

Hot Rolled Special Steel

热轧特殊钢

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前言

Preface

宝钢热轧特殊钢的开发已经经历了十几年的时间，从最初的低碳钢逐步向高碳钢发展，合金含量也逐步提高，相继开发了刀模锯片、精冲用钢、耐热结构钢、弹簧钢等系列产品。产品广泛应用于锯片基体制造、汽车零部件、工程机械、锅炉、化工能源等领域。目前，宝钢已经形成了品种丰富，种类齐全的热轧特殊钢，极大满足了用户的需求。

Baosteel started the development of hot rolled special steels (BT steels) more than 10 years ago. We have developed various products, from low carbon steel to high carbon or high alloy steel, including saw steel, fine-blanking steel, heatresistant structure steel, spring steel etc. Hot-rolled special steel has a wide range of applications, such as saw manufacturing, automobile parts, engineering machinery, boilers, chemical energy. At presently, Baosteel has formed a full range of hot-rolled special steel, and greatly meets the needs of our customers.



制造工艺及交货状态

Manufacture process and delivery condition

生产工艺流程: 热轧特殊钢采用氧气转炉冶炼镇静钢，经过精炼后进行连续铸造，连铸坯送热轧厂再加热并采用控轧控冷工艺轧制成卷，性能质量检测合格后准发交货。供货形式包括直发卷、精整卷，也可切板交货。

交货状态: 热轧特殊钢可采用控轧、退火、淬火、淬火加回火等状态交货。

加工配送服务: 根据用户需求，钢板可采用抛丸表面预处理方式交货。

Manufacture process: BT steels are killed in oxygen converter. After refining and continuous casting, the slabs are reheated and rolled into coil in TMCP rolling process. After inspection, the BT steels can be delivered in coil, or in sheet with powerful leveling and cutting.

Delivery condition: TMCP, quenched, annealed quenched and tempered etc.

Processing and distribution service: According to customer's requirements, steel plate can be delivered with pretreatment such as blasting.

宝钢热轧特殊钢主要品种及用途

Varieties and applications of BT steel series

碳素结构钢

各类机械零部件，包括汽车零部件、链条、摩擦片及供冷轧使用的各类钢卷。

碳素工具钢

锯片、刀具、农业机械零部件及供冷轧使用的钢卷。

合金结构钢

各类汽车零部件，链条、座椅调节机构、离合器弹簧膜片，以及供冷轧使用的钢卷。

合金工具钢

刀具、锯片，以及供冷轧使用的钢卷。

弹簧钢

各类收卷装置中的弹性元件。

其他特殊用途

锅炉压力容器用钢、轴承钢、渗氮钢等。

Carbon steel for machine structure

Mechanical and automobile parts, such as chain, friction plate, Re-rolling.

Carbon tool steel

Saw, blade, knife, agricultural machine parts, Re-rolling.

Alloy steel for structural use

Automobile parts, such as chain, seat adjustment systems, clutch plates, Re-rolling.

Alloy tool steel

Cutlery, saw, circular saws, Re-rolling.

Spring steel

Various elastic parts in winding apparatus, etc.

Other types

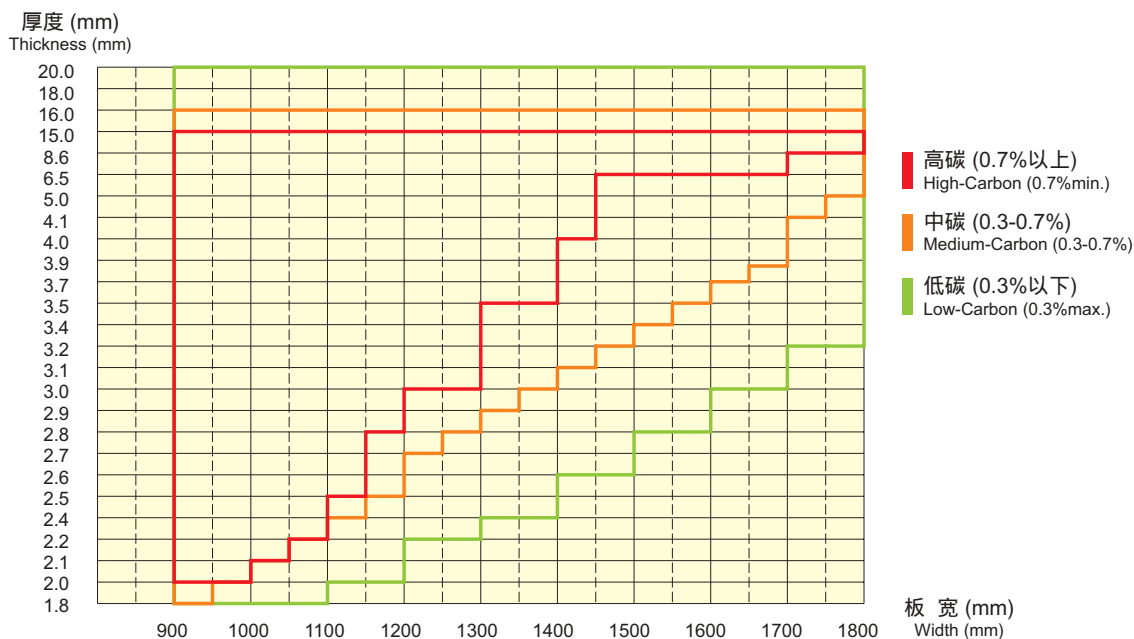
Steel for boiler and pressure vessel, bearing steel, nitriding steel, etc.

牌号及可供规格范围

Steel grades and size

可供货范围

Available Dimension



主要牌号及化学成分

Designation and compositions

类别 Types	牌号 Designation	化学成分 (%) Chemical Composition (%)								
		C	Si	Mn	S	P	Cr	Mo	Ni	其他元素 Other elements
碳素结构钢 Carbon steel for machine structural use	S10C	0.08~0.13	0.15~0.35	0.3~0.60	0.015max	0.025max				
	S15C	0.13~0.18	0.15~0.35	0.3~0.60	0.015max	0.025max				
	S20C	0.18~0.23	0.15~0.35	0.30~0.60	0.015max	0.025max				
	S35C	0.32~0.38	0.15~0.35	0.60~0.90	0.015max	0.025max				
	S45C	0.42~0.48	0.15~0.35	0.60~0.90	0.015max	0.025max				
	S50C	0.47~0.53	0.15~0.35	0.60~0.90	0.015max	0.025max				
	S55C	0.52~0.58	0.15~0.35	0.60~0.90	0.015max	0.025max				
	SAE1018	0.14~0.20	0.15~0.30	0.60~0.90	0.015max	0.025max				
	SAE1020	0.17~0.23	0.15~0.30	0.30~0.60	0.015max	0.025max				
	SAE1035	0.31~0.38	0.15~0.30	0.60~0.90	0.015max	0.025max				
	SAE1045	0.42~0.50	0.15~0.30	0.60~0.90	0.015max	0.025max				
	SAE1050	0.47~0.55	0.15~0.30	0.60~0.90	0.015max	0.025max				
	SAE1055	0.52~0.60	0.15~0.30	0.60~0.90	0.015max	0.025max				
	SAE1070	0.65~0.80	0.15~0.30	0.60~0.90	0.015max	0.025max				
碳素工具钢 Carbon tool steel	SAE1078	0.72~0.86	0.15~0.30	0.30~0.60	0.015max	0.025max				
	SK5	0.80~0.90	0.35max	0.50max	0.015max	0.025max				
合金结构钢 Alloy steel for structural use	15Cr	0.12~0.18	0.17~0.37	0.40~0.70	0.015max	0.025max	0.70~1.00			
	20Cr	0.18~0.24	0.17~0.37	0.40~0.70	0.015max	0.025max	0.70~1.00			
	40Cr	0.37~0.44	0.17~0.37	0.50~0.80	0.015max	0.025max	0.80~1.10			
	15CrMo	0.12~0.18	0.17~0.37	0.40~0.70	0.015max	0.025max	0.80~1.10	0.40~0.55		
	20CrMo	0.17~0.24	0.17~0.37	0.40~0.70	0.015max	0.025max	0.80~1.10	0.15~0.25		
	30CrMo	0.26~0.34	0.10~0.30	0.40~0.70	0.015max	0.025max	0.80~1.10	0.15~0.25		
	35CrMo	0.32~0.40	0.17~0.37	0.40~0.70	0.015max	0.025max	0.80~1.10	0.15~0.25		
	34CrMo4	0.30~0.37	0.40max	0.60~0.90	0.015max	0.025max	0.90~1.20	0.15~0.30		
	42CrMo4	0.38~0.45	0.40max	0.60~0.90	0.015max	0.025max	0.90~1.20	0.15~0.30		
	SNCM220	0.17~0.23	0.15~0.35	0.60~0.90	0.015max	0.025max	0.40~0.65	0.15~0.30	0.40~0.70	
	H42B	0.37~0.45	0.17~0.37	0.70~1.00	0.015max	0.025max	0.25max		0.20max	
	20MnB5	0.17~0.23	0.40max	1.10~1.40	0.015max	0.025max	-		0.20max	0.0008~0.0050 (B)
	26MnB5	0.23~0.28	0.40max	1.10~1.40	0.015max	0.025max	0.10~0.20		0.20max	0.0008~0.0050 (B)
	27MnCrB5	0.24~0.30	0.40max	1.10~1.40	0.015max	0.025max	0.60max		0.20max	0.0008~0.0050 (B)
	40MnB	0.37~0.44	0.17~0.37	1.10~1.40	0.015max	0.025max				0.0008~0.0050 (B)
	16MnCr5	0.14~0.19	0.40max	1.00~1.30	0.015max	0.025max	0.80~1.10			
20CrMnTi	0.17~0.23	0.17~0.37	0.80~1.10	0.015max	0.025max	1.10~1.30			0.04~0.10 (Ti)	
40CrMn	0.37~0.45	0.17~0.37	0.90~1.20	0.015max	0.025max	0.90~1.20				
50Mn2V	0.48~0.57	0.30max	1.40~1.80	0.015max	0.025max	0.30max			0.08~0.16 (V)	
合金工具钢 Alloy tool steel	75Cr1	0.72~0.80	0.20~0.45	0.60~0.90	0.015max	0.025max	0.30~0.60			
	8CrV/80CrV2	0.75~0.85	0.20~0.40	0.30~0.60	0.015max	0.025max	0.40~0.70			0.15~0.25 (V)
弹簧钢 Spring steel	50CrV4	0.47~0.55	0.40max	0.70~1.10	0.015max	0.025max	0.90~1.20			0.10~0.25 (V)
	65Mn	0.62~0.70	0.17~0.37	0.90~1.20	0.015max	0.025max	0.30max			
	SUP6	0.56~0.64	1.5~1.8	0.7~1.0	0.015max	0.025max				
	SUP10	0.47~0.55	0.15~0.35	0.65~0.95	0.015max	0.025max				
	60Si2MnA	0.56~0.64	1.60~2.00	0.70~1.00	0.015max	0.025max				
C67S	0.65~0.72	0.15~0.35	0.60~0.90	0.015max	0.025max					

产品典型机械性能

Typical Mechanical Properties

钢板和钢卷热轧态硬度、退火后硬度、不同冷却介质下的淬火硬度如下表所示：

Hardness of BT steels in different heat treatment conditions:

类别 Types	牌号 Designation	热轧硬度HV Hot-rolled hardnessHV	退火硬度HV Annealed hardnessHV	水淬 Water Quenching		油淬 Oil Quenching	
				淬火温度 Temperature	淬火硬度HRC Hardness HRC	淬火温度 Temperature	淬火硬度HRC HardnessHRC
碳素结构钢 Carbon steel for machine structural use	S35C	≤250	≤150	820~900	≥45	830~900	≥44
	S45C	≤260	≤160	820~890	≥52	830~890	≥50
	S50C	≤270	≤160	800~880	≥54	810~880	≥52
	S55C	≤280	≤170	800~880	≥55	810~880	≥53
	SAE1035	≤250	≤150	820~900	≥45	830~900	≥44
	SAE1045	≤260	≤160	820~900	≥52	820~890	≥50
	SAE1050	≤280	≤160	800~880	≥54	810~880	≥52
	SAE1055	≤300	≤170	800~880	≥55	810~880	≥53
碳素工具钢 Carbon tool steel	SAE1070	≤350	≤180	750~860	≥58	780~890	≥56
	SAE1078	≤360	≤180	760~850	≥60	790~880	≥58
合金结构钢 Alloy steel for structural use	SK5	≤370	≤180	760~850	≥60	790~880	≥58
	15Cr	≤250	≤170	820~890	≥34	850~900	≥32
	20Cr	≤260	≤170	820~890	≥35	850~900	≥33
	40Cr	≤300	≤180	800~880	≥47	830~890	≥45
	15CrMo	≤260	≤170	800~880	≥37	850~900	≥35
	20CrMo	≤270	≤170	800~880	≥38	850~900	≥36
	30CrMo	≤300	≤180	800~880	≥47	830~900	≥45
	35CrMo	≤310	≤180	800~880	≥50	830~890	≥48
	34CrMo4	≤310	≤180	800~880	≥50	830~890	≥48
	42CrMo4	≤320	≤180	800~880	≥52	830~890	≥50
	SAE4130	≤300	≤180	800~880	≥47	830~900	≥45
	SAE4140	≤320	≤180	800~880	≥52	830~890	≥50
	H42B	≤300	≤180	800~880	≥50	830~890	≥48
	40Mn	≤300	≤180	800~880	≥50	830~890	≥48
	20MnB5	≤270	≤170	820~900	≥45	830~890	≥43
	26MnB5	≤280	≤170	820~900	≥46	830~900	≥44
	27MnCrB5	≤280	≤170	800~880	≥48	830~900	≥46
	40MnB	≤300	≤180	800~880	≥50	830~900	≥48
	16MnCr5	≤270	≤170	820~900	≥35	830~900	≥33
	20CrMnTi	≤280	≤170	800~880	≥36	830~900	≥34
40CrMn	≤300	≤180	800~880	≥48	830~900	≥46	
合金工具钢 Alloy tool steel	50Mn2V	≤350	≤180			810~880	≥48
	75Cr1	≤370	≤180			780~880	≥55
弹簧钢 Spring steel	8CrV/80CrV2	≤370	≤180			780~880	≥56
	50CrV4	≤350	≤180			820~880	≥54
	65Mn	≤360	≤180			800~880	≥56
	SUP6	≤360	≤180			800~880	≥56
	SUP10	≤350	≤180			820~880	≥54
	60Si2MnA	≤360	≤180			800~880	≥56
	C67S	≤350	≤180			780~880	≥56

钢板尺寸、外形、重量及允许偏差

Dimension, shape & weight tolerance

钢板尺寸、外形、重量及允许偏差满足《GB709-2006热轧钢板和钢带的尺寸、外形、质量及允许偏差》的要求。

用户如对尺寸公差、不平度等有附加要求，供需双方协商确认，并在技术协议中注明。

Dimension, shape & weight tolerance meets GB709-2006 (Dimension, shape, weight and tolerances for hot-rolled steel plates and sheets).

Additional requirements concerning the dimension tolerance, flatness etc. should be mutual confirmed in technical agreements.

热轧特殊钢质量特点

Quality Characteristics

碳素结构钢

Carbon steel for machine structure

碳素结构钢是应用最为广泛的热轧特殊钢，具有良好的加工性能和较高性价比，并且通过热处理可获得良好的机械性能。

S15C是一种低碳结构钢，通过球化退火后具有良好的成型性能，可应用于精冲行业座椅调节机构零件的生产制造。

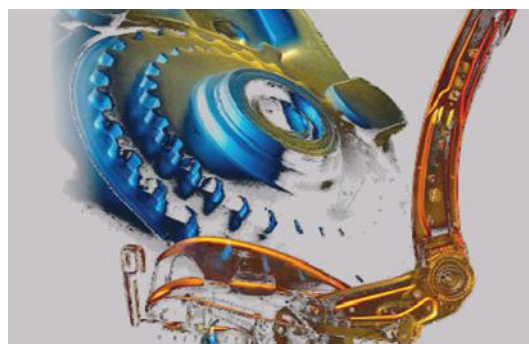
S35C具有一定的淬透性，可通过调整热处理工艺来达到相应的性能，高于S35C的钢种热处理后具有较高的强度，但是热处理后变形和开裂的风险增加。

Carbon steel for machine structure is widely used for structure parts of automobiles and other machinery. It has good processability in low cost, good mechanical properties after heat treatment.

S15C is a low carbon structural steel, which has good formability by spheroidizing annealing. It can be applied to the seat adjustment system by fine-blanking process.

S35C has good hardenability and property by adjusting different heat treatment accordingly.

Carbon steel with higher carbon content can get higher strength after heat treatment, but the risk of distortion and cracking increases.



碳素工具钢

Carbon tool steel

为了获得比碳素结构钢更高的强度和耐磨性，碳素工具钢被广泛使用。一般来说，碳素工具钢均需要经过淬火和回火处理，为了防止淬火开裂，一般采用油淬或者盐浴淬火。

Carbon tool steel is widely used to obtain a higher strength and wear resistance than carbon steel. Generally, carbon tool steel requires hardened and tempered treatment. In order to prevent quench cracking, oil quenching or salt bath quenching is preferred.

合金结构钢

Alloy steel for structural use

合金结构钢用来制造各类零部件，通过添加不同配比的Mn、Cr、Ni、Mo、V等合金，达到提高淬透性和回火后的综合性能。

Alloy structural steel is used to manufacture various machine parts. By adding different proportions of Mn, Cr, Ni, Mo, V and other alloys, the hardenability and tempering properties are improved.

Cr-Mo钢是宝钢生产的一种典型合金结构钢，具有良好的淬透性，热处理后具有较高的硬度，并且抗回火软化，具有较高的韧性。

Cr-Mo steel is a typical alloy structural steel produced by Baosteel. This steel has good hardenability, resistance to tempering, and high toughness.

Mn-B钢系列产品是另一种具有良好淬透性的合金结构钢，通过添加微量硼，使材料的热处理性能得到极大提高，在某些领域可替代其他合金体系钢种，达到降低成本的目的。高端SUV传动轴、平衡杆等均可见到Mn-B钢的身影。

Mn-B steel is another good hardenability alloy structural steel. By adding a small amount of boron, the hardenability of the material can be significantly improved, in some areas, Mn-B steel may be an alternative to other alloy steel in order to reduce the costs. Mn-B steels are used in the fields of premium SUV drive shaft, balance bar, etc.



合金工具钢

Alloy tool steel

与碳素工具钢相比，合金工具钢中添加的合金元素能够进一步提高耐磨性能和韧性，是刀具、锯片等行业首选的钢种。

Compared with carbon tool steel, alloying elements are added to improve the wear resistance and toughness. Alloy tool steel is almost exclusively used for cutting tools because of its excellent properties.

弹簧钢

Spring steel

Si-Mn系弹簧钢是应用最广泛的弹簧钢，由于含有较高的Si含量导致的高延性，使其适宜进一步深加工各类汽车弹性零部件，同时较高的Mn含量能提高强度和硬度。

Si-Mn alloy steel is the most widely used spring steel. High Si content improves formability for further process for automobile spring parts, while higher Mn content can improve the strength and hardness.

其他特殊用途

Other types

锅炉压力容器用钢、轴承钢、渗氮钢等。

Steel for boiler and pressure vessel, bearing steel, nitriding steel, etc.

典型应用案例

Typical Applications

案例1 牌号：30CrMo/SAE 4130

Case 1 Grade: 30CrMo/SAE 4130

1 基本信息

Basic Information

30CrMo在国内产品分类中归属于合金结构钢，国外标准将其归入特殊钢系列中的淬火回火钢，其显著特点是通过一定的热处理后达到高强度和高韧性的良好匹配。

宝钢生产的30CrMo通过Cr、Mo等合金元素的配比，最大限度的增加了零件的淬透性，通过一定温度的回火，在保持高强度的情况下，还具有高韧性、耐高温、耐磨等性能，其制造的零件特别适合在复杂环境下服役。

30CrMo is classified as alloy steel for structural use in GB standard, and classified as quenched and tempered steel in foreign standards. It is distinguishing for its good matching of high strength and high toughness through certain heat treatment.

Baosteel 's 30CrMo has excellent hardenability and tempering properties by adding proper Cr, Mo and other alloy elements . Through suitable tempering treatment, it maintains high strength and high toughness, as well as high temperature resistance , wear-resistant properties. 30CrMo is suitable for the parts which serve in a complex environment.

2 显微组织

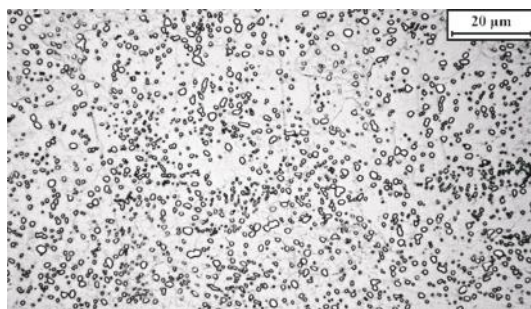
Microstructure

30CrMo热轧组织通常为铁素体和珠光体组织，典型的晶粒度大于8级，维氏硬度在200~250之间。

经过球化退火后的组织为铁素体、100%球状渗碳体，维氏硬度降至125左右，具有极佳的成型性能。

The hot-rolled microstructure of 30CrMo is ferrite and pearlite. The typical grain size is more than level 8. The typical Vickers hardness is from 200 to 250.

After spheroidizing annealing, 30CrMo can get 100% globular cementite microstructure, with Vickers hardness reduced to 125 or so, to obtain excellent formability.



球化退火后的金相组织 (HV: ~125)

3 加工应用信息

Processing and Application Information

30CrMo主要应用在刀模锯片汽车零部件以及油田设备等机械工程行业。

这种钢具有良好的热处理性能，热轧态可直接使用，也可进行冷轧加工，适用高精度要求的零件制造。热轧态适宜简单零件的冲压成型，冷轧、球化退火后的钢带适宜精密冲压等复合成型，具有良好的加工性能。

由于其优异的强韧性、耐磨损性能，30CrMo常被用作切割材料，如刀模、锯片基体等，其在一定的高温下仍能保持较高的硬度，所以在其他行业如汽轮机、电站锅炉中制造紧固件，在油田钻井工作中也被用作扶正器等零件。

30CrMo is mainly used in the mechanical engineering industry of automotive parts, oilfield equipment, etc.

This steel has excellent heat-treatment properties. It can be used directly in hot-rolled condition, also can be cold-rolled for application of high precision parts. It is suitable for simple stamping parts in as rolled condition and suitable for fine-blanking and other complex forming after cold rolling and annealing to set good processibility.

Due to its excellent strength ,toughness and wear resistance, 30CrMo is often used as cutting tools such as die cutter, saw matrix, etc. This steel maintains its hardness and strength even in the high temperatures, so it can be used in energy industries to make steam turbines, boiler fasteners. 30CrMo can also be used as a centralizer in the oil drilling work.



案例2 牌号: SK5

Case 2 Grade: SK5

1 基本信息

Basic Information

SK5是一种典型的碳素工具钢，执行JIS G4401标准。由于碳含量达到0.80%以上，热处理后零件具有较高的硬度和耐磨性，可广泛应用于工具行业。

SK5 is a typical carbon tool steel, according to the JIS G4401 standard. With carbon content more than 0.80%, SK5 has a high hardness and wear resistance after heat treatment. It has been widely used in the tool industry.

2 显微组织

Microstructure

SK5热轧组织通常为珠光体组织。通过精细的控制轧态的组织，SK5具有强塑性的良好匹配，可以进行分条、剪切、压延等加工。

The hot-rolled SK5 usually has a microstructure of pearlite. Its microstructure is controlled through proper rolling to get a good match of high strength and good plasticity. SK5 can be slitted, sheared or re-rolled in as rolled condition.

3 加工应用信息

Processing and Application Information

SK5主要应用在各类需要高硬度高耐磨的工具行业，例如美术刀片、手术刀片、纺针。由于宝钢采用了特殊的炼钢工艺，保证了SK5较小的成分波动范围，使得零件的性能能够稳定控制并且减少了用户的生产成本，同时特殊的炼钢工艺使得SK5具有很高的纯净度，产品的疲劳性能由此得到大大提高。

SK5 is mainly used in tool industry which requires high hardness and high wear resistance, such as knife, scalpel, spinning needle. Baosteel selects special steel-making process to get a stable chemical composition to ensure the stable performance of the parts and reduce the costs. Due to the high purity of SK5, the fatigue properties of is very good.

SK5由于较高的含碳量，为了发挥高碳钢的作用，热处理工艺的选择至关重要，根据零件的不同服役条件，选择合适的淬火工艺和介质能够获取不同的性能，不论采取何种热处理工艺，SK5均能发挥其特殊的优势。

Because of high carbon content of SK5, heat treatment process is critical for different applications. Different properties may be obtained by selecting different quenching process and cooling medium.

结束语

Our vision

宝钢一贯秉持“要善于学习，更要善于创新”的创业精神，在热轧特殊钢的开发征程上勇于开拓进取，产品不断升级换代，技术不断突破创新，我们愿以更好的产品和服务全心全意地效力于国内外相关行业的进步发展。

Following the creed, "Good at learning and better at innovation", Baosteel is pioneering in the development of hot-rolled special steel, continuous upgrade of products and breakthrough of technology. With high quality products and full-hearted service, Baosteel will contribute to the development of domestic and foreign manufacturing industry.

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宝钢在线
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武汉宝钢华中贸易有限公司 电话: 027-84298800 传真: 027-84298224	沈阳宝钢东北贸易有限公司 电话: 024-31391158 传真: 024-31391160	上海宝钢商贸有限公司 电话: 021-26640781 传真: 021-26640700	上海宝钢浦东国际贸易有限公司 电话: 021-26640606 传真: 021-26640666

东北亚及澳洲大区 Northeast Asia and Oceania Region

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东南亚及南亚大区 South East Asia and South Asia Region

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