



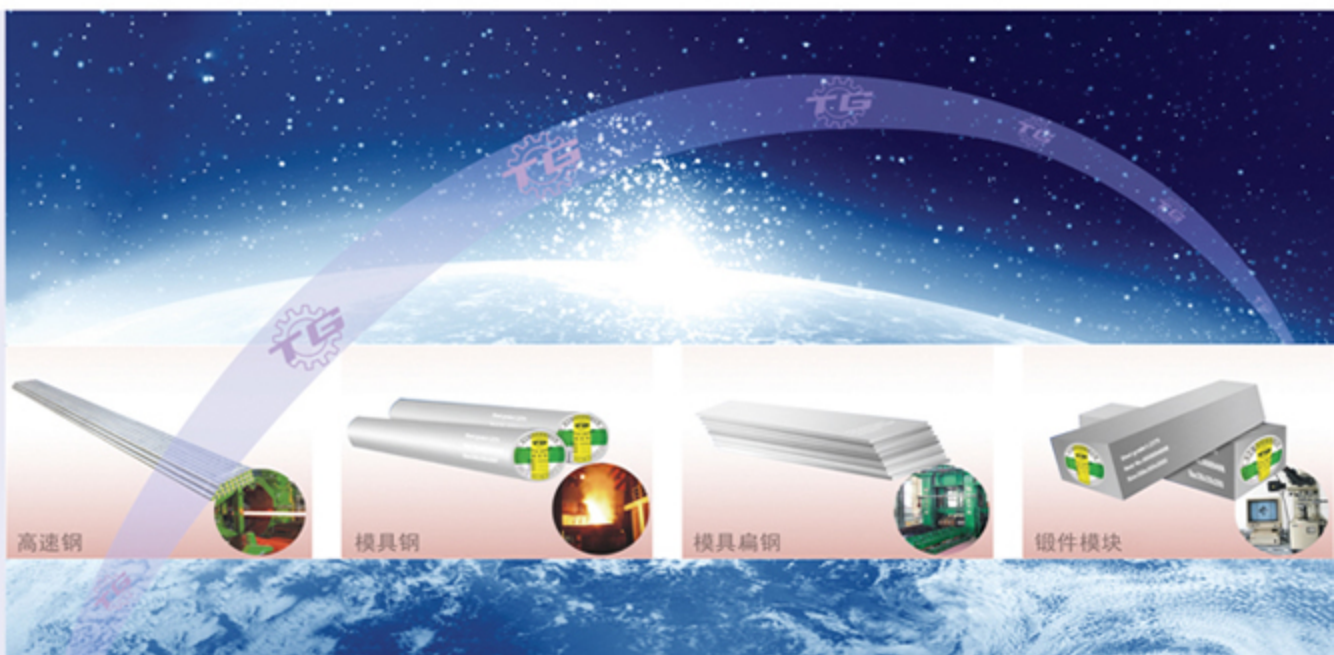
天工国际

TIANGONG INTERNATIONAL



全球著名供应商
Global Supplier

港股代码 0826
HK stock code



高速钢

模具钢

模具高钢

锻件模块

工模具钢

HSS & DIE STEEL

天工国际有限公司
Tiangong International Company Limited



TIANGONG INTERNATIONAL

TG—The name your can trust

公司简介

Brief introduction of company



天工国际有限公司是世界高速钢、切削工具生产基地，全国大型出口外向型企业，国家机电产品出口基地企业之一，于2007年7月26日在香港上市，股票代码：826。2001年，天工高速钢产量跃居世界第一位，“TG”牌已成为中国知名名牌。公司以生产工具麻花钻及其专用材料高速钢和模具钢为主，产品畅销欧美等世界五十多个国家以及香港、台湾地区。公司现具有年生产高速钢、冷作、热作模具钢15万吨的能力，在中国每出口三支麻花钻中就有一支产于天工。

天工建有国内第一条工模具钢连轧生产线和从奥地利GFM公司进口的精锻生产线，建立和完善了一整套的稀土高速钢和麻花钻生产流水线，是国内屈指可数的稀土高速钢及其工具制品一条龙生产销售服务体系的专业企业，拥有从矿业到特钢业、工具业一体化的整套生产销售体系，形成了中国独一无二的产业链条。电炉、LF炉外精炼炉、中频炉、电渣重熔炉、高速钢单流水平连铸机、1250T和2000T快锻、500T和1300T精锻机、连轧、冷轧、冷拔机组、剥皮机、连续退火炉、真空退火炉、煤气发生炉、退火电炉、步进炉、轧钢坯料感应加热装置等在公司一应俱全，技术装备在中国乃至国际特钢行业中堪称领先。

天工生产的产品全部按照国家、国际标准组织生产，于1998年通过了中国方圆委、国家质量技术监督局ISO9001质量体系国际标准认证。天工生产的M7钨系高速钢被审定为“国家火炬计划项目”和“江苏省高新技术产品”以及《中国高新技术产品出口目录》产品，M42高速钢被审定为“江苏省科技攻关项目”和“国家火炬计划项目”，TG高速工具钢获2005年江苏省火炬计划项目，M1高速工具钢审定为2005年国家重点新产品计划项目，TG牌工具、高速钢被评为中国名牌产品。公司信用等级为AAA级，是全国重信用守合同企业，是国家重点高新技术企业，江苏省重点民营企业，荣获“全国金属工具制造行业效益十佳企业”（排名第一位）。拥有四十多项国家发明、实用新型等专利。2005年被评为中国十佳诚信企业。公司董事长、总经理朱小坤先后被评为“中国管理100人”，全国机械工业优秀企业家，全国钢铁工业劳模，江苏省劳模，“中国十佳诚信企业家”等多项殊荣。

天工坚持走产、学、研相结合之路，与钢铁研究总院、东南大学、南京理工大学等建立了良好的产学研合作关系。其中与钢铁研究总院共同组建了高速钢研究中心，与东南大学成立了高速钢及工具工程技术研究中心，成立了江苏省博士后科研工作站，通过产学研合作，解决了高速钢、模具钢生产的大量实际问题，造就了天工一大批懂技术、创新力强的实用型人才。

公司建立健全了一整套现代化管理机制，ERP信息化管理系统将质量、产量、成本、利润、安全和环保等一系列管理指标全部与工资、责任挂钩。严密的质量检测、严格的质量责任、严谨的质量工艺，确保所有产品都符合国家和国际质量标准。

公司的发展目标是“做特钢著名企业，当工具产业骄子”

公司的发展理念是“一切从诚信做起”，“树百年天工，创知名品牌”。

Tiangong International Company limited is one of base for producing HSS and cutting tools in the world、large-scaled export-oriented enterprise and one of the export bases of electromechanical products in China. On the 26th of July, 2007, Tiangong international succeed becoming a member of HongKong stock market with the stock code: 826. In the year of 2001, HSS output became the No.1 in the world, "TG Brand" as the well known brand in China. Our main products: HSS twist drill and its main material HSS, as well as die steel have a ready market in more than 50 countries in European and America as well as in HongKong and TaiWan. Our company has the capacity of producing 150 thousand tons of HSS, cold、hot work tool steel, in China exporting every three pieces of twist drill, one piece comes from TG.

Our company has established the first product line of tool and die steel continuous rolling and imported the precision forging product line from GFM Company of Austria. It has set up and consummated a full set of RE hss and twist drill producing line. Meanwhile It is a numbered professional enterprise which has the complete RE hss and its tool product producing-sale-service system, and it has a full producing service system from mining、special steel line to tool line, which forms the unique industry chain in China. Our company has a full production equipment including electric arc furnace, finery, intermediate frequency furnace, ESR furnace, HSS contecaster, quick forging machine in 1250T and 2000T, precision forging machine in 500T and 1300T, continuous rolling machine, cold rolling, cold drawing, peeling, continuous annealing furnace, vacuum annealing furnace, coal gas producer, electrical annealing furnace, stepping furnace, rolling blank induction heating equipment, which is in the leading place in China even in the world.

Our products are strictly produced according to national and international standards. It gained the CQM quality certificate and ISO 9001 certificate in 1998. M7 hss has been approved to be "National Torch programme", "Jiangsu High and New Technology product", M42 hss as "Jiangsu scientific and Technological project", "National Torch programme". TG hss is approved to be "Jiangsu Torch programme" in 2005, M1 hss as National key new product projects. TG tool and hss has been approved to be China brand-name products. The credit grade of our company is AAA and it has been appraised to be the enterprise paying much attention to the credit and the contract. It is the National Key High and New Technology Enterprise、Jiangsu Key Private Technology Enterprise. Our company has been approved to be No.1 in benefit in national metal tool manufacturing industry. It owns more than 40 items of invention, and practical patents. Our company is one of the credit enterprise, and our chief executive Mr.Zhu xiaokun gained the title "100 China administrators", "National Machinery Industry Excellent Entrepreneurs", "National model worker in the iron & steel industry", "Model Worker in Jiangsu province", "China credit entrepreneur" and so on.

Our company attaches much importance to the combination of producing、learning and researching and has established good cooperation with Central Iron and Steel Research Institute、Southeast University、Nanjing University of science and Technology and so on. We found the Hss Research Centre with Central Iron and Steel Research Institute. Besides, we and Southeast University set up the Research Center of hss and tool project technology, as well as post-doctoral research station in Jiangsu province, which helps us solve a good number of practical questions and brings up many persons with much knowledge、experience and great creativity.

Our company has established a complete set of modern managing system. It's the ERP information managing system that enables us to combine the series of managing targets including quality、output、cost、safety、protection of environment with Worker's responsibility and their wage. Our company insists on the strict quality inspecting、quality responsibility and technical line to assure that products can accord with the national and international standards.

Our goal of development is to become the famous enterprise in special steel and cutting tool industry.

Our tenet of development is to establish the "TG brand" beginning from the trust for hundreds of years.

天工——您可信任的名字

我们的宗旨：

MAXIM OF OUR COMPANY:

最佳产品！

EXCELLENT PRODUCT!

最优服务！

EXCELLENT SERVICE!

最惠价格！

FAVORABLE PRICE!

树百年天工

BUILD UP TIANGONG OF 100 YEARS

创知名品牌

FORM FAMOUS BRAND

天下无处不天工

WONDERFUL EVERYWHERE



天工国际董事局主席朱小坤先生
Chairman: Mr. Zhuxiaokun





TIANGONG INTERNATIONAL

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工 模 具 钢 简 介

Brief Introduction Of Tool & Die Steel

高速工具钢是一种重要的工具材料，主要用于制造切削刀具和冷作模具。

1、用于制作刀具材料，它与另一种主要刀具材料硬质合金相比，有下列主要优点：

● 刀具制造工艺简便能很方便地进行机械加工，这一点对制造形状复杂的刀具特别有利，使用厂能对高速工具钢原材料进行改锻，以改变其形状和尺寸。

● 刃磨方便，能磨制很锋利的刃口，不一定要使用昂贵的超硬磨具CBN砂轮。高速工具钢热处理后有较高的硬度和耐磨性，视钢种的不同硬度可达61-70HRC，且在560℃以下能保持高的热硬度。

● 高速工具钢热处理后，其抗弯强度与冲击韧性远高于硬质合金，由于其韧性好，适宜制作间断切削，在冲击载荷的刀具。

● 能用于较高的切削速度，一般可达30m/分，高速工具钢齿轮滚刀采用合理串刀时，滚削速可达100m/分。

2、用于作冷作模具材料，它与一般的冷作模具钢相比，有下列优点：

● 优良的耐磨性能，使模具寿命长。

● 较高的抗弯强度，使模具工作时不易因工作压力大而产生尺寸变形。

目前很多工业产品质量的改善，生产效率的提高，产品成本的降低以及产品更新换代的速度，在一定程度上取决于模具的制造精度、质量、制造周期、生产成本和使用寿命等因素。如家用电器约80%左右的零部件依靠模具加工；机电工业中约70%的零部件采用模具成形。随着世界模具制造业的迅速发展，作为模具工业基础的模具钢，近年来发展也极为迅速。我公司主要生产高合金模具钢，具有高的耐磨性，红硬性较高，纯净度高韧性好的特点。如：热作系列、冷作系列、塑胶系列。

另公司生产高碳铬马氏体不锈钢，此钢具有高的强度、不锈、耐蚀性能。

Brief Introduction of Tool & Die Steel

High speed tool steel is one of the most important tool materials mainly used for cutting tools and cold working dies.

1. Used as cutting tool material

Compared with another main material cutting toolsintered carbide, high speed steel has the following advantages:

- Making cutting tool manufacturing technology more simple and convenient. It can be easily machined, which is very useful for manufacturing cutting tools of complicated shape. Users can re-forged raw material of high speed tool steel to change its shape and size.
- Making sharpening cutting edges convenient. It can grind very sharp cutting edges not always by using super-hard CBN wheels.
- It can obtain good wearing resistance of a little high hardness. It can reach 61-70 HRC according to different grades of high speed steel and can keep high hot hardness under 560℃.
- Its bending resistance and impact toughness are much higher than carbide. Owing to its good toughness, high speed steel is suitable for making discontinuous cutting tools with impact loads.
- It can be used for high-speed cutting, generally it can reach speed of 30m/min. High speed tool steel gear hob can reach a hobbing speed of 100m/min under the correct shift of hob from cutting area.

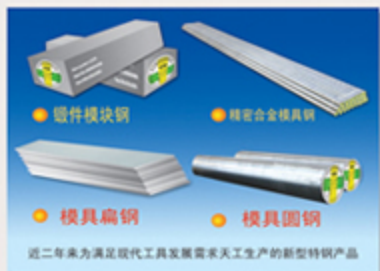
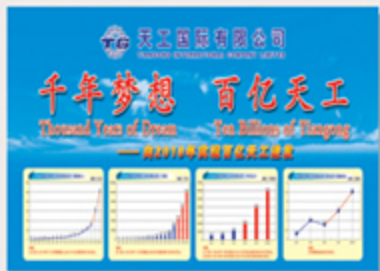
2. Used as cold working die

Compared with common cold working tool steel, high speed steel has these main merits as follows:

- Its good wearing resistance prolongs the mould life.
- Its high pressure resistance enables the mold not to be size distorted by great pressure.

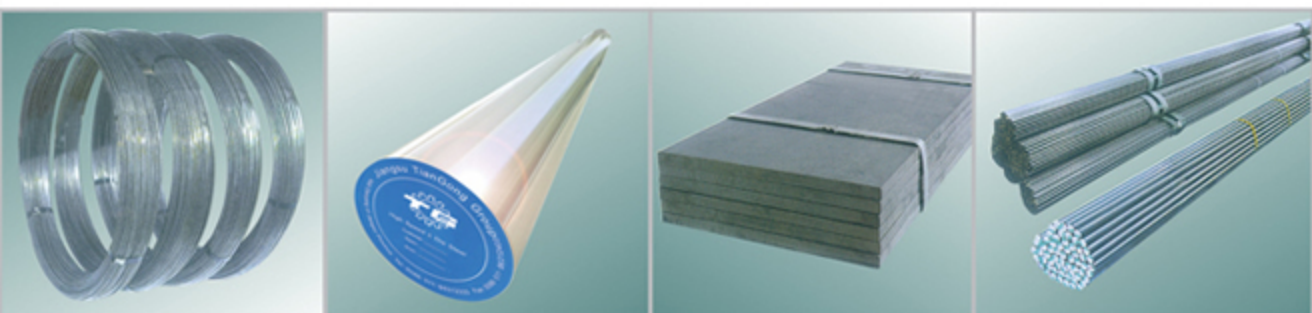
Nowadays, to a certain degree, it lies on the producing precision、quality、production cycle、cost、service life etc. To improve the quality of industry products, to improve the working efficiency, decreasing the cost and the speed of product updating. For instance, about 80% of the components and parts of the electronic household appliances relies on the die processing; in the mechanotronics, 70% of the components and parts is shaped by the die. As the die producing industry develops quickly in the world, die steel, as the base of the international die producing industry, develops rapidly too. Our company mainly manufactures high alloy die steel, which has the advantages of high wear resistance、good red hardness、fine purity、good toughness and so on. For example, Hot working die steel: TG H13, TG H13W; Cold working die steel: TG X5, TG X6, TG X4, D2; Plastic die steel: TG P20, TGP56R, TGP50, and so on.

Besides, our company also produces high-carbon chromium martensitic stainless steel, which has the performances of preferable intension、stainlessness and corrosion resistance.



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工 具 钢 产 品
HSS & DIE STEEL

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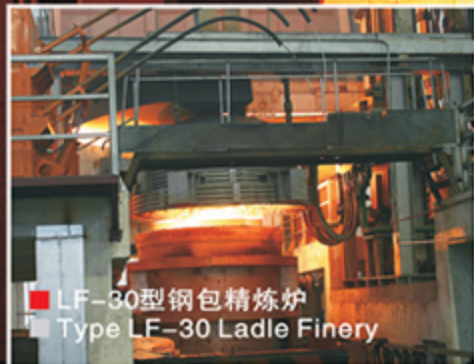
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- TX2-20C型电弧炉
- Type HX2-20C Electric Arc Furnace



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■ LF-30型钢包精炼炉
■ Type LF-30 Ladle Finery



■ 电弧炉
■ Electric Arc Furnace



■ VOD炉

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电弧炉、LF炉外精炼炉、中频炉、电渣重熔炉、高速钢单流水平连铸机、1250T快锻、500T和1000T精锻机、250、300、350、400、550、650轧钢机组、连轧、冷轧、冷拔机组、剥皮机、连续退火炉、真空退火炉、煤气发生炉、退火电炉、步进炉、轧钢坯料感应加热装置等在公司一应俱全，技术装备在中国乃至国际特钢行业中堪称领先。



■ 电渣重熔
■ Electroslag Remelting

Our company has a full production equipment including electric arc furnace, finery, intermediate frequency furnace, electroslag remelting furnace, HSS conticaster, quick forging, 250, 300, 350, 400, 550, 650 rolling mill complex, continuous rolling, cold rolling, cold drawing, continuous annealing furnace, vacuum annealing furnace, coal gas producer, electrical annealing furnace, stepping furnace, rolling blank induction heating equipment, which is in the leading place in China even in the world.



■ 台式退火炉
■ Electric Annealing Furnace



■ 高速钢铸锭
■ HSS Ingot Casting



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■ 1300吨径向锻造机
■ 1300T Radial Forging

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■ SXP32-500T 精锻机 Type SXP32-500T Precision Forging Machine



■ 1250K快锻机 1250 Quick Forging Machine



■ 50K快锻机
■ 50 Quick Forging Machine



■ 2000KN 锻造机
■ 2000KN Forging Machine



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■ 扁钢轧机
■ Flat Bar Rolling



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■ 连轧机
■ Rolling



工模具钢产品
HSS & DIE STEEL
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Tianguong International

- 高速钢研究中心
- HSS research center



- 日本AkashiHK-114型
数显显微硬度计
Japanese Akashi
HK-114 Digital
Microhardness Tester

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■ 数显洛氏硬度计
■ Digital Rockwell Hardness



■ 德国ZEISS2000体式显微镜
■ Germany ZEISS2000 Microscope



■ 德国ZEISS2000MAT金相显微镜
■ Germany ZEISS2000 Metalloscope



■ 电子布氏硬度计
■ Electronic Brinell Hardness

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■ VMS-1510A影像测量仪
■ Type VMS-1510A Image measuring apparatus



■ 2206型表面粗糙度测量仪
■ Type 2206 Surface Roughness measuring apparatus

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■ 美国、瑞士直读光谱仪，可快速分析高速钢中的W、Mo、Cr、V、S、P、N、Nb等元素含量
American and Swiss spectrometers content of W、Mo、Cr、V、Co、S、P、N、Nb and so on.



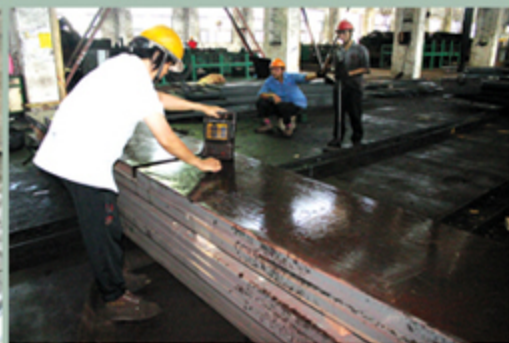
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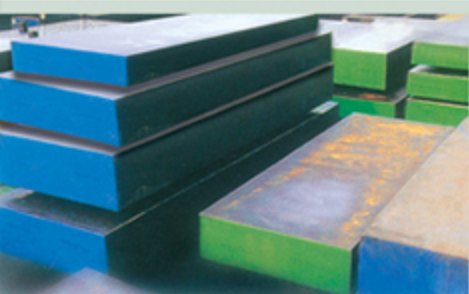
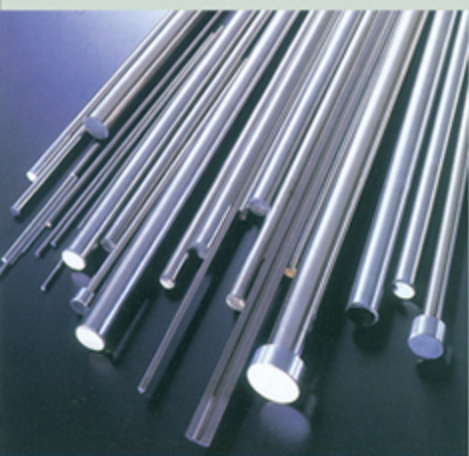
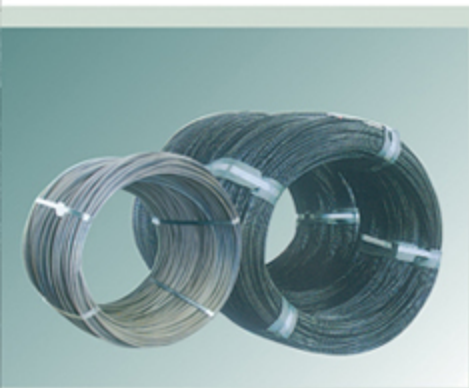
■ 探伤检测
■ Crack Inspecting



■ 超声波探伤
■ Ultrasonic Inspecting



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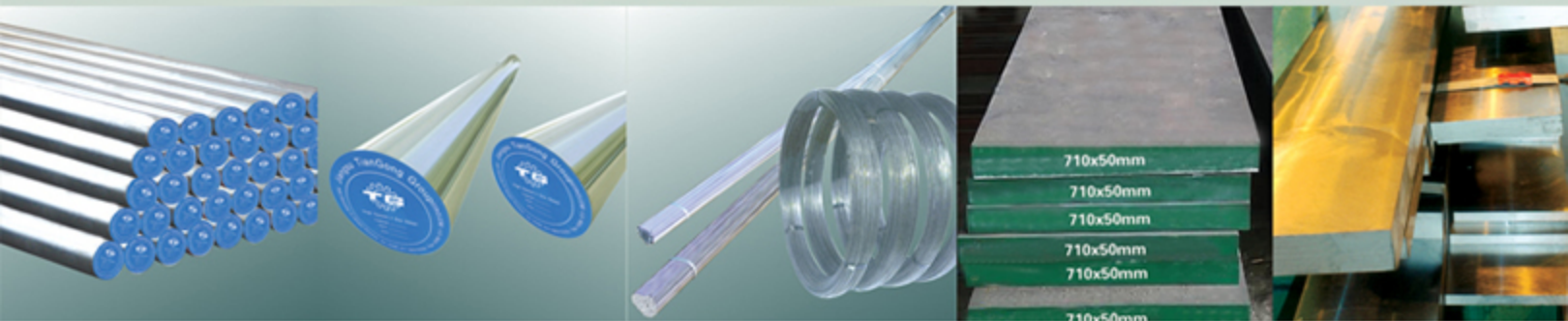


工模具钢产品
HSS & DIE STEEL

工模具钢产品

HSS & DIE STEEL

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Tiangong International
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TG — *The name your can trust*

序号 NO.	钢号 Steel Grade	退火温度 (°C) Annealing Temperature	去应力退火 (°C) Stress Relieving Temperature	淬火温度 (°C) Quenching Temperature	淬火冷却介质 Quenching Cooling Medium	正常回火 温度 (°C) Tempering Temperature	淬回火 洛氏硬度 Quenching & Tempering Rock well Hardness
1	W9Mo3Cr4V (W9)	840-860	720-760	1210-1240	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	63-66
2	W6Mo5Cr4V2 (M2)	840-860	720-760	1210-1230	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	63-66
3	DIN(德标)M2	840-860	720-760	1200-1230	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	64-67
4	W6Mo5Cr4V2A1 (M2A1)	860-880	720-760	1200-1240	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	65-68
5	W2Mo9Cr4V2 (M7)	840-860	720-760	1180-1210	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	65-67
6	W6Mo5Cr4V2Co5 (M35)	840-860	720-760	1200-1235	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	64-67
7	W2Mo9Cr4V Co8 (M42)	860-880	720-760	1160-1190	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	530-560	66-68
8	W18Cr4V (W18)	840-860	720-760	1270-1285	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	550-570	63-66
9	W4Mo3Cr4VSi (W4)	840-860	720-760	1170-1190	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	540-560	63-66
10	W4Mo2Cr4VSi (T-4241)	840-860	720-760	1140-1170	盐浴600°C以下, 也可用油冷或空冷 Salt Bath under 600°C, also oil or air cooling	530-550	63-65.5
11	4Cr5MoSiV1 (H13)	860-890	730-760	1020-1050	油或空气 Oil or air	560-580	47-49
12	Cr12Mo1V1	870-890	720-740	980-1040; 1060-1100	油冷或空气冷 Oil or air cooling	180-230 510-540	60-64
13	3Cr2W8V	800-820	750-770	1050-1100	油冷 Oil cooling	600-620	40-47
14	9Cr18MoV	880-920	800-840	1050-1075	油冷 Oil cooling	100-200	≥55
15	9Cr18Mo	850-870	730-750	1050-1100	油冷 Oil cooling	150-160	≥58
16	9Cr18	880-920	800-840	1000-1050	油冷 Oil cooling	200-300	≥55
17	S7	845	650-675	540-595	Quench: Air, positive pressure quench (2 bar minimum) or interrupted oil to below 150°F (65°C) Sections > 3" may require interrupted oil quench. Oil quench to 1000-1100°F (540-595°C), then air cool to handwarm.	205-540	91.5-96.7
18	A2	870	650-675		Quench: Air or positive pressure quench (2 bar minimum) to below 150°F (65°C)	205-540	58-61



序号 No.	钢号 Steel Grade	特性 Characteristic
1	W9Mo3Cr4V (W9)	我国研制的新型钨钼系通用高速钢,使用性能与W18Cr4V(T1)和W6Mo5Cr4V2(M2)相当,但综合性能优于T1和M2 It is current has developed in our country. Its service performance is equal to that of W18Cr4V(T1) and W6Mo5Cr4V2(M2), but its allround property is better than that of T1 and M2
2	W6Mo5Cr4V2 (M2)	钨钼系通用型高速钢的代表型号,韧性高,热塑性良好,具有较高的硬度,红硬性及高温硬度 It is the typical steel grade of W-Mo current hss, with high toughness, good thermal plasticity, high hardness, red hardness and hot hardness
3	DIN(德标)M2	钨钼系通用型高速钢的代表型号,具有更高的硬度,红硬性及钨钼系通用型高速钢的代表钢高温硬度,同时具有较高的韧性和热塑性 It is the typical steel grade of W-Mo current with much higher hardness, red hardness and typical steel hot hardness of W-Mo current hss also with high toughness & thermal plasticity
4	W6Mo5Cr4V2A1 (M2A1)	钨钼系通用高速钢,具有耐磨性好,热硬度及韧性较高,可磨削性优良的特点,在切削一般硬度的材料时有良好的效果,但在热加工及热处理时易于氧化脱碳。 It is one of W-Mo current hss steel grade with good wear resistance but hardness a little high toughness and nice grindability. When cutting the materials with normal hardness it can obtain good cutting. But it tends to be oxidized and decarburized when being processed and heat treated
5	W2Mo9Cr4V2 (M7)	钨钼系通用高速钢,具有强度高、耐磨、高硬度和高红硬性,较好的热塑性等优点,其韧性优于含钴高速钢,可磨削加工性能差,过热敏感性较大,较易氧化脱碳 It is one of W-Mo current hss steel grade with high hardness, wear resistance, hot hardness, and hardness and a little high thermal plasticity. Its toughness is better than Co hss. Its grindability is a little bad with high oxidizing sensitivity which makes it tend to be oxidized and decarburized
6	W6Mo5Cr4V2Co5 (M35)	钨钼系一般含钴高速钢,红硬性、高温硬度、耐磨性均较W6Mo5Cr4V2要高,该钢切削性能较好,但强度和冲击韧性较低,热加工及热处理时,易于氧化脱碳。 It is one of the W-Mo Co hss steel grade with high hardness, wear resistance, hot hardness, and wearing resistance are all better than W6Mo5Cr4V2. Its bad intensity and impact toughness make it tend to be oxidized and decarburized when being processed and heat treated
7	W2Mo9Cr4V Co8 (M42)	钨钼系高合金含钴超硬型高速钢,具有高的常温硬度、高温硬度、高红硬度、易磨削等特点,加工超硬度钢等难加工材料时表现了良好的切削性能,但韧性稍差。 It is one of the W-Mo high C superhard Co hss with high hardness and hot hardness, high red hardness and good grindability. It has good cutting cutting character when cutting intractable materials such as super high intensity steel. But its toughness is a little bad
8	W18Cr4V (W18)	钨钼系通用型高速钢,具有高的常温硬度、红硬性及高温硬度,热处理高温范围较宽,淬火不易过热,易于磨削加工,但塑性较钨钼系高速钢差。 It is one of the W-Mo current hss with high hardness, red hardness and hot hardness. It has small range of heat treating temperature, it is hard to be overheat when being quenched and is easy to grind. But its plasticity is worse than that of Mo hss
9	W4Mo3Cr4VSi (W4)	高性能低合金高速钢,具有较高的硬度、红硬性以及韧性,热塑性良好,切削性能好 It is a kind of high performance low alloy hss with a little high hardness, red hardness, toughness, good thermal plasticity and good cutting character.
10	W4Mo2Cr4VSi (T-4241)	经济型低合金高速钢,具有一定的红硬性,韧性良好,热塑性良好等特点,通常在较软的,中等强度合金切削条件下使用。 It is an economical low alloy hss with some red hardness, good toughness and thermal plasticity. It is generally used under soft and moderate intensity metal cutting condition
11	4Cr5MoSiV1 (H13)	是一种空冷硬化的热作模具钢,也是所有热作模具钢中最广泛使用的钢号之一,具有较高的热强度和硬度,在高温条件下具有很好的韧性、热疲劳性能和一定的耐磨性,在较低的温度条件下空淬,热处理变形小,空淬时产生的氧化皮倾向小,而且可以抵抗熔渣的冲刷作用。 It is one of the air cooling hardened hot die steel and it is one of the widely used hot die steels with a bit high hot intensity and hardness. It has good toughness, thermal fatigue property and a certain wear resistance under moderate temperature condition. It can resist of molten aluminum with small heat treating distortion and small tendency of bringing scale when being air quenched under low austenitizing temperature condition
12	Cr12Mo1V1	是国际上广泛采用的高碳高铬冷作模具钢,属莱氏体钢,具有高淬透性,淬硬性,高温抗氧化性能好,淬火和抛光抗蚀能力好,热处理变形小。 It is one of the world-wide used high C high Cr cold die steel which belongs to ledeburitic steels with high hardenability, hardening capacity, antioxidation property, good character of resisting to rust and low heat treating distortion
13	3Cr2W8V	在高温下有较高的强度和硬度,相变温度较高,抵抗冷变形的耐热疲劳性良好。 Under high temperature it has a bit high strength and hardness with high phase-transition temperature and heat-resistant durability of anti-temper
14	9Cr18MoV	是一种高碳高铬马氏体不锈钢,属于莱氏体钢,在90Cr18钢的基础上加Mo, V而发展起来的,具有更高的硬度,更高的耐磨性,抗回火稳定性和耐腐蚀性能,以及较好的韧性和高温尺寸稳定性。 It is one of the widely used cold die steel which belongs to high Cr ledeburitic steel with high hardenability and good wear resistance. But it has a little bad impact toughness and is easy to fracture
15	9Cr18Mo	是一种高碳高铬马氏体不锈钢,属于莱氏体钢,在90Cr18钢的基础上加Mo而发展起来的,具有更高的硬度,更高的耐磨性,抗回火稳定性和耐腐蚀性能,以及较好的韧性和高温尺寸稳定性。 It is one of the high C high Cr martensitic stainless steel, belonging to ledeburitic steel which is developed on the basis of 9Cr18 by adding Mo. It has much higher hardness, wear resistance, anti-tempering stability, corrosion-resisting properties and good high temperature specification stability.
16	9Cr18	是一种应用广泛的冷作模具钢,属高碳高铬类型的莱氏体钢,具较好的淬透性和良好的耐磨性,冲击韧性较差,易脆裂 It is one of the high C high Cr martensitic stainless steel, belonging to ledeburitic steel which is developed on the basis of 9Cr18 by adding Mo and V. It has much higher hardness, wear resistance, anti-tempering stability, corrosion-resisting properties, good toughness and high temperature specification stability
17	S7	S7 is a shock resisting tool steel with excellent toughness and high strength; along with low to medium wear resistance. It has been widely used for many years to make chisels and punches which undergo shock loading, and has found increasing use for small plastic molds. S7 is easy to machine in the annealed condition and can be readily heat treated. It is deep hardening and in many cases (except for large sections) it can be air quenched, exhibiting minimal distortion on hardening. Due to its relatively high attainable hardness (HRC 58/60) it offers high compressive strength (resistance to deformation) while retaining good toughness. S7 is a versatile tool steel for both cold and warm shock applications.
18	A2	(AISI A2) is an air-hardening medium alloy tool steel which is heat treatable to HRC 60-62. It has wear resistance intermediate between the oil hardening tool steels (O1) and the high carbon chromium tool steel (D2). Because it offers a combination of good toughness along with moderate wear resistance, it has been widely used for many years in variety of cold work applications which require fairly high abrasion resistance but where the higher carbon/high chromium steels are prone to chipping and cracking. (AISI A2) is quite easily machined in the annealed condition and, like other air-hardening tool steels, exhibits minimal distortion on hardening, making it an excellent choice for dies of complicated design.

序号 NO.	钢号 SteelGrade	用途 Usage
1	W9Mo3Cr4V (W9)	可替代W18Cr4V和W6Mo5Cr4V2制作各种工具。
2	W6Mo5Cr4V2 (M2)	用于制造各种承受冲击力较大的工具和一般刀具,如插齿刀,铣刀,丝锥,钻头。 也可制造大型及热塑性成形刀具和高负荷下耐磨损的刀具,如冷作模具。
3	DIN(德标)M2	主要用于制造各种承受冲击力较大的工具和复杂刀具,如插齿刀,铣刀,丝锥,拉刀等。
4	W6Mo5Cr4V2A1 (M2A1)	用于制作螺纹刀具,如丝锥,板牙等;还用作钻头,铣刀及各种车削刀具,各种冷作模具等。
5	W2Mo9Cr4V2 (M7)	用于制作各种拉刀、插齿刀、齿轮滚刀、铣刀、刨刀等切削刀具。刀具使用寿命长,切削难加工材料时,接近含钴高速钢的使用寿命。
6	W6Mo5Cr4V2Co5 (M35)	用于制作高速切削机床的刀具和要求耐高温并有一定振动载荷的刀具。
7	W2Mo9Cr4V Co8 (M42)	用于制各种复杂的高精度的刀具,如精密拉刀、成形铣刀、专用刀具及各种高硬度刀具,可用于对难加工,超高强度材料的切削加工。
8	W18Cr4V (W18)	主要用于制作高速切削的车刀、钻头、铣刀、铰刀等刀具,还用于做板牙、丝锥、扩孔钻、拉丝模、锯片等。
9	W4Mo3Cr4VSi (W4)	主要用于麻花钻、机用锯条,也可用于其它性能要求较低的工具,还可部分用于高载荷模具,航空高温轴承及特殊耐热耐磨零部件等。
10	W4Mo2Cr4VSi (T-4241)	主要用于钻头、丝锥、锯条及高效木工工具,也可部分用于高载荷模具,航空高温轴承及特殊耐热耐磨零部件等。
11	4Cr5MoSiV1 (H13)	该钢广泛用于制造热挤压模具与芯棒、模锻锤和锻模、锻造压力模具、精锻机用模具镶块以及铝、铜及其合金的压铸模。
12	Cr12Mo1V1	宜制造各种高精度、长寿命的冷作模具、刃具和量具,例如形状复杂的冲孔凹模、冷挤压模、滚丝模、搓丝板、冷剪切刀和精密量具等。
13	3Cr2W8V	这种钢可用于制作高温下高应力、但不受冲击负荷的凸模、凹模,如平锻机上用的凹模、镶块、铜合金挤压模、压铸用模具;也可供作同时承受较大压应力、弯应力、拉应力的模具,如反挤压的模具;还可供作高温下受力的热金属切刀等。
14	9Cr18MoV	适宜制造承受在腐蚀环境条件下又要求高负荷、高耐磨的模具以及优良的不锈钢切片机械刀具、剪切工具、手术刀片、高耐磨设备零件。
15	9Cr18Mo	适宜制造承受在腐蚀环境条件下又要求高负荷、高耐磨的模具和轴承套圈及滚动体。
16	9Cr18	适宜制造承受高耐磨、高负荷以及在腐蚀介质作用下的塑料具、轴承套圈、滚动体以及不锈钢切片机械刀具、剪切工具、手术刀片、高耐磨设备零件等。



序号 NO.	钢号 Steel Grade		特性 Characteristic				
			抗压强度 compressive strength	热硬度 hot hardness	耐磨性 wear resistance	韧性 toughness	可磨削性 grindability
1	W9Mo3Cr4V (W9)	It can be used to produce different kinds of tool instead of W6Mo5Cr4V2 and W18Cr4V.					
2	W6Mo5Cr4V2 (M2)	It can be used to produce various kinds of tool enduring big impact force and common cutlery, such as slotting cutter, milling cutter, tap, drill and so on. It can also be used to produce big, thermal plasticity shaped cutlery and anti-abrasive cutlery under high load as cold die steel.					
3	DIN (德标) M2	It is mainly used to produce the cutlery enduring big impact force and complicated cutlery, such as slotting cutter, milling cutter, tap, broach and so on.					
4	W6Mo5Cr4V2A1 (M2A1)	It is used to manufacture screw tool such as tap, tapping die; it can also be used to produce drill, milling cutter, turning cutlery and cold die.					
5	W2Mo9Cr4V2 (M7)	It is used to manufacture broach, slotting cutter, gear hobber, milling cutter, planer tool. The cutlery has a long using life. When cutting intractable materials, its life is almost as long as Co has.					
6	W6Mo5Cr4V2Co5 (M35)	It is used to manufacture to produce different kinds of high speed cutting machine tools and the tools requiring to high temperature resistant and have a certain oscillating load.					
7	W2Mo9Cr4V Co8 (M42)	It is used to manufacture all kinds of complicated high accuracy cutlery, for instance, precise broach, shaped milling cutter, special purpose turning tool and all high hardness cutlery. Also it can be used to process intractable, superhigh intensity materials.					
8	W18Cr4V (W18)	It is used to manufacture high speed cutting turning tool, drill, milling cutter, reamer, as well as tapping die, tap, reamer bit, wire drawing die and saw bit.					
9	W4Mo3Cr4VSi (W4)	It is mainly used to manufacture twist drill, saw bit, and also be used to produce other low performance requirement tools and partly used on high load die, aviation high temperature bearing and special requirement fireproof abrasionproof components and parts.					
10	W4Mo2Cr4VSi (T-4241)	It is mainly used to produce drill, tap, saw bit and high efficiency wood tool and partly used on high load die, aviation high temperature bearing and special requirement fireproof abrasionproof components and parts.					
11	4Cr5MoSiV1 (H13)	It is widely used to manufacture hot extruding die, cored bar, forging die, hammer press die, precision forging machine die insert block and aluminum, copper and its alloy pressure casting die.					
12	Cr12Mo1V1	It is used to manufacture high precision long life cold die, cutting tool and measuring tool such as, complicated shaped punching concave die, cold extrusion, thread rolling die, screw plate, cold shear knife and precision measuring tool.					
13	3Cr2W8V	It can be used to produce the male mould and concave with high temperature and nonimpact load such as male mould and concave die, biscuit bolch, copper alloy extrusion die and casting die in horizontal forging machine. It can also be used to produce the dies which can endure high compressive stress, flexural stress and tension stress such as inverted extrusion dies. Besides, it can be used to produce hot metal cutters under high temperature.					
14	9Cr18MoV	It is used to manufacture dies that require high load, high wear resistance and endure to work in the erosive condition and the stainless mechanical out sheet, shear cutlery, surgical knife blade and the parts for high wear resistance equipments.					
15	9Cr18Mo	It is used to manufacture dies that require high load, high wear resistance and endure to work in the erosive condition, bearing ring and rolling body.					
16	9Cr18	It is used to manufacture the plastic die, bearing ring, rolling body that can high wear resistance, high load under corrosive medium and the stainless mechanical out sheet, shear cutlery, surgical knife blade and the parts for high wear resistance equipments.					
17	S7	It can be used for: Punches, Chisels, Shears, Plastic Molds, Blanking Dies, Hobbed Dies, Forming Dies, Cold/Warm Heading Dies, Tablet Compression Dies, Zinc Die Casting Dies					
18	A2	It can be used for: Punches and Dies, Blanking Dies, Coining Dies, Forming Dies, Fineblanking Dies, Trim Dies, Wear Parts, Shear Blades, Industrial Knives/Slitters, Scrap Choppers, Gauges, Tablet Compression Tooling, Mold Inserts					

NO.	Steel Grade	Quenching Temperature (°C)	Quenching Cooling Medium	Tempering Temperature (°C)	Tempering Hardness	Hardness	UT standard
19	X4	1030-1060°C	oil-cooling or air-cooling	180-200°C, by two times	59-61HRC	≤HB255	SEP1921, (DEC.84)E/e
20	X5	1030-1060°C		200°C 60.5HRC 400°C 56HRC 500°C 55.5HRC		≤HB255	SEP1921, (DEC.84)E/e
21	X6	1030-1060°C	oil-cooling or air-cooling	200°C 60-62HRC 500°C 59.5-62HRC		≤HB255	SEP1921, (DEC.84)E/e
22	H13W	1030°C	air-cooling	560-580°C, by two times	47-48HRC	≤HB235	SEP1921, (DEC.84)E/e
23	H10	1030-1050°C	Oil or saltbath	500-550°C	52HRC	≤HB230	SEP1921, (DEC.84)E/e
24	P50	1050-1080°C	oil-cooling	200°C 58HRC 300°C 54HRC 500°C 52.5HRC 600°C 37HRC		≤HB230	SEP1921, (DEC.84)E/e
25	P56R	1050-1080°C	oil-cooling	200°C 58HRC 300°C 54HRC 500°C 52.5HRC 600°C 37.5HRC		≤HB230	SEP1921, (DEC.84)E/e



NO.	Steel Grade	Delivery status	Size:	Usage	Characteristic
19	X4	As Hot rolled & forged, delivery condition: annealed	Flat Bar Thickness: 12mm-80mm Width: 200mm-710mm Round Bar 2.1mm-400mm	It is suitable for produce cold-pressing die and cold extrusion die which in high-load working condition.	This steel grade belongs to cold-working die steel, with high toughness as well as high wear resistance.
20	X5	As Hot rolled & forged, delivery condition: annealed	Flat Bar Thickness: 12mm-80mm Width: 200mm-710mm Round Bar 2.1mm-400mm	It is suitable for produce cold-pressing die and cold extrusion die	High Strength and Toughness Cold Work Die Steel, it is higher in strength and toughness, compared with Cr12.
21	X6	As Hot rolled & forged, delivery condition: annealed	Flat Bar Thickness: 12mm-80mm Width: 200mm-710mm Round Bar 2.1mm-400mm	Applied in complex and precise moulds like punch dies, line shearing and cutting shape-forming hot work moulds, screw rolling moulds, stainless stel plate punch dies, high speed punch, and also used in powerful wooden milling machines for shearing or cutting.	One fold toughness than SKD11, 520-530 °C with 61-63HRC to get rid of risk about cracking when processing, very suitable for surface hardening treatment to improve the longevity of mould.
22	H13W	In annealed condition.	Hot rolled flat bar Thickness: 10mm-100mm Width: 200mm-710mm Round Bar Diameter: 5-600mm	Suitable for Aluminium Extrusion Die.	H13W is the upgrade of H13. It included all Property which H13 has. Compared with H13, H13W has higher heat resistance, after controled the P,S. The impact value increased. And controled the O in the mateiral to reduce the crack.
23	H10	In annealed condition.	Hot rolled flat bar Thickness: 10mm-100mm Width: 200-710mm Round Bar Diameter: 5-600mm	Suitable for Aluminium Extrusion Die, and Aluminium Copper forging Die.	Good Tempering resistance Thermal conductivity and Hardness as compare with H13.
24	P50	As Hot rolled, in annealed condition.	Hot rolled flat bar Thickness: 10mm-100mm Width: 200-710mm	Suitable for plastic mould and transparent plastic mould under general conditions of corrosion-resistant.	It belongs to martensitic mould steel, with good machining performance, after quenching & tempering, with excellent corrosion resistance, polished performance, high intensity and wear resistance.
25	P56R	As Hot rolled, in annealed condition.	Hot rolled flat bar Thickness: 10mm-100mm Width: 200-710mm	Suitable for plastic mould and transparent plastic mould under general conditions of corrosion-resistant.	It belongs to martensitic mould steel, with good machining performance, after quenching & tempering, with excellent corrosion resistance, polished performance, high intensity and wear resistance.

Corresponding Countries Steel Grade						Chemical Composition(%)								
ITEM	序号 NO.	GB	AISI	JIS	DIN	C	Si	Mn	W	Mo	Cr	V	其它 OTHER	
HSS	1	W9Mo3Cr4V1				0.77-0.87	0.20-0.40	0.20-0.40	8.50-9.50	2.70-3.30	3.80-4.40	1.30-1.70		
	2	W6Mo5Cr4V2	M2	SKH51		0.80-0.90	0.20-0.45	0.15-0.40	5.50-6.75	4.50-5.50	3.80-4.40	1.75-2.20		
	3			SKH9	1.3343	0.86-0.94	≤0.45	≤0.40	5.90-6.70	4.70-5.20	3.80-4.50	1.70-2.10		
	4	CW6Mo5Cr4V2				0.86-0.94	≤0.45	≤0.40	5.90-6.70	4.70-5.20	3.80-4.50	1.70-2.10		
	5	W6Mo5Cr4V2Al				1.05-1.15	0.20-0.60	0.15-0.40	5.50-6.75	4.50-5.50	3.80-4.40	1.75-2.20	Al: 0.80-1.20	
	6	W6Mo5Cr4V2Co5	M35	SKH55	1.3243	0.87-0.95	0.25-0.45	0.20-0.40	5.90-6.70	4.70-5.20	3.80-4.50	1.70-2.10	Co: 4.50-5.00	
	7	W2Mo9Cr4VCo8	M42	SKH59	1.3247	1.05-1.15	0.15-0.65	0.15-0.40	1.15-1.85	9.00-10.00	3.50-4.25	0.95-1.35	Co: 7.75-8.75	
	8			M52			0.85-0.95	0.20-0.60	0.15-0.45	0.75-1.50	4.00-4.90	3.50-4.30	1.65-2.25	
	9	W2Mo9Cr4V2	M7	SKH58			0.97-1.05	0.20-0.55	0.15-0.40	1.40-2.10	8.20-9.20	3.50-4.00	1.75-2.25	
	10	W18Cr4V	T1	SKH2	1.3355	0.73-0.83	0.20-0.40	0.10-0.40	7.20-18.70	≤0.3	3.80-4.50	1.00-1.20		
	11	W4Mo3Cr4VSi					0.83-0.93	0.70-1.00	0.20-0.40	3.50-4.50	2.50-3.50	3.80-4.40	1.20-1.80	
	12	W4Mo2Cr4VSi					0.90-1.00	0.80-1.30	0.20-0.45	1.50-2.50	0.50-1.20	3.80-6.00	0.50-1.00	
DIE STEEL	13	4Cr3Mo3SiV	H10		1.2365	0.28-0.35	0.10-0.40	0.15-0.45		2.50-3.00	2.70-3.20	0.40-0.70		
	14	4Cr5MoSiV	H11	SKD6	1.2343	0.33-0.41	0.80-1.20	0.25-0.50		1.10-1.50	4.80-5.50	0.30-0.50		
	15	4Cr5MoSiV1	H13	SKD61	1.2344	0.35-0.42	0.80-1.20	0.20-0.50		1.20-1.50	4.80-5.50	0.85-1.15		
	16	3Cr2W8V	H21	SKD5	1.2581	0.26-0.36	0.15-0.50	0.15-0.40	8.50-10.0		3.00-3.75	0.30-0.60		
	17	Cr12Mo1V1	D2	SKD11	1.2379	1.45-1.60	0.10-0.60	0.20-0.60		0.70-1.00	11.00-13.00	0.70-1.00		
	18	Cr12	D3	SKD1	1.2080	1.90-2.20	0.10-0.60	0.20-0.60			11.00-13.00			
	19		D6		1.2436	2.00-2.30	0.10-0.40	0.30-0.60	0.60-0.80		11.00-13.00			
	20	Cr5Mo1V	A2	SKD12	1.2363	0.95-1.05	0.10-0.50	0.40-1.00		0.90-1.40	4.75-5.50	0.15-0.50		
	21		S7		1.2357	0.45-0.55	0.20-1.00	0.20-0.90		1.30-1.80	3.00-3.50	Max 0.35		
	22	MnCrWV	O1	SKS3	1.2510	0.90-1.05	0.15-0.35	1.00-1.20	0.50-0.70		0.50-0.70	0.05-0.15		
	23	5CrNiMo	L6	SKS51	1.2714	0.50-0.60	0.10-0.40	0.60-0.90		0.35-0.55	0.80-1.20	0.05-0.15	Ni: 1.50-1.80	
	24	3Cr2Mo	P20		1.2311	0.30-0.38	0.35-0.60	0.60-1.00		0.30-0.55	1.50-1.80			
	25	3Cr2Mo+Ni				0.32-0.38	0.20-0.40	0.60-0.80	≤0.20	0.25-0.40	1.70-2.00	0.15-0.30	Ni: 0.85-1.15	
	26				1.2738	0.35-0.45	0.20-0.40	1.30-1.60		0.15-0.25	1.80-2.10		Ni: 0.90-1.20	
	27				1.2367	0.35-0.40	0.30-0.50	0.30-0.50		2.70-3.20	4.80-5.20	0.40-0.60		
	28			DC53		0.90-1.05	0.80-1.10	0.20-0.50		1.80-2.40	7.50-8.50	0.15-0.35		
	29			NAK80		0.10-0.20	≤0.45	1.40-2.00		0.20-0.50	Cur: 0.80-1.20 Al: 0.70-1.30	Al: 0.70-1.30	Ni: 2.90-3.40	
	30	9Cr18Mo	440C	SUS440C		0.95-1.10	≤0.80	≤0.80		0.40-0.70	16.0-18.0			
	31	X4				1.25-1.35	0.20-0.50	0.10-0.45			7.50-8.50	0.10-0.20	P: ≤0.030 S: ≤0.020	
	32	X5				1.25-1.35	0.80-1.00	0.10-0.45	Mo+1/2W		7.50-8.50	0.15-0.30	P: ≤0.030 S: ≤0.020	
	33	X6				0.90-1.05	0.80-1.10	0.10-0.45		1.80-2.10	7.50-8.50	0.20-0.35	P: ≤0.025 S: ≤0.020	
	34	4Cr5MoSiV1	H13W	SKD 61	1.2344	0.36-0.43	0.85-1.20	0.30-0.50	0.80-1.00	0.50-0.70	4.50-5.50	0.60-0.80	P: ≤0.030 S: ≤0.015	
	35		P50			0.36-0.45	≤0.60	≤0.80			12.00-14.00	0.10-0.20	P: ≤0.030 S: ≤0.020	
	36		P56R			0.35-0.45	0.90-1.20	0.40-0.70			13.00-14.00	0.25-0.35	P: ≤0.030 S: ≤0.020 Ni: 0.40-0.60	

目前我们天工能够正常供货的其它钢种情况如下：
Today our TG can produce & supply other different grade steel as following:

Grade	GB	DIN	AISI	Form of Supply
钢号	中国牌号		美标牌号	供应类型
1.2080	Cr12	X210Cr12	D3	圆钢/扁钢(Round Bar/Flat Bar)
1.2842	9Mn2V	90MnCrV8	02	
1.2510	9CrWMn	100MnCrW4	01	圆钢/扁钢(Round Bar/Flat Bar)
1.2363	Cr5Mo1V	X100CrMo5	A2	圆钢/扁钢(Round Bar/Flat Bar)
1.2343	4Cr5MoSiV1	X38CrMoV5-1	H11	圆钢(Round Bar)
1.2367		X38CrMoV5-3		圆钢(Round Bar)
1.2083		X42Cr13	420	扁钢(Flat Bar)
1.2085		X33CrS16		扁钢(Flat Bar)
1.2311		40CrMnMo7		扁钢(Flat Bar)
1.2738		40CrMnNiMo8-6-1		扁钢(Flat Bar)
1.2714		56NiCrMoV7	L6	圆钢(Round Bar)
1.2767		X45NiCrMo4		圆钢(Round Bar)
1.2357		50CrMoV13-14	S7	圆钢(Round Bar)

备注:如对以上系列钢种的供货情况有疑问,及时联系我公司相关销售人员;同时我们天工还可以根据客户要求配合一起研发其它高合金钢种。

Notice: If you have any question for the supplying sizes range of above mentioned ,different grade steel, please contact with our sales peoples! Tks!And our TG can develop some other new grade steel of High Alloy according Customer's detail inquiry.



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钢材硬度对照参考表
Hardness Comparison Table

抗拉强度	维氏硬度	布氏硬度	洛氏硬度	抗拉强度	维氏硬度	布氏硬度	洛氏硬度
Rm	HV	HB	HRC	Rm	HV	HB	HRC
N/mm2				N/mm2			
255	80	76	-	660	205	195	-
270	85	80.7	-	675	210	199	-
285	90	85.2	-	690	215	204	-
305	95	90.2	-	705	220	209	-
320	100	95	-	720	225	214	-
335	105	99.8	-	740	230	219	-
350	110	105	-	755	235	223	-
370	115	109	-	770	240	228	20.3
380	120	114	-	785	245	233	21.3
400	125	119	-	800	250	238	22.2
415	130	124	-	820	255	242	23.1
430	135	128	-	835	260	247	24
450	140	133	-	850	265	252	24.8
465	145	138	-	865	270	257	25.6
480	150	143	-	880	275	261	26.4
490	155	147	-	900	280	266	27.1
510	160	152	-	915	285	271	27.8
530	165	156	-	930	290	276	28.5
545	170	162	-	950	295	280	29.2
560	175	166	-	965	300	285	29.8
575	180	171	-	995	310	295	31
595	185	176	-	1030	320	304	32.2
610	190	181	-	1060	330	314	33.3
625	195	185	-	1095	340	323	34.4
640	200	190	-	1125	350	333	35.5

抗拉强度	维氏硬度	布氏硬度	洛氏硬度	抗拉强度	维氏硬度	布氏硬度	洛氏硬度
Rm	HV	HB	HRC	Rm	HV	HB	HRC
N/mm2				N/mm2			
1115	360	333	36.6	2030	610	(570)	55.7
1190	370	342	37.7	2070	620	(580)	56.3
1220	380	352	38.8	2105	630	(589)	56.8
1255	390	361	39.8	2145	640	(599)	57.3
1290	400	371	40.8	2180	650	(608)	57.8
1320	410	380	41.8		660	(618)	58.3
1350	420	390	42.7		670		58.8
1385	430	399	43.6		680		59.2
1420	440	409	44.5		690		59.7
1455	450	418	45.3		700		60.1
1485	460	428	46.1		720		61
1520	470	437	46.9		740		61.8
1555	480	447	47.7		760		62.5
1595	490	(456)	48.4		780		63.3
1630	500	(466)	49.1		800		64
1665	510	(475)	49.8		820		64.7
1700	520	(485)	50.5		840		65.3
1740	530	(494)	51.1		860		65.9
1775	540	(504)	51.7		880		66.4
1810	550	(513)	52.3		900		67
1845	560	(523)	53		920		67.5
1880	570	(532)	53.6		940		68
1920	580	(542)	54.1				
1955	590	(551)	54.7				
1995	600	(561)	55.2				

您信任的名字





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Wonderful Everywhere

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