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股票代码　厦门钨业 600549

STOCK CODE OF XTC 600549

CEMENTED CARBIDE ROLL PRODUCT

硬质合金轧辊

洛阳金鹭硬质合金工具有限公司

Luoyang Golden Egret Geotools CO.,Ltd.

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COMPANY PROFILE

厦门钨业

厦门钨业是在上海证券交易所上市的集团型股份公司，中国上市公司500强、国家重点高新技术企业、国家火炬计划钨材料产业基地、国家首批发展循环经济示范企业。

厦门钨业主要从事钨精矿、钨钼中间制品、粉末产品、丝材板材、硬质合金、切削工具等各种钨系列产品；稀土氧化物、稀土金属、稀土发光材料、磁性材料和稀土贮氢、系列锂电池材料等各种稀土材料和能源新材料的生产、销售与研发。公司拥有从钨钼矿山→冶炼→深加工→钨钼二次资源回收的完整的钨产业链，以及稀土矿山开发、冶炼加工、稀土新材料、科研应用等完整的稀土产业体系。依托厦钨设有“国家钨材料工程技术研究中心”和“能源新材料研究中心”。

厦钨以“让员工实现自我价值，使用户得到满意服务，为股东取得丰厚回报，与社会共谋和谐发展”为宗旨，将继续发展资金、技术、设备和人才等优势，持续创新，占领技术制高点，为打造最具竞争实力的国际性一流公司而不懈奋斗。

Xiamen tungsten is listed on the Shanghai Stock Exchange Group Co., Ltd.Chinese top 500 listed companies, national key high-tech enterprise of national Torch Plan tungsten materials industry base, first national development of circular economy demonstration enterprise.

Mainly engaged in Xiamen tungsten tungsten concentrate, molybdenum powder products, intermediate products, wire sheet, hard alloy cutting tools, etc. all kinds of tungsten products; rare earth oxides, rare earth metals, rare earth luminescent materials, magnetic materials and rare earth hydrogen storage series, lithium battery materials such as rare earth materials and new energy materials production, sales and R & D.

The company has from mining, smelting and deep processing of tungsten and molybdenum tungsten industry chain to complete the two tungsten resource recovery, and development of rare earth mining, smelting, processing, research and application of new rare earth materials complete rare earth industry system. Relying on a "national Xiamen tungsten tungsten materials engineering technology research center" and "new energy materials research center".

COMPANY PROFILE

洛阳金鹭

洛阳金鹭硬质合金工具有限公司，成立于2012年，是国有上市公司厦门钨业股份有限公司100%投资的“金鹭”系硬质合金骨干企业。公司注册资金10.5亿元人民币，一期投资10亿元人民币。主要从事钨粉、碳化钨粉、硬面材料、硬质合金顶锤、硬质合金辊环、复合片基体、矿山工具等钨系列产品的生产与销售。

洛阳金鹭致力于硬质合金辊环，顶锤以及复合片基体等硬质合金产品的全面开发与生产，我们潜心打造具有高硬度、高抗弯强度、高抗压强度及抗热裂纹性能优异的产品，是超硬材料生产企业追求更高产品品质、更高效益的有力支持者。

LUOYANG GOLDEN EGRET GEOTOOLS CO.,LTD. founded in 2012,is wholly-owned by the listed company XIAMEN TUNGSTEN CO.,LTD(XTC).As a backbone cemented carbide enterprise of XTC with registered capital of 1.05billion RMB and first investment of 1billion RMB,GEOTOOLS specializes in producing high quality tungsten powder,tungsten carbide powder,carbide anvils,carbide roll rings,carbide substrates for PDC bit,mining drill bits and hard facing materials.

GEOTOOLS dedicates into development and production of high quality cemented roll ring,carbide anvil and substrate for PDC compact with high hardness, high bend strength, high compressive strength and thermal crack resistance. GEOTOOLS is a strong supporter for our customers to persuit better product quality and higher benefit.

INDUSTRY CHAIN

产业链

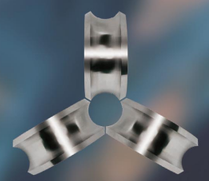
厦钨集团拥有从矿石开采到硬质合金深加工产品的一体化钨产业链：

- 从源头上控制原材料，保证原料供应及成品品质的稳定。
- 有效整合资源、增强下游行业的竞争力。
- 厦钨掌控全球约30%高品位钨资源，年产超3万吨钨冶炼产品，为世界最大的钨品生产和供应基地；

制粉车间 Powder process workshop

RTP车间 RTP workshop

合金制品车间 Great products workshop



Xiamen tungsten ore mining group has from the hard alloy deep-processing products of tungsten industry chain integration:

- Control of raw materials from the source to ensure the quality of raw materials and finished products.
- Effective integration of resources, reduce production costs, maintain price stability, enhance the competitiveness of the downstream industry.
- Xiamen tungsten controls about 30 percent of the world high grade tungsten resources, an annual output of over 3 million tons of tungsten smelting products, is the world's largest tungsten production and supply base.

INDUSTRY CHAIN

金鹭WC原料的技术特性

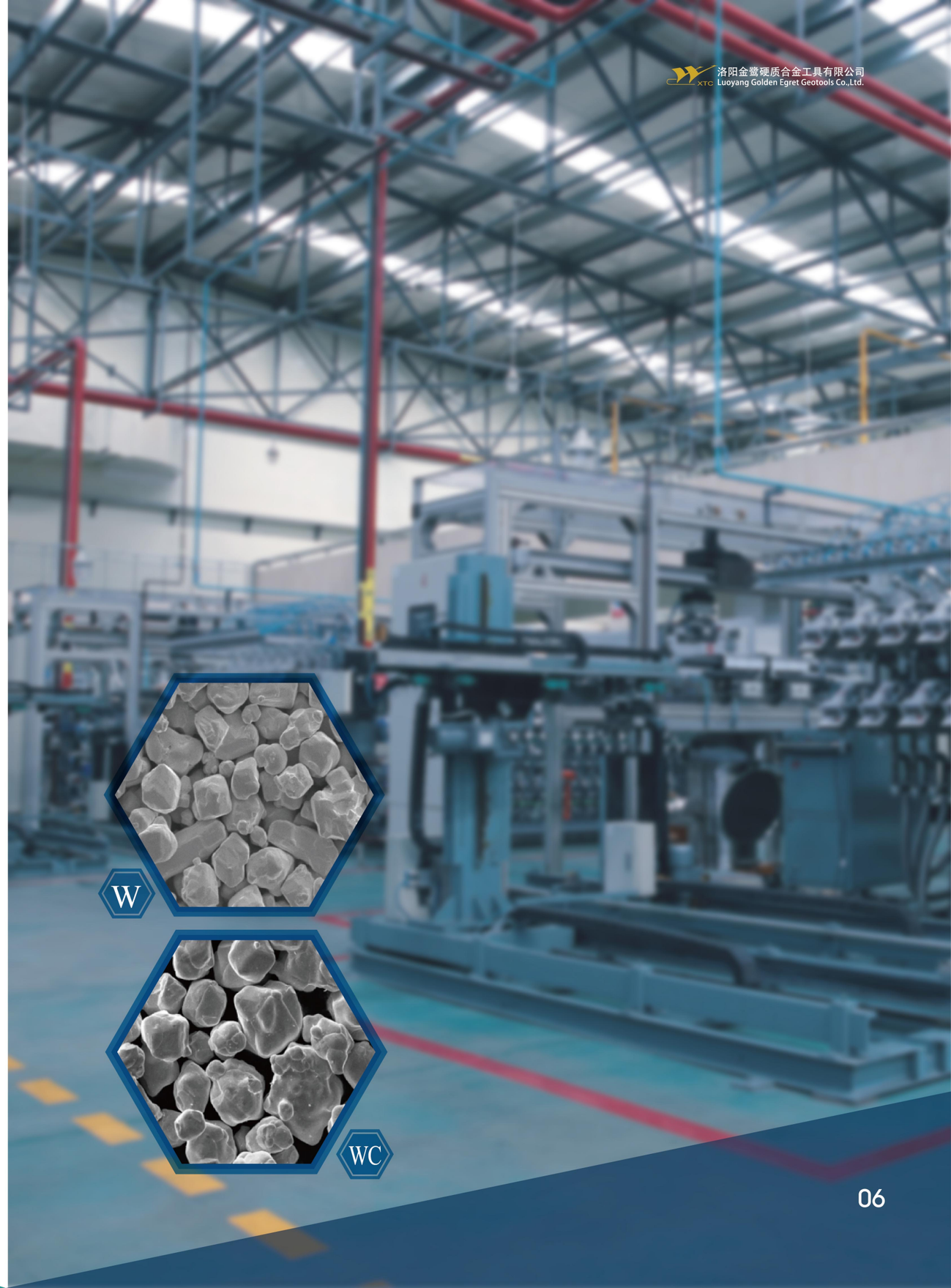
钨粉末制造处于国际先进水平，自主生产的超粗晶钨粉、碳化钨粉，颗粒均匀性好，单晶强度、硬度高。

Tungsten powder manufacturing is in the international advanced level, and its know-how of ultra coarse tungsten powder, tungsten carbide powderproduced by XTC by international advancedtechnologywithevenparticle size are with better grain size and higher hardness.

- 洛阳金鹭辊环采用超粗晶WC粉（粒度20μm以上）为原料。
- 金鹭牌超粗晶WC粉的生产采用一流的自动化还原和碳化设备，同时采用先进的高温还原、高温碳化工艺，制备出的超粗晶WC具有粉末纯度高，碳化程度高，游离碳低，亚晶尺寸粗大，单晶强度和硬度高，晶型完整等优异特点。
- 这种优质WC应用到辊环上能够有效地提高辊环的强度和韧性，提高合金组织的抗热疲劳，减缓轧制过程中辊环热裂纹的扩展，达到降低单次修磨量和提高单槽过钢量的目的。

- Our rolls adopts ultra coarse WC powder (grain size>20μm) as raw materials.
- XTC ultra-coarse WC powder produced by the state of artautomatic reduction and carbonization equipmentwith excellent characteristics of high purity, high carbonization degree, low carbon free, sub-grain size large, single grain of high strength and hardness, shape integrity .
- The application of such qualitative WC to roll products will definitely improve the strength and toughness of roll effectively,i slow down the expansion of cracks in the rolling process by improving anti-thermal-fatigue. and eventually to reduce amount redressing amount andincrease improve the passlife.

WC technical characteristics of raw materials

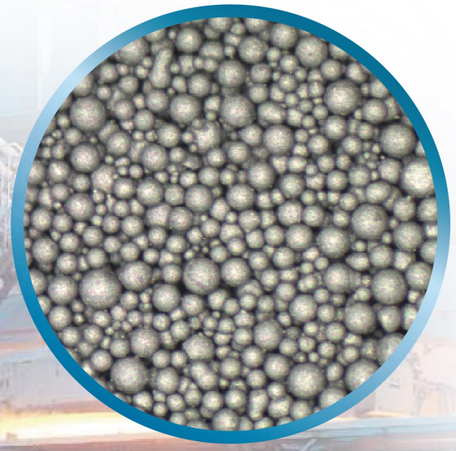


TECHNICAL CHARACTERISTICS OF RTP 混合料的技术特点

混合料制备主要设备
EQUIPMENT FOR RTP

自动球磨机
Milling machine

喷雾干燥塔
Spray-drying



洛阳金鹭辊环混合料粒子形态
Morphology of RTP

洛阳金鹭常用辊环混合料牌号及性能
Grade and property of RTP

牌号 Grade	成分 Main compositions		密度 Density	硬度 Hardness	抗弯强度 Travers rupture strength	抗压强度 Compressive Strength
	WC%	Co+Ni+其它	g/cm³	HRA	N/mm²	Mpa
GD10H	94	6	14.90-15.10	≥88.0	≥2500	≥4200
GR15	92	8	14.60-14.80	≥87.0	≥2400	≥4000
GR20	89.5	10.5	14.30-14.60	≥86.0	≥2400	≥3800
GR25	86.5	13.5	14.10-14.30	≥85.0	≥2400	≥3600
GR30	85	15	13.90-14.20	≥84.0	≥3000	≥3400
GR40	82	18	13.60-13.90	≥83.0	≥2500	≥3300
GR40A	81	19	13.60-13.90	≥83.0	≥2500	≥3300
GR45	80	20	13.40-13.60	≥81.5	≥2500	≥3200
GR50	77	23	13.10-13.40	≥80.0	≥2500	≥3100
GR55	74	26	12.80-13.10	≥79.0	≥2400	≥3100
GR60	70	30	12.50-12.80	≥78.0	≥2600	≥3000
GD50B	84	16	13.80-14.10	≥87.0	≥2500	≥3600

- 采用超粗晶WC粉，经过PLC控制的可倾式球磨设备球磨而成，保证了湿磨工艺的准确性。
- 采用先进的喷雾干燥系统，制作出的混合料氧含量低且稳定，有效提高了合金中碳的控制水平。
- 自动化的设备使生产过程洁净高效、质量稳定可控。
- 混合料松装密度和流动性稳定，可控制波动范围在1%以内，压制的压坯不易出现裂纹及密度不均匀等现象。

- RTP with raw material of ultra-coarse WC,is milled by lean-able milling machined which is controlled by PLC to ensure the accuracy of wet grinding process.
- Advanced spray drying system, ensures the low and stable oxygen content in RTP, and effectively improves the control level of carbon in the alloy.
- Equipment utomation ensures efficient and spotless production process, as well as stable and controllable quality.
- Stable density and fluidity with fluctuation range less than 1%, which avoids the cracks during pressing process and density variation.

压坯的特征：

（1）“自动化双向压制”技术使产品各部位密度均匀一致。

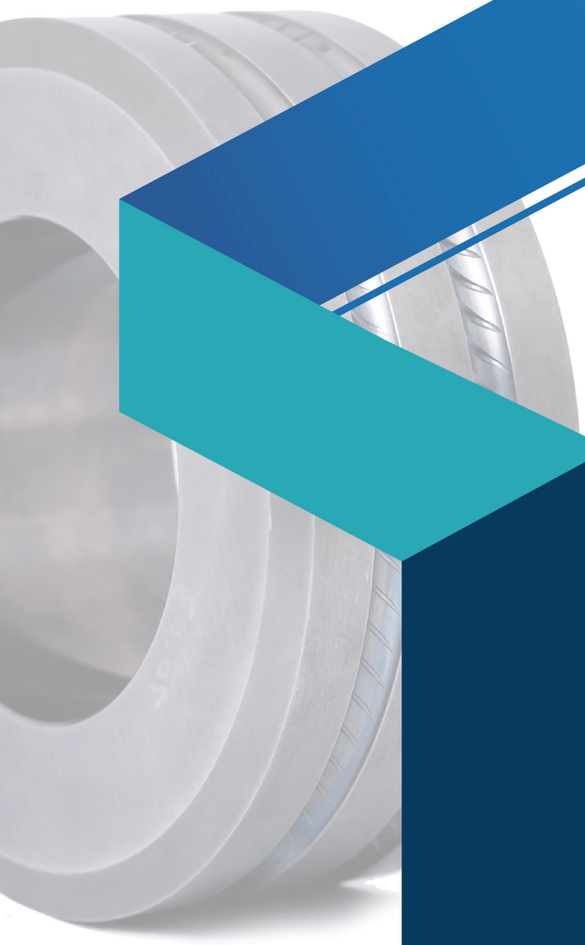
（2）脱模保护预加载功能保证压坯无裂纹、分层等缺陷，质量稳定性高。

（3）PLC精确控制程序，产品尺寸精度高，加工余量精确可控。

PRESS FORMING TECHNOLOGY

压制成型技术

全自动粉末液压成型机
Automatic hydraulic press machine



设备特点：

（1）设备自主研发，已申请专利。

（2）可实现全自动化压制成型。

从称料、加料、压制、分段排气、保压、脱模、取坯等过程全部由程序自动化控制完成，生产效率极高。

（3）设备通过PLC控制，可实现压制压力、压坯高度精确控制。

（4）设备具有自动称料系统，可智能化控制修正重量偏差，压坯单重稳定可控。同时自动称料可保证产品的洁净，避免人工对原料带来的污染。

（5）设备具有阴模浮动和脱模保护功能，可实现自动化双向压制，及有效解决产品密度不均匀及裂纹问题。

（6）设备操作简单，产品质量100%可控，适合大批量稳定化生产。

Equipment characteristics:

(1) Machines are researched and developed independently with patent protection.

(2) Fully automatic molding.
Process automation,from the material weighing, feeding, pressing, subsection exhausting, pressure holding, mold releasing highly improves the production efficiency.

(3) To achieve accurate pressing height and pressure by PLC control.

(4) Single pressing weight is stable and controllable by automatic weight system which controls and corrects weight intelligently, meanwhile, automatic weight system ensures spotless productions effectively.

(5) Mode floating and releasing function of the equipment makes it possible to, realize the automatic bidirectional pressing to effectively solve the problem of density and crack.

(6) Easy operation, stable quality and 100% controllability is suitable for scale production.

Characteristics of blank:

(1) “Automatic bidirectional pressing” ensures even density of the final products.

(2) The preloading function of the mold release ensures the stale quality by avoiding cracks and delamination of the pressing.

(3) PLC system controls the accuracy of product size, which makes milling amount precisely controllable.

SINTERING TECHNOLOGY

烧结成型技术

设备特点：

（1）加热控制系统稳定，炉内温度波动很小，在2°C以内，各区域烧结温度高度一致，温度波动小产品质量稳定可靠。

（2）炉子可达到的真空度高，产品不易氧化，产品内外性能波动小。

（3）炉内各位置气氛高度均匀一致，每炉各产品之间质量稳定性好。

（4）炉子整体控制系统稳定可靠，各炉产品之间质量差距小，适用于大规模稳定化生产。

Equipment characteristics:

(1) Controllable heating system ensures even temperature with fluctuation range <3℃and stable quality of final products.

(2) High vacuum inside the furnace avoids oxidations to protect the productions inside-and-outside performance.

(3) The atmosphere of each position in the furnace is uniform and the quality is good, which ensures the performance of each batch at same level.

(4) The high stability of the furnace control system ensures the quality stability and is suitable for mass production.

德国PVA进口低压炉

PVA HIP furnace

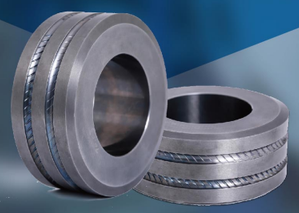
烧结技术特性:

（1）配合德国PVA低压炉，采用国际先进的控碳技术，通过正压加负压的脱蜡方式，使产品磁性能控制在2%以内的波动。

（2）自主开发的集脱蜡和加压烧结的“一体化烧结工艺”，使产品质量更加精确可控。

（3）采用随炉陪烧块模式监测辊环性能。

（4）烧结而成的辊环合金内部没有任何夹渣、脱、渗碳等组织缺陷，也没有裂纹、孔洞等结构缺陷。



Sintering technology characteristics:

(1) The state of the art carbon control technology of German PVA furnace and de-waxing by both positive and negative pressure ensure the magnetic saturation within 2% fluctuation.

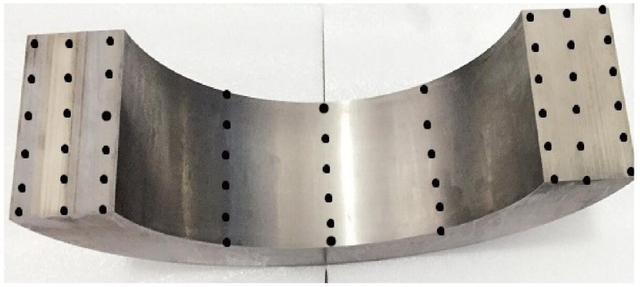
(2) Self-developed sintering process integrates de-waxing and sintering makes the products quality more precise and controllable.

(3) To supervise roll quality by sintering sample which is sintered along with the products.

(4) There are no structure defects such as slag, delamination, carburizing, crack,hole and other defects inside the roll.

烧结完后合金磁性能测量数据

Magnetic property measured data after sintered



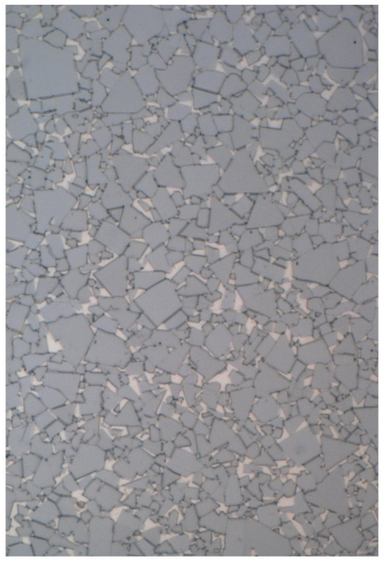
24.7	24.7	24.8	24.7	24.8	24.8	24.8	24.9	24.7
24.9	24.8	24.9	24.8	24.8	24.9	24.9	24.8	24.9
25.0	24.9	25.0	24.8	24.8	25.0	25.0	25.0	25.0
24.9	24.9	25.0	24.9	24.9	24.9	24.9	25.1	25.0
24.8	25.0	24.8	24.9	24.8	24.9	24.9	25.1	24.8
24.8	24.9	25.1	24.8	24.9	24.8	24.8	25.0	24.8

Φ380辊环剖面及内孔磁性测量数据 Magnetic Property of Roll Profile and inner

★ 由表中可以看出我司辊环磁性能波动很小 Few fluctuation from the chart

烧结完后合金金相组织照片

SEM after sintered



我司某牌号辊环合金金相照片

SEM of roll ring

ROLLER RING PROCESSING TECHNOLOGY

辊环加工技术

辊环加工设备
Machining equipment

辊环加工设备为先进的数控磨床和德国万特辊环专用磨床，设备精度高，稳定性好，故障率低，产品精度处于行业先进水平。

The machining equipments for roll ring are CNC grinding machine and WENDT GERMANY lathe with high precision, stability and low failure rate which makes the quality of final product in a leading level.

辊环设备的加工水平
PROCESSING LEVEL

- 辊环的端面、内孔和外圆的加工及开槽刻肋，均采用数控磨床及德国辊环专用磨床加工，保证了辊环的尺寸精度及形位公差处于国内先进水平。磨床具体加工水平如下表所示：

The end face , inner hole and outer diameter and notching machining, are made by advanced CNC grinding machine and the German roll special grinding machine, to ensure that the size accuracy and position tolerances. Specific processing level ofgrinding machine as shown in the following table:

序号 No	项目 Item	检测数量 Quant	精度标准 Precision
1	外径 Outside Diameter	全检 Full Inspection	≤0.02mm
2	内孔 Inner Bore		≤0.01mm
3	高度 Height		≤0.02mm
4	端面平面度 End Face Flatness		≤0.01mm
5	端面跳动 End Face Runout		≤0.006mm
6	内孔粗糙度 The Inner Bore Roughness		R0.2
7	圆跳动 Circular Runout		≤0.005mm

INSPECTION SYSTEM

辊环的检测系统

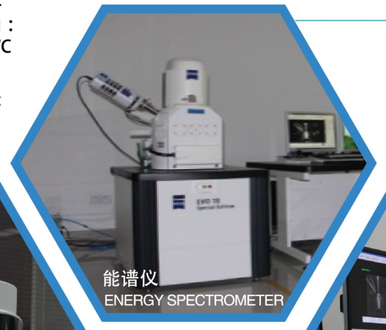
• 材质方面检测：
MATERIAL INSPECTION

★ 电感耦合等离子发射光谱仪作用：主要用于检测WC中杂质含量

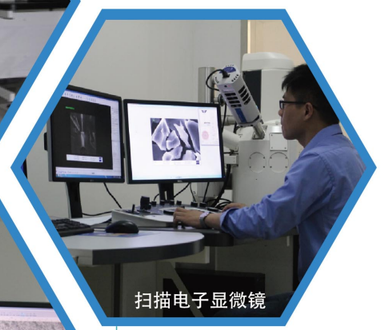
ICP: to inspect the impurity of WC

★ 能谱仪作用：主要用于检测合金中元素含量

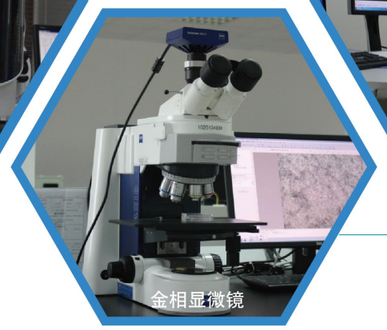
EDS: to test the metal elements in the alloy



INDUCTIVE COUPLED PLASMA EMISSION SPECTROMETER(ICP)



SCANNING ELECTRON MICROSCOPE

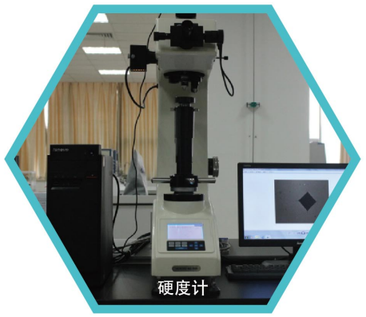


METALLOGRAPHIC MICROSCOPE

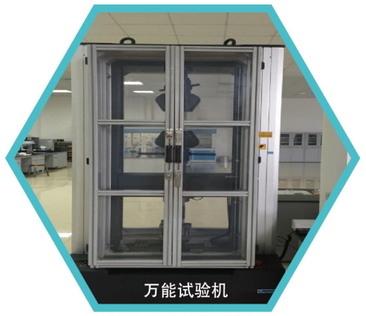
★ 金相显微镜/扫描电子显微镜作用：主要用于观察合金显微组织

SEM: to test the metallurgical structure of the alloy

• 性能检测
FUNCTIONAL INSPECTION:



MICRO VICKERS



UNIVERSAL TESTER

★ 硬度计万能试验机作用：主要用于检测合金硬度及抗弯强度、抗压强度等性能。

Hardness meter: to test and hardness, bending strength, compressive strength.

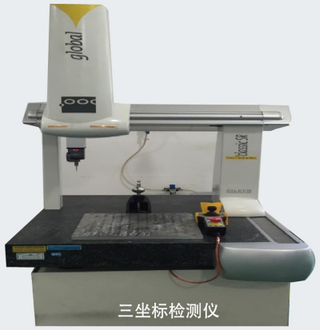
磁力仪
MAGNETOMETER

磁饱和检测仪
MAGNETIC SATURATION DETECTOR

★ 磁力仪磁饱和检测仪作用：主要通过检测材质磁性能来反馈合金内部晶粒大小及渗、脱碳现象。

Magnetometer: to react grain size, carburization and de-carburization by test the magnetism of the material.

• 尺寸及形位公差检测
SIZE AND SHAPE TESTER



CMM three coordinates measuring instrument

★ 三坐标检测仪尺寸及形位公差检测作用：主要用于检测成品尺寸及形位公差

CMM (Coordinate measuring machine): to test the final size and tolerance of the final product

• 内部缺陷的检测
INNER DEFAULT DETECTOR

数字式超声波探伤仪
Ultrasonic fault detector

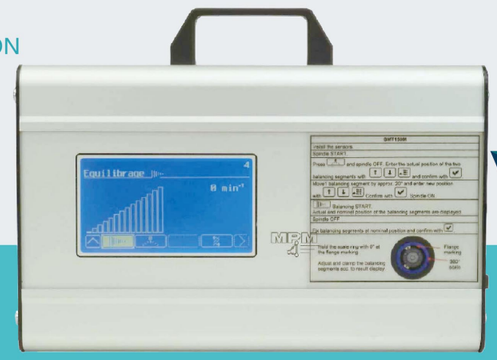
★ 数字式超声波探伤仪内部缺陷的检测作用：主要用于检测辊环成品中的裂纹、孔洞等缺陷。

Ultrasonic Defect Detection: to test and cracks, holes inside the alloy.

• 辊环动平衡检测
DYNAMIC BALANCE INSPECTION

★ 辊环动平衡检测作用：主要用于检测辊环在高速转动下的动平衡情况。

Dynamic Balancing Detection: to test the dynamic balancing during running with high speed.



动平衡检测仪
Dynamic balance detector

QUALITY CONTROL
质量控制

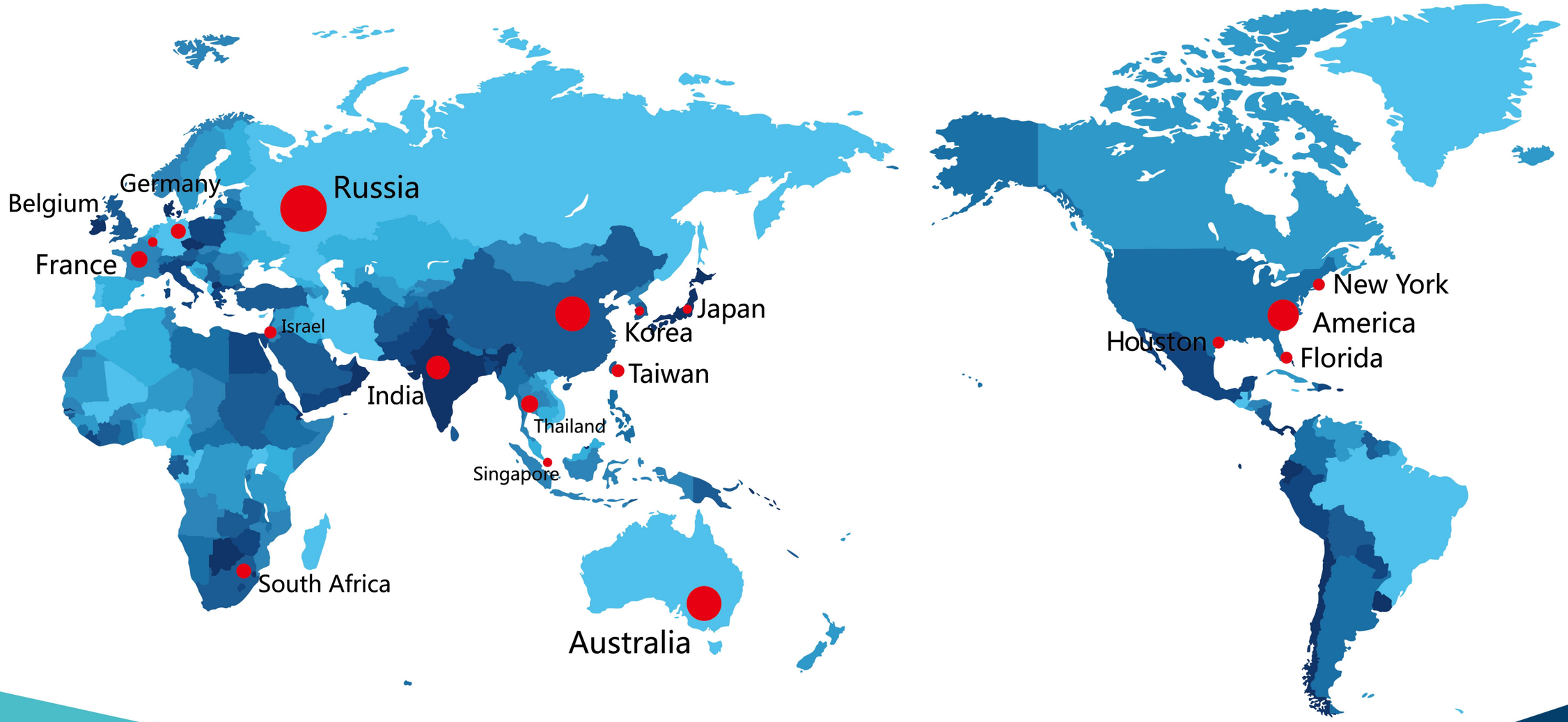
质量是产品生存的根本，是企业发展的立足点。洛阳金鹭是厦门钨业一脉相承的全新开始，发展之初就将优异的产品质量作为起点，稳定的产品质量为发展的保证。有多年粉末及钨系列生产经验和完备的质量控制体系。洛阳金鹭拥有先进的检测设备，完善的过程质量体系（监控）及最终质量检测控制体系。

Quality is the survival root of the product and,the foothold of enterprise development. Luoyang Golden Egret Geotools Co., Ltd. as a new beginning of XTC take best quality as its insurance to the enterprise development at the very beginning. Luoyang Golden Egret Geotools Co., Ltd. occupies advanced testing equipment, processing and final products control system to ensure quality.

QUALIFICATION CERTIFICATE
资质证书

SALES DISTRIBUTION NETWORK

营销网络



SALES DISTRIBUTION NETWORK