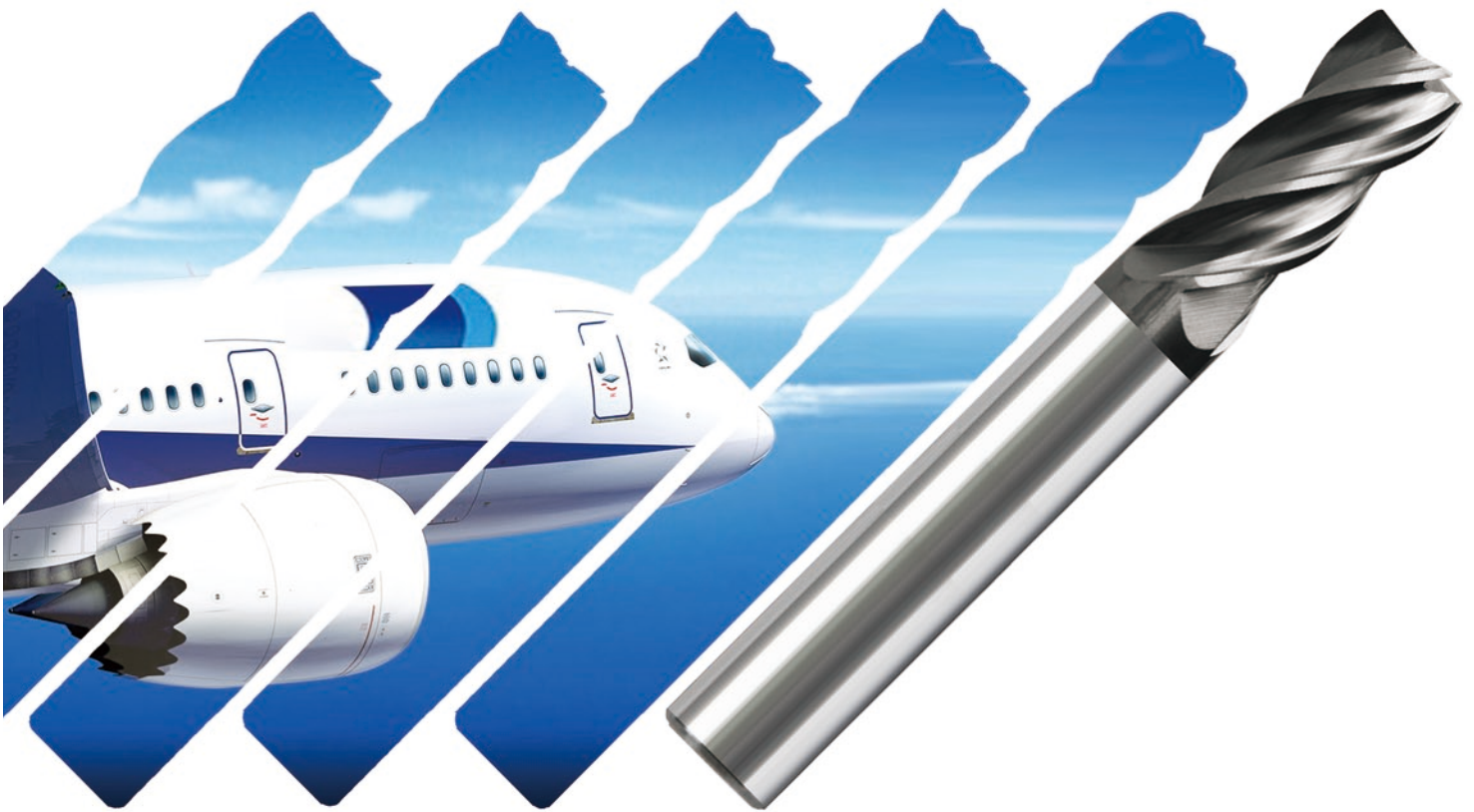


航空钛合金专用刀具

Aerospace Titanium Alloy Tools

ST200/D958



上海天拓电气有限公司
Shanghai Teentool Co.,Ltd

公司简介

About GESAC

上海天拓电气有限公司，成立于 2003 年，是一家高新技术企业。主要从事钨粉、碳化钨粉、硬质合金、切削刀具等钨系列产品 的生产和销售；是世界最大的钨粉、碳化钨粉供应商和出口商；是高品质硬质合金及其精密切削工具的制造商。

公司拥有一支自强不息的、高素质员工团队，拥有国际一流的工艺技术、生产设备和检测仪器；其生产的“金鹭”牌系列产品以优良的品质和完善的服务，享誉国内外；客户遍布全球四十多个工业发达国家和地区。

公司建立了国家级技术中心，独立承担并完成了多项“国家科技攻关计划”项目、“国家火炬计划”项目、“国家重点新产品”开发项目及省市重点研究课题，被评为“国家重点高新技术企业”、“先进技术企业”、“出口型企业”。

公司坚持以诚信为本的理念，致力于不断创新、发展成为“设备一流”、“技术一流”、“管理一流”、“质量一流”、“服务一流”的现代化企业。



钛合金应用

Application of Titanium Alloy

在航空飞行器上，具有优异特性的钛合金材料已被加工制作成重要的受力结构件和连接件而广泛使用，如钛合金起落架支撑梁、机翼滑轨、发动机的压气机盘、涡轮盘以及飞机尾部整流器、排气装置等。这些零部件往往结构复杂，材料去除量大，表面质量要求高，对切削加工技术提出了非常高的要求。

Due to superior properties, titanium alloy have been widely used as important structural components and conjunctive components in aircraft, such as landing gear support structure, fan disk and low pressure compressor disks and blades in turbine, tail cone, exhaust duct etc. Complicated structure, high metal removal rate, good surface finishing are primary features of these components, which requires high cutting technology.



钛合金的切削特点

Characteristic of Titanium Alloy Machining

(1) 单位面积切削力大

High pressure loads on the cutting edge.

钛合金变形系数小，切屑与刀具前刀面接触面积小，使得刀具表面单位面积切削力大大增加，加速刀具磨损、破损。

High resistance to plastic deformation of titanium alloy may lead to a small chip-tool contact area, which will cause a serious stress concentration and heat generation at the tool nose.

(2) 切削温度高

High cutting temperature

由于钛合金导热系数小，在切削加工中切削温度急剧上升，特别在切屑与前刀面接触区域温度可高达1000℃，切削产生的热量仅约20%被切屑带走，80%作用在刀具上。高的切削温度会显著降低刀具强度，直接加速了刀具的磨损，大大降低了刀具使用寿命。

Poor thermal conductivity may lead to violent temperature rise in the cutting zone during the cutting process, especially at chip-tool contact area where temperature may reach 1000°C or more. Of this generated heat, about 80% it is retained in the tool and 20% in the chip. And high cutting temperature will greatly accelerate tool wear and lead to a poor tool life.

(3) 高化学活性，加剧刀具失效









Strong chemical reactivity

在高切削温度下，钛合金材料与刀具之间具有高的化学活性，刀具容易发生氧化磨损、扩散磨损，从而加速刀具失效。

Tool failure is easily caused due to the strong chemical reactivity with tool materials under high cutting temperature conditions, in which oxidation wear and dissolution-diffusion wear of tools often occur.

ST200航空钛合金高效加工立铣刀

ST200 Endmill for High Efficiency Milling of Aerospace Titanium Alloy

| 产品系列 Tool Series | 刀具类型 Tool Type | 刀具外形 End Mill | 刀具名称 Description | 型号 Type | 尺寸范围 Diameter Range | 页次 Page | 工件材料 Workpiece Material | | | |
|---------------------|----------------------|---|--|------------|------------------------|------------|----------------------------|---|---|--|
| | | | | | | | P | S | | |
| | | | | | | | 4 5 6 | 3 | | |
| | | | | | | | 合金钢 Alloy Steel | TA α 相合金 Microstructure Alloy | TC α 相和 β 相合金 α or β Microstructure Alloy | TB β 相合金 Microstructure Alloy |
| ST200 | 平头 Square End |  | 4刃平头 4 Flute, Standard Length | ST200-S4 | D6-D32 | 08 | ○ | ○ | ○ | ○ |
| | |  | 5刃平头 5 Flute, Standard Length | ST200-S5 | D6-D32 | 08 | ○ | ○ | ○ | ○ |
| | |  | 6刃平头 6 Flute, Standard Length | ST200-S6 | D6-D32 | 08 | ○ | ○ | ◎ | ○ |
| | 圆角头 Corner Radius |  | 4刃圆角头 4 Flute, Corner Radius | ST200-R4 | D6-D32 | 09 | ○ | ◎ | ◎ | ◎ |
| | |  | 5刃圆角头 5 Flute, Corner Radius | ST200-R5 | D6-D32 | 10 | ○ | ◎ | ◎ | ◎ |
| | |  | 6刃圆角头 6 Flute, Corner Radius | ST200-R6 | D6-D32 | 11 | ○ | ◎ | ◎ | ◎ |
| | |  | 4刃长颈圆角头 4 Flute Corner Radius, with Reduced Neck | ST200-RN4 | D6-D32 | 12 | ○ | ◎ | ◎ | ◎ |
| | |  | 5刃长颈圆角头 5 Flute Corner Radius, with Reduced Neck | ST200-RN5 | D6-D32 | 13 | ○ | ◎ | ◎ | ◎ |
| | |  | 6刃长颈圆角头 6 Flute Corner Radius, with Reduced Neck | ST200-RN5 | D6-D32 | 14 | ○ | ◎ | ◎ | ◎ |
| | 球头 Ballnose |  | 4刃球头 4 Flute, Ballnose | ST200-B4 | R3-R12 | 15 | ○ | ◎ | ◎ | ◎ |
| | |  | 4刃长颈球头 4 Flute, Ballnose , with Reduced Neck | ST200-BN4 | R3-R12 | 15 | ○ | ◎ | ◎ | ◎ |

◎ 最适合 Most Suitable ○ 适合 Suitable

ST200 航空钛合金高效加工立铣刀

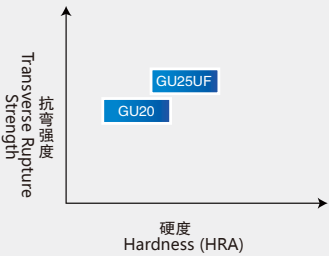
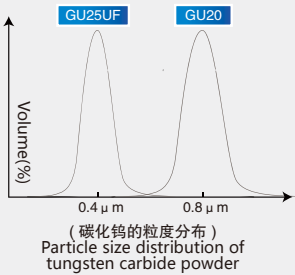
ST200 Endmill for High Efficiency Milling of Aerospace Titanium Alloy

主要用途 Main application

- 超细晶的硬质合金GU25UF，耐磨性好和高韧性的基体
Ultra-fine cemented carbide GU25UF High wear resistance and toughness
- 优异的耐磨性和抗粘结性 AlCrN 涂层
High wear resistance and anti-stickness, AlCrN coating
- 锋利的切削刃，先进的刃口处理
Advanced flute edge treatment
- 优异的不等分布排屑槽
Unequal flutes spacing for excellent chip evacuation

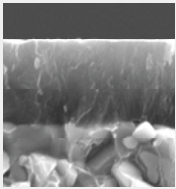
超细晶的硬质合金GU25UF Ultra-fine cemented carbide GU25UF

- GU25UF是以晶粒度0.4um的WC为原料，含钴12%的硬质合金。
GU25UF is produced from 0.4um micron tungsten carbide powder with 12% cobalt powder.



AlCrN 涂层 AlCrN Coating

- 纳米结构的涂层具有高的抗氧化温度，最高适用温度可达到1100°C。
Nano-structure coating has a high oxidation temperature, the most suitable temperature is 1100°C.
- 良好的韧性及热冲击稳定性。
Good toughness and thermal shock resistance stability.



涂层基本物理特性 Basic physical character of coating

| 涂层 coating | 维氏硬度 (Hv 0.05) Vickers Hardness | 残余压缩应力 [Gpa] Residual Compressive Stress | 最高适用 温度 [°C] Most Suitable Temperature | 摩擦系数 Coefficient of Friction |
|---------------|--|--|---|------------------------------------|
| AlCrN | 3200 | -3 | 1100 | 0.35 |

ST200应用案例一

ST200 Application Case Studies 1

① 独特的基体材料和涂层，可保证其耐崩刃性和耐磨性，在高速、大进给及大切削深度条件下，提高加工效率

The unique combination of substrate and coating guarantees the anti-fracture resistance and wear resistance effectively. Ability to withstand large depths of cuts at high feeds rates.



| | | | | | |
|--------------------------|--|-------------------------|-------------------|---------------------|-------------------|
| 刀具名称 Description | 5刃圆角头 5 Flute, Cornor Radius | 刀具磨损状况 Wear conditon | | | |
| 型号 Type | ST200-R5-16030 | | | | |
| 工件材料 Workpiece | 钛合金 Ti6Al4V (TC4) | 第一型腔 (22.5min) | 第二型腔 (45min) | 第三型腔 (67.5min) | 第四型腔 (90min) |
| 切削方式 Machining Method | 型腔加工 Cavity Milling | X100 | X100 | X100 | X100 |
| 加工时间 Cutting Time | 70min | | | | |
| 冷却方式 Coolant | 水冷 water | | | | |
| 转速 Speed | 1195RPM (60m/min) | | | | |
| 进给速度 Feed Rate | 382mm/min (0.064mm/t) | | | | |
| 切削深度 Cutting Depth | a _p =28mm, a _e =3mm | | | | |

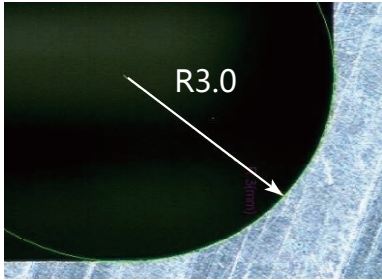
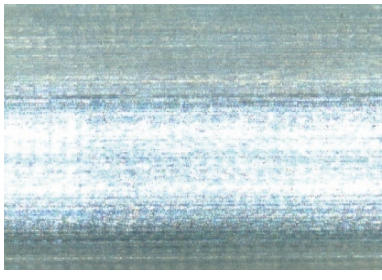
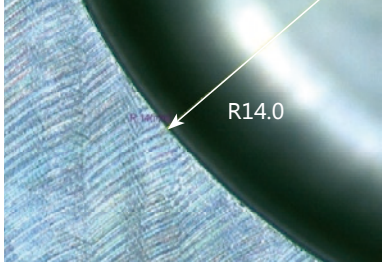
| | | |
|--|----------------------------|---------------------------------|
| | 加工形状 Shape Dimensions | 142 (L) × 92 (W) × 28 (H) |
| | 工件材料 Workpiece Material | 钛合金 Ti6Al14V |
| | 底部 R 角 Radius of Bottom | R3.0 |
| | 转角 R Radius of Corner | R14.0 |

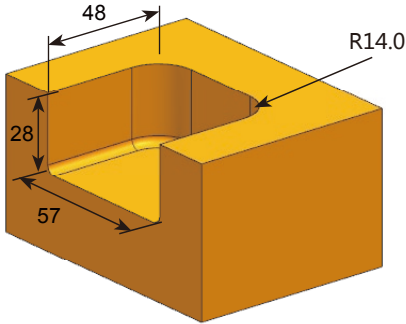
ST200应用案例二

ST200 Application Case Studies 2

② 特殊的曲面圆弧形状 具有极高的圆弧加工精度及表面质量

Special circle curve milling, High precision of shape and high quality of surface.

| | | | | |
|--------------------------|-----------------------|---|---|---|
| 刀具名称 Description | | 5刃圆角头 5 Flute, Corner Radius | 底部R角 : R3.0 Radius of Bottom:R3.0 |  |
| 型号 Type | | ST200-R5-16030 | | |
| 工件材料 Workpiece | | 钛合金 Ti6Al4V (TC4) | | |
| 切削方式 Machining Method | | 侧铣 Side milling | | |
| 加工时间 Cutting Time | | 9.5min | 侧面质量 Quality of Surface |  |
| 半精加工 Semi-finishing | 切削速度 Cutting Speed | 1195RPM (60m/min) | | |
| | 进给速度 Feed Rate | 382mm/min (0.064mm/t) | | |
| | 切削深度 Cutting Depth | $a_p=28\text{mm}$, $a_e=4\text{mm}$ | 转角R角 : R14.0 Radius of Corner: R14.0 |  |
| 精加工 Finishing | 切削速度 Cutting Speed | 1195RPM (60m/min) | | |
| | 进给速度 Feed Rate | 360mm/min (0.06mm/t) | | |
| | 切削深度 Cutting Depth | $a_p=28\text{mm}$, $a_e=1\text{mm}$ | | |

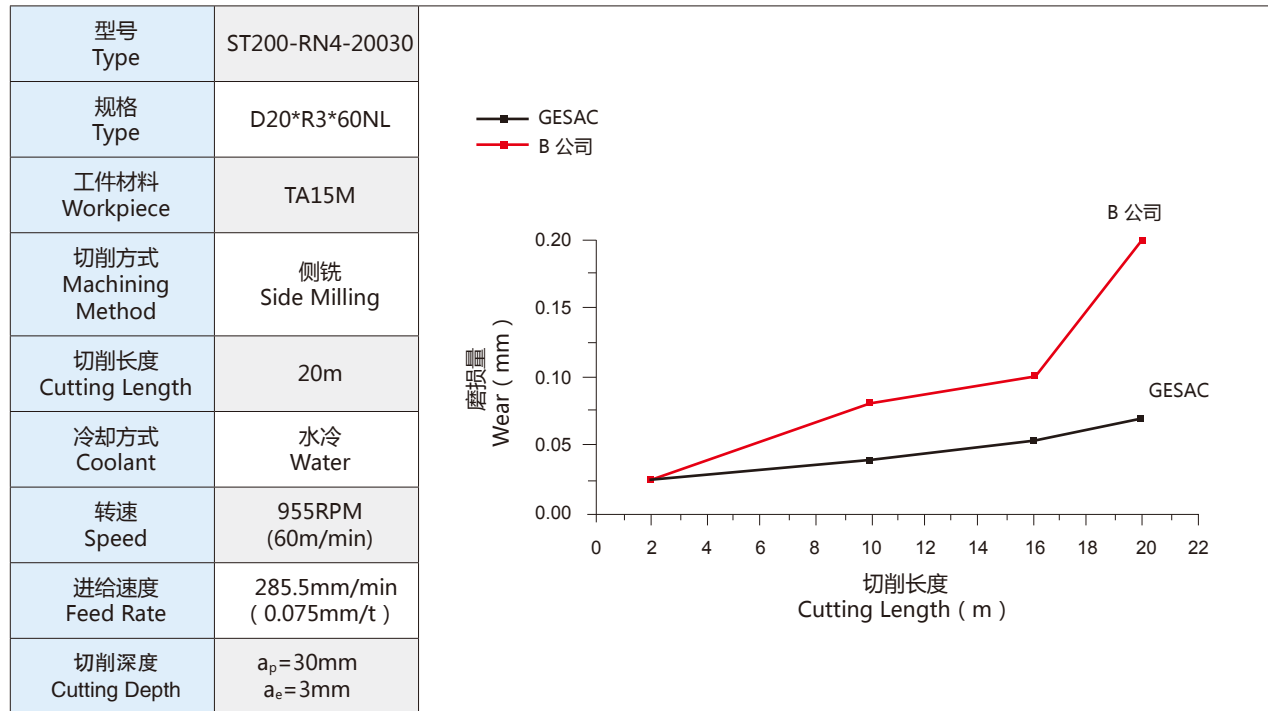
| | | |
|---|----------------------------|------------------------|
|  | 加工形状 Shape Dimensions | 57(L)x48(W)x28(H) |
| | 工件材料 Workpiece Material | 钛合金 Ti6Al4V (TC4) |
| | 底部 R 角 Radius of Bottom | R3.0 |
| | 转角 R Radius of Corner | R14.0 |

ST200应用案例三

ST200 Application Case Studies 3

③ 锋利的切削刃，先进的刀口处理，实现稳定的切削，增加刀具的寿命

Advanced flute edge treatment, wear condition is stable, enabling long-life cutting.



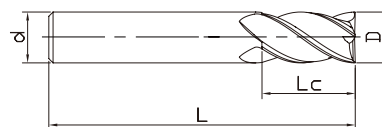
磨损状况： Wear Condition

| | 切削2m后 Cutting Length : 2m | 切削10m后 Cutting Length : 10m | 切削20m后 Cutting Length : 20m |
|-------|------------------------------|--------------------------------|--------------------------------|
| | X100 | X100 | X100 |
| GESAC | | | |
| B 公司 | | | |

ST200-S4

4 刃平头

4 Flute,
Standard Length



| D | 公差 Tol |
|--------|------------|
| D ≤ 16 | 0 -0.03 |
| D > 16 | 0 -0.04 |

单位(mm)

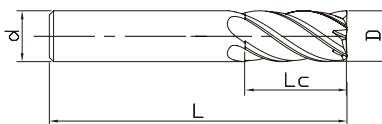
| 型号 Type | D | Lc | L | d |
|----------------|----|----|-----|----|
| ST200-S4-06012 | 6 | 12 | 50 | 6 |
| ST200-S4-08016 | 8 | 16 | 60 | 8 |
| ST200-S4-10020 | 10 | 20 | 70 | 10 |
| ST200-S4-12024 | 12 | 24 | 75 | 12 |
| ST200-S4-16032 | 16 | 32 | 90 | 16 |
| ST200-S4-20040 | 20 | 40 | 100 | 20 |

订货示例 Ordering Example : ST200-S4-06012

ST200-S5

5 刃平头

5 Flute,
Standard Length



| D | 公差 Tol |
|--------|------------|
| D ≤ 16 | 0 -0.03 |
| D > 16 | 0 -0.04 |

单位(mm)

| 型号 Type | D | Lc | L | d |
|----------------|----|----|-----|----|
| ST200-S5-10025 | 10 | 25 | 70 | 10 |
| ST200-S5-12030 | 12 | 30 | 75 | 12 |
| ST200-S5-16036 | 16 | 36 | 90 | 16 |
| ST200-S5-20045 | 20 | 45 | 110 | 20 |
| ST200-S5-25050 | 25 | 50 | 110 | 25 |

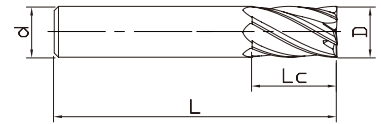
订货示例 Ordering Example : ST200-S5-10025

ST200-S6



6 刃平头

6 Flute,
Standard Length



| D | 公差 Tol |
|--------|------------|
| D ≤ 16 | 0 -0.03 |
| D > 16 | 0 -0.04 |

单位(mm)

| 型号 Type | D | Lc | L | d |
|----------------|----|----|-----|----|
| ST200-S6-10025 | 10 | 25 | 70 | 10 |
| ST200-S6-12030 | 12 | 30 | 75 | 12 |
| ST200-S6-16036 | 16 | 36 | 90 | 16 |
| ST200-S6-20045 | 20 | 45 | 110 | 20 |
| ST200-S6-25050 | 25 | 50 | 110 | 25 |

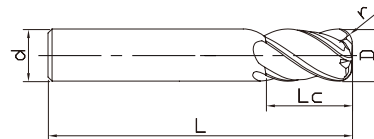
订货示例 Ordering Example : ST200-S6-10025

ST200-R4



4 刃圆角头

4 Flute,
Corner Radius



| D | 公差 Tol |
|-------------|--|
| $D \leq 16$ | $\begin{matrix} 0 \\ -0.03 \end{matrix}$ |
| $D > 16$ | $\begin{matrix} 0 \\ -0.04 \end{matrix}$ |

单位 (mm)

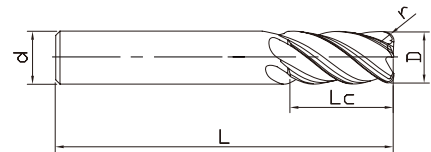
| 型号 Type | D | r | Lc | L | d |
|----------------|----|-----|----|-----|----|
| ST200-R4-06005 | 6 | 0.5 | 16 | 50 | 6 |
| ST200-R4-06010 | 6 | 1 | 16 | 50 | 6 |
| ST200-R4-08010 | 8 | 1 | 20 | 60 | 8 |
| ST200-R4-08020 | 8 | 2 | 20 | 60 | 8 |
| ST200-R4-10010 | 10 | 1 | 25 | 70 | 10 |
| ST200-R4-10020 | 10 | 2 | 25 | 70 | 10 |
| ST200-R4-10030 | 10 | 3 | 25 | 70 | 10 |
| ST200-R4-12010 | 12 | 1 | 30 | 75 | 12 |
| ST200-R4-12020 | 12 | 2 | 30 | 75 | 12 |
| ST200-R4-12030 | 12 | 3 | 30 | 75 | 12 |
| ST200-R4-16010 | 16 | 1 | 36 | 90 | 16 |
| ST200-R4-16020 | 16 | 2 | 36 | 90 | 16 |
| ST200-R4-16030 | 16 | 3 | 36 | 90 | 16 |
| ST200-R4-20010 | 20 | 1 | 45 | 110 | 20 |
| ST200-R4-20020 | 20 | 2 | 45 | 110 | 20 |
| ST200-R4-20030 | 20 | 3 | 45 | 110 | 20 |
| ST200-R4-20040 | 20 | 4 | 45 | 110 | 20 |
| ST200-R4-20050 | 20 | 5 | 45 | 110 | 20 |
| ST200-R4-25010 | 25 | 1 | 50 | 115 | 25 |
| ST200-R4-25020 | 25 | 2 | 50 | 115 | 25 |
| ST200-R4-25030 | 25 | 3 | 50 | 115 | 25 |
| ST200-R4-25040 | 25 | 4 | 50 | 115 | 25 |
| ST200-R4-25050 | 25 | 5 | 50 | 115 | 25 |

订货示例 Ordering Example : ST200-R4-06005

ST200-R5

5 刃圆角头

5 Flute,
Corner Radius



| D | 公差 Tol |
|--------|--|
| D ≤ 16 | $\begin{matrix} 0 \\ -0.03 \end{matrix}$ |
| D > 16 | $\begin{matrix} 0 \\ -0.04 \end{matrix}$ |

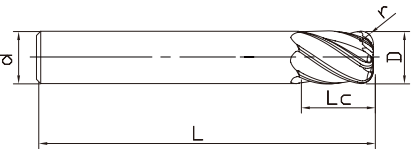
单位 (mm)

| 型号 Type | D | r | Lc | L | d |
|----------------|----|-----|----|-----|----|
| ST200-R5-06005 | 6 | 0.5 | 16 | 50 | 6 |
| ST200-R5-06010 | 6 | 1 | 16 | 50 | 6 |
| ST200-R5-08010 | 8 | 1 | 20 | 60 | 8 |
| ST200-R5-08020 | 8 | 2 | 20 | 60 | 8 |
| ST200-R5-10010 | 10 | 1 | 25 | 70 | 10 |
| ST200-R5-10020 | 10 | 2 | 25 | 70 | 10 |
| ST200-R5-10030 | 10 | 3 | 25 | 70 | 10 |
| ST200-R5-12010 | 12 | 1 | 30 | 75 | 12 |
| ST200-R5-12020 | 12 | 2 | 30 | 75 | 12 |
| ST200-R5-12030 | 12 | 3 | 30 | 75 | 12 |
| ST200-R5-16010 | 16 | 1 | 36 | 90 | 16 |
| ST200-R5-16020 | 16 | 2 | 36 | 90 | 16 |
| ST200-R5-16030 | 16 | 3 | 36 | 90 | 16 |
| ST200-R5-20010 | 20 | 1 | 45 | 110 | 20 |
| ST200-R5-20020 | 20 | 2 | 45 | 110 | 20 |
| ST200-R5-20030 | 20 | 3 | 45 | 110 | 20 |
| ST200-R5-20040 | 20 | 4 | 45 | 110 | 20 |
| ST200-R5-20050 | 20 | 5 | 45 | 110 | 20 |
| ST200-R5-25010 | 25 | 1 | 50 | 115 | 25 |
| ST200-R5-25020 | 25 | 2 | 50 | 115 | 25 |
| ST200-R5-25030 | 25 | 3 | 50 | 115 | 25 |
| ST200-R5-25040 | 25 | 4 | 50 | 115 | 25 |
| ST200-R5-25050 | 25 | 5 | 50 | 115 | 25 |

订货示例 Ordering Example : ST200-R5-06005

ST200-R6

6 刃圆角头
6 Flute,
Corner Radius



| D | 公差 Tol |
|--------|--|
| D ≤ 16 | $\begin{matrix} 0 \\ -0.03 \end{matrix}$ |
| D > 16 | $\begin{matrix} 0 \\ -0.04 \end{matrix}$ |

单位 (mm)

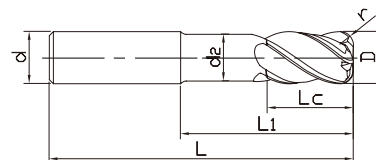
| 型号 Type | D | r | Lc | L | d |
|----------------|----|-----|----|-----|----|
| ST200-R6-10005 | 10 | 0.5 | 25 | 70 | 10 |
| ST200-R6-10010 | 10 | 1 | 25 | 70 | 10 |
| ST200-R6-10015 | 10 | 1.5 | 25 | 70 | 10 |
| ST200-R6-10020 | 10 | 2 | 25 | 70 | 10 |
| ST200-R6-10030 | 10 | 3 | 25 | 70 | 10 |
| ST200-R6-12005 | 12 | 0.5 | 30 | 75 | 12 |
| ST200-R6-12020 | 12 | 2 | 30 | 75 | 12 |
| ST200-R6-12030 | 12 | 3 | 30 | 75 | 12 |
| ST200-R6-16015 | 16 | 1.5 | 36 | 90 | 16 |
| ST200-R6-16020 | 16 | 2 | 36 | 90 | 16 |
| ST200-R6-16030 | 16 | 3 | 36 | 90 | 16 |
| ST200-R6-20010 | 20 | 1 | 45 | 110 | 20 |
| ST200-R6-20020 | 20 | 2 | 45 | 110 | 20 |
| ST200-R6-20030 | 20 | 3 | 45 | 110 | 20 |
| ST200-R6-20040 | 20 | 4 | 45 | 110 | 20 |
| ST200-R6-20050 | 20 | 5 | 45 | 110 | 20 |
| ST200-R6-25010 | 25 | 1 | 50 | 115 | 25 |
| ST200-R6-25020 | 25 | 2 | 50 | 115 | 25 |
| ST200-R6-25030 | 25 | 3 | 50 | 115 | 25 |
| ST200-R6-25040 | 25 | 4 | 50 | 115 | 25 |
| ST200-R6-25050 | 25 | 5 | 50 | 115 | 25 |

订货示例 Ordering Example : ST200-R6-10005

ST200-RN4

4 刃长颈圆角头

4 Flute,
with Reduced Neck



| D | 公差 Tol |
|--------|--|
| D ≤ 16 | $\begin{matrix} 0 \\ -0.03 \end{matrix}$ |
| D > 16 | $\begin{matrix} 0 \\ -0.04 \end{matrix}$ |

单位 (mm)

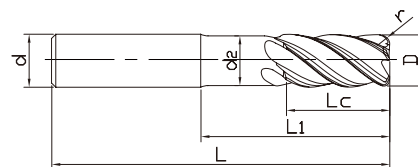
| 型号 Type | D | r | Lc | L1 | d2 | L | d |
|-----------------|----|-----|----|----|-----|-----|----|
| ST200-RN4-08005 | 8 | 0.5 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN4-08010 | 8 | 1 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN4-08015 | 8 | 1.5 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN4-08020 | 8 | 2 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN4-10005 | 10 | 0.5 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN4-10010 | 10 | 1 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN4-10015 | 10 | 1.5 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN4-10020 | 10 | 2 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN4-10030 | 10 | 3 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN4-12010 | 12 | 1 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN4-12015 | 12 | 1.5 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN4-12020 | 12 | 2 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN4-12030 | 12 | 3 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN4-16015 | 16 | 1.5 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN4-16020 | 16 | 2 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN4-16030 | 16 | 3 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN4-20020 | 20 | 2 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN4-20030 | 20 | 3 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN4-20040 | 20 | 4 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN4-20050 | 20 | 5 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN4-25020 | 25 | 2 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN4-25030 | 25 | 3 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN4-25040 | 25 | 4 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN4-25050 | 25 | 5 | 50 | 70 | 24 | 130 | 25 |

订货示例 Ordering Example : ST200-RN4-08005

ST200-RN5

5 刃长颈圆角头

5 Flute,
with Reduced Neck



| D | 公差 Tol |
|-------------|--|
| $D \leq 16$ | $\begin{matrix} 0 \\ -0.03 \end{matrix}$ |
| $D > 16$ | $\begin{matrix} 0 \\ -0.04 \end{matrix}$ |

单位 (mm)

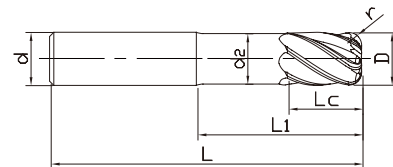
| 型号 Type | D | r | Lc | L1 | d2 | L | d |
|-----------------|----|-----|----|----|-----|-----|----|
| ST200-RN5-06005 | 6 | 0.5 | 12 | 20 | 0 | 60 | 6 |
| ST200-RN5-06010 | 6 | 1 | 12 | 20 | 0 | 60 | 6 |
| ST200-RN5-08010 | 8 | 1 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN5-08020 | 8 | 2 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN5-10010 | 10 | 1 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN5-10020 | 10 | 2 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN5-10030 | 10 | 3 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN5-12010 | 12 | 1 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN5-12020 | 12 | 2 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN5-12030 | 12 | 3 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN5-16020 | 16 | 2 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN5-16030 | 16 | 3 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN5-20020 | 20 | 2 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN5-20030 | 20 | 3 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN5-20040 | 20 | 4 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN5-20050 | 20 | 5 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN5-25020 | 25 | 2 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN5-25030 | 25 | 3 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN5-25040 | 25 | 4 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN5-25050 | 25 | 5 | 50 | 70 | 24 | 130 | 25 |

订货示例 Ordering Example : ST200-RN5-06005

ST200-RN6

6 刃长颈圆角头

6 Flute,
with Reduced Neck



| D | 公差 Tol |
|--------|--|
| D ≤ 16 | $\begin{smallmatrix} 0 \\ -0.03 \end{smallmatrix}$ |
| D > 16 | $\begin{smallmatrix} 0 \\ -0.04 \end{smallmatrix}$ |

单位 (mm)

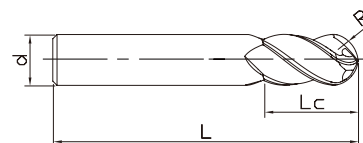
| 型号 Type | D | r | Lc | L1 | d2 | L | d |
|-----------------|----|-----|----|----|-----|-----|----|
| ST200-RN6-06005 | 6 | 0.5 | 12 | 20 | 5.5 | 60 | 6 |
| ST200-RN6-06010 | 6 | 1 | 12 | 20 | 5.5 | 60 | 6 |
| ST200-RN6-08010 | 8 | 1 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN6-08020 | 8 | 2 | 16 | 25 | 7.2 | 65 | 8 |
| ST200-RN6-10010 | 10 | 1 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN6-10020 | 10 | 2 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN6-10030 | 10 | 3 | 20 | 35 | 9 | 75 | 10 |
| ST200-RN6-12010 | 12 | 1 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN6-12020 | 12 | 2 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN6-12030 | 12 | 3 | 24 | 45 | 11 | 90 | 12 |
| ST200-RN6-16020 | 16 | 2 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN6-16030 | 16 | 3 | 32 | 50 | 15 | 100 | 16 |
| ST200-RN6-20030 | 20 | 3 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN6-20040 | 20 | 4 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN6-20050 | 20 | 5 | 40 | 60 | 19 | 110 | 20 |
| ST200-RN6-25030 | 25 | 3 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN6-25040 | 25 | 4 | 50 | 70 | 24 | 130 | 25 |
| ST200-RN6-25050 | 25 | 5 | 50 | 70 | 24 | 130 | 25 |

订货示例 Ordering Example : ST200-RN6-06005

ST200-B4

4 刃球头

4 Flute,
Ballnose



| R | 公差 Tol |
|------------|-------------|
| $R \geq 3$ | ± 0.020 |

单位 (mm)

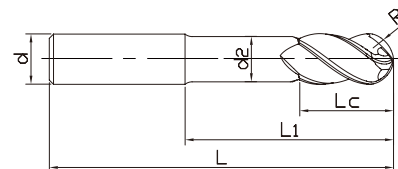
| 型号 Type | R | Lc | L | D |
|----------------|----|----|-----|----|
| ST200-B4-06009 | 3 | 9 | 50 | 6 |
| ST200-B4-08012 | 4 | 12 | 60 | 8 |
| ST200-B4-10015 | 5 | 15 | 70 | 10 |
| ST200-B4-12018 | 6 | 18 | 75 | 12 |
| ST200-B4-16024 | 8 | 24 | 90 | 16 |
| ST200-B4-20030 | 10 | 30 | 100 | 20 |

订货示例 Ordering Example : ST200-B4-06009

ST200-BN4

4 刃长颈球头

4 Flute,
Ballnose, with Reduced Neck



| R | 公差 Tol |
|------------|-------------|
| $R \geq 3$ | ± 0.020 |


单位 (mm)


| 型号 Type | R | Lc | L1 | d2 | L | d |
|-----------------|---|----|----|------|----|----|
| ST200-BN4-06018 | 3 | 9 | 18 | 5.6 | 60 | 6 |
| ST200-BN4-08020 | 4 | 12 | 20 | 7.6 | 60 | 8 |
| ST200-BN4-10025 | 5 | 15 | 25 | 9.6 | 70 | 10 |
| ST200-BN4-12030 | 6 | 18 | 30 | 11.4 | 75 | 12 |
| ST200-BN4-16035 | 8 | 24 | 35 | 15.2 | 90 | 16 |


订货示例 Ordering Example : ST200-BN4-06018

ST200 推荐切削参数

ST200 Recommended Milling Condition

| 工件材料 Workpiece | |  | | 切削速度 (m/min) | | | 刃径 Diameter (mm) | | | | | | | |
|-------------------|----|---|----------------|-------------------|---------------|-----------|-----------------------|-------|-------|-------|-------|------|-----|------|
| | | a _p | a _e | 最小 Min | 较好 Optimum | 最大 Max | mm | 6 | 8 | 10 | 12 | 16 | 20 | 25 |
| P | P4 | ≤1.5*D | ≤0.1*D | 70 | 90 | 120 | fz | 0.05 | 0.06 | 0.07 | 0.075 | 0.08 | 0.1 | 0.12 |
| | P5 | ≤1.5*D | ≤0.1*D | 70 | 90 | 120 | fz | 0.045 | 0.06 | 0.065 | 0.075 | 0.08 | 0.1 | 0.12 |
| | P6 | ≤1.5*D | ≤0.1*D | 70 | 85 | 120 | fz | 0.05 | 0.06 | 0.065 | 0.075 | 0.08 | 0.1 | 0.1 |
| S | TA | ≤1.5*D | ≤0.1*D | 50 | 75 | 90 | fz | 0.045 | 0.055 | 0.06 | 0.07 | 0.08 | 0.1 | 0.12 |
| | TC | ≤1.5*D | ≤0.1*D | 50 | 70 | 100 | fz | 0.045 | 0.055 | 0.06 | 0.065 | 0.08 | 0.1 | 0.1 |
| | TB | ≤1.5*D | ≤0.1*D | 30 | 45 | 60 | fz | 0.045 | 0.055 | 0.06 | 0.065 | 0.08 | 0.1 | 0.1 |

| 工件材料 Workpiece | |  | | 切削速度 (m/min) | | | 刃径 Diameter (mm) | | | | | | | |
|-------------------|----|---|--|-------------------|---------------|-----------|-----------------------|-------|-------|-------|-------|------|------|-------|
| | | a _p | | 最小 Min | 较好 Optimum | 最大 Max | mm/t | 6 | 8 | 10 | 12 | 16 | 20 | 25 |
| P | P4 | ≤0.8*D | | 70 | 90 | 120 | fz | 0.045 | 0.055 | 0.065 | 0.075 | 0.08 | 0.1 | 0.1 |
| | P5 | ≤0.5*D | | 70 | 90 | 120 | fz | 0.045 | 0.05 | 0.06 | 0.075 | 0.08 | 0.1 | 0.1 |
| | P6 | ≤0.3*D | | 70 | 85 | 120 | fz | 0.04 | 0.05 | 0.06 | 0.075 | 0.08 | 0.1 | 0.1 |
| S | TA | ≤0.3*D | | 50 | 75 | 90 | fz | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.1 | 0.1 |
| | TC | ≤0.3*D | | 50 | 70 | 100 | fz | 0.04 | 0.05 | 0.06 | 0.065 | 0.08 | 0.09 | 0.085 |
| | TB | ≤0.25*D | | 30 | 45 | 60 | fz | 0.04 | 0.05 | 0.06 | 0.065 | 0.07 | 0.09 | 0.08 |

| 工件材料 Workpiece | |  | | 切削速度 (m/min) | | | 刃径 Diameter (mm) | | | | | | |
|---|----|---|----------------|-------------------|---------------|-----------|-----------------------|-------|-------|-------|-------|------|------|
| | | a _p | P _f | 最小 Min | 较好 Optimum | 最大 Max | mm/t | 6 | 8 | 10 | 12 | 16 | 20 |
|  | P4 | ≤0.2*D | ≤0.3*D | 100 | 140 | 160 | fz | 0.05 | 0.07 | 0.08 | 0.1 | 0.12 | 0.14 |
| | P5 | ≤0.2*D | ≤0.3*D | 100 | 130 | 160 | fz | 0.05 | 0.07 | 0.08 | 0.1 | 0.12 | 0.14 |
| | P6 | ≤0.2*D | ≤0.3*D | 100 | 120 | 150 | fz | 0.05 | 0.065 | 0.075 | 0.09 | 0.11 | 0.12 |
|  | TA | ≤0.2*D | ≤0.3*D | 50 | 75 | 90 | fz | 0.05 | 0.06 | 0.07 | 0.075 | 0.08 | 0.1 |
| | TC | ≤0.2*D | ≤0.3*D | 50 | 70 | 100 | fz | 0.045 | 0.055 | 0.06 | 0.065 | 0.08 | 0.1 |
| | TB | ≤0.2*D | ≤0.2*D | 30 | 45 | 60 | fz | 0.045 | 0.055 | 0.06 | 0.065 | 0.08 | 0.1 |

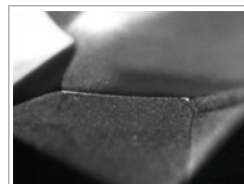
D958 钛合金加工麻花钻

D958 Twist Drill for Titanium Alloy

主要用途

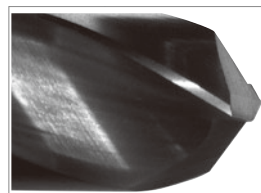
Main application

- 耐热合金的专用刀型高强度的切削刃口，具有良好的抗崩刃性
Special Chip for Heat-resistance Alloy. High hardness Flute Edges, excellent resistance to edge chipping



- 超细晶硬质合金，耐磨性好和高韧性的基体
Ultra-fine cemented carbide, High wear resistance and toughness

- 高性能的专用涂层
Advanced Coating
涂层能有效抑制刀具过快磨损，并具有较强的抗粘性能。
The coating can improve the wear resistance and material sticking to the tool.



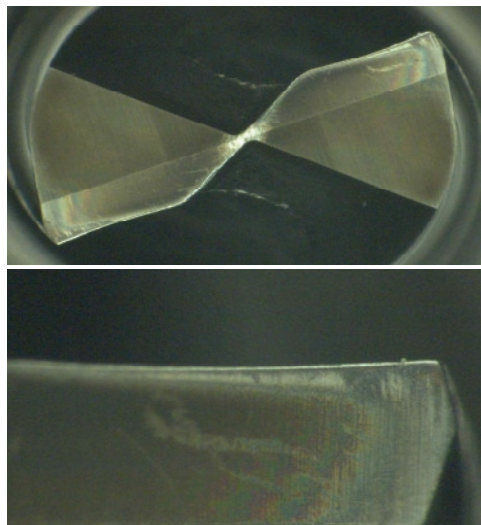
D958应用案例

D958 Application Case Studies

D958具有独特的槽形、适当的前角，在钻削钛合金这类导热系数低、易使切削刃局部产生高温的难切削材料时，能够实现高效率加工

D958 has unique groove, and suitable rake angle. The drills performs effectively when drilling the material like titanium alloy, which is low thermal conductivity, easily to cause partially heat at the cutting flutes.

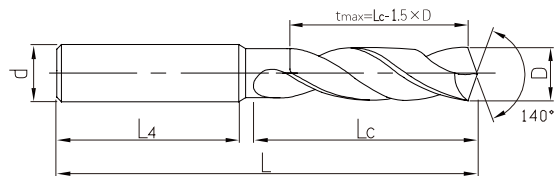
| | |
|--------------------------|---------------------------------|
| 型号 Type | D958-A3N-0600 |
| 规格 Size | D6*28*36*66*d6 |
| 工件材料 Workpiece | 钛合金 Ti6Al4V (TC4) |
| 切削方式 Machining Method | 盲孔钻削 Drilling the Blind Hole |
| 加工孔数 Hole Numbers | 500 |
| 冷却方式 Coolant | 水冷 Water |
| 转速 Speed | 2122RPM (40m/min) |
| 进给速度 Feed Rate | 255mm/min (0.12mm/t) |
| 切削深度 Cutting Depth | 18mm |



D958-A3N

3D 外冷麻花钻

Straight Shank Twist Drill (3D)



t_{max} — 推荐最大钻深



| | |
|-------------------------|---|
| 钻头直径 Drill Diameter | 4.0-15.5mm |
| 冷却方式 Coolant | 外冷 Outside |
| 最大孔深 Maximum Depth | 3D |
| 涂层 Coating | AlTiN |
| 孔公差 Hole Tolerance | IT8-9 |
| 表面粗糙度 Surface Roughness | Ra1-2 |
| 适应场合 Application | 适用于钛合金、高温合金及不锈钢的加工 Suitable for Drilling Titanium Alloy, Heat-Resistance Super Alloy and Stainless Steels |

| 型号 Type | D (m7) | d (h6) | L | Lc | L4 |
|---------------|--------|--------|-----|----|----|
| D958-A3N-0400 | 4.0 | 6 | 66 | 24 | 36 |
| D958-A3N-0420 | 4.2 | 6 | 66 | 24 | 36 |
| D958-A3N-0450 | 4.5 | 6 | 66 | 24 | 36 |
| D958-A3N-0500 | 5.0 | 6 | 66 | 28 | 36 |
| D958-A3N-0510 | 5.1 | 6 | 66 | 28 | 36 |
| D958-A3N-0550 | 5.5 | 6 | 66 | 28 | 36 |
| D958-A3N-0600 | 6.0 | 6 | 66 | 28 | 36 |
| D958-A3N-0680 | 6.8 | 8 | 79 | 34 | 36 |
| D958-A3N-0700 | 7.0 | 8 | 79 | 34 | 36 |
| D958-A3N-0750 | 7.5 | 8 | 79 | 41 | 36 |
| D958-A3N-0800 | 8.0 | 8 | 79 | 41 | 36 |
| D958-A3N-0850 | 8.5 | 10 | 89 | 47 | 40 |
| D958-A3N-0880 | 8.8 | 10 | 89 | 47 | 40 |
| D958-A3N-1000 | 10.0 | 10 | 89 | 47 | 40 |
| D958-A3N-1170 | 11.7 | 12 | 102 | 55 | 45 |
| D958-A3N-1550 | 15.5 | 16 | 115 | 65 | 48 |

订货示例 Ordering Example : D958-A3N-0400

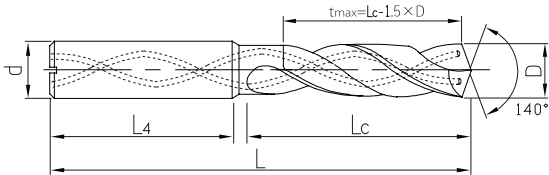
| 工件材料 Workpiece Material | | | | | | | |
|--------------------------|-------------------|---------------------------------|-------|----------------------------|---------------------|--------------------|-------------------|
| P | | | M | K | | S | |
| 1 2 3 4 | 5 | 6 | 1 2 3 | 1 2 | 3 | 1 2 3 | 4 |
| 碳钢、 合金钢 (< 35HRC) | 合金钢 (35-48HRC) | PH与铁素体/ 马氏体不锈钢 (< 35HRC) | 不锈钢 | 灰铸铁、 球墨铸铁 (< 32HRC) | 高合金铸铁 (35-45HRC) | 高温合金 (< HB450) | 钛合金 (< HB400) |
| | | | ○ | | | ○ | ◎ |

◎ 最适合 Most Suitable ○ 适合 Suitable

D958-A3C

3D 内冷麻花钻

Straight Shank Twist Drill
With Inter Coolant(3D)



t_{max} — 推荐最大钻深



| | |
|-------------------------|---|
| 钻头直径 Drill Diameter | 5.0-15.5mm |
| 冷却方式 Coolant | 内冷 Inside |
| 最大孔深 Maximum Depth | 3D |
| 涂层 Coating | AlTiN |
| 孔公差 Hole Tolerance | IT8-9 |
| 表面粗糙度 Surface Roughness | Ra1-2 |
| 适应场合 Application | 适用于钛合金、高温合金及不锈钢的加工 Suitable for Drilling Titanium Alloy, Heat-Resistance Super Alloy and Stainless Steels |

| 型号 Type | D (m7) | d(h6) | L | Lc | L4 |
|---------------|----------|-------|-----|----|----|
| D958-A3C-0500 | 5.0 | 6 | 66 | 28 | 36 |
| D958-A3C-0510 | 5.1 | 6 | 66 | 28 | 36 |
| D958-A3C-0550 | 5.5 | 6 | 66 | 28 | 36 |
| D958-A3C-0600 | 6.0 | 6 | 66 | 28 | 36 |
| D958-A3C-0680 | 6.8 | 8 | 79 | 34 | 36 |
| D958-A3C-0700 | 7.0 | 8 | 79 | 34 | 36 |
| D958-A3C-0750 | 7.5 | 8 | 79 | 41 | 36 |
| D958-A3C-0800 | 8.0 | 8 | 79 | 41 | 36 |
| D958-A3C-0850 | 8.5 | 10 | 89 | 47 | 40 |
| D958-A3C-0880 | 8.8 | 10 | 89 | 47 | 40 |
| D958-A3C-1000 | 10.0 | 10 | 89 | 47 | 40 |
| D958-A3C-1170 | 11.7 | 12 | 102 | 55 | 45 |
| D958-A3C-1550 | 15.5 | 16 | 115 | 65 | 48 |

订货示例 Ordering Example : D958-A3C-0500

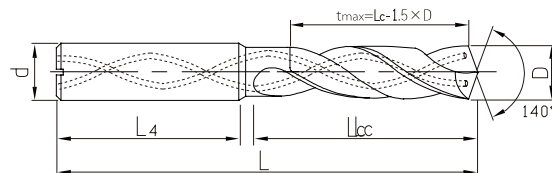
| 工件材料 Workpiece Material | | | | | | | |
|---------------------------|---------------------|----------------------------------|-------|-----------------------------|-----------------------|---------------------|--------------------|
| P | | | M | K | | S | |
| 1 2 3 4 | 5 | 6 | 1 2 3 | 1 2 | 3 | 1 2 3 | 4 |
| 碳钢、 合金钢 (< 35HRC) | 合金钢 (35-48HRC) | PH与铁素体/ 马氏体不锈钢 (< 35HRC) | 不锈钢 | 灰铸铁、 球墨铸铁 (< 32HRC) | 高合金铸铁 (35-45HRC) | 高温合金 (< HB450) | 钛合金 (< HB400) |
| | | | ○ | | | ○ | ◎ |

◎ 最适合 Most Suitable ○ 适合 Suitable

D958-A5C

5D 内冷麻花钻

Straight Shank Twist Drill
With Inter Coolant(5D)



t_{max} — 推荐最大钻深



| | |
|-------------------------|---|
| 钻头直径 Drill Diameter | 5.0-12mm |
| 冷却方式 Coolant | 内冷 Inside |
| 最大孔深 Maximum Depth | 5D |
| 涂层 Coating | AlTiN |
| 孔公差 Hole Tolerance | IT8-9 |
| 表面粗糙度 Surface Roughness | Ra1-2 |
| 适应场合 Application | 适用于钛合金、高温合金及不锈钢的加工 Suitable for Drilling Titanium Alloy, Heat-Resistance Super Alloy and Stainless Steels |

| 型号 Type | D (m7) | d(h6) | L | Lc | L4 |
|---------------|----------|-------|-----|----|----|
| D958-A5C-0500 | 5.0 | 6 | 82 | 44 | 36 |
| D958-A5C-0550 | 5.5 | 6 | 82 | 44 | 36 |
| D958-A5C-0590 | 5.9 | 6 | 82 | 44 | 36 |
| D958-A5C-0600 | 6.0 | 6 | 82 | 44 | 36 |
| D958-A5C-0635 | 6.35 | 8 | 91 | 53 | 36 |
| D958-A5C-0800 | 8.0 | 8 | 91 | 53 | 36 |
| D958-A5C-0954 | 9.54 | 10 | 103 | 61 | 40 |
| D958-A5C-1000 | 10.0 | 10 | 103 | 61 | 40 |
| D958-A5C-1050 | 10.5 | 12 | 118 | 71 | 45 |
| D958-A5C-1200 | 12.0 | 12 | 118 | 71 | 45 |


订货示例 Ordering Example : D958-A5C-0500


| 工件材料 Workpiece Material | | | | | | | |
|---------------------------|---------------------|----------------------------------|-------|-----------------------------|-----------------------|---------------------|--------------------|
| P | | | M | K | | S | |
| 1 2 3 4 | 5 | 6 | 1 2 3 | 1 2 | 3 | 1 2 3 | 4 |
| 碳钢、 合金钢 (< 35HRC) | 合金钢 (35-48HRC) | PH与铁素体/ 马氏体不锈钢 (< 35HRC) | 不锈钢 | 灰铸铁、 球墨铸铁 (< 32HRC) | 高合金铸铁 (35-45HRC) | 高温合金 (< HB450) | 钛合金 (< HB400) |
| | | | ○ | | | ○ | ◎ |

◎ 最适合 Most Suitable ○ 适合 Suitable

D958 推荐切削参数

D958 Recommended Milling Condition

| ISO | 材料编号 Code Number | Vc(m/min) | | fn (mm/rev) | | | | |
|---|---------------------|-----------------------------------|----------------------------------|----------------|----------------|----------------|----------------|----------------|
| | | 冷却方式：外冷 Coolant Type : Outside | 冷却方式：内冷 Coolant Type : inside | D3 | D4 | D6 | D8 | D10 |
|  | 5.1 | 20-25-30 | 25-30-35 | 0.08-0.10-0.12 | 0.09-0.11-0.14 | 0.11-0.13-0.16 | 0.12-0.15-0.18 | 0.13-0.18-0.22 |
| | 5.2 | 10-15-20 | 15-20-25 | 0.06-0.08-0.10 | 0.07-0.09-0.11 | 0.05-0.06-0.08 | 0.11-0.13-0.16 | 0.13-0.17-0.20 |
| | 5.3 | 15-30-45 | 20-35-50 | 0.04-0.05-0.07 | 0.05-0.06-0.08 | 0.05-0.06-0.08 | 0.06-0.08-0.11 | 0.08-0.11-0.14 |

| ISO | 材料编号 Code Number | Vc(m/min) | | fn (mm/rev) | | | | |
|---|---------------------|-----------------------------------|----------------------------------|----------------|----------------|----------------|----------------|----------------|
| | | 冷却方式：外冷 Coolant Type : Outside | 冷却方式：内冷 Coolant Type : inside | D12 | D14 | D16 | D18 | D20 |
|  | 5.1 | 20-25-30 | 25-30-35 | 0.17-0.21-0.26 | 0.21-0.25-0.29 | 0.22-0.26-0.30 | 0.25-0.30-0.35 | 0.26-0.32-0.37 |
| | 5.2 | 10-15-20 | 15-20-25 | 0.16-0.19-0.23 | 0.19-0.23-0.27 | 0.20-0.25-0.30 | 0.20-0.25-0.30 | 0.21-0.26-0.32 |
| | 5.3 | 15-30-45 | 20-35-50 | 0.08-0.13-0.16 | 0.11-0.15-0.18 | 0.12-0.16-0.20 | 0.12-0.16-0.20 | 0.13-0.17-0.21 |



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