

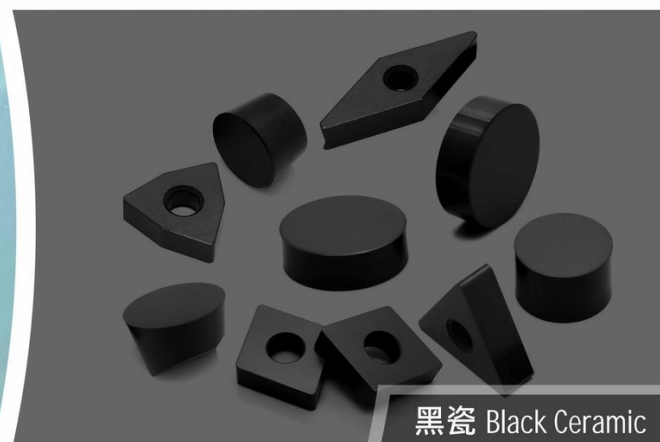
为效率而生
Born For Efficiency

先进陶瓷切削刀具

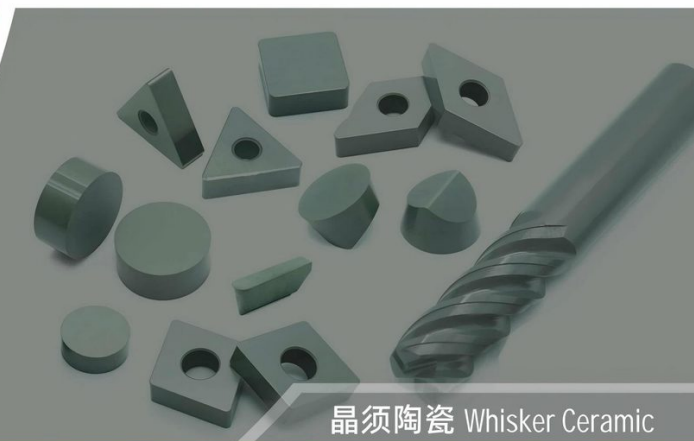
Advanced Ceramic Cutting Tools



赛隆陶瓷 SiALON



黑瓷 Black Ceramic



晶须陶瓷 Whisker Ceramic



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关于我们/About Us

- 晶须增强陶瓷切削刀具
- SiALON陶瓷切削刀具
- 氧化铝基陶瓷切削刀具
- 复合陶瓷切削刀具
- 超硬切削刀具

陶瓷切削刀具因其卓越性能，被广泛应用于航空航天、汽车制造和模具加工领域。它们在加工镍基合金、钴基合金和高硬度钢材等难切削材料时展现出杰出能力，有效克服了传统硬质合金刀具在加工高温合金时的低效问题。高性能陶瓷切削刀具对于航空发动机、燃气轮机、汽车工业和轧钢等领域零部件加工至关重要。株洲新陶新材料有限公司始终坚持研发驱动创新的承诺，通过重大投入实现先进陶瓷产品的持续突破。这一战略提升了我们的行业地位，证明持续的科学创新是提升企业规模与产品质量的基石。

- Whisker-reinforced ceramic cutting tools
- SiALON ceramic cutting tools
- Alumina-based ceramic cutting tools
- Composite ceramic cutting tools
- Superhard cutting tools

Ceramic cutting tools, due to their excellent performance, are widely applied in aerospace, automotive manufacturing, and mold processing fields. They demonstrate outstanding capabilities in machining difficult-to-cut materials such as nickel-based alloys, cobalt-based alloys, and high-hardness steels, effectively overcoming the inefficiency problems of traditional cemented carbide tools when machining high-temperature alloys. High-performance ceramic cutting tools are crucial for component machining in fields such as aero engines, gas turbines, automotive industry, and steel rolling rolls. Zhuzhou Advanced Ceramic Technology Co., Ltd. maintains its commitment to R&D-driven innovation, with significant investments enabling continuous breakthroughs in advanced ceramic products. This strategy has elevated our industry standing, proving that sustained scientific innovation is the cornerstone for enhancing both corporate scale and product quality.



陶瓷刀具/Ceramics Inserts

材料分类与核心原理

氧化铝基陶瓷 (Al_2O_3)

- 成分与结构: $\alpha-Al_2O_3$ 作为主要晶相，添加 TiC (20-30%) 和 ZrO_2 (5-10%) 以提升韧性。
- 原理: 刚玉晶体结构 (六方密堆积) 提供 HV 1800-2000 的维氏硬度；TiC 颗粒提供弥散强化，而 ZrO_2 发生马氏体相变，实现 600-800 MPa 的抗弯强度。
- 特性: 优异的化学稳定性和耐磨性，但抗热震性差 ($\Delta T < 400^\circ C$) 且脆性高。适用于铸铁和淬硬钢的连续或半连续加工，可实现高加工精度和表面质量。

赛隆陶瓷 (SiALON)

- 成分与结构: $\beta-Si_3N_4$ 六方晶系为主相；添加 Al_2O_3 以促进液相烧结。形成可调节 α/β 相比的固溶体以平衡硬度和韧性，形成致密多相陶瓷。
- 原理: α 相贡献更高硬度 (HV 1900-2100)， β 相增强韧性 (8-10 MPa·m^{1/2})； $SiO_2-Al_2O_3$ 在高温下形成氧化膜，降低摩擦系数。高共价键含量 (70%) 提供卓越抗热震性 ($\Delta T > 800^\circ C$)。
- 特性: 综合性能最优，抗氧化性超过 1200°C，抗蠕变性好且摩擦系数低。特别适用于高温合金 (如 Inconel 718, GH4169)、钛合金和耐热钢等难加工材料的断续切削高速加工。

碳化硅晶须增强陶瓷 ($SiCw/Al_2O_3$)

- 成分与结构: Al_2O_3 基体中嵌入 20-30% SiC 晶须 (长径比 50:1)，硬度仅次于金刚石。
- 原理: 晶须诱导的载荷分布机制实现韧协同优化，断裂韧性提升至 8-10 MPa·m^{1/2}；高热导系数 (80-100 W/(m·K)) 减少切削热积累。
- 特性: 优异的抗崩损性兼具耐磨性和强度。主要用于镍基高温合金 (如 Inconel 718)、钛合金和高强度铸铁等难加工材料的粗加工和半精加工，尤其适用于金属去除率超 500 cm³/min 的高效加工。

Material Classification and Core Principles

Alumina-Based Ceramics (Al_2O_3)

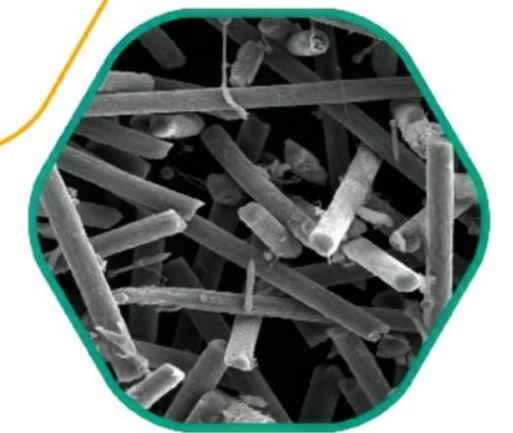
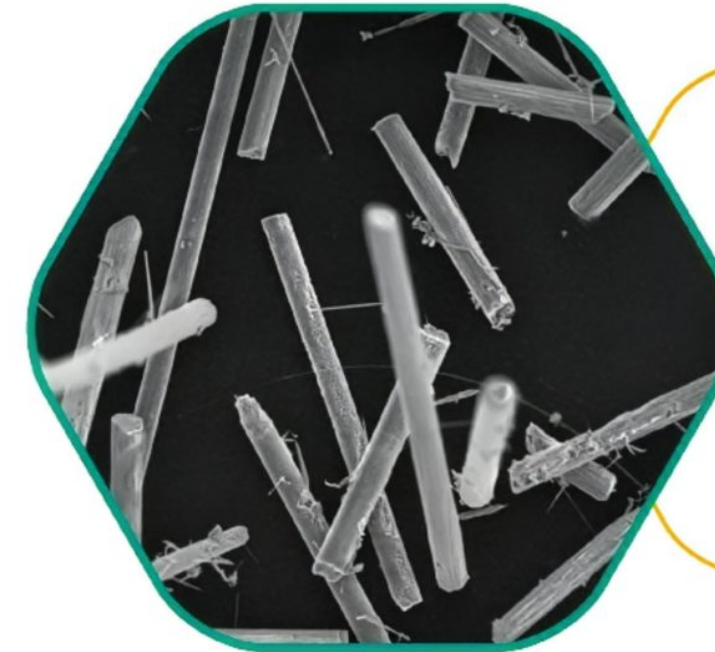
- Composition & Structure: $\alpha-Al_2O_3$ as the main crystalline phase, with additions of TiC (20-30%) and ZrO_2 (5-10%) to improve toughness.
- Principle: Corundum crystal structure (hexagonal close-packed) provides a Vickers hardness of HV 1800-2000. TiC particles provide dispersion strengthening while ZrO_2 undergoes martensitic phase transformation achieving flexural strength of 600-800 MPa.
- Characteristics: Excellent chemical stability and wear resistance, but poor thermal shock resistance ($\Delta T < 400^\circ C$) and high brittleness. Suitable for continuous or semi-continuous machining of cast iron and hardened steel, enabling high machining accuracy and surface quality.

Sialon Ceramics (SiALON)

- Composition & Structure: $\beta-Si_3N_4$ hexagonal crystal system as the primary phase; Al_2O_3 is added to promote liquid phase sintering. It forms a solid solution with a tunable α/β phase ratio to balance hardness and toughness, resulting in a dense multiphase ceramic.
- Principle: The α -phase contributes to higher hardness (HV 1900-2100), while the β -phase enhances toughness (8-10 MPa·m^{1/2}). $SiO_2-Al_2O_3$ forms an oxide film at elevated temperatures, reducing the coefficient of friction. The high covalent bond content (70%) provides excellent thermal shock resistance ($\Delta T > 800^\circ C$).
- Characteristics: Optimal overall performance with oxidation resistance exceeding 1200°C, good creep resistance, and low friction coefficient. It is particularly suitable for interrupted cutting operations, enabling high-speed of difficult-to-machine materials such as high-temperature alloys (e.g., Inconel 718, GH4169), titanium alloys, and heat-resistant steels.

Silicon Carbide Whisker-Reinforced Ceramics ($SiCw/Al_2O_3$)

- Composition & Structure: Al_2O_3 matrix embedded with 20-30% SiC whiskers (aspect ratio of 50:1), enabling hardness second only to diamond.
- Principle: The whisker-induced load distribution mechanism enables synergistic optimization of hardness and toughness, improving fracture toughness to 8-10 MPa·m^{1/2}; high thermal conductivity (80-100 W/(m·K)) reduces cutting heat accumulation.
- Characteristics: Excellent chipping resistance with combined wear resistance and strength. Primarily used for rough and semi-finishing operations of difficult-to-machine materials such as nickel-based superalloys (e.g., Inconel 718), titanium alloys, and high-strength cast iron, especially for high-efficiency machining with metal removal rates exceeding 500 cm³/min.



应用领域 / Application Area

应用领域 / Application Area

航空航天工业 / Aerospace Industry :

加工航空发动机用镍基高温合金部件（例如 Inconel 718），包括轴、涡轮盘、燃烧室机匣以及整体叶盘（叶片集成式盘）。

Machining nickel-based superalloy components (e.g., Inconel 718) for aero-engines, including shafts, turbine disk, combustor casings and blisks (blade-integrated disks).

能源领域 / Energy Sector :

涡轮叶片加工，转子盘车削，冷却孔和气膜冷却孔钻削，密封环槽加工，合金油气管道，核电部件加工。

Turbine blade machining, Rotor disc turning, Cooling hole & film cooling hole drilling, Sealing ring groove processing, Alloy oil/gas pipelines, Nuclear power components machining.

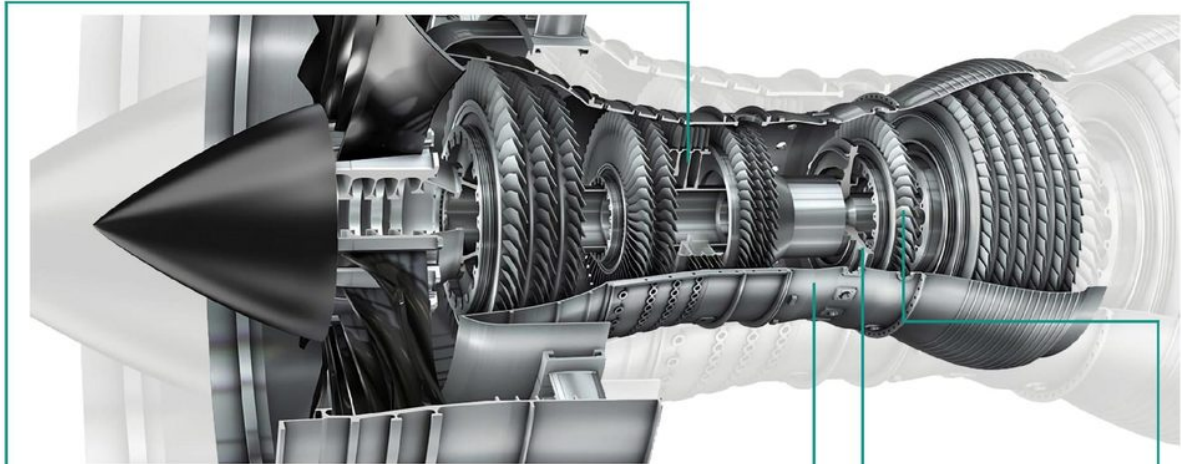
轧钢工业 / Steel Rolling Sector :

高铬铸铁轧辊的粗加工/精加工，碳化钨轧辊的轧槽加工和修复，高速钢轧辊的轧槽加工操作。

Roughing/finishing of high-chromium cast iron rolls, Grooving and refurbishment of tungsten carbide rolls, Fluting operations on high-speed steel rolls.



航空航天工业 / Aerospace Industry



盘轴 / Rotor Disk Shaft



燃烧室机匣 / Combustor Casing



涡轮盘 / Turbine Disk



叶盘 / 叶片 / Bladed Disk / Bladed

航空用切削刀具 / Cutting Tools for Aerospace

速度需求 - 航空刀片 / The Need for Speed - Aerospace Inserts

我们的晶须 / SIALON 增强陶瓷切削刀具专为粗加工和半精加工应用中的重型材料去除而设计。

它们为耐热超合金的高速加工提供完美解决方案 - Inconel, Waspaloy, Haynes, Monel, Rene, Incoloy A-286, Nimonic, Udimet 等。

新陶新材 CW25/CS35 牌号提供全面先进的高速切削刀具解决方案，用于：

Our MSU whisker/SIALON reinforced ceramic cutting tools are designed for heavy material removal in roughing and semi-finishing applications.

They offer the perfect solution for high-speed machining of Heat Resistant Super Alloys- Inconel, Waspaloy, Haynes, Monel, Rene, Incoloy A-286, Nimonic, Udimet, etc.

The MSU CW25/CS35 Grade offers a comprehensive and advanced range of high-speed cutting tool solutions for:

● 速度能力提升（比硬质合金刀具提高十倍以上）实现更高产量和更短周期时间

Increased speed capability (more than ten times compared to carbide cutting tools) for higher throughput and shorter cycle times

● 韧性和抗断裂性增强以提高进给率能力

Increased toughness and fracture resistance for higher feed rate capability

● 增加多样性和锋利刃口处理 / Increased variety and sharper edge preparation

● 高效切削 / Efficient cutting

● 刀具寿命更长 / Longer tool life

● 连续切削条件下性能更佳 / Superior performance in continuous cutting conditions

● 适用湿式与干式加工 / Capable of both wet and dry machining

随着航空航天工业对轻量化材料的需求增长，新陶新材可制造专用于难切削材料加工的新牌号与刀具。凭借更高的切削速度和进给率，在以下应用中提供稳定加工效果与更长刀具寿命：

As demand for lightweight materials in the aerospace industry increases, MSU can manufacture new grades and tooling that specialize in machining hard-to-cut materials.

With higher speed and feed rates, MSU cutting tools deliver consistent results and longer tool life in applications for:

● 粗车（外圆/内孔）/ Rough turning (O.D. & I.D.)

● 半精加工（外圆/内孔）/ Semi finishing (O.D. & I.D.)

● 铣削 / Milling

● 开槽 / Grooving

航空发动机高温合金零件加工 / High-Temperature Alloy Component

Machining for Aero-Engines

应用案例 / Application Cases:

● 涡轮盘榫槽加工：晶须增韧陶瓷刀片用于铣削镍基高温合金（例如 Inconel 718 切削速度达 500 m/min），刀具寿命相比硬质合金提升 8-10 倍。

Turbine Disk Fir-Tree Slot Machining: Whisker-reinforced ceramic insert used for milling nickel-based superalloys (e.g., Inconel 718), cutting speed reaching 500 m/min, tool life increased by 8-10 times compared to cemented carbide.

● 燃烧室机匣台阶特征粗铣：用于粗铣加工的 SIALON 陶瓷刀片可提供延长 2-3 倍的刀具寿命与单件循环时间减少 60%，并具有卓越的热稳定性。

Rough Milling of Combustor Casing Step Features: SIALON ceramic inserts for rough milling applications deliver 2-3X extended tool life and 60% reduced cycle time per part with superior thermal stability.

核心优势 / Core Advantages:

● 降本增效：晶须增韧陶瓷刀片在极端工况下提供卓越的稳定性，并具备优异的抗崩刃性。

Cost reduction and efficiency enhancement: Whisker-reinforced ceramic inserts deliver exceptional stability under extreme operating conditions with superior edge chipping resistance.

● 耐高温性：1200°C 下硬度保持率 >85%，有效抑制高温合金加工硬化层引发的崩刃。High-Temperature Resistance: Hardness retention rate >85% at 1200°C, effectively suppressing edge chipping induced by work hardening layers in superalloys.

应用案例 / Application Cases:

● 叶盘粗开槽：在整体叶盘（IBR）粗开槽加工中，SIALON 陶瓷刀片可实现 350-400 m/min 的切削速度，材料去除率达 500 cm³/min。

Rough Slotting of Bladed disk: During rough slotting of integrally bladed disks (IBR), Sialon ceramic insert achieve cutting speeds of 350-400 m/min with material removal rates reaching 500 cm³/min.

核心优势 / Core Advantages:

● 耐高温稳定性与化学惰性：SIALON 陶瓷刀片在 1300°C 切削温度下保持 90% 以上的强度保持率，加工 Inconel 738LC 材质叶盘时呈现零扩散磨损。

High-Temperature Stability and Chemical Inertness: Sialon ceramic insert maintain over 90% strength retention at 1300°C cutting temperature, exhibiting zero diffusional wear when machining Inconel 738LC bladed disks.

能源领域 / Energy Sector

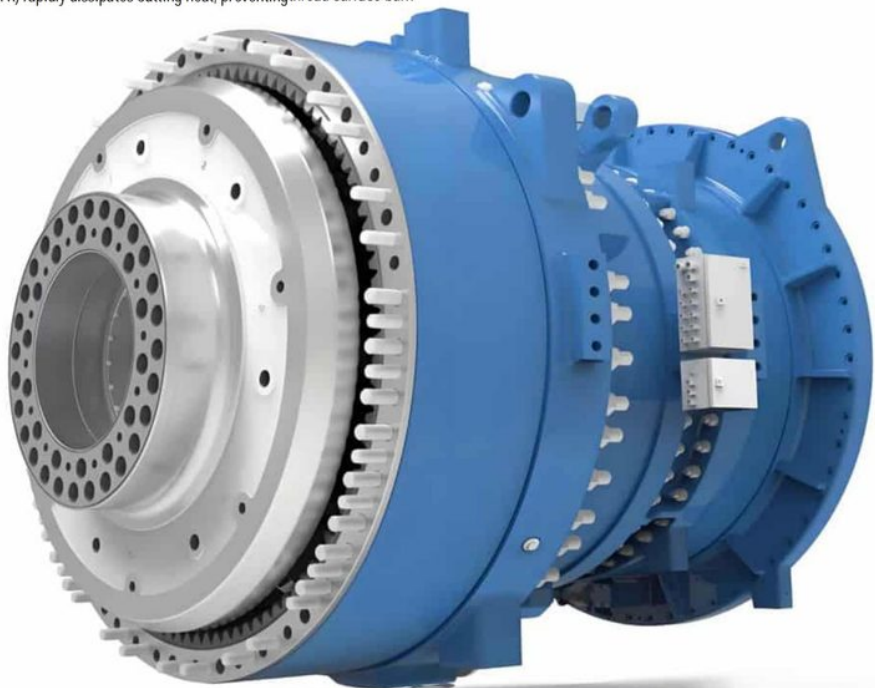
风电行业 / Wind power industry

1. 大型轴承套圈加工(硬化钢, 60~65 HRC)/Machining of Large Bearing Rings (Hardened Steel, HRC60-65) :

- 刀片选型: 氧化铝基陶瓷 (TiC/ZrO₂增强) 或氮化硅基陶瓷 (赛隆陶瓷)。
Insert Selection: Alumina-based Ceramics (TiC/ZrO₂ Reinforced) or Silicon Nitride-based Ceramics.
- 应用案例 / Application Cases:
 - 使用赛隆陶瓷刀片车削直径超2m的风电主轴轴承套圈, 实现切削速度350 m/min、进给量0.3 mm/r, 金属去除率达硬质合金刀具的3倍。
Turning of wind turbine spindle bearing rings with diameters exceeding 2m, using SiAlON ceramic inserts. Achieved cutting speeds up to 350 m/min, feed rate of 0.3 mm/r, and metal removal rates triple that of cemented carbide tools.
 - 表面粗糙度控制在Ra0.8 μm以下, 取消后续磨削工序, 加工时间减少40%。
Surface roughness controlled below Ra0.8 μm, eliminating the need for subsequent grinding operations and reducing processing time by 40%.
- 核心优势 / Core Advantages:
 - 高耐磨性有效抵抗硬化钢中的硬质相磨损, 刀具寿命延长至硬质合金的5倍;
High wear resistance effectively combats carbide wear in hardened steels; tool life extended up to 5 times that of cemented carbide;
 - 耐高温性 (> 1200°C) 抑制切削热导致材料软化变形, 确保轴承尺寸稳定性。
High temperature resistance (>1200°C) suppresses material softening and deformation caused by cutting heat, ensuring dimensional stability of the bearings.

2. 叶片连接螺栓(高强度合金钢, 抗拉强度 > 1000 MPa)/Blade Connection Bolts (High-strength Alloy Steel, Tensile Strength > 1000 MPa) :

- 刀片选型: 碳化硅晶须增强陶瓷 (SiCw/Al₂O₃)。
Insert Selection: Silicon Carbide Whisker-reinforced Ceramics (SiCw/Al₂O₃).
- 应用案例 / Application Cases:
 - 采用SiCw/Al₂O₃刀片车削M36螺栓螺纹, 在冲击载荷下持续断续切削, 金属去除率超500 cm³/min, 刀具寿命较硬质合金提升8倍。
Turning of M36 bolt threads using SiCw/Al₂O₃ inserts: sustained intermittent cutting under impact loads, achieving a metal removal rate exceeding 500 cm³/min. Tool life improved by 8 times compared to cemented carbide.
- 核心优势 / Core Advantages:
 - 高断裂韧性 (KIC = 8~10 MPa·m^{1/2}) 抵抗螺栓毛坯余量不均引发的冲击载荷;
High fracture toughness (KIC = 8~10 MPa·m^{1/2}) enables resistance to impact loads caused by uneven stock allowance on bolt blanks;
 - 导热系数 > 80 W/(m·K) 快速导散切削热, 避免螺纹表面烧伤并保障表面完整性。
Thermal conductivity exceeding 80 W/(m·K) rapidly dissipates cutting heat, preventing thread surface burn and ensuring surface integrity.



核电领域 / Nuclear Energy Sector

1. 反应堆阀门密封面加工(钴基合金堆焊层, 55HRC以上)/Reactor Valve Sealing Surface (Cobalt-based alloy hardfacing layer, HRC55+):

- 刀片选型: 晶须增强氧化铝陶瓷或α/β复相赛隆陶瓷。
Insert Selection: Whisker-reinforced alumina ceramic or α/β composite Sialon.
- 应用案例 / Application Cases:
 - 采用SiCw/Al₂O₃刀具车削阀门密封面, 切削速度150 m/min, 单刀口可加工50件, 替代原电火花工艺使成本降低60%。
Turning of valve sealing surface using SiCw/Al₂O₃ tool, cutting speed 150m/min, 50 pieces can be processed with single edge grinding, replacing the original EDM process, cost reduced by 60%.
- 核心优势 / Core Advantages:
 - 化学惰性避免钴基合金加工中的扩散磨损;
Chemical inertness avoids diffusion wear in cobalt-based alloy machining;
 - 硬度 > 2000HV 高效切削硬化层, 表面完整性优于磨削工艺。
Hardness >2000HV efficiently cuts hardened layers, surface integrity superior to grinding.

2. 乏燃料储罐内衬加工(高锰钢, 显著加工硬化特性)/Spent Fuel Storage Tank Liner (High-manganese steel, significant work hardening) :

- 刀片选型: β-赛隆陶瓷 (Si₃-ZrO₂N₈-Z固溶体)。
Insert Selection: β-Sialon ceramic (Si₃-ZrO₂N₈-Z solid solution).
- 应用案例 / Application Cases:
 - 储罐内孔镗削中, 赛隆刀片在硬度HB500工况下实现250 m/min切削速度, 干式加工避免放射性污染。
Boring of tank inner hole, Sialon insert at hardness HB500 cutting speed 250m/min, dry machining, avoiding radioactive contamination.
- 核心优势 / Core Advantages:
 - 抑制加工硬化能力: 切削力波动降低40%, 抑制表面硬化层形成;
Work hardening suppression ability: Cutting force fluctuation reduced by 40%, inhibiting surface hardened layer formation;
 - 辐射稳定性: 不含钴元素, 避免中子活化污染。
Radiation stability: No cobalt element, avoiding neutron activation contamination.

轧钢工业 / Steel Rolling Industry



轧钢工业专用切削刀具 / Cutting Tools for the Steel Rolling Industry

刀片质量与机械设备及工件同等重要

The quality of inserts is as important as the machinery and workpiece

专为保护您的工件免受极端高温和力量造成的损坏并确保更长刀具寿命而设计, 新陶新材的轧钢厂刀片为轧机牌坊铣削和轧辊辊颈平面铣削提供了理想选择。

轧钢厂专用几何构型用于在最苛刻的粗车条件下切除重型材料。刀片适用于: Designed to protect your workpiece from damage caused by extreme heat and force and ensuring longer tool life, MSU's steel mill inserts offer an optimal choice for milling frackling blocks and for milling flats on mill roll necks. Steel mill geometries are used to remove heavy material in the most demanding rough turning conditions. Inserts are available for:

- 球墨铸铁轧辊 / Nodular iron mill rolls
- 淬硬钢轧辊 / Hardened steel mill rolls
- 延性铸铁轧辊 / Ductile iron mill rolls
- 轧辊不锈钢堆焊层 / 修复作业 / Stainless steel weld overlays / repair work on mill rolls
- 支撑辊 / Back up rolls
- 淬硬工具钢 / hardened tool steel

作为金属陶瓷和硬质合金刀片的高性能替代品, 轧钢厂刀片在以下方面提供卓越的成本效益:

As a high-performance alternative to cermet and carbide inserts, steel mill inserts deliver superior cost efficiency in:

- 高速硬铣削 / High speed hard milling
- 轧辊辊颈低碳钢的高速铣削 / High speed milling of mild steels commonly used for mill roll necks
- 轧机牌坊制造中广泛使用的低碳钢的高速铣削
High speed milling of mild steels widely used in frackling block manufacturing
- 用于减少硬铣削毛刺的正前角几何构型 / Positive geometries for burr reduction in hard milling
- 独特的刀口处理几何构型 / Unique edge prep geometries
- 因高速和高进给率提高的生产率 / Increased productivity due to high speed and feed rates
- 粗车 (30HRC以上) / Rough turning (30 HRC +)
- 铣削 (30HRC以上) / Milling (30 HRC +)
- 适用于广泛管径的管材铣削扒皮工具, 轧辊车削 (包含工作辊和支撑辊)
Tube milling scarfing tools for a wide range of pipe diameters, mill roll turning (both work rolls and back up rolls)

轧辊修复与成型 / Roll Repair and Forming

应用案例 / Application Cases:

- 高铬铸铁轧辊车削: 晶须增韧陶瓷 (SiCw/Al₂O₃) 应用于高铬合金轧辊粗加工, 材料去除率超过500 cm³/min, 使其成为重型加工操作的理想选择。
High Chromium Cast Iron Roll Turning: Whisker-Toughened Ceramic (SiCw/Al₂O₃) is applied for the rough machining of high chromium alloy rolls, achieving a material removal rate exceeding 500 cm³/min making it ideal for heavy-duty machining operations.
- 冷硬铸铁轧辊修复: 含30%碳化钛的氧化铝基陶瓷刀片, 实现“以车代磨”理念。单件循环加工效率提高四倍, 设备停机时间减少70%。
Cold Hard Cast Iron Roll Repair: Alumina-based ceramic inserts containing 30% TiC, enabling the concept of "turning instead of grinding." The single-cycle machining efficiency is increased by fourfold, equipment downtime is reduced by 70%.

核心优势 / Core Advantages:

- 抗冲击性: 碳化硅晶须/氧化铝陶瓷的断裂韧性达到10 MPa·m^{1/2}, 使材料能够承受加工过程中铸造毛胚余量的变化。
Impact Resistance: The fracture toughness of SiCw/Al₂O₃ ceramic reaches 10 MPa·m^{1/2}, allowing the material to withstand the variations in casting blank allowances during machining.
- 超高硬度: 硬度范围为HV HV 1800~2000, 耐磨性是硬质合金的5~8倍。单刀片可修复3~5根轧辊, 显著提高刀具寿命和成本效益。
Ultra-High Hardness: With a hardness range of HV 1800~2000, 5~8 times greater wear resistance compared to cemented carbide. A single insert can be used to repair 3-5 rolls, significantly improving tool life and cost efficiency.

轧机部件高效加工 / Efficient Machining of Rolling Mill Components

应用案例 / Application Cases:

- 轴承钢轧机主轴: 赛隆陶瓷 (α/β-赛隆)用于精车操作, 实现250 m/min的线切削速度, 表面粗糙度Ra ≤ 0.4 μm, 实现免磨削加工并显著缩短周期时间。
Bearing Steel Rolling Mill Spindle: Sialon ceramic (α/β-SIALON) is utilized for finish turning operations, achieving a linear cutting speed of 250 m/min. Surface Ra ≤ 0.4 μm, enabling grinding-free processing and significantly reducing cycle time.
- 球墨铸铁轧机机架: 以1500 m/min的切削速度进行加工, 刀具寿命可达传统硬质合金刀具的6倍。
Ductile Cast Iron Rolling Mill Frame: Machining is performed at a cutting speed of 1500 m/min, with tool life extending up to six times that of conventional cemented carbide tools.

核心优势 / Core Advantages:

- 抗热震性: 耐温差ΔT > 800°C, 适用于轧钢作业典型的高温环境加工。
Thermal Shock Resistance: ΔT > 800°C, suitable for Machining in the high-temperature environments typical of steel rolling operations.
- 化学稳定性: 防止与铸铁中存在的石墨发生反应, 显著减少沟槽磨损, 从而延长刀具寿命并提高表面光洁度质量。
Chemical Stability: preventing reactions with graphite present in cast iron and significantly reducing groove wear, which enhances tool longevity and surface finish quality.

汽车工业/Automotive Industry

汽车工业用切削刀具

在严苛的汽车加工场景中，车削与铣削刀具需具备均匀磨损特性和极低维护需求。

为满足高效生产流程与高产量需求，MSU 推出采用碳化硅晶须的刀片系列，专为汽车工业提供持久耐用性与稳定可靠结果，包括：

- 高抗断裂性，确保在断续与连续加工中保持稳定切削
- 大切深能力，最大切削深度达0.1英寸（2.54毫米）
- 速度能力，铸铁加工线速度达2400+表面英尺/分钟（约1220米/分钟）
- 高进给能力，0.018英寸/转（IPR）以上进给率（约0.457毫米/转）

我们的 MSU 晶须刀片专为铸铁、蠕墨铸铁、可锻铸铁、球墨铸铁、淬火钢（传动部件）、白口铁、冷硬铁和粉末金属中的大余量切削而设计。相较于传统陶瓷刀具，其高硬度显著延长了加工极磨材料时的刀具寿命。

我们提供多种材料类型和牌号的产品，以适配具体的汽车工业应用场景，包括：

- 制动盘和球墨铸铁制动鼓
- 传送带
- 减震器
- 皮带轮
- 齿轮箱
- 变速箱盖
- 汽缸套
- 飞轮，等一系列产品。

Cutting Tools for Automotive Applications

It is essential for turning and milling tools in automotive applications to wear evenly with minimal maintenance in the most demanding applications.

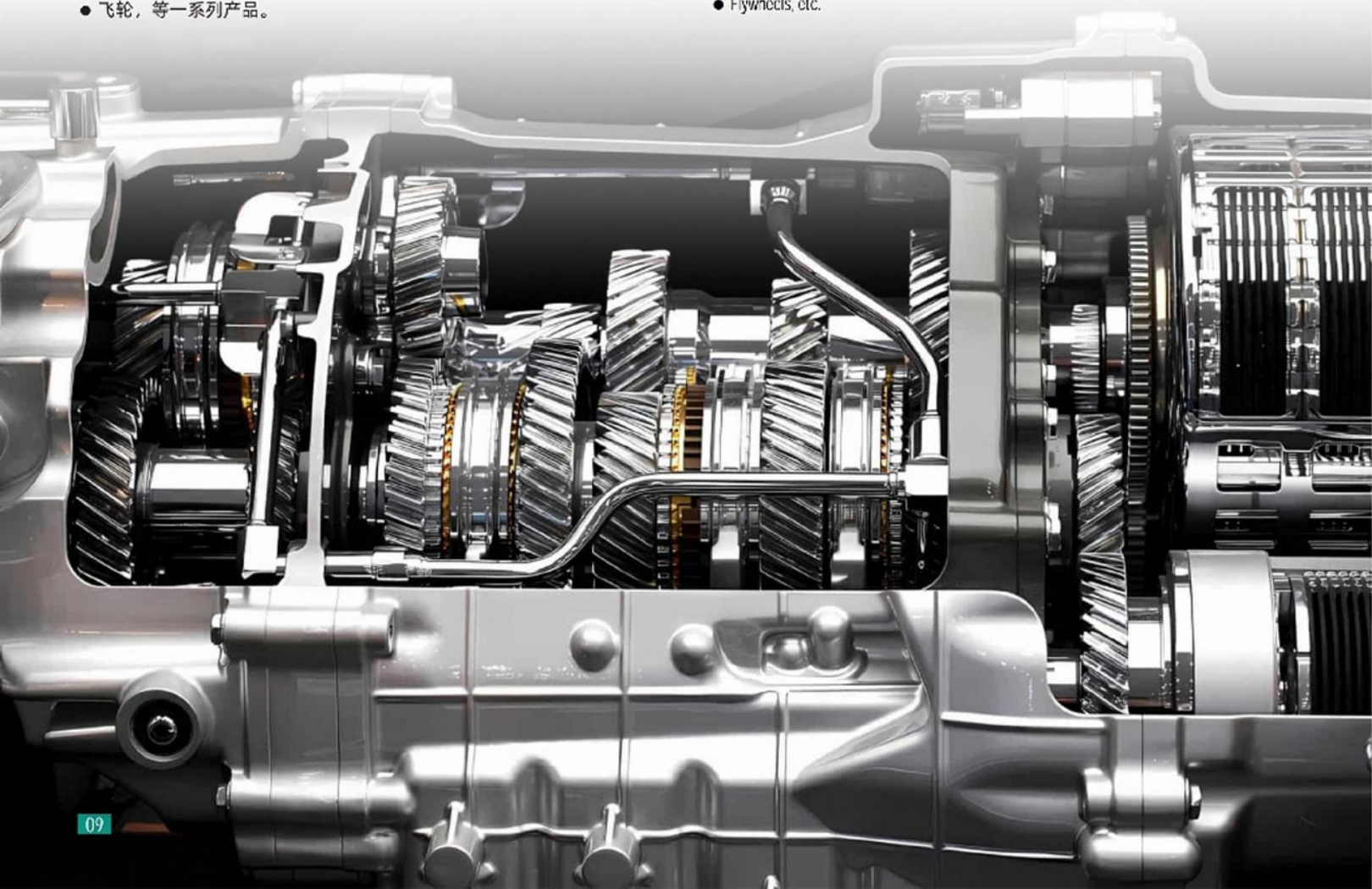
To meet the workflow and high output demands, MSU has a range of inserts for the automotive industry using SiC whiskers that are long-lasting and deliver consistent and reliable results as well as.

- High Fracture resistance for consistent cutting in interrupted and continuous operations
- High DOC capability (Max .100")
- Speed capability of 2,400+ SFM in cast iron
- Feed rate capability of .018" IPR

Our MSU inserts are designed for heavy DOC material removal in cast iron, compacted graphite iron (CGI), ductile iron, nodular iron, hardened steels (transmission components), white iron, chilled iron, and powdered metals. Our high hardness allows us to machine these extremely abrasive materials with extended tool life vs. traditional ceramics.

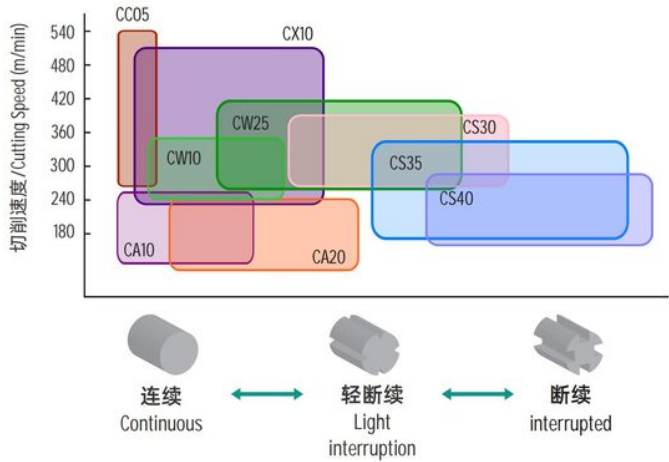
We offer several types and grades of materials for a range of products to suit specific automotive applications including:

- Brake rotors and ductile iron brake drums
- Carriers
- Dampers
- Pulleys
- Gear boxes
- Transmission covers
- Cylinder liner sleeves
- Flywheels, etc.



牌号信息/Grade Information

牌号/Grade	成分 Composition	ISO	特点及应用 Characteristics and Application	微观结构 Microstructure
CC05	CBN	K05,H05	优异的耐磨性与抗热震性。 适用于铸铁、淬硬钢及高温合金的高速连续加工。 卓越的表面光洁度。 Excellent wear resistance and thermal shock resistance. Suitable for high-speed continuous machining of cast iron, hardened steel, and high-temperature alloys. Superior surface finish.	
CX10	复合陶瓷 Composite Ceramics	K10,H10	与晶须陶瓷相比，刀具寿命显著延长；加工效率最高可达两倍；优异的表面光洁度。 采用粉末冶金制造的高温合金亦可加工。 Compared with whisker ceramics, tool life is significantly extended; machining efficiency reaches up to twice; Superb surface finish. Heat-resistant alloys made by powder metallurgy can also be machined.	
CA10	Al ₂ O ₃ +TiCN	K10,H10	适用于淬硬钢及其他硬质材料的高速连续至轻度断续切削，以及铸铁精加工。 For high-speed continuous up to light interrupted cutting of hardened steels and other hard materials and finishing of cast iron.	
CA20	Al ₂ O ₃ +(TiC+Metal)	K20,H20	适用于淬硬钢、铸铁及其他硬质材料的连续至轻度断续切削，韧性较优，适于半精加工。 Continuous and light interrupted cutting of hardened steel, cast iron, and other hard materials, with better toughness, suited for semi-finishing machining.	
CW10	Whisker	K10,S10	专注于立铣精加工的高温合金、高硬度钢及铸铁精加工。 Finishing of high-temperature alloys, high-hardness steels, and cast iron with focus on end milling finishing.	
CW25	Whisker	K25,S25	镍基/钴基合金、铸铁及高硬度钢在连续或轻度断续切削条件下的高速加工。 High-speed machining of nickel-based/cobalt-based alloys, cast iron, and high-hardness steels in continuous or light interrupted cutting.	
CS30	SiALON	K30,S30	具有优异的耐磨性和韧性。被广泛应用于高温合金的粗铣和半精铣。 Possesses excellent wear resistance and toughness. Is widely applied to rough milling and semi-finishing milling of high-temperature alloys.	
CS35	SiALON	K35,S35	与晶须陶瓷相比，具有卓越的抗崩刃性。因此实现高进给、大切深加工，达成效率提升。在Inconel氧化皮去除加工中表现卓越。亦适用于立铣加工。 Compared with whisker ceramics, possesses superior flaw resistance. Therefore, enables high-feed and high-depth-of-cut machining, achieving efficiency improvement. Demonstrates outstanding performance in scale removal machining of Inconel. Also suitable for end milling.	
CS40	SiALON	K40,S40	最适用于高温合金与铸铁材料氧化皮去除加工及断续切削的材料。 The material most suitable for scale removal machining and interrupted cutting of high-temperature alloys and cast iron materials.	



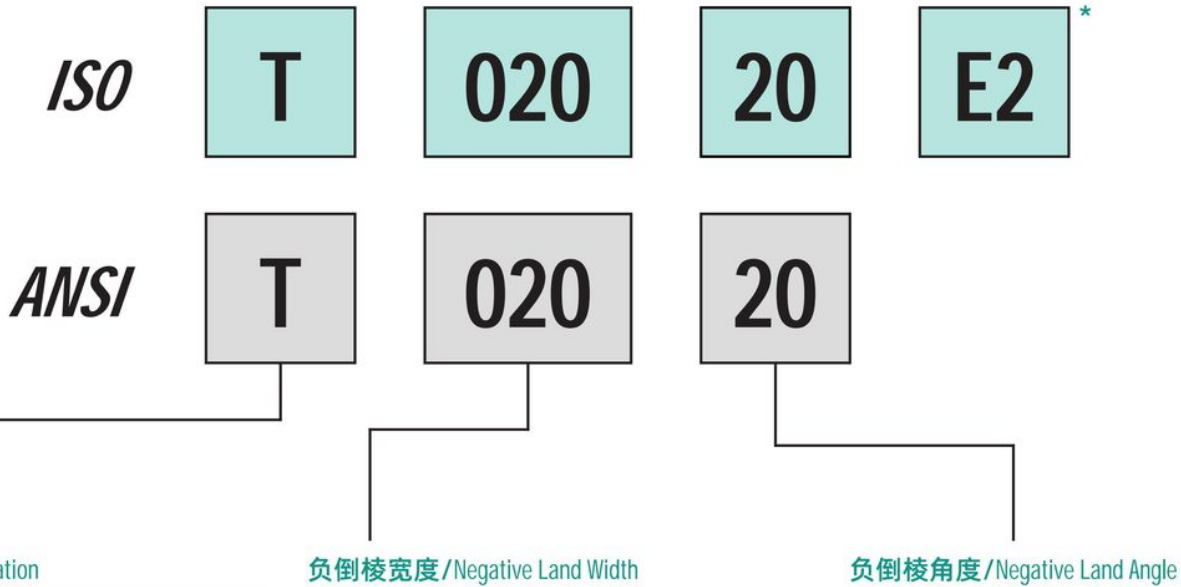
牌号 Grade	去黑皮粗加工 Rough with Scale	粗加工 Rough	半精加工 Semi-Finishing	精加工 Finishing
CC05				
CX10				
CA10				
CA20				
CW10				
CW25				
CS30				
CS35				
CS40				

牌号对比图/Grade Comparison Chart

成分 Composition	山特维克 SANDVIK	NTK	肯纳 KENNAMETAL	特固克 TaeguTec	尤尼恩 Union	赛朗泰克 CeramTec	京瓷 KYOCERA	绿叶 Greenleaf
CBN	CC05	CB7014 CB7015	BK140	KB1304	TB610 TB670	SBN1000	WBN115 WBN565 WBN750 WXM Series	KBN series
Composite Ceramics	CX10		JX1/JX3	KYHK15B				
Al ₂ O ₃ +TiCN	CA10	CC6050	HC4/ZC4 HC7/ZC7	KY4400	AB30	ST100 ST300	SH2	KT66
Al ₂ O ₃ +TiC+Metal	CA20	CC650	HC2 /HC5	KY1615	AB20	ST500 ST900	SH4	A66N PT600M
Whisker	CW10 CW25	CC670 CC675	533 WA1/WA5	KY4300	TC430	SW400 SW800	RST330	KS001 KXW1
SiALON	CS30 CS35 CS40	CC6060 CC6065 CC6160 CC6165	SX5/SX3 SX7/SX9	KYS25/KYS30 KY1540/KYK10	AS10 AS500	SN800 SN950 SN1000	SL LKM SLT Series	KS6030 KS6040

新产品研发持续进行中，产品牌号将不断扩展。获取最新动态请联系授权代理商或销售代表。
New product development is ongoing, and our product grade will be continuously expanded. For the latest updates, please contact our authorized agents or sales representatives.

陶瓷刀具刃口处理 / Ceramic Inserts Edge-Preparation



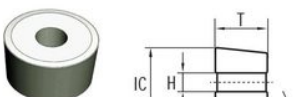
刃口处理 Edge Pre	ANSI	ISO	应用 Application
锋利切削刃 Sharp Cutting Edge	F	F	铝 Aluminium
钝化 Honed	E	E	轻载 Light
倒棱 Chamfered	T	T	轻/中/重载 Light/Medium/Heavy
钝化+倒棱 Honed and Chamfered	T with E2 at end (.002" hone)	S (0.04mm hone)	轻/中/重载 Light/Medium/Heavy
	T with E1 at end (.001" hone)	Z (0.02mm hone)	轻/中/重载 Light/Medium/Heavy
2段倒棱 Double Chamfered	P	P	轻/重载 Light/Heavy
2段倒棱+钝化 Double Chamfered and Honed	HD	HD	轻/重载 Light/Heavy

代码 Code	描述 Description		a	r
	ANSI	ISO	公制/英制 Metric/Inch	公制/英制 Metric/Inch
E	01	002	-	.02/.001"
	02	004	-	.04/.002"
T	02	005	.05/.002"	-
	04	010	.10/.004"	-
	06	015	.15/.006"	-
	08	020	.20/.008"	-
S	04	010	.10/.004"	.04/.002"
	08	020	.20/.008"	.04/.002"
Z	04	010	.10/.004"	.02/.001"
	08	020	.20/.008"	.02/.001"

* 刃口钝化 / Edge Honed
E0 : 0.01mm
E1 : 0.02mm
E2 : 0.04mm

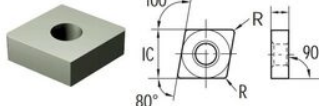
CDH

IOS/ANSI	IC	T	H
CDH 22/CDH 22	12.7/1/2"	6.35/1/4"	3.175/1/8"
CDH 33/CDH 33	19.05/3/4"	9.525/3/8"	6.35/1/4"
CDH 42/CDH 42	25.4/1"	12.7/1/2"	6.76/.266"
CDH 515/CDH 515	31.7/5/4"	9.525/3/8"	9.93/.391"

	○ 稳定工况 / Stable Machining Conditions		☺ 间断工况 / Intermittent Machining Conditions				☹ 恶劣间断工况 / Severe Intermittent Conditions			
	K	铸铁 Cast Iron							☺	
	S	耐热合金 Heat-Resistant Alloy								
	H	淬硬钢 Hardened Steel				○				
ISO	ANSI	H Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
CDH 22 HD00710	CDH 22 HD02810	3.175/.125"				▲			▲	
CDH 33 HD01510E2	CDH 33 HD06010E2	6.35/.250"				▲			▲	
CDH 42 HD02015E1	CDH 42 HD08015E1	6.76/.266"				▲			▲	
CDH 515 HD01810	CDH 515 HD07110	9.93/.391"				▲			▲	

CNGA

IOS/ANSI	IC	T
CNGA 1204/CNGA 43	12.7/1/2"	4.76/3/16"
CNGA 1606/CNGA 54	15.875/5/8"	6.35/1/4"
CNGA 1906/CNGA 64	19.05/3/4"	6.35/1/4"

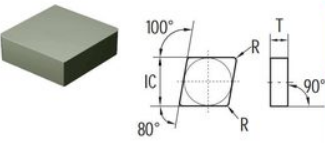
	○ 稳定工况 / Stable Machining Conditions		☺ 间断工况 / Intermittent Machining Conditions		☹ 恶劣间断工况 / Severe Intermittent Conditions					
	K	铸铁 Cast Iron			○	☺				
	S	耐热合金 Heat-Resistant Alloy					○		☺	
	H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
CNGA 120404 T01020	CNGA 431 T0420	0.4/.016"			▲	▲	▲		▲	
CNGA120408 T01020	CNGA 432 T0420	0.8/.031"			▲	▲	▲		▲	
CNGA 120408 T02020	CNGA 432 T0820				▲	▲	▲		▲	
CNGA 120408 T02025	CNGA 432 T0825				▲	▲	▲		▲	
CNGA 120408 Z02020	CNGA 432 T0820E1				▲	▲	▲		▲	
CNGA 120412 T01020	CNGA 433 T0420	1.2/.047"			▲	▲	▲		▲	
CNGA 120412 T02020	CNGA 433 T0820				▲	▲	▲		▲	
CNGA 120412 T02025	CNGA 433 T0825				▲	▲	▲		▲	
CNGA 120412 Z02020	CNGA 433 T0820E1				▲	▲	▲		▲	
CNGA 120416 T01020	CNGA 434 T0420	1.6/.063"			▲	▲	▲		▲	
CNGA 120416 T02020	CNGA 434 T0820				▲	▲	▲		▲	
CNGA 120416 T02025	CNGA 434 T0825				▲	▲	▲		▲	
CNGA 160612 T01020	CNGA 543 T0420	1.2/.047"			▲	▲	▲		▲	
CNGA 160612 Z02025	CNGA 543 T0825E1				▲	▲	▲		▲	
CNGA 160616 T01020	CNGA 544 T0420	1.6/.063"			▲	▲	▲		▲	
CNGA 190612 T01020	CNGA 643 T0420	1.2/.047"			▲	▲	▲		▲	
CNGA 190612 T02020	CNGA 643 T0820				▲	▲	▲		▲	
CNGA 190612 Z02025	CNGA 643 T0825E1				▲	▲	▲		▲	
CNGA 190616 T02020	CNGA 644 T0820	1.6/.063"			▲	▲	▲		▲	

注：产品供应情况因地区而异。规格如有变更恕不另行通知。
Note: Product availability varies by region. Specifications subject to change without notice.

▲ 主推牌号 / Main recommended grade ● 可定制可选牌号 / Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。 / Note: Edge preparation not listed in the table can be customized for production.

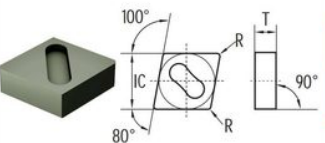
CNGN

IOS/ANSI	IC	T
CNGN 1204/CNGN 43	12.7/1/2"	4.76/3/16"
CNGN 1207/CNGN 45	12.7/1/2"	7.94/5/16r
CNGN 1906/CNGN 64	19.05/3/4"	6.35/1/4r

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
		K	铸铁 Cast Iron				○			⌚	
		S	耐热合金 Heat-Resistant Alloy				○			⌚	
		H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
CNGN 120404 T01020	CNGN 431 T0420	0.4/.016"			●	●	▲		▲		
CNGN 120408 T01020	CNGN 432 T0420	0.8/.031"			●	●	▲		▲		
CNGN 120408 T02020	CNGN 432 T0820				●	●	▲		▲		
CNGN 120408 T02025	CNGN 432 T0825				●	●	▲		▲		
CNGN 120408 S02020	CNGN 433 T0820E2				●	●	▲		▲		
CNGN 120412 T01020	CNGN 433 T0420	1.2/.047"			●	●	▲		▲		
CNGN 120412 T02020	CNGN 433 T0820				●	●	▲		▲		
CNGN 120412 T02025	CNGN 433 T0825				●	●	▲		▲		
CNGN 120412 S02020	CNGN 433 T0820E2				●	●	▲		▲		
CNGN 120416 T01020	CNGN 434 T0420	1.6/.063"			●	●	▲		▲		
CNGN 120416 T02020	CNGN 434 T0820				●	●	▲		▲		
CNGN 120416 T02025	CNGN 434 T0825				●	●	▲		▲		
CNGN 120416 S02020	CNGN 443 T0820E2				●	●	▲		▲		
CNGN 120708 T02020	CNGN 452 T0820	0.8/.031"			●	●	▲		▲		
CNGN 120712 T02020	CNGN 453 T0820	1.2/.047"			●	●	▲		▲		
CNGN 120716 T02020	CNGN 454 T0820	1.6/.063"			●	●	▲		▲		
CNGN 190612 T02020	CNGN 643 T0820	1.2/.047"			●	●	▲		▲		
CNGN 190616 T01020	CNGN 644 T0420	1.6/.063"			●	●	▲		▲		
CNGN 190716 T02020	CNGN 654 T0820				●	●	▲		▲		

CNGX

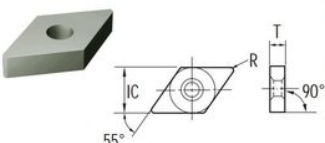
IOS/ANSI	IC	T
CNGX 1204/CNGX 43	12.7/1/2"	4.76/3/16"
CNGX 1207/CNGX 45	12.7/1/2"	7.94/5/16r

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
		K	铸铁 Cast Iron							⌚	
		S	耐热合金 Heat-Resistant Alloy							⌚	
		H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
CNGX 120408 S02020	CNGX 432 T0820E2	0.8/.031r							●		
CNGX 120412 S02020	CNGX 433 T0820E2	1.2/.047"							●		
CNGX 120416 S02020	CNGX 434 T0820E2	1.6/.063"							●		
NGX 120708 T02025	CNGX 452 T0825	0.8/.031"							●		
CNGX 120712 T02025	CNGX 453 T0825	1.2/.047"							●		
CNGX 120716 T02025	CNGX 454 T0825	1.6/.063"							●		

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

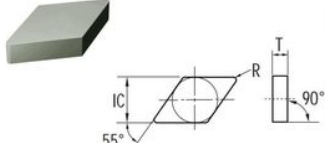
DNGA

IOS/ANSI	IC	T
DNGA 1504/DNGA 43	12.7/1/2"	4.76/3/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
		K	铸铁 Cast Iron				○		⌚		
		S	耐热合金 Heat-Resistant Alloy				○		⌚		
		H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
DNGA 150404 T01020	DNGA 431 T0420	0.4/.016"			▲	▲	●		●		
DNGA 150408 T01020	DNGA 432 T0420	0.8/.031"			▲	▲	●		●		
DNGA 150408 T02025	DNGA 432 T0825				▲	▲	●		●		
DNGA 150408 S01025	DNGA 432 T0425E2				▲	▲	●		●		
DNGA 150412 T01020	DNGA 433 T0420				▲	▲	●		●		
DNGA 150412 T02025	DNGA 433 T0825	1.2/.047"			▲	▲	●		●		
DNGA 150412 S01025	DNGA 433 T0425E2				▲	▲	●		●		
DNGA 150416 T01020	DNGA 434 T0420				▲	▲	●		●		
DNGA 150416 T02025	DNGA 434 T0825				▲	▲	●		●		
DNGA 150416 S02025	DNGA 434 T0825E2				▲	▲	●		●		

DNGN

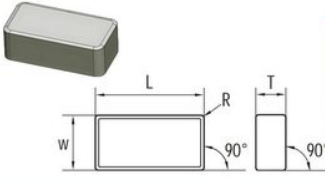
IOS/ANSI	IC	T
DNGN 1504/DNGN 43	12.7/1/2"	4.76/3/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
		K	铸铁 Cast Iron				○		⌚		
		S	耐热合金 Heat-Resistant Alloy				○		⌚		
		H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
DNGN 150408 T01020	DNGN 432 T0420	0.8/.031"			▲	▲	●		●		
DNGN 150408 T02025	DNGN 432 T0825				▲	▲	●		●		
DNGN 150408 S02020	DNGN 432 T0820E2				▲	▲	●		●		
DNGN 150412 T01020	DNGN 433 T0420	1.2/.047"			▲	▲	●		●		
DNGN 150412 T02025	DNGN 433 T0825				▲	▲	●		●		
DNGN 150412 S02020	DNGN 433 T0820E2				▲	▲	●		●		
DNGN 150416 T01020	DNGN 434 T0420	1.6/.063"			▲	▲	●		●		
DNGN 150416 T02025	DNGN 434 T0825				▲	▲	●		●		
DNGN 150416 S02020	DNGN 434 T0820E2				▲	▲	●		●		

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

LNJ

IOS/ANSI	W	L	T
LNJ6688/LNJ6688	19.05/3/4"	38.1/3/2"	12.7/1/2"

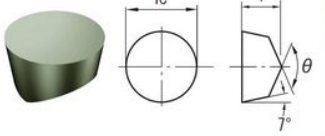
		○ 稳定工况/Stable Machining Conditions ⏻ 间断工况/Intermittent Machining Conditions ⚙️ 恶劣间断工况/Severe Intermittent Conditions								
	K	铸铁 Cast Iron					○	○		
	S	耐热合金 Heat-Resistant Alloy								
	H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
LNJ 6688 HD15I5E1	LNJ 6688 HD06015E1	3.8/1/8"				●	●			
LNJ 6688 HD20I5E2	LNJ 6688 HD08015E2					●	●			

RCGX

IOS/ANSI	IC	θ
RCGX 0604/RCGX 23	6.35/1/4"	120°
RCGX 0606/RCGX 24	6.35/1/4"	120°
RCGX 0907/RCGX 35	9.525/3/8"	120°
RCGX 1207/RCGX 45	12.7/1/2"	120°

IOS/ANSI	IC	θ
RCGX 102/RCGX 102	6.35/1/4"	120°
RCGX 103/RCGX 103	9.525/3/8"	120°
RCGX 104/RCGX 104	12.7/1/2"	120°
RCGX 105/RCGX 105	15.87/5/8"	120°

IOS/ANSI	IC	θ
RCGX 106/RCGX 106	19.05/3/4"	120°
RCGX 108/RCGX 108	25.4/1"	140°

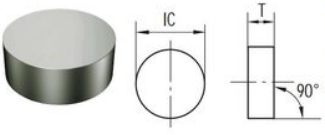
		○ 稳定工况/Stable Machining Conditions ⏻ 间断工况/Intermittent Machining Conditions ⚙️ 恶劣间断工况/Severe Intermittent Conditions								
	K	铸铁 Cast Iron			○	⏻			⏻	
	S	耐热合金 Heat-Resistant Alloy		○			○		⏻	⚙️
	H	淬硬钢 Hardened Steel								
ISO	ANSI	T Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
RCGX 060400 T01020	RCGX 23 T0420	4.76/3/16"		●	▲	▲	▲		▲	▲
RCGX 060400 Z01020	RCGX 23 T0420E1				▲	▲	▲		▲	
RCGX 060600 T01020	RCGX 24 T0220	6.35/1/4"		●	▲	▲	▲		▲	
RCGX 060600 Z02020	RCGX 24 T0820E1				▲	▲	▲		▲	
RCGX 090700 T01020	RCGX 35 T0420	7.94/5/16"		●	▲	▲	▲		▲	
RCGX 090700 Z01020	RCGX 35 T0420E1				▲	▲	▲		▲	
RCGX 090700 T02020	RCGX 35 T0820				▲	▲	▲		▲	
RCGX 090700 Z02020	RCGX 35 T0820E1				▲	▲	▲		▲	
RCGX 090700 T02025	RCGX 35 T0825				▲	▲	▲		▲	
RCGX 090700 Z02025	RCGX 35 T0825E1				▲	▲	▲		▲	
RCGX 120700 T01020	RCGX 45 T0420			●	▲	▲	▲		▲	
RCGX 120700 Z01020	RCGX 45 T0420E1				▲	▲	▲		▲	
RCGX 120700 T02020	RCGX 45 T0820				▲	▲	▲		▲	
RCGX 120700 Z02020	RCGX 45 T0820E1				▲	▲	▲		▲	
RCGX 120700 T02025	RCGX 45 T0825				▲	▲	▲		▲	
RCGX 120700 Z02025	RCGX 45 T0825E1				▲	▲	▲		▲	
RCGX 102 HD20I5E1	RCGX 102 HD08015E1	7.85/0.309"			▲	▲	▲		▲	
RCGX 103 HD20I5E1	RCGX 103 HD08015E1	7.92/0.312"			▲	▲	▲		▲	
RCGX 104 HD20I5E1	RCGX 104 HD08015E1				▲	▲	▲		▲	
RCGX 105 HD20I5E1	RCGX 105 HD08015E1	9.86/0.388"			▲	▲	▲		▲	
RCGX 106 HD20I5E1	RCGX 106 HD08015E1				▲	▲	▲		▲	
RCGX 108 HD20I5E1	RCGX 108 HD08015E1	11.71/0.461"			▲	▲	▲		▲	

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

RNGN

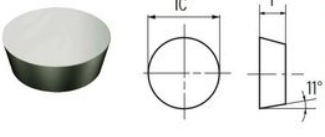
IOS/ANSI	IC	T
RNGN 0903/RNGN 32	9.525/3/8"	3.18/1/8"
RNGN 0904/RNGN 33	9.525/3/8"	4.76/3/16"
RNGN 1204/RNGN 43	12.7/1/2"	4.76/3/16"
RNGN 1207/RNGN 45	12.7/1/2"	7.94/5/16"

IOS/ANSI	IC	T
RNGN 1507/RNGN 55	15.875/5/8"	7.94/5/16"
RNGN 1907/RNGN 65	19.05/3/4"	7.94/5/16"
RNGN 2507/RNGN 85	25.4/1"	7.94/5/16"
RNGN 2509/RNGN 86	25.4/1"	9.525/3/8"

		○ 稳定工况/Stable Machining Conditions ⏻ 间断工况/Intermittent Machining Conditions ⚙️ 恶劣间断工况/Severe Intermittent Conditions								
	K	铸铁 Cast Iron			○	⏻			⏻	
	S	耐热合金 Heat-Resistant Alloy		○			○		⏻	
	H	淬硬钢 Hardened Steel								
ISO	ANSI	/	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
RNGN 090300 T01020	RNGN 32 T0420	/		●	▲	▲	▲		▲	
RNGN 090400 T01020	RNGN 33 T0420			●	▲	▲	▲		▲	
RNGN 120400 T01020	RNGN 43 T0420			●	▲	▲	▲		▲	
RNGN 120400 T02025	RNGN 43 T0825			●	▲	▲	▲		▲	
RNGN 120700 T01020	RNGN 45 T0420			●	▲	▲	▲		▲	
RNGN 120700 Z02020	RNGN 45 T0820E1				▲	▲	▲		▲	
RNGN 150700 T01020	RNGN 55 T0420				▲	▲	▲		▲	
RNGN 190700 T01020	RNGN 65 T0420				▲	▲	▲		▲	
RNGN 250700 T01020	RNGN 85 T0420				▲	▲	▲		▲	
RNGN 250900 T01020	RNGN 86 T0420				▲	▲	▲		▲	

RPGN

IOS/ANSI	IC	T
RPGN 0602/RPGN 215	6.35/1/4"	2.38/3/32"
RPGN 0603/RPGN 22	6.35/1/4"	3.18/1/8"
RPGN 0903/RPGN 32	9.525/3/8"	3.18/1/8"
RPGN 1204/RPGN 43	12.7/1/2"	4.76/3/16"

		○ 稳定工况/Stable Machining Conditions ⏻ 间断工况/Intermittent Machining Conditions ⚙️ 恶劣间断工况/Severe Intermittent Conditions								
	K	铸铁 Cast Iron			○	⏻			⏻	
	S	耐热合金 Heat-Resistant Alloy		○			○		⏻	
	H	淬硬钢 Hardened Steel								
ISO	ANSI	/	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
RPGN 060200 T01020	RPGN 215 T0420	/		●	▲	▲	▲		▲	
RPGN 060200 T02020	RPGN 215 T0820			●	▲	▲	▲		▲	
RPGN 060300 T01020	RPGN 22 T0420			●	▲	▲	▲		▲	
RPGN 060300 T02020	RPGN 22 T0820			●	▲	▲	▲		▲	
R9GN 090300 T01020	RPGN 32 T0420			●	▲	▲	▲		▲	
RPGN 090300 T02020	RPGN 32 T0820			●	▲	▲	▲		▲	
RPGN 120400 T01020	RPGN 43 T0420			●	▲	▲	▲		▲	
RPGN 120400 T02020	RPGN 43 T0820			●	▲	▲	▲		▲	

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

RPGX

IOS/ANSI	IC	θ
RPGX 0604/RPGX 23	6.35/1/4"	120°
RPGX 0907/RPGX 35	9.525/3/8"	120°
RPGX 1207/RPGX 45	12.7/1/2"	120°

			○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions								
			K 铸铁 Cast Iron			○	⌚			⌚	
			S 耐热合金 Heat-Resistant Alloy		○			○		⌚	
			H 淬硬钢 Hardened Steel								
ISO	ANSI	T Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
RPGX 060400 T01020	RPGX 23 T0420	4.76/3/16"		●	▲	▲	▲		▲		
RPGX 060400 Z01020	RPGX 23 T0420E1			●	▲	▲	▲		▲		
RPGX 090700 T01020	RPGX 35 T0420	7.94/.31"		●	▲	▲	▲		▲		
RPGX 090700 T02020	RPGX 35 T0820			●	▲	▲	▲		▲		
RPGX 090700 Z02020	RPGX 35 T0820E1			●	▲	▲	▲		▲		
RPGX 120700 T01020	RPGX 45 T0420			●	▲	▲	▲		▲		
RPGX 120700 T02020	RPGX 45 T0820			●	▲	▲	▲		▲		
				●	▲	▲	▲		▲		

SNGA

IOS/ANSI	IC	T
SNGA1204/SNGA 43	12.7/1/2"	4.96/3/16"
SNGA 1506/SNGA 54	15.875/5/8"	6.35/1/4"
SNGA 1906/SNGA 64	19.05/3/4"	6.35/1/4"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions								
		K 铸铁 Cast Iron			○	⌚			⌚	
		S 耐热合金 Heat-Resistant Alloy					○		⌚	
		H 淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
SNGA 120408 T01020	SNGA 432 T0420	0.8/.031"			▲	▲	▲		▲	
SNGA 120408 T02020	SNGA 432 T0820				▲	▲	▲		▲	
SNGA 120416 T01020	SNGA 434 T0420	1.6/.063"			▲	▲	▲		▲	
SNGA 120416 T02025	SNGA 434 T0825				▲	▲	▲		▲	
SNGA 150612 T01020	SNGA 543 T0420	1.2/.047"			▲	▲	▲		▲	
SNGA 150612 T02025	SNGA 543 T0825				▲	▲	▲		▲	
SNGA 150616 T01020	SNGA 544 T0420	1.6/.063"			▲	▲	▲		▲	
SNGA 150616 T02020	SNGA 544 T0820				▲	▲	▲		▲	
SNGA 190616 T02025	SNGA 644 T0825				▲	▲	▲		▲	

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

SNGN

IOS/ANSI	IC	T
SNGN 1204/SNGN 43	12.7/1/2"	4.76/3/16"
SNGN 1207/SNGN 45	12.7/1/2"	7.94/5/16"
SNGN 1506/SNGN 54	15.875/5/8"	6.35/1/4"
SNGN 1906/SNGN 64	19.05/3/4"	6.35/1/4"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions								
		K 铸铁 Cast Iron			○	⌚			⌚	
		S 耐热合金 Heat-Resistant Alloy					○		⌚	
		H 淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
SNGN 120408 T01020	SNGN 432 T0420	0.8/.031"			▲	▲	▲		▲	
SNGN 120408 T02020	SNGN 432 T0820				▲	▲	▲		▲	
SNGN 120408 T02025	SNGN 432 T0825				▲	▲	▲		▲	
SNGN 120408 S02020	SNGN 432 T0820E2				▲	▲	▲		▲	
SNGN 120412 T01020	SNGN 433 T0420	1.2/.047"			▲	▲	▲		▲	
SNGN 120412 T02020	SNGN 433 T0820				▲	▲	▲		▲	
SNGN 120412 T02025	SNGN 433 T0825				▲	▲	▲		▲	
SNGN 120412 S02020	SNGN 433 T0820E2				▲	▲	▲		▲	
SNGN 120416 T01020	SNGN 434 T0420	1.6/.063"			▲	▲	▲		▲	
SNGN 120416 T02020	SNGN 434 T0820				▲	▲	▲		▲	
SNGN 120416 T02025	SNGN 434 T0825				▲	▲	▲		▲	
SNGN 120416 S02020	SNGN 434 T0820E2				▲	▲	▲		▲	
SNGN 120708 T01020	SNGN 452 T0420	0.8/.031"			▲	▲	▲		▲	
SNGN 120712 T01020	SNGN 453 T0420	1.2/.047"			▲	▲	▲		▲	
SNGN 120716 T01020	SNGN 454 T0420	1.6/.063"			▲	▲	▲		▲	
SNGN 190612 T01020	SNGN 643 T0420	1.2/.047"			▲	▲	▲		▲	
SNGN 190616 T01020	SNGN 644 T0420	1.6/.063"			▲	▲	▲		▲	

SNGX

IOS/ANSI	IC	T
SNGX 1204/SNGX 43	12.7/1/2"	4.76/3/16"
SNGX 1207/SNGX 45	12.7/1/2"	7.94/5/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions								
		K 铸铁 Cast Iron							⌚	
		S 耐热合金 Heat-Resistant Alloy							⌚	
		H 淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
SNGX 120408 S02020	SNGX 432 T0820E2	0.8/.031"							●	
SNGX 120412 S02020	SNGX 433 T0820E2	1.2/.047"							●	
SNGX 120416 S02020	SNGX 434 T0820E2	1.6/.063"							●	
SNGX 120708 T02025	SNGX 452 T0825	0.8/.031"							●	
SNGX 120712 T02025	SNGX 453 T0825	1.2/.047"							●	
SNGX 120716 T02025	SNGX 454 T0825	1.6/.063"							●	

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

SPGN

IOS/ANSI	IC	T
SPGN 0903/SPGN32	9.525/3/8"	3.18/1/8"
SPGN 1204/SPGN 43	12.7/1/2"	4.76/3/16"
SPGN 1904/SPGN 63	19.05/3/4"	4.76/3/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
	K	铸铁 Cast Iron			○					⌚	
	S	耐热合金 Heat-Resistant Alloy				○				⌚	
	H	淬硬钢 Hardened Steel			○						
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
SPGN 090308 T01020	SPGN 322 T0420	0.8/.031"			●		●		●		
SPGN 120408 T01020	SPGN 432 T0420				●		●		●		
SPGN 120412 T01020	SPGN 433 T0420	1.2/.047"			●		●		●		
SPGN 120416 T01020	SPGN 434 T0420	1.6/.063"			●		●		●		
SPGN 190412 T01020	SPGN 633 T0420	1.2/.047"					●		●		
SPGN 190416 T01020	SPGN 634 T0420	1.6/.063"					●		●		

TNGA

IOS/ANSI	IC	T
TNGA 1604/TNGA 33	9.525/3/8"	4.76/3/16"
TNGA 2204/TNGA 43	12.7/1/2"	4.76/3/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
	K	铸铁 Cast Iron			○	⌚			⌚		
	S	耐热合金 Heat-Resistant Alloy					○		⌚		
	H	淬硬钢 Hardened Steel									
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
TNGA 160408 T01020	TNGA 332 T0420	0.8/.031"			▲	▲	●		●		
TNGA 220408 T01020	TNGA 432 T0420				▲	▲	●		●		
TNGA 220408 T02025	TNGA 432 T0825				▲	▲	●		●		

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

TNGN

IOS/ANSI	IC	T
TNGN 16A04/TNGN 33	9.525/3/8"	4.76/3/16"
TNGN 2204/TNGN 43	12.7/1/2"	4.76/3/16"
TNGN 2207/TNGN 45	12.7/1/2"	7.94/5/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
	K	铸铁 Cast Iron			○	⌚			⌚		
	S	耐热合金 Heat-Resistant Alloy					○		⌚		
	H	淬硬钢 Hardened Steel									
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
TNGN 160408 T01020	TNGN 332 T0420	0.8/.031"			▲	▲	●		●		
TNGN 220408 T01020	TNGN 432 T0420				▲	▲	●		●		
TNGN 220408 S02025	TNGN 432 T0825E2				▲	▲	●		●		
TNGN 220412 T01020	TNGN 433 T0420	1.2/.047"			▲	▲	●		●		
TNGN 220412 S02025	TNGN 433 T0825E2				▲	▲	●		●		
TNGN 220416 T01020	TNGN 434 T0420	1.6/.063"			▲	▲	●		●		
TNGN 220416 S02025	TNGN 434 T0825E2				▲	▲	●		●		
TNGN 220712 T01020	TNGN 453 T0420	1.2/.047"			▲	▲	●		●		
TNGN 220716 T01020	TNGN 454 T0420	1.6/.063"			▲	▲	●		●		

VNGA

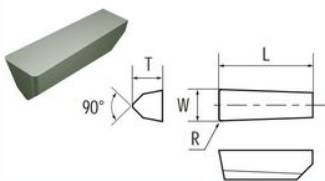
IOS/ANSI	IC	T
VNGA 1604/VNGA 33	9.525/3/8"	4.76/3/16"
VNGA 2204/VNGA 43	12.7/1/2"	4.76/3/16"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
	K	铸铁 Cast Iron			○	⌚			⌚		
	S	耐热合金 Heat-Resistant Alloy					○		⌚		
	H	淬硬钢 Hardened Steel									
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40	
VNGA 160404 T01020	VNGA 331 T0420	0.4/.016"			▲	▲	●		●		
VNGA 160408 T01020	VNGA 332 T0420	0.8/.031"			▲	▲	●		●		
VNGA 160412 T01020	VNGA 333 T0420	1.2/.047"			▲	▲	●		●		
VNGA 220408 T01020	VNGA 432 T0420	0.8/.031"			▲	▲	●		●		
VNGA 220412 T01020	VNGA 433 T0420	1.2/.047"			▲	▲	●		●		

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

VGW

IOS/ANSI	T	L
VGW 41/VGW 41	4.75/.187"	12.7/.500"
VGW 62/VGW 62	6.35/.250"	19.05/.750"
VGW 83/VGW 83	8.56/.337"	25.4/1.00"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions											
		K	铸铁 Cast Iron										
		S	耐热合金 Heat-Resistant Alloy	○	○			○			⌚		
		H	淬硬钢 Hardened Steel										
ISO	ANSI	R	W	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40		
		Metric/Inch											
VGW 4125-1 E004	VGW 4125-1 E02	0.4/.016"	3.18/.125"	●	●			▲		●			
VGW 4125-1 T00520	VGW 4125-1 T0220			●	●			▲		●			
VGW 4125-2 E004	VGW 4125-2 E02			●	●			▲		●			
VGW 4156-1 E004	VGW 4156-1 E02	0.4/.016"	3.96/.156"	●	●			▲		●			
VGW 4156-1 T00520	VGW 4156-1 T0220			●	●			▲		●			
VGW 4156-2 E004	VGW 4156-2 E02			●	●			▲		●			
VGW 4187-1 E004	VGW 4187-1 E02	0.4/.016"	4.75/.187"	●	●			▲		●			
VGW 4187-1 T00520	VGW 4187-1 T0220			●	●			▲		●			
VGW 4187-2 E004	VGW 4187-2 E02			●	●			▲		●			
VGW 6218-1 E004	VGW 6218-1 E02	0.4/.016"	5.54/.218"	●	●			▲		●			
VGW 6218-1 T00520	VGW 6218-1 T0220			●	●			▲		●			
VGW 6218-2 E004	VGW 6218-2 E02			●	●			▲		●			
VGW 6250-1 E004	VGW 6250-1 E02	0.4/.016"	6.35/.250"	●	●			▲		●			
VGW 6250-1 T00520	VGW 6250-1 T0220			●	●			▲		●			
VGW 6250-1 Z01020	VGW 6250-1 T0420E1			●	●			▲		●			
VGW 6250-2 E004	VGW 6250-2 E02	0.8/.031"	7.14/.281"	●	●			▲		●			
VGW 6250-3 E004	VGW 6250-3 E02	1.2/.047"		●	●			▲		●			
VGW 6281-4 E004	VGW 6281-4 E02	1.6/.063"		●	●			▲		●			
VGW 6281-4 T00520	VGW 6281-4 T0220		●	●			▲		●				
VGW 8312-2 E004	VGW 8312-2 E02	0.8/.031"	7.92/.312"	●	●			▲		●			
VGW 8312-2 T00520	VGW 8312-2 T0220			●	●			▲		●			
VGW 8312-4 E004	VGW 8312-4 E02			1.6/.063"	●	●			▲		●		
VGW 8312-4 T00520	VGW 8312-4 T0220	●	●				▲		●				
VGW 8375-2 E004	VGW 8375-2 E02	0.8/.031"	9.525/.375"	●	●			▲		●			
VGW 8375-2 T00520	VGW 8375-2 T0220			●	●			▲		●			
VGW 8375-4 E004	VGW 8375-4 E02			1.6/.063"	●	●			▲		●		
VGW 8375-4 T00520	VGW 8375-4 T0220	●	●				▲		●				

ZT

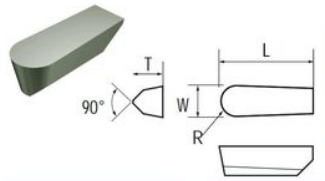
IOS/ANSI	IC	T
ZT-1130/ZT-1130	38.1/3/2"	12.7/1/1/2"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions										
		K	铸铁 Cast Iron					⌚			⌚	
		S	耐热合金 Heat-Resistant Alloy									⌚
		H	淬硬钢 Hardened Steel									
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40		
ZT1130	ZT-1130	114.3/4.5"					▲		●			

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

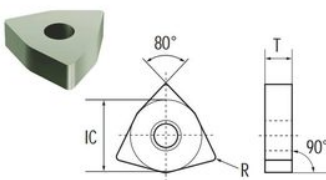
VGW...R

IOS/ANSI	T	L
VGW 41/VGW 41	4.75/.187"	12.7/.500"
VGW 62/VGW 62	6.35/.250"	19.05/.750"
VGW 83/VGW 83	8.56/.337"	25.4/1.00"

		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
	K	铸铁 Cast Iron									
	S	耐热合金 Heat-Resistant Alloy	○	○			○			⌚	
	H	淬硬钢 Hardened Steel									
ISO	ANSI	R Metric/Inch	W	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
VGW 4125-R E004	VGW 4125-R E02	1.59/0.63"	3.18/.125"	●	●			▲		●	
VGW 4125-R T00520	VGW 4125-R T0220			●	●			▲		●	
VGW 4156-R E004	VGW 4156-R E02			●	●			▲		●	
VGW 4156-R T00520	VGW 4156-R T0220	1.98/.078"	3.96/.156"	●	●			▲		●	
VGW 4156-R Z02020	VGW 4156-R T0820E1			●	●			▲		●	
VGW 4187-R E004	VGW 4187-R E02			●	●			▲		●	
VGW 4187-R T00520	VGW 4187-R T0220	2.38/.094"	4.75/.187"	●	●			▲		●	
VGW 6218-R E004	VGW 6218-R E02			●	●			▲		●	
VGW 6218-R T00520	VGW 6218-R T0220			●	●			▲		●	
VGW 6250-R E004	VGW 6250-R E02	3.18/.125"	6.35/.250"	●	●			▲		●	
VGW 6250-R T00520	VGW 6250-R T0220			●	●			▲		●	
VGW 6281-R E004	VGW 6281-R E02			●	●			▲		●	
VGW 6281-R T00520	VGW 6281-R T0220	3.58/.141"	7.14/.281"	●	●			▲		●	
VGW 8312-R E004	VGW 8312-R E02			●	●			▲		●	
VGW 8312-R T00520	VGW 8312-R T0220			●	●			▲		●	
VGW 8375-R E004	VGW 8375-R E02	4.76/.188"	9.525/.375"	●	●			▲		●	
VGW 8375-R T00520	VGW 8375-R T0220			●	●			▲		●	

WNGA

IOS/ANSI	IC	T
WNGA 0604/WNGA 33	9.525/3/8"	4.76/3/16"
WNGA 0804/WNGA 43	12.7/1/2"	4.76/3/16"



			○ 稳定工况 / Stable Machining Conditions			⌚ 间断工况 / Intermittent Machining Conditions		⚠ 恶劣间断工况 / Severe Intermittent Conditions		
	K	铸铁 Cast Iron			○	⌚			⌚	
	S	耐热合金 Heat-Resistant Alloy							⌚	
	H	淬硬钢 Hardened Steel								
ISO	ANSI	R Metric/Inch	CC05	CX10	CA10	CA20	CW25	CS30	CS35	CS40
WNGA 060408 T01020	WNGA 332 T0420	0.8/.031"			▲	▲			▲	
WNGA 060412 T01020	WNGA 333 T0420	1.2/.047"			▲	▲			▲	
WNGA 080404 T01020	WNGA 431 T0420	0.4/.016"			▲	▲			▲	
WNGA 080408 T01020	WNGA 432 T0420	0.8/.031"			▲	▲			▲	
WNGA 080412 T01020	WNGA 433 T0220	1.2/.047"			▲	▲			▲	
WNGA 080416 T00520	WNGA 434 T0420	1.6/0.63"			▲	▲			▲	

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的刃口处理方案可定制生产。/Note: Edge preparation not listed in the table can be customized for production.

实现超越硬质合金立铣刀的高效率粗加工

Achieving High-Efficiency Roughing Superior to Carbide End Mills

通柄型 Straight Shank

最合适的排屑槽形状 Optimum flute geometry

实现顺畅排屑
Enables smooth chip evacuation

负前角刃型 Negative cutter form

提高刃尖刚性
Increases cutting edge rigidity

可通过切断使用部进行再研磨
Can be reincarnated by cutting away the used portion

可再研磨
Regrindable



缩颈型 Reduced Neck Shank

耐热合金加工时的注意点

适用于三维立体加工 Suitable for 3D machining

不仅擅长平面铣削，还精于叶片加工
Not only excels in flat surface milling, but also in the machining of blades

可达性 Accessibility

避开干涉区域，触及工件狭窄、深腔、复杂的曲面
Avoid interference zones and access narrow, deep cavities, and complex curved surfaces on workpieces



选型多样 Variety of lineup

根据加工需要选择4刃或6刃
Select 4- or 6-flute specification based on your application needs

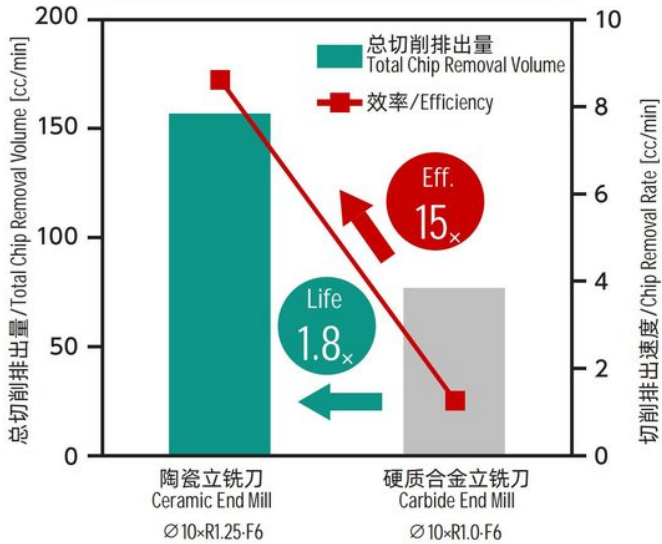
产品特点/Product Features

一款新型整体式陶瓷立铣刀问世，性能远超硬质合金铣刀！
A new monolithic ceramic end mill launched, outperforming carbide milling tools in performance!

陶瓷材料实现了压倒性的高速加工，在耐热合金和铸铁的立铣加工领域掀起革命。采用耐缺损性优秀的SiAlON陶瓷材质，实现了耐热合金和铸铁的高速加工。和硬质合金立铣刀相比，能提高3~15倍加工效率，最适合加工航空零件、机床零件、压缩机零件。
Ceramic materials enable overwhelmingly high-speed machining, revolutionizing end milling of heat-resistant alloys and cast iron. Featuring SiAlON ceramic with exceptional chipping resistance, they achieve high-speed machining of high-temperature alloys and cast iron. Compared with cemented carbide end mills, machining efficiency can be improved by 3-15 times, making them ideal for processing aerospace parts, machine tool components and compressor parts.

【高温合金/High-temperature alloys】- Inconel718

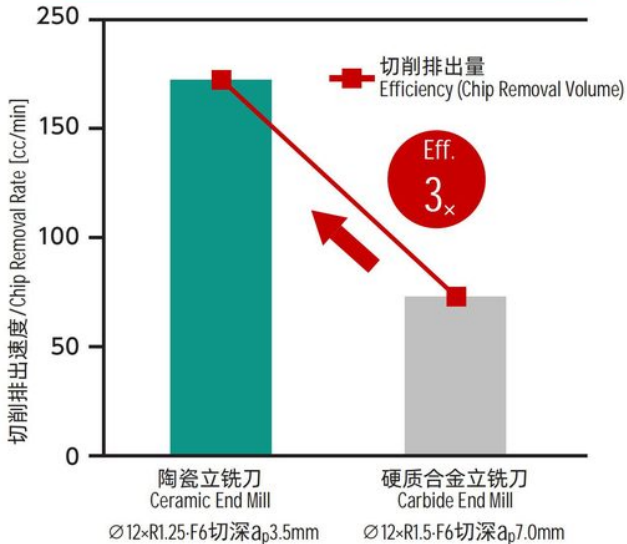
效率·寿命比较/Efficiency & Tool Life Comparison



V_C 600m/min ← 400m/min
※ 请设定在至少300m/min以上

【铸铁/Cast Iron】- FC200

(槽加工)效率比较/(Slot Milling) Efficiency Comparison

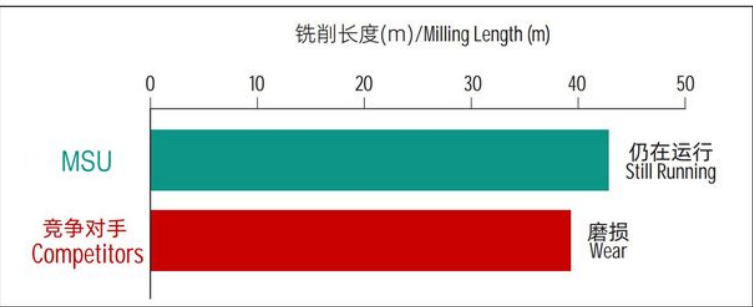


V_C 700m/min ← 110m/min
※ 请设定在至少350m/min以上

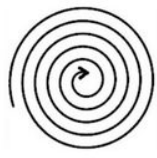
通柄型
Straight Shank

积屑瘤生成水平较低时，可支持连续加工/Continuous use is possible with low level of the built-up edge

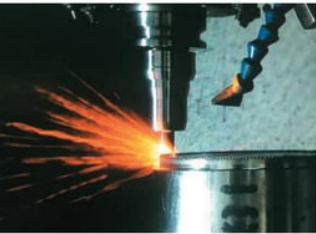
刀具 TOOL	MSU TB-D12R1.5C12S9L70F4	其他公司4刃产品 Competitor 4-Flute
工件材料 Work Material	Inconel 718 (45HRC)	
加工方法 Machining Method	从外缘向内的螺旋铣削加工 Milling spirally inward from the outer periphery	
切削速度 Cutting Speed	500m/min / 1,640.4ft/min --- (13,260r/min)	
进给速度 Feed	3,182mm/min (0.6mm/t) / 125.3in/min (0.0236in/t)	
切深 Depth of Cut	A _p =7.2mm/0.2835" Ae=1.2mm/0.0472"	
冷却 Coolant	吹气 / Air Blow	
机器 Machine	立式加工中心/Vertical Machining Center	



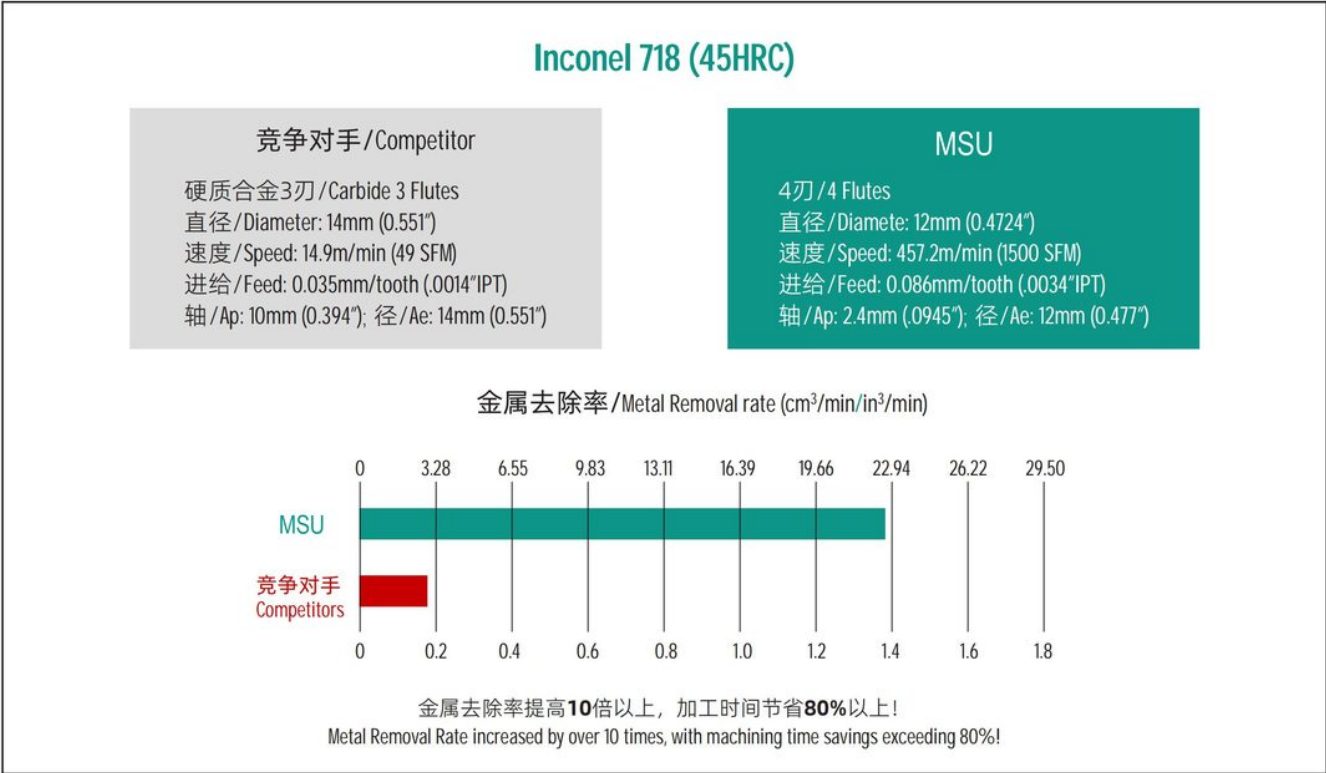
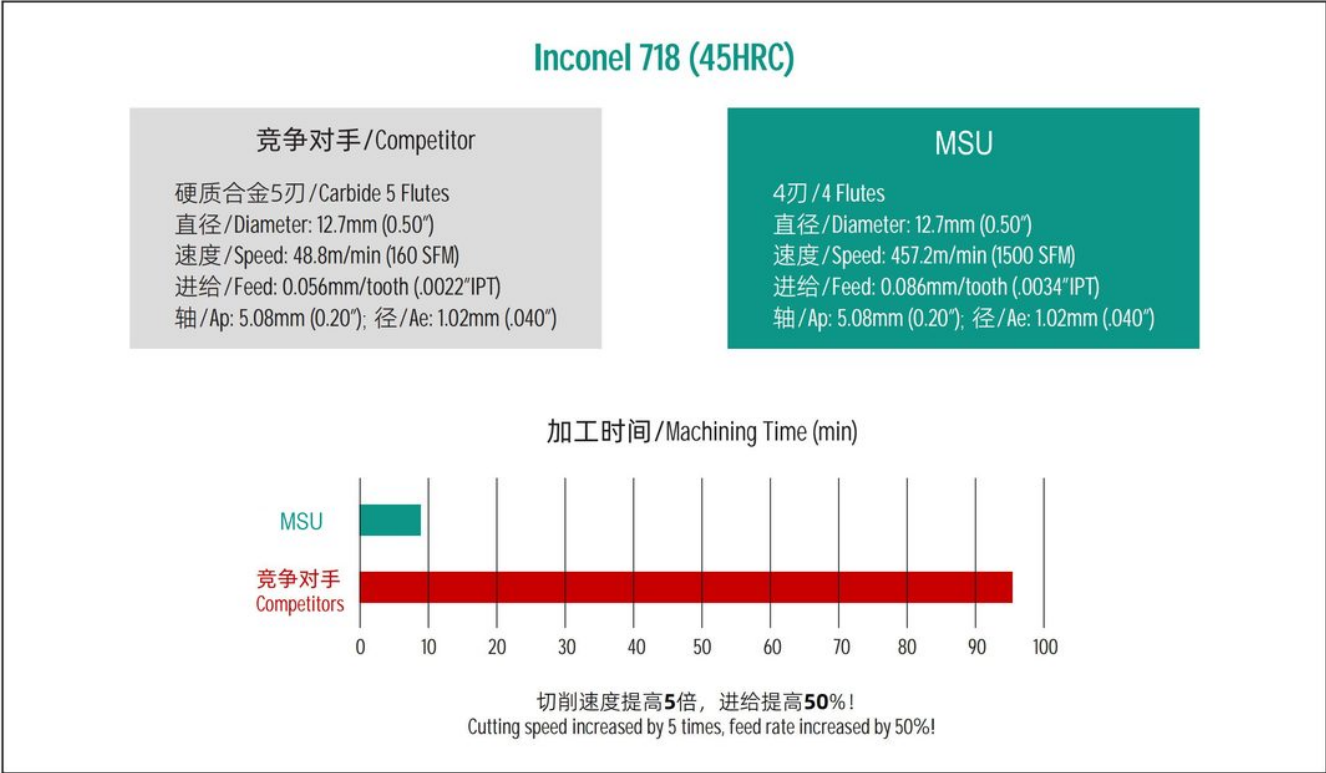
Φ153 × 100



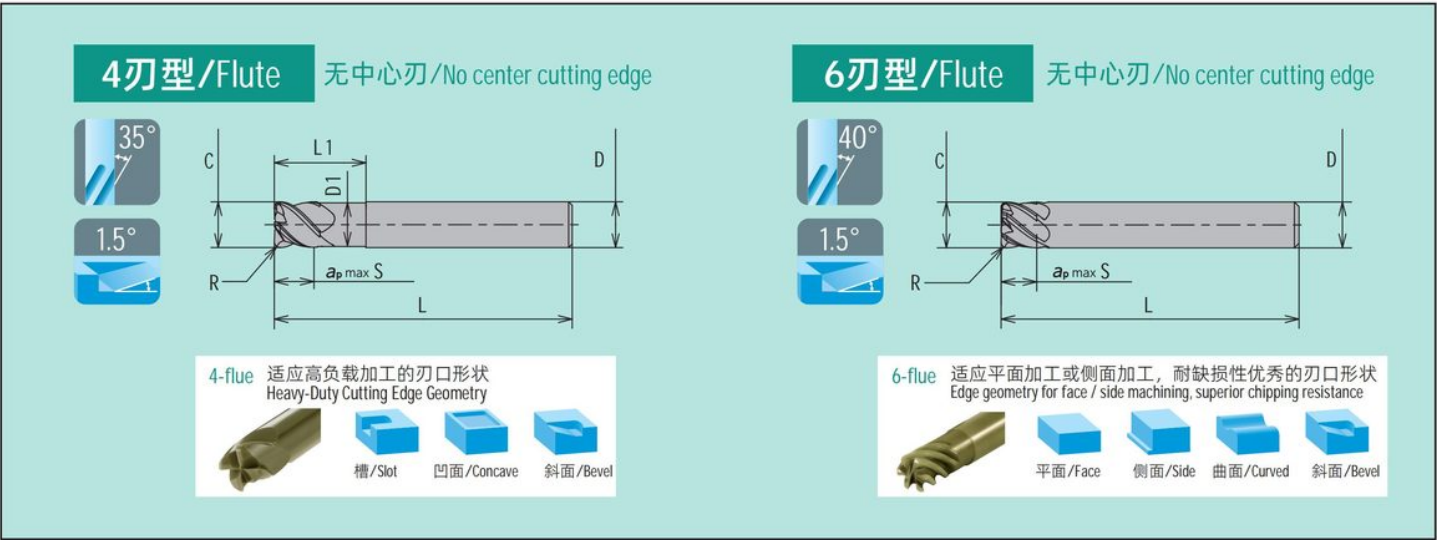
铣削路径/Cutter path



加工案例研究/Machining Case Study



刃型与加工方向 / Edge Type & Machining Direction



建议切削条件(高温合金加工) / Recommended Cutting Data (HRSA)

加工方法 Machining Method	刃数 Flut	刃径 Cutting Diameter	切深 ap(mm)	切幅 ae(mm)	进给 / Feed (mm/t)	Vc (m/min)			切削油 Cutting Oil
						300	600	1,000	
侧面加工 / Side Machining 	4/6	8	≤4.0	≤0.8	0.03				DRY
		10, 3/8"	≤5.0	≤1.0	0.03				
		12, 1/2"	≤6.0	≤1.2	0.03				
		16, 5/8"	≤8.0	≤1.6	0.03				
		20, 3/4"	≤10.0	≤2.0	0.03				
槽加工 / Slot Machining 	4	8	≤2.0	-	0.03				DRY
		10, 3/8"	≤2.5	-	0.03				
		12, 1/2"	≤3.0	-	0.03				
	6	16, 5/8"	≤4.0	-	0.03				
		8	≤1.2	-	0.03				DRY
		10, 3/8"	≤1.5	-	0.03				
		12, 1/2"	≤1.8	-	0.03				
		16, 5/8"	≤2.4	-	0.03				
		20, 3/4"	≤2.9	-	0.03				
									DRY

建议切削条件(铸铁加工) / Recommended Cutting Data (Cast Iron Machining)

加工方法 Machining Method	刃数 Flut	刃径 Cutting Diameter	切深 ap(mm)	切幅 ae(mm)	进给 / Feed (mm/t)	Vc (m/min)			切削油 Cutting Oil
						350	600	750	
侧面加工 / Side Machining 	4/6	12, 1/2"	≤9.0	≤2.0	0.1				DRY
		16, 5/8"	≤12.0	≤2.0	0.1				
		20, 3/4"	≤15.0	≤2.0	0.1				
槽加工 / Slot Machining 	4/6	12, 1/2"	≤3.0	-	0.1				DRY
		16, 5/8"	≤4.0	-	0.1				
		20, 3/4"	≤5.0	-	0.05				

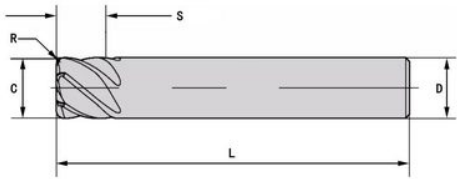
高温合金加工注意点 / Notes for Machining High-Temperature Alloys

- 推荐进行连续加工(加工中途不离开工件)。断续加工时容易发生缺损或破损。
Continuous machining is recommended (without withdrawing the tool from the workpiece during machining). Chipping or breakage may easily occur during interrupted machining.
- 加工中途请不要去除刃口上的熔着物。
Do not remove built-up edge from the cutting edge during machining.
- 切削速度请设定在至少300m/min以上。
Set the cutting speed to at least 300 m/min.
- 建议斜面加工的角度最大不超过1.5°，将进给降低至通常的50%。
For bevel machining, the recommended angle is max. 1.5°, and feed rate should be reduced to 50% of the normal value.

铸铁加工注意点 / Notes for Cast Iron Machining

- 切削速度请设定在至少350m/min以上。
Set the cutting speed to at least 350 m/min.
- 刀具伸出量尽可能控制在2D以内。
Keep tool overhang within 2D as much as possible.
- 为了保证刀具寿命和安定性，推荐【完全干式】。
Fully dry machining is recommended to ensure tool life and stability.
- 加工请避免微小切深的加工，以免底刃和黑皮表面干摩擦而影响使用。
Avoid machining with extremely small depth of cut, to prevent dry friction between the bottom cutting edges and the cast skin, which may affect tool performance.

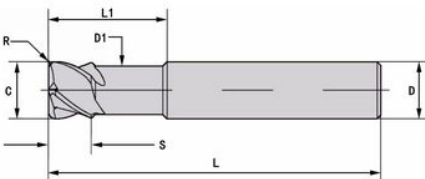
通柄型 Straight Shank



		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
		K	铸铁 Cast Iron					○		⌚	
		S	耐热合金 Heat-Resistant Alloy					○		⌚	
		H	淬硬钢 Hardened Steel								
Metric/Inch 型号TYPE	D 柄径 Shank Diameter	R 刀尖圆弧 Corner Radius	C 刃径 Cutting Edge Diameter	S 刃长(最大切深) Effective Cutting Length (Max Axial Depth)	L 总长 Overall Length	F 刃数 Number of Flutes	CW10	CS35			
TB-D4R0.5C4S3L50F4	4.0/.157"	0.50/.0197"	4.0/.157"	3.0/.118"	50.0/1.968"	4	●	▲			
TB-D6R0.75C6S4.5L50F4	6.0/.236"	0.75/.0295"	6.0/.236"	4.5/.177"	50.0/1.968"		●	▲			
TB-D8R1.0C8S6.0L60F4	8.0/.315"	1.00/.0394"	8.0/.315"	6.0/.236"	60.0/2.362"		●	▲			
TB-D10R1.25C10S7.5L65F4	10.0/.394"	1.25/.0492"	10.0/.394"	7.5/.295"	65.0/2.559"		●	▲			
TB-D12R1.5C12S9L70F4	12.0/.472"	1.50/.0590"	12.0/.472"	9.0/.354"	70.0/2.756"		●	▲			
TB-D16R1.75C16S12L75F4	16.0/.630"	1.75/.0689"	16.0/.630"	12.0/.472"	75.0/2.952"		●	▲			
TB-D20R2.0C20S15L80F4	20.0/.787"	1.75/.0689"	20.0/.787"	15.0/.590"	80.0/3.149"		●	▲			
TB-D4R0.5C4S3L50F6	4.0/.157"	0.50/.0197"	4.0/.157"	3.0/.118"	50.0/1.968"	6	●	▲			
TB-D6R0.75C6S4.5L50F6	6.0/.236"	0.75/.0295"	6.0/.236"	4.5/.177"	50.0/1.968"		●	▲			
TB-D8R1.0C8S6.0L60F6	8.0/.315"	1.00/.0394"	8.0/.315"	6.0/.236"	60.0/2.362"		●	▲			
TB-D10R1.25C10S7.5L65F6	10.0/.394"	1.25/.0492"	10.0/.394"	7.5/.295"	65.0/2.559"		●	▲			
TB-D12R1.5C12S9L70F6	12.0/.472"	1.50/.0590"	12.0/.472"	9.0/.354"	70.0/2.756"		●	▲			
TB-D16R1.75C16S12L75F6	16.0/.630"	1.75/.0689"	16.0/.630"	12.0/.472"	75.0/2.952"		●	▲			
TB-D20R2.0C20S15L80F6	20.0/.787"	1.75/.0689"	20.0/.787"	15.0/.590"	80.0/3.149"		●	▲			

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的可定制生产。/Note: Not listed in the table can be customized for production.

缩颈型 Reduced Neck Shank



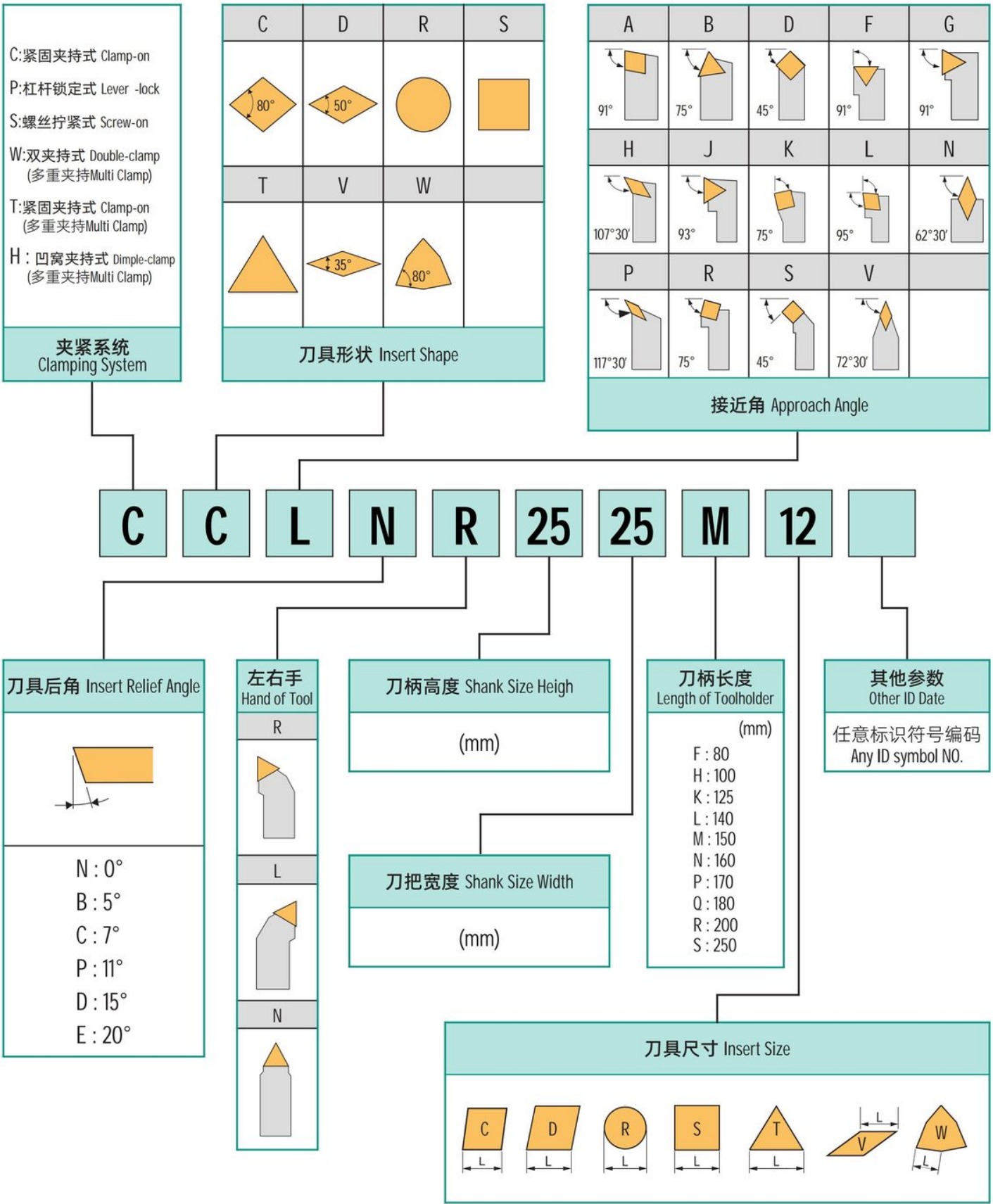
		○ 稳定工况/Stable Machining Conditions ⌚ 间断工况/Intermittent Machining Conditions ⚠ 恶劣间断工况/Severe Intermittent Conditions									
		K	铸铁 Cast Iron							○	⌚
		S	耐热合金 Heat-Resistant Alloy							○	⌚
		H	淬硬钢 Hardened Steel								
Metric/Inch 型号TYPE	D 柄径 Shank Diameter	R 刀尖圆弧 Corner Radius	C 刃径 Cutting Edge Diameter	S 刃长(最大切深) Effective Cutting Length (Max Axial Depth)	D1 缩颈 Reduced Neck	L1 有效长度 Useful Length	L 总长 Overall Length	F 刃数 Number of Flutes	CW10	CS35	
SJ-D4R0.5C4S3L50F4	4.0/.157"	0.50/.0197"	4.0/.157"	3.0/.118"	3.80/.015"	6.0/.236"	50.0/1.968"	4	●	▲	
SJ-D6R0.75C6S4.5L50F4	6.0/.236"	0.75/.0295"	6.0/.236"	4.5/.177"	5.80/.228"	9.0/.354"	50.0/1.968"		●	▲	
SJ-D8R1.0C8S6.0L60F4	8.0/.315"	1.00/.0394"	8.0/.315"	6.0/.236"	7.70/.303"	12.0/.472"	60.0/2.362"		●	▲	
SJ-D10R1.25C10S7.5L65F4	10.0/.394"	1.25/.0492"	10.0/.394"	7.5/.295"	9.60/.378"	15.0/.590"	65.0/2.559"		●	▲	
SJ-D12R1.5C12S9L70F4	12.0/.472"	1.50/.0590"	12.0/.472"	9.0/.354"	11.50/.453"	18.0/.708"	70.0/2.756"		●	▲	
SJ-D16R1.75C16S12L75F4	16.0/.630"	1.75/.0689"	16.0/.630"	12.0/.472"	15.40/.606"	24.0/.945"	75.0/2.952"		●	▲	
SJ-D20R2.0C20S15L80F4	20.0/.787"	1.75/.0689"	20.0/.787"	15.0/.590"	15.40/.606"	30.0/1.181"	80.0/3.149"		●	▲	
SJ-D4R0.5C4S3L50F6	4.0/.157"	0.50/.0197"	4.0/.157"	3.0/.118"	3.80/.015"	6.0/.236"	50.0/1.968"	6	●	▲	
SJ-D6R0.75C6S4.5L50F6	6.0/.236"	0.75/.0295"	6.0/.236"	4.5/.177"	5.80/.228"	9.0/.354"	50.0/1.968"		●	▲	
SJ-D8R1.0C8S6.0L60F6	8.0/.315"	1.00/.0394"	8.0/.315"	6.0/.236"	7.70/.303"	12.0/.472"	60.0/2.362"		●	▲	
SJ-D10R1.25C10S7.5L65F6	10.0/.394"	1.25/.0492"	10.0/.394"	7.5/.295"	9.60/.378"	15.0/.590"	65.0/2.559"		●	▲	
SJ-D12R1.5C12S9L70F6	12.0/.472"	1.50/.0590"	12.0/.472"	9.0/.354"	11.50/.453"	18.0/.708"	70.0/2.756"		●	▲	
SJ-D16R1.75C16S12L75F6	16.0/.630"	1.75/.0689"	16.0/.630"	12.0/.472"	15.40/.606"	24.0/.945"	75.0/2.952"		●	▲	
SJ-D20R2.0C20S15L80F6	20.0/.787"	1.75/.0689"	20.0/.787"	15.0/.590"	15.40/.606"	30.0/1.181"	80.0/3.149"		●	▲	

▲ 主推牌号/Main recommended grade ● 可定制可选牌号/Optional grade available for build-to-order
注：未列于表的可定制生产。/Note: Not listed in the table can be customized for production.

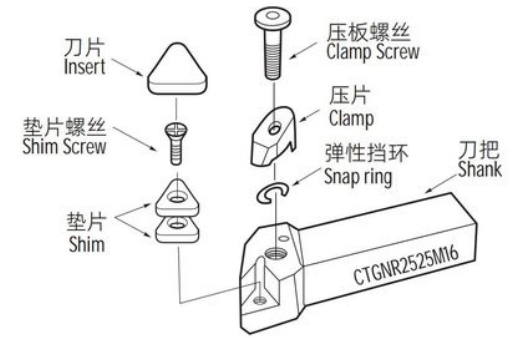
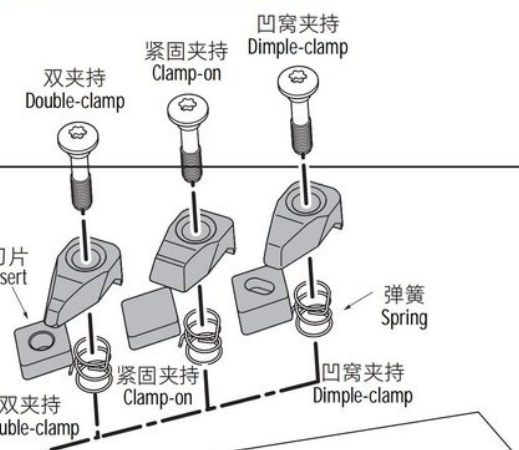
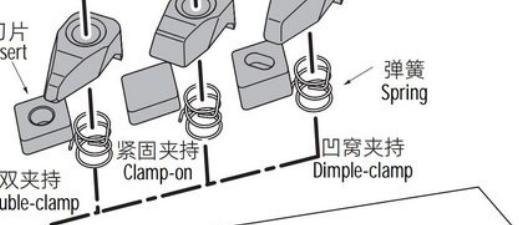
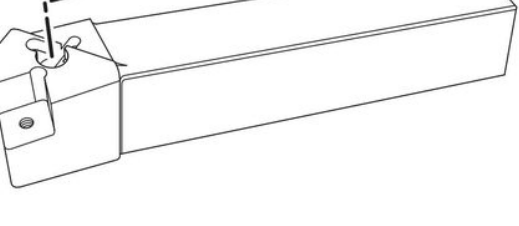
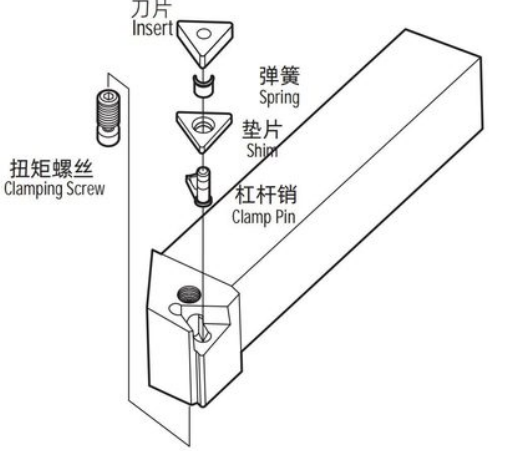
车削加工刀柄 Toolholders for Turning Machining



刀柄识别系统 Holder Identification System



车削刀柄结构和特点 / Structure and Features of Turning ToolHolders

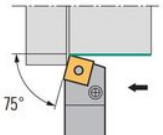
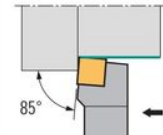
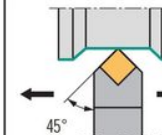
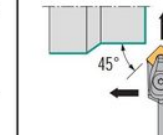
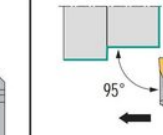
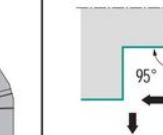
系列Series	结构Structure	特点Features
C 型： 紧固夹持 C type： Clamp-on		- 以高夹持力牢固夹紧刀片 Secures the insert with high clamping force - 优异的转位精度 Excellent in indexing accuracy - 适用于包含断续切削在内的重载加工场景 Suitable for heavy-duty applications including interrupted cut machining - 陶瓷刀具专用夹紧系统 Clamping system for ceramic cutting tools
W 型： 双夹持 W type： Double-clamp	多重紧固刀杆 Multi-Clamp Holder 	仅需更换夹紧压片即可实现三种夹紧方式 Shim screw clamping methods can be utilized by a simple clamp shim
T 型： 紧固夹持 T type： Clamp-on		- 陶瓷刀具最佳选择，夹持更牢固、精度更高的改进型系统 Best for ceramic tools, improved system with stronger and more accurate clamping - 通过优化夹紧力防止刀片崩损 Prevents insert breakage by optimizing the clamping force - 具备高度重复定位精度，可实现高精度加工 Allows for highly accurate machining with highly repeatable accuracy - 支持刀片顶部和底部双向夹紧，更换刀片更便捷 Inserts can be easily changed as clamping is possible from the top and bottom of the tool
H 型： 凹窝夹持 H type： Dimple-clamp		
P 型： 杠杆锁紧 P type： Lever lock		- 通用型刀杆 General-purpose toolholder - 排屑流畅且不损伤夹紧机构 Allows for smooth chip control without damaging the clamping mechanism - 通过优化夹紧力防止刀片崩损 Prevents insert breakage by optimizing the clamping force - 适配全材质刀片（陶瓷刀片不推荐使用） For inserts of all material grades however not recommended for ceramics

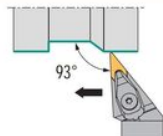
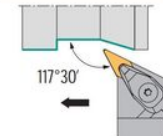
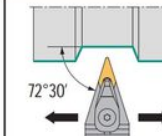
车削刀柄选择指南 / Turning ToolHolders Selection Guide

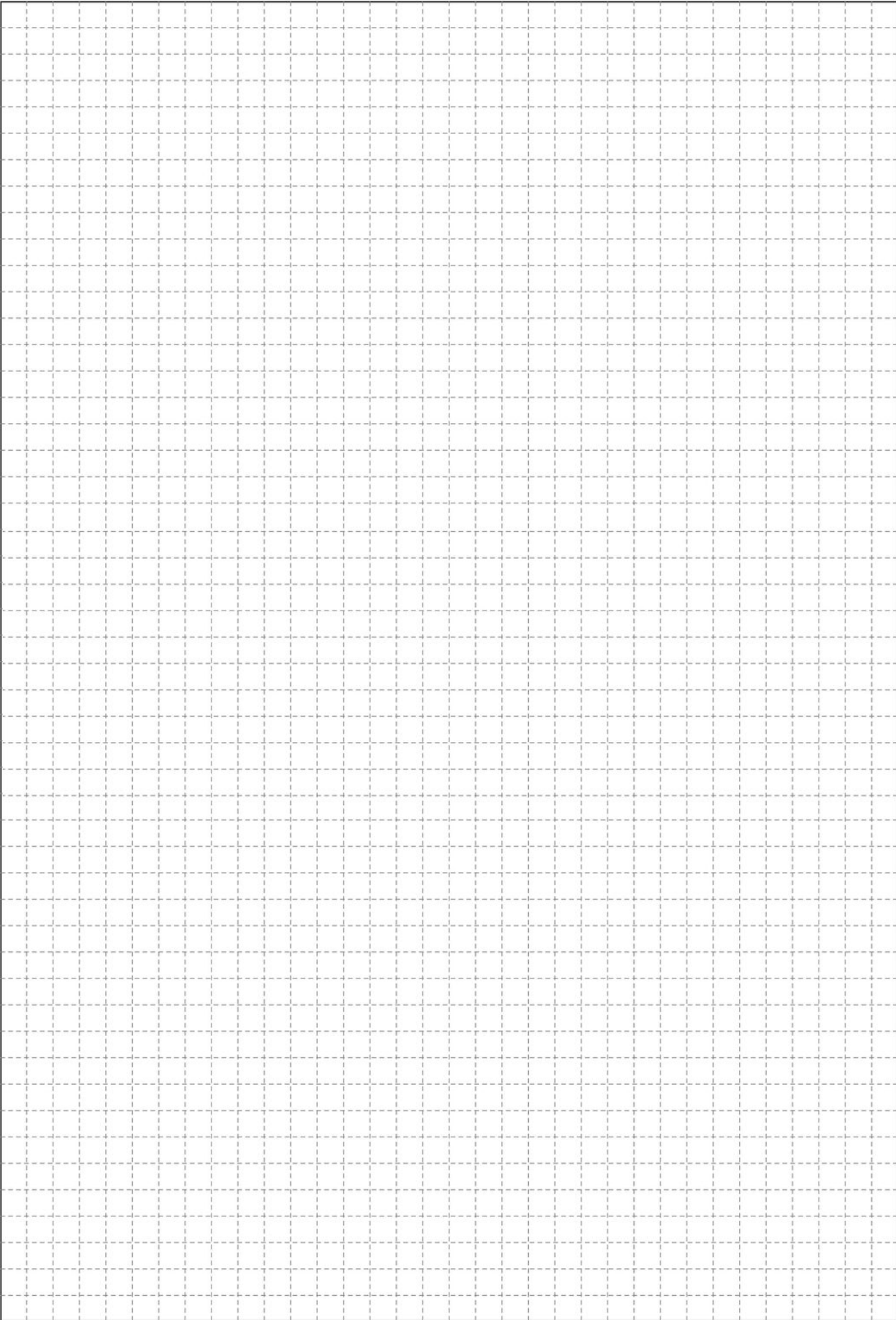
主偏角 Lead Angle (KAPR)	95°	75°	75°	93°	107°30'	62°30'
刀杆结构 示意图 Tooling						
刀片形状 Insert Shape	CNGA/CNGN/CNGX		CNGA/CNGN		DNGA/DNGX	
C/T 型： 紧固夹持 C/T type： Clamp-on	CCLN TCLN	CCBN TCBN	CCKN	CDJN		
W 型： 双夹持 W type： Double-clamp	WCLN	WCBN		WDJN	WDHN	WDNN
H 型： 凹窝夹持 H type： Dimple-clamp	HCLN			HDJN	HDHN	HDNN
P 型： 杠杆锁紧 P type： Lever lock	PCLN			PDJN		

主偏角 Lead Angle (KAPR)	-	-	-	-	91°	91°
刀杆结构 示意图 Tooling						
刀片形状 Insert Shape	RNGN		CDH	RCGX/RPGX	TNGA/TNGN	
C/T 型： 紧固夹持 C/T type： Clamp-on	CRDNN	CRGN		CRDCN	TTFN	TTGN
W 型： 双夹持 W type： Double-clamp					WTFN	WTGN
H 型： 凹窝夹持 H type： Dimple-clamp				HRCD		
P 型： 杠杆锁紧 P type： Lever lock						

车削刀柄选择指南 / Turning ToolHolders Selection Guide

主偏角 Lead Angle (KAPR)	95°	85°	45°	45°	95°	95°
刀杆结构 示意图 Tooling						
刀片形状 Insert Shape	SNGA	SNGN	SNGA/SNGN/SNGX		WNGA	
C/T 型： 紧固夹持 C/T type : Clamp-on		CSHN	CSDN TSDN	CSSN TSSN		
W 型： 双夹持 W type : Double-clamp			WSDN	WSSN	WWLN	WWLN-2
H 型： 凹窝夹持 H type : Dimple-clamp			HSDN	HSSN		
P 型： 杠杆锁紧 P type : Lever lock	PSBN		PSDN			

主偏角 Lead Angle (KAPR)	93°	117°30'	72°30'
刀杆结构 示意图 Tooling			
刀片形状 Insert Shape	VNGA/VNGX		
C/T 型： 紧固夹持 C/T type : Clamp-on			
W 型： 双夹持 W type : Double-clamp	WVJN	WVPN	WVVN
H 型： 凹窝夹持 H type : Dimple-clamp	HVJN	HVPN	HVVN
P 型： 杠杆锁紧 P type : Lever lock			



CN系列刀柄/CN...series/Toolholders

TCLN Type

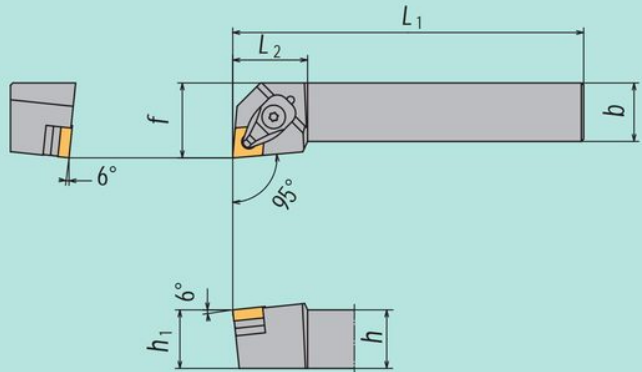
紧固夹持/Clamp-on

WCLN Type

双夹持/Double-clamp

HCLN Type

凹窝夹持/Dimple-clamp

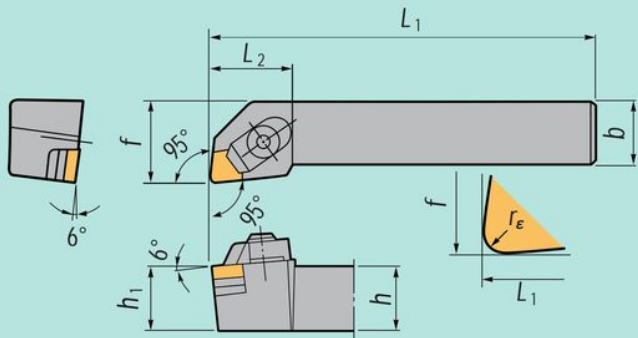


多重紧固刀柄 Multi-Clamp Holder

● 图示为右手刀 / Diagram shows right-hand tool

CCLN Type

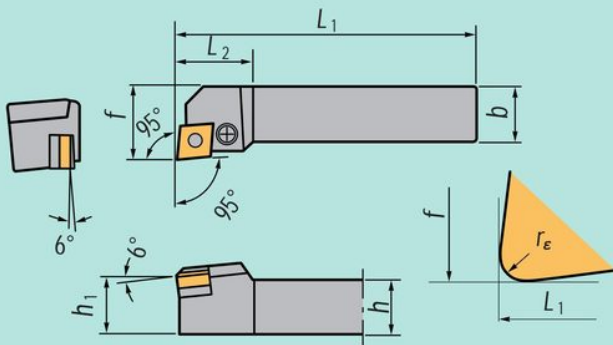
紧固夹持/Clamp-on



● 图示为右手刀 / Diagram shows right-hand tool

PCLN Type

杠杆锁紧/Lever lock



● 图示为右手刀 / Diagram shows right-hand tool

刀柄尺寸/Toolholder Size...TCLN/WCLN/HCLN

多重紧固刀柄 Multi-Clamp Holder

①	型号/Model Number	Stock		Size (mm)								Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring
		R	L	h	b	L ₁	h ₁	f	L ₂									
	TCLN ^{R/L} 2525M12	●	●	25	25	150	25	32	32	TC6CN Clamp-on	ACN423	AOS-6 *30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D		
	3225P12	●	●	32	25	170	32	32	32									
	3232P12			32	32	170	32	39	32									
	WCLN ^{R/L} 2525M12	●	●	25	25	150	25	32	32	DC6CN Double-clamp	ACN423	AOS-6 *30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D		
	3225P12	●	●	32	25	170	32	32	32									
	3232P12			32	32	170	32	39	32									
	HCLN ^{R/L} 2525M12	●	●	25	25	150	25	32	32	HC6CN Dimple-clamp	ACN423	AOS-6 *30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D		
	3225P12	●	●	32	25	170	32	32	32									
	3232P12			32	32	170	32	39	32									

刀柄尺寸/Toolholder Size...CCLN

②	型号/Model Number	Stock		Size (mm)								Clamp	Shim	Clamping screw	Shim screw	Wrench	Snap
		R	L	h	b	L ₁	h ₁	f	L ₂								
	CCLN ^{R/L} 3225P12	●	●	32	25	170	32	32	32	CC08M	ACN422	BS0835W	M3*12	LW-4	SR08		

刀柄尺寸/Toolholder Size...PCLN

③	型号/Model Number	Stock		Size (mm)								Shim	Lever	Clamping screw	Wrench	Spring
		R	L	h	b	L ₁	h ₁	f	L ₂							
	PCLN ^{R/L} 2020K43	●	●	20	20	125	20	25	28	LSC42	LCL4	LCS4	LW-3	LSP4		
	2525M43	●	●	25	25	150	25	32	28							

适用刀片/Suitable Insert

	Model Number	Suitable Insert
①	TCKLN ^{R/L} ...12	CNGN1204 (1207)
	WCLN ^{R/L} ...12	CNGA1204 (1207)
	HCLN ^{R/L} ...12	CNGX1207
②	CCLN ^{R/L} 12	CNGN1204 (1207)
③	PCLN ^{R/L} ...43	CNGA1204

CN系列刀柄/CN...series/Toolholders

TCBN Type

紧固夹持/Clamp-on

WCLN Type

双夹持/Double-clamp

多重紧固刀柄 Multi-Clamp Holder

①

● 图示为右手刀 / Diagram shows right-hand tool

CCBN Type

紧固夹持/Clamp-on

● 图示为右手刀 / Diagram shows right-hand tool

CCKN Type

紧固夹持/Clamp-on

● 图示为右手刀 / Diagram shows right-hand tool

刀柄尺寸/Toolholder Size...TCBN/WCBN

多重紧固刀柄 Multi-Clamp Holder

①	型号/Model Number		Stock		Size (mm)					Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring	
			R	L	h	b	L ₁	h ₁	f	L ₂							
	TCBN ^{R/L}	2525M12	●	●	25	25	150	25	22	32	TC6CN Clamp-on	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12	●	●	32	25	170	32	22	32							
		3232P12			32	32	170	32	29	32							
	WCBN ^{R/L}	2525M12	●	●	25	25	150	25	22	32	DC6CN Double-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12	●	●	32	25	170	32	22	32							
		3232P12			32	32	170	32	29	32							

刀柄尺寸/Toolholder Size...CCBN/CCKN

	型号/Model Number	Stock		Size (mm)								Clamp	Shim	Clamping screw	Shim screw	Wrench	Snap
		R	L	h	b	L ₁	h ₁	f	L ₂								
②	CCBN _{R/L} 2525M12	●		25	25	150	25	22	32	CC08M	ACN422	BS0835W	M3 * 12	LW-4	SR08		
③	CCKN _{R/L} 2525M12	●		25	25	150	25	32	30								

适用刀片/Suitable Insert

	Model Number	Suitable Insert	
①	TCBN _{R/L} ...12	CNGN1204 (1207)	
	WCBN _{R/L} ...12	CNGA1204 (1207)	
②	CCBN _{R/L} 2525M12	CNGN1204 (1207)	
③	CCKN _{R/L} 2525M12		

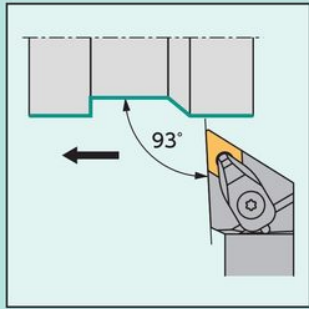
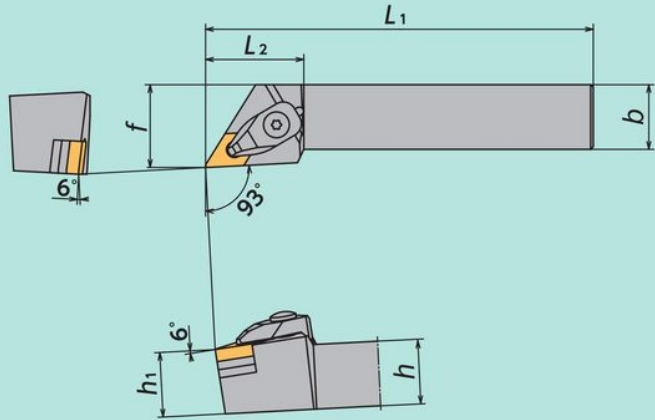
DN系列刀柄/DN...series/Toolholders

WDJN Type

双夹持/Double-clamp

HDJN Type

凹窝夹持/Dimple-clamp

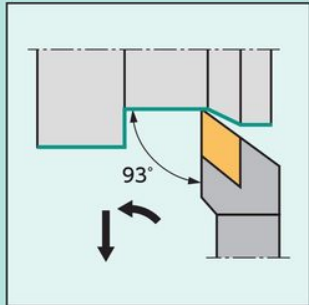
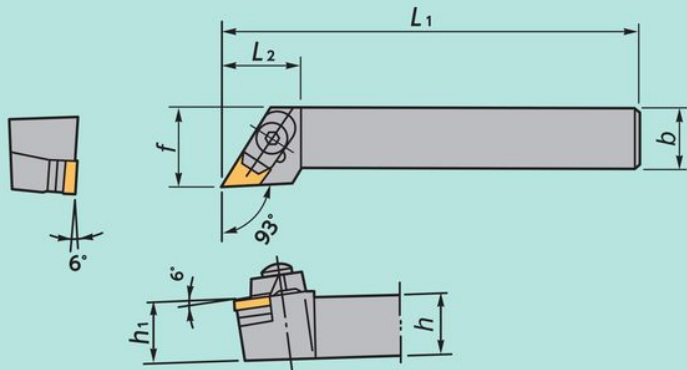


多重紧固刀柄 Multi-Clamp Holder

• 图示为右手刀 / Diagram shows right-hand tool

CDJN Type

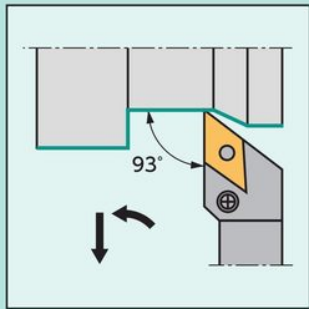
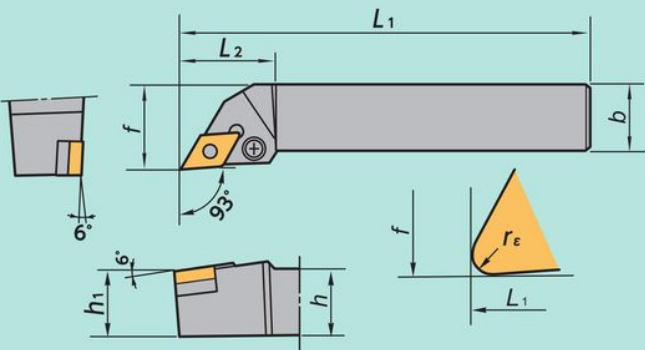
紧固夹持/Clamp-on



• 图示为右手刀 / Diagram shows right-hand tool

PCLN Type

杠杆锁紧/Lever lock



• 图示为右手刀 / Diagram shows right-hand tool

刀柄尺寸/Toolholder Size...WDJN/HDJN

多重紧固刀柄 Multi-Clamp Holder

①	型号/Model Number		Stock		Size (mm)					Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring	
			R	L	h	b	L ₁	h ₁	f	L ₂							
	WDJN ^{R/L}	2525M15	●	●	25	25	150	25	32	38	DC6CN Double-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P15	●	●	32	25	170	32	32	38							
		3232P15			32	32	170	32	32	38							
	HDJN ^{R/L}	2525M15	●	●	25	25	150	25	32	38	HC6CN Dimple-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P15	●	●	32	25	170	32	32	38							
		3232P15			32	32	170	32	39	38							

刀柄尺寸/Toolholder Size...CDJN

②	型号/Model Number	Stock		Size (mm)								Clamp	Shim	Clamping screw	Shim screw	Wrench	Snap
		R	L	h	b	L ₁	h ₁	f	L ₂								
	CDJN ^{R/L} 2525M15			25	25	150	25	32	32	CC08M	ACN422	BS0835W	M3 * 12	LW-4	SR08		
	3225P15			32	25	170	32	32	32								

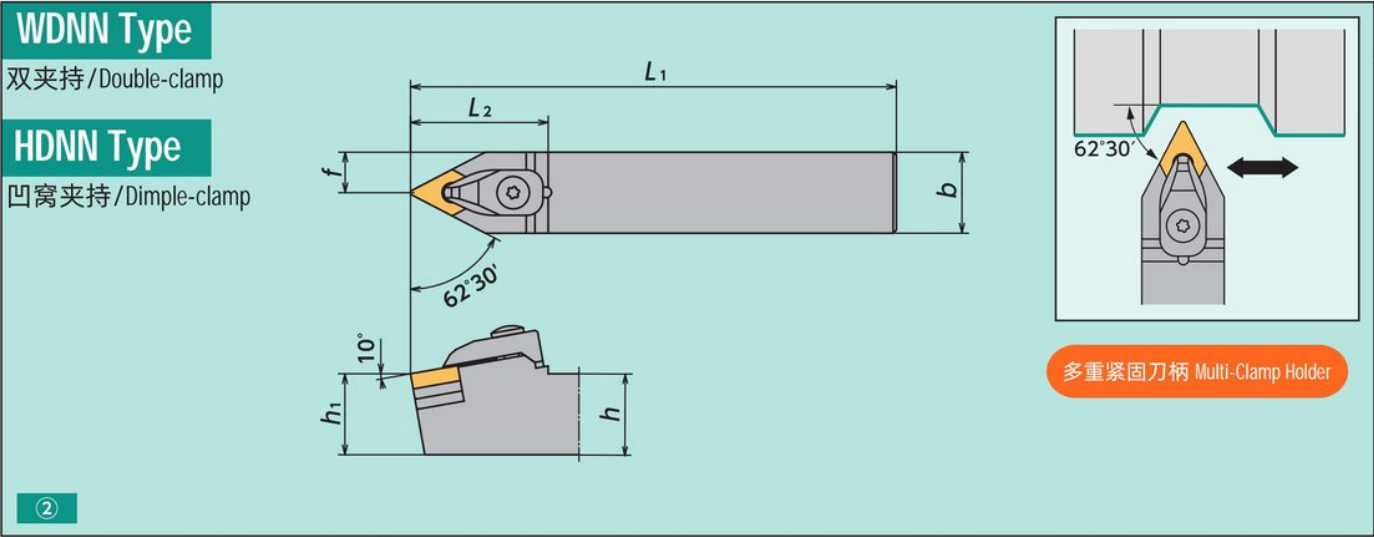
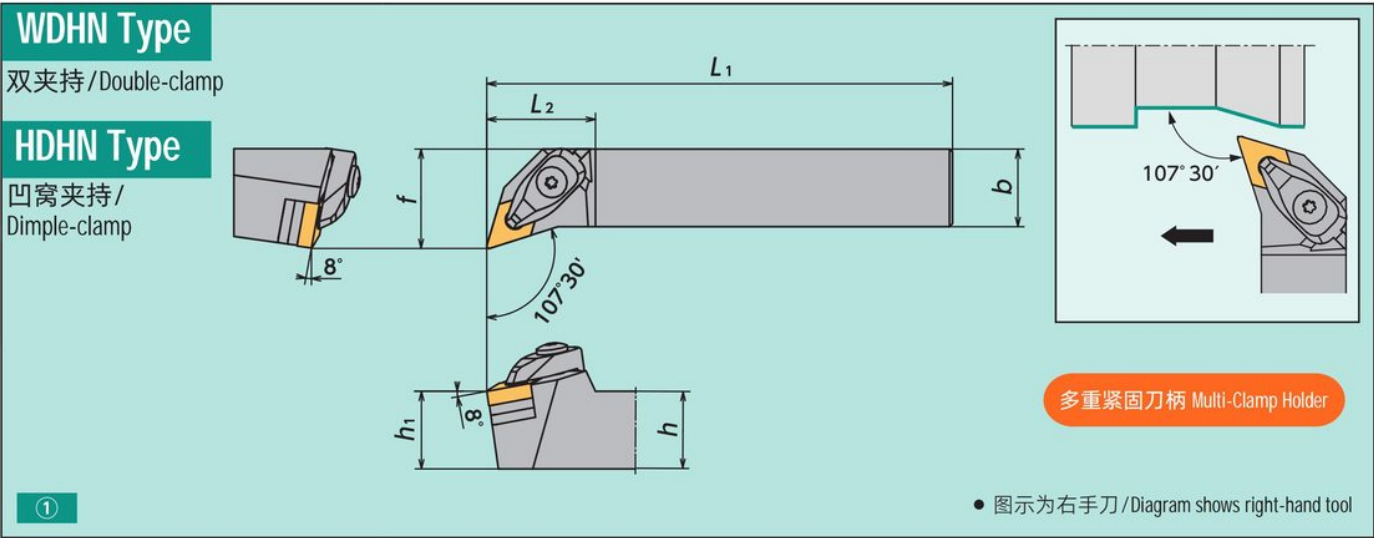
刀柄尺寸/Toolholder Size...PDJN

③	型号/Model Number	Stock		Size (mm)								Shim	Lever	Clamping screw	Wrench	Spring
		R	L	h	b	L ₁	h ₁	f	L ₂							
	PDJN ^{R/L} 2020K43	●	●	20	20	125	20	25	32	LSC42	LCL4	LCS4	LW-3	LSP4		
	2525M43	●	●	25	25	150	25	32	32							

适用刀片/Suitable Insert

	Model Number	Suitable Insert
①	WDJN ^{R/L} ...15	DNGA1504 (1507)
	HDJN ^{R/L} ...15	DNGX1507
②	CDJN ^{R/L} ...15	DNGN1504 (1507)
③	PDJN ^{R/L} ...43	DNGA1504 (1507)

DN系列刀柄/DN...series/Toolholders



刀柄尺寸/Toolholder Size...WD/HD.HN/NN

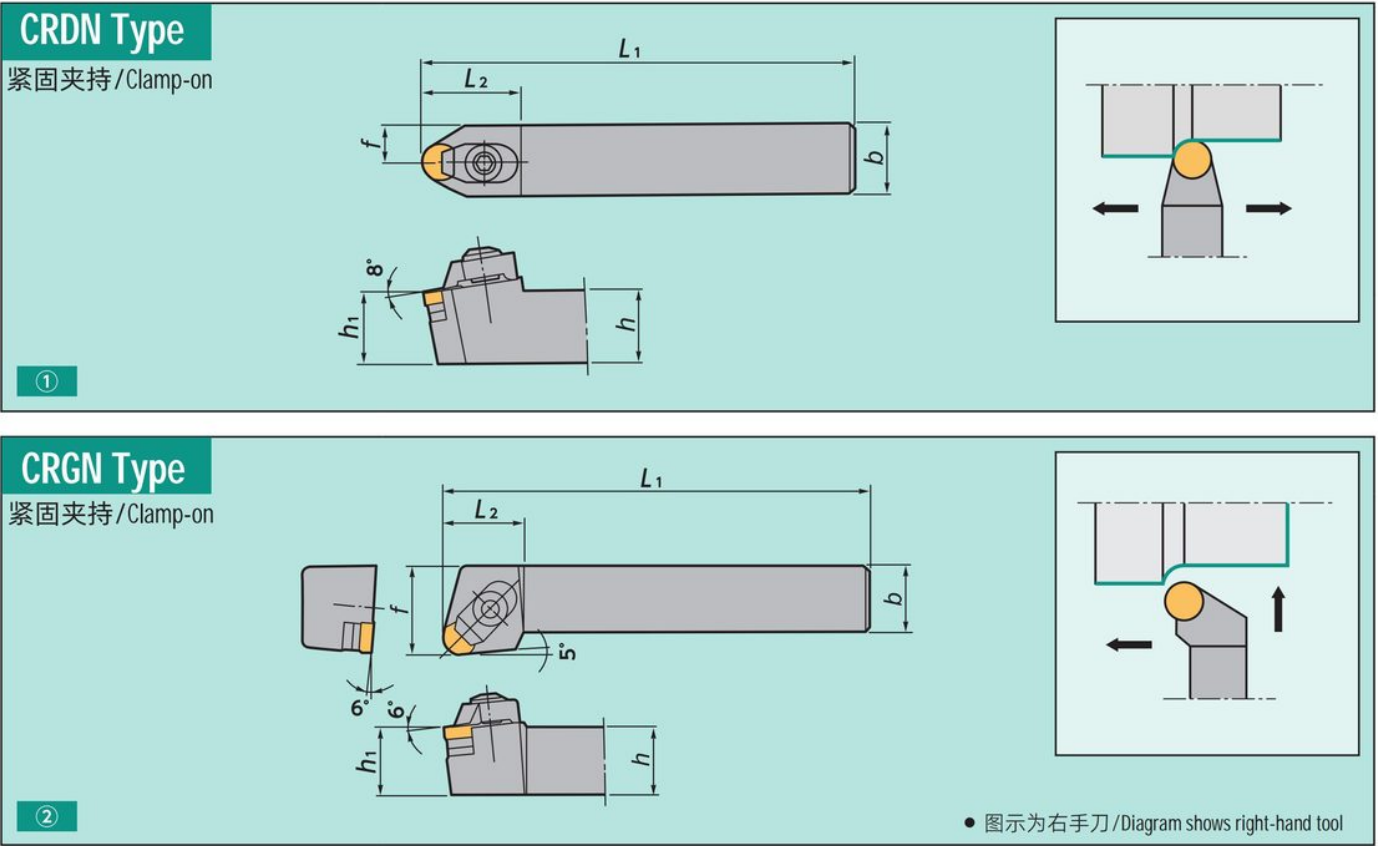
多重紧固刀柄 Multi-Clamp Holder

	型号/Model Number		Stock		Size (mm)					Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring		
			R	L	h	b	L ₁	h ₁	f	L ₂								
①	WDHN ^{R/L}	2525M15	●	●	25	25	150	25	32	35	DC6CN Double-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D	
		3225P15	●	●	32	25	170	32	32	35								
		3232P15			32	32	170	32	39	35								
		HDHN ^{R/L}	2525M15	●	●	25	25	150	25	32	35	HC6CN Dimple-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P15	●	●	32	25	170	32	32	35								
		3232P15			32	32	170	32	39	35								
②	WDNNN	2525M15		●	25	25	150	25	12.5	42.5	DC6CN Double-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D	
		3225P15			32	25	170	32	12.5	42.5								
		3232P15			32	32	170	32	16.0	42.5								
		HDNNN	2525M15		●	25	25	150	25	12.5	42.5	HC6CN Dimple-clamp	ACN423	AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P15			32	25	170	32	12.5	42.5								
		3232P15			32	32	170	32	16	42.5								

适用刀片/Suitable Insert

	Model Number	Suitable Insert
①	WDHN ^{R/L} ...15	DNGA1504 (1507)
	HDHN ^{R/L} ...15	DNGX1507
②	WDNNN...15	DNGA1504 (1507)
	HDNNN...15	DNGX1507

RN系列刀柄 / RN...series/Toolholders



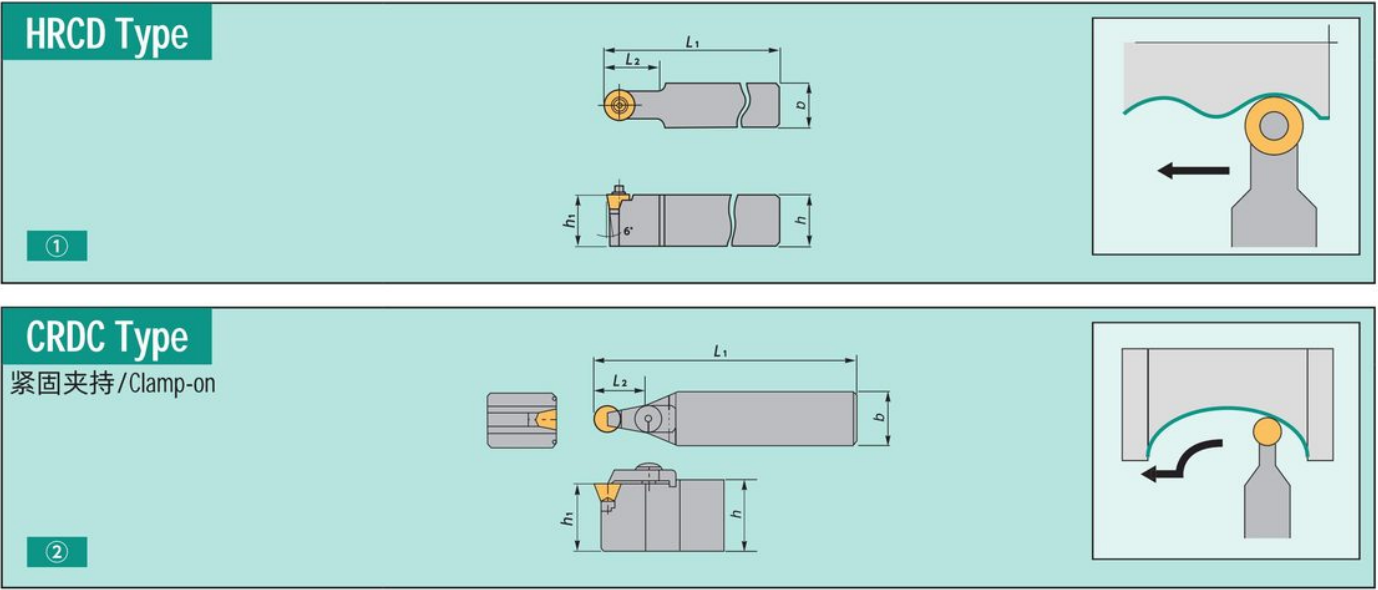
刀柄尺寸 / Toolholder Size...CRDN/CRGN

	型号 / Model Number		Stock		Size (mm)							Clamp	Shim	Clamping screw	Shim screw	Wrench	Snap
			R	L	h	b	L ₁	h ₁	f	L ₂							
①	CRDNN	2525M12	●		25	25	150	25	32	32		CC08M	ARN42	BS0835W	M3 * 12	LW-4	SR08
		3225P12	●		32	25	170	32	32	32							
②	CRGN	3225P12	●		32	25	170	32	32	32		CC08M	ARN42	BS0835W	M3 * 12	LW-4	SR08

适用刀片 / Suitable Insert

	Model Number	Suitable Insert
①	CRDNN...12	RNGN1204 (1207)
②	CRGN...12	

RN系列刀柄 / RN...series/Toolholders



刀柄尺寸 / Toolholder Size...HRCD/CRDC和适用刀片 / Suitable Insert

	型号 / Model Number		Stock		Size (mm)							适用刀片 Suitable Insert	
			R	N	L	h	b	L ₁	h ₁	f	L ₂		
①	HRCD	-22	●			50	50	300	50	—	30	CDH22	
		-33	●			50	50	300	50	—	50	CDH33	
		-42				50	50	300	50	—	80	CDH42	
		-43				50	50	300	50	—	80	CDH43	
		-53				50	50	300	50	—	100	CDH53	
②	CRDCN	2525M06				25	25	150	25	—	20	RCGX/RPGX0607 (08)	
		2525M09				25	25	150	25	—	20	RCGX/RPGX0907 (08)	
		2525M12				25	25	150	25	—	20	RCGX/RPGX1207 (08)	
		3225P06	●			32	25	170	32	—	20	RCGX/RPGX0607 (08)	
		3225P09	●			32	25	170	32	—	20	RCGX/RPGX0907 (08)	
		3225P12	●			32	25	170	32	—	25	RCGX/RPGX1207 (08)	
		3232P15				32	32	170	32	—	30	RCGX/RPGX1510	

刀柄零件 / Toolholder components

components	Clamping screw	Clamping screw	Washer	Shim	Clamp	Spring Pin	Wrench
Model Number							
HRCD-22	CS0316		W120	HACDH22 (A)			LW-2.5
-33	CS0625		W110	HACDH33 (A)			LW-5
-42	1/4-20UNC * 11/4		W106	HACDH42 (A)			LWU-4
-43	1/4-20UNC * 11/2			HACDH43 (A)			LWU-5
-53	3/8-16UNC * 11/2		W107	HACDH53 (A)			LW-3
CRDCN3225P06		BS0520	WS-5	HARCGX06 (C)	HC35KR-4099	—	LW-4
3225P09				HARCGX0908V (D)	HC35KR-6075	2 * 8AW	
3225P12		BS0625	WS-6	HARCGX1208V (D)	HC35KR-6076	2.5 * 8AW	

SN系列刀柄/SN...series/Toolholders

TSDN Type

紧固夹持/Clamp-on

WSDN Type

双夹持/Double-clamp

HSDN Type

凹窝夹持/Dimple-clamp

多重紧固刀柄 Multi-Clamp Holder

TSSN Type

紧固夹持/Clamp-on

WSSN Type

双夹持/Double-clamp

HSSN Type

凹窝夹持/Dimple-clamp

多重紧固刀柄 Multi-Clamp Holder

● 图示为右手刀 / Diagram shows right-hand tool

CSDN Type

紧固夹持/Clamp-on

● 图示为右手刀 / Diagram shows right-hand tool

CSSN Type

紧固夹持/Clamp-on

● 图示为右手刀 / Diagram shows right-hand tool

刀柄尺寸/Toolholder Size...TS/WS/..DNN/SN

多重紧固刀柄 Multi-Clamp Holder

	型号/Model Number		Stock		Size (mm)							Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring
			R	L	h	b	L ₁	h ₁	f	L ₂								
①	TSDNN	2525M12	●		25	25	150	25	12.5	35		TC6CN		AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12	●		32	25	170	32	12.5	35		Clamp-on	ACN423					
	WSDNN	2525M12	●		25	25	150	25	12.5	35		DC6CN		AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12	●		32	25	170	32	12.5	35		Double-clamp	ACN423					
	HSDNN	2525M12	●		25	25	150	25	12.5	35		HC6CN		AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12	●		32	25	170	32	12.5	35		Dimple-clamp	ACN423					
②	TSSN _{R/L}	2525M12	●	●	25	25	150	25	32	35		TC6CN		AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12			32	25	170	32	32	35		Clamp-on	ACN423					
	WSSN _{R/L}	2525M12	●	●	25	25	150	25	32	35		DC6CN		AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12			32	25	170	32	32	35		Double-clamp	ACN423					
	HSSN _{R/L}	2525M12	●	●	25	25	150	25	32	35		HC6CN		AOS-6 * 30W	FSS15- 3.0 * 12	LLR-T20	LLR-T10	ASGL6-D
		3225P12			32	32	170	32	32	35		Dimple-clamp	ACN423					

刀柄尺寸/Toolholder Size...CSDNN/CSSN

	型号/Model Number		Stock		Size (mm)							Clamp	Shim	Clamping screw	Shim screw	Wrench	Snap
			R	L	h	b	L ₁	h ₁	f	L ₂							
③	CSDNN	2525M12	●		25	25	150	25	12.5	35		CC08M	ASN423	BS0835W	M3 * 12	LW-4	SR08
④	CSSN _{R/L}	2525M12	●		25	25	150	25	32	32							
		3225P12	●		32	25	170	32	32	31							

适用刀片/Suitable Insert

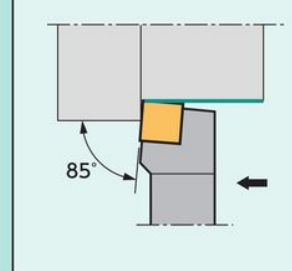
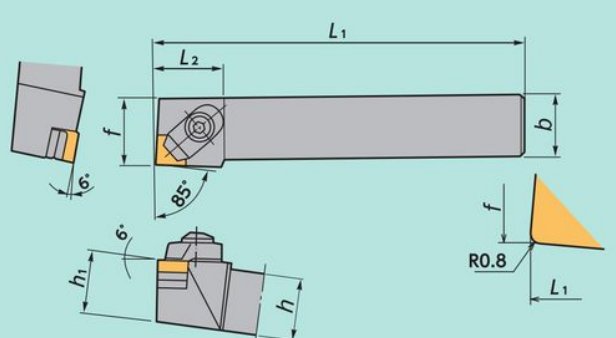
	Model Number	Suitable Insert	
①	TSDNN...12	SNGN1204 (1207)	
	WSDNN...12	SNGA1204 (1207)	
	HSDNN...12	SNGX1207	
②	TSSN _{R/L} ...12	SNGN1204 (1207)	
	WSSN _{R/L} ...12	SNGA1204 (1207)	
	HSSN _{R/L} ...12	SNGX1207	

	Model Number	Suitable Insert	
③	CSDNN...12	SNGN1204 (1207)	
④	CSSN ^{R/L} ...12		

SN系列刀柄/SN...series/Toolholders

CSHN Type

紧固夹持/Clamp-on

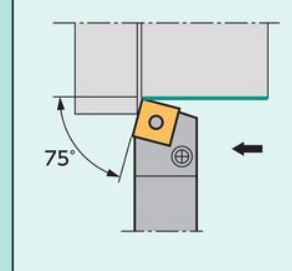
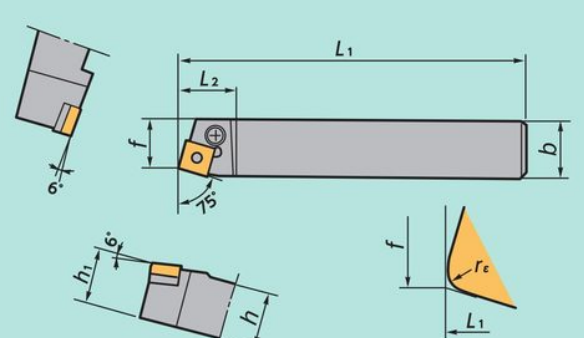


①

• 图示为右手刀 /Diagram shows right-hand tool

PSBN Type

杠杆锁紧/Lever lock

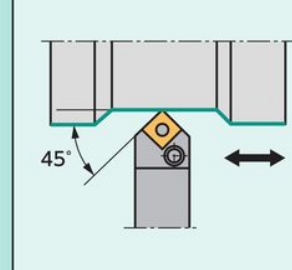
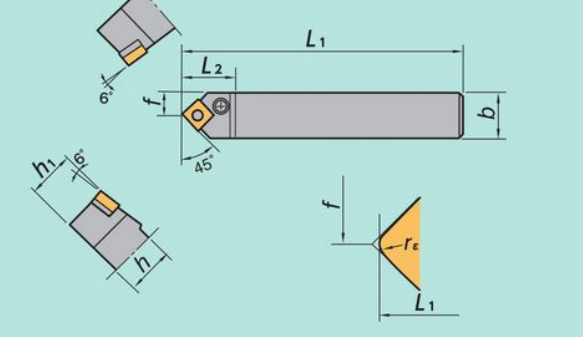


②

• 图示为右手刀 /Diagram shows right-hand tool

PSDN Type

杠杆锁紧/Lever lock



③

刀柄尺寸/Toolholder Size...CSHN

	型号/Model Number	Stock		Size (mm)								Clamp	Shim	Clamping screw	Shim screw	Wrench	Snap
		R	L	h	b	L ₁	h ₁	f	L ₂								
①	CSHN ^{R/L} 2525M12	●	●	25	25	150	25	27	30	CC08M	ASN423	BS0835W	M3 * 12	LW-4	SR08		

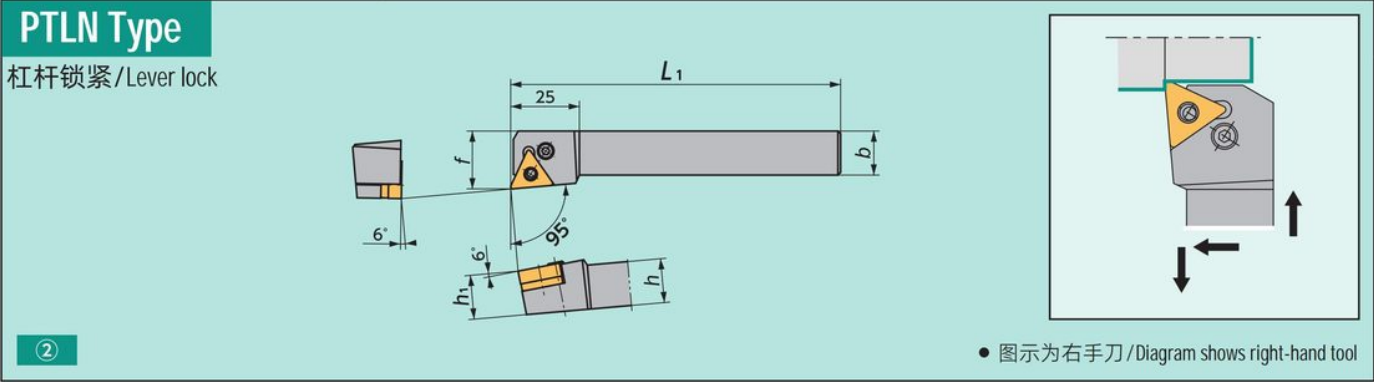
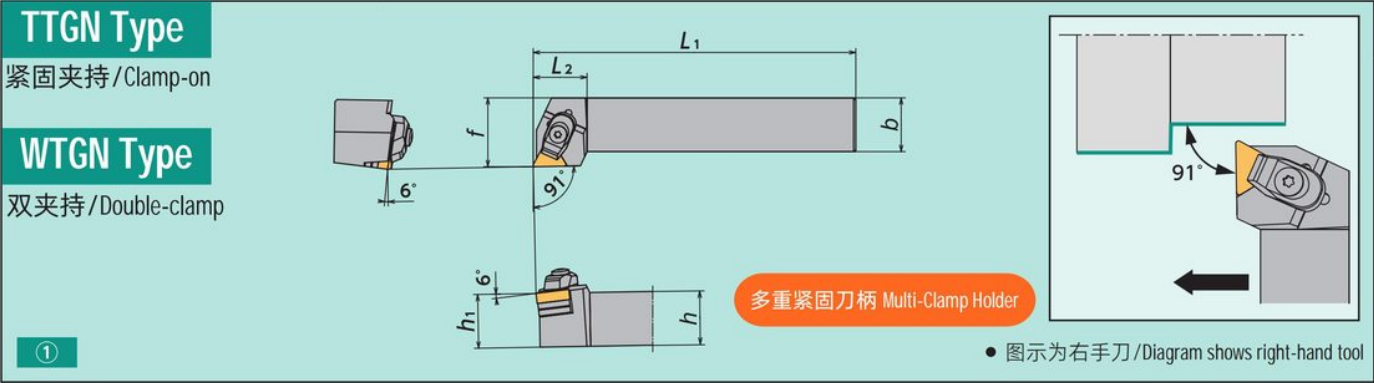
刀柄尺寸/Toolholder Size...PSBN/PSDNN

	型号/Model Number	Stock		Size (mm)								Shim	Lever	Clamping screw	Wrench	Spring
		R	L	h	b	L ₁	h ₁	f	L ₂							
②	PSBN ^{R/L} 2020K43	●	●	20	20	125	20	17	28	LSS42	LCL4	LCS4	LW-3	LSP4		
	2525M43	●	●	25	25	150	25	22	25	LSS42	LCL4	LCS4	LW-3	LSP4		
③	PSDNN 2020K43	●		20	20	125	20	10	30	LSS42	LCL4	LCS4	LW-3	LSP4		
	2525M43	●		25	25	150	25	12.5	30	LSS42	LCL4	LCS4	LW-3	LSP4		

适用刀片/Suitable Insert

	Model Number	Suitable Insert	
①	CSHN...12	SNGN1204	
②	PSBN...43	SNGA1204	
③	PSDNN...12		

TN系列刀柄/TN...series/Toolholders & 刀柄尺寸/Toolholder Size...TTGN/WTGN/PTLN



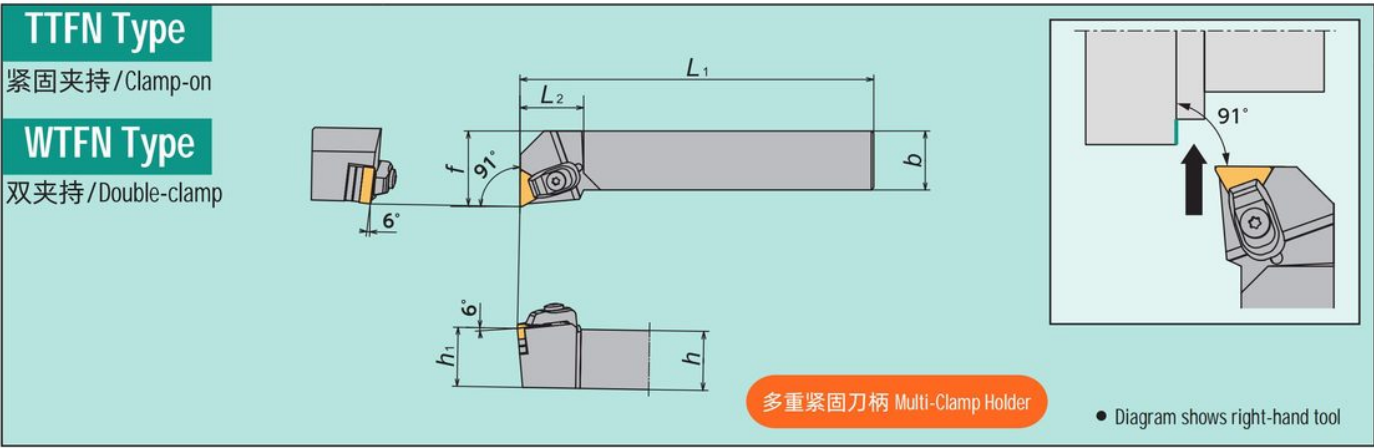
①	型号/Model Number		Stock		Size (mm)								Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring
			R	L	h	b	L ₁	h ₁	f	L ₂									
	TTGN [®] /L	2525M16	●	●	25	25	150	25	32	25			TC5TN Clamp-on	ATN 323	AOS-5 * 26W	FSS15- 3.0 * 12	LLR-T15	LLR-T10	ASGL5-D
		3225P16			32	25	170	32	32	25									
		3232P16			32	32	170	32	39	25									
	WTGN [®] /L	2525M16	●	●	25	25	150	25	32	25			TC5TN Double-clamp	ATN 323	AOS-5 * 26W	FSS15- 3.0 * 12	LLR-T15	LLR-T10	ASGL5-D
		3225P16			32	25	170	32	32	25									
		3232P16			32	32	170	32	39	25									

②	型号/Model Number		Stock		Size (mm)								Shim	Lever	Clamping screw	Wrench	Spring
			R	L	h	b	L ₁	h ₁	f	L ₂							
	PTLN [®] /L	2020L33	●	●	20	20	140	20	25	25			LST317	LCL3	LCS3	LW-2.5	LSP3

适用刀片/Suitable Insert

	Model Number	Suitable Insert
①	TTGN [®] /L...16	TNGN1604 (1607)
	WTGN [®] /L...16	TNGA1604
②	PTGN [®] /L...33	TNGA1604

TN系列刀柄/TN...series/Toolholders



刀柄尺寸/Toolholder Size...TTFN/WTFN

型号/Model Number	Stock		Size (mm)								Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring
	R	L	h	b	L ₁	h ₁	f	L ₂									
TTFN [®] /L	●	●	25	25	150	25	32	27			TC5TN Clamp-on	ATN 323	AOS-5 * 26W	FSS15- 3.0 * 12	LLR-T15	LLR-T10	ASGL5-D
					32	25	170	32	32	27							
					32	32	170	32	39	27							
WTFN [®] /L	●	●	25	25	150	25	32	27			TC5TN Double-clamp	ATN 323	AOS-5 * 26W	FSS15- 3.0 * 12	LLR-T15	LLR-T10	ASGL5-D
					32	25	170	32	32	27							
					32	32	170	32	39	27							

适用刀片/Suitable Insert

Model Number	Suitable Insert
TTFN [®] /L...16	TNGN1604 (1607)
WTFN [®] /L...16	TNGA1604

VN系列刀柄/VN...series/Toolholders

WVJN Type

双夹持/Double-clamp

HVJN Type

凹窝夹持/Dimple-clamp

多重紧固刀柄 Multi-Clamp Holder

● 图示为右手刀 / Diagram shows right-hand tool

WVPN Type

双夹持/Double-clamp

HVPN Type

凹窝夹持/Dimple-clamp

多重紧固刀柄 Multi-Clamp Holder

● 图示为右手刀 / Diagram shows right-hand tool

WVVN Type

双夹持/Double-clamp

HVVN Type

凹窝夹持/Dimple-clamp

多重紧固刀柄 Multi-Clamp Holder

● 图示为右手刀 / Diagram shows right-hand tool

刀柄尺寸/Toolholder Size...WV/HV.JN/PN/VNN

多重紧固刀柄 Multi-Clamp Holder

	型号 / Model Number		Stock		Size (mm)						Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring
			R	L	h	b	L ₁	h ₁	f	L ₂							
①	WVJN ^{R/L}	2525M16	●	●	25	25	150	25	32	41	DC6CN Double-clamp	AVN 323	AOS-6 * 30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D
		3225P16	●	●	32	25	170	32	32	41							
		3232P16			32	32	170	32	39	41							
	HVJN ^{R/L}	2525M16			25	25	150	25	32	41	HC6CN Dimple-clamp	AVN 323	AOS-6 * 30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D
		3225P16			32	25	170	32	32	41							
		3232P16			32	32	170	32	39	41							
②	WVPN ^{R/L}	2525M16	●	●	25	25	150	25	32	35	DC6CN Double-clamp	AVN 323	AOS-6 * 30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D
		3225P16			32	25	170	32	32	35							
		3232P16			32	32	170	32	39	35							
	HVPN ^{R/L}	2525M16			25	25	150	25	32	35	HC6CN Dimple-clamp	AVN 323	AOS-6 * 30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D
		3225P16			32	25	170	32	32	35							
		3232P16			32	32	170	32	39	35							
③	WVVNN	2525M16		●	25	25	150	25	12.5	44	DC6CN Double-clamp	AVN 323	AOS-6 * 30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D
		3225P16			32	25	170	32	12.5	44							
		3232P16			32	32	170	32	16.0	44							
	HVVNN	2525M16			25	25	150	25	12.5	44	HC6CN Dimple-clamp	AVN 323	AOS-6 * 30W	FSS15- 3.0*12	LLR-T20	LLR-T10	ASGL6-D
		3225P16			32	25	170	32	12.5	44							
		3232P16			32	32	170	32	16	44							

适用刀片/Suitable Insert

	Model Number	Suitable Insert
①	WVJN ^{R/L} ...	VNGA1604(1607)
	HVJN ^{R/L} ...	VNGX1607
②	WVPN ^{R/L} ...	VNGA1604(1607)
	HVPN ^{R/L} ...	VNGX1607
③	WVVNN...	VNGA1604(1607)
	HVVNN...	VNGX1607

WN系列刀柄 / WN...series/Toolholders

WWLN Type

双夹持 / Double-clamp

多重紧固刀柄 Multi-Clamp Holder

• 图示为右手刀 / Diagram shows right-hand tool

WWLN-2 Type

双夹持 / Double-clamp

多重紧固刀柄 Multi-Clamp Holder

• 图示为右手刀 / Diagram shows right-hand tool

刀柄尺寸 / Toolholder Size...WWLN/WWLN-2

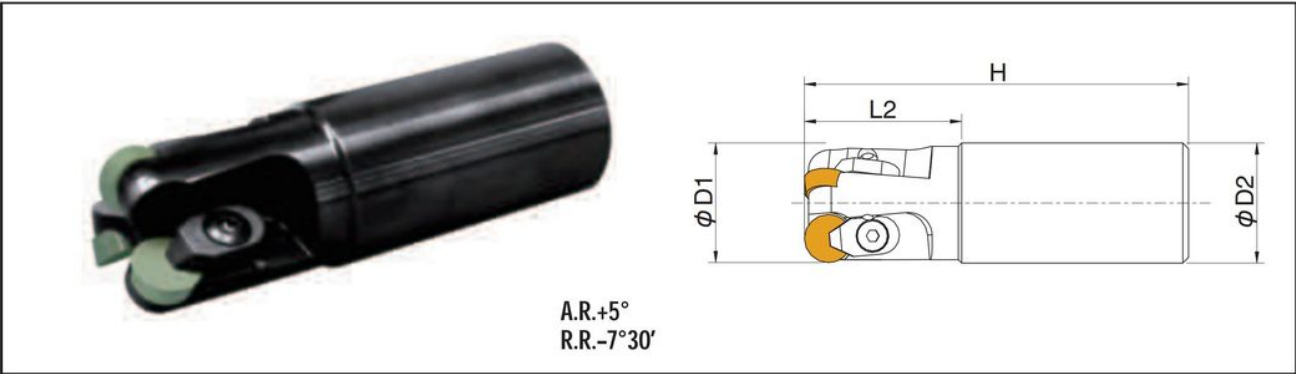
	型号/Model Number		Stock		Size (mm)					Clamp	Shim	Clamp screw	Shim screw	Wrench	Shim wrench	Spring		
			R	L	h	b	L ₁	h ₁	f	L ₂								
①	WWLN ^R / _L	2525M08	●	●	25	25	150	25	32	33	DC6CN Double-clamp	AWN423-W	AOS-6 * 30W	FSS15- 3.0* 12	LLR-T20	LLR-T10	ASGL6-D	
		3225P08				32	25	170	32	32								33
		3232P08				32	32	170	32	40								33
②	WWLN ^R / _L	2525M08-2	●	●	25	25	150	25	32	33	DC6CN Double-clamp	AWN423-W	AOS-6 * 30W	FSS15- 3.0* 12	LLR-T20	LLR-T10	ASGL6-D	
		3225P08-2				32	25	170	32	32								33
		3232P08-2				32	32	170	32	40								33

适用刀片 / Suitable Insert

	Model Number	Suitable Insert
①	WWLN ₁ ...	WNGA 0804
②	WWLN ₂ ...-2	

适用于高温合金及淬硬材料 / For HRSA materials and Hardened Materials

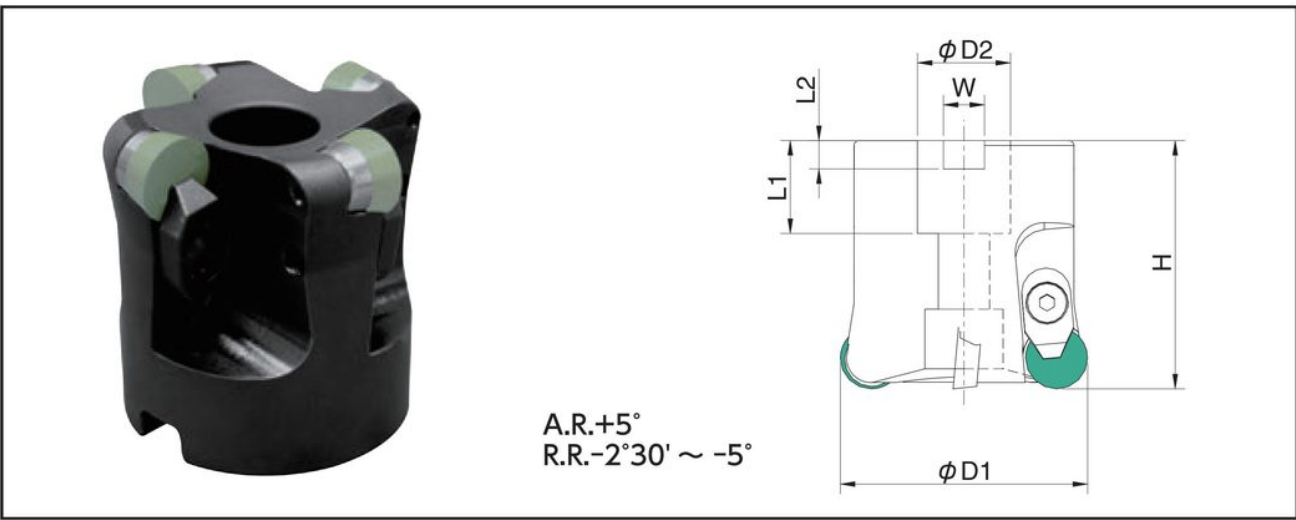
JRPMW Shank type



立铣刀型（正角刀片） / End Mill Type (Positive Insert)

Model Number		Dimensions (mm)				Clamp	Clamp screw	Weight (Kg)	Suitable Insert
		D ₁	D ₂	H	L ₂				
JRPMW032E250R03	3	32	25	120	40	AMS-5T	AOB-5S-T25	0.52	RPGN 1204
JRPMW032E320R03	3	32	32					0.70	
JRPMW040E320R03	3	40	32					0.82	

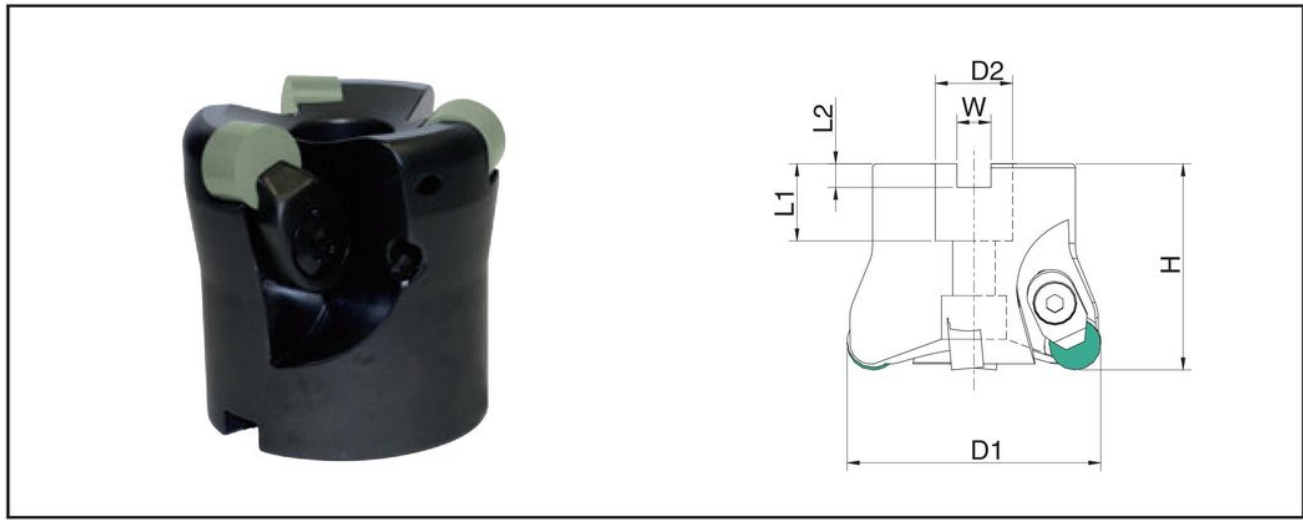
JRPMW Arbor type



壳型（正角刀片） / Shell Type (Positive Insert)

Model Number		Dimensions (mm)						Shim	Shim screw	Clamp	Clamp screw	A.R.	R.R.	Weight (Kg)	Suitable Insert
		D ₁	H	D ₂	W	L ₁	L ₂								
JRPMW050S220R04	4	50	50	22	10.4	20	6.3	ARP42A	M3 * 8	AMS-5T	AOB-5S-T25	+5°	-5°	0.4	RPGN 1204
JRPMW063S220R04	4	63	50	22	10.4	20	6.3					+5°	-5°	0.6	
JRPMW080S254R05	5	80	50	25.4	9.5	25	6.0					+5°	-2°30	0.9	

JRNMW Arbor type

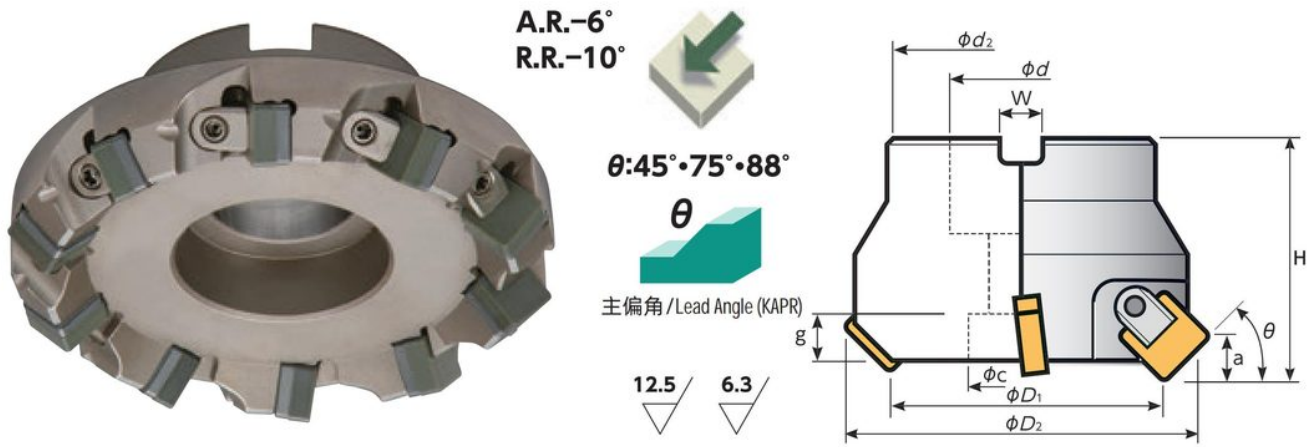


壳型（负角刀片）/Shell Type (Negative Insert)

Model Number		Dimensions (mm)						Clamp	Clamp screw	A.R.	R.R.	Weight (Kg)	Suitable Insert
		D_1	H	D_2	W	L_1	L_2						
JRNMW050S220R03	3	50	50	22	10.4	20	6.3	AMS-6T	AOB-6S-T30	-5°	-10°	0.52	RNGN 1207
JRNMW063S220R04	4	63	50	22	10.4	20	6.3			-5°	-10°	0.65	
JRNMW080S254R05	5	80	50	25.4	9.5	25	6.0			-5°	-10°	0.95	

适用于灰铸铁/球墨铸铁/For Gray/Ductile Cast Iron

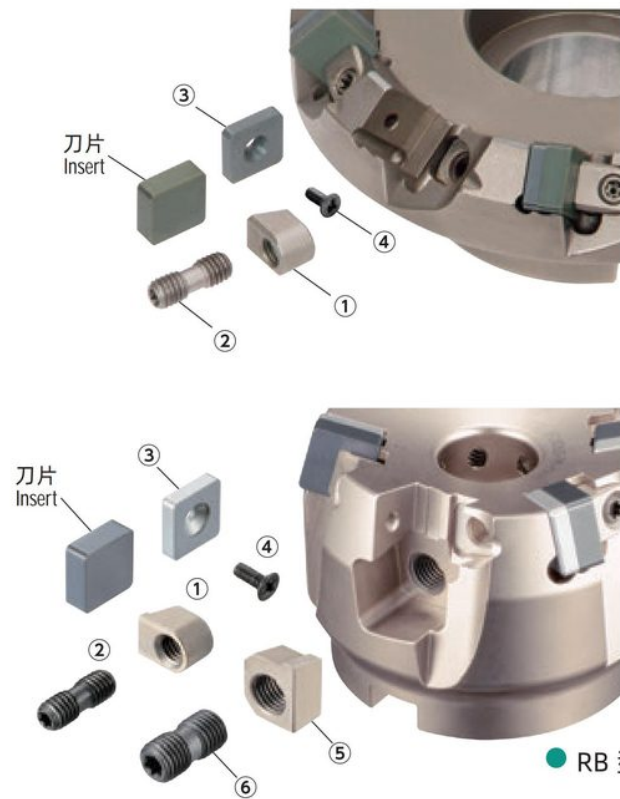
JFDX.. series



θ	Model Number	Stock	Flutes	Dimensions (mm)									Weight (Kg)
				ϕD_1	ϕD_2	H	a	ϕd	W	ϕd_2	ϕc	g	
45°	JFDX 063-45-06R	●	6	63	72	50	8	22	10.4	58	18	10.5	1.03
	080-45-08R	●	8	80	95	50	8	25.4	9.5	62	36	10.5	1.31
	100-45-10R	●	10	100	120	50	8	31.75	12.7	62	45	8.5	1.76
	125-45-12R	●	12	125	146	58	8	38.1	15.9	83	55	13.5	2.90
75°	JFDX 063-75-06R	●	6	63	70	50	12	22	10.4	58	18	18.5	0.89
	063-75-06RB	●	6	63	70	50	12	22	10.4	58	18	18.5	1.07
	080-75-08R	●	8	80	87	50	12	25.4	9.5	62	36	15.5	1.16
	080-75-08RB	●	8	80	87	50	12	25.4	9.5	62	36	15.5	1.46
	100-75-10R	●	10	100	107	50	12	31.75	12.7	62	45	16.5	1.49
	100-75-10RB	●	10	100	107	50	12	31.75	12.7	62	45	16.5	1.93
	125-75-12R	●	12	125	132	58	12	38.1	15.9	83	55	21.5	2.66
	125-75-12RB	●	12	125	132	58	12	38.1	15.9	83	55	21.5	3.44
88°	160-75-16R		16	160	166	60	12	50.8	19	100	72	20.5	4.20
	160-75-16RB	●	16	160	166	60	12	50.8	19	100	72	20.5	5.57
	JFDX 063-88-06R	●	6	63	64	50	12	22	10.4	58	18	13	0.89
	080-88-08R	●	8	80	81	50	12	25.4	9.5	62	36	13.5	1.13
	100-88-10R	●	10	100	101	50	12	31.75	12.7	62	45	16.5	1.48
	125-88-12R	●	12	125	126	58	12	38.1	15.9	83	55	21.5	2.71
	160-88-16R		16	160	156	60	12	50.8	19	100	72	20.5	4.20

● RB 型：单个刀片槽高度可调/RB type : One insert pocket can be adjusted for height

备件清单 / Spare Parts



组件 / Components				
① 楔块 Wedge	② 夹紧螺钉 Clamp screw	③ 垫片 Shim	④ 螺钉 Screw	扳手 Wrench
HLW175	WS0616-T15	ASN423	M3 * 8	T-15A

组件 / Components		
⑤ 楔块 Wedge	⑥ 夹紧螺钉 Clamp screw	扳手 Wrench
HLW177	WS0816-T25	LLR-T25

● RB 型：单个刀片槽高度可调 / RB type : One insert pocket can be adjusted for height

Capto 刀柄系列 / Capto ToolHolders

模块化与精度的典范组合 / Modularity and Precision: A Paragon of Combination

Capto 代表了一种革命性的模块化刀具接口系统。这一创新从根本上突破了传统刀柄的限制，在车铣复合加工中心、走心式车床以及对精度和刚性要求极高的五轴加工中心上展现出卓越性能。
Capto represents a revolutionary modular tool interface system. This innovation has fundamentally transformed the limitations of traditional tool holders, demonstrating exceptional performance in turn-mill machining centers, Swiss-type lathes, and five-axis machining centers demanding extreme precision and rigidity.

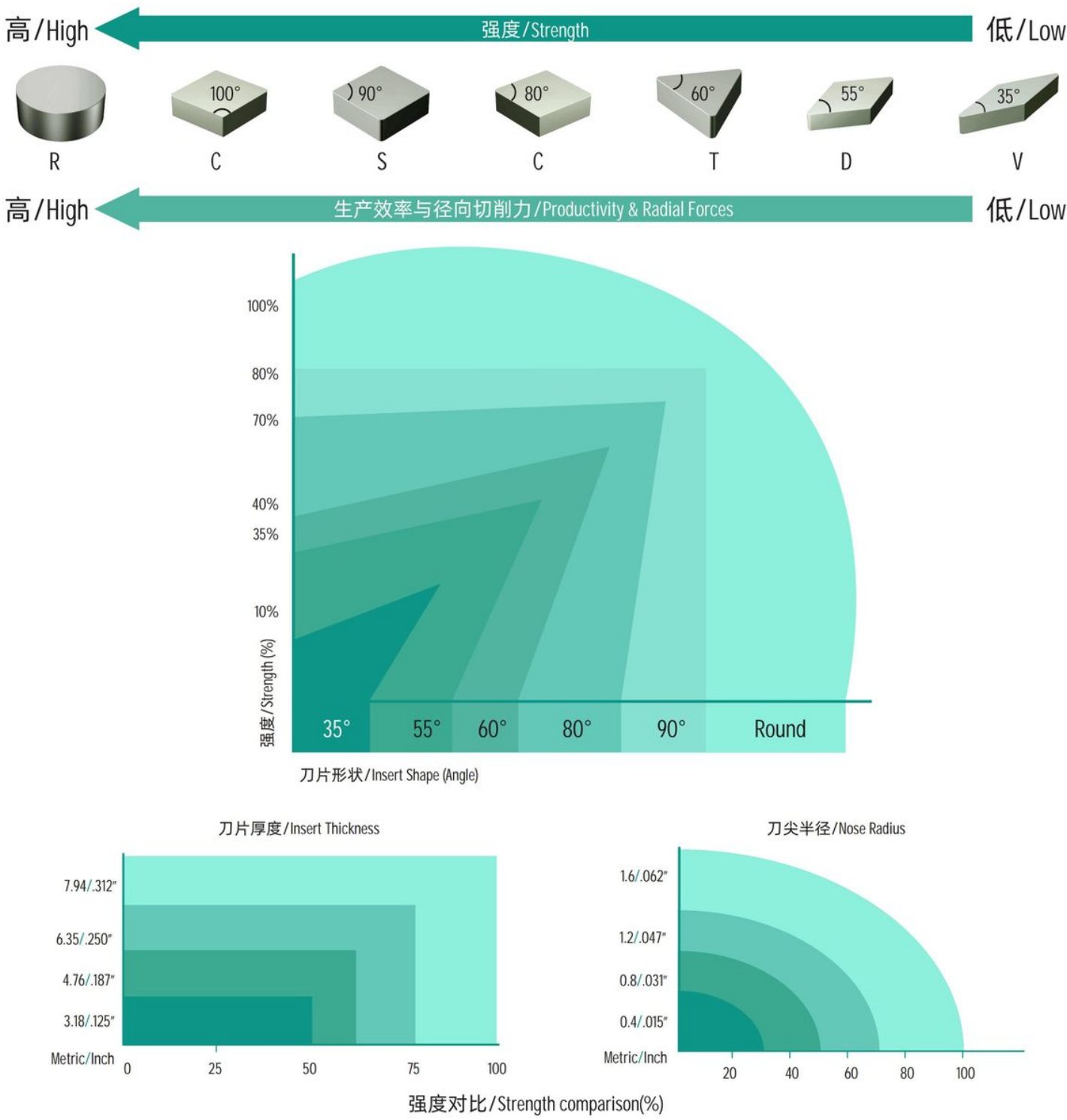
我们提供全系列 Capto 刀柄型号并支持产品定制 / We supply the full range of Capto tool holder models and support product customization.



Capto 刀柄系统凭借创新的多边形锥面接口设计与模块化理念，成功克服了传统刀柄在刚性、精度、扭矩传递、重复定位精度及系统灵活性方面的关键局限。该技术已成为高端制造领域——尤其是车铣复合加工与高精度五轴加工中不可或缺的核心技术，显著提升了加工的效率、切削精度和工艺可靠性。

选择 Capto 即意味着投资高性能、卓越灵活性且面向未来的加工解决方案。
The Capto tool holder system has successfully overcome critical limitations of traditional tool holders in rigidity, accuracy, torque transmission, repeat positioning precision, and system flexibility through its innovative polygonal taper interface design and modular philosophy. It has become an indispensable core technology in high-end manufacturing – particularly within turn-mill machining and high-precision five-axis machining – significantly enhancing processing efficiency, machining accuracy, and process reliability. Choosing Capto signifies investing in high-performance, exceptional flexibility, and a future-ready machining solution.

刀具选择指南 / Guidelines for Insert Selection



为了获得最佳性能，请始终使用尽可能坚固的刀片形状，以最大化刀尖强度和生产率。如果加工条件允许，优先选用圆形刀片，或刀尖半径大、切入角小的方形刀片。

在加工操作中，尽可能使用最大的刀尖半径，这样可以增强刀片强度并延长刀具寿命。但请注意，这会导致刀具压力增加。更大的刀片厚度在加工过程中提供了额外的强度和整体性，显著提高抗冲击性、散热性和刀具寿命，从而实现更高的生产效率。

For the best performance always use the strongest possible insert shape to maximize corner strength and productivity. If the operation allows, it is best to use round inserts or square inserts with a large nose radius and a small entering angle.

Use the largest nose radius possible for the operation, so you increase the strength of the insert which will result in better tool life but remember that this will result in increased tool pressure. Larger insert thickness gives added strength and integrity during machining offering far better impact resistance, heat dispersion, and longer tool life. This results in higher productivity.

刃口处理是成功的关键 / Edge Conditions are a Key to Success

在使用陶瓷刀片实现成功加工时，一个重要因素是采用正确的刃口处理。陶瓷属于硬质材料，因此刀片需要进行一定的刃口加工处理，以承受切削力并优化刀具性能。刃口处理必须与所选陶瓷牌号、被加工的耐热超级合金（HRSA）材料类型以及所执行的加工操作相匹配。大多数陶瓷加工应用可通过 **MSU** 的标准刃口处理方案实现。

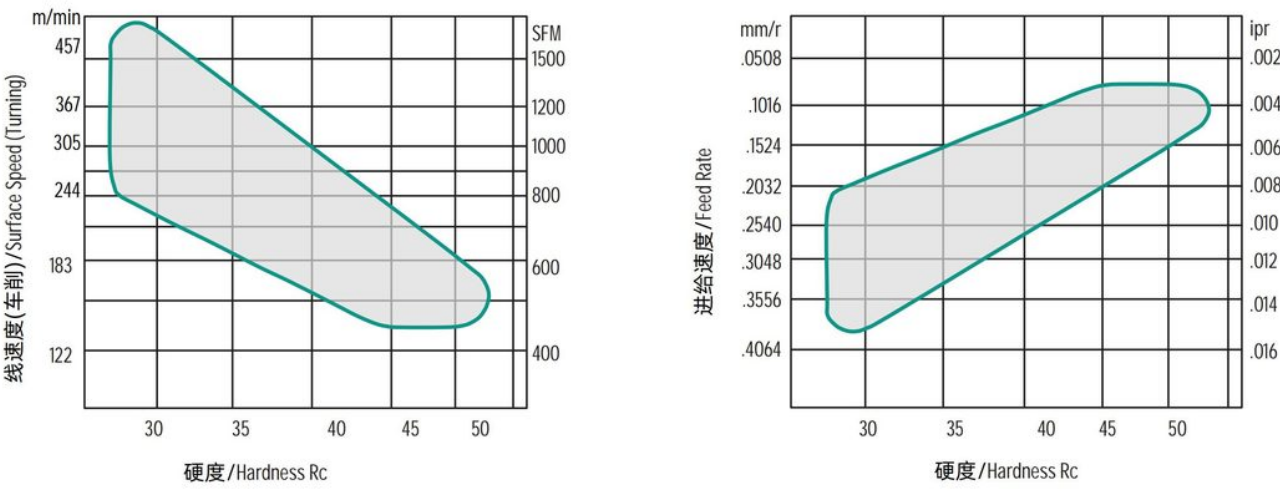
在可能出现的特殊工况下，刃口处理可能需要定制化以满足特定条件。下表描述了标准刃口处理方案。

An important factor for achieving success when machining with ceramic inserts is to use the correct edge preparation. Ceramic is a hard material therefore the insert needs some edge work in order to withstand cutting forces and optimize the cutting tool performance. The edge preparation must correspond to the ceramic grade selected, the type of HRSA material being machined and the machining operation being performed. The majority of ceramic applications can be handled with **MSU's** standard edge preparations.

In unique circumstances that may arise, an edge preparation may need to be specialized to meet the conditions. The table below describes standard edge preparation specifications.

刃口强度提升/Edge Strength Increases		F型 F Style	不建议在陶瓷刀片上使用过于锋利的刃口。 Up sharp edges are not recommended for ceramics.
		E型 E Style	钝化处理有助于保护陶瓷刃口免受崩刃或断裂。进给率必须大于钝化尺寸以避免产生摩擦而非有效切削。过度的钝化处理会缩短刀具寿命 Hones help protect the edge of ceramics from chipping or fracturing. Feed rates must be greater than the hone size to prevent a rubbing rather than a cutting action. Excessive honing reduces tool life.
		T型 T Style	这种几何形状是陶瓷刃口处理中最常见的类型。切削力集中在陶瓷刃口的特定区域。 This geometry is typically the most common ceramic edge preparation. The cutting forces are distributed over a concentrated area of the ceramic edge.
		Z & S型 Z & S Style	在倒角面上叠加钝化处理可显著增强刃口强度以抵御崩刃。这类几何结构通常最适用于断续切削或淬硬钢车削加工。 A hone added to a T-land provides a stronger edge to prevent chipping. Usually this type of geometry works best on interrupted cuts or turning hardened steels.
		HD型 HD Style	双倒角面与钝化处理的组合通常用于重载粗加工或淬硬材料加工。这类刃口具备极强的抗冲击性，但也会产生较大的切削力。 Double T-lands and hones are generally used in heavy roughing cuts or hardened materials. This edge is extremely shock resistant but also generates large cutting forces.

了解工件材料以确定加工参数 / Know the Workpiece Material to Determine Parameters



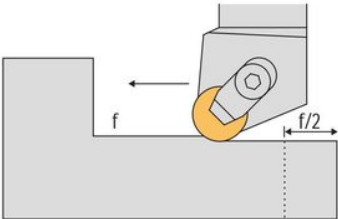
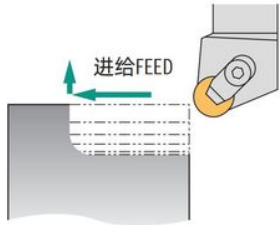
要有效使用陶瓷刀片进行加工，必须综合考虑材料的物理硬度和表面状态以确定加工时的初始速度与进给量。图表数据是基于使用RNG45刀片且切削深度 $\leq 3.175\text{mm}$ (.125") 的条件。在粗加工/带氧化皮工况下，应根据材料硬度选择速度范围的下限值；若加工洁净HRSA材料，基于硬度采用速度范围的上限值。当使用几何强度较弱的刀片（如三角形）时，需降低进给量。

切屑形态是材料硬度的有效指示——材料越硬，切屑会更容易断裂。硬化材料会导致切削温度升高，从而加剧刀片刃口的月牙洼磨损。较软的HRSA材料加工特性与不锈钢类似。在此类工况下，优先选择韧性更高、抗高温硬度较低的刀片牌号，这既能适应降低的加工温度，又可增强切屑与刀片的碰撞破碎效果。

To effectively machine with ceramic inserts it is important to factor in the physical hardness of the material and the surface condition to determine the starting speed and feed. The chart information is based on using an RNG 45 insert with a depth of cut from .125 inches or less. In rough / scale conditions, use the lower side of the speed range for the hardness of the material. If machining clean HRSA material use the higher speed range based on the hardness. When using weaker geometry inserts such as triangles it is important to reduce feeds. The formation of the chip is a good indicator of the material hardness, the chips will break easily. The cutting temperatures will be higher with hardened materials resulting in more notch wear on the insert edge. Softer HRSA materials machine similar to stainless steels. Insert grades with greater toughness and reduced hot hardness resistance are ideal in these conditions due to reduced machining temperatures and an increase of the chip breaking against the insert.

对于具有锻造氧化皮工件表面的零件（通常在约26 Rc的软态下加工），需要降低25%速度并提高进给量，直至氧化皮清除。切削铸造HRSA材料时，速度可高于图表推荐值，但建议将进给量减至图表标注值的一半。最大切削深度应控制在约1.524mm (.060"，针对RNG45刀片)，并尽可能采用充足冷却液。棒材是最易加工的材料形态，与锻件相比，允许使用更硬、更耐磨的刀片牌号。

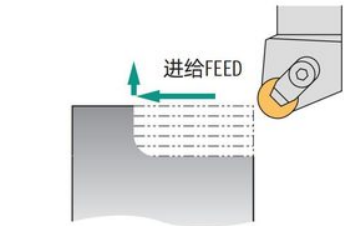
Parts that have a forged scale work surface, typically machined in soft state around 26 Rc, require a 25% speed reduction and an increase of the feed until the scale is gone. When cutting cast HRSA material speeds can be increased from those indicated on the graph and it is recommended to reduce feeds to one half of the value indicated on the chart. The maximum depth of cut should be around .060" (for an RNG45) and use flood coolant conditions where applicable. Bar stock is the easiest to machine allowing the use of harder more wear resistant insert grades than when machining forgings.



材料 / Material	工件 / Components	优势 / Advantage	可加工性 / Machinability
锻造件 / Forging	大型件 / Large	高强度 / High strength	中等 / Medium
铸造件 / Casting	复杂形状 / Complex shapes	低强度 / Low strength	较差 / Poor
棒材 / Bar Stock	直径 $\leq 190.5\text{mm}$ Less than 190.5mm (7.5") dia.	可用性 / 强度 Availability / strength	良好 / Good

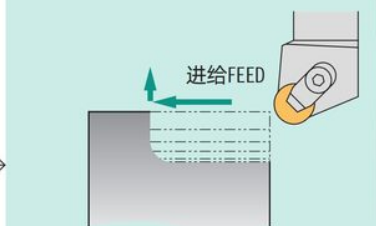
粗加工 / Rough

相同切削深度 / Same Depth of Cut



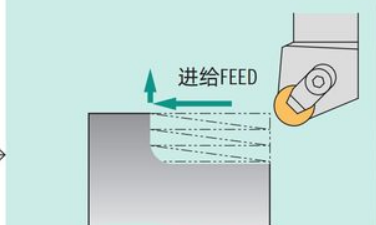
注)
如图所示，刀片切削刃上的缺口磨损是因多次走刀采用相同切削深度导致的。此类磨损将显著缩短刀具寿命。以下编程示例将有助于减少此类失效模式。
Note)
Notch wear on the insert cutting edge as shown in is the result of multiple passes being taken at the same depth of cut. This type of wear will minimize tool life. The following programming examples will help to minimize this mode of failure.

可变切削深度 / Varying Depth of Cut



注) 另一项可能减少缺口磨损的编程调整是通过改变切削深度实现。同样原理适用：缺口磨损会分散发生在切削刃的多个位置，而非集中在一个点上。
Note) Another programming change that may help to reduce notching is by varying the depth of cut. Again, the same principle applies, notching takes place at various points on the cutting edge rather than concentrated at one point.

斜坡进刀 / Ramping



注) 在相同切削方向上编程“斜坡进刀”切削是减少切痕的最佳程序之一。通过改变切削深度，磨损会分散到整个切削刃上，而不是集中在某一点。
Note) Programming "Ramping" cuts in the same cutting direction is one of the best procedures to use to minimize notching. By varying the DOC, wear is distributed over the entire cutting edge not on one point.

重复使用相同切削深度的走刀

此操作无益，因刀片会在重复切削深度的接触点形成严重缺口磨损，导致需频繁更换刀片。因此，最佳实践是通过以下两种技术之一逐点改变切削深度。
Repeated passes with same depth of cut
This is not a beneficial practice because the insert will develop severe notching at the point of the repetition of DOC. This will result in indexing the insert often. For this reason it is best to vary the depth of cut point by utilizing one of two techniques.

通过多次走刀改变切削深度

在每次走刀中逐渐减小切削深度。此操作可能略微增加加工时间，但将显著延长刀片寿命并减少刀片更换频率。
Vary the Depth of cut through multiple passes.
Gradually reduce the depth of cut with every pass. This may increase the operation time slightly but will result in longer tool life for the insert and less indexing of the insert.

采用斜坡编程的多次走刀

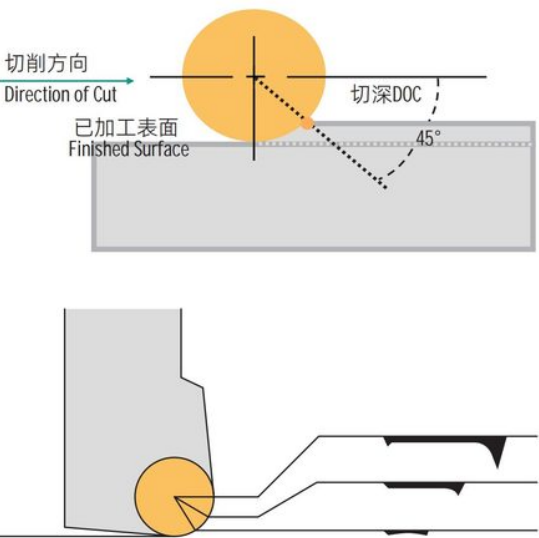
该技术已被证实对粗加工操作有益。在沿工件移动时逐渐退出走刀，可显著减少缺口磨损。由于表面已形成斜坡，后续走刀需编程为恒定切削。
Multiple passes using ramping programming
This technique has a proven benefit to roughing operations. Gradually feed out while traversing the part will result in significant reductions in notching. The subsequent pass is programmed at a constant cut since the surface is now ramped.

切削深度与刀具寿命/Depth of Cut and Tool Life

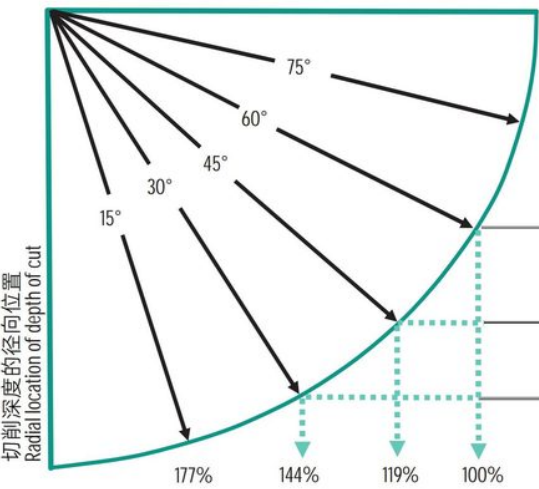
由于切削深度缺口磨损导致的刀片失效是加工耐热合金时的典型结果，必须加以控制以防止切削刃的灾难性失效。切削深度是加工操作中最大化刀具寿命并最小化切削刃缺口磨损的关键考量因素。主偏角的减小会导致刀片刃口上的切削力增加。当切削深度超过刀片刃口上从刀片中心延伸的45度线与切削刃相交的点时，缺口磨损会加剧，刀片刃口失效的风险也随之增加。刀片圆弧尺寸与应选择的最大切削深度(约60度标记处)之间存在直接关系。具体推荐值参见下方图表。

任何切削深度的增加都需要降低速度和进给率。参数设定基于陶瓷刀片耐受高温的能力，以及通过保持切屑厚度使热量集中在刀片前部区域，从而实现低切削压力和最小磨损。若仅降低速度而未相应减少进给，此效果将丧失，且由于切屑温度降低导致刀片刃口崩缺，加工性能会下降。

Insert failure due to depth of cut notching is a typical result when machining heat resistant alloys and must be controlled to prevent a catastrophic failure of the cutting edge. The depth of cut is a key consideration during the machining operation to maximize tool life and minimize notch wear on the cutting edge. A decrease in the lead angle results in increased cutting forces on the insert edge. As the DOC exceeds beyond the point on the insert edge where a 45 degree line from the center of the insert intersects the cutting edge the greater the notch wear and the increased risk for failure of the insert edge. There is a direct relationship between the insert radius size and the maximum depth of cut (at around 60 deg. mark) which should be taken. See the chart below for recommendations. Any increase in DOC requires a reduction of the speed and feed rates. Parameters are based on the ceramic insert's ability to withstand high temperatures and run with a chip thickness that allows the heat to be concentrated in the zone ahead of the insert resulting in low cutting pressure and minimal wear. If the speed is reduced without a corresponding reduction in feed, this effect will be lost and the performance will fall off due to chipping of the insert edge from a cooler chip.



速度-进给率VS.圆弧处切削深度/Speed and Feed Rate (%) vs.Depth of Cut on the Radius



刀片直径/Insert Diameter (Metric/Inches)		
6.35/.250"	9.525/.375"	12.7/.50"

切削深度/Depth of Cut (Metric/Inches)		
1.6/.063"	2.387/.094"	3.175/.125"
.9652/.038"	1.422/.056"	1.905/.075"
.457/.018"	.711/.028"	.889/.035"

线速度与进给率（百分比）/Surface Speed and Feed Rate (Percentage)

刀片半径/Insert Radius	理想切削深度/Ideal DOC	刀片型号说明/Insert Descriptions
3.18/.125"	0.93/.038"	RCGX/RPGX0604 (23); RPG0601 (215)..
4.76/.187"	1.40/.056"	RCGX/RPGX0907 (35); RNGN/RPG0903 (32)
6.35/.250"	1.86/.075"	RCGX/RPGX1207 (45); RNG1204/1207 (43/45); RPG1204 (43)
7.94/.312"	2.33/.092"	RNG1207 (55)
9.53/.375"	2.79/.110"	RNG1909/1907 (64/65); RPG1907 (65)
12.7/.500"	3.72/.147"	RNG2507/2509 (85/86)

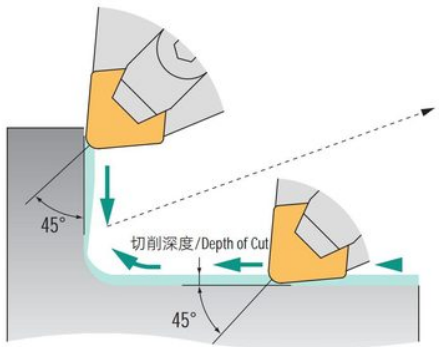
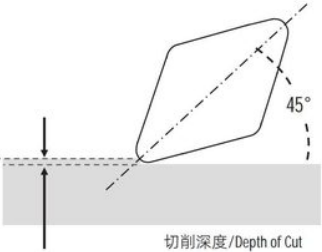
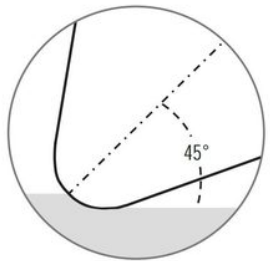
基于刀片圆角半径的切削深度推荐/Depth of Cut Recommendation based on Insert Corner Radius

为在使用带圆角半径的直刃刀片（C、D或S型）时最大化刀具寿命（与圆形刀片相比），允许的切削深度与圆角半径相关，而非刀片尺寸。为最小化缺口磨损并允许双向切削，有效的加工步骤是：在粗加工中使用圆形刀片去除更多材料，随后在精加工中，使用直刃刀片去除的材料量应与刀片刀尖半径相匹配。

选择具有合适圆角半径的刀片以完成精加工工序的切削深度至关重要。若零件标注有特定半径特征要求，则精加工时预留的材料量不得超过该特征所需的刀片半径对应的余量。大圆角半径可能因工件与刀片间产生的径向力而导致薄壁零件偏斜。

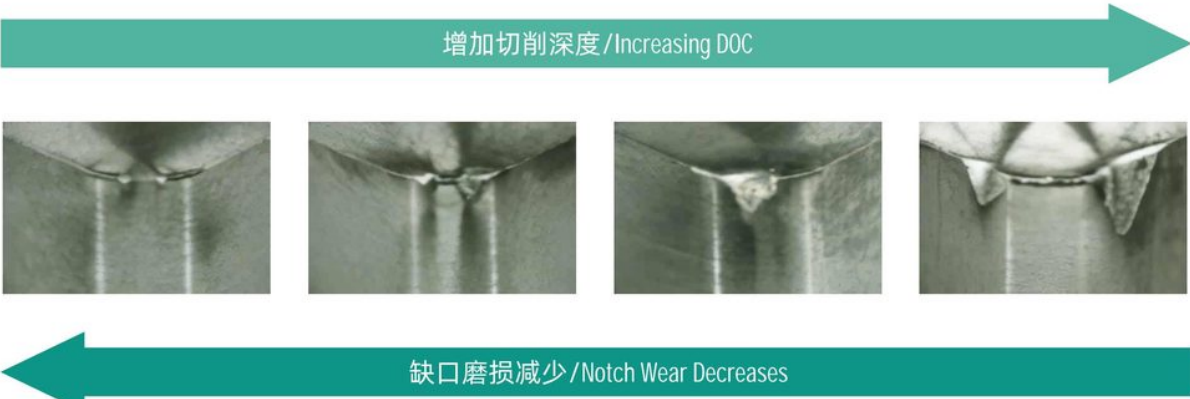
To maximize tool life when using straight-edged inserts(C, D, or S)with corner radii , as opposed to a round insert, the allowable depths of cut are related to the radius and not the insert size. To minimize notching and allow a cut from both directions, the effective machining procedure is to take more material off during the roughing operation, with a round insert Then the material removal amount for the finishing operation, with a straight edge insert, should be suitable for the nose radius of the insert.

It is important to choose the insert with the appropriate corner radius to complete the finishing operation's depth of cut. If the part has a required radius feature called out, then do not leave more than the amount of material called out for the required insert radius to finish the part and feature. A large corner radius may deflect a part with thin walls because of radial forces generated between the workpiece and insert.



如这些照片所示，通过去除与刀片刀尖圆弧半径相匹配的适当余量，并保持在刀片圆角半径的45度标记线以下，可最小化缺口磨损，从而允许在刀片上进行双向切削编程。

As seen in these photos, by removing the appropriate amount of stock for the nose radius of the insert and staying below the 45° mark of the corner radius notching is minimized allowing a cutting operation to be programmed from both directions on the insert.



主偏角 /Lead Angles

切削耐热合金时，应尽可能采用较大的主偏角。较大的主偏角可使切削力分散到刀片更大的表面积上，从而延长刀具寿命、改善表面光洁度并减少缺口磨损。随着主偏角的增大，切屑流动也会更顺畅。

When cutting heat resistant alloys consideration should be given to using the largest lead angle possible. A large lead angle allows the cutting forces to be spread over a larger surface area of the insert. This will also improve tool life and surface finish while reducing notching. As the lead angle increases the chip will flow more easily.

进给 /Feed

表面光洁度与刀片刀尖圆弧半径及编程进给率直接相关。刀片圆弧半径越大，为实现所需光洁度采用的进给率越高。使用SiAlON陶瓷刀具加工耐热超级合金HRSA时，应通过提高进给率发挥其高强度优势，从而减少刀具磨损并缩短切削时间。

Surface finish is directly related to the insert nose radius and the feed rate programmed. The larger the radius on the insert the faster the tool can be fed to achieve the appropriate finish. When machining HRSA materials with SiAlON ceramics utilize their superior strength by increasing the feed rate which will minimize wear and cutting time.

高镍基耐热合金铣削加工 /Milling perations on Heat Resistant Alloys (High Nickel)

铣刀中的圆形刀片在旋转过程中周期性切入切出材料，这种对切削刃的作用类似于车削中的断续切削。刀具与材料的周期性接触还会阻碍刀片前端达到理想温度。因此,需通过提高转速、降低每齿进给量或两者结合来增加热量生成。建议采用顺铣工艺,避免切屑薄层区域温度过高导致切屑熔焊及二次切削，从而延长刀具寿命。

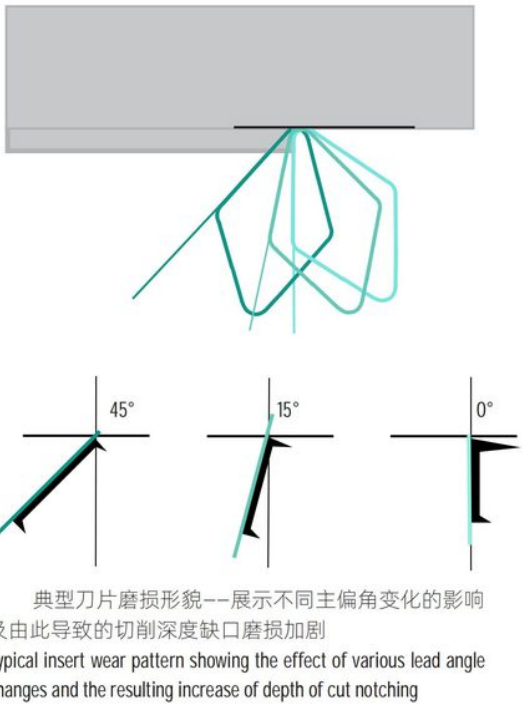
根据切削宽度调整速度：相较于车削参数表建议值，随切削宽度增加按比例提升转速,同时将车削推荐的进给率降低约50%(此为每齿进给量，非每转进给量)。

切削宽度与刀片前端温度呈正相关：切削宽度越小，刀片脱离切削的时间占比越高，温度越低。下表展示了不同切削宽度(以铣刀直径百分比表示)对应的转速提升百分比。若切削路径等于铣刀直径，则刀片每转仅50%时间参与切削。因此，相较于车削参数，必须提高转速并降低进给率以达成所需温度条件。

Button inserts in a milling cutter rotate in and out of the cut during a revolution this reaction on the insert edge is comparable to machining an interrupted cut on a turning operation. This rotation in and out of the material also can hinder achieving the desired temperature ahead of the tool. So, an increase in speed, reduced feed/ tooth in order or a combination will help generate the heat. It is recommended to use climb milling techniques to avoid elevated temperatures in a thin area of the chip which could create chip welding and re-cutting of the chip which reduces tool life. Increase speeds from turning recommendations in chart according to width of cut. Reduce the feed rate recommendations for turning in chart by about 50% (This is feed per tooth, not per revolution of the cutter).

The width of the cut has a direct relationship to the temperature generated ahead of the inserts: As the width is decreased the temperature decreases because the insert is out of the cut more than in the cut. The chart below shows the percentage to increase speeds given in the previous chart for various widths of cut. The widths are also expressed as percentages of the cutter diameter (so all cutter sizes apply) A milling insert can only be cutting 50% of each revolution if the path of cut is equal to the cutter diameter. So, it will always be necessary to increase speed and reduce feed compared to the turning recommendations to achieve the temperatures needed.

切削宽度占铣刀直径百分比 Width of cut in % of cutter diameter engaged	表面速度占图表基准百分比 Surface speed in % of Graph
100%	125%
90%	150%
80%	220%
70%	280%
60%	340%
50%	400%
40%	460%



最小化悬伸量 /Minimize overhang

悬伸量过大会导致刀柄偏斜，引发振动与颤振，进而损坏刀片并可能造成刀片断裂。在使用转塔式机床时，应考虑以直刃刀片替代圆形刀片。直刃设计可消除径向切削力并解决颤振问题。

Too much overhang causes the holder to deflect resulting in vibration and chatter which is damaging to ceramic inserts and can lead to insert breakage. When working with turret style machines, straight edged inserts should be considered in place of round inserts. The straight edge eliminates radial tool forces and chatter issues.

预倒角加工 /Pre-chamferring

对工件进行预倒角加工可降低刀片在切入或切出材料时崩刃或断裂的风险。为确保预倒角操作的有效性，需将进给方向编程为与倒角呈90度夹角，以避免缺口磨损并延长刀片寿命。

Pre-chamferring the part reduces the potential for insert chipping or breaking upon the entry or exit point of work material. To effectively complete a pre-chamfer operation it is important to program the feed at a 90 degree angle to the chamfer in order to prevent notching and increase insert tool life.

无停留加工 /No dwelling

刀片处于摩擦工件而非切削状态时会发生磨损。
Inserts wear out when rubbing the part instead of cutting.

冷却液 /Coolant

使用氧化铝陶瓷刀具、SiAlON陶瓷刀具及晶须增强陶瓷刀具进行车削时，应采用充分浇注冷却液的条件。When turning with BIDE MICS, SiAlON and Whisker a flood coolant ondition should be used.

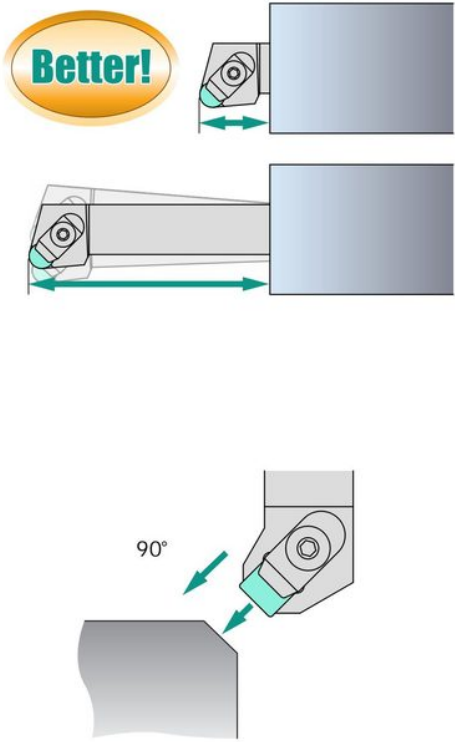
若加工中存在高断续切削工况（如铣削铸件表面或加工深槽），建议关闭冷却液。In some cases where a high interruption is encountered it may be best to shut off the coolant.

使用CW10、CW25、CS30、CS35、CS40系列刀具进行铣削时，应完全禁用冷却液。No coolant should be used while milling with CW10、CW25、CS30、CS35、CS40.

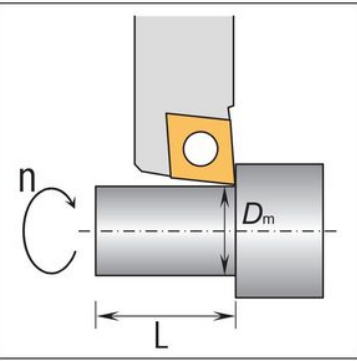
刃口处理 /Edge preparations

耐热超级合金（HRSA）加工的典型要求是刀片切削刃保持锋利。
Typical HRSA machining requires the insert cutting edge to be sharp.

采用微T型刃带或钝化刃口亦可有效减少缺口磨损、剥落及积屑瘤。
Using a slight T-land or honededge is also effective to reduce notching, flaking and built up edge.



计算车削速度/Calculating the turning speed



根据转速计算车削速度/Calculating the turning speed from the rotation speed

$$V_C = \frac{\pi \times D_m \times n}{1000} \quad \text{Metric}$$

$$V_C = \frac{\pi \times D_m \times n}{12} \quad \text{ANSI}$$

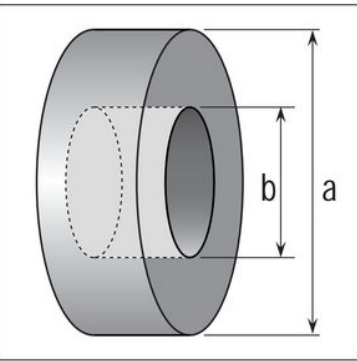
根据车削速度来计算主轴转速/Calculating the revolution speed from the turning speed

$$n = \frac{V_C \times 1000}{\pi \times D_m} \quad \text{Metric}$$

$$n = \frac{V_C \times 12}{\pi \times D_m} \quad \text{ANSI}$$

V_C : 切削速度/Cutting speed (m/min/SFM)
 D_m : 加工直径/Machining Diameter (mm/inch)
 n : 主轴转速/Spindle Speed (rev/min)
 π : 3.14

计算车削时间/Calculating the turning time



计算外(内)圆加工切削时间/Calculating the cutting time for OD (ID) machining

$$T = \frac{L}{f \times n}$$

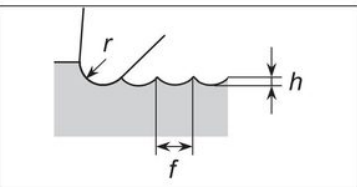
T : 时间/Time (min)
 L : 加工长度/Machining Length (mm/inch)
 f : 进给率/Feed Rate (mm/rev/inch/rev)
 n : 主轴转速/Spindle Speed (rev/min)

$$T = \frac{\pi \times (a^2 - b^2)}{4000 \times V_C \times f} \quad \text{Metric}$$

$$T = \frac{\pi \times (a^2 - b^2)}{48 \times V_C \times f} \quad \text{ANSI}$$

T : 时间/Time (min)
 V_C : 切削速度/Cutting speed (m/min/SFM)
 f : 进给率/Feed Rate (mm/rev/inch/rev)
 π : 3.14

计算理论表面粗糙度/Calculating the theoretical surface roughness



$$h = \frac{f^2}{8 \times r} \times 1000 \quad \text{Metric}$$

$$h = \frac{f^2}{8 \times r} \times 1000^2 \quad \text{ANSI}$$

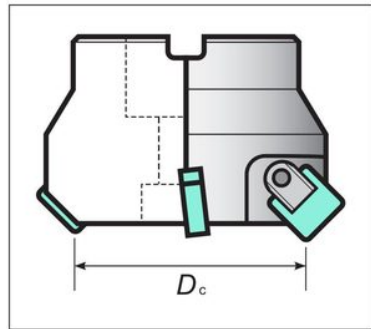
h : 理论表面粗糙度
Theoretical surface roughness ($\mu\text{m}/\mu\text{inch}$)
 f : 进给率/Feed Rate (mm/rev/inch/rev)
 r : 圆角半径/Corner radius (mm/inch)

【实际加工表面粗糙度的指导原则/Guidelines for actually finished surface roughness】

钢质工件: 实际加工表面粗糙度约为理论表面粗糙度的1.5至3倍;
Steel type work: Theoretical surface roughness $\times 1.5$ to 3;

铸铁质工件: 实际加工表面粗糙度约为理论表面粗糙度的3至5倍。
Cast iron type work: Theoretical surface roughness $\times 3$ to 5.

计算铣削速度/Calculating the milling speed



根据转速计算铣削速度/Calculating the milling speed from the rotation speed

$$V_C = \frac{\pi \times D_c \times n}{1000} \quad \text{Metric}$$

$$V_C = \frac{\pi \times D_c \times n}{12} \quad \text{ANSI}$$

根据铣削速度来计算主轴转速/Calculating the revolution speed from the milling speed

$$n = \frac{V_C \times 1000}{\pi \times D_c} \quad \text{Metric}$$

$$n = \frac{V_C \times 12}{\pi \times D_c} \quad \text{ANSI}$$

V_C : 切削速度/Cutting speed (m/min/SFM)
 D_c : 加工直径/Machining Diameter (mm/inch)
 n : 主轴转速/Spindle Speed (rev/min)
 π : 3.14

计算进给速度和进给率/Calculating the feeding speed and feed rate

计算每齿进给量/Calculating the feed rate per blade

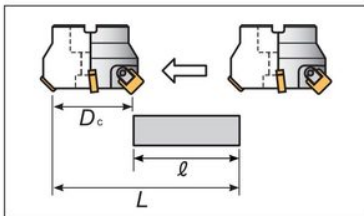
$$f_z = \frac{V_f}{z \times n}$$

计算每分钟进给速度/Calculating the feeding speed per minute

$$V_f = f_z \times z \times n$$

f_z : 每齿进给量/Feed per Tooth (mm/tooth/inch/tooth)
 V_f : 工作台进给速度/Table feed (mm/min/inch/min)
 z : 齿数/Number of tooth
 n : 主轴转速/Spindle speed (r/min)

计算加工时间/Calculating the machining time



$$T = \frac{L}{V_f}$$

T : 加工时间/Machining (min)
 L : 工作台进给总长/Total length of table feed ($\ell + D_c$)
 V_f : 工作台进给速度/Table feed (mm/min/inch/min)

车削加工故障排除/Troubleshooting for Turning

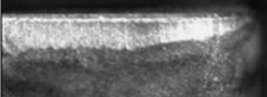
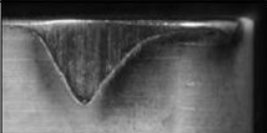
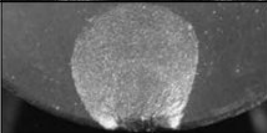
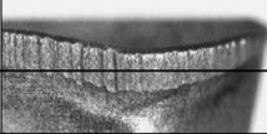
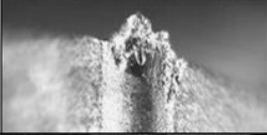
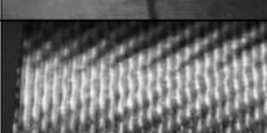
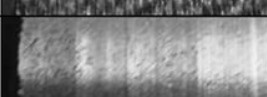
问题类型			可能原因				纠正措施				材质/牌号选择				切削条件				刀具形状								机床安装																															
							降低				增加				使用非水溶性类型 评估干式/湿式加工				检查断屑槽类型				前角				刀片刀尖圆弧半径				侧切削刃角				刃口强度与刃口处理				提高刀片精度				提高刀柄刚性				提升刀具安装精度				检查刀具悬伸量				防止机床振动，提升机床刚性			
更低				更高				使用非水溶性类型 评估干式/湿式加工				检查断屑槽类型				前角				刀片刀尖圆弧半径				侧切削刃角				刃口强度与刃口处理				提高刀片精度				提高刀柄刚性				提升刀具安装精度				检查刀具悬伸量				防止机床振动，提升机床刚性										

刀具寿命短	刀具过度磨损	不合适的刀具材质/牌号	●													●	↘	↘	↘	↘																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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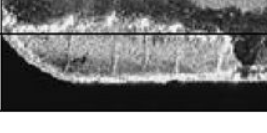
Troubleshooting for Turning

Type of problem			Corrective measures				Possible cause				Material/grade selection				Cutting conditions				Tool shape						Machine/ installation			
											Change to a harder material/grade	Change to a tougher material/grade	Change to a material/grade more resistant to thermal shock	Change to a material/grade more resistant to deposition	Cutting speed	Feed rate	Depth of cut	Coolant		Review the type of chipbreaker	Rake angle	Nose radius of the insert	Side cutting edge angle	Cutting edge strength, honing	Improve the accuracy of insert	Improve the rigidity of the holder	Improve the installation accuracy of the cutting tool	Review the overhang of the cutting tool
			Decrease	Increase	Use non-water-soluble type	Review dry or wet operation	Decrease	Increase																				
		Unsuitable tool material/grade	●																									
		Excessive insert wear	Unsuitable cutting edge shape											●	↘	↗	↗	↗										
Short tool life		Improper cutting conditions						↗				Wet																
		Fracture/ chipping of the cutting edge	Unsuitable tool material/grade		●																							
			Improper cutting conditions						↘	↘																		
			Insufficient cutting edge strength											●		↗		↗										
	Thermal shock				●		↘	↘	↘	●	Dry				↗													
	Built-up edge				●	↗	↗		●	Wet																		
	Insufficient toughness																		●		●	●	●					
	Improper accuracy of insert																	●										
Poor dimensional accuracy		Clearance/relief of the work/tool											●	↗	↘	↘	↘			●		●	●	●				
		Need for offsetting during cutting	Increased flank wear	●												↗												
		Built-up edge				●	↗																					
		Improper cutting conditions					↘	↗																				
Poor surface finish		Deposition					↗			●	Wet																	
		Unsuitable cutting edge shape											●		↗													
Heat	Deterioration in tool life/accuracy due to excessive heat generation	Chatter					↘	↘	↘																			
		Improper cutting conditions					↘	↘	↘																			
		Unsuitable cutting edge shape											●	↗				↘										
		Boundary wear	●																									
Burring		Improper cutting conditions						↕			Wet																	
		Unsuitable cutting edge shape											●	↗	↘	↘	↘											
Burring, chipping, scuffing		Improper cutting conditions						↘	↘																			
		Unsuitable cutting edge shape											●	↗	↗	↗	↘		●	●	●	●						
		Vibration																										
		Scuffing	Unsuitable tool material/grade				●																					
Improper cutting conditions						↗			●	Wet																		
		Unsuitable cutting edge shape											●	↗			↘											
		Vibration						↘	↗	↗		Wet							●	●	●	●						
Chip control		Improper cutting conditions																										
		Chipbreaker's effective chip control range											●															
		Unsuitable cutting edge shape													↘	↘												

故障排除案例研究：车削/Troubleshooting Case Studies: Turning

	故障现象/Case/Symptom		可能原因/Possible causes	纠正措施/Corrective measures
刀片/Insert	侧面磨损 VB wear		材料/牌号太软/The material/grade is too soft 切削速度过高/Cutting speed is too high 后角过小/Relief angle is too small	使用涂层牌号/Use a coated grade 选择高耐磨材料/牌号/Choose a material/grade highly resistant to wear 降低切削速度/Decrease the cutting speed
	前刀面磨损 Wear on face		高温导致刀片材料与切屑发生化学反应 High temperature causes chemical reactions between the insert material and chips	使用涂层牌号/Use a coated grade 降低切削速度和进给速率/Decrease both of the cutting speed and feed rate 增大前角/Widen the rake angle
	缺口磨损 Notching wear		工件表面过硬/The work surface is too hard 边界区域氧化/Boundary area has been oxidized 切屑导致的飞边已被切除 Burs, caused by chips in the sheared form, have been cut	增大副切削刃角/Widen the side cutting edge angle 增大刀尖半径, 使切削在圆弧范围内进行 Make the nose radius larger so that cutting is performed within the radius 使用圆形刀片/Use a round insert
	崩刃/断裂 Chipping/Fracture		进给速率过高/Feed rate is too high 切屑堆积/Chips have become trapped 颤振导致振动/Chatter resulting in vibration	修改刃口钝化处理/Enlarge the honed edge 增大刀尖半径/Make the nose radius larger 减小前角以增强刃口强度 Narrow the rake angle to secure the cutting edge strength
	(片状)剥落 Flaking		切削区域弹性变形对刃口施加压应力 Elastic deformation in the cutting zone applies compressive stress to the cutting edge 沉积/粘附材料脱落 deposited/adhered material is peeled off	检查刃口并调整切削条件/Change the cutting conditions by checking the cutting edge 选择抗断裂性强的材质/牌号/Choose a material/grade highly resistant to fracture 提高冷却液流量和压力/Increase the coolant rate and pressure 改善机床主轴径向跳动精度/Improve the run-out of the main spindle of the machine
	塑性变形 Plastic deformation		切削力过大且热量过高 Excessive cutting force and heat	选择高耐磨材料/牌号/Choose a material/grade highly resistant to wear 降低切削速度和进给率/Decrease both of the cutting speed and feed rate 增大刀尖半径/Make the nose radius larger 使用冷却液/Use coolant
工件/Work piece	积屑瘤 Built-up edge		切削温度低于工件材料的再结晶温度 The cutting temperature is lower than the recrystallization temperature of the work material	提高切削速度/Increase the cutting speed 使用润滑性优异的冷却液/Use coolant with excellent lubrication performance 换用与工件材料亲和性低的牌号/Change to a grade with less affinity to the work material
	沉积 Deposition		发热引发工件材料在刀面的化学反应 Heat generation leads to chemical reactions of the work material on the tool face	提高切削速度/Increase the cutting speed 增大后角/Widen the relief angle 将刀面研磨至镜面效果/Hone the face with a mirror-like-surface finish 换用与工件材料亲和性低的牌号 Change to a grade with less affinity to the work material
	夹紧裂纹 Clamping crack		刀片在不当的安装状态下被夹紧 The insert was clamped under improper seating conditions	清洁夹紧区域并按规范安装刀片 Clean the clamping areas and install the insert in the recommended way 按指定扭矩拧紧/Tighten to the specified torque
	崩刃 Chipping		进给速率过高/The feed rate is too high 刀片选择不当/An unsuitable insert was selected	降低进给速率/Decrease the feed rate 采用更精细的刃口处理/Use a smaller edge preparation 换用抗边界磨损的牌号/Change to a grade highly resistant to boundary wear 调整刀柄切削刃角度/Change the cutting edge angle of the holder
工件/Work piece	毛刺 Burring		进给速率不正确/The feed rate is incorrect 刀片形状不合适/The shape of insert is not suitable	降低进给速率/Decrease the feed rate 采用更精细的刃口处理/Use a smaller edge preparation
	颤振纹 Chatter mark		切削力过大/The cutting force is too great 工件与刀具刚性不足 The rigidity of the work piece and cutting tool is insufficient	降低进给速率/Decrease the feed rate 采用更精细的刃口处理 /Use a smaller edge preparation 最小化刀具悬伸量/Ensure tool overhang is minimised 调整刀柄切削刃角度/Change the cutting edge angle of the holder
	沟槽 Gouging		切削刃因沉积/积屑瘤导致的振动 Vibration of the cutting edge due to deposition/built-up edge	提高切削速度/Increase the cutting speed 使用高润滑性切削油/Use cutting oil excellent in lubrication performance 换用与工件材料亲和性低的牌号 Change to a grade with less affinity to the work material

故障排除案例研究：铣削/Troubleshooting Case Studies: Milling

	故障现象/Case/Symptom		可能原因/Possible causes	纠正措施/Corrective measures
刀片/Insert	侧面磨损 VB wear		切削速度过高/Cutting speed is too high 进给率过低/Feed rate is too low 刀片形状不匹配/The shape of the insert is not suitable 刀片材料/牌号错误 The material/grade of the insert is not suitable	降低切削速度/Decrease cutting speed 提高进给率/Increase the feed rate 增大刀尖圆弧半径/Make the nose radius larger 更换高抗边界磨损牌号 Change to a grade highly resistant to boundary wear
	缺口磨损 Notching wear		刀片材料/牌号错误 The material / grade of the insert is not suitable 铣刀体不匹配/The shape of the cutter is not suitable 刀片形状不匹配/The shape of insert is not suitable	更换高抗边界磨损牌号 Change to a grade highly resistant to boundary wear 增大前角/Widen the rake angle 更换不同的刀片形状/Change the Insert shape to a different one
	崩刃/断裂 Chipping/ Fracture		切削速度设定错误/The cutting speed is incorrect 铣刀体不匹配/The shape of the cutter is not suitable 刀片形状不匹配/The shape of insert is not suitable	降低进给率和切削深度以减少切削力 Decrease the feed rate and depth of cut in order 采用更小的刃口处理/Use a smaller edge preparation 对切削刃进行圆角珩磨处理 Prepare the cutting edge to give it a round honing 更换为高抗断裂牌号/Change to a grade highly resistant to fracture
	热裂纹 Thermal crack		切削条件设定错误 The cutting conditions are incorrect 刀片材料/牌号错误 The material / grade of the insert is not suitable	降低切削速度/Decrease the cutting speed 从湿式切削切换为干式切削/Change to dry cutting from wet cutting 采用抗热冲击性强的材料/牌号 Use a material / grade highly resistant to thermal shock
工件/Work piece	崩刃 Chipping		进给速率太高/The feed rate is too high 刀片选择不当/An unsuitable insert is selected 铣刀体不匹配/The shape of the cutter is not suitable	降低进给速率/Decrease the feed rate 采用更小的刃口处理/Use a smaller edge preparation 更换高抗边界磨损牌号/Change to a grade highly resistant to boundary wear 将主偏角设置为45度/Set the lead angle at 45 degrees
	毛刺 Burring		进给率设定错误/The feed rate is incorrect 刀片形状不匹配/The shape of insert is not suitable 铣刀体不匹配/The shape of the cutter is not suitable	调整进给率/Adjust the feed rate 采用更小的刃口处理/Use a smaller edge preparation 减小主偏角/Make the lead angle narrower