied to manufacture of various automotive parts. The interstitial free steel [IF steel] in particular has been greatly used for extremely hard drawing parts such as inner door plates, luggage boot cover plates and crankcase oil pans for its high value r, value n and percent elongation. See following table for their applications and features:

Application	Features	Steel Grades, for example
Commercial purposes (CQ)	With some ductibility, they are suitable to simple forming, bending or welding.	DC01, SPCC, BLC
Drawing (DQ)	With more ductibility than the common ones, they are suitable to manufacturing parts through drawing and relatively complicated deforming.	DC03, SPCD, BLD
Deep drawing (DDQ)	With more ductibility and homogeneity than the drawing ones, they are suitable to manufacturing parts through deep drawing and complicated deforming.	DC04, SPCE, BUSD
Extra-deep drawing (EDDQ)	With more ductibility and homogeneity than the deep drawing ones, they are suitable to manufacturing parts through extra-deep drawing and more complicated deforming.	DC05, BUFD
Supreme extra-deep drawing (SEDDQ)	With more excellent drawing capability than the extra deep drawing ones, they are suitable to manufacturing parts through supreme extra-deep drawing and extremely complicated deforming.	DC06, BSUFD

Chapter 4 产品介绍 Products Instruction

汽车用普冷钢板（带） Common cold rolled automotive plates (strips) 低碳和超低碳钢板及钢带 Low carbon and ultra-low carbon steel plates and strips	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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1.1.1.1 供货标准、牌号与相当或相近标准、牌号对照表  
1.1.1.1 Reference list of supply standards and steel grades as well as those equivalent or close to them

标准号 Standard No.	Q/BQB 403-2003	EN 10130-1999	EN 10130-1991	DIN1623-(1)-1983	GB/T5213-2001	Q/BQB 403-1999 BZJ 407-1999
牌 号 Steel Grades	DC01 (St12)	DC01	FeP01	St12	—	St12
	DC03 (St13)	DC03	FeP03	RRSt13	—	St13
	DC04 (St14, St15)	DC04	FeP04	St14	SC1	St14, St14F, St14HF, St14ZF, St15
	DC05 (BSC2)	DC05	FeP05	—	SC2	BSC2
	DC06 (St16, St14-T, BSC3)	DC06	FeP06	—	SC3	St16, St14-T, BSC3

标准号 Standard No.	Q/BQB 402-2003	JIS G 3141-1996	GB/T 5213-2001	Q/BQB 402-1999
牌 号 Steel Grades	SPCC	SPCC	—	SPCC
	SPCD	SPCD	—	SPCD
	SPCE	SPCE	SC1	SPCE, SPCEF, SPCEHF, SPCEZF
	SPCEN	SPCEN	SC2	SPCEN

标准号 Standard No.	Q/BQB 408-2003	JFS A 2001-1998	GB5213-2001
牌 号 Steel Grades	BLC	JSC270C	—
	BLD	JSC270D	—
	BUSD	JSC270E	SC1
	BUFD	JSC270F	SC2
	BSUFD	JSC260G	SC3

1.1.1.2 产品尺寸  
1.1.1.2 Product sizes

公称厚度：0.30mm~3.5mm，公称宽度：700mm~1850mm  
Nominal thickness: 0.30mm ~ 0.35mm, nominal width: 700mm~1850mm



### 汽车用普冷钢板（带）

Common cold rolled automotive plates (strips)

低碳和超低碳钢板及钢带

Low carbon and ultra-low carbon steel plates and strips

### 汽车用电镀锌钢板（带）

### 汽车用热镀锌钢板（带）

#### 1.1.1.3 力学及工艺性能

#### 1.1.1.3 Mechanical and process performances

牌 号 Steel Grade	屈服强度 <sup>a</sup> Yield Strength <sup>a</sup> MPa	抗拉强度 不小于 Tensile Strength Mpa ≥	断后伸长率 <sup>b</sup> (L <sub>0</sub> =80mm, b=20mm) % 不小于 After Breakage Percent Elongation (L <sub>0</sub> =80mm, b=20mm) % ≥				r值 <sup>b, c</sup> 不小于 r <sup>b, c</sup> ≥	n值 <sup>b, c</sup> 不小于 n <sup>b, c</sup> ≥
			公称厚度 mm Nominal Thickness mm					
			<0.70	0.70~<1.0	1.0~<1.6	≥1.6		
DC01 (St12)	130~260	270	28	30	32	34	—	—
DC03 (St13)	120~240	270	32	34	35	36	—	—
DC04 (St14, St15)	120~210	270	36	38	39	40	1.5	0.18
DC05 (BSC2)	110~190	260	38	39	40	41	1.8	0.20
DC06 (St16, St14-T, BSC3)	100~180	250	39	40	41	42	2.0	0.22

a 当屈服现象不明显时采用 $R_{p0.2}$ ，否则采用 $R_{eL}$ 。

b 对于牌号DC04其r值、n值为 $r_{90}$ 和 $n_{90}$ ；对于牌号DC05、DC06其r值、n值为 $\bar{r}$ 和 $\bar{n}$ 。当厚度≥1.6mm时，r值允许降低0.2；当厚度≥2.0mm时，r值和n值不作保证。

$\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ； $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ 。

a. taking  $R_{p0.2}$  in case of indistinct yield, otherwise  $R_{eL}$ .

b.  $r_{90}$  and  $n_{90}$  for DC04,  $\bar{r}$  and  $\bar{n}$  for DC05 and DC06, allowable reduction by 0.2 in case of thickness≥1.6mm, no guarantee for r and n in case of thickness≥2.0mm.

c.  $\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ； $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ 。

牌 号 Steel Grade	屈服强度 <sup>a</sup> 不大于 Yield Strength <sup>a</sup> MPa ≤	抗拉强度 不小于 Tensile Strength Mpa ≥	断后伸长率 <sup>b</sup> (L <sub>0</sub> =50mm, b=25mm) % 不小于 After Breakage Percent Elongation (L <sub>0</sub> =50mm, b=25mm) % ≥			
			公称厚度 mm Nominal Thickness mm			
			<0.60	0.60~<1.0	1.0~<1.6	≥1.6
SPCC	—	270	34	36	37	38
SPCD	—	270	36	38	39	40
SPCE SPCEN	210	270	38	40	41	42

a 当屈服现象不明显时采用 $R_{p0.2}$ ，否则采用 $R_{eL}$ 。

b 试样为GB/T228中的P14试样。

a. taking  $R_{p0.2}$  in case of indistinct yield, otherwise  $R_{eL}$ .

b. using P14 sample of GB/T228

牌 号 Steel Grade	屈服强度 <sup>a</sup> Yield Strength <sup>a</sup> MPa	抗拉强度 不小于 Tensile Strength Mpa ≥	断后伸长率 <sup>b</sup> (L <sub>0</sub> =80mm, b=20mm) % 不小于 After Breakage Percent Elongation (L <sub>0</sub> =80mm, b=20mm) % ≥				r值 <sup>c, d</sup> 不小于 r <sup>c, d</sup> ≥	n值 <sup>c, d</sup> 不小于 n <sup>c, d</sup> ≥
			公称厚度 mm Nominal Thickness mm					
			<0.60	0.60~<1.0	1.0~<1.6	≥1.6		
BLC	140~270	270	36	38	40	42	—	—
BLD	120~240	270	38	40	42	44	1.4	0.18
BUSD	120~210	260	40	42	44	46	1.6	0.20
BUFD	120~190	250	42	44	46	48	1.8	0.21
BSUFD	110~180	250	44	46	48	50	2.0	0.22

a 当屈服现象不明显时采用 $R_{p0.2}$ ，否则采用 $R_{eL}$ 。

b 试样为GB/T228中的P14试样。

c 对于牌号BLD其r值、n值为 $r_{90}$ 和 $n_{90}$ ；对于牌号BUSD、BUFD、BSUFD其r值、n值为 $\bar{r}$ 和 $\bar{n}$ 。当厚度≥1.6mm时，r值允许降低0.2；当厚度≥2.0mm时，r值和n值不作保证。

$\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ； $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ 。

a. taking  $R_{p0.2}$  in case of indistinct yield, otherwise  $R_{eL}$ .

b. using P14 sample of GB/T228

c.  $r_{90}$  and  $n_{90}$  for BLD,  $\bar{r}$  and  $\bar{n}$  for BUSD

d.  $\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ； $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ 。



汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
低碳和超低碳钢板及钢带		
Low carbon and ultra-low carbon steel plates and strips		

1.1.1.4 拉伸应变痕

低碳钢通常会发生时效，导致屈服强度上升，伸长率下降，加工过程中可能产生桔皮，表面粗糙等缺陷，因此需规定各牌号的拉伸应变痕保证时间。各牌号拉伸应变痕如下表的规定。

牌 号	拉伸应变痕
DC01 (St12)	钢板及钢带在室温条件下储存，在制造后3个月内，保证使用时不出现拉伸应变痕
DC03 (St13) DC04 (St14, St15)	钢板及钢带在室温条件下储存，在制造后6个月内，保证使用时不出现拉伸应变痕
DC05 (BSC2) DC06 (St16, St14-T, BSC3)	钢板及钢带在室温条件下储存，保证使用时不出现拉伸应变痕
SPCC	无保证期
SPCD SPCE	钢板及钢带在室温条件下储存，在制造后3个月内，保证使用时不出现拉伸应变痕
SPCEN	钢板及钢带在室温条件下储存，保证使用时不出现拉伸应变痕
BLC	无保证期
BLD	钢板及钢带在室温条件下储存，在制造后6个月内，保证使用时不出现拉伸应变痕
BUSD BUFD BSUFD	钢板及钢带在室温条件下储存，保证使用时不出现拉伸应变痕

1.1.1.4 Tensile strain mark

Aging often occurs on low carbon steel and causes steel yield strength increasing and elongation percent decreasing, which may lead to the occurrence of defects such as orange peels and coarse surface during processing. Therefore, it is necessary to specify guarantee time for tensile strain marks of each steel grade.

Refer to following table for provisions of tensile strain marks of each steel grade.

Steel Grade	Tensile Strain Mark
DC01 (St12)	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 3 months after they are produced and in case of room temperature storage.
DC03 (St13) DC04 (St14, St15)	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 6 months after they are produced and in case of room temperature storage.
DC05 (BSC2) DC06 (St16, St14-T, BSC3)	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application in case of room temperature storage.
SPCC	No guarantee period
SPCD SPCE	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 3 months after they are produced and in case of room temperature storage.
SPCEN	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application in case of room temperature storage.
BLC	No guarantee period
BLD	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 6 months after they are produced and in case of room temperature storage.
BUSD BUFD BSUFD	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application in case of room temperature storage.



#### 1.1.1.5 表面质量

针对国内钢厂无法生产超高级精整表面质量钢板（O5板）的现状，宝钢积极组织生产、科研方面的人员大力攻关，在国内首先开发出了O5板这一冷轧精品，并实现了稳定批量供货，极大地满足了汽车用户的需求。目前宝钢生产的低碳及超低碳钢板不仅被广泛地用于制作汽车的内部零件，而且还被大量用作表面质量要求高的轿车及客车等汽车的外覆盖件。钢板表面质量分为三个级别，以满足不同用途的要求。如下表所示：

级 别	代 号	特 征
较高级的精整表面	FB (O3)	表面允许有少量不影响成型性及涂、镀附着力的缺陷，如轻微的划伤、压痕、麻点、辊印及氧化色等。
高级的精整表面	FC (O4)	产品二面中较好的一面无肉眼可见的明显缺欠，另一面必须至少达到FB的要求。
超高级的精整表面	FD (O5)	产品二面中较好的一面不得有任何缺欠，即不能影响涂漆后的外观质量或电镀后的外观质量，另一面必须至少达到FB的要求。

目前国内主要轿车、客车生产厂都大量采用宝钢生产的O5板制作轿车和客车的门外板、行李箱盖板、侧围外板、顶盖等大型外覆盖件，使用效果良好并可代替进口钢板。

#### 1.1.1.5 Surface quality

In view of current situation that no local steel plant could produce ultra high-grade finishing surface steel plates (O5 plates), Baosteel actively organized production and scientific research forces to tackle the problem and developed O5 plates, cold rolled superior products, first in China. Baosteel have been able to steadily supply such plates in batches to greatly meet the demands of automobile makers. At present, Baosteel's low carbon and ultra-low carbon steel plates have been not only widely used in making internal automotive parts but applied in large quantities to outside cover parts of automobiles such as sedans and passage cars, which require high surface quality. Steel plate surface quality is classified into three grades to satisfy different application requirements. See following table.

Grade	Code No.	Features
Relatively high-grade finishing surface	FB (O3)	It is allowed for the existence of a few surface defects which will not affect forming and coating & plating adhesiveness such as minor scratch, impression, pit, roll mark and oxidation tint.
High-grade finishing surface	FC (O4)	One side of relatively good quality is free from any remarkable defect visible and the other side must reach FB requirements at least.
Ultra high-grade finishing surface	FD (O5)	One side of relatively good quality is free from any defect, namely appearance quality after painting or electrogalvanizing is not affected, and the other side must reach FB requirements at least.

Currently, main domestic makers for sedans and passage cars all use great amount O5 plates produced by Baosteel for large outside cover parts such as outside door plates, luggage boot cover plates, outside side plates and top covers. They show excellent application effects and can substitute imported steel plates.

Chapter 4 产品介绍 Products Instruction

汽车用普冷钢板（带） Common cold rolled automotive plates (strips)	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
碳素结构钢板及钢带 Carbon structural steel plates and strips		

1.1.2 碳素结构钢板及钢带

碳素结构钢钢板及钢带St37-2G, St44-3G, St52-3G综合力学性能（强度、伸长率等）及工艺性能（弯曲）良好，尺寸精度高，并具有良好的焊接性能，适用于简单加工的构件。可用作汽车的一些结构部件，如车厢边框及中底板和各种加强板等。

1.1.2.1 供货标准、牌号与相当或相近标准、牌号对照表

标准号	Q/BQB 410-2003	DIN 1623-(2)-1986
牌 号	St37-2G	St37-2G
	St44-3G	St44-3G
	St52-3G	St52-3G

1.1.2.2 产品尺寸

牌 号	公称厚度	公称宽度
St37-2G	0.56~3.0	700~1600
St44-3G	1.2~2.0	700~1250
St52-3G	1.2~2.0	700~1250

1.1.2.3 力学及工艺性能

牌 号	屈服强度 <sup>a</sup> MPa 不小于	抗拉强度 Mpa	断后伸长率 (L <sub>0</sub> =80mm, b=20mm) % 不小于	180°弯曲实验 (b≥20mm)
				弯心直径
St37-2G	215	360~510	20	0.5a
St44-3G	245	430~580	18	1a
St52-3G	325	510~680	16	1a

a 当屈服现象不明显时采用R<sub>p0.2</sub>，否则采用R<sub>el</sub>。

1.1.2.4 表面质量

级 别	代 号	特 征
较高级的精整表面	FB (O3)	表面允许有少量不影响成型性及涂、镀附着力的缺陷，如轻微的划伤、压痕、麻点、辊印及氧化色等。
高级的精整表面	FC (O4)	产品二面中较好的一面无肉眼可见的明显缺欠，另一面必须至少达到FB的要求。

## 汽车用普冷钢板（带）

Common cold rolled automotive plates (strips)

碳素结构钢板及钢带

Carbon structural steel plates and strips

## 汽车用电镀锌钢板（带）

## 汽车用热镀锌钢板（带）

### 1.1.2 Carbon structural steel plates and strips

Carbon structural steel plates and strips, St37-2G, St44-3G, St52-3G, are featured with good comprehensive mechanical performance (strength and percent elongation, etc.) and process performance (bending), high dimensional accuracy and excellent welding performance. They are suitable to manufacturing structural members with simple processing and may be used as some structural parts for automobiles, such as car body frames, middle base plates and various reinforcement plates.

#### 1.1.2.1 Reference list of supply standards and steel grades as well as those equivalent or close to them

Standard No.	Q/BQB 410-2003	DIN 1623-(2)-1986
Steel Grades	St37-2G	St37-2G
	St44-3G	St44-3G
	St52-3G	St52-3G

#### 1.1.2.2 Product sizes

Steel Grade	Nominal Thickness	Nominal Width
St37-2G	0.56~3.0	700~1600
St44-3G	1.2~2.0	700~1250
St52-3G	1.2~2.0	700~1250

#### 1.1.2.3 Mechanical and process performances

Steel Grade	Yield Strength <sup>a</sup> MPa ≥	Tensile Strength Mpa	After Breakage Percent Elongation (L <sub>0</sub> =80mm, b=20mm) % ≥	180° Bending Test (b≥20mm)
				Bending Center Diameter
St37-2G	215	360~510	20	0.5a
St44-3G	245	430~580	18	1a
St52-3G	325	510~680	16	1a

a. taking R<sub>p0.2</sub> in case of indistinct yield, otherwise R<sub>el</sub>.

#### 1.1.2.4 Surface quality

Grade	Code No.	Features
Relatively high-grade finishing surface	FB (O3)	It is allowed for the existence of a few surface defects which will not affect forming and coating & plating adhesiveness such as minor scratch, impression, pit, roll mark and oxidation tint.
High-grade finishing surface	FC (O4)	One side of relatively good quality is free from any remarkable defect visible and the other side must reach FB requirements at least.

汽车用普冷钢板（带） Common cold rolled automotive plates (strips) 加磷高强度钢板及钢带 High-strength phosphor steel plates and strips	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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1.1.3 加磷高强度钢板及钢带

加磷高强度钢是指在低碳钢或超低碳钢中特别添加一定量的磷，利用磷的固溶强化作用提高钢的强度，使用这种钢板可使汽车冲压件的厚度适当减薄，能降低汽车的自重，获得良好的经济效益。既可用于制作车门外板、发动机盖板、顶盖等外覆盖件，也可制作横梁、纵梁等加强件和结构件。

1.1.3 High-strength phosphor steel plates and strips

High-strength phosphor steel plates and strips refer to low carbon or ultra-low carbon steel especially added with certain amount of phosphor, which increases steel strength by its solid solution strengthening function. Adoption of such plates may properly reduce thickness of automotive drawn parts thus lighten automobile dead weight. They can be used for manufacturing outside cover parts such as outside door plates, engine hood plates, top cover plates, and reinforcements and structural members such as cross beams and longitudinal beams.



汽车用普冷钢板（带） Common cold rolled automotive plates (strips) 加磷高强度钢板及钢带 High-strength phosphor steel plates and strips	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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### 1.1.3.1 供货标准、牌号与相当或相近标准、牌号对照表

标准号	Q/BQB 411-2003	JFS A 2001-1998	JIS G 3135-1986	Q/BQB 409-1999 BZJ 411-1999
牌 号	B170P1	JSC340P	SPFC340	B170P1
	B210P1	JSC390P	SPFC390	B210P1
	B250P1	JSC440P	SPFC440	B250P1
	—	—	—	B210P2
	—	—	—	B250P2
	—	—	—	B280P2
	B180P2 (BP340)	JSC340W	—	BP340
	B220P2 (BP380)	JSC390W	—	BP380

### 1.1.3.1 Reference list of supply standards and steel grades as well as those equivalent or close to them

Standard No.	Q/BQB 411-2003	JFS A 2001-1998	JIS G 3135-1986	Q/BQB 409-1999 BZJ 411-1999
Steel Grades	B170P1	JSC340P	SPFC340	B170P1
	B210P1	JSC390P	SPFC390	B210P1
	B250P1	JSC440P	SPFC440	B250P1
	—	—	—	B210P2
	—	—	—	B250P2
	—	—	—	B280P2
	B180P2 (BP340)	JSC340W	—	BP340
	B220P2 (BP380)	JSC390W	—	BP380

### 1.1.3.2 产品尺寸

公称厚度：0.45mm~2.5mm；公称宽度：800mm~1850mm。

### 1.1.3.2 Product sizes

Nominal thickness: 0.45mm ~ 2.5mm, nominal width: 800mm~1850mm

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汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
Common cold rolled automotive plates (strips)		
加磷高强度钢板及钢带		
High-strength phosphor steel plates and strips		

1.1.3.3 力学性能

牌 号	屈服强度 <sup>a</sup> MPa	抗拉强度 Mpa 不小于	断后伸长率 <sup>b</sup> (L <sub>0</sub> =50mm, b=25mm) % 不小于			r值 <sup>c,d</sup> 不小于	n值 <sup>c,d</sup> 不小于
			公称厚度 mm				
			0.60~<1.0	1.0~<1.6	≥1.6		
B170P1	170~260	340	36	38	40	1.5	0.18
B210P1	210~310	390	32	34	36	1.5	0.18
B250P1	250~360	440	30	32	34	—	—

a 当屈服现象不明显时采用R<sub>p0.2</sub>，否则采用R<sub>el</sub>。  
b 试样为GB/T228中的P14试样。  
c 对于牌号B170P1其r值、n值为 $\bar{r}$ 和 $\bar{n}$ ；对于牌号B210P1其r值、n值为 $r_{90}$ 和 $n_{90}$ 。当厚度≥1.6mm时，r值允许降低0.2；当厚度≥2.0mm时，r值和n值不作保证。  
d  $\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ； $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ 。

牌 号	屈服强度MPa	抗拉强度 Mpa 不小于	断后伸长率 (Lo=80mm, b=20mm) % 不小于
B180P2 (BP340)	180~280	340	30
B220P2 (BP380)	220~320	380	28

a 当屈服现象不明显时采用R<sub>p0.2</sub>，否则采用R<sub>el</sub>。

1.1.3.4 拉伸应变痕

牌 号	拉伸应变痕
B170P1, B210P1, B250P1	钢板及钢带在室温条件下储存，保证使用时不出现拉伸应变痕
B180P2 (BP340), B220P2 (BP380)	钢板及钢带在室温条件下储存，在制造后6个月内，保证使用时不出现拉伸应变痕

1.1.3.5 表面质量

级 别	代 号	特 征
较高级的精整表面	FB (O3)	表面允许有少量不影响成型性及涂、镀附着力的缺陷，如轻微的划伤、压痕、麻点、辊印及氧化色等。
高级的精整表面	FC (O4)	产品二面中较好的一面无肉眼可见的明显缺欠，另一面必须至少达到FB的要求。
超高级的精整表面	FD (O5)	产品二面中较好的一面不得有任何缺欠，即不能影响涂漆后的外观质量或电镀后的外观质量，另一面必须至少达到FB的要求。



### 1.1.3.3 Mechanical performances

Steel Grade	Yield Strength <sup>a</sup> MPa	Tensile Strength MPa ≥	After Breakage Percent Elongation <sup>b</sup> (L <sub>0</sub> =50mm, b=25mm) % ≥			r <sup>c,d</sup> ≥	n <sup>c,d</sup> ≥
			Nominal Thickness mm				
			0.60~<1.0	1.0~<1.6	≥1.6		
B170P1	170~260	340	36	38	40	1.5	0.18
B210P1	210~310	390	32	34	36	1.5	0.18
B250P1	250~360	440	30	32	34	—	—

a. taking R<sub>p0.2</sub> in case of indistinct yield, otherwise R<sub>el</sub>.

b. using P14 sample of GB/T228

c.  $\bar{r}$  and  $\bar{n}$  for B170P1,  $r_{90}$  and  $n_{90}$  for BP210P1, allowable reduction by 0.2 in case of thickness ≥ 1.6mm, no guarantee for r and n in case of thickness ≥ 2.0mm.

d.  $\bar{r} = (r_{90} + 2r_{45} + r_0)/4$ ;  $\bar{n} = (n_{90} + 2n_{45} + n_0)/4$ .

Steel Grade	Yield Strength <sup>a</sup> MPa	Tensile Strength MPa ≥	After Breakage Percent Elongation (L <sub>0</sub> =80mm, b=20mm) % ≥
B180P2 (BP340)	180~280	340	30
B220P2 (BP380)	220~320	380	28

a. taking R<sub>p0.2</sub> in case of indistinct yield, otherwise R<sub>el</sub>.

### 1.1.3.4 Tensile strain mark

Steel Grade	Tensile Strain Mark
B170P1, B210P1, B250P1	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application in case of room temperature storage.
B180P2 (BP340), B220P2 (BP380)	It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 6 months after they are produced and in case of room temperature storage.

### 1.1.3.5 Surface quality

Grade	Code No.	Features
Relatively high-grade finishing surface	FB (O3)	It is allowed for the existence of a few surface defects which will not affect forming and coating & plating adhesiveness such as minor scratch, impression, pit, roll mark and oxidation tint.
High-grade finishing surface	FC (O4)	One side of relatively good quality is free from any remarkable defect visible and the other side must reach FB requirements at least.
Ultra high-grade finishing surface	FD (O5)	One side of relatively good quality is free from any defect, namely appearance quality after painting or electrogalvanizing is not affected, and the other side must reach FB requirements at least.

汽车用普冷钢板（带） Common cold rolled automotive plates (strips)	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
烘烤硬化高强度钢板及钢带 High-strength bake hardening steel plates and strips		

1.1.4 烘烤硬化高强度钢板及钢带

烘烤硬化钢（BH钢）是指采用特定的化学成份和生产工艺使钢板中固溶一定的碳原子，钢板在交货状态下具有较低的屈服强度，冲压成形后，进行涂漆烘烤时屈服强度增加一定值的一种新型高效汽车用钢。BH钢可以提高汽车外板的抗凹陷性，同时又具有良好的成形性能，因此越来越受到汽车厂的重视。宝钢生产的BH钢有低碳和超低碳两种，具有成形性能好，烘烤硬化值（BH值）稳定等特点。广泛用于汽车门外板、发动机盖板等外覆件上。

1.1.4.1 供货标准、牌号与相当或相近标准、牌号对照表

标准号	Q/BQB 416-2003	JFS A 2001-1998	JIS G 3135-1986	Q/BQB 409-1999 BZJ 416-1999
牌 号	B140H1	JSC270H	—	B140H1
	B180H1	JSC340H	—	B180H1
	—	—	—	B180H2
	—	—	—	B210H2
	—	—	—	B250H2
	B180H2(BH340)	—	SPFC340H	BH340
	—	—	—	BH340A

1.1.4.2 产品尺寸

公称厚度：0.45mm~2.0mm；公称宽度：800mm~1850mm。

### 1.1.4 High-strength bake hardening steel plates and strips

Bake hardening steel (BH steel) refers to steel added with some solid solution carbon atoms by adoption of special chemical compositions and production process. It is a new type of high-efficient automotive steel plates with relative low yield strength at delivery and increased yield strength by certain extents through coating baking after their draw forming. Automobile makers are paying more attention to BH steel for its enhancement of automotive body sheets in impression-resistant strength and its excellent formability. Baosteel makes two kind of BH steel, i.e. low carbon BH steel and ultra-low carbon BH steel, featured with good formability and stable bake hardness (BH value). They are widely used for manufacturing cover plates of automobiles such as outside door plates and engine hood plates.

#### 1.1.4.1 Reference list of supply standards and steel grades as well as those equivalent or close to them

Standard No.	Q/BQB 416-2003	JFS A 2001-1998	JIS G 3135-1986	Q/BQB 409-1999 BZJ 416-1999
Steel Grades	B140H1	JSC270H	—	B140H1
	B180H1	JSC340H	—	B180H1
	—	—	—	B180H2
	—	—	—	B210H2
	—	—	—	B250H2
	B180H2 (BH340)	—	SPFC340H	BH340
	—	—	—	BH340A

#### 1.1.4.2 Product sizes

Nominal thickness: 0.45mm ~ 2.0mm, nominal width: 800mm~1850mm



汽车用普冷钢板（带） Common cold rolled automotive plates (strips)	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
烘烤硬化高强度钢板及钢带 High-strength bake hardening steel plates and strips		

1.1.4.3 力学性能

牌 号	屈服强度 <sup>a</sup> MPa	抗拉强度 Mpa 不小于	断后伸长率 <sup>b</sup> (L <sub>0</sub> =50mm, b=25mm) % 不小于	断后伸长率 <sup>b</sup> (L <sub>0</sub> =80mm, b=20mm) % 不小于	$\bar{r}$ 值 <sup>c</sup> 不小于	$\bar{n}$ 值 <sup>c</sup> 不小于	烘烤硬化值 <sup>d</sup> (BH值) Mpa 不小于
B140H1	140~230	270	41	—	1.6	0.20	30
B180H1	180~280	340	35	—	1.4	0.18	30
B180H2 (BH340)	180~280	340	—	32	1.4	0.18	30

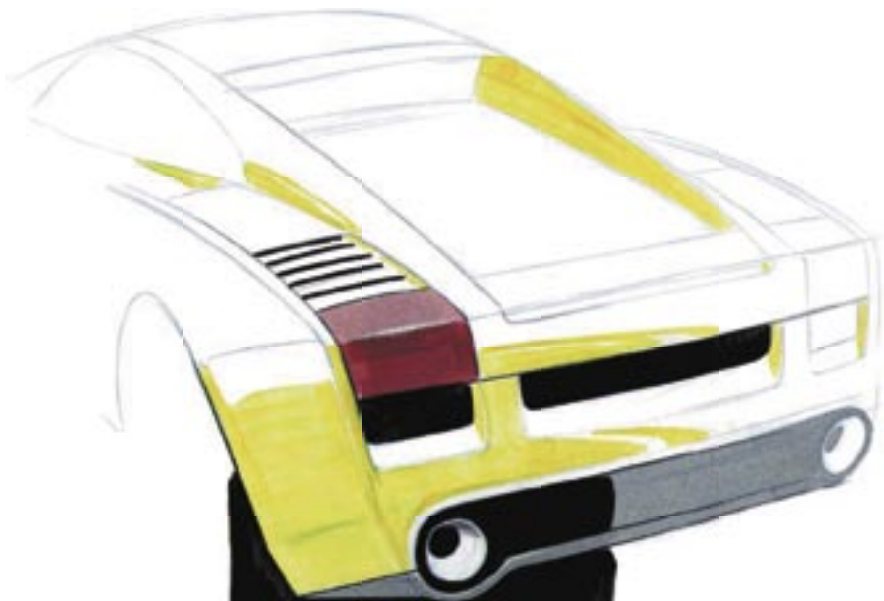
a 当屈服现象不明显时采用 $R_{p0.2}$ ，否则采用 $R_{el}$ 。  
b 试样为GB/T228中的P14试样。  
c  $\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ； $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ 。  
d BH值会随储存时间的延长以及温度的升高而降低，因此建议用户尽快使用。

1.1.4.4 拉伸应变痕

钢板及钢带在室温条件下储存，在制造后3个月内，保证使用时不出现拉伸应变痕。由于烘烤硬化钢比较容易产生拉伸应变痕，因此建议用户尽快使用。

1.1.4.5 表面质量

级 别	代 号	特 征
较高级的精整表面	FB (O3)	表面允许有少量不影响成型性及涂、镀附着力的缺陷，如轻微的划伤、压痕、麻点、辊印及氧化色等。
高级的精整表面	FC (O4)	产品二面中较好的一面无肉眼可见的明显缺欠，另一面必须至少达到FB的要求。
超高级的精整表面	FD (O5)	产品二面中较好的一面不得有任何缺欠，即不能影响涂漆后的外观质量或电镀后的外观质量，另一面必须至少达到FB的要求。



#### 1.1.4.3 Mechanical performances

Steel Grade	Yield Strength <sup>a</sup> MPa	Tensile Strength Mpa ≥	After Breakage Percent Elongation <sup>b</sup> (L <sub>0</sub> =50mm, b=25mm) % ≥	After Breakage Percent Elongation <sup>b</sup> (L <sub>0</sub> =80mm, b=20mm) % ≥	$\bar{r}$ <sup>c</sup> ≥	$\bar{n}$ <sup>c</sup> ≥	Bake Hardness <sup>d</sup> (BH Value) Mpa ≥
B140H1	140~230	270	41	-	1.6	0.20	30
B180H1	180~280	340	35	-	1.4	0.18	30
B180H2 (BH340)	180~280	340	-	32	1.4	0.18	30

a. taking  $R_{p0.2}$  in case of indistinct yield, otherwise  $R_{eL}$ .  
b. using P14 sample of GB/T228  
c.  $\bar{r}=(r_{90}+2r_{45}+r_0)/4$ ;  $\bar{n}=(n_{90}+2n_{45}+n_0)/4$ .  
d. The user is s□

#### 1.1.4.4 Tensile strain mark

It is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 3 months after they are produced and in case of room temperature storage. However, the user is suggested to use BH steel as soon as possible because they tend to gaining tensile strain marks.

#### 1.1.4.5 Surface quality

Grade	Code No.	Features
Relatively high-grade finishing surface	FB (O3)	It is allowed for the existence of a few surface defects which will not affect forming and coating & plating adhesiveness such as minor scratch, impression, pit, roll mark and oxidation tint.
High-grade finishing surface	FC (O4)	One side of relatively good quality is free from any remarkable defect visible and the other side must reach FB requirements at least.
Ultra high-grade finishing surface	FD (O5)	One side of relatively good quality is free from any defect, namely appearance quality after painting or electrogalvanizing is not affected, and the other side must reach FB requirements at least.

汽车用普冷钢板（带） Common cold rolled automotive plates (strips) 双相高强度冷轧钢板及钢带 Cold rolled high-strength dual-phase steel plates and strips	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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1.1.5 双相高强度冷轧钢板及钢带

双相高强度钢属相变强化高强度钢，是指通过采用特定的化学成份和生产工艺在钢的铁素体基体上弥散分布一定量的马氏体，形成以铁素体加马氏体为主的组织，在提高强度的同时改善钢的成形性能。具有屈服比低、无屈服延伸、应变强化指数高和良好的抗碰撞性能，可以实现减轻汽车重量的同时提高安全性能，是近年来发展起来的先进高强度钢，在汽车工业发达国家已经批量使用。主要用于汽车车轮、保险杠、悬挂系统和加强件，也可用于汽车内外板。

1.1.5.1 供货标准、牌号与相当或相近标准、牌号对照表

标准号	Q/BQB 418-2003	JFS A2001-1998	Q/BQB 418-1999
牌 号	B340/590DP	JSC590Y	B340VK
	B400/780DP	JSC780Y	B400VK

1.1.5.2 产品尺寸

公称厚度：0.60mm~2.00mm，公称宽度：800mm~1730mm。

1.1.5.3 力学性能

牌 号	屈服强度 <sup>a</sup> MPa	抗拉强度 MPa 不小于	断后伸长率 <sup>b</sup> （ L <sub>0</sub> =50mm， b=25mm ） % 不小于			180° 弯曲试验 （ b≥20mm ）
			公称厚度 mm			
			0.60～<1.0	1.0～<1.6	1.6	弯心直径
B340/590DP	340～500	590	16	18	20	0.5a
B400/780DP	400～590	780	—	14	16	1.0a

a 当屈服现象不明显时采用R<sub>p0.2</sub>，否则采用R<sub>el</sub>。  
b 试样为GB/T 228中的P14试样。

1.1.5.4 表面质量

级 别	代 号	特 征
较高级的精整表面	FB (O3)	表面允许有少量不影响成型性及涂、镀附着力的缺陷，如轻微的划伤、压痕、麻点、辊印及氧化色等。
高级的精整表面	FC (O4)	产品二面中较好的一面无肉眼可见的明显缺欠，另一面必须至少达到FB的要求。



### 1.1.5 Cold rolled high-strength dual-phase steel plates and strips

High-strength dual-phase steel, a phase change strengthening steel, is in a structure mainly composed of ferrite and martensite, which is dispersed in certain quantity to ferritic matrix by adoption of special chemical compositions and production process. While it gets rained in strength, it gets improved at formability. It is featured with low yield strength, no yield elongation, high strain strengthening index and excellent collision-resistance and can increase safety of automobiles while lowering their weight. It is an advanced high-strength recently developed and has been applied in batches to automotive industry in developed countries. It is mainly used for manufacturing wheels, bumpers, suspension systems and reinforcements as well as outside plates of automobiles.

#### 1.1.5.1 Reference list of supply standards and steel grades as well as those equivalent or close to them

Standard No.	Q/BQB 418-2003	JFS A2001-1998	Q/BQB 418-1999
Steel Grade	B340/590DP	JSC590Y	B340VK
	B400/780DP	JSC780Y	B400VK

#### 1.1.5.2 Product sizes

Nominal thickness: 0.60mm ~ 2.00mm, nominal width: 800mm~1730mm

#### 1.1.5.3 Mechanical performances

Steel Grade	Yield Strength <sup>a</sup> MPa	Tensile Strength MPa ≥	After Breakage Percent Elongation <sup>b</sup> (L <sub>0</sub> =50mm, b=25mm) % ≥			180° Bending Test (b≥20mm)
			Nominal Thickness mm			
			0.60~<1.0	1.0~<1.6	1.6	Bending Center Diameter
B340/590DP	340~500	590	16	18	20	0.5a
B400/780DP	400~590	780	—	14	16	1.0a

a. taking R<sub>p0.2</sub> in case of indistinct yield, otherwise R<sub>cl</sub>.

b. using P14 sample of GB/T228

#### 1.1.5.4 Surface quality

Grade	Code No.	Features
Relatively high-grade finishing surface	FB (O3)	It is allowed for the existence of a few surface defects which will not affect forming and coating & plating adhesiveness such as minor scratch, impression, pit, roll mark and oxidation tint.
High-grade finishing surface	FC (O4)	One side of relatively good quality is free from any remarkable defect visible and the other side must reach FB requirements at least.

汽车用普冷钢板（带） Common cold rolled automotive plates (strips) 低合金高强度钢板及钢带 High-strength low alloy steel plates and strips	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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1.1.6 低合金高强度钢板及钢带

低合金高强钢是在低碳钢中添加少量的铌和/或钛等合金元素，使其与碳、氮等元素形成碳化物、氮化物并在铁素体基体上析出从而提高钢的强度。这种钢具有良好的成形性能和较高的强度，主要用于汽车座椅、横梁等结构件。

1.1.6.1 供货标准、牌号与相当或相近标准、牌号对照表

标准号	Q/BQB 419-2003	JFS A 2001-1998
牌 号	B340LA	JSC440R
	B410LA	JSC590R

1.1.6.2 产品尺寸

公称厚度：0.45mm~2.0mm，公称宽度：800mm~1850mm。

1.1.6.3 力学性能

牌 号	屈服强度 <sup>a</sup> MPa	抗拉强度 MPa 不小于	断后伸长率 <sup>b</sup> （ L <sub>0</sub> =50mm， b=25mm ） % 不小于			180° 弯曲试验 （ b≥20mm ）
			公称厚度 mm			
			0.60～<1.0	1.0～<1.6	1.6	弯心直径
B340LA	340～460	440	22	24	26	0.5a
B410LA	410～560	590	16	17	18	a

a 当屈服现象不明显时采用R<sub>m0.2</sub>，否则采用R<sub>el</sub>。  
b 试样为GB/T 228中的P14试样。

1.1.6.4 表面质量

级 别	代 号	特 征
较高级的精整表面	FB (O3)	表面允许有少量不影响成型性及涂、镀附着力的缺陷，如轻微的划伤、压痕、麻点、辊印及氧化色等。
高级的精整表面	FC (O4)	产品二面中较好的一面无肉眼可见的明显缺欠，另一面必须至少达到FB的要求。

### 汽车用普冷钢板（带）

Common cold rolled automotive plates (strips)

低合金高强度钢板及钢带

High-strength low alloy steel plates and strips

### 汽车用电镀锌钢板（带）

### 汽车用热镀锌钢板（带）

## 1.1.6 High-strength low alloy steel plates and strips

High-strength low alloy steel is low carbon steel added with a little alloy elements such as niobium and/or titanium, which will be allowed to form carbide and nitride with carbon and nitrogen and separate these carbide and nitride out of ferritic matrix to increase steel strength. With excellent formability and relatively high strength, it is mainly used for manufacturing structural parts of automobiles such as chairs and cross beams.

### 1.1.6.1 Reference list of supply standards and steel grades as well as those equivalent or close to them

Standard No.	Q/BQB 419-2003	JFS A 2001-1998
Steel Grades	B340LA	JSC440R
	B410LA	JSC590R

### 1.1.6.2 Product sizes

Nominal thickness: 0.45mm ~ 2.0mm, nominal width: 800mm~1850mm

### 1.1.6.3 Mechanical performances

Steel Grade	Yield Strength <sup>a</sup> MPa	Tensile Strength MPa ≥	After Breakage Percent Elongation <sup>b</sup> (L <sub>o</sub> =50mm, b=25mm) % ≥			180° Bending Test (b≥20mm)
			Nominal Thickness mm			Bending Center Diameter
			0.60~<1.0	1.0~<1.6	1.6	
B340LA	340~460	440	22	24	26	0.5a
B410LA	410~560	590	16	17	18	a

a. taking R<sub>p0.2</sub> in case of indistinct yield, otherwise R<sub>el</sub>.

b. using P14 sample of GB/T228

### 1.1.6.4 Surface quality

Grade	Code No.	Features
Relatively high-grade finishing surface	FB (O3)	It is allowed for the existence of a few surface defects which will not affect forming and coating & plating adhesiveness such as minor scratch, impression, pit, roll mark and oxidation tint.
High-grade finishing surface	FC (O4)	One side of relatively good quality is free from any remarkable defect visible and the other side must reach FB requirements at least.

汽车用普冷钢板（带） Common cold rolled automotive plates (strips)	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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1.2 冷轧钢板及钢带可供尺寸规格范围

冷轧钢板及钢带通常可供尺寸规格范围如下表所示，不同牌号的可供尺寸规格范围参见相应章节或另行规定。

单位：mm

品 种		厚 度	宽 度	长 度（或带卷内径）
钢 板	切 边	0.30~3.50	700~1830	1000~6000
	不切边		730~1850	
钢 带	切 边	0.30~3.50	700~1830	508 / 610（内径）
	不切边		730~1850	

1.3 冷轧钢板及钢带尺寸、外形的允许偏差

冷轧钢板和钢带尺寸、外形的允许偏差按Q / BQB401-2003规定执行

1.2 Size range of cold rolled steel plates and strips available

Size range of cold rolled steel plates and strips available is given in the following table. Refer to relevant chapters or other stipulations for size range of cold rolled steel plates and strips available in different steel grades.

Unit: mm

Variety		Thickness	Width	Length (or Coil Inside Diameter)
Steel plates	Edge Cutting	0.30~3.50	700~1830	1000~6000
	Edge Misalignment		730~1850	
Steel strips	Edge Cutting	0.30~3.50	700~1830	508 / 610 (Inside Diameter)
	Edge Misalignment		730~1850	

1.3 Allowable size and outline deviations of cold rolled steel plates and strips

Allowable size and outline deviations of cold rolled steel plates and strips shall follow the regulation of Q/BQB401-2003.

汽车用普冷钢板（带） Common cold rolled automotive plates (strips)	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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### 1.3.1 冷轧钢板、钢带厚度允许偏差

#### 1.3.1 Allowable thickness deviation of cold rolled steel plates and strips

规定的 最小屈服强度 MPa Min. Yield Strength Specified MPa	公称厚度 mm Nominal Thickness mm	厚度允许偏差 mm Allowable Thickness Deviation mm					
		普通精度 PT.A General Precision PT.A			高级精度 PT.B High-grade Precision PT.B		
		公称宽度 mm Nominal Width mm			公称宽度 mm Nominal Width mm		
		< 1200	1200 ~ < 1500	≥ 1500	< 1200	1200 ~ < 1500	≥ 1500
<280	0.30 ~ 0.40	± 0.04	± 0.05	—	± 0.025	± 0.035	—
	> 0.40 ~ 0.60	± 0.05	± 0.06	± 0.07	± 0.035	± 0.045	± 0.05
	> 0.60 ~ 0.80	± 0.06	± 0.07	± 0.08	± 0.045	± 0.05	± 0.05
	> 0.80 ~ 1.00	± 0.07	± 0.08	± 0.09	± 0.05	± 0.06	± 0.06
	> 1.00 ~ 1.20	± 0.08	± 0.09	± 0.10	± 0.06	± 0.07	± 0.07
	> 1.20 ~ 1.60	± 0.10	± 0.11	± 0.11	± 0.07	± 0.08	± 0.08
	> 1.60 ~ 2.00	± 0.12	± 0.13	± 0.13	± 0.08	± 0.09	± 0.09
	> 2.00 ~ 2.50	± 0.14	± 0.15	± 0.15	± 0.10	± 0.11	± 0.11
	> 2.50 ~ 3.00	± 0.16	± 0.17	± 0.17	± 0.11	± 0.12	± 0.12
280 ~ <360	> 3.00 ~ 3.50	± 0.17	± 0.19	± 0.19	± 0.14	± 0.15	± 0.15
	0.30 ~ 0.40	± 0.05	± 0.06	—	± 0.03	± 0.04	—
	> 0.40 ~ 0.60	± 0.06	± 0.07	± 0.08	± 0.04	± 0.05	± 0.06
	> 0.60 ~ 0.80	± 0.07	± 0.08	± 0.10	± 0.05	± 0.06	± 0.06
	> 0.80 ~ 1.00	± 0.08	± 0.10	± 0.11	± 0.06	± 0.07	± 0.07
	> 1.00 ~ 1.20	± 0.10	± 0.11	± 0.12	± 0.07	± 0.08	± 0.08
	> 1.20 ~ 1.60	± 0.12	± 0.13	± 0.13	± 0.08	± 0.10	± 0.10
	> 1.60 ~ 2.00	± 0.14	± 0.16	± 0.16	± 0.10	± 0.11	± 0.11
	> 2.00 ~ 2.50	± 0.17	± 0.18	± 0.18	± 0.12	± 0.13	± 0.13
≥ 360	> 2.50 ~ 3.00	± 0.19	± 0.20	± 0.20	± 0.13	± 0.14	± 0.14
	> 3.00 ~ 3.50	± 0.20	± 0.23	± 0.23	± 0.17	± 0.18	± 0.18
	0.30 ~ 0.40	± 0.06	± 0.07	—	± 0.04	± 0.05	—
	> 0.40 ~ 0.60	± 0.07	± 0.08	± 0.10	± 0.05	± 0.06	± 0.07
	> 0.60 ~ 0.80	± 0.08	± 0.10	± 0.11	± 0.06	± 0.07	± 0.07
	> 0.80 ~ 1.00	± 0.10	± 0.11	± 0.13	± 0.07	± 0.08	± 0.08
	> 1.00 ~ 1.20	± 0.11	± 0.13	± 0.14	± 0.08	± 0.10	± 0.10
	> 1.20 ~ 1.60	± 0.14	± 0.15	± 0.15	± 0.10	± 0.11	± 0.11
	> 1.60 ~ 2.00	± 0.17	± 0.18	± 0.18	± 0.11	± 0.13	± 0.13
	> 2.00 ~ 2.50	± 0.20	± 0.21	± 0.21	± 0.14	± 0.15	± 0.15
	> 2.50 ~ 3.00	± 0.23	± 0.24	± 0.24	± 0.15	± 0.17	± 0.17
	> 3.00 ~ 3.50	± 0.24	± 0.27	± 0.27	± 0.20	± 0.21	± 0.21

汽车用普冷钢板（带） Common cold rolled automotive plates (strips)	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带）
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1.3.2 冷轧钢板、钢带宽度允许偏差

边缘状态	公称宽度 mm	宽度允许偏差 mm	
		高级精度 PW.B	普通精度 PW.A
不切边 EM	730~1850	—	0~+8
切 边 EC	700~<1200	0~+2	0~+4
	1200~1830	0~+3	0~+5

1.3.3 冷轧钢板长度允许偏差

公称长度 L	长度允许偏差	
	高级精度 PL.B	普通精度 PL.A
≤2000	0~+3	0~+6
>2000	0~+0.0015 X L	0~+0.003 X L

1.3.4 冷轧钢板不平度允许值

规定的 最小屈服强度 MPa	公称宽度 mm	不平度 不大于					
		高级精度 PF.B			普通精度 PF.A		
		公称厚度 mm					
		<0.70	<0.70~<1.20	≥1.20	<0.70	<0.70~<1.20	≥1.20
<280	≤1200	5	4	3	12	10	8
	>1200~1500	6	5	4	15	12	10
	>1500	8	7	6	19	17	15
280~<360	≤1200	8	6	5	15	13	10
	>1200~1500	9	8	6	18	15	13
	>1500	12	10	9	22	20	19
≥360	—	—	—	—	—	—	—

1.3.5 冷轧钢板、钢带镰刀弯允许值

产品分类	镰刀弯≤	测量长度
切边钢带及长度>2000的钢板	6	2000
长度≤2000的钢板	钢板实际长度的0.3%	



### 1.3.2 Allowable width deviation of cold rolled steel plates and strips

Edge Status	Nominal Width mm	Allowable Width Deviation mm	
		High-grade Precision PW.B	General Precision PW.A
Edge misalignment	730~1850	—	0~+8
Edge cutting	700~<1200	0~+2	0~+4
	1200~1830	0~+3	0~+5

### 1.3.3 Allowable length deviation of cold rolled steel plates and strips

Nominal Length	Allowable Length Deviation mm	
	High-grade Precision PL.B	General Precision PL.A
≤2000	0~+3	0~+6
>2000	0~+0.0015 X L	0~+0.003 X L

### 1.3.4 Allowable flatness of cold rolled steel plates

Min. Yield Strength Specified MPa	Nominal Width mm	Flatness ≤					
		High-grade Precision PF.B			General Precision PF.A		
		Nominal Thickness mm					
		<0.70	<0.70~<1.20	≥1.20	<0.70	<0.70~<1.20	≥1.20
<280	≤1200	5	4	3	12	10	8
	>1200~1500	6	5	4	15	12	10
	>1500	8	7	6	19	17	15
280~<360	≤1200	8	6	5	15	13	10
	>1200~1500	9	8	6	18	15	13
	>1500	12	10	9	22	20	19
≥360	—	—	—	—	—	—	—

### 1.3.5 Allowable camber of cold rolled steel plates and strips

Product Variety	Camber ≤	Measuring Length
Edge cutting strips and steel plates longer than 2000	6	2000
Steel plates ≤ 2000	0.3% of actual plate length	

汽车用普冷钢板（带）	汽车用电镀锌钢板（带） Electrogalvanized automotive plates (strips)	汽车用热镀锌钢板（带）
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二、汽车用电镀锌钢板（带）  
2. Electrogalvanized automotive plates (strips)

宝钢生产的电镀锌钢板及钢带具有耐蚀性好、表面质量高（可提供O5表面），加工性能及涂装性能优异等特点，可用于制作汽车内外板及结构件和加强件。目前，国内主要的汽车厂大都使用了宝钢生产的电镀锌板。

Electrogalvanized plates and strips made by Baosteel are featured with good erosion-resistant, high surface quality (O5 plate surfaces are available) and excellent processing and coating performances. They can be used to manufacture inside and outside automotive plates, structural parts and reinforcements. Currently, most main domestic automobile makers use electrogalvanized plates or electrolytic Zn-Ni coated plates produced by Baosteel.

2.1 电镀锌牌号与基板牌号对照表  
2.1 Reference list of electrogalvanized plate grades and base plate grades

牌 号 Steel Grade	用 途 Purpose	基板牌号 Base Plate Grade	对应基板标准 Corresponding Base Plate Standards
SECC、SECD、SECE	冲压用钢 Drawing	SPCC、SPCD、SPCE	Q/BQB 402-2003
SECIF		DC05 ( BSC2 )	Q/BQB 403-2003
BLCE+Z		BLC	Q/BQB 408-2003
BLDE+Z		BLD	
BUSDE+Z		BUSD	
BUFDE+Z		BUFD	
BSUFDE+Z		BSUFD	
B170P1E+Z	冷成形用钢 Cold forming	B170P1	Q/BQB 411-2003
B210P1E+Z		B210P1	
B250P1E+Z		B250P1	
B180P2E+Z		B180P2 ( BP340 )	
B220P2E+Z		B220P2 ( BP380 )	Q/BQB 416-2003
B140H1E+Z		B140H1	
B180H1E+Z		B180H1	
B180H2E + Z		B180H2 ( BH340 )	Q/BQB 418-2003
B340/590DPE + Z		B340/590DP	
B400/780DPE + Z		B400/780DP	Q/BQB 419-2003
B340LAE + Z		B340LA	
B410LAE + Z		B410LA	

2.2 产品尺寸

公称厚度：0.30mm～2.0mm，公称宽度：800mm～1830mm。

注：钢板及钢带的公称厚度为基板厚度和镀层厚度之和。

2.2 Product sizes

Nominal thickness: 0.30mm~2.0mm, nominal width: 800mm~1830mm

Note: nominal thickness of a plate/strip is sum of base plate thickness and coating thickness.

汽车用普冷钢板（带）	汽车用电镀锌钢板（带） Electrogalvanized automotive plates (strips)	汽车用热镀锌钢板（带）
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2.3 力学和工艺性能

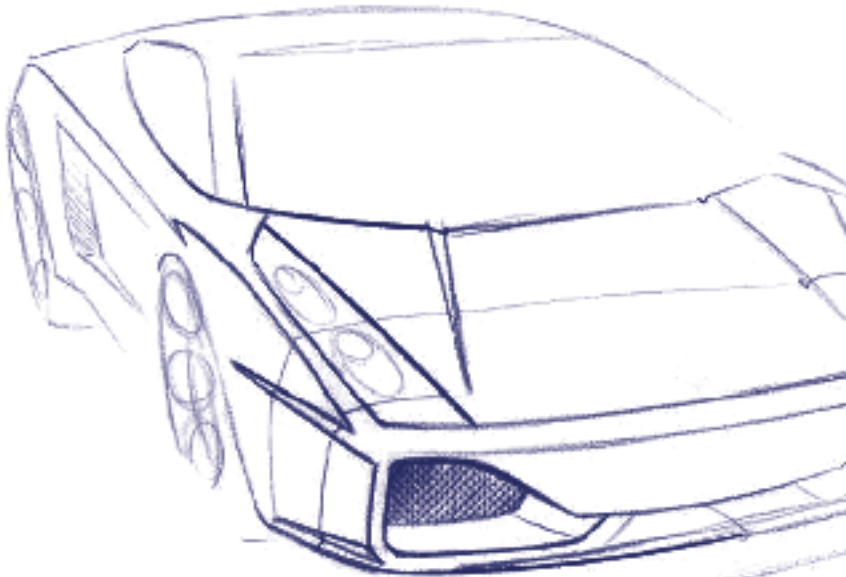
- 1. 纯锌镀层钢板及钢带的力学性能及工艺性能应符合相应基板的规定。
- 2. 锌镍合金镀层钢板及钢带力学性能中的断后伸长率，允许比相应基板的规定值下降2个单位，r值允许比相应基板的规定值下降0.2；其他力学性能及工艺性能应符合相应基板的规定。

2.4 镀层可供重量范围如下表的规定

		g/m <sup>2</sup>
镀层形式	镀层种类	
	纯锌镀层（单面）	
等 厚	3~90	
差 厚	3~90，两面差值最大值为40	
单 面	10~110	
注：50g/m <sup>2</sup> 纯锌镀层重量约等于7.1 μm		

2.5 镀层弯曲试验

- 1. 对冲压用钢板及钢带，应对镀层进行弯曲试验，在任何方向上，当弯心直径为0a，弯曲角度180°，试验进行至二面贴合时，试样外侧表面（距试样二侧边部各大于7mm的部分）不得发生镀层脱落。
- 2. 对冷成形用钢板及钢带，应对镀层进行弯曲试验，在任何方向上，弯曲角度180°，试样外侧表面（距试样二侧边部各大于7mm的部分）不得发生镀层脱落。弯心直径见对应基板中的规定；如基板对弯心直径没有要求，弯心直径按0a执行。



### 2.3 Mechanical and process performances

- 1) The mechanical and process performances of pure zinc coated plates/strips must comply with the stipulations of those of relevant base plates.
- 2) Among the mechanical performances of Zn-Ni alloy coated plates/strips, breakage percent elongation is allowed to be lowered by 2 units against that of relevant base plates,  $r$  is allowed to be lowered by 0.2 against that of relevant base plates and other mechanical and process performances shall comply with the stipulations of those of relevant base plates.

### 2.4 Available coating weight range is given in the following table.

Coating Form	Coating Variety
	Pure Zinc Coating (single-side)
Equally coating	3~90
Differential coating	3~90, max. coating thickness difference between two sides: 40
Single-side coating	10~110

Note: 50g/m<sup>2</sup> pure zinc coating weight is equivalent to about 7.1μm

### 2.5 Coating bending test

- 1) Steel plates and strips for drawing purposes are subject to coating bending test. No coating strips on the outside surface of a sample (at the spot over 7mm away from two edges of the sample), which is bended by 180 degrees in any direction with bending center diameter of 0a, when its two surfaces are met.
- 2) Steel plates and strips for cold forming purposes are subject to coating bending test. There are no coating strips on the outside surface of a sample (at the spot over 7mm away from two edges of the sample), which is bended by 180 degrees in any direction. Refer to provisions of relevant base plates for bending center diameter and take 0a as the bending center diameter in case of no requirements by the base plates for it.



## Chapter 4 产品介绍 Products Instruction

汽车用普冷钢板（带）

汽车用电镀锌钢板（带）

Electrogalvanized automotive plates (strips)

汽车用热镀锌钢板（带）

### 2.6 表面质量

代 号	级 别	特 征
FB (O3)	较高级的精整表面	不得有漏镀、镀层脱落、裂纹等缺陷，但不影响成型性及涂漆附着力的轻微缺陷，如小划痕、小辊印、轻微的刮伤等缺陷则允许存在。
FC (O4)	高级的精整表面	产品二面中较好的一面必须对轻微划痕、辊印等缺陷进一步限制，另一面必须至少达到FB的要求。
FD (O5)	超高级的精整表面	产品二面中较好的一面必须对缺陷进一步限制，即不能影响涂漆后的外观质量，另一面必须至少达到FB的要求。

### 2.7 表面处理

1	铬酸钝化处理（C）	该表面处理可减少产品表面在运输和储存期间产生白锈。
2	铬酸钝化处理 + 涂油（S）	该表面处理可进一步减少产品表面产生白锈。
3	磷化处理(含封闭处理)（P）	该表面处理为钢板进一步涂漆作表面准备，起一定的润滑作用，同时可减少产品表面产生白锈。
4	磷化处理(含封闭处理) + 涂油（Q）	该表面处理可减少产品表面产生白锈，并可改善钢板的成型性能。
5	磷化处理(不含封闭处理)（T）	该表面处理可减少产品表面产生白锈。
6	磷化处理(不含封闭处理) + 涂油（V）	该表面处理可减少产品表面产生白锈，并改善钢板的成型性能。
7	涂油（O）	该表面处理可减少产品表面产生白锈。一般不作为后加工用轧制油和冲压润滑油。
8	不处理（M）	不处理方式极易使产品表面产生白锈，如需方指定采用该方式，应在合同中注明。

### 2.6 Surface quality

Code No.	Grade	Features
FB (O3)	Relatively high-grade finishing surface	No defects such as holiday, coating stripping and cracks are allowed. However, it is allowed for the existence of minor defects which will not affect forming and coating adhesiveness such as minor scratch, small roll mark and slight scuffing.
FC (O4)	High-grade finishing surface	One side of relatively good quality must further restrict on defects such as light scratch and roll mark and the other side must reach FB requirements at least.
FD (O5)	Ultra high-grade finishing surface	One side of relatively good quality must further restrict on defects, namely appearance quality after painting is not affected, and the other side must reach FB requirements at least.

### 2.7 Surface treatment

1	Chromate treatment (C)	This surface treatment can reduce white rusts formed on product surfaces during transportation and storage.
2	Chromate treatment + oiling (S)	This surface treatment can further reduce white rusts formed on product surfaces.
3	Phosphate treatment (with seal treatment) (P)	This surface treatment serves as preparation for further surface painting and has some lubrication function. Also, it can reduce white rusts formed on product surfaces.
4	Phosphate treatment (with seal treatment) + oiling (O)	This surface treatment can reduce white rusts formed on product surfaces and improve formability of steel plates.
5	Phosphate treatment (without seal treatment) (T)	This surface treatment can reduce white rusts formed on product surfaces.
6	Phosphate treatment (without seal treatment) + oiling (V)	This surface treatment can reduce white rusts formed on product surfaces and improve formability of steel plates.
7	Oiling (O)	This surface treatment can reduce white rusts formed on product surfaces. However, it normally does not used as rolling oil and drawing lubrication oil for post processing.
8	No treatment (M)	No treatment tends to the forming of white rusts on steel plate and strip surface. If the user requires such method, it shall be indicated in the orders.



汽车用普冷钢板（带）	汽车用电镀锌钢板（带） Electrogalvanized automotive plates (strips)	汽车用热镀锌钢板（带）
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## 2.8 供货标准、牌号与相当或相近标准、牌号对照表

## 2.8 Reference list of supply standards and steel grades as well as those equivalent or close to them

Q/BQB 430-2003	JIS G3313-1998	GB/T17675-1995	ASTM A591-98（基板）
SECC	SECC	DX1	CS
SECD	SECD	DX2	DS
SECE	SECE	DX3	DDS
SECIF	—	—	EDDS

Q/BQB 430-2003	EN 10152-1993	Q/BQB 430-2003	JFS A3021-1998
BLCE+Z	DC01+ZE	B170P1E+Z	JEC370P
BLDE+Z	DC03+ZE	B210P1E+Z	JEC390P
BUSDE+Z	DC04+ZE	B250P1E+Z	JEC440P
BUFDE+Z	DC05+ZE	B180P2E+Z	JEC340W
BSUFDE+Z	DC06+ZE	B220P2E+Z	JEC390W
		B140H1E+Z	—
		B180H1E+Z	—
		B180H2E+Z	—
		B340/590DPE+Z	—
		B400/780DPE+Z	—
		B340LAE+Z	—
		B410LAE+Z	JEC590R

## 2.9 尺寸、外形的允许偏差

电镀锌钢板及钢带尺寸、外形的允许偏差同相应原板，按Q/BQB401-2003的规定执行。

## 2.9 Allowable size and outline deviations

Allowable size and outline deviations of electrogalvanized plates and strips shall abide by stipulations of Q/BQB401-2003 on relevant base plates.



### 三、汽车用热镀锌钢板（带）

#### 3. Hot dip galvanized automotive plates (strips)

宝钢生产的热镀锌板（卷），锌层附着力强，耐腐蚀能力强，锌层厚度控制准确，尺寸精度高，板型平直；有良好的力学性能，加工性和焊接性。可用于制作汽车内外板以及结构件和加强件。国内主要汽车厂已大量使用。

Hot dip galvanized plates (coils) of Baosteel are featured with strong coating adhesiveness, high erosion-resistance, accurately controlled zinc coating thickness, high size precision, flat profile and good mechanical, processing and welding performance. They can be used for making outside and inside automotive plates, structural parts and reinforcements. Great quantities of them have been used by main domestic automobile makers.

汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带） Hot dip galvanized automotive plates (strips)
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### 3.1 用途及特点如下表的规定

牌 号	用 途	特 点
DC51D+Z (St01Z, St02Z, St03Z) , DC51D+ZF	一般用	低碳钢和/或超低碳钢
DC52D+Z (St04Z), DC52D+ZF	冲压用	
DC53D+Z (St05Z), DC53D+ZF	深冲用	超低碳钢
DC54D+Z (St06Z), DC54D+ZF	特深冲用	
DD54D+Z (St06ZR)		
DC56D+Z (St07Z), DC56D+ZF	超深冲用	
S220GD+Z, S220GD+ZF, S250GD+Z, S250GD+ZF, S280GD+Z (StE280-2Z), S280GD+ZF, S320GD+Z, S320GD+ZF, S350GD+Z (StE345-2Z), S350GD+ZF, S550GD+Z, S550GD+ZF	结构用	碳素钢或低合金钢
H220PD+Z, H220PD+ZF	冷成形用	加磷高强度钢
H260PD+Z, H260PD+ZF		低合金高强度钢
H300LAD+Z, H300LAD+ZF, H340LAD+Z (HSA340Z), H340LAD+ZF, H380LAD+Z, H420LAD+Z (HSA410Z)		
H180YD+Z, H180YD+ZF, H220YD+Z, H220YD+ZF, H260YD+Z, H260YD+ZF		超低碳高强度钢
H180BD+Z, H180BD+ZF, H220BD+Z, H220BD+ZF, H260BD+Z, H260BD+ZF		烘烤硬化高强度钢

### 3.1 Applications and features are given as following table

Steel Grade	Application	Feature
DC51D+Z (St01Z, St02Z, St03Z) , DC51D+ZF	Commercial purpose	Low carbon and/or ultra-low carbon steel
DC52D+Z (St04Z), DC52D+ZF	Drawing	
DC53D+Z (St05Z), DC53D+ZF	Deep drawing	Ultra-low carbon steel
DC54D+Z (St06Z), DC54D+ZF	Extra deep drawing	
DD54D+Z (St06ZR)		
DC56D+Z (St07Z), DC56D+ZF	Supreme extra deep drawing	
S220GD+Z, S220GD+ZF, S250GD+Z, S250GD+ZF, S280GD+Z (StE280-2Z), S280GD+ZF, S320GD+Z, S320GD+ZF, S350GD+Z (StE345-2Z), S350GD+ZF, S550GD+Z, S550GD+ZF	Structure	Carbon steel or low-alloy steel
H220PD+Z, H220PD+ZF	Cold forming	High-strength phosphor steel
H260PD+Z, H260PD+ZF		High-strength low-alloy steel
H300LAD+Z, H300LAD+ZF, H340LAD+Z (HSA340Z), H340LAD+ZF, H380LAD+Z, H420LAD+Z (HSA410Z)		
H180YD+Z, H180YD+ZF, H220YD+Z, H220YD+ZF, H260YD+Z, H260YD+ZF		
H180BD+Z, H180BD+ZF, H220BD+Z, H220BD+ZF, H260BD+Z, H260BD+ZF		

3.2 产品尺寸

公称厚度：0.30mm~3.0mm，公称宽度：800mm~1830mm。

注：钢板及钢带的公称厚度为基板厚度和镀层厚度之和。

3.3 厚度允许偏差

规定的最小屈服强度小于280MPa时厚度允许偏差应符合表1的规定。

表1						单位：mm
公称厚度	下列宽度时的厚度允许偏差					
	普通精度 PT.A			高级精度 PT.B		
	≤1200	> 1200~1500	> 1500	≤1200	> 1200~1500	> 1500
0.30~0.40	±0.05	±0.06	—	±0.03	±0.04	—
>0.40~0.60	±0.06	±0.07	±0.08	±0.04	±0.05	±0.06
>0.60~0.80	±0.07	±0.08	±0.09	±0.05	±0.06	±0.06
>0.80~1.00	±0.08	±0.09	±0.10	±0.06	±0.07	±0.07
>1.00~1.20	±0.09	±0.10	±0.11	±0.07	±0.08	±0.08
>1.20~1.60	±0.11	±0.12	±0.12	±0.08	±0.09	±0.09
>1.60~2.00	±0.13	±0.14	±0.14	±0.09	±0.10	±0.10
>2.00~2.50	±0.15	±0.16	±0.16	±0.11	±0.12	±0.12
>2.50~3.00	±0.17	±0.18	±0.18	±0.12	±0.13	±0.13

规定的最小屈服强度不小于280MPa时厚度允许偏差应符合表2的规定。

表2						单位：mm
公称厚度	下列宽度时的厚度允许偏差					
	普通精度 PT.A			高级精度 PT.B		
	≤1200	> 1200~1500	> 1500	≤1200	> 1200~1500	> 1500
0.30~0.40	±0.06	±0.07	—	±0.04	±0.05	—
>0.40~0.60	±0.07	±0.08	±0.09	±0.05	±0.06	±0.07
>0.60~0.80	±0.08	±0.09	±0.11	±0.06	±0.07	±0.07
>0.80~1.00	±0.09	±0.11	±0.12	±0.07	±0.08	±0.08
>1.00~1.20	±0.11	±0.12	±0.13	±0.08	±0.09	±0.09
>1.20~1.60	±0.13	±0.14	±0.14	±0.09	±0.11	±0.11
>1.60~2.00	±0.15	±0.17	±0.17	±0.11	±0.12	±0.12
>2.00~2.50	±0.18	±0.19	±0.19	±0.13	±0.14	±0.14
>2.50~3.00	±0.20	±0.21	±0.21	±0.14	±0.15	±0.15

### 3.2 Product sizes

Nominal thickness: 0.30mm~3.0mm, nominal width: 800mm~1830mm

Note: nominal thickness of a plate/strip is sum of base plate thickness and coating thickness.

### 3.3 Allowable thickness deviation

The allowable thickness deviation in case of min. yield strength < 280 MPa specified shall comply with the provisions of Table 1.

Nominal Thickness	Allowable Thickness Deviation in case of Following Widths					
	General Precision PT.A			High-grade Precision PT.B		
	≤1200	>1200~1500	>1500	≤1200	>1200~1500	>1500
0.30~0.40	±0.05	±0.06	—	±0.03	±0.04	—
>0.40~0.60	±0.06	±0.07	±0.08	±0.04	±0.05	±0.06
>0.60~0.80	±0.07	±0.08	±0.09	±0.05	±0.06	±0.06
>0.80~1.00	±0.08	±0.09	±0.10	±0.06	±0.07	±0.07
>1.00~1.20	±0.09	±0.10	±0.11	±0.07	±0.08	±0.08
>1.20~1.60	±0.11	±0.12	±0.12	±0.08	±0.09	±0.09
>1.60~2.00	±0.13	±0.14	±0.14	±0.09	±0.10	±0.10
>2.00~2.50	±0.15	±0.16	±0.16	±0.11	±0.12	±0.12
>2.50~3.00	±0.17	±0.18	±0.18	±0.12	±0.13	±0.13

The allowable thickness deviation in case of min. yield strength ≥ 280 MPa specified shall comply with the provisions of Table 2.

Nominal Thickness	Allowable Thickness Deviation in case of Following Widths					
	General Precision PT.A			High-grade Precision PT.B		
	≤1200	>1200~1500	>1500	≤1200	>1200~1500	>1500
0.30~0.40	±0.06	±0.07	—	±0.04	±0.05	—
>0.40~0.60	±0.07	±0.08	±0.09	±0.05	±0.06	±0.07
>0.60~0.80	±0.08	±0.09	±0.11	±0.06	±0.07	±0.07
>0.80~1.00	±0.09	±0.11	±0.12	±0.07	±0.08	±0.08
>1.00~1.20	±0.11	±0.12	±0.13	±0.08	±0.09	±0.09
>1.20~1.60	±0.13	±0.14	±0.14	±0.09	±0.11	±0.11
>1.60~2.00	±0.15	±0.17	±0.17	±0.11	±0.12	±0.12
>2.00~2.50	±0.18	±0.19	±0.19	±0.13	±0.14	±0.14
>2.50~3.00	±0.20	±0.21	±0.21	±0.14	±0.15	±0.15



3.4 宽度允许偏差

钢板及钢带的宽度允许偏差按表3的规定。

表3		单位：mm
公称宽度	宽度允许偏差	
	普通精度 PW.A	高级精度 PW.B
≤1200	+5 0	+2 0
>1200~1500	+6 0	+2 0
>1500	+7 0	+3 0

其它的尺寸、外形及其允许偏差按 Q/BQB401 的规定。

3.5 力学性能和镀层附着性

1. 钢板及钢带的力学性能和镀层附着性应符合表4、表5、表6中的规定。
2. 拉伸试样为横向试样。当屈服现象不明显时，屈服强度为 $R_{p0.2}$ ；当屈服现象明显时，冲压用钢和冷成型用钢的屈服强度采用  $R_{eL}$ ，结构钢的屈服强度采用 $R_{eH}$ 。
3. 弯曲180° 后，试样外表面不得出现镀层脱落，距试样边部5mm内允许有镀层脱落；对于锌铁合金产品，弯曲180° 后，试样外表面允许出现细纹开裂或表面变糙。镀层弯曲试验试样为纵向试样或横向试样。

3.4 Allowable width deviation

The allowable width deviation of steel plates and strips shall comply with the provisions of Table 3.

Table 3		Unit: mm
Nominal Width	Allowable Width Deviation	
	General Precision PW.A	High-grade Precision PW.B
≤1200	+5 0	+2 0
>1200~1500	+6 0	+2 0
>1500	+7 0	+3 0

Q/BQB401 regulations shall be followed for other sizes, outlines and their allowable deviations.

3.5 Mechanical performances and coating adhesiveness

- 1) Steel plates and strips shall comply with the provisions of Table 4, Table 5 and Table 6 in terms of mechanical performances and coating adhesiveness.
- 2) The tensile samples are horizontal ones. Yield strength  $RP0.2$ is taken in case of indistinct yield, and  $ReL$  is taken for the drawing and cold forming steel in case of distinct yield.  $ReH$  is taken for the structural steel.
- 3) There are no coating strips on the outside surface of a sample, which is bended by 180 degrees, with the exception of the parts within 5mm from either edge of the sample. For Zn-Fe alloy products, it is allowed for the existence of hair cracks or surface roughing on the outside surface of a sample. The coating bending test samples are longitudinal or horizontal ones.





表4 Table 4

牌 号 Steel Grade	力学性能 Mechanical Performances						镀层附着性 Coating Adhesiveness		
	屈服强度 MPa  Yield Strength MPa	抗拉强度 MPa  Tensile Strength MPa	n <sub>90</sub> 不小于  n <sub>90</sub> ≥	r <sub>90</sub> 不小于  r <sub>90</sub> ≥	断后伸长率 % 不小于 After Breakage Percent Elongation % ≥		下列镀层重量 ( g/m² ) 时的弯心直径 <sup>c</sup> (a=板厚) Bending Center Diameter in Following Coating Weight (g/m²) <sup>c</sup> (a=plate thickness)		
					L <sub>0</sub> =80mm, b=20mm				
					下列公称厚度时 mm Under following nominal thickness mm				
					≤0.7	>0.7	≤140/140	>140/140~ 175/175	>175/175
DC51D+Z (St01Z, St02Z, St03Z), DC51D+ZF	—	270~500	—	—	20	22	0a	1a	2a
DC52D+Z (St04Z), DC52D+ZF	140~300	270~420	—	—	24	26			
DC53D+Z (St05Z), DC53D+ZF	140~260	270~380	—	—	28	30			
DC54D+Z (St06Z)	140~220	270~350	0.18	1.6	34	36			
DC54D+ZF				1.4	32	34			
DC56D+Z (St07Z) <sup>a</sup>	120~180	270~350	0.21	1.9	38	40			
DC56D+ZF <sup>a, b</sup>			0.20	1.7	36	38			

a 当产品厚度大于1.5mm时，r<sub>90</sub>最小规定值可降低0.2。  
b 当产品厚度不大于0.7mm时，r<sub>90</sub>最小规定值可降低0.2，n<sub>90</sub>最小规定值可降低0.01。  
c 对于差厚镀层产品，厚镀层面作为弯曲试验的外表面。  
a. Allowable reduction of min. r<sub>90</sub> specified is by 0.2 in case of product thickness >1.5mm.  
b. Allowable reduction of min. r<sub>90</sub> and n<sub>90</sub> specified are respectively by 0.2 and 0.01 in case of product thickness < 0.7mm.  
c. For differential coated products, the thicker coating is used as outside surface in bending test.



Chapter 4 产品介绍 Products Instruction

汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带） Hot dip galvanized automotive plates (strips)
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表5 Table 5

牌 号 Steel Grade	力学性能 Mechanical Performances				镀层附着性 Coating Adhesiveness
	屈服强度 MPa 不小于 Yield Strength MPa ≥	抗拉强度 MPa 不小于 Tensile Strength MPa ≥	断后伸长率 % 不小于 After Breakage Percent Elongation ≥		弯心直径 (a=板厚) Bending Center Diameter (a=plate thickness)
			L <sub>0</sub> =80mm b=20mm		
			公称厚度 mm Nominal Thickness mm		
			≤0.7	>0.7	
S220GD+Z, S220GD+ZF	220	300	18	20	1a
S250GD+Z, S250GD+ZF	250	330	17	19	1a
S280GD+Z (StE280-2Z), S280GD+ZF	280	360	16	18	2a
S320GD+Z, S320GD+ZF	320	390	15	17	3a
S350GD+Z (StE345-2Z) <sup>a</sup> , S350GD+ZF <sup>a</sup>	350	420	14	16	3a
S550GD+Z, S550GD+ZF	550	560	—	3	—

a. 公称厚度>1.5mm时，弯心直径为4a。  
a. bending center diameter is 4a in case of nominal thickness>1.5mm.

表6 Table 6

牌 号 Steel Grade	力学性能 Mechanical Performances						镀层附着性 Coating Adhesiveness	
	屈服强度 MPa Yield Strength MPa	抗拉强度 MPa Tensile Strength MPa	r <sub>90</sub> 不小于 r <sub>90</sub> ≥	r <sub>90</sub> <sup>a</sup> 不小于 r <sub>90</sub> <sup>a</sup> ≥	BH <sup>b</sup> MPa	断后伸长率 <sup>a</sup> % 不小于 After Breakage Percent Elongation <sup>a</sup> %	下列公称厚度（mm）时的 弯心直径 <sup>c</sup> （a=板厚） Bending Center Diameter <sup>c</sup> in Following Nominal Thickness (mm) (a=plate thickness)	
							L <sub>0</sub> =80mm b=20mm	
H220PD+Z, H220PD+ZF	220~320	340~420	0.15	1.3	—	32	1a	1a
H260PD+Z, H260PD+ZF	260~340	380~440	—	—	—	28	2a	2a
H300LAD+Z, H300LAD+ZF	300~380	380~480	—	—	—	23	2a	3a
H340LAD+Z (HSA340Z), H340LAD+ZF	340~420	410~510	—	—	—	21	3a	4a
H380LAD+Z	380~480	440~560	—	—	—	19	3a	4a
H420LAD+Z (HSA410Z)	420~520	470~590	—	—	—	17	3a	4a
H180YD+Z, H180YD+ZF	180~240	340~400	0.18	1.7	—	34	0a	0a
H220YD+Z, H220YD+ZF	220~280	340~410	0.17	1.5	—	32	1a	1a
H260YD+Z, H260YD+ZF	260~320	380~440	0.16	1.4	—	30	2a	2a
H180BD+Z, H180BD+ZF	180~240	300~360	0.16	1.5	30	34	0a	0a
H220BD+Z, H220BD+ZF	220~280	340~400	0.15	1.2	30	32	1a	1a
H260BD+Z, H260BD+ZF	260~320	360~440	—	—	30	28	2a	2a

a. 对于合金化热镀锌产品，伸长率最小规定值可降低2%，r<sub>90</sub>可降低0.2。  
b. BH值指经2%预应变的试样放置在170℃±5℃温度下保持20分钟，然后在室温下进行拉伸试验，测得的屈服强度对该试样2%预应变时应力的增加值。BH值会随储存时间的延长以及温度的升高而降低，因此建议用户尽快使用。  
c. 当两面镀层重量之和大于180g/m<sup>2</sup>时，弯心直径增加1a；对于差厚镀层产品，厚镀层面作为弯曲试验的外表面。  
a. for alloyed hot-dip galvanized products, the allowable reduction of min. percent elongation and r<sub>90</sub> specified can be respectively by 2% and 0.2.  
b. BH refers to the increment of tested y□  
170°C±5°C for 20 minutes. The user is s□  
c. In case the total weight of two coating sides is larger than180g/m<sup>2</sup>, the bending center diameter will increase by 1a; for differential coated products, the thicker coating is used as outside surface in bending test.

汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带） Hot dip galvanized automotive plates (strips)
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### 3.6 镀层重量范围

镀层形式	适用的表面结构	下列镀层种类的镀层重量范围 <sup>a</sup> g/m <sup>2</sup> (A/B)	
		纯锌镀层	锌铁合金镀层
等厚	Z、X、G、GX、N、R	40/40~225/225	30/30~90/90
差厚 <sup>b</sup>	N、R	30~150(每面)	—

a 50 g/m<sup>2</sup>镀层重量约等于7.1 μm。  
b 对于差厚镀层差厚比最大1:3。

### 3.7 表面结构

表面结构	代号	特    征	用    途
正常锌花	Z	镀锌后在通常条件下锌层冷凝而得的锌花。	一般用途
小锌花	X	通过对锌层的控制冷凝而形成的表面，呈现比正常锌花小的细小锌花。	用于正常锌花不能满足表面外观要求的用途。
光整锌花	G	经专门光整处理得到的表面结构。	用于高表面质量要求的用途，如：用作彩涂基板。
光整小锌花	GX		
零锌花	N	采用特定生产工艺使镀层表面无肉眼可见的锌花。	—
锌铁合金	R	无锌花，灰色，一般无光泽。	适用于进一步涂漆。

### 3.6 Coating weight range

Coating Form	Applicable Surface Structure	Weight Range of Following Coatings <sup>a</sup> g/m <sup>2</sup> (A/B)	
		Zinc Coating	Zn-Fe Alloy Coating
Equally coating	Z, X, G, GX, N, R	40/40~225/225	30/30~90/90
Differential Coating <sup>b</sup>	N, R	30~150 (each side)	—

a. 50 g/m<sup>2</sup>coating weight is equivalent to about 7.1 μm.  
b. max. differential coating thickness ratio is 1:3.

### 3.7 Surface structure

Surface Structure	Code No.	Features	Application
Conventional spangle	Z	Spangles condensated on zinc coating under normal conditions after galvanizing.	Commercial purposes
Small spangle	X	Surface in spangles smaller than conventional ones and due to controlled condensation of zinc coating.	Applications where conventional spangles cannot meet the surface appearance requirements.
Skin passed spangle	G	Surface structure after special skin pass treatment.	Applications of high surface quality requirements, such as color coating base plates.
Skin passed small spangle	GX		
Zero spangle	N	No visible spangles on coating surface as a result of a special production process.	—
Zn-Fe alloy	R	No spangle, gray, normally matte	Applicable to further painting

## Chapter 4 产品介绍 Products Instruction

汽车用普冷钢板（带）

汽车用电镀锌钢板（带）

汽车用热镀锌钢板（带）

Hot dip galvanized automotive plates (strips)

### 3.8 表面处理

1	铬酸钝化处理（L）	铬酸钝化处理是为了防止产品在运输和贮存期间产生白锈而进行的化学处理。
2	涂油处理（Y）	涂油处理是为了防止产品在运输和贮存期间产生白锈。
3	铬酸钝化加涂油处理（LY）	铬酸钝化加涂油处理是为了进一步避免产生白锈，在产品表面进行铬酸钝化后进一步进行涂油处理。

### 3.9 表面质量

级 别	特 征
FB (O3)	允许有小腐蚀点、暗点、带痕、小的铬酸钝化处理缺陷及小锌粒。
FC (O4)	不得有腐蚀点，但在小范围内允许存在轻微压痕、划伤、锌流波纹、轻微的铬酸钝化缺陷，另一面应至少保持FB表面。
FD (O5)	较好的一面必须对缺欠进一步限制，即不能影响涂漆后的外观质量，并应有均匀良好的镀层，另一面应至少保持FB表面。

### 3.8 Surface treatment

1	Chromate treatment (L)	Chromate treatment is a chemical treatment with an aim to prevent white rusts formed on product surfaces during transportation and storage.
2	Oiling (Y)	Oiling is to prevent white rusts formed on product surfaces during transportation and storage.
3	Chromate treatment + oiling (LY)	This treatment with oiling after surface chromate treatment is to further avoid the forming of white rusts.

### 3.9 Surface quality

Code No.	Features
FB (O3)	It is allowed for the existence of small erosion spots, dark spots, strip marks, minor chromate treatment defects and small zinc particles.
FC (O4)	No erosion spot is allowed. However, it is allowed for the existence of light impression, scratches, zinc flow ripple marks, minor chromate treatment defects in small range, while the other side must reach FB requirements at least.
FD (O5)	One side of relatively good quality must further restrict on defects, namely appearance quality after painting is not affected, and the other side must reach FB requirements at least.

### 3.10 拉伸应变痕

对于牌号DC53D+Z、DC53D+ZF、DC54D+Z、DC54D+ZF、DC56D+Z、DC56D+ZF，保证在制造后6个月内使用时不出现拉伸应变痕；对于牌号DC51D+Z、DC51D+ZF、DC52D+Z、DC52D+ZF、H180BD+Z、H180BD+ZF、H220BD+Z、H220BD+ZF、H260BD+Z、H260BD+ZF、H220PD+Z、H220PD+ZF、H260PD+Z、H260PD+ZF，由于这些牌号的钢容易产生拉伸应变痕，建议用户尽快使用，如对拉伸应变痕有特殊要求，应在订货时协商并在合同中注明。

### 3.10 Tensile strain mark

For the steel grades DC53D+Z, DC53D+ZF, DC54D+Z, DC54D+ZF, DC56D+Z, and DC56D+ZF, it is guaranteed that no tensile strain mark occurs on steel plates and strips at their application within 6 months after they are produced. For the steel grades DC51D+Z, DC51D+ZF, DC52D+Z, DC52D+ZF, H180BD+Z, H180BD+ZF, H220BD+Z, H220BD+ZF, H260BD+Z, H260BD+ZF, H220PD+Z, H220PD+ZF, H260PD+Z and H260PD+ZF, the user is suggested to use them as soon as possible because they tend to gaining tensile strain marks. Special requirements for tensile strain marks, if any, shall be negotiated during order placement and indicated in the orders.



## Chapter 4 产品介绍 Products Instruction

汽车用普冷钢板（带）

汽车用电镀锌钢板（带）

汽车用热镀锌钢板（带）

Hot dip galvanized automotive plates (strips)

### 3.11 本标准与被代替标准相近牌号对照表

### 3.11 Steel grade reference list of the standards and those substituted by them

Q/BQB 420-2003	Q/BQB 420-2001	Q/BQB 422-2000
DC51D+Z (St01Z, St02Z, St03Z), DC51D+ZF	St01Z, St02Z, St03Z —	DC51D+Z DC51D+ZF
DC52D+Z (St04Z), DC52D+ZF	St04Z —	DC52D+Z DC52D+ZF
DC53D+Z (St05Z), DC53D+ZF	St05Z —	DC53D+Z DC53D+ZF
DC54D+Z (St06Z), DC54D+ZF	St06Z —	DC54D+Z, DC54D+ZF
DC56D+Z (St07Z), DC56D+ZF	St07Z	DC56D+Z, DC56D+ZF
S220GD+Z, S220GD+ZF	—	S220GD+Z, S220GD+ZF
S250GD+Z, S250GD+ZF	—	S250GD+Z, S250GD+ZF
S280GD+Z (StE280-2Z), S280GD+ZF	StE280-2Z —	S280GD+Z, S280GD+ZF
S320GD+Z, S320GD+ZF	—	S320GD+Z, S320GD+ZF
S350GD+Z (StE345-2Z), S350GD+ZF	StE345-2Z —	S350GD+Z, S350GD+ZF
S550GD+Z, S550GD+ZF	—	S550GD+Z, S550GD+ZF
H220PD+Z, H220PD+ZF	—	H220PD+Z, H220PD+ZF
H260PD+Z, H260PD+ZF	—	H260PD+Z, H260PD+ZF
H300LAD+Z, H300LAD+ZF	—	H300LAD+Z, H300LAD+ZF
H340LAD+Z (HSA340Z), H340LAD+ZF	HSA340Z —	H340LAD+Z, H340LAD+ZF
H380LAD+Z	—	H380LAD+Z
H420LAD+Z (HSA410Z)	HSA410Z	H420LAD+Z
H180YD+Z, H180YD+ZF	—	H180YD+Z, H180YD+ZF
H220YD+Z, H220YD+ZF	—	—
H260YD+Z, H260YD+ZF	—	—
H180BD+Z, H180BD+ZF	—	H180BD+Z, H180BD+ZF
H220BD+Z, H220BD+ZF	—	—
H260BD+Z, H260BD+ZF	—	H260BD+Z, H260BD+ZF

汽车用普冷钢板（带）	汽车用电镀锌钢板（带）	汽车用热镀锌钢板（带） Hot dip galvanized automotive plates (strips)
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本标准与引用标准及其他标准相近牌号对照表

Steel grade reference list of the standards, the cited standards and other standards

Q/BQB 420-2003	EN10142:2000 EN10147:2000 EN10292:2000	EN 10142:1990 EN 10147:1991	JISG3302-1994	ASTMA653M -2002
DC51D+Z (St01Z, St02Z, St03Z), DC51D+ZF	DX51D+Z, +ZF	FeP02GZ, ZF	SGCC	CS type C
DC52D+Z(St04Z), DC52D+ZF	DX52D+Z, +ZF	FeP03GZ, ZF	SGCC	CS type A, type B
DC53D+Z(St05Z), DC53D+ZF	DX53D+Z, +ZF	FeP05GZ, ZF	SGCD1	FS type A, type B
DC54D+Z(St06Z), DC54D+ZF	DX54D+Z, +ZF	FeP06GZ, ZF	SGCD2	DDS
DC56D+Z(St07Z), DC56D+ZF	DX56D+Z, +ZF	DX56D+Z, +ZF (SEW 021)	SGCD3	EDDS
S220GD+Z, S220GD+ZF	S220GD+Z, +ZF	FeE220GZ, ZF	—	SS 230
S250GD+Z, S250GD+ZF	S250GD+Z, +ZF	FeE250GZ, ZF	—	SS 255
S280GD+Z (StE280-2Z) S280GD+ZF	S280GD+Z, +ZF	FeE280GZ, ZF	SGC340	SS 275
S320GD+Z, S320GD+ZF	S320GD+Z, +ZF	FeE320GZ, ZF	—	—
S350GD+Z(StE345-2Z), S350GD+ZF	S350GD+Z, +ZF	FeE350GZ, ZF	—	SS 340 class 1
S550GD+Z, S550GD+ZF	S550GD+Z, +ZF	FeE550GZ, ZF	—	SS 550
H220PD+Z, H220PD+ZF	H220PD+Z, +ZF	—	—	—
H260PD+Z, H260PD+ZF	H260PD+Z, +ZF	—	—	—
H300LAD+Z, H300LAD+ZF	H300LAD+Z, +ZF	—	—	—
H340LAD+Z(HSA340Z), H340LAD+ZF	H340LAD+Z, +ZF	—	—	HSLAS Type B Grade 340
H380LAD+Z	H380LAD+Z	—	—	—
H420LAD+Z(HSA410Z)	H420LAD+Z	—	—	HSLAS Type B Grade 410
H180YD+Z, H180YD+ZF	H180YD+Z, +ZF	—	—	—
H220YD+Z, H220YD+ZF	H220YD+Z, +ZF	—	—	—
H260YD+Z, H260YD+ZF	H260YD+Z, +ZF	—	—	—
H180BD+Z, H180BD+ZF	H180BD+Z, +ZF	—	—	—
H220BD+Z, H220BD+ZF	H220BD+Z, +ZF	—	—	—
H260BD+Z, H260BD+ZF	H260BD+Z, H260BD+ZF	—	—	—





冲压成形 Forming	焊接技术	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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## 冲压成形 Forming

### 1. 基本力学性能

汽车用户使用汽车板首先要进行冲压成形，把钢板冲压成零件所需要的形状和尺寸。薄板的冲压成形是一个非常复杂的过程，和钢板的力学性能、钢板与模具之间的接触摩擦条件、模具及压机的参数等等都有关系。首先关心的是钢板的基本力学性能，主要有屈服强度，抗拉强度，延伸率，r值，n值。一般来说，高的延伸率，高的r值和高的n值有利于冲压成形。



### 1. Mechanical Properties

The first thing for the automobile customer is to form the auto sheet to the desired shape and dimensions. The forming of the auto sheet is a very complex process related to the mechanical property, friction coefficient, die and stamping conditions. The mechanical properties are principally concerned by customer, which includes  $\sigma_s$ ,  $\sigma_b$ ,  $\delta$ , r value, n value. Generally, the higher  $\delta$ , n value and r value is useful for forming process.



冲压成形 Forming	焊接技术	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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2. 模拟成形性能

除了基本力学性能，模拟各种基本成形特征的成形试验结果对钢板成形性能的评价也很重要。采用数字摄像、图形处理和数值分析，可进行材料、冲压U形弯曲模具和冲压工艺参数之间的相互关系的研究。

模拟成形试验研究项目主要有：“S”梁试验评价板料回弹性能、液压胀形试验、杯突试验评价板料胀形性能、成形极限图试验、拉深成形实验评价板料的拉深成形性能、锥杯试验检验拉深-胀形复合成形的板料成形性能、扩孔试验评价板料扩孔成形性能等。

2. Simulative Formability Experiment

Besides the fundamental mechanical properties, it is also important to evaluate the simulative formability corresponding to the typical forming processes. The relationships between the material properties, die and stamping parameters can be studied by the digital video, image processing and numerical analysis.

The main items of simulative formability experiment include: springback performance of “U-bending test” test, hydraulic bulge test, cupping test for evaluating bulging performance, forming limit diagram test (FLD), drawing experiment for evaluating drawing ability, conical cup experiment for evaluating both drawing and bulging ability, hole-expansion experiment for flanging ability and so on.



实验装置  
Test Facility



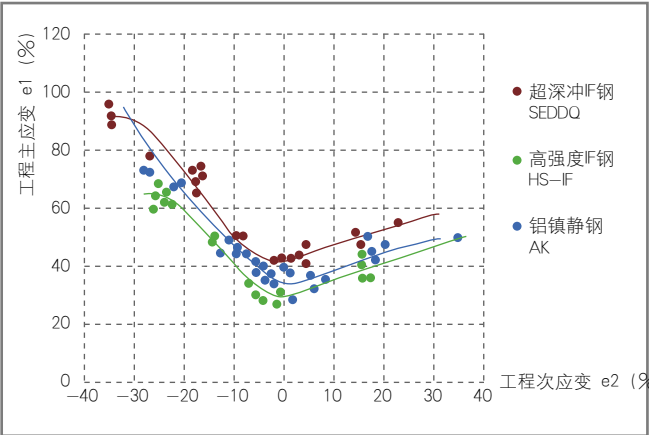
FLD  
FLD



液压胀形  
Hydraulic Bulge Test

在上述的各种成形试验中，成形极限图(FLD)试验非常重要。FLD是板料在不同应变路径下的局部失稳极限应变构成的曲线。FLD描述了各种应变状态下材料的成形极限，对分析复杂零件的成形非常有帮助。下图为典型钢种成形极限图：

FLD experiment is extremely important among the previous experiments. FLD is composed of ultimate strain in different strain path, which describes the forming limit under various strain conditions and is very helpful for the analysis to the forming process of complex parts. The typical FLD can be shown as follows:



不同钢种的成形极限图  
FLD of different Sheet Steel

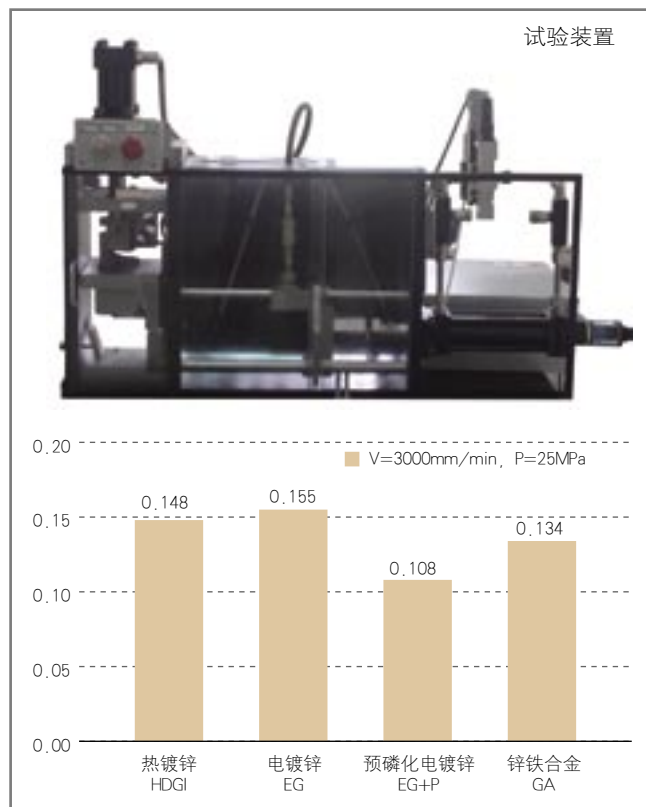
FLC曲线越往上说明材料所能承受的应变越大，成形性能越好。  
The higher the FLC curve is, the better the formability is.

### 3. 表面摩擦特性

除了钢板本身的成形性能外，钢板表面与模具之间的摩擦条件也是影响成形结果的重要因素。要了解钢板与模具之间的摩擦特征是一个相当困难的事情。拉延珠试验机是研究汽车板表面状态的专用设备。该设备通过全软件控制和不同模具实现模拟汽车板的冲压过程，测定汽车板的表面摩擦系数，以研究润滑、粗糙度、温度等对成形的影响，测定汽车板镀层粘附性等级，以研究表面质量和耐腐蚀性。摩擦试验目的是评价汽车用钢板或润滑油的摩擦特性。试验范围：常温 - 120度之间。

### 3. Surface Friction Characteristic

Besides the forming property of steel, the friction condition between steel surface and die is also an important factor for the formation result, but it is difficult to obtain friction condition accurately. The drawbead tester is a special equipment to investigate the surface condition, which can simulate forming process and measure friction coefficient for researching the influence of lubrication, roughness and temperature on formation. It can also measure the degree of coating adhesion to determine the surface quality and corrosion resistant. The purpose of friction experiment is to estimate the friction character of auto sheet or lubricating oil. The operating temperature is from normal temperature to 120°C.



图：4种典型镀锌钢板的摩擦系数  
Friction Coefficient of Four Typical Zn-coating Sheet

### 4. 锌层附着力评估及典型值

目前汽车中镀锌钢板的使用越来越多，在冲压过程中锌层的附着力就显得很重要。用实验方法可以评价汽车用镀锌薄钢板在模拟拉延筋状态下的锌层粘附性。试验使用范围：常温 - 120度之间。

### 4. Coating Adhesion

More and more Zn-coated sheets are used in automotive, and in result the research of adhesion is becoming more and more important and necessary. Experiments can evaluate the adhesion characteristics of Zn-coated steel sheet in the condition of draw bead. The testing temperature is from normal temperature to 120°C.



冲压成形 Forming	焊接技术	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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5. 板材及零件抗凹陷性能评估及试验曲线

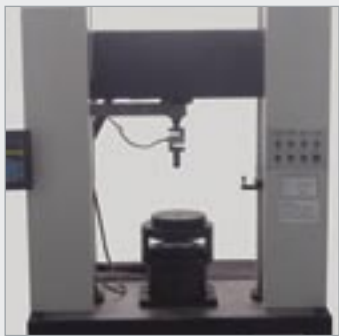
为达到节能目的，汽车覆盖件设计日趋轻量化，成形中大量采用高强度超薄钢板，为评估钢板减薄引起刚性的变化，提出了抗凹性指标。所谓抗凹性是指构件承受横向集中载荷抵抗抗凹陷的能力，它包括：局部凹陷抗力，抗凹刚度。

试验对特定试件模拟覆盖件进行抗凹性评估，在准静态（低速）和动态（高速）压入条件下提供重复可比较的抗凹试验结果，为零件选材提供依据。

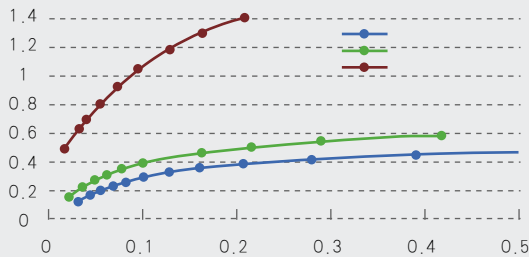
5. Dent resistance of sheet and parts

More and more high strength and ultra-thin steel sheets are used in exposure parts in automotive industry in order to reduce weight for saving energy. Dent resistance is used to evaluate the alternation of stiffness caused by thinner sheet under the cross direction concentrated load. It contains local dent resisting force and dent resistance rigidity.

Dent resistance experiment can also evaluate the dent resistance of simulative parts. It can give a repetitive comparable outcome in quasistatic (low velocity) dynamic state (high velocity). Consequently it is usually used to choose material.



板材抗凹试验设备  
Dent resistance for sheet



不同厚度钢板的抗凹性比较  
Dent resistance of different Thickness

板材抗凹性评估实例：从上图可以看出，厚度增加，局部凹陷抗力增大  
屈服强度增大，局部凹陷抗力增大

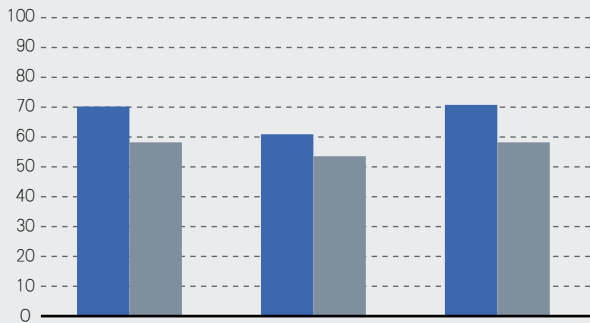
零件抗凹性试验对覆盖件进行抗凹性评估，在准静态（低速）和动态（高速）压入条件下提供重复可比较的抗凹试验结果，对零件成形后的使用性能进行评估。

Local dent resisting force will increase when thickness is increased. It can also be seen from the above diagram: Local dent resisting force will increase with the increasing of yield strength.

Because the dent resistance experiment can give a repetitive comparable outcome in quasistatic (low velocity) dynamic state (high velocity), it also can estimate the service performance of finished product.



零件抗凹试验  
Anti-concave of Part



不同钢种零件抗凹性比较  
Anti-concave of different Steel Parts



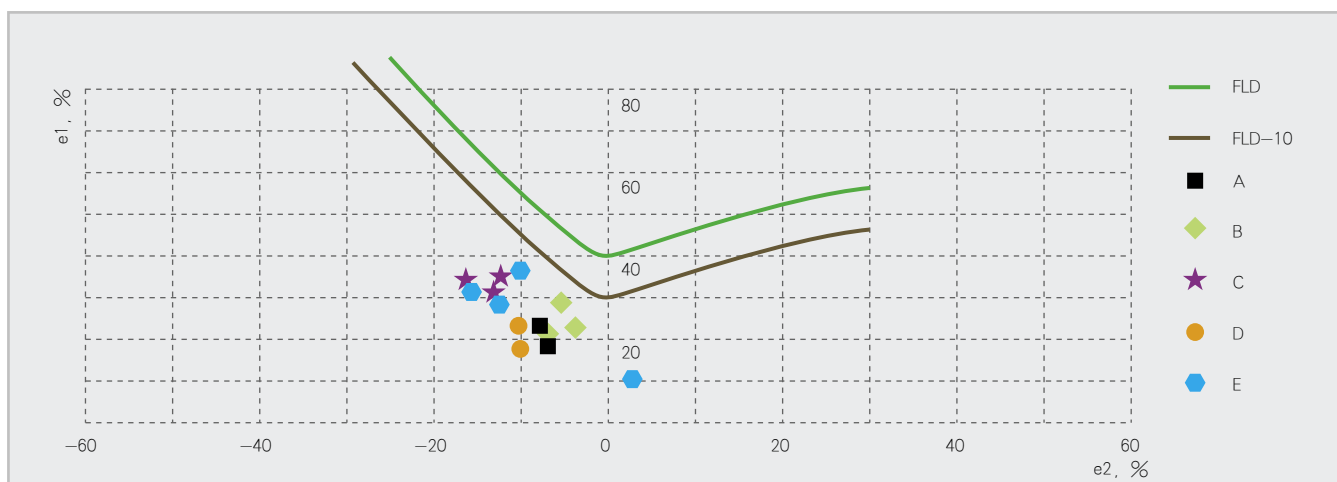
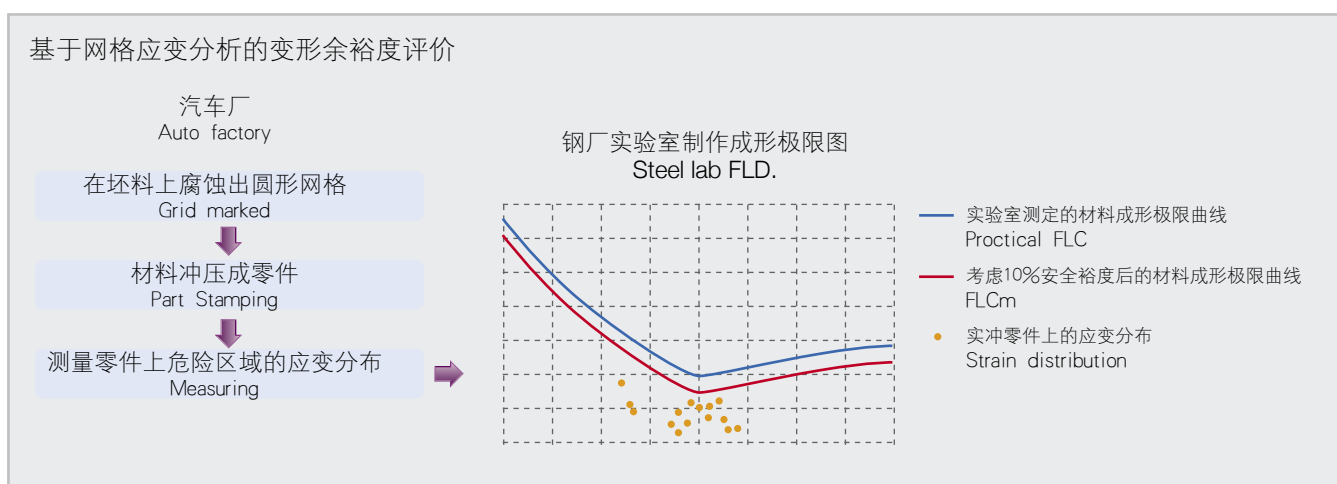
## 6. CGA技术的工程应用

采用成形极限图(FLD),网格应变分析(CGA)以及厚度应变分析(TSA)对零件冲压成形的安全裕度进行评估。

下图就是一个具体实例:

## 6. Engineering application of CGA (Circle Grid Analysis) technology

The safety of forming can be evaluated with the use of forming limit diagram (FLD), CGA and thickness-strain analysis (TSA). The CGA technology can be illustrated by the following process:



通过网格应变分析,零件处于安全状态。

From the curve, it is very clear that the part is in the safe state through CGA.

冲压成形 Forming	焊接技术	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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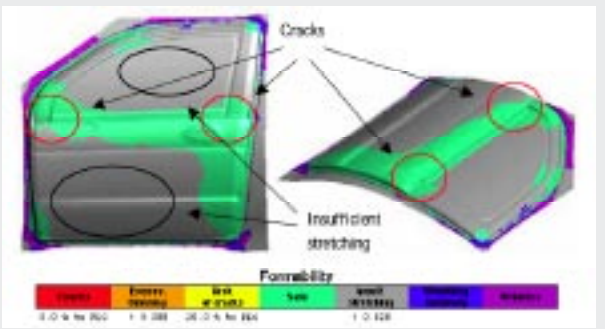
7. 有限元仿真及应用

汽车的计算机仿真技术是计算机辅助分析技术的一种，它始终贯穿于汽车的设计阶段。刚度强度分析、碰撞分析、模态分析用于检验汽车结构是否符合安全标准；虚拟路试用于检验汽车的结构、零件和焊点等的抗疲劳性；冲压仿真分析用于检验车身零件是否具有良好的可成形性。因此汽车计算机仿真技术有效地缩短了汽车的设计周期，节约了大量的人力、物力和时间，从而降低了成本，提高了汽车厂的竞争能力。

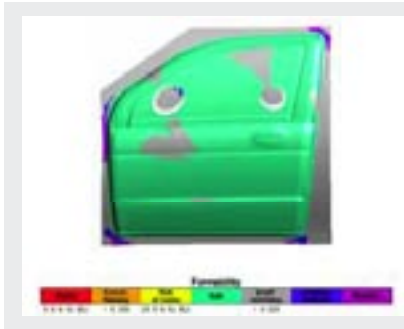
7. Finite Element Simulation

Computer simulation technology of automobile, a kind of computer aided engineering (CAE), is used during of the whole course of auto designing stage. Stiffness analysis, crash-simulation and modal analysis are used to check if the auto structure meets the safe requests. VPG is used to check if the auto structure, the parts and the welded joints have good ability to withstand fracture. Stamping simulation is used to check if the parts have good formability. So the computer simulation technology of automobile effectively shorten the cycle of auto design, decrease the cost and increase the competitive ability of car-manufacturers.

基于初始模具设计的前门外板的冲压成形性  
The formability of front outer door based on the initial die design



通过优化拉延筋的布置和强度，以及增加工艺切口，改善该零件的冲压成形性能。  
The formability of the part is improved by optimizing the dispose and intensity of drawbeads and adding cutting.



基于改进模具设计的前门外板的冲压成形性  
The formability of the front outer door based on the improved die design



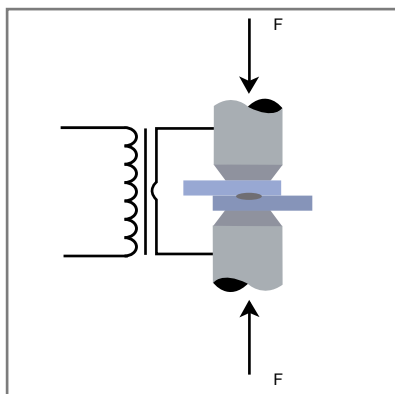
## 焊接技术 Welding

### 1. 汽车板点焊

点焊作为薄板连接的一种重要焊接方法在生产制造业有广泛的应用，尤其是在汽车行业。以轿车为例，每一辆轿车上都有几千个焊点，而这些焊点的质量直接影响汽车的使用性能。镀层钢板与无镀层冷轧钢板在点焊工艺性方面又展现出不同的特性，随着镀层钢板在轿车工业的大量使用，掌握不同镀层汽车板的点焊工艺及性能就显得非常重要。

#### 1. Spot welding

Spot welding has been widely used in industry as a kind of joining method for steel sheets, especially in automotive industry. There have thousands of spot welds in one car. The quality of spot welds had important influence on the properties of car. The spot welding technology of galvanized steel was different compared with that of the cold rolled steel without zinc coatings. With the wide application of galvanized steel in automotive industry, to know about the spot welding technology and weldability of galvanized steel would be very important.



点焊示意图  
The scheme of spot welding

#### 汽车板点焊方法

点焊是焊件装配成搭接接头，并压紧在两电极之间，利用电阻热熔化母材金属，形成焊点的电阻焊焊接方法。点焊过程通常有3个彼此衔接的阶段：焊件在电极间预先压紧；通电后把焊接区加热到一定温度；在电极压力作用下冷却。点焊时由于一定直径电极的加压，使被焊工件变形，且仅在焊接区紧密接触形成电流通道，而其他部分不构成电流通道，从而在焊接区域得到极高的电流密度。

#### Spot welding method

Spot welding belongs to the electrical resistance welding method which use electrical resistance to heat the base metal to form the welded joints which usually adopted the lap joints. Generally speaking, there have three continuous phases during the spot welding process. The first is to hold specimen together between two electrodes; the second process is to heat the welding area to certain temperature range by electrical circuit; the third process is to cool the specimen under the pressure of electrode force. During the spot welding process, the specimen was deformed under the pressure of electrodes with certain diameters and formed the electrical circuit only in the welded area. As a result, there have high current density in the welded area.



冲压成形	焊接技术 Welding	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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**A. 镀层种类、镀层厚度、钢板厚度对焊接性能的影响**  
镀锌钢板与普通冷轧钢板在点焊时表现出不同的工艺性，这种差异主要是因镀层的影响造成的。以镀锌板为例，由于锌先熔化，并产生锌环，从而使试样真实的接触面积扩大，实际电流密度减小，所以为得到同样尺寸的熔核，焊接镀锌钢板的焊接电流要比无镀层钢板的大。

在其它参数相同而镀层厚度不同时，随镀层厚度的增加，最小焊接电流 $I_{min}$ 要升高，最大焊接电流 $I_{max}$ 要下降，致使可焊电流范围减小。

在其它参数相同而钢板厚度不同时，则焊接电流随板厚的增加而升高，但可焊电流范围宽度变化不大，焊点的拉剪强度差异较大。

**B. 焊接电流、焊接时间的影响**  
焊接电流对焊点静载强度的影响显著，在可焊电流范围内焊点静载强度随焊接电流增加而增大。在靠近电流下限的区域，随电流的增加焊点强度的增长速度比靠近电流上限时快。

为了得到合格的熔核尺寸和焊点强度，焊接时间与焊接电流在一定范围内可以互补。为了获得一定强度的焊点，可以采用大焊接电流和短时间（强规范），也可以采用小焊接电流和长时间（弱规范）。选用强条件和弱条件，取决于金属的性能、厚度。

**C. 电极压力、电极形状及材料的影响**  
在增大电极压力的同时，增大焊接电流或延长焊接时间，以弥补电阻减小的影响，可以保持焊点强度不变。采用这种焊接条件有利于提高焊点强度的稳定性。电极压力过小，将引起飞溅，也会使焊点强度降低；电极压力过大，使焊接区压痕太深，减薄严重，也会使焊点强度降低。

当其它参数不变时，电极端面尺寸增大，则电极与试样接触面积增大、电流密度减小、散热效果增强，均使焊接区加热程度减弱，因而熔核尺寸减小，使焊点承载能力降低。随电极端头的变形和磨损，接触面积将增大，焊点强度将降低。

**A. Influence of coating type, thickness of coating and steel sheets on the properties of spot welding**

As for spot welding, galvanized steel demonstrates different welding technology compared with that of cold rolled steel without zinc coatings. The difference is caused by the coatings. Zinc was firstly melted and formed with zinc ring. As a result, the real contact area was increased and the current density was decreased. The welding current for the galvanized steel was higher than that of cold rolled steel without zinc coating in order to obtain the same diameter of nugget.

With the increase of zinc thickness while the other parameters are on the same condition, the minimum welding current  $I_{min}$  will increase and the maximum welding current  $I_{max}$  will decrease. This will lead to the decrease of welding lobe.

With the increase of thickness for steel sheets while the other conditions are the same, the welding current will increase but the width for the welding current lobe varies little. However, the shearing strength for the spot welds changes greatly.

**B. Influence of welding current and welding time**

The influence of welding current on the static strength of welds is great. The static strength of welds increase with the welding current within the welding lobe. In the area near to the bottom of welding lobe, the increase rate of static strength was higher than that of the area near to the top of welding lobe.

In order to obtain the qualified nugget size and strength of welds, the welding time and welding current can compensate within the certain range. For the spot welds with qualified strength, the welding parameters can choose the higher welding current with the short welding cycle time or the lower welding current with the long welding cycle time. This will depend on the properties and thickness of steel sheets.

**C. Influence of electrode force, electrode shape and material**

With the increase of electrode force, there should have higher welding current or long welding time to keep the strength of welds in order to compensate the influence of decreased electrical resistance. By using this welding condition, it is beneficial to improve the stability of the strength of welds. Too lower electrode force can cause splash while too higher electrode force can cause deep dent of welding area. On both situations, the strength of welds would be decreased.

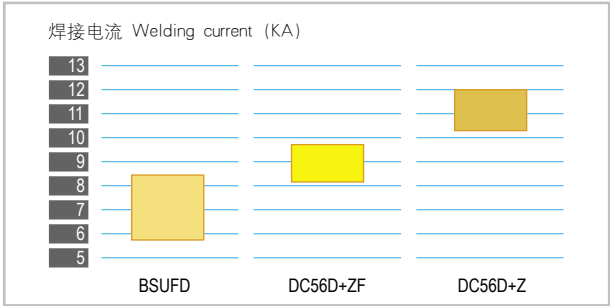
With the increase of the edge size for the electrode face, the contact area between the electrodes and specimen would increase, the current density would decrease. As a result, the nugget size would decrease. This will lead to the reduction of capacity for welds to sustain the load. With the deformation and wear of electrodes, the contact area would also increase. This would also lead to the reduction of strength for the spot welds.

典型汽车板点焊工艺

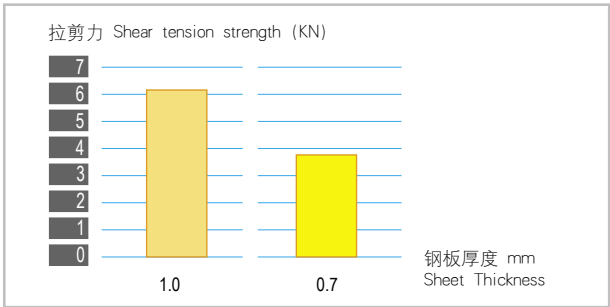
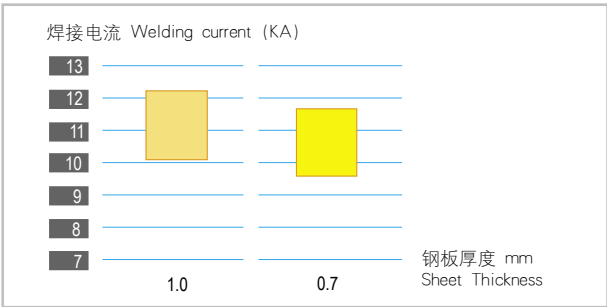
焊接电流的下限以允许最小熔核尺寸为标准。焊接电流的上限以产生飞溅或电极与钢板粘连为标准。

The typical spot welding technology for automobile steel sheets

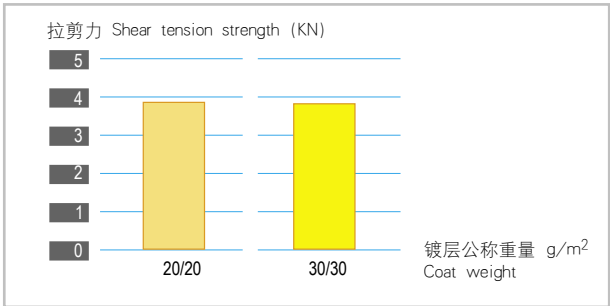
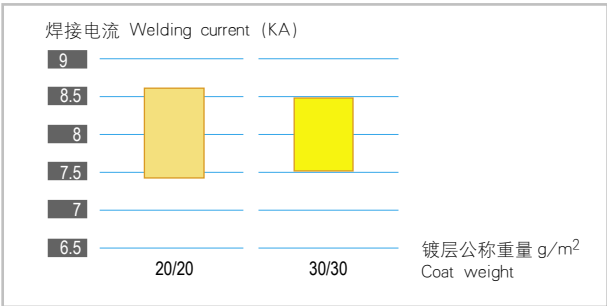
The bottom of welding current is according to the minimum qualified nugget size. The top of welding current is according to the appearance of splash or electrode-to-sheet sticking.



不同表面状态对点焊工艺参数的影响  
Influence of different surface condition on welding parameters



不同钢板厚度对点焊的影响  
Influence of thickness of steel sheets on spot welding



不同镀锌层厚度对点焊的影响  
Influence of thickness of zinc coating on spot welding

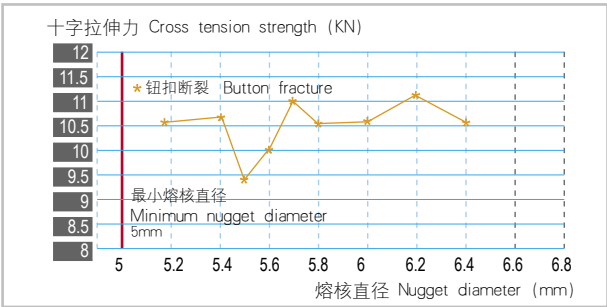
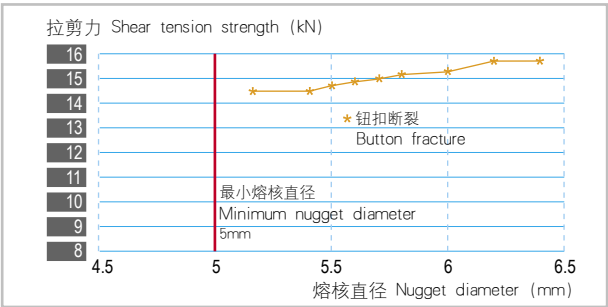
冲压成形	焊接技术 Welding	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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典型汽车板点焊接头性能

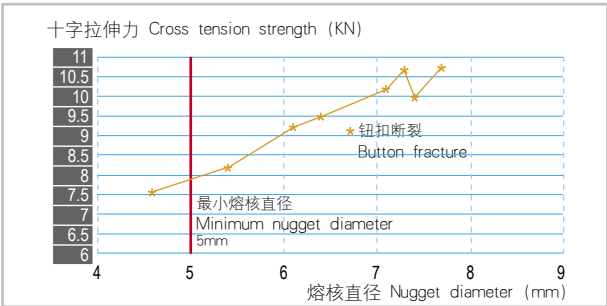
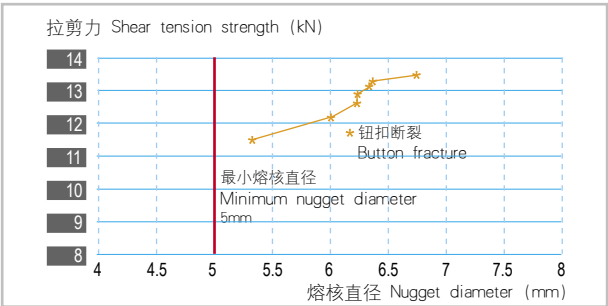
点焊接头强度用抗剪力与正拉力来评定。正拉力Fn与抗剪力Fs的比值（ $K=Fn/Fs$ ）称为剪性比，它的数值越大，接头的塑性越好。正拉力Fn通过十字拉伸试验(CTS)获得；抗剪力Fs通过拉剪试验（TSS）获得。

Typical properties of welded joints of automobile steel sheets

The strength of welded joints for spot welding was evaluated by shearing load and cross tension load. The ratio value of cross tension load with shearing load ( $K=Fn/Fs$ ) was used to evaluate the ductility of welded joints. The tension load was obtained by cross-tension stress test while the shearing load was obtained by shear-tension test.



普通冷轧钢板点焊的拉剪试验和十字拉伸试验  
The results of CTS and TSS for the cold rolled steel without coating



锌铁合金热镀锌板点焊的拉剪试验和十字拉伸试验  
The results of CTS and TSS for the hot deep galvanized steel with Zn-Fe alloy

冲压成形	焊接技术 Welding	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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## 2 汽车板激光拼焊

### 2 Laser tailor welded blanks for automobiles

激光（LASER）是上世纪六十年代出现的一项新技术，随后利用激光进行加工，被逐渐应用于汽车、航空、机械、电子、医疗卫生等各行各业中。汽车工业的飞速发展，又推动了激光加工技术的迅速发展。激光拼焊技术即将原来由几块不同厚度和不同强度板材分别冲压成零部件，然后焊接成整体件的工序，改成先将不同强度和不同厚度的板材冲裁、焊接成整体毛坯，然后进行整体冲压成型。

Laser was the new technology that appeared in the sixties of the last century. Laser processing was widely used in the automobile, aerospace, mechanical, electrical and medical industry. The rapid development of automotive industry promoted the development of laser processing technology. Tailor welded blanks are defined as two or more separate pieces of flat material, dissimilar thickness, and/or mechanical properties, jointed together before forming to provide customized and superior qualities in the finished stamping.

#### 汽车板激光拼焊的优点

- 1 不同材料的任意组合。**激光拼焊板可以将不同钢种、不同厚度、不同表面状态的钢板组合在一起，以满足设计者在汽车不同部位进行设计时，对材料的不同要求，如对易腐蚀的部位，可采用涂镀层钢板；对不受载荷的部位可采用强度等级较低的钢板或采用比原先更薄的钢板；对承受载荷较大的部位则可采用高强度钢板等，从而降低钢材消耗，减轻车身重量，最终降低汽车能耗，减少环境污染。
- 2 零件组合一体成型。**采用激光拼焊板可以将某些原来由几个零件拼接的零件组合实现一体成型，既提高了车身的装配精度，又可简化工序、减少模具设备，降低制造成本。
- 3 提高结构的可靠性和安全性。**由于采用了连续的激光焊缝代替了不连续的点焊，改善了结构刚性，同时，在需要加强的部位，使用了高强板和厚规格钢板，从而提高了整个车身结构的可靠性和安全性。
- 4 满足汽车对宽幅板的需求。**受轧机宽度的限制，能生产宽幅板的厂不多。而采用激光拼焊生产宽幅板比较容易。



#### The benefits of laser tailor welded blanks

- 1. The different combinations of different materials.** Laser tailor welded blanks just use laser technology to join the different steel, thickness and coating condition together to meet the demand of car designer.
- 2. The complete forming by the combinations of automobile parts.** By using tailor welded blanks, the combination of blanks which was formed independently before the appearance of tailor welded blanks was realized. The precision of car body structure can be improved and a lot of press equipment and working procedures can be saved.
- 3. The improvement of safety and reliability for structural parts.** Continuous laser welding was used instead of spot welding. The structural integrity was improved. And more thick and high strength steel were used in some certain locations. The safety and reliability of structural parts were improved.
- 4. Potential to produce wide width automobiles.** Automobile industry shows great concern on the wide width steel sheets while the width of steel sheets were constrained by the roller machine. Tailor welded blanks can solve this problem.

# Chapter 5 汽车板使用技术 Use Technology of Automotive Sheets

冲压成形	焊接技术 Welding	涂装技术	磷化技术	电泳涂装技术	涂装外观质量控制技术
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## 激光拼焊板常用用途

激光拼焊板的这些优点在生产中体现为高质量、高效率、低成本。ULSAB项目在一辆轿车上，共用了16个拼焊板冲压件，由于选用了拼焊板，车身零件数量约减少20%，减重25%。激光拼焊板已被广泛用在汽车内门板、纵梁、底板、立柱等多种汽车内部结构件。

## The application of tailor welded blanks

The benefits of tailor welded blanks were shown as high quality, high efficiency and low cost. In the project of Ultra Light Steel Auto Body, there have 16 tailor welded blanks in one car. As a result, the number of automobile parts was reduced 20%, the weight of the car was reduced 25%. Tailor welded blanks had been widely used in the application of door inner, rail, floor panel and pillar, etc..



地板  
The floor panel



纵梁  
Rail

冲压成形	焊接技术	涂装技术 Coating Technology	磷化技术	电泳涂装技术	涂装外观质量控制技术
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## 涂装技术 Coating Technology

汽车90 % 以上的外表面是涂装面，由车厂对白车身实施涂装工艺而得。目的是赋予汽车优良的耐蚀/耐候性和高装饰性外观，以延长使用寿命、提高商品价值。

首先，涂装后的汽车板应具备高度的功能性，即良好的耐蚀性、耐候性、抗机械冲击性等，其性能的优劣取决于被涂装材自身的防腐性能和涂装特性以及覆盖于其上的有机、无机复合涂装层的综合性能。

同时，涂装后的汽车板还应具有很好的装饰性，一般用肉眼结合仪器测定的外观评估法来表征。主要有涂层表面的桔皮值以及反映反射影像的鲜映性DOI值等。

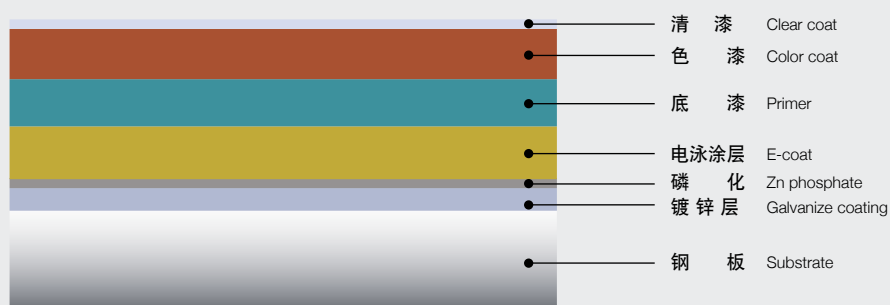
Coating, mainly fulfilled at the paintshop of automobile manufacturers, covers about 90% area of a car's surface. The purpose of that coating is to contribute the car-body an excellent durability and decorative appearance, thus to extend its service life and commercial value.

This coating is multifunctional. First, the coated automotive steel sheet should have a good corrosion resistance, durability and stone-chipping resistance. All these properties are accomplished relying on the basic character of the material and a comprehensive contribution of the multiple organic/inorganic layers on it.

Besides, the coated automotive steel sheet should also have good decorative property, which can be evaluated by bared eyes and some special equipments. The main indexes are orange-peel value and DOI value which shows the clarity of the reflective image on the high gloss top coating.

轿车涂层结构示意图

Illustration of the structure of a typical automobile multi-layers coating



轿车涂装基本流程示意图

Typical coating process of a car





磷化技术 Phosphating technology

磷化是前处理的核心工艺。它是通过钢板/镀锌层表面与酸性磷酸盐溶液反应生成一层非金属的、半导电的多孔磷酸盐无机转化膜。该转化膜的主要功能是提高基板与漆膜的结合力，并改善涂层的膜下防腐和耐水性。由锌、锰、镍三元改性磷化体系通过浸喷结合工艺处理得到的低锌伪转化型磷化膜作为电泳底漆的底层已在汽车行业广泛应用了40余年，并在全球范围内成为了标准化的前处理模式。

Phosphating is the core process of the pretreatment. The phosphate film is a porous and semi-conductive inorganic conversion layer formed by the reaction between steel/zinc coating and the phosphate solution. The formed layer can improve the adhesion of coating on the car body effectively; meanwhile supply the car an excellent under-film corrosion resistance and waterproof property. The most universal way to obtain the phosphating layer is to use a tri-cation(containing Zn, Mn, Ni) waterborne system and a full-dip process. The resulted crystalline layer with low zinc ratio has already been considered as a standard process of the pretreatment of ED-coating, and applied widely in auto industry for more than 40 years.

磷化膜的沉积是一个复杂的化学反应加上电化学反应的过程，可用以下的一系列化学方程式简单表述。  
The forming process of phosphate layer is quite complicated, a mixture of a series of chemical reactions and electro-chemical reactions and can be described briefly with the reaction formulae below.

冷轧板磷化过程 Phosphate of cold-rolled steel sheet

$$\text{Fe} + \text{H}^+ \longrightarrow \text{Fe}^{2+} + \text{H}_2$$

(1)

$$\text{Me}(\text{H}_2\text{PO}_4)_2 \longleftrightarrow \text{MeHPO}_4 + \text{H}^+ \longleftrightarrow \text{Me}_3(\text{PO}_4)_2 + \text{H}^+$$

(2)

$$\text{Fe} + \text{Me}(\text{H}_2\text{PO}_4)_2 \longrightarrow \text{MeFe}(\text{HPO}_4)_2 + \text{H}_2$$

(3)

$$\text{Me}(\text{H}_2\text{PO}_4)_2 + \text{Fe}(\text{H}_2\text{PO}_4)_2 + \text{H}_2\text{O} \longrightarrow \text{Me}_3(\text{PO}_4)_2 \bullet 4\text{H}_2\text{O} + \text{Me}_2\text{Fe}(\text{PO}_4)_2 \bullet 4\text{H}_2\text{O} + \text{H}_3\text{PO}_4$$

(4)

磷化膜 Phosphate layer

镀锌板磷化过程 Phosphate of Zinc-coated steel sheet

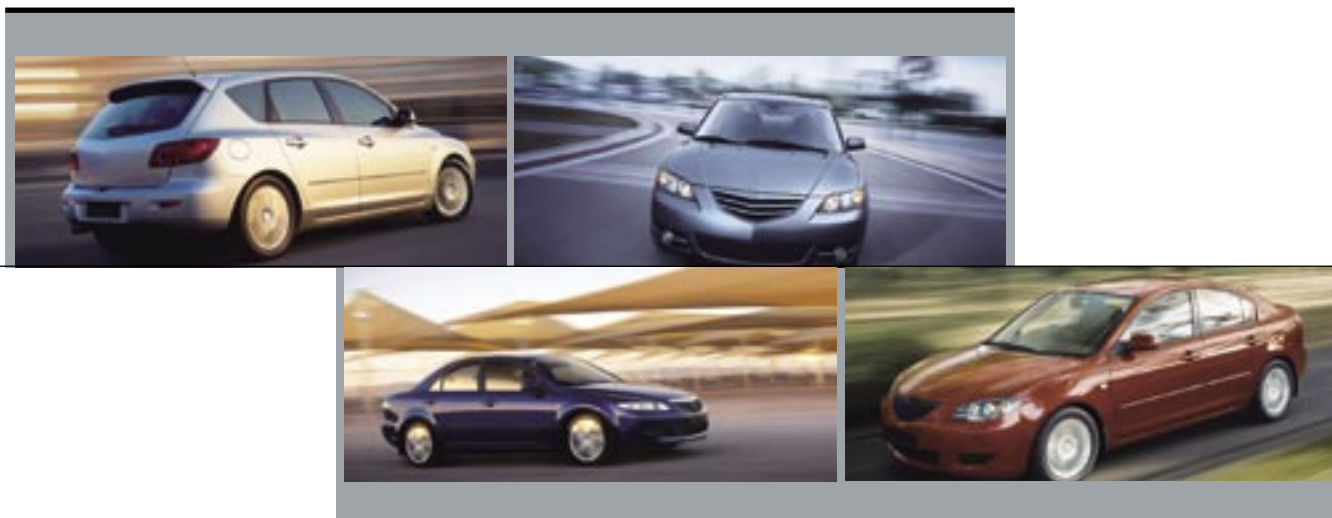
$$\text{Me}(\text{H}_2\text{PO}_4)_2 + \text{H}_2\text{O} \longrightarrow \text{Me}_3(\text{PO}_4)_2 \bullet 4\text{H}_2\text{O} + \text{H}^+$$

Me: Zn, Mn, Ni, Ca

不同钢板的磷化膜结构 Properties of phosphate layers on different substrates	基材	基体SEM SEM of substrate	磷化膜SEM SEM of phosphate layer
	冷轧板 CRS		
	热镀锌 GI		
	热镀锌铁合金 GA		
	电镀锌预磷化 EGP		

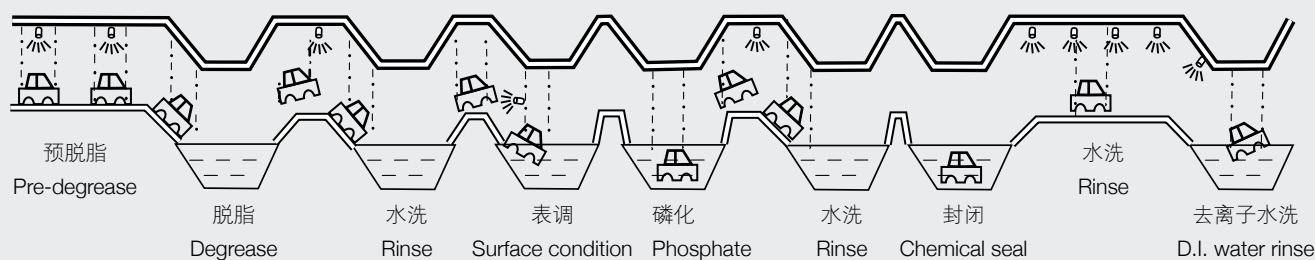


冲压成形	焊接技术	涂装技术	磷化技术 Phosphating Technology	电泳涂装技术	涂装外观质量控制技术
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典型轿车涂装前处理工艺流程图

A typical pretreatment process of car-body



	晶粒尺寸 Crystal size ( $\mu\text{m}$ )	膜 重 Film weight ( $\text{g}/\text{m}^2$ )	磷化膜特征 Main characteristics
	3~7	2~5	磷化膜含Fe, 成膜物质为 $\text{Me}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ 和 $\text{Zn}_2\text{Fe}(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ , P比>90%, 具有优异的耐水性和抗碱性 Fe contained Main components are $\text{Me}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ and $\text{Zn}_2\text{Fe}(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ P ratio>90% Excellent water and alkali resistance
	3~7	2~5	磷化膜不含Fe, 成分为 $\text{Me}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ Me: Zn、Mn、Ni, 需通过Mn、Ni改善膜下防腐性 No Fe contained Main component is $\text{Me}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ Me: Zn, Mn, Ni Mn and Ni should be added into the layer to improve the under-film corrosion resistance
	3~7	3~8	磷化膜含少量Fe, 抗膜下腐蚀性性能优于GI A little Fe contained Under-film corrosion resistance is better than that of GI
	3~7	1~3	为钢厂提供的预磷化膜, 结构和性能与车厂的磷化膜一致, 车厂磷化后基本不改变形貌 A kind of Pre-phosphate layer, treated at EGL Main Components and properties are similar to the layers treated at paintshop of automobile manufacturers Remained after re-phosphate at the paintshop of automobile manufacturers

电泳涂装技术 Electrophoresis

电泳涂装是一种特殊的漆膜形成方法。其基本原理类似于金属的电镀，只不过镀在磷化膜表面的是有机高分子物质，电泳后得到的湿膜再通过加热进行交联固化。

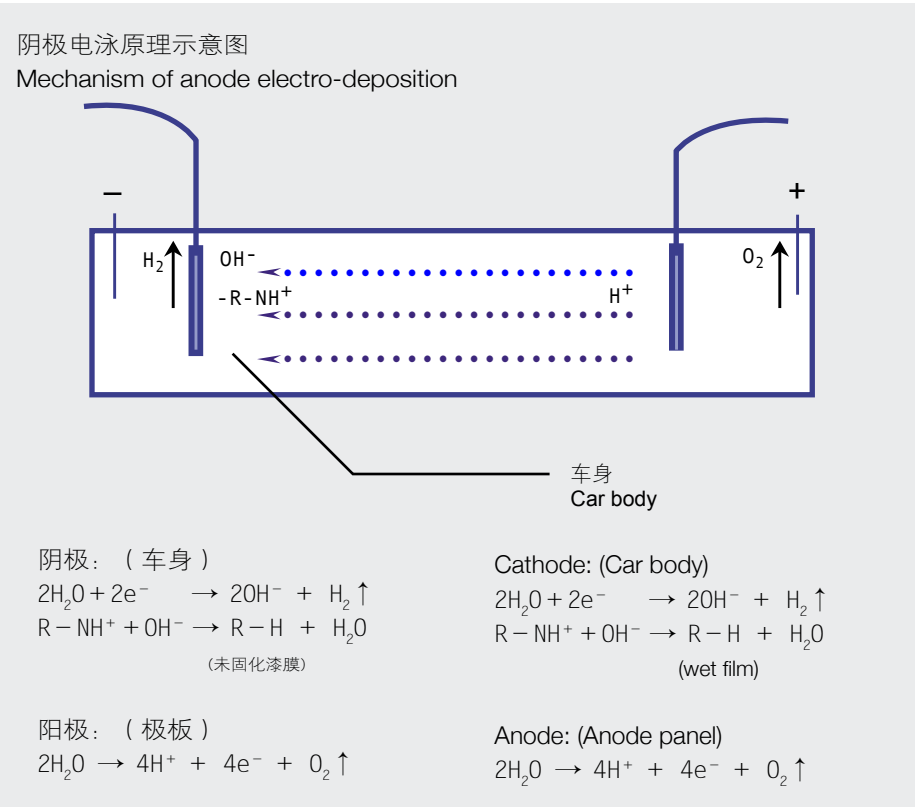
电泳涂装法在汽车涂装中获得应用也已有30多年历史，它是汽车工业中普及最快、技术更新最多的金属件涂漆方法。

70年代开发的阴极电泳涂料具有泳透率高、涂层耐腐蚀性高的优点，加之无铅、无锡环保型阴极电泳漆的开发成功，形成了阴极电泳涂装替代阳极电泳涂装之势。至今在技术上已形成了5代阴极电泳产品。

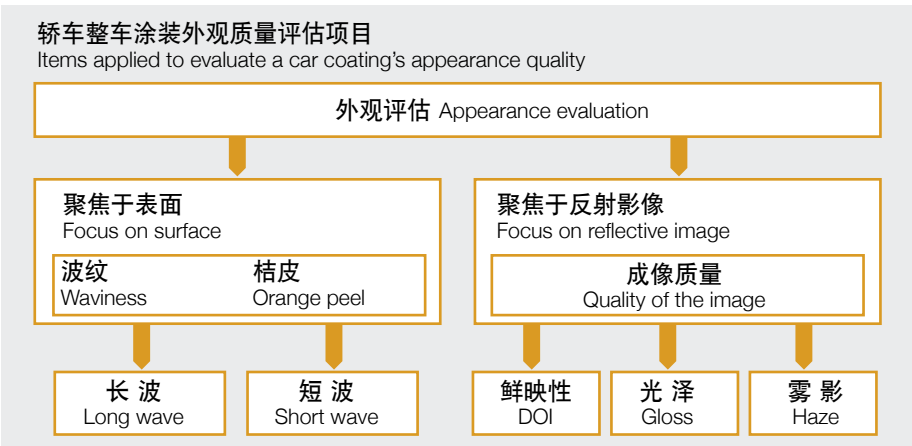
目前所有的高级轿车均采用阴极电泳进行第一层有机涂层的涂装。

Also called electro-deposition (ED). The working mechanism is similar to that of electro-galvanizing. What deposited to the substrate is no longer metal, but a kind of thermalsetting organic material. Then the wet film should be heated in oven to be cured.

Electrophoresis process has been applied in auto industry for more than 30 years. Today, it has become a standard method to treat the first layer of organic coating on body-in-white.



涂装外观质量控制技术  
Quality-controlling  
technology of coating  
appearance





率和质量成本、简化流程、持续改进、重视劳动安全 and 产品安全性、预防缺陷、防错、开展产品审核和过程审核等方面大大丰富了一贯质量管理的内容。产品质量先期策划（APQP）和控制计划（CP）、潜在失效模式及后果分析（FMEA）等相关手册广泛应用于质量管理。正在实施的企业系统创新工程（ESI）、六西格玛精益运营管理，把质量管理推向更高层次。

实践证明，一贯质量管理较好地适应了宝钢这样的现代化钢铁企业，体现了集中、一贯、高效、优化的特点，实现了质量管理由中间向两头延伸的全过程的整体优化。宝钢在自己的质量管理实践中，不断吸收世界先进的质量管理理念和方法，与时俱进，进一步充实和丰富了一贯质量管理的内容，从而适应了“建成全球最具竞争力的钢铁企业”这一战略目标。

宝钢在引进国外现代化技术装备的同时，也引进了整套现代化管理方式，通过在生产运行中消化、吸收和发展，建立了一贯质量管理体系。为了使宝钢产品在国内和国际市场上更具竞争力，满足汽车用户的需要，宝钢在不断完善一贯质量管理和努力提高产品质量的同时，加快了质量体系产的国际认证步伐。1992年开始，我们从钢铁行业实际出发，按照ISO9002标准的要求，建立和完善文件化的质量体系，并于1994年通过了英国BSI公司ISO9002（1995年转为ISO9001）认证，1999年和2003年分别通过了BSI公司QS9000和ISO/TS16949:2002版标准认证。

通过贯彻实施ISO9001、QS9000和ISO/TS16949标准，使宝钢质量体系建设和运行不断进入更深层次，质量方针和目标得到深入贯彻和实施，持续改进、缺陷预防，减少变差和浪费能力大大提高。按ISO/TS16949标准建立起来的严密的文件化质量体系，适应了世界汽车工业不同汽车制造商对质量管理体系的要求，它在质量管理体系法制化、突出质量管理的八项原则、重视激励员工与充分授权、关注员工的工作效

产品质量先期策划（APQP）和控制计划（CP）、潜在失效模式及后果分析（FMEA）等相关手册广泛应用于质量管理。正在实施的企业系统创新工程（ESI）、六西格玛精益运营管理，把质量管理推向更高层次。



While importing modernized technical equipment from abroad, Baosteel have introduced complete set of modern management methods and built up the through-going management system by digestion, absorption and development of these methods during production operation. To make its products more competitive in both local and oversea markets and satisfy automobile makers' requirements, it accelerated its pace in international quality system certification. Since 1992, it has been building and improving its documentation quality system according to ISO9002 standard requirements in view of the actual situation of iron and steel industry. In 1994, it was awarded with ISO9002 certification (converted to ISO9001 in 1995) by BSI, UK. In addition, it passed the QS9000 certification in 1999 and ISO/TS16949:2000 standard certification in 2003.

With the implementation of ISO9001, QS9000 and ISO/TS16049 standards, Baosteel's quality system construction and

Manuals related to advanced product quality planning (APQP), control plan (CP), potential failure mode and effect analysis (FMEA) are widely adopted in quality management. The ongoing enterprise system innovation project (ESI) and six- $\sigma$  intensive lean operation and management pushes the quality management to a higher level.

operation kept progressing towards deeper levels, quality policies and targets got carried out to a deep degree, and the ability for continuous improvement, prevention of defects and reduction of variation difference and waste got enhanced greatly. The strict documentation quality system established according to the ISO/TS16949 standard fit to the requirements for quality management systems by different automobile makers of the global automobile industry. It greatly enriches the through-going quality

management in the aspects such as allowing the quality management by laws, highlighting eight principles for quality management, laying weight on employee inspiration and sufficient authorization, caring working efficiency and quality cost of employees, streamlining the process, keeping improvement, paying attention to labor security and product security, preventing defects and errors and carrying out product review and process review. Manuals related to advanced product quality planning (APQP), control plan (CP),

potential failure mode and effect analysis (FMEA) are widely adopted in quality management. The ongoing enterprise system innovation project (ESI) and six- $\sigma$  intensive lean operation and management pushes the quality management to a higher level.

Practices prove the through-going quality management is relatively well suitable to a modernized steel complex like Baosteel, while showing central, through-going, highly efficient and optimal features and realizing full-process, from the center to the two ends by extension, integral optimization of quality management. Keeping absorbing world advanced quality management philosophies and methods during its own quality management practices and maintaining the pace abreast of the time, Baosteel further enriched the through-going quality management thus fitted to the strategic objective of "building Baosteel into a world most competitive iron & steel enterprise".

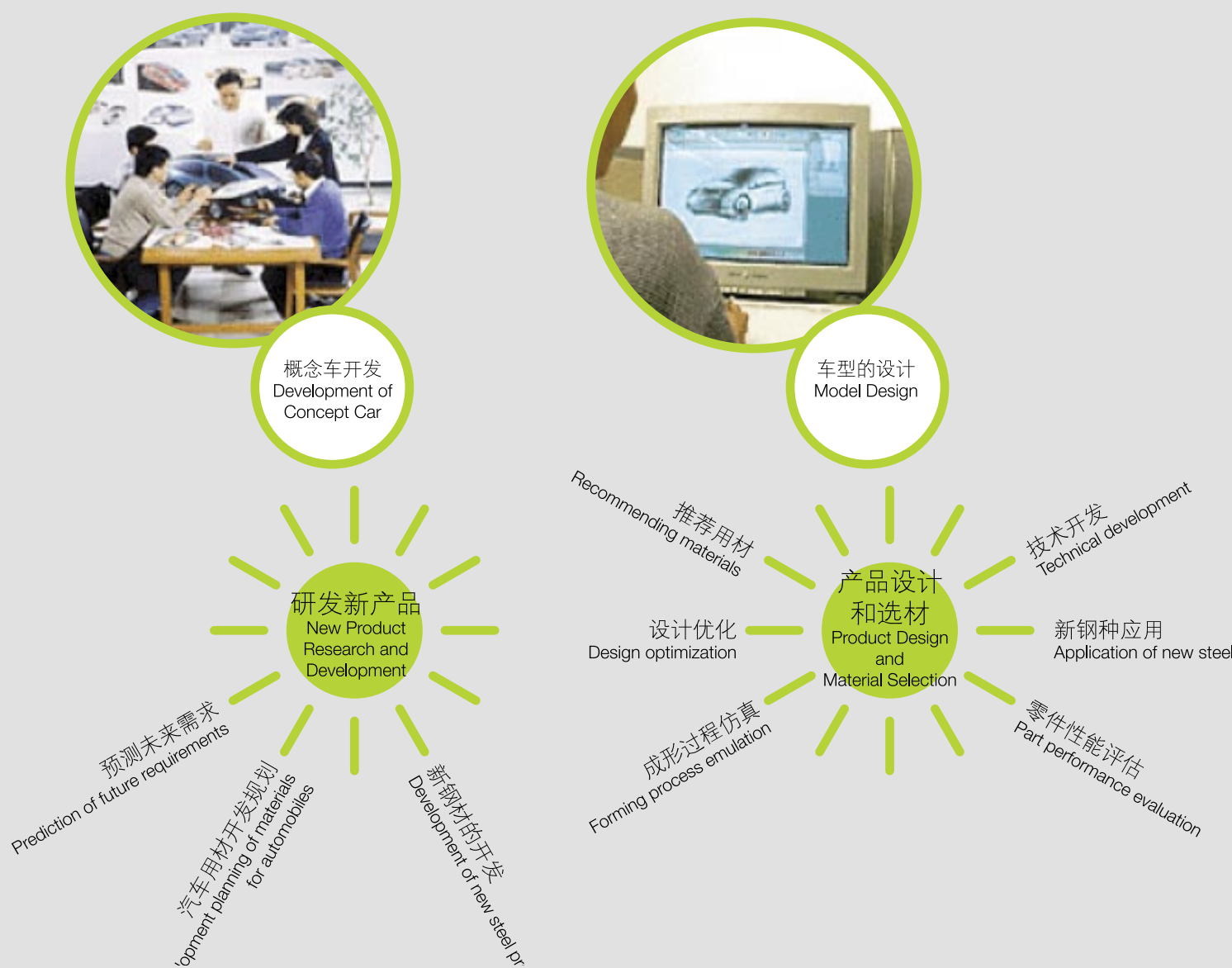
## Chapter 7 Perfect Product Service System

### 第七章 完善的产品服务体系

宝钢秉承以用户为中心的经营理念，  
全面深化与用户的战略协作，  
在新品研发、材料选用、资源配置、拓展合作渠道等方面进行深层次合作。

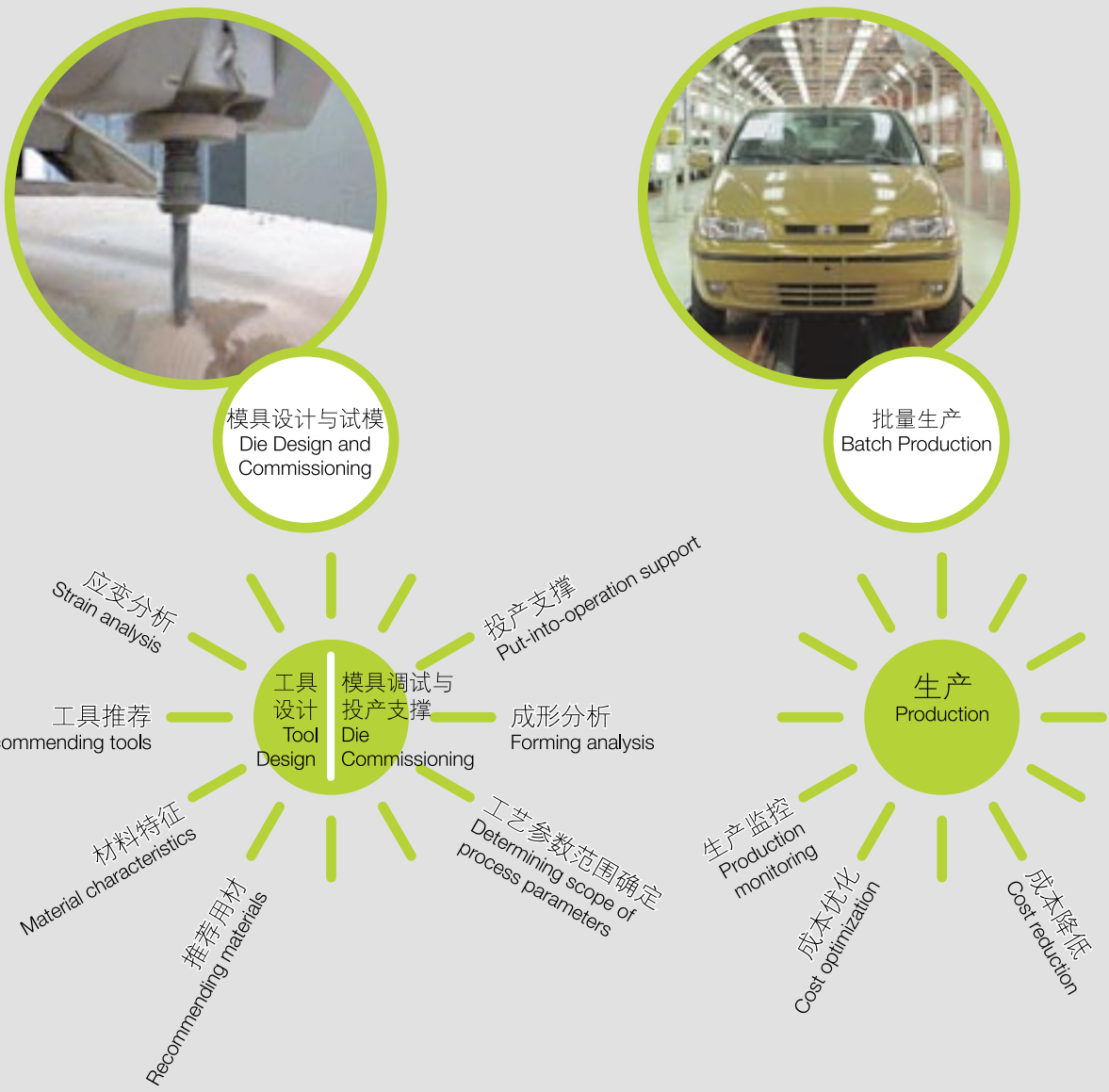
在汽车开发各个阶段均为汽车制造商提供先行服务

Providing automobile makers with earlier service at each stage during automobile development





Upholding the user-centered operation philosophy, Baosteel deepens strategic cooperation with users in an all-round way through carrying out deep-level cooperation in such aspects as new product research & development, material selection, resource configuration and expansion of cooperation channels.



# Chapter 7 完善的产品服务体系 Perfect Product Service System

## 售前服务 Prepurchase service

- 提供详细的宝钢汽车板介绍材料与标准
- 为用户提供正确的选材指导
- 提供汽车用钢先期介入  
在车型设计进行初选材料；提供CAE仿真分析，验证零件设计与选材的准确性，并提供最佳方案
- Providing detailed instruction data and standards of Baosteel's automotive sheets.
- Serving users with instructions on correct selection of material.
- Providing earlier involvements on automotive steel Preliminary material selection in model design, providing CAE emulation analysis, verifying accuracy of the design of and material selection for parts and presenting optimal solution.

## 售中服务 On-purchase service


- 合同跟踪  
提供详细的用户合同跟踪信息，确保交货期
- Order tracking  
Providing detailed user order tracking information to ensure punctual goods delivery.

## 售后服务 After sales service

- |  |   |
|--|---|
| ■ 质保书查询                                | 为用户提供网上质保书查询功能  |
| ■ 技术支持                                 | 为用户提供宝钢汽车板产品在使用中各类问题的咨询，进行汽车板产品使用现场跟踪服务   |
| ■ 异议处理                                 | 快速有效的处理产品质量异议，包括现场的跟踪调整试验，提供异议材料紧急替代方案，满足用户生产需求   |
| ■ 客户信息反馈                               | 通过各种渠道收集客户信息，整理分类，改进产品，反馈用户，满足用户需求  |
| ■ Query for certificated quality level | Providing users with online query for certificated quality level.   |
| ■ Technical supports                   | Providing users with advisories for various problems met during the application of Baosteel's automotive sheet products and site tracking service on product application.   |
| ■ Claim handling                       | Handling quickly and effectively handle claims on product quality, including site tracking & adjustment tests, provision of emergent substitute proposal against claimed material to meet users production demands. |
| ■ Customer information feedback        | Collecting customers' information through various means, sorting and classifying the information, improving products accordingly, feeding back information to users' and satisfying users' requirements.            |

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若您希望进一步了解宝钢汽车用冷轧产品，  
请致电宝钢用户服务热线

Please dial customer service hot line of Baosteel if you want further information about  
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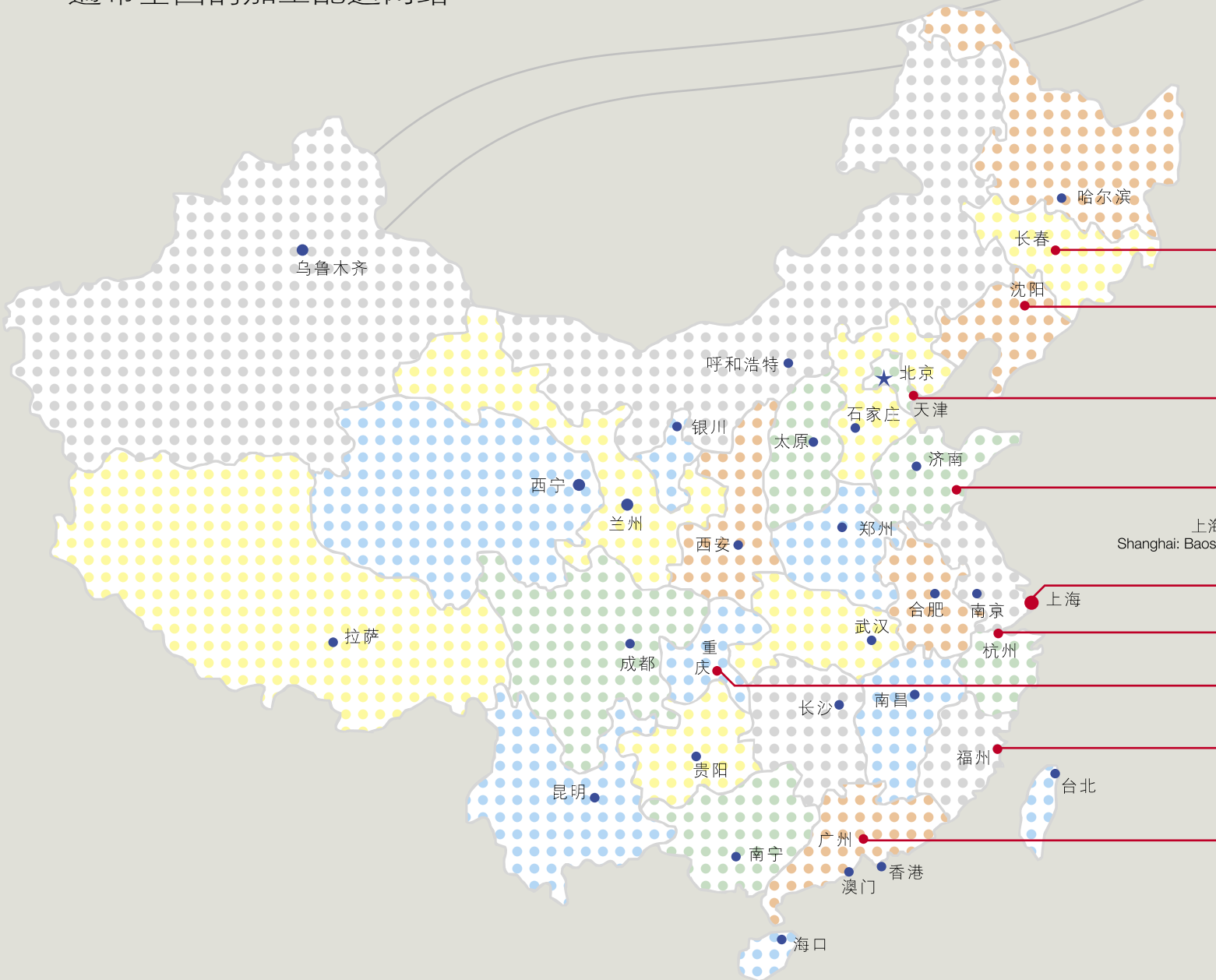
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Qingdao Baomit Steel Distribution Co., Ltd.		Fax. 0532-6092000
母: 宝森分部 en Subdivision	Tel. 021-58638855	Tel. 021-56930909
	Fax. 021-58634255	Fax. 021-56934093
上海: 申井		Tel. 021-69573899
Shanghai Shenjing Steel Processing Co., Ltd.		Fax. 021-69573900
宝钢阿赛洛激光拼焊板有限公司		Tel. 0532-6768579
Baosteel Arcelor Laser Tailor Welded Blank Co., Ltd.		Fax. 0532-6092000
杭州宝钢钢材配送有限公司		Tel. 023-68885533
Hangzhou Baosteel Steel Distribution Co., Ltd.		Fax. 023-68883559
重庆宝井钢材加工配送有限公司		Tel. 0591-22786888
Chongqing Baomit Steel Distribution Co., Ltd.		Fax. 0591-22785998
福州宝钢钢材配送有限公司		Tel. 020-84982248
Fuzhou Baosteel Steel Distribution Co., Ltd.		Fax. 020-84982212
广州宝钢井昌钢材配送有限公司		Tel. 020-84982248
Guangzhou Baosteel Jingchang Steel Distribution Co., Ltd.		Fax. 020-84982212

具备激光拼焊生产线  
With laser tailor welding line

Chapter 8

Guide for Ordering Products

第八章

产品订货指南

1、订货所需信息及注意事项

Necessary information and cautions in ordering



订货时用户需提供下列信息：  
A user need providing following information while placing order



- a. 产品名称（钢板或钢带）  
Product designation  
(steel plates or strips)
- b. 本产品标准号  
Product standard number
- c. 牌号  
Steel grade
- d. 产品规格及尺寸精度  
（包括厚度、宽度、长度）  
Product specification and size accuracy  
(incl. thickness, width and length)
- e. 边缘状态  
Edge status
- f. 表面质量级别  
Surface quality level
- g. 不平度精度  
Flatness accuracy
- h. 涂镀产品需提供镀层种类、镀层重量  
及表面处理  
Coating type, coating weight and surface  
treatment in case of coated products
- i. 热镀锌产品需提供表面结构  
Surface structure in case of hot dip  
galvanized products
- j. 重量  
Weight
- k. 包装方式  
Packing method
- l. 用途  
Application
- m. 其他特殊要求  
Other special requirements

注意事项：  
按本标准供货的钢带通常涂一般防锈油。所涂油膜  
应能用碱水溶液清除掉，供方保证涂油产品自准发  
之日起在通常的包装、运输、装卸及储存条件下六  
个月不生锈，经供需双方协议并在合同中注明，亦  
可不涂油供货。

Cautions:  
The steel strips supplied according to the standard are  
usually applied with common rustproof oil film, which  
can be swept away with alkali solution. The supplier  
guarantees that the oiled products will be free from rust  
under normal packing, transportation, loading and storage  
conditions within 6 months from the approved delivery  
date. However, products without oil coating can also be  
supplied subject to statement in the contract reached  
after discussion between the user and the supplier.

## 2、订货涉及的计量方法

### Order-related quantitative methods



#### 钢板理论重量计算方法

计算顺序	计算方法	结果修约
基本重量 $\text{kg/mm} \cdot \text{m}^2$	7.85 (厚度1mm, 面积1 $\text{m}^2$ 的重量)	—
单位重量 $\text{kg/m}^2$	基本重量 ( $\text{kg/m}^2$ ) $\times$ 厚度 (mm)	修约至四位有效数字
钢板面积 $\text{m}^2$	宽度 (m) $\times$ 长度 (m)	修约至四位有效数字
1块板重量 kg	单位重量 ( $\text{kg/m}^2$ ) $\times$ 钢板面积 ( $\text{m}^2$ )	修约至三位有效数字
1捆重量 kg	1块板重量 (kg) $\times$ 同规格的1捆钢板块数	修约至kg的整数位S
总重量 kg		—

数值修约方法按GB8170《数值修约规则》的规定。

#### Calculation method for theoretical weight of steel plates

Calculation Sequence	Calculation Method	Result Revision and Cancellation
Basic weight $\text{kg/mm} \cdot \text{m}^2$	7.85 (weight with $T=1\text{mm}$ and $\text{area}=1\text{m}^2$ )	—
Unit weight $\text{kg/m}^2$	Basic weight ( $\text{kg/m}^2$ ) $\times$ Thickness (mm)	Revised and cancelled to four effective digits
Steel plate area $\text{m}^2$	Width (m) $\times$ Length (m)	Revised and cancelled to four effective digits
Weight per plate kg	Unit weight ( $\text{kg/m}^2$ ) $\times$ Steel plate area ( $\text{m}^2$ )	Revised and cancelled to three effective digits
Weight per bundle kg	Weight per plate (kg) $\times$ number of same-size plates per bundle	Revised and cancelled to integral number digit in kg S
Total weight kg		—

Value revision and cancellation method abides by the stipulations of *Regulation for Value Revision and Cancellation*.

#### 镀层重量计算方法

#### Calculation method for coating weight

##### 纯锌镀层 Zinc coating

单面公称镀层重量 Single-side Nominal Coating Weight	40	50	60	90	100	110	125	135	175	225
相当锌层厚度mm Converted Coating Thickness mm	0.008	0.010	0.013	0.017	0.020	0.022	0.024	0.027	0.032	0.040

##### 合金化镀层

##### Alloy coating

单面公称镀层重量 Single-side Nominal Coating Weight	30	40	50	60	90
相当锌层厚度mm Converted Coating Thickness mm	0.006	0.008	0.010	0.013	0.017



### 3、产品标签及包装方式

#### Product tags and packing methods

##### 标志

标志按需要应包括：

商标、供方名称、品名、标准、规格、捆包号、用户合同号、炉号、镀层重量、颜色、生产日期、计重方式、净重、毛重、收货单位、防护标志等。

##### Shipping mark:

The Shipping Mark shall consist of: Trade mark, Seller's name, Product name, Applicable standards, Specifications, Package No., Contract No., Heat No., Weight of zinc film, Color, Production date, Weighing method, Net weight, Gross weight, Consignee and Protection symbols, etc..

##### 质量证明书

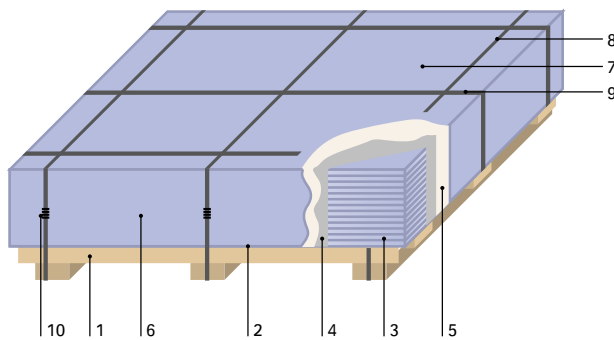
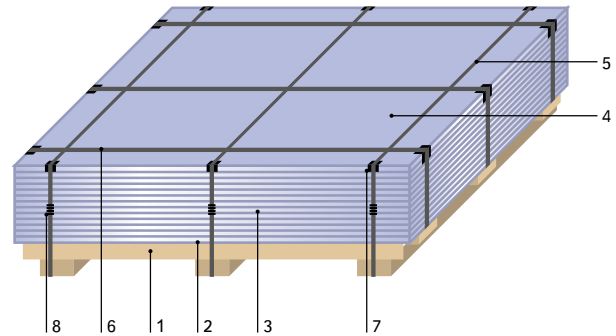
每批交货的钢板及钢带(钢卷)必须开具质量证明书。质量证明书上按需要应注明：商标、供方名称、品名、标准、产品规格、钢卷号或捆包号、用户合同号、炉号、颜色、重量、订货单位、件数、标准中规定的各项试验的结果、交货日期、质量证明书签发日期、质量管理部门负责人的签字等。

##### Quality Certificate:

Each shipment of delivered steel sheets or steel coils shall be attached with the Quality Certificate. The Quality Certificate shall cover: Trade mark, seller's name, Product name, Applicable standards, Product specifications, Coil No. & Package No., Contract No., Heat No., Color, Weight, Buyer, Quantity, Test Results as per standards, Delivery time, Quality Certificate issuance date, Signature by Chief of the Quality Control Dept., etc..

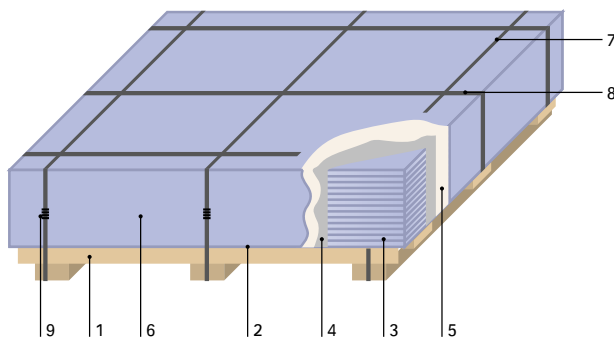
- 1 托架;
- 2 下盖板;
- 3 钢板;
- 4 上盖板;
- 5 横向捆带;
- 6 纵向捆带;
- 7 护角;
- 8 锁扣

1. bracket
2. bottom cover plate
3. steel plate
4. up cover plate
5. latitudinal binding belt
6. longitudinal binding belt
7. angle bead
8. lock



- 1 托架;
- 2 下盖板;
- 3 钢板;
- 4 防锈纸;
- 5 塑料薄膜;
- 6 侧护板;
- 7 上盖板;
- 8 横向捆带;
- 9 纵向捆带;
- 10 锁扣

1. bracket
2. bottom cover plate
3. steel plate
4. antirust paper
5. plastic film
6. side protective plate
7. up cover plate
8. latitudinal binding belt
9. longitudinal binding belt
10. lock

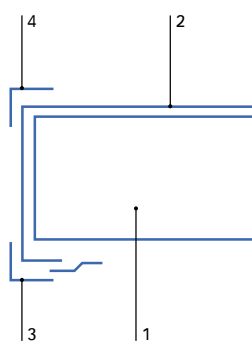
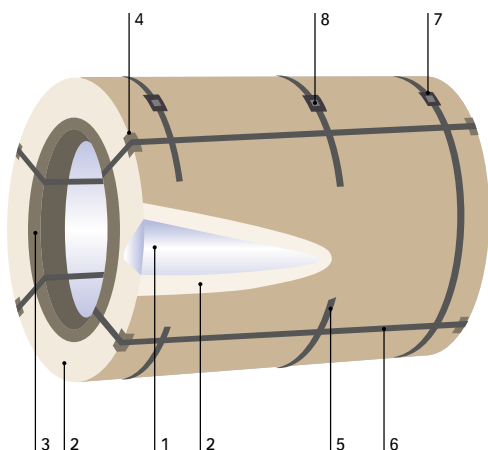


- 1 托架;
- 2 下盖板;
- 3 钢板;
- 4 防锈纸;
- 5 塑料薄膜;
- 6 铁盒盖;
- 7 横向捆带;
- 8 纵向捆带;
- 9 锁扣

1. bracket
2. bottom cover plate
3. steel plate
4. antirust paper
5. plastic film
6. iron box cover
7. latitudinal binding belt
8. longitudinal binding belt
9. lock



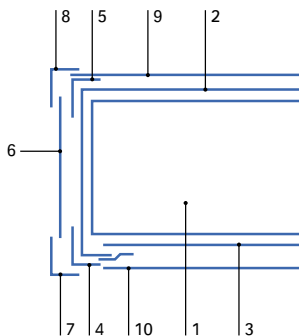
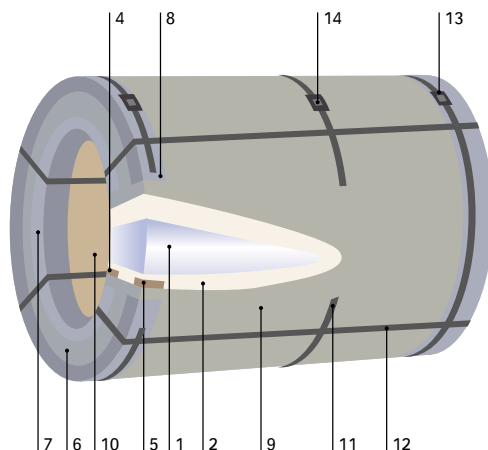
## Chapter 8 产品订货指南 Guide for Ordering Products



简易包装m0

- 1 钢卷;
- 2 外周防锈纸;
- 3 纸内护角;
- 4 纸外护角;
- 5 周向捆带;
- 6 径向捆带;
- 7 锁扣垫片;
- 8 锁扣

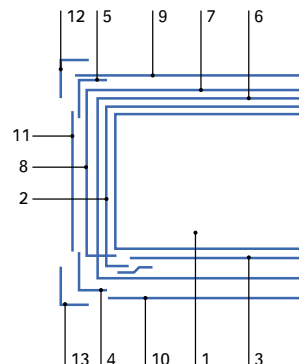
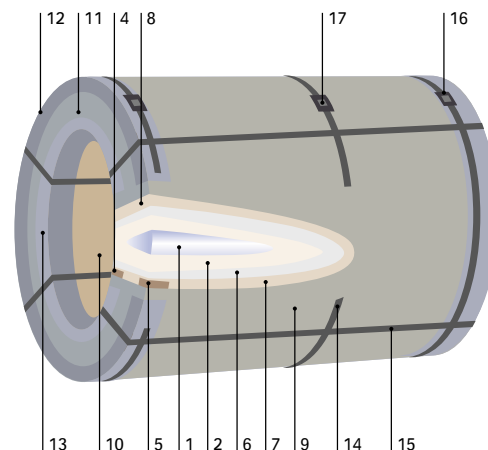
1. coil
2. outside antirust paper
3. inside paper angle bead
4. angle bead outside paper
5. circle binding belt
6. radial binding belt
7. lock washer
8. lock



普通包装n0

- 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 铁圆护板;
- 7 铁内护角;
- 8 铁外护角;
- 9 外周包板;
- 10 内周护板;
- 11 周向捆带;
- 12 径向捆带;
- 13 锁扣垫片;
- 14 锁扣

1. coil
2. outside antirust paper
3. inside antirust paper
4. inside paper angle bead
5. outside paper angle bead
6. round iron protective plate
7. inside iron angle bead
8. outside iron angle bead
9. outside packing boarding
10. inside protective plate
11. circle binding belt
12. radial binding belt
13. lock washer
14. lock



精包装p0

- 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 外周瓦楞纸;
- 8 圆护瓦楞纸;
- 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. coil
2. outside antirust paper
3. inside antirust paper
4. inside paper angle bead
5. outside paper angle bead
6. plastic sheath
7. outside corrugated paper
8. round corrugated paper
9. outside packing boarding
10. inside protective plate
11. round iron protective plate
12. outside iron angle bead
13. inside iron angle bead
14. circle binding belt
15. radial binding belt
16. lock washer
17. lock



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