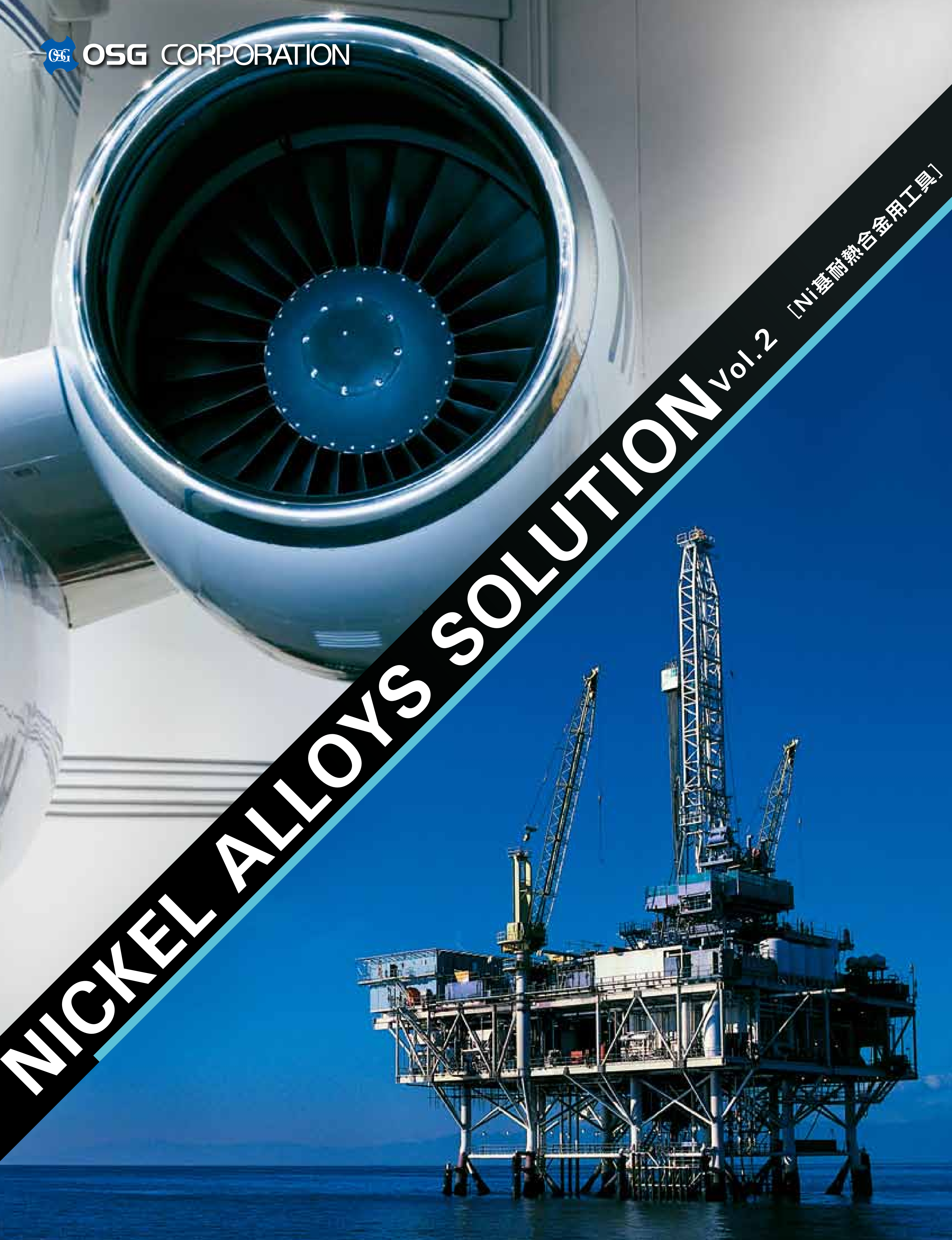
OSG CORPORATION

NICKEL ALLOYS SOLUTION Vol.2

［Ni基耐熱合金用工具］



Ni基耐热合金用样本前言

From the editors of the Catalog of Products for Nickel-Based Heat-Resistant Alloys

Ni基耐热合金用样本前言一直以来，Ni基耐热合金有着很好的『耐热性』『韧性』『延展性』，因此常被使用于需要很高耐热性能的喷气式引擎的涡轮齿牙和其他相关的飞机的零部件等地方。目前，其利用范围扩大到部分汽车零部件、家庭用燃烧机器等方面，随之，我们接受的这个方面的咨询也越来越多。
在此前提下，作为有关Ni基耐热合金切削加工的全方位解决方案，在积累了OSG长年技术的刀具里，挑出了非常合适Ni基耐热合金加工的刀具，并整理了样本。以便很荣幸的能够给客户提供有效信息。

OSG开发小组全体

Due to their superior heat resistance, toughness, and ductility characteristics, a large quantity of nickel-based heat-resistant alloys have traditionally been used in areas requiring a high level of heat resistance, such as turbine blades of jet engines and other aircraft related components. Today, their applications have become even more widespread, including some automotive components and household combustion equipment. The number of inquiries received from our customers regarding these products has increased year after year.
Therefore, we decided to provide a total solution for machining nickel-based heat-resistant alloys. From the numerous tools cultivated over OSG' s years of experience, we selected those that we recommend for nickel-based heat-resistant alloy applications, and compiled them into this catalog. We hope that this will help with our customers' operations.

OSG Development Group

Ni基耐热合金

Nickel-Based Heat-Resistant Alloys

Ni基耐热合金是非常难加工的材料。与快削钢相比，切削加工难度大了10倍。

Nickel-based heat-resistant alloys are materials with extremely poor machinability. They are approximately 10 times more difficult to machine than free-cutting steel.

加工材料性能指数 Comparison of Machinability

<table>
<tr><th>加工材料
Work Material</th><th>加工材料性能指数
Machinability</th><th colspan="2">加工材料
Work Material</th><th>加工材料性能指数
Machinability</th></tr>
<tr><td rowspan="2">快削钢(AISI　B1112)
Free Cutting Steel</td><td rowspan="2">100%</td><td colspan="2">铁素体不锈钢
Ferritic Stainless Steels</td><td>65~50%</td></tr>
<tr><td colspan="2">马氏体不锈钢
Martensitic Stainless Steels</td><td>55~40%</td></tr>
<tr><td>铜　合　金
Copper Alloy</td><td>100~70%</td><td colspan="2">奥氏体不锈钢
Austenitic Stainless Steels</td><td>50~40%</td></tr>
<tr><td>低炭素钢
Low Carbon Steel</td><td>85~70%</td><td colspan="2">钛合金
Titanium Alloy</td><td>30~27%</td></tr>
<tr><td>中炭素钢
Medium Carbon Steel</td><td>65~50%</td><td rowspan="3">耐热合金
Heat Resistant Alloy</td><td>Fe基
Fe-Based</td><td>27~20%</td></tr>
<tr><td>高炭素钢
High Carbon Steel</td><td>60~50%</td><td>Ni基
Nickel-Based</td><td>15~6%</td></tr>
<tr><td>铸　　铁
Cast Iron</td><td>50%</td><td>Co基
Co-Based</td><td>10~6%</td></tr>
</table>

加工Ni基合金的课题以及加工工具的条件 Problems machining nickel-based alloys and performance levels required of tools

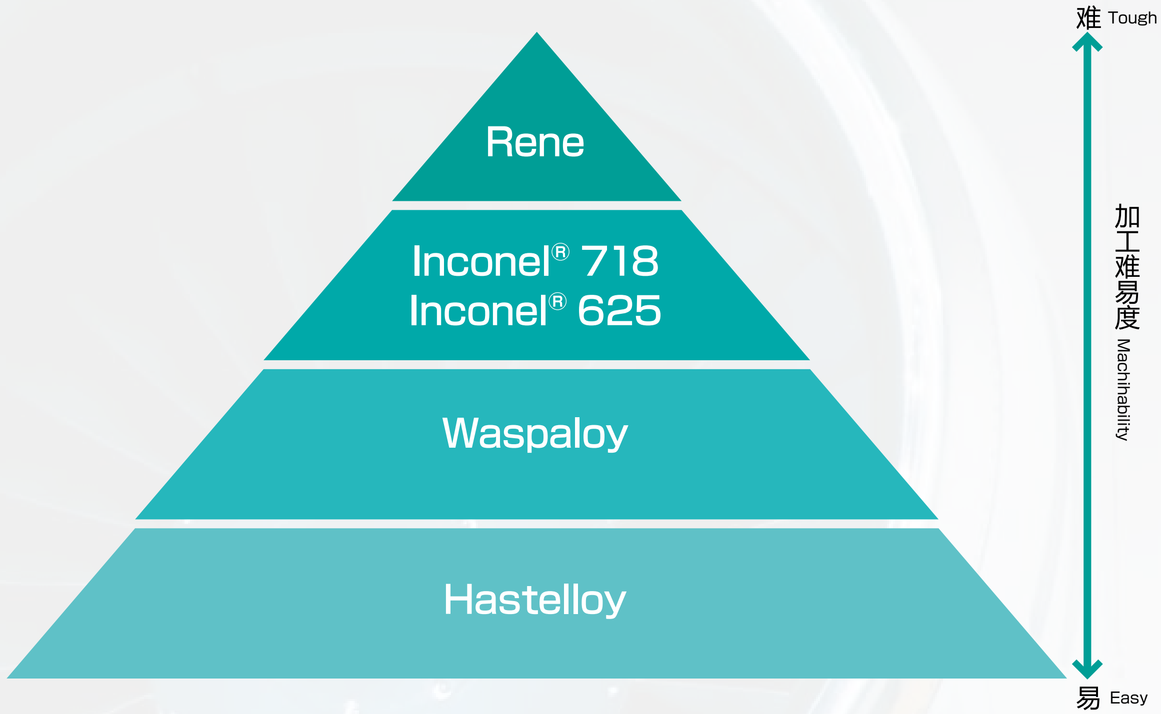
<table>
<tr><th colspan="2">课　题
Issue</th><th>加工工具的必要条件
Tool requirement</th></tr>
<tr><td colspan="2">加工时会产生非常高的切削热
Generation of extremely high cutting heat</td><td rowspan="2">切削抵抗的削减
Reduction of cutting force</td></tr>
<tr><td colspan="2">很大的切削抵抗
Large cutting force</td></tr>
<tr><td rowspan="4">加工工具寿命短
Significantly shorter tool life</td><td>工具磨损严重
Extreme tool wear</td><td>具有良好的耐磨耗性
Improve wear resistance</td></tr>
<tr><td rowspan="3">由于溶着引起的刀具崩损
Chipping caused by welding</td><td>具有很好的刃尖强度
Improve cutting edge strength</td></tr>
<tr><td>强韧的工具母材
Tough tool base material</td></tr>
<tr><td>耐溶着性好
Prevent welding</td></tr>
<tr><td colspan="2">由于加工材料的价格昂贵，所以加工时要求很高的成品率。
Being an expensive work material, a greater yield is needed.</td><td>加工稳定
Stability</td></tr>
</table>

本目录介绍了满足以上条件的丝锥，钻头及铣刀系列，并且给出了加工案例。

This catalog presents taps, drills, and end mills that meet the aforementioned requirements, together with examples.

代表的Ni基耐热合金
Typical Nickel-Based Heat-Resistant Alloys

※本样本是加工难度最高的Ni基耐热合金对象的集合。
We have compiled this catalog targeting nickel alloys of the highest degree of difficulty.



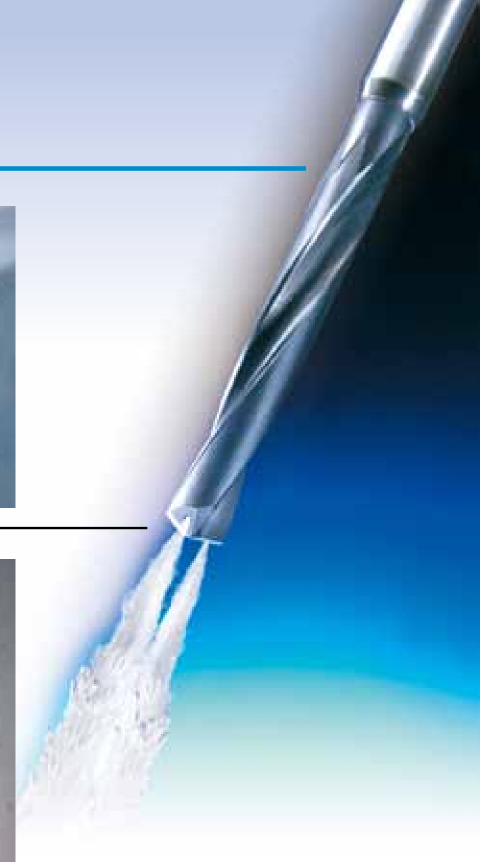
推荐工具一览表及适用的加工材料 List of recommended tools and applicable work materials

产品种类 Product category	推荐工具 Recommended tools	所在页 Page	Ni 基耐热合金 Nickel-Based Alloys	钛合金 Titanium Alloy	析出硬质不锈钢 Precipitation Stainless Steel SUS630
硬质合金钻头 Carbide Drills	WH055-5D	P3～4	◎		
丝锥 Taps	WHR-NI-SFT※	P5～6	◎		
	WHR-NI-POT※			○	
螺纹铣刀 Thread Milling Cutters	WH-VM-PNC	P7	◎	◎	◎
	WX-PNC	P8	◎	◎	◎
铣刀 End Mills	NEO-PHS	P9～14	◎	◎	◎
	NEO-CR-PHS				
	NEO-EMS				
	NEO-CR-EMS				
高速钢钻头 HSS Drills	VPH-GDS	P15～22	◎	○	○

没有印※的产品，也可对应加工其它加工材料，具体请参考OSG产品目录。
Items without ※ can be used for other wok materials. Please see OSG catalog for details.

最适 Ideal:◎ 适用 Good:○

上述产品可根据客户要求订制非标品。具体请咨询本社营业人员。
Products that are not included in the standard stock sizes are also available through special orders.



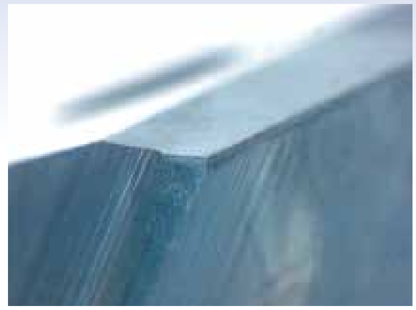
WHO55-5D 的特点 Features

1 锋利的切削刃

Sharp cutting edge

为了加工时效处理后的Ni基耐热合金，需要切削刃锋利来确保加工。锋利的切削刃还可以抑制发热，因此能实现切屑的稳定生成。

This tool is provided with sharper cutting edges for machining of aging-treated nickel-based alloys. This ensures sharpness, suppresses the generation of heat during machining, and promotes the stable creation of cutting chips.



2 高工具刚性 High regidity

槽的螺旋角，采用了小螺旋形状，实现高工具刚性。

With respect to the twist angle of the flutes, a weak twist shape has been used to attain high tool rigidity, making machining of high precision holes possible.

3 切屑生成稳定

Enables stable creation of cutting chips!

WHO55-5D加工后的切屑
Cutting chips after machining with WHO55-5D

其他公司加工后的切屑
Cutting chips after machining with a competitor's product.

4 耐摩耗性优异

Excellent wear resistance

对应水溶性内部给油的高速加工，采用WXS涂层，实现更长的寿命！

The tools use WXS Coating to support high-speed machining with internally-fed water-soluble coolant, resulting in a long tool life.

传统的钻头在加工Ni基耐热合金时遇到的问题

Obstacles for conventional drills on nickel-based material machining

	传统硬质合金钻头 Carbide Drill	其他公司传统的HSS钻头 PM HSS Drill
尺寸 Size	ϕ5.6	
加工材料 Work Material	Inconel® 718 (44HRC)	
切削速度 Drilling Speed	10m/min($568min^{-1}$)	5m/min($284min^{-1}$)
进给量 Feed	34mm/min (0.06mm/rev)	14mm/min (0.05mm/rev)
切削深度 Depth of Hole	20mm (通孔) (Through)	
切削油剂 Coolant	非水溶性切削油剂 Non-Water Soluble	

■传统硬质合金钻头
Carbide Drill

加工1孔后的照片 After 1 Hole

早期崩刃
Chipping

■其他公司传统的HSS钻头
PM HSS Drill

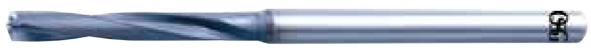
加工2孔后的照片 After 2 Hole

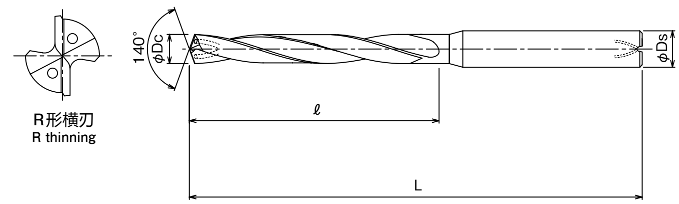
早期磨耗
Wear of lip relief

高硬度钢（~55HRC）用硬质合金内冷油孔钻头 Carbide drills with oil holes for high hardness steel (up to 55HRC)

NEW

WH055-5D





●材　　质 Tool Material：超微粒子硬质合金 Micro Grain Carbide

●表面处理 Surface Treatment：WXS 涂层 WXS Coating

单位:mm　Unit:mm

商品号 EDP No.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
3316330	3.3	32	78	6	B
3316340	3.4	32	78	6	B
3316349	3.49	32	78	6	B
3316350	3.5	32	78	6	B
3316360	3.6	34	78	6	B
3316370	3.7	34	78	6	B
3316380	3.8	36	78	6	B
3316390	3.9	36	78	6	B
3316400	4	36	78	6	B
3316410	4.1	38	88	6	B
3316415	4.15	38	88	6	B
3316420	4.2	38	88	6	B
3316430	4.3	41	88	6	B
3316440	4.4	41	88	6	B
3316450	4.5	41	88	6	B
3316460	4.6	43	88	6	B
3316470	4.7	43	88	6	B
3316480	4.8	45	88	6	B
3316490	4.9	45	88	6	B
3316500	5	45	88	6	B
3316510	5.1	42	92	6	B
3316520	5.2	42	92	6	B
3316530	5.3	44	92	6	B
3316540	5.4	44	92	6	B
3316550	5.5	44	92	6	B
3316556	5.56	46	92	6	B
3316560	5.6	46	92	6	B

商品号 EDP No.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
3316570	5.7	46	92	6	B
3316580	5.8	48	92	6	B
3316590	5.9	48	92	6	B
3316600	6	48	92	6	B
3316650	6.5	52	102	8	B
3316680	6.8	56	102	8	B
3316700	7	56	102	8	B
3316750	7.5	60	118	8	B
3316780	7.8	64	118	8	B
3316800	8	64	118	8	B
3316850	8.5	68	128	10	B
3316858	8.58	70	128	10	B
3316870	8.7	70	128	10	B
3316880	8.8	72	128	10	B
3316900	9	72	128	10	B
3316950	9.5	76	136	10	B
3316980	9.8	80	136	10	B
3316997	9.97	80	136	10	B
3317000	10	80	136	10	B
3317030	10.3	84	146	12	B
3317050	10.5	84	146	12	B
3317080	10.8	88	146	12	B
3317100	11	88	146	12	B
3317150	11.5	92	156	12	B
3317156	11.56	94	156	12	B
3317180	11.8	96	156	12	B
3317200	12	96	156	12	B

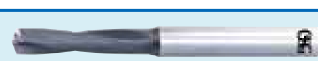
B = 标准库存品　　B = Standard stock item

特殊品制作介绍

考虑到产品的通用性，钻头的径长比设计为5D长度，如需追求更长寿命，更稳定的加工，也可以非标定制3D长度，详细请咨询我司销售人员

Introducing the production of special-order products.
* Please contact our Sales Department for details.

例）



WH055-3D（水溶性 内部给油型）Water Soluble Internal

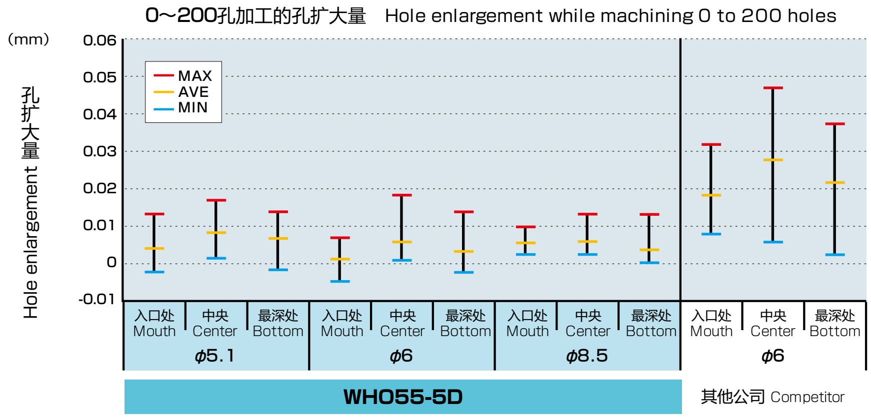
对应加工时效处理后的Ni基耐热合金(40HRC~45HRC)，最佳的涂层、锋利的切削刃，高工具刚性，实现稳定长寿命的加工！

These products are provided with the ideal coating, tool rigidity, and sharp cutting edge to machine aging-treated nickel-based alloys (40 - 45HRC) while achieving machining stability and long tool life.

加工事例 Cutting Data

各尺寸的稳定扩孔量
Stable hole enlargement by each size

使用工具 Tool	WH055-5D 各尺寸 Each Size
加工材料 Work Material	Inconel®718 (43HRC)
切削速度 Drilling Speed	30m/min
进给量 Feed	1.5%Dc mm/rev
切削深度 Depth of Hole	各3D（盲孔） (Blind)
切削油剂 Coolant	水溶性切削油剂（内部给油） Water Soluble (Internal)
使用机械 Machine	立式加工中心（BT40） Vertical Machining Center



高刚性刀体的设计，该产品可以成功的稳定每个尺寸的扩孔量。可实现并适用在精加工之前的钻孔工序等要求精度较高的孔加工。
Created with highly rigid body shapes, these products have been successful in suppressing the enlargement of holes of every size in a stable manner. This allows, these tools to be used for machining holes that require precision, such as the stable removal of stock before finish machining.

其他公司产品1.5倍的耐久性
1.5 times longer tool life against competitors.

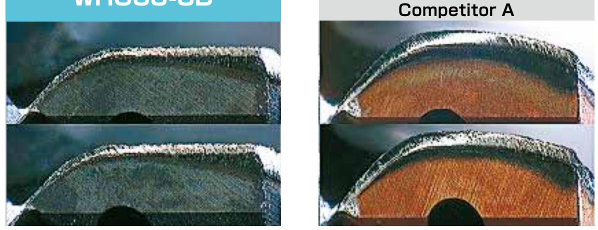
使用工具 Tool	WH055-3D ϕ6 （特殊品）(Special Order Item)
加工材料 Work Material	Inconel®718 (43HRC)
切削速度 Drilling Speed	30m/min (1,592min^{-1})
进给量 Feed	143mm/min(0.09mm/rev)
切削深度 Depth of Hole	18mm (3D 盲孔)无停顿式 (Blind) No-Step
切削油剂 Coolant	水溶性切削油剂（内部给油） Water Soluble (Internal)
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

钻头 Drills	切削孔数 Number of Holes (孔Holes) 100 200 300 400 500	
WH055-3D （特殊品） (Special Order Item)	440孔 Holes	磨耗 Wear
其他公司A Competitor A	280孔 Holes	磨耗 Wear
其他公司B Competitor B	260孔 Holes	崩刃 Chipping
其他公司C Competitor C	80孔 Holes	磨耗 Wear
其他公司D Competitor D	33孔 Holes	崩刃 Chipping

高刚性刀体加上WXS涂层以及锋利的切削刃，水溶性内部给油，可实现高速、稳定、长寿命的加工！
The highly rigid body combined with a sharp cutting edge is coated with WXS and achieves a stable, long tool life during high-speed machining.

加工240孔后的照片 After drilling 240 holes

WH055-3D	其他公司A Competitor A



加工事例 Cutting Data

非水溶性切削油剂的加工事例
Example with non-water soluble

使用工具 Tool	WHO55-3D ϕ6 (特殊品) (Special Order Item)
加工材料 Work Material	Inconel®718 (43HRC)
切削速度 Drilling Speed	10m/min (531min^{-1})
进给量 Feed	48mm/min(0.09mm/rev)
切削深度 Depth of Hole	18mm (盲孔)无停顿式 (Blind) No-Step
切削油剂 Coolant	非水溶性切削油剂 (外部給油) Non-Water Soluble (External)
使用机械 Machine	立式加工中心 (BT30) Vertical Machining Center

非水溶性切削油剂即使是外冷加工方式，只要调整切削速度，可以实现稳定寿命。
Materialized stable tool life adjusting cutting speed even with non-water soluble external coolant supply.

■工具寿命比较 Comparison of tool life

钻头 Drills	切削孔数 Number of Holes (孔Holes) 20 40 60 80 100	工具寿命 Too Life
WH55-3D (特殊品) (Special Order Item)	90孔 Holes	可继续加工 Continue
传统硬质合金钻头 Previous Carbide Drill	5孔 Holes	过早折损 Wear of lip relief

加工90孔后的照片
After Drilling 90 holes

切削条件基准表 Recommended Drilling Conditions

WHO55-5D

加工材料 WORK MATERIAL	Inconel® 718 38HRC～43HRC	
切削速度 DRILLING SPEED	10～30m/min	
直径 DRILL DIA. (mm)	转速 SPEED (min^{-1})	进给量 FEED (mm/rev)
3.3	1,900	0.03 ～ 0.07
4	1,600	0.04 ～ 0.08
5	1,300	0.05 ～ 0.1
6	1,100	0.06 ～ 0.12
7	900	0.07 ～ 0.14
8	800	0.08 ～ 0.16
9	700	0.09 ～ 0.18
10	600	0.1 ～ 0.2
11	600	0.11 ～ 0.22
12	500	0.12 ～ 0.24

1、此切削条件基准表适用于水溶性切削油剂的内部给油加工时。
2、请使用稀释倍率为20倍以下的优质水溶性切削油剂。
3. 使用油性切削油剂或者稀释倍率超过20倍时，切削速度请下调30%。
4、孔深超过3倍直径时，请使用阶梯式进给加工。
5. 装夹钻头时，请使用无损伤，无油污的弹簧夹头，并将径向跳动控制在0.02mm 以下。
6. 工件夹持必须做到无变形，无振动。
7. 油污堵塞会造成折损，因此供油装置请务必安装过滤网。

1. This speed & feed chart is based on a internal supply of water soluble coolant use.
2. Suitable cutting fluid is water-soluble high density oil (less than 20 times dilution).
3. Please slow down the speed by 30% when using water soluble coolant or emulsion more than 20 times.
4. Please apply pecking when the drilling depth is more than 3 time of the hole diameter.
5. When clamping a drill into the machine, use a collett that does not have any scratches or dust in the internal bore. Also, reduce the tool runout to less than 0.02mm.
6. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
7. A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.

WHR-NI 系列的特长 Features

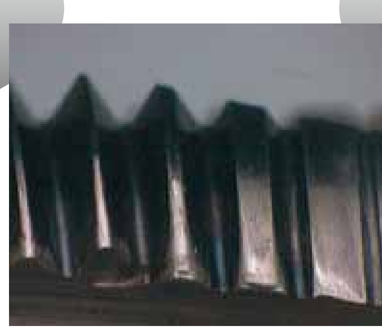
针对难加工材Ni基耐热合金的螺纹加工

Issues with machining nickel-based alloys

工具寿命短，加工时容易在工件内部折断
Short tool life, tap breaks off inside of workpiece

刃尖摩耗严重，切削刃容易崩损
Sudden tool wear, chipping of cutting edge

1/4-28 UNJF **加工130孔后的照片**
Photo of after machining 130 holes



缺损并磨损的切削锥部
Edge chipping and wear happened at the chamfer portion

折损的可能性大
High possibility of breakage

新技术1

1 Ni基耐热合金用HR涂层

HR Coated for Nickel Alloy

(WHR-NI-SFT,WHR-NI-POT)

采用耐磨耗性优异的HR涂层
Utilizes the wear-resistant HR Coating

耐摩耗性向上！
Abrasion-resistance is improved!

M10×1.5 加工12孔后的照片 Photo of after machining 12 holes

V涂层 V Coating

HR涂层 HR Coating

新技术2

2 先端槽形螺旋槽丝锥

Spiral tap with point flute

(WHR-NI-SFT)

盲孔也可使用的新型先端槽设计，提高刃尖刚性！
Newly designed point flute improves cutting edge rigidity, making it usable even in blind holes!

盲孔用 WHR-NI-SFT For blind hole

■由于高刚性、不易崩刃、耐磨损性的先端槽形，可实现很稳定地加工。
■采用了针对Ni基耐热合金，抗溶着性很好的HR涂层。
■对时效处理后的Ni基耐热合金(40-45HRC)，可实现长寿命加工

■The highly rigid point flutes resist chipping and are highly wear resistant, resulting in stable cutting performance.
■They use HR coating, which exhibits a high level of anti-welding properties against nickel-based alloys.
■They attain a long tool life when machining aging-treated nickel-based alloys (40 - 45 HRC).

通孔用 WHR-NI-POT For through hole

■采用了对Ni基耐热合金，抗溶着性很好的HR涂层。
■对时效处理后的Ni基耐热合金(40-45HRC)，可实现长寿命加工。

■ They use HR coating, which exhibits a high level of anti-welding properties against nickel-based alloys.
■ They attain a long tool life when machining aging-treated nickel-based alloys (40 - 45 HRC).

加工事例 Cutting Data WHR-NI-SFT

传统产品3倍的耐久性
3 times better life than conventional tool

使用工具 Tool	1/4-28UNJF
加工材料 Work Material	Inconel®718 (43HRC)
底孔直径 Hole Size	ϕ5.52×22mm (盲孔) (Blind)
切削长度 Tapping Length	12.7mm/min(2D) (盲孔) (Blind)
切削速度 Drilling Speed	2m/min (100min^{-1})
切削油剂 Coolant	非水溶性切削油剂 Non-Water Soluble
使用机械 Machine	立式加工中心(BT30) Vertical Machining Center

■工具寿命比較 Comparison of tool life

丝锥 Taps	加工孔数 Tapping Holes (孔 Holes) 50 / 100 / 150	工具寿命 Tool Life
WHR-NI-SFT	111孔 Holes	GP OUT
传统产品 Previous Product	37孔 Holes	GP OUT
其他公司 Competitor	14孔 Holes	GP OUT

加工事例 Cutting Data WHR-NI-POT

稳定长寿命
Stable long tool life

使用工具 Tool	M4×0.7
加工材料 Work Material	Inconel718 (45HRC)
底孔直径 Hole Size	ϕ3.3×9.5mm (通孔) (Through)
切削长度 Tapping Length	9.5mm(2.4D) (通孔) (Through)
切削速度 Drilling Speed	3m/min (2,356min^{-1})
切削油剂 Coolant	非水溶性切削油剂 Non-Water Soluble
使用机械 Machine	立式加工中心(BT30) Vertical Machining Center

■工具寿命比較 Comparison of tool life

丝锥 Taps	加工孔数 Tapping Holes (孔 Holes) 100	工具寿命 Tool Life
WHR-NI-POT	133孔 Holes 135孔 Holes	折损 Breakage
传统产品 (无涂层) Previous Product (Non-Corting)	82孔 Holes 57孔 Holes	折损 Breakage
其他公司A (氧化处理) Competitor A(Steam Oxide)	47孔 Holes 8孔 Holes	折损 Breakage
其他公司B (AlCrN) Competitor B	8孔 Holes 12孔 Holes	折损 Breakage
其他公司C (TiCN) Competitor C	4孔 Holes 3孔 Holes	折损 Breakage

加工后的照片 Photo of after machining

	第一支 No.1		第二支 No.2	
	60孔 Holes	120孔 Holes	60孔 Holes	120孔 Holes
WHR-NI-POT				
传统产品 (无涂层) Previous Product (Non-Coating)		82孔折损 Breakage	57孔折损 Breakage	

WHR-NI-SFT、WHR-NI-POT的性能评价 Performance evaluation

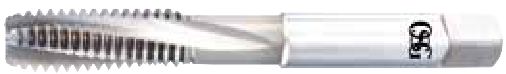
由于耐溶着性好的HR涂层，使得针对Inconel® 718 材料的长寿命、稳定切削成为可能！

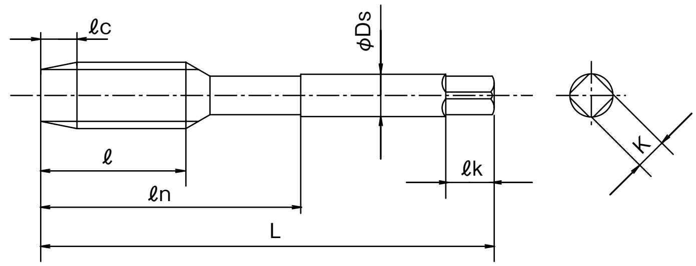
Longer tool life and stable operation on Inconel 718® thanks to welding resistant HR coating.

Ni 基耐热合金用螺旋槽丝锥 Spiral fluted taps for Nickel-based heat resistant alloys

NEW

WHR-NI-SFT





●材质 Tool Material: CPM

●表面处理 Surface Treatment: HR 涂层 HR Coating

●螺旋角 Helix Angle: 11°

螺纹种类：M

单位:mm Unit:mm

商品号 EDP NO.	螺纹尺寸 Thread Size	精度 TAP Limit	切削锥长 ℓc	全长 L	螺纹长 ℓ	径长 ℓn	柄径 Ds	槽数 Flutes	凸顶尖 External Centre	库存 Stock
3901410	M 3 × 0.5	OH3	2.5P	46	11	19	4	3	—	B
3901413	M 4 × 0.7	OH3	2.5P	52	13	21	5	3	有	B
3901416	M 5 × 0.8	OH3	2.5P	60	16	29	5.5	3	有	B
3901419	M 6 × 1	OH3	2.5P	62	19	—	6	3	有	B
3901422	M 8 × 1.25	OH3	2.5P	70	22	36	7	3	—	B
3901426	M10 × 1.5	OH3	2.5P	75	24	41	8.5	3	—	B
3901432	M12 × 1.75	OH4	2.5P	82	29	43	10.5	3	—	B

1. 精度栏　为加工2级内螺纹的丝锥推荐精度。
2. 丝锥精度不保证内螺纹精度。
1. The recommended tap limit corresponds to JIS class 2 internal thread standard.
2. TAP Limit does not guarantee thread limit for the internal thread after tapping.

螺纹种类：UN,UNJ

单位:mm Unit:mm

商品号 EDP NO.	螺纹尺寸 Thread Size	精度 TAP Limit	切削锥长 ℓc	全长 L	螺纹长 ℓ	径长 ℓn	柄径 Ds	槽数 Flutes	凸顶尖 External Centre	库存 Stock
3901446	No8-32UNJC	GH3	2.5P	52	13	21	5	3	有	B
3901455	No10-32UNJF	GH3	2.5P	60	16	29	5.5	3	有	B
3901467	1/4-28UNJF	GH4	2.5P	62	19	—	6	3	有	B
3901473	5/16-24UNJF	GH4	2.5P	70	22	36	7	3	—	B
3901479	3/8-24UNJF	GH4	2.5P	75	24	41	8.5	3	—	B
3901485	7/16-20UNJF	GH5	2.5P	80	25	40	10.5	3	—	B
3901491	1/2-20UNJF	GH5	2.5P	85	29	45	10.5	3	—	B

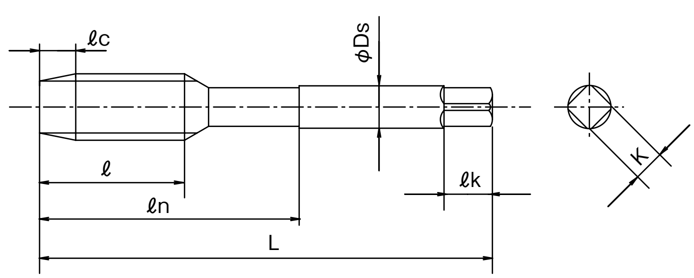
B＝标准在库品　　B＝Standard stock item.

1. 精度栏　为加工 2 级内螺纹的丝锥推荐精度。
2. 加工3B 级内螺纹时，请使用完全同步进给(刚性攻丝)及铣刀夹头以防止内螺纹扩大的现象出现
3. 丝锥的精度不能够保证内螺纹的精度。
1. The recommended tap limit corresponds to JIS class 2 internal thread standard.
2. To machine 3B class internal threads, use synchronized feeding and a milling chuck as measures against the problem of enlarged internal threads.
3. TAP Limit does not guarantee thread limit for the internal thread after tapping.

Ni基耐热合金用刃倾角丝锥 Pointed taps for Nickel-based heat resistant alloys

NEW

WHR-NI-POT



●材质 Tool Material: CPM

●表面处理 Surface Treatment: HR 涂层 HR Coating

螺纹种类：M

单位:mm Unit:mm

商品号 EDP NO.	螺纹尺寸 Thread Size	精度 TAP Limit	切削锥长 ℓc	全长 L	螺纹长 ℓ	径长 ℓn	柄径 Ds	槽数 Flutes	凸顶尖 External Centre	库存 Stock
3901210	M3 × 0.5	OH3	5P	46	18	19	4	3	有	B
3901213	M4 × 0.7	OH3	5P	52	20	21	5	3	有	B
3901216	M5 × 0.8	OH3	5P	60	22	29	5.5	3	有	B
3901219	M6 × 1	OH3	5P	62	24	—	6	3	有	B
3901222	M 8 × 1.25	OH3	5P	70	22	36	7	3	有	B
3901226	M10 × 1.5	OH3	5P	75	24	41	8.5	3	—	B
3901232	M12 × 1.75	OH4	5P	82	29	43	10.5	3	—	B

1. 精度栏　为加工2级内螺纹的丝锥推荐精度。
2. 丝锥精度不保证内螺纹精度。
1. The recommended tap limit corresponds to JIS class 2 internal thread standard.
2. TAP Limit does not guarantee thread limit for the internal thread after tapping.

螺纹种类：UN,UNJ

单位:mm Unit:mm

商品号 EDP NO.	螺纹尺寸 Thread Size	精度 TAP Limit	切削锥长 ℓc	全长 L	螺纹长 ℓ	径长 ℓn	柄径 Ds	槽数 Flutes	凸顶尖 External Centre	库存 Stock
3901246	No8-32UNJC	GH3	5P	52	20	21	5	3	有	B
3901255	No10-32UNJF	GH3	5P	60	22	29	5.5	3	有	B
3901267	1/4-28UNJF	GH4	5P	62	24	—	6	3	有	B
3901273	5/16-24UNJF	GH4	5P	70	22	36	7	3	有	B
3901279	3/8-24UNJF	GH4	5P	75	24	41	8.5	3	—	B
3901285	7/16-20UNJF	GH5	5P	80	25	40	10.5	3	—	B
3901291	1/2-20UNJF	GH5	5P	85	29	45	10.5	3	—	B

B＝标准在库品　　B＝Standard stock item.

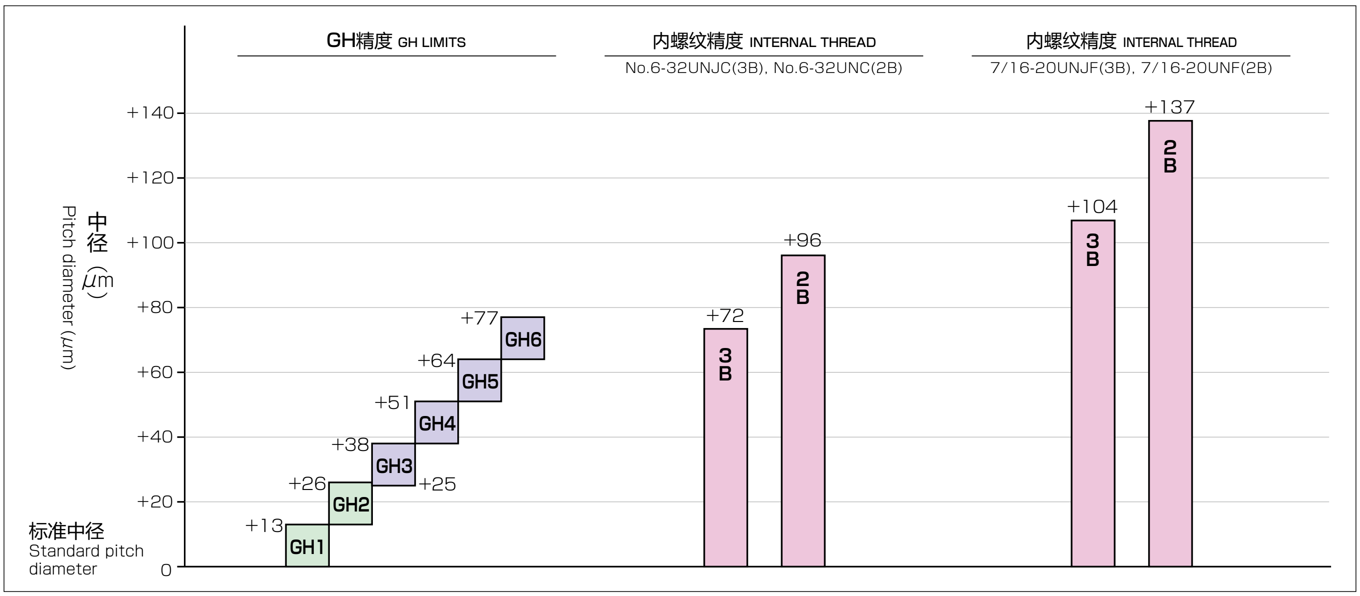
1. 精度栏　为加工 2 级内螺纹的丝锥推荐精度。
2. 加工3B 级内螺纹时，请使用完全同步进给(刚性攻丝)及铣刀夹头以防止内螺纹扩大的现象出现
3. 丝锥的精度不能够保证内螺纹的精度。
1. The recommended tap limit corresponds to JIS class 2 internal thread standard.
2. To machine 3B class internal threads, use synchronized feeding and a milling chuck as measures against the problem of enlarged internal threads.
3. TAP Limit does not guarantee thread limit for the internal thread after tapping.

GH精度(适用于美制螺纹)GH Limit (Only for Unified thread)

为了与高精度要求的飞机零件螺纹加工相对应，采用了比OH精度公差带更窄的GH精度
To machine threads for aircraft components that require high precision, we used GH precision,
which has a narrower tolerance than OH precision.

GH1, 2 GH1,2
上公差：0.013×n Upper tolerance : 0.013×n
下公差:上公差−0.013 Lower tolerance : (upper limit) −0.013
单位： mm Unit : mm (n=GH番号) (n=GH number)

GH3以上 GH3 over
上公差：0.013×(n-2)+0.025 Upper tolerance : 0.013×(n-2)+0.025
下公差:上公差−0.013 Lower tolerance : (upper limit)−0.013
单位：mm Unit : mm (n=GH 番号) (n=GH number)

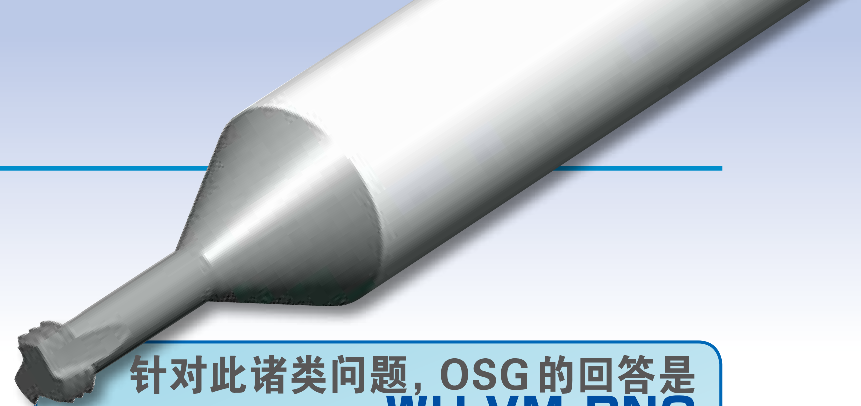


■切削条件基准表 Recommended Cutting Conditions

加工材料 WORK MATERIAL		切削速度 (m/min) Tapping Speed		切削油剂 CUTTING FLUIDS			
		WHR-NI-SFT	WHR-NI-POT	非水溶性 NON WATER-SOLUBLE	水溶性 (乳液) WATER-SOLUBLE	半干式 SEMI-DRY	干式 DRY
Ni基耐热合金 NICKEL ALLOYS	镍合金® Inconel®	1~3	2~4	◎	—	—	—

这个表中所示为通常情况下的选定基准，但使用条件会根据实际情况变更。
1.These are general recommendations which depending upon conditions, may be altered.

WH-VM-PNC的特点 Features



多样化的加工材料
Diversification of work materials

Ni基耐热合金以及超过50HRC 的高硬度材料以及脆性材料等的小径内螺纹很难加工

Due to the use of high-hardness materials exceeding 50HRC, heat-resistant steels, and even brittle materials, small-diameter internal threads are becoming increasingly difficult to machine.

加工机械的制约
Machining equipment constraints

随着超高速、高精度化，没有逆转功能的小型机床显露头角
小型加工中心开始展露头角

Along with the need for ultra-high speed and high precision operations, small machining centers without reverse function (tap cycles) have emerged.

内螺纹的高精度、高品位化
High precision and high quality of internal threads

『底孔没有余量』『没有毛刺的高品位』『高精度的内螺纹』等，对内螺纹的要求呈高难度化

The demands for internal threads are becoming increasingly difficult, such as "no room in pilot holes", "high quality with no burrs", and "high precision internal threads".

切削油剂的制约
Coolant constraints

普通丝锥用水溶性油剂对Ni基耐热合金进行加工非常困难

Standard taps have difficulty machining nickel-based alloys with water-soluble coolant.

针对此诸类问题，OSG的回答是 WH-VM-PNC

OSG's answer to counter these various problems is WH-VM-PNC.

1 螺纹长为3个牙，可减少切削抵抗，减轻对工具及机床的负担

The 3-crest thread length reduces cutting force and applies a low load to the tool and equipment.

2 能称手使用的40mm短全长

A short overall length of 40mm for superb ease of use.

3 采用在铣刀上使用的针对高硬度材的WXS涂层及专用硬质合金母材

It uses the WXS Coating, with a proven track record on end mills for high hardness materials, and an exclusive carbide base material.

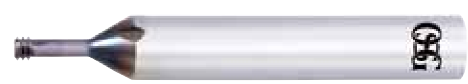
这里有新系列的产品值得您的信赖，可满足您的加工要求。

Here is a new lineup of products that you can trust for machining operations that ordinary taps are unable to satisfy.

小径NC螺纹铣刀® SMALL DIAMETER NC PLANET CUTTER®

NEW

WH-VM-PNC

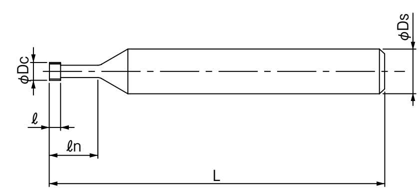


●材质 Tool Material: 超微粒子硬质合金 Micro Grain Carbide

●表面处理 Surface Treatment: WXS 涂层 WXS Coating

●螺旋角 Helix Angle: 11°

●柄径允许公差 Tolerance for Shank Diameter: h6



螺纹种类：M

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	螺距 Pitch	全长 L	螺纹长 ℓ	颈长 ℓn	柄径 Ds	槽数 Flutes	最小加工径 Min. Cutting Bore Dia.	库存 Stock
3900500	1.5	0.4	40	1.2	4.4	6	3	M2	B
3900501	1.9	0.45	40	1.4	5.6	6	3	M2.5, M2.6	B
3900502	2.4	0.5	40	1.5	6.5	6	3	M3	B
3900503	3.1	0.7	40	2.1	8.7	6	3	M4	B
3900504	4	0.8	40	2.4	10.8	6	3	M5	B

B＝标准在库品　　B＝Standard stock item.

1. WH-VM-PNC(M)是内螺纹专用工具。
2. 螺纹铣刀系列不推荐使用攻丝油膏。
3. 最大加工螺纹长=颈长

1. WH-VM-PNC (M) is available only for milling internal threads.
2. The use of tapping paste is not recommended with the Planet Cutter series.
3. Max. tapping length＝ℓn

螺纹种类：U・UNJ

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	牙数 T.P.I.	全长 L	螺纹长 ℓ	颈长 ℓn	柄径 Ds	槽数 Flutes	最小加工径 Min. Cutting Bore Dia.	库存 Stock
3900513	3.2	32	40	2.4	9.1	6	3	No.8	B

B＝标准在库品　　B＝Standard stock item.

1. WH-VM-PNC(U, UNJ)是内螺纹专用工具。
2. 螺纹铣刀系列不推荐使用攻丝油膏。
3. 最大加工螺纹长=颈长

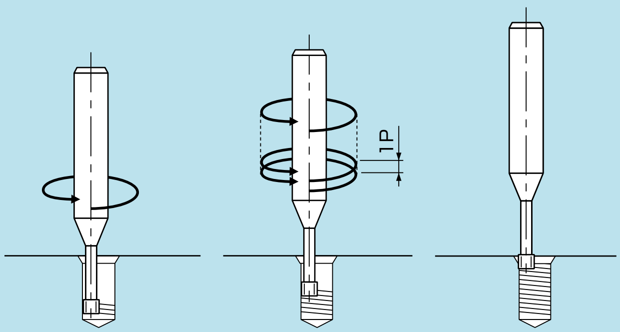
1. WH-VM-PNC (U, UNJ) is available only for milling internal threads.
2. The use of tapping paste is not recommended with the Planet Cutter series.
3. Max. tapping length＝ℓn

为了让小径螺纹铣刀能发挥更大优点

So that you can take full advantage of the small diameter Planet Cutter

加工方法(耐热合金/高硬度材)

Machining method (Heat resistant alloys/High hardness materials)



①螺纹的深处加工3个牙。

①Machine three pitches at the bottom of the hole.

②回转一分钟后向Z轴方向移动反复圆弧切削。

②Repeat arc cutting movement only 1P in the Z axial direction for each rotation.

③最后孔口加工后结束。

③To finish, machine the entrance of the hole.

■切削条件基准表 Recommended Cutting Conditions

加工材料 WORK MATERIAL		切削速度 Tapping Speed (m/min)	进给量 FEED (mm/t)
Ni基耐热合金 NICKEL ALLOYS	镍合金® Inconel®	20～60	0.01～0.03
钛合金 TITANIUM ALLOYS	Ti-6Al-4V	20～60	0.01～0.03

1. 此切削条件基准表适用于使用水溶性切削油剂的通常情况下。根据加工机器，加工回数的设定，无上述的限制。可广泛对应各种情况。
2. 根据工件刚性，机器及夹具的刚性，有必要改变切削条件。
3. 螺纹加工深度较深的情况以及螺距较大的情况下，请选择小进给量。
4. 加工后的平行内螺纹使用有锥度的通规，旋入时如有困难，请追加螺纹精加工工序。
5. 为延长刀具寿命，请在径方向分2-4次加工。

1. The Recommended Cutting Conditions are general conditions using water-soluble coolant. Depending on the machining equipment or the number of passes, the above conditions may not be applicable; they can be addressed in a wide range of ways.
2. Please adjust the cutting conditions depending on the rigidity of machine, tool holders, and workpiece clamping.
3. If the tapping length is long, or when machining a large-pitch thread, select a smaller feed and separate the machining process into a few segments.
4. If a machined parallel internal thread is tapered and prevents the go-gauge from going through, add a zero cut (finish machining).
5. To extend the tool life, separate the machining into 2～4 passes.

针对Inconel®718材料加工小径内螺纹

Machining small diameter internal threads with INCONEL®718

使用工具 Tool	3.2×2.4 U32	
加工材料 Work Material	Inconel718 (40HRC)	
切削速度 Cutting Speed	40m/min 3,980min⁻¹	60m/min 5,970min⁻¹
进给速度 Feed	120mm/min (0.03mm/t)	180mm/min (0.03mm/t)
内螺纹尺寸 Internal Thread	No.10-32 UNF	
底孔直径 Drill Hole Size	φ4.1×14mm (盲孔) (Blind)	
切削长度 Tapping Length	9mm(1.9D) (盲孔) (Blind)	
加工方法 Machining Method	顺铣 2·4加工回数 Down Cut 2·4 passes	
切削油剂 Coolant	水溶性切削油剂 Water Soluble	
使用机械 Machine	立式加工中心(HSK-A40)Vertical Machining Center	

■工具寿命 Tool life

切削速度 Cutting Speed	通过数 Passes	工具寿命 Tool life holes (孔Holes)	工具寿命 Tool life
40m/min	4	50孔 Holes	崩刃大 Extensive chipping of cutting edge
60m/min	4	60孔 Holes	崩刃大 Extensive chipping of cutting edge
60m/min	2	40孔 Holes	崩刃大 Extensive chipping of cutting edge

与丝锥相比，螺纹铣刀的切削条件制约小，不需要担心切屑的处理，切削油剂的润滑性以及螺纹加工是否稳定。在这个加工案例中，由于加工材料的价值昂贵，我们需要提高小径内螺纹加工的通过率。此外，通过调整进给量，加工回数以及变更切削油剂，也可实现更好的工具耐久性以及成本的削减。

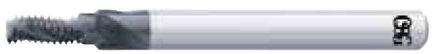
Compared to taps, Planet Cutters have fewer cutting condition limitations. There are no worries about chip management or coolant lubricity, and stable tapping is possible. In this example, we were able to improve the yield rate of small diameter internal threads in a high value workpiece. Further durability improvements and cost reductions can be expected by adjusting the feed rate and number of passes, and changing the cutting fluid.

NC螺纹铣刀® WX-PNC的特点 Features

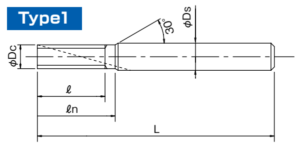
1. 使用水溶性切削油剂加工Ni基耐热合金等难加工材料成为可能！
Difficult materials, such as heat-resistant alloys, can also be machined by using water-soluble cutting solvents!
2. 使用小型机械来加工大径螺纹！
For tapping large-diameter threads on small machines!
3. 将切屑问题控制在最小化！
Minimizes problems associated with tapping chips!
4. 一把工具可以加工同样螺距不同外径的螺纹！
A single tool can be used to machine threads with multiple pitch diameters.
5. 耐密型良好的内螺纹加工！
For tapping airtight, internal threads!
6. 可加工底孔余量小的盲孔内螺纹！
For tapping threads in blind holes near the bottom of the hole.

NC螺纹铣刀® NC Planet cutter®

WX-PNC



Type1



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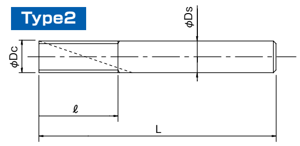

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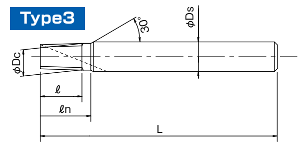

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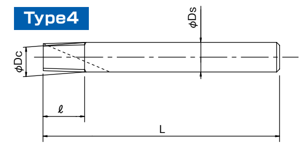


螺纹种类：M

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	螺距 Pitch	全长 L	螺纹长 ℓ	颈长 ℓn	柄径 Ds	槽数 Flutes	最小加工径 Min. Cutting Bore Dia.	形状 Type	库存 Stock
3900001	4.5	1	60	13	15	6	3	6	1	B
3900011	6	1	65	17	–	6	3	8	2	B
3900012	6	1.25	65	17.5	–	6	3	8	2	B
3900021	7.5	1	70	21	26	8	3	10	1	B
3900023	7.5	1.5	70	22.5	26	8	3	10	1	B
3900032	9.5	1.25	85	26.3	28	10	4	12	1	B
3900033	9.5	1.5	85	25.5	28	10	4	12	1	B
3900034	9.5	1.75	85	26.3	28	10	4	12	1	B
3900042	10	1	85	29	–	10	4	14	2	B
3900043	10	1.5	85	30	–	10	4	14	2	B
3900044	10	2	85	30	–	10	4	14	2	B
3900052	12	1	95	33	–	12	4	16	2	B
3900053	12	1.5	95	34.5	–	12	4	16	2	B
3900054	12	2	95	34	–	12	4	16	2	B
3900073	16	1.5	105	42	–	16	4	20	2	B
3900075	16	2.5	105	42.5	–	16	4	20	2	C
3900083	20	1.5	120	49.5	–	20	5	27	2	B
3900084	20	2	120	50	–	20	5	27	2	C
3900086	20	3	120	51	–	20	5	27	2	C

B,C＝标准在库品　B,C＝Standard stock item.

- **WX-PNC(M)是内螺纹专用工具。**
- WX-PNC (M) is available only for milling internal threads.

1. 最大加工螺纹长＝螺纹长　Max. tapping length＝ℓ

螺纹种类：U

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	牙数 T.P.I.	全长 L	螺纹长 ℓ	颈长 ℓn	柄径 Ds	槽数 Flutes	最小加工径 Min. Cutting Bore Dia.	形状 Type	库存 Stock
3900350	4.55	20	60	10.2	11.4	6	3	1/4	1	C
3900351	4.55	28	60	10	10.9	6	3	1/4	1	C
3900355	6.2	18	65	12.7	14.1	8	3	5/16	1	C
3900356	6.2	24	65	12.7	14.1	8	3	5/16	1	C
3900360	7.6	16	65	14.3	–	8	3	3/8	2	C
3900361	7.6	24	65	14.8	–	8	3	3/8	2	C
3900365	8.8	14	75	18.1	19.9	10	3	7/16	1	C
3900366	8.8	20	75	17.8	19.1	10	3	7/16	1	C
3900370	9.4	13	75	19.5	21.5	10	4	1/2	1	C
3900371	9.4	20	75	19.1	20.4	10	4	1/2	1	C
3900375	10.9	12	85	23.3	25.4	12	4	9/16	1	C
3900380	11.4	18	85	22.6	24	12	4	9/16	1	C
3900390	18.9	12	110	33.9	36	20	4	7/8	1	C

C＝标准在库品　C＝Standard stock item.

- **WX-PNC(U)是内螺纹专用工具。**
- WX-PNC (U) is available only for milling internal threads.

1. 最大加工螺纹长＝螺纹长　Max. tapping length＝ℓ

螺纹种类：R(PT)·Rc(PT)

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	牙数 T.P.I.	全长 L	螺纹长 ℓ	颈长 ℓn	柄径 Ds	槽数 Flutes	适用尺寸 Range of Thread Size	形状 Type	库存 Stock
3900201	7.5	28	60	9.1	12.7	8	3	1/8	3	B
3900211	10	19	75	14.7	–	10	4	1/4·3/8	4	B
3900214	12	14	85	20	–	12	4	1/2·3/4	4	B
3900218	20	11	95	27.7	–	20	5	1～2	4	C

B,C＝标准在库品　B,C＝Standard stock item.

1. 最大加工螺纹长＝螺纹长　Max. tapping length＝ℓ

螺纹种类：NPT

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	牙数 T.P.I.	全长 L	螺纹长 ℓ	柄径 Ds	槽数 Flutes	适用尺寸 Range of Thread Size	形状 Type	库存 Stock
3900259	5.9	27	60	10.3	6	3	1/16·1/8	4	B
3900261	10	18	75	15.5	10	4	1/4·3/8	4	B
3900265	16	14	85	20	16	4	1/2·3/4	4	C
3900268	20	11½	95	24.3	20	5	1～2	4	C

B,C＝标准在库品　B,C＝Standard stock item.

1. 最大加工螺纹长＝螺纹长　Max. tapping length＝ℓ

■切削条件基准表 Recommended Cutting Conditions

加工材料 WORK MATERIAL		切削速度 CUTTING SPEED (m/min)	进给量 FEED (mm/t)
Ni基耐热合金 NICKEL ALLOYS	镍合金® Inconel®	20～60	0.01～0.03
钛合金 TITANIUM ALLOYS	Ti-6Al-4V	20～60	0.02～0.06

1. 此切削条件基准表适用于使用水溶性切削油剂的通常情况下。
2. 根据工件刚性，机器及夹具的刚性，有必要改变切削条件。
3. 螺纹加工深度较深的情况以及螺距较大的情况下，请选择小进给量。
4. 加工后的平行内螺纹使用有锥度的通规，旋入时如有困难，请追加螺纹精加工工序。

1. The indicated speeds and feeds are for water soluble oil.
2. Please adjust the cutting conditions depending on the rigidity of machine, tool holders, and workpiece clamping.
3. If the tapping length is long, or when machining a large-pitch thread, select a smaller feed and separate the machining process into a few segments.
4. If a machined parallel internal thread is tapered and prevents the go-gauge from going through, add a zero cut (finish machining).

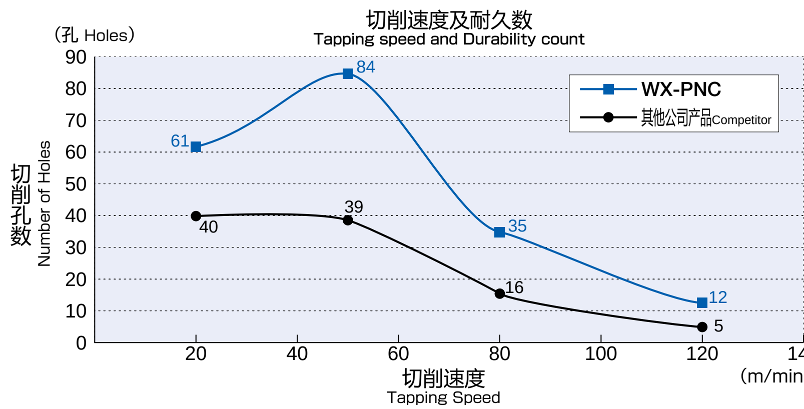
实现其他公司产品2倍的耐久性

It achieved twice the tool life of the competitor in INCONEL®718

使用工具 Tool	4.55×10.8 U20
加工材料 Work Material	INCONEL®718(43HRC) INCONEL®718(43HRC)
内螺纹尺寸 Internal Thread Size	1/4-20UNC
切削长度 Tapping Length	9mm
每刃进给量 Feed Per Tooth	0.03mm/t
切削油剂 Coolant	水溶性切削油剂 (10%) Water Soluble (10%)
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center

这是针对Inconel®718材料加工，使用不同切削速度的耐久性比较结果。以50m/min以下的切削速度加工，工具耐久性佳，是比较好的加工领域范围。WX-PNC不管切削速度如何，都是其它公司产品2倍的工具寿命。

These are the test results in INCONEL®718 at various cutting speeds. At cutting speeds under 50m/min, durability is better and this seems to be an effective machining range. The WX-PNC achieves twice the tool life of the competitor, no matter the cutting speed.



钛合金加工的性能比较

Performance in Titanium alloys

使用工具 Tool	4.55×10.8 U20
加工材料 Work Material	Ti-6Al-4V (32HRC)
切削速度 Cutting Speed	50m/min (3,500min^{-1})
进给速度 Feed	150mm/min (0.05mm/t)
内螺纹尺寸 Internal Thread	1/4-20UNC
底孔直径 Drill Hole Size	ϕ5.1×12mm (盲孔) (Blind)
内螺纹尺寸 Tapping Length	9mm(1.4D) (盲孔) (Blind)
加工方法 Machining Method	顺铣 Down Cut
切削油剂 Coolant	水溶性切削油剂 Water Soluble
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

■工具寿命比较 Comparison of tool life

丝锥 Taps	加工孔数 Tool life holes (孔Holes) 1,000 2,000	工具寿命 Tool life
WX-PNC	2,494孔 Holes	可继续加工 Continue
其他公司 Competitor	439孔 Holes	过早折损 Damege

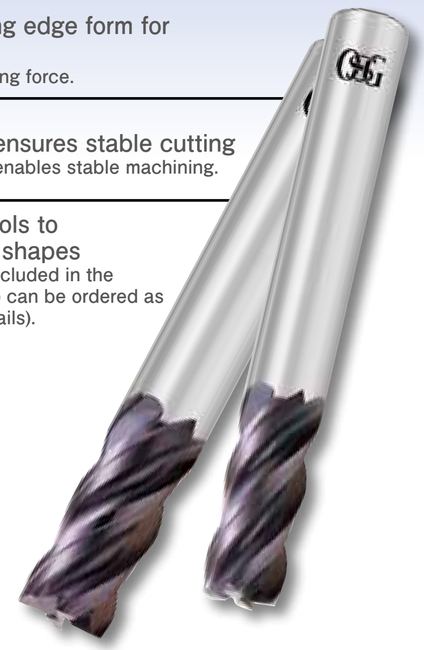
加工2,494孔后的照片
Photo of after machining 2,494 holes

加工2494个孔后，刃尖摩耗小，可继续加工。

After cutting 2,494 holes, wear of cutting edge is small.
It is possible to make more threads.

不等距导程铣刀 NEO 系列的特点

Features of Variable-Lead End Mill NEO Series



1 独特的正前角刃形针对Ni基耐热合金加工
实现降低切削热，降低切削抵抗。

Proprietary positive cutting edge form for nickel-based alloys
It reduces cutting heat and cutting force.

2 采用不等距导程设计，实现稳定切削
发挥防振效果，可实现稳定加工。

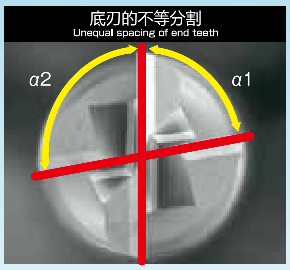
The variable lead shape ensures stable cutting
The vibration absorption effect enables stable machining.

3 丰富的产品线适合不同的加工形状
标准品(P16-P18)中没有的尺寸可制作非标品。(可参照以下内容)

An abundant variety of tools to accommodate machining shapes
Sizes and shapes that are not included in the standard lineup (pages 16 to 18) can be ordered as special items (see below for details).

此形状可抑制跳动 !!

This shape suppresses chattering!!



-ADVANCED NEO-

为需要更长工具寿命的客户而制作 特殊对应事例

for the customers who demand even longer tool life - Exaple of sepcially made tools

最适合的刃数、涂层、母材的选择，实现了令人惊讶的耐久性。请不用犹豫的联系我们。

Astonishing durability can be achieved through the selection of the ideal number of flutes, coatings, and base materials. Please feel free to contact us.

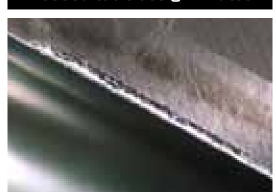
实现最佳规格

Implementation of the ideal method

使用工具 Tool	φ12 (特殊品) (8刃) (Special Order Product)(Flutes)
加工材料 Work Material	Inconel718 (46HRC)
加工方法 Milling Method	侧面切削 Side Milling
切削速度 Milling Speed	1,326min^{-1} (50m/min)
进给速度 Feed	530mm/min(0.05mm/t)
切削深度 Milling Depth	ap=7mm(0.58D) ae=1mm(0.08D)
切削油剂 Coolant	水溶性切削油剂(20倍) Water Soluble(5%)
使用机械 Machine	卧式加工中心(BT40) Vertical Machining Center

[同样刃数的比较 Comprison in same number of flutes]

最适规格品 8刃
Most suitable design Flutes



切削长度 8.12m
Milling Length 8.12m

传统规格品 A 8刃
Conventional design A Flutes

切削长度 8.12m
Milling Length8.12m

传统规格品 B 8刃
Conventional design B Flutes

切削长度 8.12m
Milling Length 8.12m

不仅仅是刃数多，比起以前的规格有着惊人的寿命

There are not just more flutes, the durability is dramatically increased over the conventional method.

■最适规格的提案！ We suggest the ideal method!

刃数 Z

重视寿命的刃形形状
Cutting edge shape for durability

外径 Dc 以上 More	外径 Dc 小于 Less	刃数 Z
φ10	φ12	6枚刃以下
φ12	φ16	8枚刃以下
φ16	φ20	10枚刃以下
φ20	φ25	12枚刃以下
φ25	—	14枚刃以下

※每种尺寸请根据上述刃数对应用途来选择。
※We select the number of flutes for each size as indicated above.

涂层 Coating

标准品 FX 涂层以外，还有 WXS、WXL、TiAlN、SS 及 V 涂层可供选择。

In addition to the standard FX products, we select from WXS, WXL, TiAlN, SS and V Coating.

母材 Base Materials

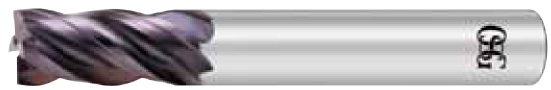
请咨询我社营业人员。

Please contact our sales staff.

不等距导程铣刀 短刃形　4刃
Variable - Lead End Mill Short Four Flute

畅销产品
Best Seller

NEO-PHS



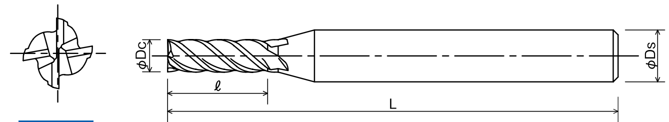
●材质　超微粒子硬质合金
Tool Material　Micro Grain Carbide

●表面处理　FX 涂层（TiAlN 涂层）
Surface Treatment　FX Coating（TiAlN Coating）

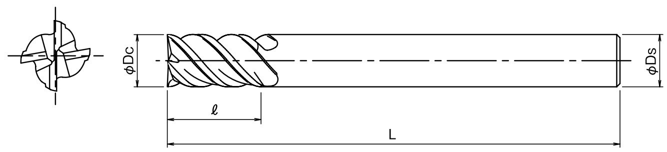
●外径允许公差　Dc≦12　0～−0.02mm
Tolerance for Outer Diameter　12＜Dc　0～−0.03mm

●螺旋角　36°/39°
Helix Angle

Type1



Type2



单位:mm　Unit:mm

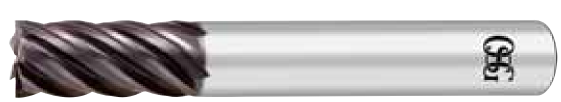
商品号 EDP No.	外径 Dc	全长 L	刃长 ℓ	柄径 Ds	形状 Type	库存 Stock
8529230	3	50	6	6	1	B
8529240	4	50	8	6	1	B
8529250	5	50	10	6	1	B
8529260	6	50	12	6	2	B
8529280	8	60	16	8	2	B
8529300	10	70	20	10	2	B
8529320	12	75	24	12	2	B
8529360	16	100	32	16	2	B
8529400	20	105	40	20	2	B
8529450	25	120	50	25	2	B

B=标准库存品　　B=Standard stock item.

不等距导程铣刀 短刃形　6刃
Variable - Lead End Mill Short Six Flute

畅销产品
Best Seller

NEO-EMS

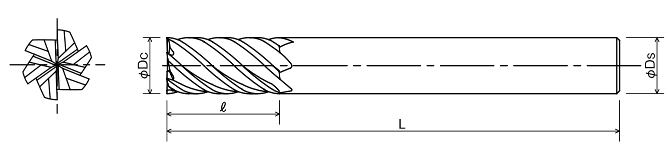


●材质　超微粒子硬质合金
Tool Material　Micro Grain Carbide

●表面处理　FX 涂层（TiAlN 涂层）
Surface Treatment　FX Coating（TiAlN Coating）

●外径允许公差　Dc≦16　0～−0.02mm
Tolerance for Outer Diameter　16＜Dc　0～−0.03mm

●螺旋角　37°/38°/39°
Helix Angle



单位:mm　Unit:mm

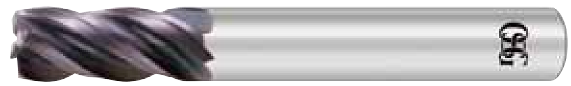
商品号 EDP No.	外径 Dc	全长 L	刃长 ℓ	柄径 Ds	库存 Stock
8519360	6	50	12	6	B
8519380	8	60	16	8	B
8519400	10	70	20	10	B
8519420	12	75	24	12	B
8519460	16	100	32	16	B
8519500	20	105	40	20	B
8519550	25	120	50	25	B

B=标准库存品　　B=Standard stock item.

不等距导程铣刀 短刃圆弧角 4刃
Variable - Lead End Mill Short Bull Nose Four Flute

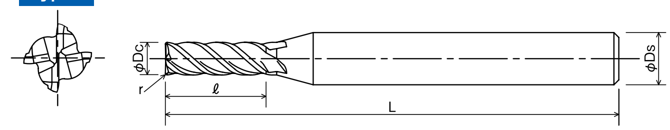
畅销产品 Best Seller

NEO-CR-PHS

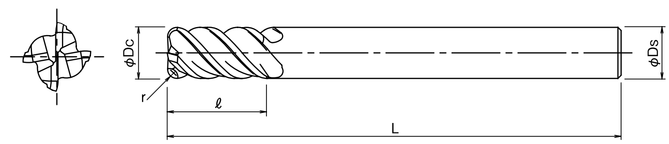


- **材质** Tool Material: 超微粒子硬质合金 Micro Grain Carbide
- **表面处理** Surface Treatment: FX 涂层（TiAlN 涂层） FX Coating（TiAlN Coating）
- **外径允许公差** Tolerance for Outer Diameter: Dc≦12 0～−0.02mm; 12＜Dc 0～−0.03mm
- **螺旋角** Helix Angle: 36°/39°

Type1



Type2



单位:mm Unit:mm

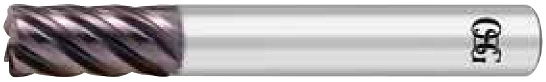
商品号 EDP No.	外径×角半径 Dc × r	全长 L	刃长 ℓ	柄径 Ds	形状 Type	库存 Stock
8529531	3 × R0.2	50	6	6	1	B
8529533	3 × R0.5	50	6	6	1	B
8529541	4 × R0.2	50	8	6	1	B
8529543	4 × R0.5	50	8	6	1	B
8529545	4 × R1	50	8	6	1	B
8529551	5 × R0.2	50	10	6	1	B
8529553	5 × R0.5	50	10	6	1	B
8529555	5 × R1	50	10	6	1	B
8529562	6 × R0.3	50	12	6	2	B
8529563	6 × R0.5	50	12	6	2	B
8529565	6 × R1	50	12	6	2	B
8529582	8 × R0.3	60	16	8	2	B
8529583	8 × R0.5	60	16	8	2	B
8529585	8 × R1	60	16	8	2	B
8529587	8 × R1.5	60	16	8	2	B
8529589	8 × R2	60	16	8	2	B
8529602	10 × R0.3	70	20	10	2	B
8529603	10 × R0.5	70	20	10	2	B
8529605	10 × R1	70	20	10	2	B
8529607	10 × R1.5	70	20	10	2	B
8529609	10 × R2	70	20	10	2	B
8529613	10 × R3	70	20	10	2	B
8529633	12 × R0.5	75	24	12	2	B
8529635	12 × R1	75	24	12	2	B
8529637	12 × R1.5	75	24	12	2	B
8529639	12 × R2	75	24	12	2	B
8529643	12 × R3	75	24	12	2	B
8529662	16 × R1	100	32	16	2	B
8529663	16 × R1.5	100	32	16	2	B
8529664	16 × R2	100	32	16	2	B
8529665	16 × R3	100	32	16	2	B
8529682	20 × R1	105	40	20	2	B
8529684	20 × R2	105	40	20	2	B
8529685	20 × R3	105	40	20	2	B
8529686	20 × R4	105	40	20	2	B
8529687	20 × R5	105	40	20	2	B
8529702	25 × R1	120	50	25	2	B
8529704	25 × R2	120	50	25	2	B
8529705	25 × R3	120	50	25	2	B
8529706	25 × R4	120	50	25	2	B
8529707	25 × R5	120	50	25	2	B

B=标准库存品　　B=Standard stock item.

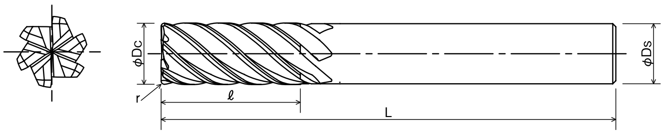
不等距导程铣刀 短刃圆弧角 6刃
Variable - Lead End Mill Short Bull Nose Six Flute

畅销产品 Best Seller

NEO-CR-EMS



- ●材质 Tool Material: 超微粒子硬质合金 Micro Grain Carbide
- ●表面处理 Surface Treatment: FX 涂层（TiAlN 涂层） FX Coating（TiAlN Coating）
- ●外径允许公差 Tolerance for Outer Diameter: Dc≦16 0～−0.02mm; 16＜Dc 0～−0.03mm
- ●螺旋角 Helix Angle: 37° /38° /39°



单位:mm Unit:mm

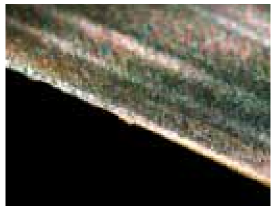
商品号 EDP No.	外径×角半径 Dc × r	全长 L	刃长 ℓ	柄径 Ds	库存 Stock
8519662	6 × R0.3	50	12	6	B
8519663	6 × R0.5	50	12	6	B
8519665	6 × R1	50	12	6	B
8519682	8 × R0.3	60	16	8	B
8519683	8 × R0.5	60	16	8	B
8519685	8 × R1	60	16	8	B
8519687	8 × R1.5	60	16	8	B
8519689	8 × R2	60	16	8	B
8519702	10 × R0.3	70	20	10	B
8519703	10 × R0.5	70	20	10	B
8519705	10 × R1	70	20	10	B
8519707	10 × R1.5	70	20	10	B
8519709	10 × R2	70	20	10	B
8519713	10 × R3	70	20	10	B
8519733	12 × R0.5	75	24	12	B
8519735	12 × R1	75	24	12	B
8519737	12 × R1.5	75	24	12	B
8519739	12 × R2	75	24	12	B
8519743	12 × R3	75	24	12	B
8519762	16 × R1	100	32	16	B
8519763	16 × R1.5	100	32	16	B
8519764	16 × R2	100	32	16	B
8519765	16 × R3	100	32	16	B
8519782	20 × R1	105	40	20	B
8519784	20 × R2	105	40	20	B
8519785	20 × R3	105	40	20	B
8519786	20 × R4	105	40	20	B
8519787	20 × R5	105	40	20	B
8519802	25 × R1	120	50	25	B
8519804	25 × R2	120	50	25	B
8519805	25 × R3	120	50	25	B
8519806	25 × R4	120	50	25	B
8519807	25 × R5	120	50	25	B

B=标准库存品　　B=Standard stock item.

加工事例 Cutting Data

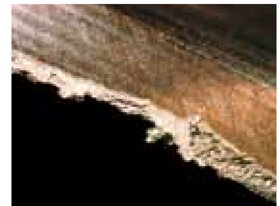
比起传统产品，显示超群的耐久性
Superb durability against conventional tool

使用工具 Tool	NEO-PHS φ10
加工材料 Work Material	Inconel718 (46HRC)
加工方法 Milling Method	侧面切削 Side Milling
切削速度 Milling Speed	1,300min^{-1} (41m/min)
进给速度 Feed	210mm/min(0.04mm/t)
切削深度 Milling Depth	ap=15mm(1.5D) ae=0.5mm(0.05D)
切削油剂 Coolant	水溶性切削油剂(20倍) Water Soluble(5%)
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

NEO-PHS

切削长度 1.8m
Milling Length 1.8m

传统产品 **A** Conventional tool A

切削长度 1.8m
Milling Length 1.8m

传统产品 **B** Conventional tool B

切削长度 0.6m
Milling Length 0.6m

与传统产品相比，显示了更优异的耐久性能！
This end mill possesses extraordinary durability compared to conventional products.

采用难加工材料加工最适合的刃形（正前角刃形），实现稳定的加工
Using the ideal cutting edge (positive edge form)for cutting difficult-to mashine materials, stable mashining can be achieved

使用工具 Tool	NEO-PHS φ10
加工材料 Work Material	Inconel718 (46HRC)
加工方法 Milling Method	侧面切削 Side Milling
切削速度 Milling Speed	1,300min^{-1} (40m/min)
进给速度 Feed	210mm/min(0.04mm/t)
切削深度 Milling Depth	ap=15mm(1.5D) ae=0.5mm(0.05D)
切削油剂 Coolant	水溶性切削油剂(20倍) Water Soluble(5%)
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

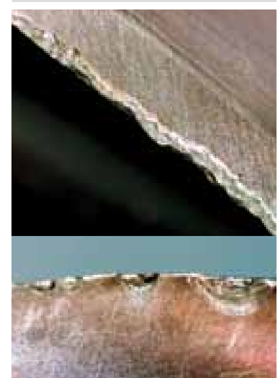
与其他公司产品相比，外周刃不会发生崩刃，可实现稳定的切削。
Chipping of the outer cutting edge does not happen as with the competitor's product, making stable cutting possible.

NEO-PHS

切削长度 4.8m
Milling Length 4.8m

其他公司 **A** Competitor A

切削长度 4.8m
Milling Length 4.8m

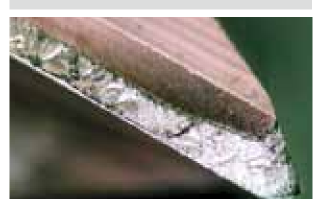
其他公司 **B** Competitor B

切削长度 3.0m
Milling Length 3.0m

即使在不等导程效果较弱的φ6刀具下也能获得长寿命
Long tool life even on 6mm diameter which is difficult to show the advantage of uneven helix angle

使用工具 Tool	NEO-PHS φ6
被削材质 Work Material	Inconel®718 (46HRC)
加工方法 Milling Method	侧面切削 Side Milling
切削速度 Milling Speed	2,100min^{-1} (40m/min)
进给速度 Feed	250mm/min(0.03mm/t)
切削深度 Milling Depth	ap=9mm(1.5D) ae=0.3mm(0.05D)
切削油剂 Coolant	水溶性切削油剂(20倍) Water Soluble(5%)
使用机械 Machine	立式加工中心(BT30) Vertical Machining Center

NEO-PHS

切削长度 4.4m
Milling Length 4.4m

其他公司 Competitor

切削长度 4.4m
Milling Length 4.4m

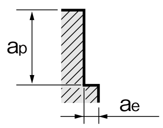
其他公司产品随着磨损的发生产生了溶着现象。NEO-PHS的磨损小，刃尖状态依旧良好。
The competition showed welding after progressed wear.
NEO-PHS showed minimum wear, still sharp edges.

NEO-PHS NEO-CR-PHS

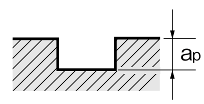
■侧面切削 Side Milling　　　■槽切削 Slotting

加工材料 WORK MATERIAL	Ni基耐热合金钢 镍合金® HEAT RESISTANT ALLOY STEELS· INCONEL® (侧面切削)		钛合金 TITANIUM ALLOY STEELS (45～55HRC) (侧面切削)		不锈钢 STAINLESS STEELS SUS630 (侧面切削)		Ni基耐热合金钢 镍合金® HEAT RESISTANT ALLOY STEELS· INCONEL® (槽切削)		钛合金 TITANIUM ALLOY STEELS (45～55HRC) (槽切削)		不锈钢 STAINLESS STEELS SUS630 (槽切削)	
尺寸 MILL DIA. (mm)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)
3	3,800	220	7,400	545	7,400	545	2,500	125	7,200	440	7,200	440
4	3,000	240	5,850	630	5,850	630	1,900	135	5,400	495	5,400	495
5	2,450	245	4,800	670	4,800	670	1,500	145	4,300	535	4,300	535
6	2,100	250	4,050	695	4,050	695	1,250	145	3,600	545	3,600	545
8	1,600	225	3,050	675	3,050	675	945	155	2,700	510	2,700	510
10	1,250	215	2,450	635	2,450	635	760	145	2,150	455	2,150	455
12	1,050	210	2,050	605	2,050	605	630	145	1,800	435	1,800	435
16	765	210	1,550	505	1,550	505	475	110	1,350	365	1,350	365
20	635	200	1,250	460	1,250	460	380	110	1,100	330	1,100	330
25	510	185	990	395	990	395	300	105	865	235	865	235

切深量 DEPTH OF CUT



ap	ae
≦1.5D	≦0.05D



ap
≦0.2D

1.请使用精度高、刚性好的设备和夹具、
2.请根据切深量、设备刚性等情况可适当调整转速、进给速度。
3.请使用不易产生烟雾的切削油剂。
4.干式加工时使用空气冷却强制排屑。

1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the cutting depth is large or when machines with low rigidity are used.
3. Please use a suitable fluid with high smoke retardant properties.
4. During Dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.

⚠ 刀具易在加工中发热，产生火花，有发生火灾的危险性，请确保尽可能最好防火措施。
该切削条件基准表适用于高速高精度加工中心。

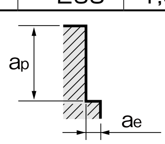
Caution: Sparks generated during operation or heat caused by tool breakage can cause fire.
Be sure to use all proper fire-prevention measures.
The conditions below are for high speed / high precision machining centers.

NEO-EMS NEO-CR-EMS

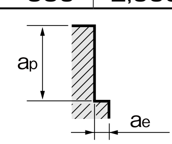
■侧面切削 Side Milling　　　■高速侧面切削 HIGH SPEED SIDE MILLING

加工材料 WORK MATERIAL	Ni基耐热合金钢 镍合金® HEAT RESISTANT ALLOY STEELS· INCONEL® (侧面切削)		钛合金 TITANIUM ALLOY STEELS (45～55HRC) (侧面切削)		不锈钢 STAINLESS STEELS SUS630 (侧面切削)		Ni基耐热合金钢 镍合金® HEAT RESISTANT ALLOY STEELS· INCONEL® (高速侧面切削)		钛合金 TITANIUM ALLOY STEELS (45～55HRC) (高速侧面切削)		不锈钢 STAINLESS STEELS SUS630 (高速侧面切削)	
尺寸 MILL DIA. (mm)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)	转速 SPEED (min-1)	进给速度 FEED (mm/min)
6	2,200	360	4,300	1,050	4,300	1,050	4,300	745	8,350	2,100	8,350	2,100
8	1,650	330	3,200	1,000	3,200	1,000	3,250	675	6,250	2,050	6,250	2,050
10	1,350	310	2,600	925	2,600	925	2,600	640	5,050	1,900	5,050	1,900
12	1,100	305	2,150	875	2,150	875	2,150	625	4,200	1,800	4,200	1,800
16	835	305	1,600	735	1,600	735	1,650	620	3,150	1,500	3,150	1,500
20	670	300	1,300	665	1,300	665	1,300	610	2,550	1,350	2,550	1,350
25	535	265	1,050	575	1,050	575	1,050	550	2,000	1,150	2,000	1,150

切深量 DEPTH OF CUT



ap	ae
≦1.5D	≦0.05D



ap	ae
≦1D	≦0.02D ae MAX=0.5mm

1.请使用精度高、刚性好的设备和夹具、
2.请根据切深量、设备刚性等情况可适当调整转速、进给速度。
3.请使用不易产生烟雾的切削油剂。
4.干式加工时使用空气冷却强制排屑。

1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the cutting depth is large or when machines with low rigidity are used.
3. Please use a suitable fluid with high smoke retardant properties.
4. During Dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.

最适于Ni基合金、耐热合金加工用高速钢钻头

The VPH-GDS HSS Drills are ideal for nickel-based alloys
and heat-resistant alloys

VPH-GDS

1 采用高级粉末高速钢 Application of high quality powdered HSS

耐摩耗性优异 Excellent wear resistance

2 锋利的切削刃 Sharp cutting edge

抑制加工中发生的切削热，切屑生成稳定 Generation of cutting heat is suppressed Creating stable cutting chips

3 短刃形，提高工具刚性。 Stub form is used for better tool rigidity

抑制崩刃及折损 Improved chipping-resistance and breakage-resistance

不仅仅适用于调制钢、铸铁，也适用于耐热合金、钛合金的粉末高速钢钻头。

由于耐热合金在北美的巨大市场，VPH-GDS在北美取得了很好的业绩。

Powdered metallurgy HSS drills are suited for not only tempered steels and cast iron, but also heat resistant alloys and titanium alloys.
This drill has a proven track record in North America, which has an enormous market for heat resistant alloys.

VP-黄金钻头 调制钢用粉末高速钢 短刃形

VP-Gold Drill Powder HSS Stub for Hardened Steel

畅销产品 Best Seller

VPH-GDS

●材质 Tool Material: 粉末高速钢 High grade Powder Metallurgy HSS (XPM)

●表面处理 Surface Treatment: V涂层／WDI®涂层※ V Coating / WDI® Coating

※2008年10月后逐步替换为WDI涂层。
Start manufacturing with WDI Coating from october 2008.

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8599005	0.5	3	38	3	D
8608051	0.51	3	38	3	D
8608052	0.52	3	38	3	D
8608053	0.53	3	38	3	D
8608054	0.54	3.5	38	3	D
8608055	0.55	3.5	38	3	D
8608056	0.56	3.5	38	3	D
8608057	0.57	3.5	38	3	D
8608058	0.58	3.5	38	3	D
8608059	0.59	3.5	38	3	D

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8599006	0.6	3.5	38	3	D
8608061	0.61	4	38	3	D
8608062	0.62	4	38	3	D
8608063	0.63	4	38	3	D
8608064	0.64	4	38	3	D
8608065	0.65	4	38	3	D
8608066	0.66	4	38	3	D
8608067	0.67	4	38	3	D
8608068	0.68	4.5	38	3	D
8608069	0.69	4.5	38	3	D

C = 标准库存品　C = Standard stock item
D = 库存中心标准在库品　D = Inventory center stock item

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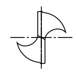
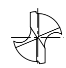
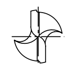
畅销产品 Best Seller



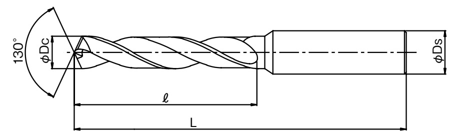
四棱式横刃
Four Facet point
(Dc≦1.5)



X形横刃
X thinning
(1.5＜Dc＜4)



R形横刃
R thinning
(Dc≧4)



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单位:mm　Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8599007	0.7	4.5	38	3	D
8608071	0.71	4.5	38	3	D
8608072	0.72	4.5	38	3	D
8608073	0.73	4.5	38	3	D
8608074	0.74	4.5	38	3	D
8608075	0.75	4.5	38	3	D
8608076	0.76	5	38	3	D
8608077	0.77	5	38	3	D
8608078	0.78	5	38	3	D
8608079	0.79	5	38	3	D
8599008	0.8	5	38	3	D
8608081	0.81	5	38	3	D
8608082	0.82	5	38	3	D
8608083	0.83	5	38	3	D
8608084	0.84	5	38	3	D
8608085	0.85	5	38	3	D
8608086	0.86	5.5	38	3	D
8608087	0.87	5.5	38	3	D
8608088	0.88	5.5	38	3	D
8608089	0.89	5.5	38	3	D
8599009	0.9	5.5	38	3	D
8608091	0.91	5.5	38	3	D
8608092	0.92	5.5	38	3	D
8608093	0.93	5.5	38	3	D
8608094	0.94	5.5	38	3	D
8608095	0.95	5.5	38	3	D
8608096	0.96	6	38	3	D
8608097	0.97	6	38	3	D
8608098	0.98	6	38	3	D
8608099	0.99	6	38	3	D
8599010	1	6	38	3	D
8608101	1.01	6	38	3	D
8608102	1.02	6	38	3	D
8608103	1.03	6	38	3	D
8608104	1.04	6	38	3	D
8608105	1.05	6	38	3	D
8608106	1.06	6	38	3	D
8608107	1.07	7	39	3	D
8608108	1.08	7	39	3	D
8608109	1.09	7	39	3	D
8599011	1.1	7	39	3	D
8608111	1.11	7	39	3	D
8608112	1.12	7	39	3	D
8608113	1.13	7	39	3	D
8608114	1.14	7	39	3	D
8608115	1.15	7	39	3	D

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608116	1.16	7	39	3	D
8608117	1.17	7	39	3	D
8608118	1.18	7	39	3	D
8608119	1.19	8	40	3	D
8599012	1.2	8	40	3	D
8608121	1.21	8	40	3	D
8608122	1.22	8	40	3	D
8608123	1.23	8	40	3	D
8608124	1.24	8	40	3	D
8608125	1.25	8	40	3	D
8608126	1.26	8	40	3	D
8608127	1.27	8	40	3	D
8608128	1.28	8	40	3	D
8608129	1.29	8	40	3	D
8599013	1.3	8	40	3	D
8608131	1.31	8	40	3	D
8608132	1.32	8	40	3	D
8608133	1.33	9	41	3	D
8608134	1.34	9	41	3	D
8608135	1.35	9	41	3	D
8608136	1.36	9	41	3	D
8608137	1.37	9	41	3	D
8608138	1.38	9	41	3	D
8608139	1.39	9	41	3	D
8599014	1.4	9	41	3	D
8608141	1.41	9	41	3	D
8608142	1.42	9	41	3	D
8608143	1.43	9	41	3	D
8608144	1.44	9	41	3	D
8608145	1.45	9	41	3	D
8608146	1.46	9	41	3	D
8608147	1.47	9	41	3	D
8608148	1.48	9	41	3	D
8608149	1.49	9	41	3	D
8599015	1.5	9	41	3	D
8608151	1.51	10	42	3	D
8608152	1.52	10	42	3	D
8608153	1.53	10	42	3	D
8608154	1.54	10	42	3	D
8608155	1.55	10	42	3	D
8608156	1.56	10	42	3	D
8608157	1.57	10	42	3	D
8608158	1.58	10	42	3	D
8608159	1.59	10	42	3	D
8599016	1.6	10	42	3	D
8608161	1.61	10	42	3	D

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C = 标准库存品　　C = Standard stock item
D = 库存中心标准在库品　　D = Inventory center stock item

畅销产品 Best Seller

VPH-GDS

●材质 Tool Material — 粉末高速钢 High grade Powder Metallurgy HSS (XPM)

●表面处理 Surface Treatment — V涂层／WDI®涂层※ V Coating / WDI® Coating

※2008年10月后逐步替换为WDI涂层。
Start manufacturing with WDI Coating from october 2008.

FROM 转上页

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608162	1.62	10	42	3	D
8608163	1.63	10	42	3	D
8608164	1.64	10	42	3	D
8608165	1.65	10	42	3	D
8608166	1.66	10	42	3	D
8608167	1.67	10	42	3	D
8608168	1.68	10	42	3	D
8608169	1.69	10	42	3	D
8599017	1.7	10	42	3	D
8608171	1.71	11	43	3	D
8608172	1.72	11	43	3	D
8608173	1.73	11	43	3	D
8608174	1.74	11	43	3	D
8608175	1.75	11	43	3	D
8608176	1.76	11	43	3	D
8608177	1.77	11	43	3	D
8608178	1.78	11	43	3	D
8608179	1.79	11	43	3	D
8599018	1.8	11	43	3	D
8608181	1.81	11	43	3	D
8608182	1.82	11	43	3	D
8608183	1.83	11	43	3	D
8608184	1.84	11	43	3	D
8608185	1.85	11	43	3	D
8608186	1.86	11	43	3	D
8608187	1.87	11	43	3	D
8608188	1.88	11	43	3	D
8608189	1.89	11	43	3	D
8599019	1.9	11	43	3	D
8608191	1.91	12	44	3	D
8608192	1.92	12	44	3	D
8608193	1.93	12	44	3	D
8608194	1.94	12	44	3	D
8608195	1.95	12	44	3	D
8608196	1.96	12	44	3	D
8608197	1.97	12	44	3	D
8608198	1.98	12	44	3	D
8608199	1.99	12	44	3	D
8599020	2	12	44	3	C
8608201	2.01	12	44	3	D
8608202	2.02	12	44	3	D
8608203	2.03	12	44	3	D
8608204	2.04	12	44	3	D
8608205	2.05	12	44	3	D

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608206	2.06	12	44	3	D
8608207	2.07	12	44	3	D
8608208	2.08	12	44	3	D
8608209	2.09	12	44	3	D
8599021	2.1	12	44	3	C
8608211	2.11	12	44	3	D
8608212	2.12	12	44	3	D
8608213	2.13	13	45	3	D
8608214	2.14	13	45	3	D
8608215	2.15	13	45	3	D
8608216	2.16	13	45	3	D
8608217	2.17	13	45	3	D
8608218	2.18	13	45	3	D
8608219	2.19	13	45	3	D
8599022	2.2	13	45	3	C
8608221	2.21	13	45	3	D
8608222	2.22	13	45	3	D
8608223	2.23	13	45	3	D
8608224	2.24	13	45	3	D
8608225	2.25	13	45	3	D
8608226	2.26	13	45	3	D
8608227	2.27	13	45	3	D
8608228	2.28	13	45	3	D
8608229	2.29	13	45	3	D
8599023	2.3	13	45	3	C
8608231	2.31	13	45	3	D
8608232	2.32	13	45	3	D
8608233	2.33	13	45	3	D
8608234	2.34	13	45	3	D
8608235	2.35	13	45	3	D
8608236	2.36	13	45	3	D
8608237	2.37	14	46	3	D
8608238	2.38	14	46	3	D
8608239	2.39	14	46	3	D
8599024	2.4	14	46	3	C
8608241	2.41	14	46	3	D
8608242	2.42	14	46	3	D
8608243	2.43	14	46	3	D
8608244	2.44	14	46	3	D
8608245	2.45	14	46	3	D
8608246	2.46	14	46	3	D
8608247	2.47	14	46	3	D
8608248	2.48	14	46	3	D
8608249	2.49	14	46	3	D

C = 标准库存品　C = Standard stock item
D = 库存中心标准在库品　D = Inventory center stock item

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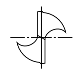
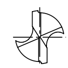
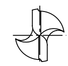
畅销产品 Best Seller



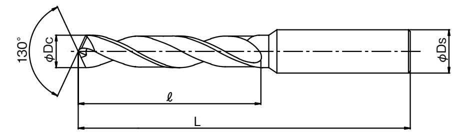
四棱式横刃
Four Facet point
(Dc≦1.5)



X形横刃
X thinning
(1.5<Dc<4)



R形横刃
R thinning
(Dc≧4)



FROM 转上页

单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8599025	2.5	14	46	3	C
8608251	2.51	14	46	3	D
8608252	2.52	14	46	3	D
8608253	2.53	14	46	3	D
8608254	2.54	14	46	3	D
8608255	2.55	14	46	3	D
8608256	2.56	14	46	3	D
8608257	2.57	14	46	3	D
8608258	2.58	14	46	3	D
8608259	2.59	14	46	3	D
8599026	2.6	14	46	3	C
8608261	2.61	14	46	3	D
8608262	2.62	14	46	3	D
8608263	2.63	14	46	3	D
8608264	2.64	14	46	3	D
8608265	2.65	14	46	3	D
8608266	2.66	16	48	3	D
8608267	2.67	16	48	3	D
8608268	2.68	16	48	3	D
8608269	2.69	16	48	3	D
8599027	2.7	16	48	3	C
8608271	2.71	16	48	3	D
8608272	2.72	16	48	3	D
8608273	2.73	16	48	3	D
8608274	2.74	16	48	3	D
8608275	2.75	16	48	3	D
8608276	2.76	16	48	3	D
8608277	2.77	16	48	3	D
8608278	2.78	16	48	3	D
8608279	2.79	16	48	3	D
8599028	2.8	16	48	3	C
8608281	2.81	16	48	3	D
8608282	2.82	16	48	3	D
8608283	2.83	16	48	3	D
8608284	2.84	16	48	3	D
8608285	2.85	16	48	3	D
8608286	2.86	16	48	3	D
8608287	2.87	16	48	3	D
8608288	2.88	16	48	3	D
8608289	2.89	16	48	3	D
8599029	2.9	16	48	3	C
8608291	2.91	16	48	3	D
8608292	2.92	16	48	3	D
8608293	2.93	16	48	3	D
8608294	2.94	16	48	3	D
8608295	2.95	16	48	3	D
8608296	2.96	16	48	3	D
8608297	2.97	16	48	3	D
8608298	2.98	16	48	3	D
8608299	2.99	16	48	3	D
8599030	3	16	48	3	C
8608301	3.01	18	50	4	D
8608302	3.02	18	50	4	D
8608303	3.03	18	50	4	D
8608304	3.04	18	50	4	D
8608305	3.05	18	50	4	D
8608306	3.06	18	50	4	D
8608307	3.07	18	50	4	D
8608308	3.08	18	50	4	D
8608309	3.09	18	50	4	D
8599031	3.1	18	50	4	C
8608311	3.11	18	50	4	D
8608312	3.12	18	50	4	D
8608313	3.13	18	50	4	D
8608314	3.14	18	50	4	D
8608315	3.15	18	50	4	D
8608316	3.16	18	50	4	D
8608317	3.17	18	50	4	D
8608318	3.18	18	50	4	D
8608319	3.19	18	50	4	D
8599032	3.2	18	50	4	C
8608321	3.21	18	50	4	D
8608322	3.22	18	50	4	D
8608323	3.23	18	50	4	D
8608324	3.24	18	50	4	D
8608325	3.25	18	50	4	D
8608326	3.26	18	50	4	D
8608327	3.27	18	50	4	D
8608328	3.28	18	50	4	D
8608329	3.29	18	50	4	D
8599033	3.3	18	50	4	C
8608331	3.31	18	50	4	D
8608332	3.32	18	50	4	D
8608333	3.33	18	50	4	D
8608334	3.34	18	50	4	D
8608335	3.35	18	50	4	D
8608336	3.36	20	52	4	D
8608337	3.37	20	52	4	D
8608338	3.38	20	52	4	D
8608339	3.39	20	52	4	D
8599034	3.4	20	52	4	C
8608341	3.41	20	52	4	D

NEXT 转下页

C = 标准库存品　C = Standard stock item
D = 库存中心标准在库品　D = Inventory center stock item

VP-黄金钻头 调制钢用粉末高速钢短刃型
VP-Gold Drill Powder HSS Stub for Hardened Steel

VPH-GDS

●材质 Tool Material　粉末高速钢 High grade Powder Metallurgy HSS (XPM)

●表面处理 Surface Treatment　V涂层／WDI®涂层※ V Coating / WDI® Coating

※2008年10月后逐渐替换为WDI涂层。
Start manufacturing with WDI Coating from october 2008.

FROM 转上页

单位:mm　Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608342	3.42	20	52	4	D
8608343	3.43	20	52	4	D
8608344	3.44	20	52	4	D
8608345	3.45	20	52	4	D
8608346	3.46	20	52	4	D
8608347	3.47	20	52	4	D
8608348	3.48	20	52	4	D
8608349	3.49	20	52	4	D
8599035	3.5	20	52	4	C
8608351	3.51	20	52	4	D
8608352	3.52	20	52	4	D
8608353	3.53	20	52	4	D
8608354	3.54	20	52	4	D
8608355	3.55	20	52	4	D
8608356	3.56	20	52	4	D
8608357	3.57	20	52	4	D
8608358	3.58	20	52	4	D
8608359	3.59	20	52	4	D
8599036	3.6	20	52	4	C
8608361	3.61	20	52	4	D
8608362	3.62	20	52	4	D
8608363	3.63	20	52	4	D
8608364	3.64	20	52	4	D
8608365	3.65	20	52	4	D
8608366	3.66	20	52	4	D
8608367	3.67	20	52	4	D
8608368	3.68	20	52	4	D
8608369	3.69	20	52	4	D
8599037	3.7	20	52	4	C
8608371	3.71	20	52	4	D
8608372	3.72	20	52	4	D
8608373	3.73	20	52	4	D
8608374	3.74	20	52	4	D
8608375	3.75	20	52	4	D
8608376	3.76	22	54	4	D
8608377	3.77	22	54	4	D
8608378	3.78	22	54	4	D
8608379	3.79	22	54	4	D
8599038	3.8	22	54	4	C
8608381	3.81	22	54	4	D
8608382	3.82	22	54	4	D
8608383	3.83	22	54	4	D
8608384	3.84	22	54	4	D
8608385	3.85	22	54	4	D

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608386	3.86	22	54	4	D
8608387	3.87	22	54	4	D
8608388	3.88	22	54	4	D
8608389	3.89	22	54	4	D
8599039	3.9	22	54	4	C
8608391	3.91	22	54	4	D
8608392	3.92	22	54	4	D
8608393	3.93	22	54	4	D
8608394	3.94	22	54	4	D
8608395	3.95	22	54	4	D
8608396	3.96	22	54	4	D
8608397	3.97	22	54	4	D
8608398	3.98	22	54	4	D
8608399	3.99	22	54	4	D
8599040	4	22	54	4	C
8608401	4.01	22	66	6	D
8608402	4.02	22	66	6	D
8608403	4.03	22	66	6	D
8608404	4.04	22	66	6	D
8608405	4.05	22	66	6	D
8608406	4.06	22	66	6	D
8608407	4.07	22	66	6	D
8608408	4.08	22	66	6	D
8608409	4.09	22	66	6	D
8599041	4.1	22	66	6	C
8608411	4.11	22	66	6	D
8608412	4.12	22	66	6	D
8608413	4.13	22	66	6	D
8608414	4.14	22	66	6	D
8608415	4.15	22	66	6	D
8608416	4.16	22	66	6	D
8608417	4.17	22	66	6	D
8608418	4.18	22	66	6	D
8608419	4.19	22	66	6	D
8599042	4.2	22	66	6	C
8608421	4.21	22	66	6	D
8608422	4.22	22	66	6	D
8608423	4.23	22	66	6	D
8608424	4.24	22	66	6	D
8608425	4.25	22	66	6	D
8608426	4.26	24	68	6	D
8608427	4.27	24	68	6	D
8608428	4.28	24	68	6	D
8608429	4.29	24	68	6	D

C = 标准库存品　C = Standard stock item
D = 库存中心标准在库品　D = Inventory center stock item

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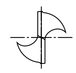
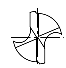
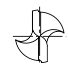
畅销产品 Best Seller



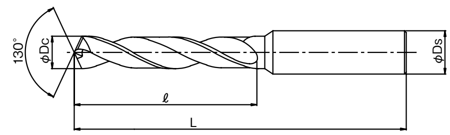
四棱式横刃
Four Facet point
(Dc≦1.5)



X形横刃
X thinning
(1.5<Dc<4)



R形横刃
R thinning
(Dc≧4)



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单位:mm Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8599043	4.3	24	68	6	C
8608431	4.31	24	68	6	D
8608432	4.32	24	68	6	D
8608433	4.33	24	68	6	D
8608434	4.34	24	68	6	D
8608435	4.35	24	68	6	D
8608436	4.36	24	68	6	D
8608437	4.37	24	68	6	D
8608438	4.38	24	68	6	D
8608439	4.39	24	68	6	D
8599044	4.4	24	68	6	C
8608441	4.41	24	68	6	D
8608442	4.42	24	68	6	D
8608443	4.43	24	68	6	D
8608444	4.44	24	68	6	D
8608445	4.45	24	68	6	D
8608446	4.46	24	68	6	D
8608447	4.47	24	68	6	D
8608448	4.48	24	68	6	D
8608449	4.49	24	68	6	D
8599045	4.5	24	68	6	C
8608451	4.51	24	68	6	D
8608452	4.52	24	68	6	D
8608453	4.53	24	68	6	D
8608454	4.54	24	68	6	D
8608455	4.55	24	68	6	D
8608456	4.56	24	68	6	D
8608457	4.57	24	68	6	D
8608458	4.58	24	68	6	D
8608459	4.59	24	68	6	D
8599046	4.6	24	68	6	C
8608461	4.61	24	68	6	D
8608462	4.62	24	68	6	D
8608463	4.63	24	68	6	D
8608464	4.64	24	68	6	D
8608465	4.65	24	68	6	D
8608466	4.66	24	68	6	D
8608467	4.67	24	68	6	D
8608468	4.68	24	68	6	D
8608469	4.69	24	68	6	D
8599047	4.7	24	68	6	C
8608471	4.71	24	68	6	D
8608472	4.72	24	68	6	D
8608473	4.73	24	68	6	D
8608474	4.74	24	68	6	D
8608475	4.75	24	68	6	D

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608476	4.76	26	70	6	D
8608477	4.77	26	70	6	D
8608478	4.78	26	70	6	D
8608479	4.79	26	70	6	D
8599048	4.8	26	70	6	C
8608481	4.81	26	70	6	D
8608482	4.82	26	70	6	D
8608483	4.83	26	70	6	D
8608484	4.84	26	70	6	D
8608485	4.85	26	70	6	D
8608486	4.86	26	70	6	D
8608487	4.87	26	70	6	D
8608488	4.88	26	70	6	D
8608489	4.89	26	70	6	D
8599049	4.9	26	70	6	C
8608491	4.91	26	70	6	D
8608492	4.92	26	70	6	D
8608493	4.93	26	70	6	D
8608494	4.94	26	70	6	D
8608495	4.95	26	70	6	D
8608496	4.96	26	70	6	D
8608497	4.97	26	70	6	D
8608498	4.98	26	70	6	D
8608499	4.99	26	70	6	D
8599050	5	26	70	6	C
8608501	5.01	26	70	6	D
8608502	5.02	26	70	6	D
8608503	5.03	26	70	6	D
8608504	5.04	26	70	6	D
8608505	5.05	26	70	6	D
8608506	5.06	26	70	6	D
8608507	5.07	26	70	6	D
8608508	5.08	26	70	6	D
8608509	5.09	26	70	6	D
8599051	5.1	26	70	6	C
8608511	5.11	26	70	6	D
8608512	5.12	26	70	6	D
8608513	5.13	26	70	6	D
8608514	5.14	26	70	6	D
8608515	5.15	26	70	6	D
8608516	5.16	26	70	6	D
8608517	5.17	26	70	6	D
8608518	5.18	26	70	6	D
8608519	5.19	26	70	6	D
8599052	5.2	26	70	6	C
8608521	5.21	26	70	6	D

NEXT 转下页

C = 标准库存品　C = Standard stock item
D = 库存中心标准在库品　D = Inventory center stock item

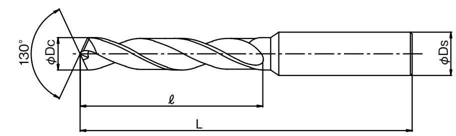
VP-黄金钻头 调制钢用粉末高速钢 短刃形
VP-Gold Drill Powder HSS Stub for Hardened Steel

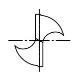
畅销产品 Best Seller

VPH-GDS

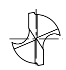
●材质 Tool Material — 粉末高速钢 High grade Powder Metallurgy HSS (XPM)

●表面处理 Surface Treatment — V涂层／WDI®涂层※ V Coating / WDI® Coating





四棱式横刃
Four Facet point
(Dc≦1.5)



X形横刃
X thinning
(1.5＜Dc＜4)

R形横刃
R thinning
(Dc≧4)

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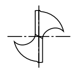
※2008年10月后逐渐替换为WDI涂层。
Start manufacturing with WDI Coating from october 2008.

单位:mm Unit:mm

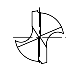
商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608522	5.22	26	70	6	D
8608523	5.23	26	70	6	D
8608524	5.24	26	70	6	D
8608525	5.25	26	70	6	D
8608526	5.26	26	70	6	D
8608527	5.27	26	70	6	D
8608528	5.28	26	70	6	D
8608529	5.29	26	70	6	D
8599053	5.3	26	70	6	C
8608531	5.31	28	72	6	D
8608532	5.32	28	72	6	D
8608533	5.33	28	72	6	D
8608534	5.34	28	72	6	D
8608535	5.35	28	72	6	D
8608536	5.36	28	72	6	D
8608537	5.37	28	72	6	D
8608538	5.38	28	72	6	D
8608539	5.39	28	72	6	D
8599054	5.4	28	72	6	C
8608541	5.41	28	72	6	D
8608542	5.42	28	72	6	D
8608543	5.43	28	72	6	D
8608544	5.44	28	72	6	D
8608545	5.45	28	72	6	D
8608546	5.46	28	72	6	D
8608547	5.47	28	72	6	D
8608548	5.48	28	72	6	D
8608549	5.49	28	72	6	D
8599055	5.5	28	72	6	C
8608551	5.51	28	72	6	D
8608552	5.52	28	72	6	D
8608553	5.53	28	72	6	D
8608554	5.54	28	72	6	D
8608555	5.55	28	72	6	D
8608556	5.56	28	72	6	D
8608557	5.57	28	72	6	D
8608558	5.58	28	72	6	D

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608559	5.59	28	72	6	D
8599056	5.6	28	72	6	C
8608561	5.61	28	72	6	D
8608562	5.62	28	72	6	D
8608563	5.63	28	72	6	D
8608564	5.64	28	72	6	D
8608565	5.65	28	72	6	D
8608566	5.66	28	72	6	D
8608567	5.67	28	72	6	D
8608568	5.68	28	72	6	D
8608569	5.69	28	72	6	D
8599057	5.7	28	72	6	C
8608571	5.71	28	72	6	D
8608572	5.72	28	72	6	D
8608573	5.73	28	72	6	D
8608574	5.74	28	72	6	D
8608575	5.75	28	72	6	D
8608576	5.76	28	72	6	D
8608577	5.77	28	72	6	D
8608578	5.78	28	72	6	D
8608579	5.79	28	72	6	D
8599058	5.8	28	72	6	C
8608581	5.81	28	72	6	D
8608582	5.82	28	72	6	D
8608583	5.83	28	72	6	D
8608584	5.84	28	72	6	D
8608585	5.85	28	72	6	D
8608586	5.86	28	72	6	D
8608587	5.87	28	72	6	D
8608588	5.88	28	72	6	D
8608589	5.89	28	72	6	D
8599059	5.9	28	72	6	C
8608591	5.91	28	72	6	D
8608592	5.92	28	72	6	D
8608593	5.93	28	72	6	D
8608594	5.94	28	72	6	D
8608595	5.95	28	72	6	D

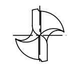
C = 标准库存品　C = Standard stock item
D = 库存中心标准在库品　D = Inventory center stock item



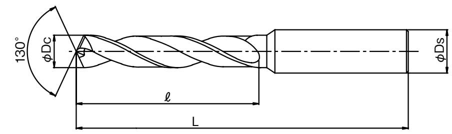
四棱式横刃
Four Facet point
(Dc≦1.5)



X形横刃
X thinning
(1.5<Dc<4)



R形横刃
R thinning
(Dc≧4)



FROM
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单位:mm　Unit:mm

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8608596	5.96	28	72	6	D
8608597	5.97	28	72	6	D
8608598	5.98	28	72	6	D
8608599	5.99	28	72	6	D
8599060	6	28	72	6	C
8599061	6.1	31	75	8	C
8599062	6.2	31	75	8	C
8599063	6.3	31	75	8	C
8599064	6.4	31	75	8	C
8599065	6.5	31	75	8	C
8599066	6.6	31	75	8	C
8599067	6.7	31	75	8	C
8599068	6.8	34	78	8	C
8599069	6.9	34	78	8	C
8599070	7	34	78	8	C
8599071	7.1	34	78	8	C
8599072	7.2	34	78	8	C
8599073	7.3	34	78	8	C
8599074	7.4	34	78	8	C
8599075	7.5	34	78	8	C
8599076	7.6	37	81	8	C
8599077	7.7	37	81	8	C
8599078	7.8	37	81	8	C
8599079	7.9	37	81	8	C
8599080	8	37	81	8	C
8599081	8.1	37	87	10	C
8599082	8.2	37	87	10	C
8599083	8.3	37	87	10	C
8599084	8.4	37	87	10	C
8599085	8.5	37	87	10	C
8599086	8.6	40	90	10	C
8599087	8.7	40	90	10	C
8599088	8.8	40	90	10	C
8599089	8.9	40	90	10	C
8599090	9	40	90	10	C
8599091	9.1	40	90	10	C
8599092	9.2	40	90	10	C
8599093	9.3	40	90	10	C

商品号 EDP NO.	外径 Dc	槽长 ℓ	全长 L	柄径 Ds	库存 Stock
8599094	9.4	40	90	10	C
8599095	9.5	40	90	10	C
8599096	9.6	43	93	10	C
8599097	9.7	43	93	10	C
8599098	9.8	43	93	10	C
8599099	9.9	43	93	10	C
8599100	10	43	93	10	C
8599101	10.1	43	100	12	C
8599102	10.2	43	100	12	C
8599103	10.3	43	100	12	C
8599104	10.4	43	100	12	C
8599105	10.5	43	100	12	C
8599106	10.6	43	100	12	C
8599107	10.7	47	104	12	C
8599108	10.8	47	104	12	C
8599109	10.9	47	104	12	C
8599110	11	47	104	12	C
8599111	11.1	47	104	12	C
8599112	11.2	47	104	12	C
8599113	11.3	47	104	12	C
8599114	11.4	47	104	12	C
8599115	11.5	47	104	12	C
8599116	11.6	47	104	12	C
8599117	11.7	47	104	12	C
8599118	11.8	47	104	12	C
8599119	11.9	51	104	12	C
8599120	12	51	108	12	C
8599121	12.1	51	108	12	C
8599122	12.2	51	108	12	C
8599123	12.3	51	108	12	C
8599124	12.4	51	108	12	C
8599125	12.5	51	108	12	C
8599126	12.6	51	108	12	C
8599127	12.7	51	108	12	C
8599128	12.8	51	108	12	C
8599129	12.9	51	108	12	C
8599130	13	51	108	12	C

C = 标准库存品　　C = Standard stock item
D = 库存中心标准在库品　　D = Inventory center stock item

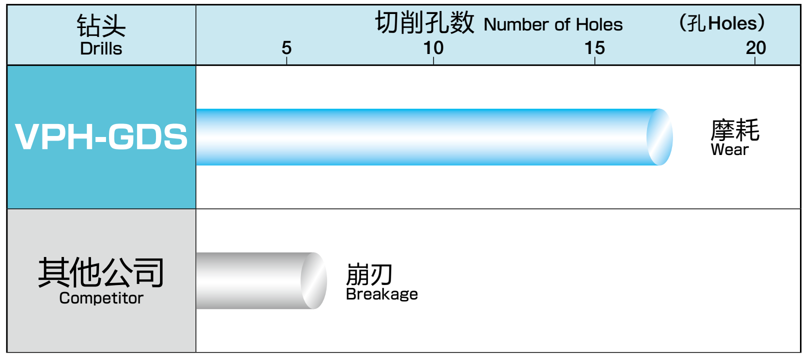
加工事例 Cutting Data

VPH-GDS的性能评价
Performance of VPH-GDS

使用工具 Tool	Φ5.9
加工材料 Work Material	Inconel718 (43HRC)
切削速度 Drilling Speed	6m/min (324min^{-1})
进给速度 Feed	19mm/min(0.06mm/rev)
孔深 Depth of Hole	12mm (盲孔) 3mm停顿 (Blind) 3mm Step
切削油剂 Coolant	非水溶性切削油剂(外部给油) Water Soluble (External)
使用机械 Machine	卧式加工中心(BT40) Vertical Machining Center

刀体采用高级粉末高速钢，并具有锋利的切削刃，加工时效处理后的Inconel 718材料，刀具寿命远远超过其他公司的产品。即使是使用普通的非水溶性切削油剂，也可以实现稳定的加工。

The highly rigid body that uses high-quality powdered HSS combined with a sharp cutting edge is able to surpass the competitor' s durability when machining aging-treated Inconel 718. Furthermore, it is able to machine stably in a general oil-based coolant environment.

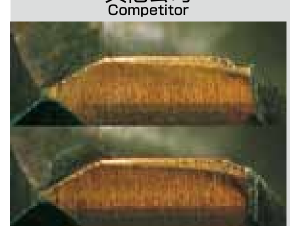


加工6孔后的照片 Photo of after drilling 6 holes

VPH-GDS

良好
Good

其他公司
Competitor



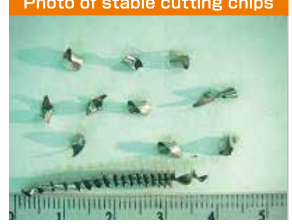
崩刃
Breakage

VPH-GDS的性能评价
Performance of VPH-GDS

使用工具 Tool	Φ6
加工材料 Work Material	HASTELLOY(生材) Hastelloy (raw)
切削速度 Drilling Speed	6m/min (318min^{-1})
进给速度 Feed	19mm/min(0.06mm/rev)
孔深 Depth of Hole	18mm (盲孔)无停顿 (Blind) No-Step
切削油剂 Coolant	非水溶性切削油剂(外部给油) Water Soluble (External)
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

加工10孔后的刃尖照片
Photo of after drilling 10 holes

稳定的切屑照片
Photo of stable cutting chips



即使在加工无时效处理的HASTELLOY(生材)时，籍由锋利的切削刃设计，可以将切屑细小的分断。

In non-aging-treated Hastelloy (raw), the sharp (high) cutting edge finely breaks down the cutting chips.

VP 黄金钻头 VPH-GDS

加工材料 WORK MATERIAL	钛合金 TITANIUM ALLOYS Ti-6Al-4V(32～38HRC)		INCONEL®·β-Ti合金 INCONEL® Inconel®718 (38～43HRC)	
切削速度 DRILLING SPEED	6～10m/min		6～8m/min	
外径 DRILL DIA. (mm)	转速 SPEED (min^{-1})	进给量 FEED RATE (mm/rev)	转速 SPEED (min^{-1})	进给量 FEED RATE (mm/rev)
0.5	5,000	0.005～0.01	3,800	0.005～0.01
1	2,400	0.01～0.02	2,000	0.01～0.02
2	1,200	0.02～0.04	1,100	0.02～0.04
3	800	0.03～0.06	740	0.03～0.06
4	699	0.04～0.08	550	0.04～0.08
5	500	0.05～0.1	445	0.05～0.1
6	440	0.06～0.12	370	0.06～0.12
7	350	0.07～0.14	320	0.07～0.14
8	320	0.08～0.16	280	0.08～0.16
9	280	0.09～0.18	250	0.09～0.18
10	260	0.1～0.2	220	0.1～0.2
11	230	0.11～0.22	200	0.11～0.22
12	210	0.12～0.24	190	0.12～0.24
13	200	0.13～0.26	170	0.13～0.26

1. 此切削条件基准表适用于使用水溶性切削油剂的场合。
2. 请使用稀释倍率20倍以下的优质水溶性切削油。
3. 使用油性切削液或大于10倍的乳化液时，请把切削速度降低20%。
4. 孔深超过4倍直径时，请进行阶梯式进给，并设定为下表的切削速度。
5. 车床、卧式设备上加工3D以上的孔时，请使用阶梯式进给。

注1：在机械转速不能达到以上参数时，请在高转速下使用，但刀具的寿命可能受到一定的影响。

D：drill dia

孔深(D为直径) Drilling depth	4D以下 ≦4D	5D以下 ≦5D	6D以下 ≦6D
切削速度抑制系数 Coefficient for reducing speed	×1	×0.9	×0.7

1. The indicated speeds and feeds are for drilling with water soluble oil.
2. The most suitable cutting fluid is water-emulsifiable, high density oil (less than 20 times dilution).
3. When using non-water soluble oil or water-emulsifiable (over 10 times dilution), reduce the drilling speed by 20% .
4. The step process should be used when the drilling depth exceeds 4 times the drill diameter. (Using the table below)
5. Step process should be used when drilling depth of the hole exceeds 3 times drill diameter for lathe / horizontal machine.

Note 1. For machines that cannot achieve the speeds indicated in the table please set rotation as high as possible. Tool life may be decreased.

可转位式刀具同样可以加工 Ni 基耐热合金，详细请参考以下样本。

For indexable tools that can also be used on nickel-based alloys, please refer to this catalog.

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Generic roughing tool expanded size range

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