



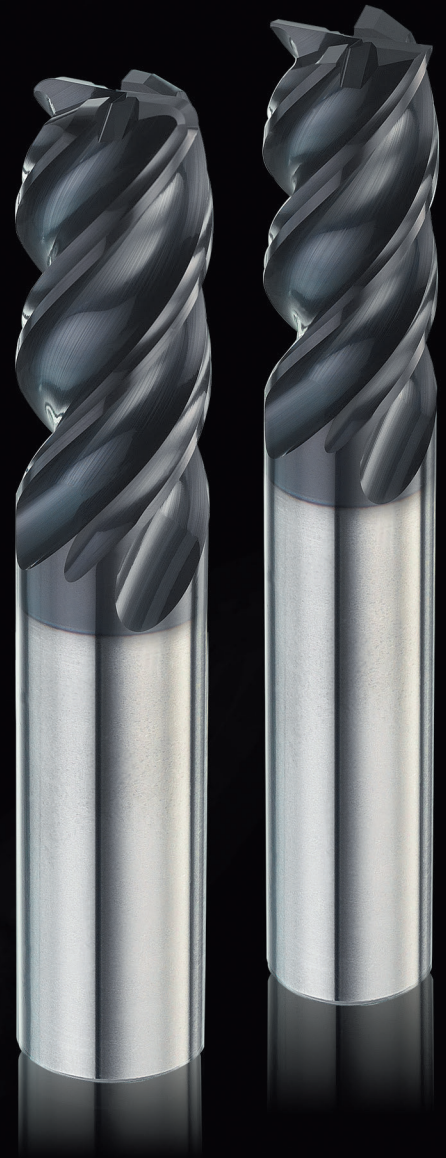
400 PLUS

SERIES

Unequal Flute Spacing & Helix

不等分割 & 不等螺旋

- Excellent vibration absorption provides stability.
- 降低刀具加工時產生的震動頻率
- Less chatter and high efficiency finishing.
- 減少工件側壁的切削震紋
- Reduce metal burr when machining.
- 減少刀具加工產生的端口毛刺



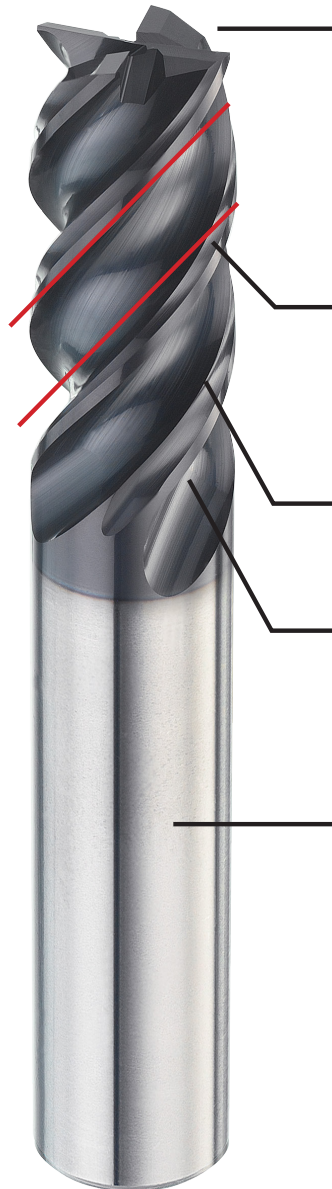
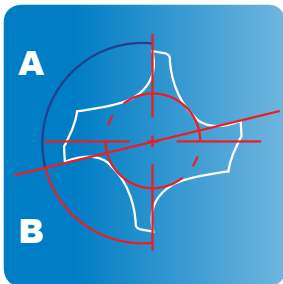
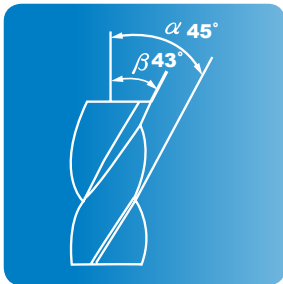
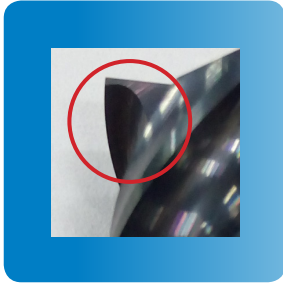
■ INDEX

■ Feature of 400 PLUS	02
400 PLUS 系列特色介紹	
METRIC 公制	
■ 400 PLUS - Unequal Flute Spacing & Helix	05
400 PLUS - 不等分割/不等螺旋	
GENERAL APPLICATION 泛用刀具	06
HIGH PERFORMANCE FOR EXOTIC MATERIALS 難切削材高效刀具	10
FRACTIONAL 英制	
■ 400 PLUS - Unequal Flute Spacing & Helix	13
400 PLUS - 不等分割/不等螺旋	
GENERAL APPLICATION 泛用刀具	14
HIGH PERFORMANCE FOR EXOTIC MATERIALS 難切削材高效刀具	16
■ CUTTING CONDITION 切削參數	19
■ TECHNICAL INFORMATION 技術資料	
COATING ADVANTAGE 塗層特色	35
DETAILS OF THE END MILL 立銑刀各部位名稱	36
GENERAL CUTTING CONDITION FORMULA 切削條件計算公式	37
FAILURE ANALYZED AND SOLVENT 故障分析與對策	38
CUSTOM TOOL REQUIREMENTS FORM 訂製刀具需求表	40



400 PLUS Series 400 PLUS 系列

Unequal Flute Spacing & Helix 不等分割 / 不等螺旋



Strong edge to prevent chipping at corners.

厚實端角設計防止刀具崩裂。

**Unequal Flute Spacing, $A \neq B$
Irregular Helix Flutes, $\alpha \neq \beta$**

Ensures stable machining of difficult-to-cut materials, and achieve high efficient performance.

刀刃分割角採用 $A \neq B$ 刀刃螺旋角採用 $\alpha \neq \beta$ 於刀刃採用不等分割角搭配其不等螺旋的設計，能有效的降低刀具加工時所產生的共振；因此400PLUS能執行高效能切削及難切削材應用。

Tool diameter tolerance 0~-0.02mm.
刃徑容許公差0~-0.02mm

Special flute geometry to improve chip disposal.

特殊圓形溝槽設計，可提升排屑效果，減少應力產生，提高刀具強度。

Superior wear and chipping resistance due to optimally matched coating and carbide material

奈米超硬底材，驚異高抗損性、優異耐磨耗性。

1. Excellent vibration absorption provides stability.

降低刀具加工時產生的震動頻率

2. Less chatter and high efficiency finishing.

減少工件側壁的切削震紋

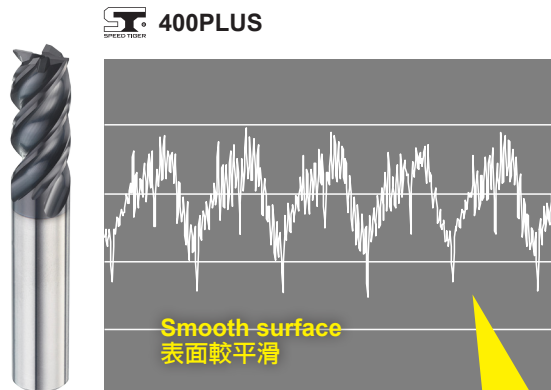
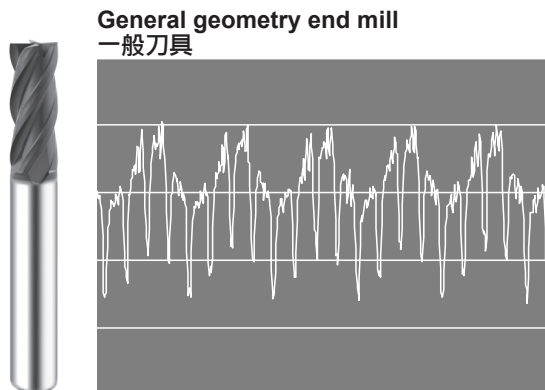
3. Reduce metal burr when machining.

減少刀具加工產生的端口毛刺

Cutting Performance 實測比較 SPEED TIGER

Cutting Analysis 切削比較

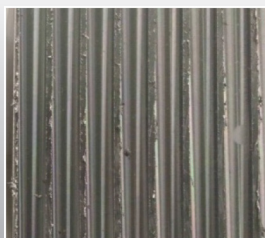
Use Dynamometer Measure System to inspect the vibration of general end mills and 400PLUS during milling.
 在相同的切削時間 (X 軸) 跟切削條件 (Y 軸) 下，使用動力測量儀測量一般刀具與 400PLUS 抗震刀具的振動頻率。



Vibration frequency is more intensive, it means that the force of the workpiece is more even.
 圖面震動頻率較密集，表示工件受力較均。

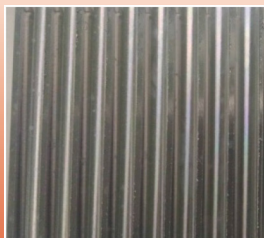
Equal V.S Unequal - Performance of Slotting SUS316 一般刀具 VS 400PLUS-SUS316 開溝實測

General geometry end mill
一般刀具



Metal Burr: A lot
毛刺：很多
Surface: Not smooth
表面：不平滑

PVE1004 (ø10mm)
400PLUS



Metal Burr: Less
毛刺：極少
Surface: Excellent
表面：光滑

Unequal Design
不等設計

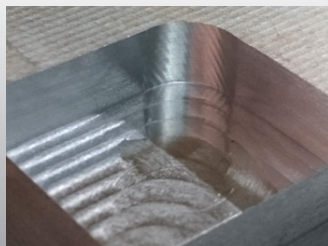
+

Special Flute Geometry
特殊刃部設計

- ✓ **Prevent Burr** 減少毛刺
- ✓ **Excellent Surface** 光滑表面
- ✓ **Improve Chip Disposal** 不易積屑
- ✓ **Longer Tool Life** 延長壽命

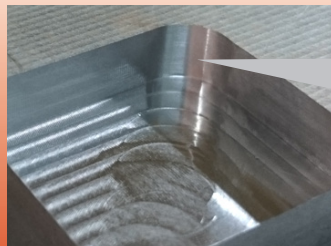
Equal vs. Unequal - Shouldering and Corner Part 一般刀具 VS 400PLUS- 肩銑與轉角處比較

General geometry end mill
一般刀具



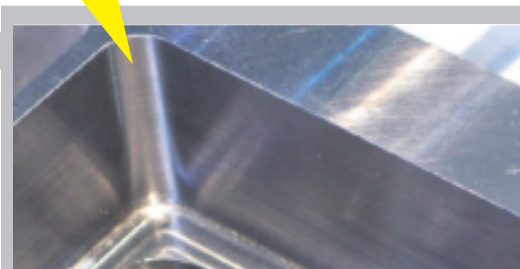
Surface: Chattering
波紋表面

PVE0804 (8mm)
400PLUS



Excellent Surface
精緻表面 !!

Smooth cutting at shouldering and corner part.
 不等設計抑制高頻顫震，使表面光滑。

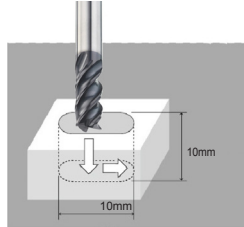




Cutting Performance 實測比較

Unequal V.S Unequal - Surface and Tool Life Comparison 他牌抗震刀具 V.S 震虎抗震刀具 - 表面及壽命比較

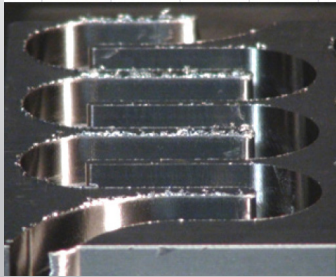
End mill 刀具	PVE1004 (Ø10mm)
Workpiece Material 工件	SUS316
Milling Type 加工方式	Slotting 溝銑
Rotation Speed (S) 轉速	2644rpm
Milling Speed (Vc) 切削速度	83m/min
Feed Rate (min-1) (F) 進給速度	646 mm/min
Depth of cut 切深	ap=10mm ae: 10mm
Feed of teeth (Fz) 每刃進給量	0.062
Machine 使用機台	Vertical Machining Center 立式綜合加工機



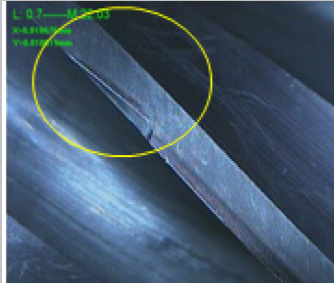
400PLUS video 切削影片



Competitor A 他牌 A

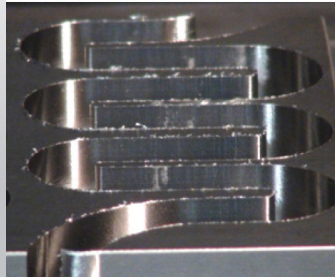


Metal Burr: Heavy 毛刺: 較厚
Surface: Fine 切壁: 尚可

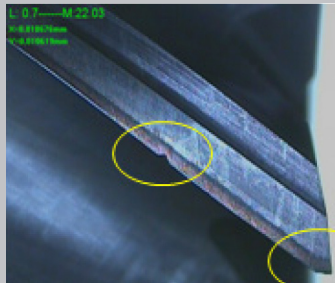


The cutting edge broke.
刃部破損

Competitor B 他牌 B



Metal Burr: Some 毛刺: 較少
Surface: Chattering 切壁: 震紋明顯

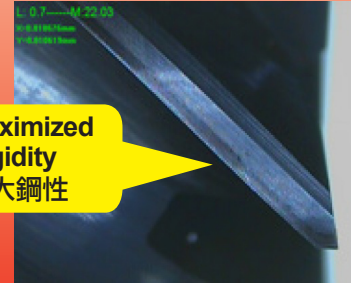


The cutting edge got chipping.
刃部缺角

PVE1004 (Ø10mm)



Metal Burr: Less 毛刺: 極少
Surface: Excellent 切壁: 光亮



The cutting edge is fine!
刃部良好

Maximized Rigidity
最大鋼性

Different Cutting Conditions on milling Carbon Steel (S45C) 加工於碳素鋼 S45C 的各式切削數據

Slotting 溝銑
S2546rpm F500
AP 10mm AE 10mm

**Helical Slot Milling
盲仁孔加工**
Expansion Milling
S3183rpm F1273
AE 2mm AP 10mm

**Wave Slotting
波浪開溝**
S2228rpm F446
AE 10mm AP 10mm



**5° Ramping
5 度斜面插銑**
SS2228rpm F624
AE 6mm AP 13.8mm

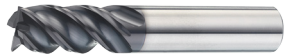








**Helical Milling
盲圓孔加工**
S3183rpm F1273
AE 2mm AP 12mm

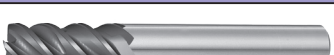








**Wave Side Milling
波浪側銑**
S3183rpm F1273
AE 2mm AP 20mm

Side Milling 側銑
S3183rpm F637
AE 2mm AP 20mm

400 PLUS Series 400 PLUS 系列 SPEED TIGER

Unequal Flute Spacing & Helix 不等分割 / 不等螺旋

End Shape 刃端形狀	Flute 刃數	Type 刀型	Model 型號	Shape 圖樣	Coating 塗層	work 切削材											Spec. Page 規格表 頁數	Cutting Condition Page 切削條件 頁數
						◎Excellent 最適用 ○Good 適用 碳鋼 / 合金鋼 Pre-hardened steel under 45HRC 45 HRC 以下 High-hardened under 50HRC 50 HRC 以下 High-hardened under 55HRC 55 HRC 以下 High-hardened under 60HRC 60 HRC 以下 High-hardened under 65HRC 65 HRC 以下 Stainless steel 不銹鋼 Copper alloy 銅合金 Aluminum alloy 鋁合金 Titanium alloy 鈦合金												
400 PLUS Series 400 PLUS 系列 Unequal Flute Spacing & Helix 不等分割 / 不等螺旋																		
Square 平刀	4	Square series 不等立銑刀	PVE		AITiBN	○	◎	◎	○					◎	○	○	6	Side Milling 側銑 19-21 
	4	Square series - Short Flute 1倍刃長不等立銑刀	PVES		AITiBN	○	◎	◎	○					◎	○	○	7	
	4	Square series - Medium Flute 1.5倍刃長不等立銑刀	PVEM		AITiBN	○	◎	◎	○					◎	○	○	7	
	4	Square series - Long Flute 3倍刃長不等立銑刀	PVEL		AITiBN	○	◎	◎	○					◎	○	○	7	
Corner Radius 圓鼻刀	4	Corner Radius series 不等圓鼻立銑刀	PVR		AITiBN	○	◎	◎	○					◎	○	○	8	Slot Milling 溝銑 22-24 
Ball Nose 球刀	4	Ball Nose series 不等球型立銑刀	PVB		AITiBN	○	◎	◎	○					◎	○	○	9	
	4	Ball Nose series 長刃有效不等 球型立銑刀	PVBSX		AITiBN	○	◎	◎	○					◎	○	○	9	

End Shape 刃端形狀	Flute 刃數	Model 型號	Shape 圖樣	Coating 塗層	Work 切削材	Application 應用範圍	Spec. Page 規格表 頁數	Cutting Condition Page 切削條件 頁數
400 PLUS Series 400 PLUS 系列 Unequal Flute Spacing & Helix 不等分割 / 不等螺旋 HIGH PERFORMANCE FOR EXOTIC MATERIALS 難切削材高效刀具								
Square 平刀	4	PVE1T PLVE1T		nACRo	Titanium 鈦合金	 	10	25
		PNVE1T PLNVE1T		nACRo	Titanium 鈦合金	 	11	26
Corner Radius 圓鼻刀	4	PVR1T		nACRo	Titanium 鈦合金	 	12	26



Cutting Condition
P19-24

400Plus

Square series ■ 不等立銑刀

400
PLUS

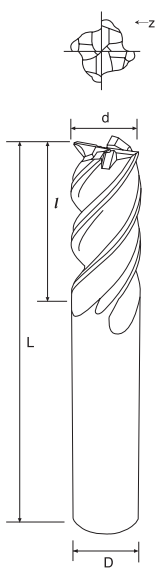


AITiBN



Mode	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	l 刃長	L 全長	D 柄徑	Z 刃數
PVE0304	3	7	50	6	4
PVE0404	4	9	50	6	4
PVE0504	5	11	50	6	4
PVE0604	6	13	50	6	4
PVE0804	8	17	60	8	4
PVE1004	10	22	75	10	4
PVE1204	12	26	75	12	4
PVE1404	14	31	100	16	4
PVE1604	16	35	100	16	4
PVE2004	20	44	100	20	4
PVE2504	25	55	100	25	4

Unit:mm



HRC
▶ 40

HRC
▶ 45

HRC
▶ 50

HRC
▶ 55

HRC
▶ 60

HRC
▶ 65



Application 適用材質：

◎ Recommend 最適合 ○ Suitable 最適合

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○	○	◎			○	○

Cutting Condition
P19-24**SPEED TIGER**

Square series - Short / Medium / Long Flute

■ 1倍 / 1.5倍 / 3倍長刃不等立銑刀

400
PLUS

AITiBN

400Plus

**PVES - Short**

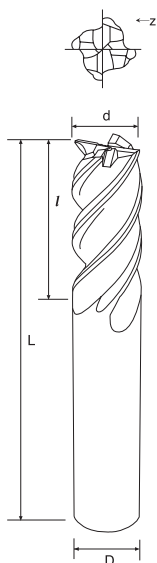
Mode	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	ℓ 刃長	L 全長	D 柄徑	Z 刃數
PVES0604	6	6	50	6	4
PVES0804	8	8	60	8	4
PVES1004	10	10	75	10	4
PVES1204	12	12	75	12	4
PVES1604	16	16	100	16	4
PVES2004	20	20	100	20	4

Unit:mm

PVEM - Medium

Mode	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	ℓ 刃長	L 全長	D 柄徑	Z 刃數
PVEM0604	6	9	50	6	4
PVEM0804	8	12	60	8	4
PVEM1004	10	15	75	10	4
PVEM1204	12	18	75	12	4
PVEM1604	16	24	100	16	4
PVEM2004	20	30	100	20	4

Unit:mm

**PVEL - Long**

Mode	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	ℓ 刃長	L 全長	D 柄徑	Z 刃數
PVEL0604	6	20	50	6	4
PVEL0804	8	25	60	8	4
PVEL1004	10	30	75	10	4
PVEL1204	12	35	75	12	4
PVEL1604	16	45	100	16	4
PVEL2004	20	50	100	20	4

Unit:mm

Application 適用材質：

◎ Recommend 最適合 ○ Suitable 最適合

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○	○	◎			○	○

HRC
▶ 40HRC
▶ 45HRC
▶ 50HRC
▶ 55HRC
▶ 60HRC
▶ 65



Cutting Condition
P19-24

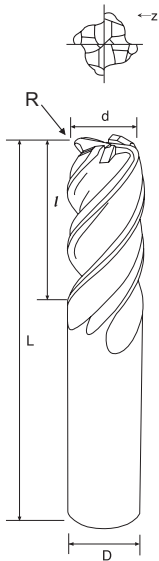
Corner Radius series

■ 不等圓鼻立銑刀

400
PLUS



AITiBN



Mode	Diameter	Corner Radius	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 直徑	R 角	l 刃長	L 全長	D 柄徑	Z 刃數
PVR0300104	3	0.1	7	50	6	4
PVR0300304	3	0.3	7	50	6	4
PVR0300504	3	0.5	7	50	6	4
PVR0400104	4	0.1	9	50	6	4
PVR0400304	4	0.3	9	50	6	4
PVR0400504	4	0.5	9	50	6	4
PVR0401004	4	1	9	50	6	4
PVR0500504	5	0.5	11	50	6	4
PVR0600104	6	0.1	13	50	6	4
PVR0600304	6	0.3	13	50	6	4
PVR0600504	6	0.5	13	50	6	4
PVR0601004	6	1	13	50	6	4
PVR0800104	8	0.1	17	60	8	4
PVR0800504	8	0.5	17	60	8	4
PVR0801004	8	1	17	60	8	4
PVR0802004	8	2	17	60	8	4
PVR1000104	10	0.1	22	75	10	4
PVR1000504	10	0.5	22	75	10	4
PVR1001004	10	1	22	75	10	4
PVR1002004	10	2	22	75	10	4
PVR1200104	12	0.1	26	75	12	4
PVR1200504	12	0.5	26	75	12	4
PVR1201004	12	1	26	75	12	4
PVR1202004	12	2	26	75	12	4
PVR1600504	16	0.5	35	100	16	4
PVR1601004	16	1	35	100	16	4
PVR1602004	16	2	35	100	16	4
PVR1603004	16	3	35	100	16	4
PVR2001004	20	1	44	100	20	4
PVR2001504	20	1.5	44	100	20	4
PVR2002004	20	2	44	100	20	4
PVR2002504	20	2.5	44	100	20	4
PVR2003004	20	3	44	100	20	4
PVR2501004	25	1	55	100	25	4

Unit:mm

Application 適用材質：

◎ Recommend 最適合 ○ Suitable 最適合

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○	○	◎			○	○

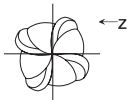
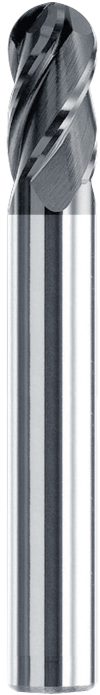
Cutting Condition
P19-24**SPEED TIGER**

Ball Nose series - 4 flutes

■ 不等球型立銑刀

400
PLUS

AITiBN



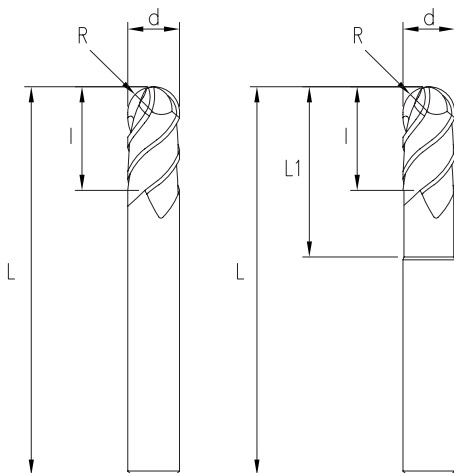
Mode	Diameter	Radius	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 直徑	R 值	l 刃長	L 全長	D 柄徑	Z 刃數
PVB0604	6	3	6	50	6	4
PVB0804	8	4	8	60	8	4
PVB1004	10	5	10	75	10	4
PVB1204	12	6	12	75	12	4
PVB1604	16	8	16	100	16	4

Unit:mm

PVBSX - Long Neck

Mode	Diameter	Radius	Flute Length	Efficient Length	Full Length	Shank Diameter	Flutes
型號	d 直徑	R 值	l 刃長	L1 有效長	L 全長	D 柄徑	Z 刃數
PVBSX0604	6	3	9	15	60	6	4
PVBSX0804	8	4	12	20	75	8	4
PVBSX1004	10	5	15	25	80	10	4
PVBSX1204	12	6	18	30	100	12	4
PVBSX1604	16	8	24	40	110	16	4

Unit:mm



Application 適用材質：

◎ Recommend 最適合 ○ Suitable 最適合

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○	○	◎			○	○

HRC
▶ 40HRC
▶ 45HRC
▶ 50HRC
▶ 55HRC
▶ 60HRC
▶ 65



Cutting Condition
P25

Square Type For Titanium

■ 鈦合金專用立銑刀

400
PLUS



nACRo



MODE	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	刃長	L全長	D柄徑	Z刃數
PVE1T0404	4	8	50	6	4
PVE1T0504	5	10	50	6	4
PVE1T0604	6	12	50	6	4
PVE1T0804	8	19	60	8	4
PVE1T1004	10	23	75	10	4
PVE1T1204	12	27	75	12	4
PVE1T1604	16	32	100	16	4
PVE1T2004	20	39	100	20	4

Unit : mm

HRC
▶ 40

HRC
▶ 45

HRC
▶ 50

HRC
▶ 55

HRC
▶ 60

HRC
▶ 65

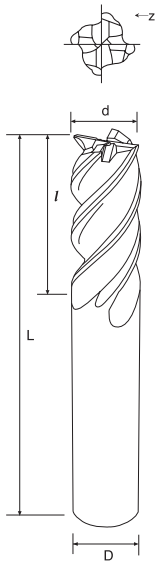


Long Flute



MODE	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	刃長	L全長	D柄徑	Z刃數
PLVE1T0404	4	13	75	6	4
PLVE1T0504	5	16	75	6	4
PLVE1T0604	6	21	75	6	4
PLVE1T0804	8	31	100	8	4
PLVE1T1004	10	37	100	10	4
PLVE1T1204	12	44	100	12	4
PLVE1T1604	16	53	150	16	4
PLVE1T2004	20	62	150	20	4

Unit : mm



Application :

◎ Recommend ○ Suitable

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○			◎			

Cutting Condition
P26

SPEED TIGER

Square Type - Long Neck For Titanium

■ 鈦合金專用有頸立銑刀

400 PLUS



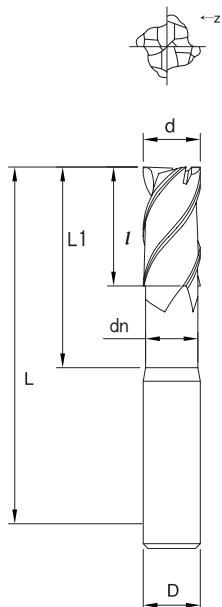
nACRo



MODE	Diameter	Flute Length	Efficient Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	切長	L1有效長	L全長	D柄徑	Z 刃數
PNVE1T0404	4	6	22	60	6	4
PNVE1T0504	5	8	24	60	6	4
PNVE1T0604	6	9	26	60	6	4
PNVE1T0804	8	12	35	75	8	4
PNVE1T1004	10	15	43	100	10	4
PNVE1T1204	12	18	51	100	12	4
PNVE1T1604	16	24	59	100	16	4

Unit : mm

Long Flute & Neck 鈦合金專用有頸長刃立銑刀



MODE	Diameter	Flute Length	Efficient Length	Neck Diameter	Full Length	Shank Diameter	Flutes
型號	d 刃徑	切長	L1有效長	dn 頸徑	L全長	D柄徑	Z 刃數
PLNVE1T0404	4	6	22	3.7	60	6	4
PLNVE1T0504	5	8	24	4.6	60	6	4
PLNVE1T0604	6	9	26	5.5	60	6	4
PLNVE1T0804	8	12	35	7.4	75	8	4
PLNVE1T1004	10	15	43	9.2	100	10	4
PLNVE1T1204	12	18	51	11	100	12	4
PLNVE1T1604	16	24	59	15	100	16	4

Unit : mm

Application :

◎ Recommend ○ Suitable

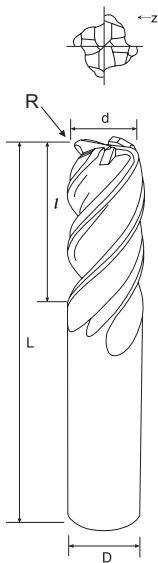
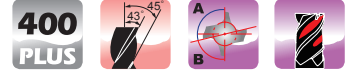
<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	"Stainless steel"	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	○				◎			



Cutting Condition
P26

Corner Radius Type For Titanium

■ 鈦合金專用圓鼻立銑刀



MODE	Diameter	Corner Radius	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	R 角	刃長	L全長	D柄徑	Z刃數
PVR1T040054	4	0.5	8	50	6	4
PVR1T050054	5	0.5	10	50	6	4
PVR1T060054	6	0.5	12	50	6	4
PVR1T060104	6	1	12	50	6	4
PVR1T080054	8	0.5	19	60	8	4
PVR1T080104	8	1	19	60	8	4
PVR1T100054	10	0.5	23	75	10	4
PVR1T100104	10	1	23	75	10	4
PVR1T100154	10	1.5	23	75	10	4
PVR1T100254	10	2.5	23	75	10	4
PVR1T120054	12	0.5	27	75	12	4
PVR1T120104	12	1	27	75	12	4
PVR1T120154	12	1.5	27	75	12	4
PVR1T120204	12	2	27	75	12	4
PVR1T120254	12	2.5	27	75	12	4
PVR1T120404	12	4	27	75	12	4
PVR1T160104	16	1	32	100	16	4
PVR1T160204	16	2	32	100	16	4
PVR1T160154	16	1.5	32	100	16	4
PVR1T160254	16	2.5	32	100	16	4
PVR1T160404	16	4	32	100	16	4
PVR1T200104	20	1	39	100	20	4
PVR1T200204	20	2	39	100	20	4
PVR1T200254	20	2.5	39	100	20	4
PVR1T200404	20	4	39	100	20	4

Unit : mm

HRC
▶ 40

HRC
▶ 45

HRC
▶ 50

HRC
▶ 55

HRC
▶ 60

HRC
▶ 65



Application :





◎ Recommend ○ Suitable










<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○			◎			

400 PLUS Series 400 PLUS 系列 SPEED TIGER

Unequal Flute Spacing & Helix 不等分割 / 不等螺旋

FRACTIONAL 英制

End Shape 刃端形狀	Flute 刃數	Type 刀型	Model 型號	Shape 圖樣	Coating 塗層	work 切削材										Spec. Page 規格表 頁數	Cutting Condition Page 切削條件 頁數				
						◎Excellent 最適用	○Good 適用	碳鋼 Carbon steel	合金鋼 Alloy steel	預硬鋼 Pre-hardened steel	50HRC under 45HRC	55HRC under 50HRC	60HRC under 55HRC	65HRC under 60HRC	High-hardened under 65HRC			High-hardened under 60HRC	High-hardened under 55HRC	High-hardened under 50HRC	High-hardened under 45HRC
400 PLUS Series 400 PLUS 系列 Unequal Flute Spacing & Helix 不等分割 / 不等螺旋																					
Square 平刀	4	Square series 不等立銑刀	IPVE		AlTiN	○	◎	◎	○											14	Side Milling 側銑 27-29 
Corner Radius 圓鼻刀	4	Corner Radius series 不等圓鼻立銑刀	IPVR		AlTiN	○	◎	◎	○											15	Slot Milling 溝銑 30-32 

End Shape 刃端形狀	Flute 刃數	Model 型號	Shape 圖樣	Coating 塗層	Work 切削材	Application 應用範圍	Spec. Page 規格表 頁數	Cutting Condition Page 切削條件 頁數
400 PLUS Series 400 PLUS 系列 Unequal Flute Spacing & Helix 不等分割 / 不等螺旋 HIGH PERFORMANCE FOR EXOTIC MATERIALS 難切削材高效刀具								
Square 平刀	4	IPVE1T IPLVE1T		nACro	Titanium 鈦合金	 	16	33
		IPNVE1T IPLNVE1T		nACro	Titanium 鈦合金	 	17	34
Corner Radius 圓鼻刀	4	IPVR1T		nACro	Titanium 鈦合金	 	18	34



Cutting Condition
P27-32

400Plus-inch

Square series ■ 不等立銑刀

400
PLUS



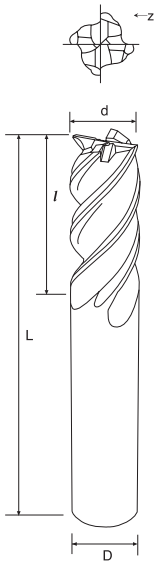
AlTiBN



FRACTIONAL 英制

Mode	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	ℓ 刃長	L 全長	D 柄徑	Z 刃數
IPVE1/8"4	1/8	3/8	1-1/2	1/8	4
IPVE5/32"4	5/32	7/16	2	3/16	4
IPVE3/16"4	3/16	7/16	2	3/16	4
IPVE7/32"4	7/32	7/16	2-1/2	1/4	4
IPVE1/4"4	1/4	1/2	2-1/2	1/4	4
IPVE9/32"4	9/32	5/8	2-1/2	5/16	4
IPVE5/16"4	5/16	13/16	2-1/2	5/16	4
IPVE11/32"4	11/32	13/16	2-1/2	3/8	4
IPVE3/8"4	3/8	7/8	2-1/2	3/8	4
IPVE13/32"4	13/32	15/16	2-3/4	7/16	4
IPVE7/16"4	7/16	1	2-3/4	7/16	4
IPVE15/32"4	15/32	1	3	15/32	4
IPVE1/2"4	1/2	1	3	1/2	4
IPVE9/16"4	9/16	1-1/8	3-1/2	9/16	4
IPVE5/8"4	5/8	1-1/4	3-1/2	5/8	4
IPVE3/4"4	3/4	1-1/2	4	3/4	4
IPVE1"4	1	1-1/2	4	1	4

Unit : inch



Application :

◎ Recommend ○ Suitable

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	◎	◎	○	○	◎			○	○

Cutting Condition
P27-32

SPEED TIGER

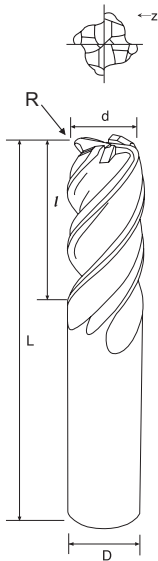
Corner Radius series

■ 不等圓鼻立銑刀

400 PLUS



FRACTIONAL 英制



Mode	Diameter	Corner Radius	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 直徑	R 角	l 刃長	L 全長	D 柄徑	Z 刃數
IPVR1/8"0.01"4	1/8	0.01	3/8	1-1/2	1/8	4
IPVR1/8"0.015"4	1/8	0.015	3/8	1-1/2	1/8	4
IPVR3/16"0.01"4	3/16	0.01	7/16	2	3/16	4
IPVR3/16"0.015"4	3/16	0.015	7/16	2	3/16	4
IPVR3/16"0.03"4	3/16	0.030	7/16	2	3/16	4
IPVR1/4"0.01"4	1/4	0.01	1/2	2-1/2	1/4	4
IPVR1/4"0.015"4	1/4	0.015	1/2	2-1/2	1/4	4
IPVR1/4"0.02"4	1/4	0.02	1/2	2-1/2	1/4	4
IPVR1/4"0.03"4	1/4	0.03	1/2	2-1/2	1/4	4
IPVR5/16"0.015"4	5/16	0.015	13/16	2-1/2	5/16	4
IPVR5/16"0.02"4	5/16	0.020	13/16	2-1/2	5/16	4
IPVR5/16"0.03"4	5/16	0.030	13/16	2-1/2	5/16	4
IPVR3/8"0.01"4	3/8	0.01	7/8	2-1/2	3/8	4
IPVR3/8"0.015"4	3/8	0.015	7/8	2-1/2	3/8	4
IPVR3/8"0.02"4	3/8	0.02	7/8	2-1/2	3/8	4
IPVR3/8"0.03"4	3/8	0.03	7/8	2-1/2	3/8	4
IPVR3/8"0.06"4	3/8	0.06	7/8	2-1/2	3/8	4
IPVR7/16"0.02"4	7/16	0.02	1	2-3/4	7/16	4
IPVR1/2"0.01"4	1/2	0.01	1	3	1/2	4
IPVR1/2"0.015"4	1/2	0.015	1	3	1/2	4
IPVR1/2"0.03"4	1/2	0.03	1	3	1/2	4
IPVR1/2"0.06"4	1/2	0.06	1	3	1/2	4
IPVR1/2"0.09"4	1/2	0.09	1	3	1/2	4
IPVR1/2"0.125"4	1/2	0.125	1	3	1/2	4
IPVR9/16"0.03"4	9/16	0.03	1-1/8	3-1/2	9/16	4
IPVR5/8"0.03"4	5/8	0.03	1-1/4	3-1/2	5/8	4
IPVR5/8"0.04"4	5/8	0.04	1-1/4	3-1/2	5/8	4
IPVR5/8"0.06"4	5/8	0.06	1-1/4	3-1/2	5/8	4
IPVR5/8"0.09"4	5/8	0.09	1-1/4	3-1/2	5/8	4
IPVR5/8"0.125"4	5/8	0.125	1-1/4	3-1/2	5/8	4
IPVR3/4"0.03"4	3/4	0.03	1-1/2	4	3/4	4
IPVR3/4"0.04"4	3/4	0.04	1-1/2	4	3/4	4
IPVR3/4"0.06"4	3/4	0.06	1-1/2	4	3/4	4
IPVR3/4"0.09"4	3/4	0.09	1-1/2	4	3/4	4
IPVR3/4"0.125"4	3/4	0.125	1-1/2	4	3/4	4
IPVR1"0.03"4	1	0.03	1-1/2	4	1	4
IPVR1"0.04"4	1	0.04	1-1/2	4	1	4
IPVR1"0.06"4	1	0.06	1-1/2	4	1	4
IPVR1"0.09"4	1	0.09	1-1/2	4	1	4
IPVR1"0.125"4	1	0.125	1-1/2	4	1	4

Unit:inch

Application :

☉ Recommend ○ Suitable

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	☉	☉	○	○	☉			○	○





Cutting Condition
P33

Square Type For Titanium

■ 鈦合金專用立銑刀

400 PLUS



FRACTIONAL 英制



MODE	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	刃長	L全長	D柄徑	Z刃數
IPVE1T1/8"4	1/8	3/8	1-1/2	1/8	4
IPVE1T3/16"4	3/16	7/16	2	3/16	4
IPVE1T1/4"4	1/4	1/2	2-1/2	1/4	4
IPVE1T5/16"4	5/16	13/16	2-1/2	5/16	4
IPVE1T3/8"4	3/8	7/8	3	3/8	4
IPVE1T1/2"4	1/2	1	3	1/2	4
IPVE1T5/8"4	5/8	1-1/4	3-1/2	5/8	4
IPVE1T3/4"4	3/4	1-1/2	4	3/4	4

Unit : inch

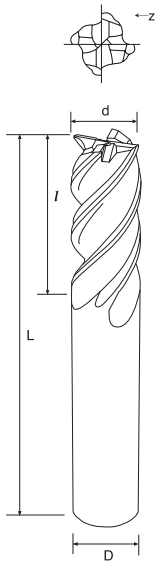
Long Flute

FRACTIONAL 英制



MODE	Diameter	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	刃長	L全長	D柄徑	Z刃數
IPLVE1T1/8"4	1/8	1/2	2-1/2	1/8	4
IPLVE1T3/16"4	3/16	5/8	2-1/2	3/16	4
IPLVE1T1/4"4	1/4	3/4	2-1/2	1/4	4
IPLVE1T5/16"4	5/16	1-1/8	3	5/16	4
IPLVE1T3/8"4	3/8	1-1/2	3	3/8	4
IPLVE1T1/2"4	1/2	2	4-1/2	1/2	4
IPLVE1T5/8"4	5/8	2-1/4	5	5/8	4
IPLVE1T3/4"4	3/4	2-1/2	5	3/4	4

Unit : inch



- HRC > 40
- HRC > 45
- HRC > 50
- HRC > 55
- HRC > 60
- HRC > 65
- [Icon]
- [Icon]
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- [Icon]
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- [Icon]
- [Icon]
- [Icon]
- [Icon]

Application :

⊙ Recommend ○ Suitable

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	⊙	⊙	○			⊙			

Cutting Condition
P34

SPEED TIGER

Square Type - Long Neck For Titanium

■ 鈦合金專用有頸立銑刀

400 PLUS



nACRo



FRACTIONAL 英制

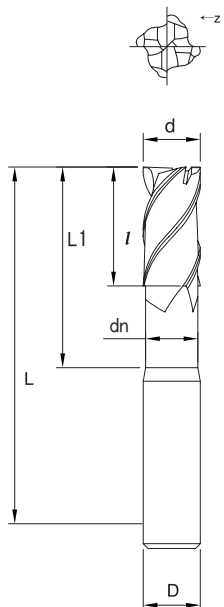


MODE	Diameter	Flute Length	Efficient Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	刃長	L1有效長	L全長	D柄徑	Z 刃數
IPNVE1T1/8"4	1/8	3/16	3/4	2-1/2	1/4	4
IPNVE1T3/16"4	3/16	1/4	3/4	2-1/2	1/4	4
IPNVE1T1/4"4	1/4	3/8	1	2-1/2	1/4	4
IPNVE1T5/16"4	5/16	1/2	1-1/4	3	5/16	4
IPNVE1T3/8"4	3/8	5/8	1-1/2	3	3/8	4
IPNVE1T1/2"4	1/2	13/16	1-3/4	3-1/4	1/2	4
IPNVE1T5/8"4	5/8	1	1-3/4	4	5/8	4
IPNVE1T3/4"4	3/4	1-1/4	2	4	3/4	4

Unit : inch

Long Flute & Neck

FRACTIONAL 英制



MODE	Diameter	Flute Length	Efficient Length	Neck Diameter	Full Length	Shank Diameter	Flutes
型號	d 刃徑	刃長	L1有效長	dn 頸徑	L全長	D柄徑	Z 刃數
IPLNVE1T1/8"4	1/8	3/8	1/2	0.117	2-1/2	1/4	4
IPLNVE1T3/16"4	3/16	1/2	3/4	0.172	2-1/2	1/4	4
IPLNVE1T1/4"4	1/4	5/8	3/4	0.23	2-1/2	1/4	4
IPLNVE1T5/16"4	5/16	3/4	1	0.289	2-1/2	5/16	4
IPLNVE1T3/8"4	3/8	13/16	1-1/4	0.344	3	3/8	4
IPLNVE1T1/2"4	1/2	1	1-1/2	0.46	3	1/2	4
IPLNVE1T5/8"4	5/8	1-1/4	1-3/4	0.586	4	5/8	4
IPLNVE1T3/4"4	3/4	1-1/2	2	0.71	4	3/4	4

Unit : inch

Application :

⊙ Recommend ○ Suitable

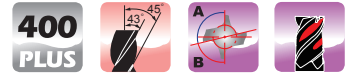
<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	"Stainless steel"	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	⊙	○				⊙			



Cutting Condition
P34

Corner Radius Type For Titanium

■ 鈦合金專用圓鼻立銑刀

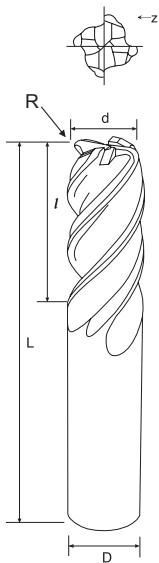


FRACTIONAL 英制



MODE	Diameter	Corner Radius	Flute Length	Full Length	Shank Diameter	Flutes
型號	d 刃徑	R 角	切長	L全長	D柄徑	Z刃數
IPVR1T3/16"0.02"4	3/16	0.02	7/16	2	3/16	4
IPVR1T1/4"0.02"4	1/4	0.02	1/2	2-1/2	1/4	4
IPVR1T1/4"0.04"4	1/4	0.04	1/2	2-1/2	1/4	4
IPVR1T5/16"0.02"4	5/16	0.02	13/16	2-1/2	5/16	4
IPVR1T5/16"0.04"4	5/16	0.04	13/16	2-1/2	5/16	4
IPVR1T3/8"0.02"4	3/8	0.02	7/8	3	3/8	4
IPVR1T3/8"0.04"4	3/8	0.04	7/8	3	3/8	4
IPVR1T3/8"0.06"4	3/8	0.06	7/8	3	3/8	4
IPVR1T1/2"0.02"4	1/2	0.02	1	3	1/2	4
IPVR1T1/2"0.04"4	1/2	0.04	1	3	1/2	4
IPVR1T1/2"0.06"4	1/2	0.06	1	3	1/2	4
IPVR1T1/2"0.09"4	1/2	0.09	1	3	1/2	4
IPVR1T1/2"0.125"4	1/2	0.125	1	3	1/2	4
IPVR1T5/8"0.04"4	5/8	0.04	1-1/4	3-1/2	5/8	4
IPVR1T5/8"0.06"4	5/8	0.06	1-1/4	3-1/2	5/8	4
IPVR1T5/8"0.09"4	5/8	0.09	1-1/4	3-1/2	5/8	4
IPVR1T5/8"0.125"4	5/8	0.125	1-1/4	3-1/2	5/8	4
IPVR1T3/4"0.04"4	3/4	0.04	1-1/2	4	3/4	4
IPVR1T3/4"0.09"4	3/4	0.09	1-1/2	4	3/4	4
IPVR1T3/4"0.125"4	3/4	0.125	1-1/2	4	3/4	4

Unit:inch



- HRC > 40
- HRC > 45
- HRC > 50
- HRC > 55
- HRC > 60
- HRC > 65
-
-
-
-
-
-
-
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-
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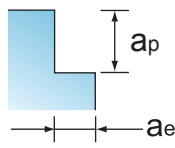
Application :

⊙ Recommend ○ Suitable

<30HRC	30~40HRC	40~50HRC	50~65HRC	Carbon steel, Alloy steel	Stainless steel	Titanium alloy	Nickel/Inconel alloy	Aluminum alloy	Copper alloy
	⊙	⊙	○			⊙			


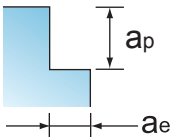
SPEED TIGER

CUTTING CONDITION - 400 PLUS SERIES

Side Milling 	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536			ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		
	Hardness BRINELL	≤ 275			≤ 375			≤ 375			> 375 ≤ 475			> 475 ≤ 655	
HRC	≤ 28.5			≤ 39.8			≤ 39.8			> 39.8 ≤ 49.1			> 50 ≤ 65		
Vc (SFM)	155	(150-163)		90	(86-93)		36	(35-38)		60	(58-62)		25	(24-26)	
ae/ap	ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D		
MILL DIA. (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
3	15,962	0.01016	648.7	9,099	0.00762	277.33	3,729	0.01270	189	6,066	0.01016	246.5	2554	0.00508	51.9
4	13,621	0.01397	761.2	7,764	0.00889	276.09	3,182	0.01715	218	5,176	0.01397	289.2	2179	0.00699	60.9
6	9,081	0.02350	853.4	5,176	0.01842	381.28	2,121	0.02826	240	3,451	0.02350	324.3	1453	0.01175	68.3
8	6,811	0.03683	1003.4	3,882	0.02794	433.86	1,591	0.04445	283	2,588	0.03683	381.3	1090	0.01842	80.3
10	5,449	0.05017	1093.3	3,106	0.03715	461.47	1,273	0.06064	309	2,070	0.05017	415.5	872	0.02508	87.5
12	4,540	0.05969	1084.1	2,588	0.04509	466.73	1,061	0.07176	304	1,725	0.05969	411.9	726	0.02985	86.7
16	3,405	0.07874	1072.5	1,941	0.06096	473.31	795	0.09906	315	1,294	0.08128	420.7	545	0.04064	88.6
20	2,956	0.08128	961.1	1,685	0.06350	427.97	691	0.10668	295	1,123	0.08890	399.4	473	0.04445	84.1
25	2,078	0.08890	739.1	1,185	0.06858	324.99	486	0.12700	247	790	0.09652	304.9	333	0.04826	64.2
Depth of cut															


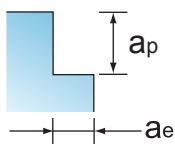


CUTTING CONDITION - 400 PLUS SERIES

Side Milling 	CAST IRONS (LOW&MEDIUM ALLOY) Gray, Malleable, Ductile			CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile			STAINLESS STEELS (FREE MACHINING) 303, 416,420F,430F,440F			STAINLESS STEELS (DIFFICULT) 304, 304L,316,316L			STAINLESS STEELS(PH) 13-8 PH,15-5PH,17-4PH, Custom 450		
	Hardness BRINELL	≦ 220			≧ 220 ≦ 260			≦ 275			≦ 275			≦ 325	
HRC	≦ 18.8			≧ 18.8 ≦ 26.6			≦ 28.5			≦ 28.5			≦ 34.4		
Vc (SFM)	100	(96-105)		100	(96-105)		137	(132-143)		100	(96-105)		87	(84-91)	
ae/ap	ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D		
MILL DIA. (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
3	12658	0.01016	514	9,737	0.00762	296.8	14,047	0.00762	428.2	9,737	0.00508	197.9	8,939	0.00508	181.6
4	10802	0.01397	604	8,309	0.01016	337.7	11,987	0.01016	487.1	8,309	0.00762	253.3	7,628	0.00762	232.5
6	7201	0.02350	677	5,539	0.01651	365.8	7,991	0.01651	527.7	5,539	0.01397	309.5	5,085	0.01397	284.2
8	5401	0.03556	768	4,155	0.02667	443.2	5,993	0.02667	639.4	4,155	0.02159	358.8	3,814	0.02159	329.4
10	4321	0.04763	823	3,324	0.03683	489.6	4,795	0.03683	706.4	3,324	0.02889	384.1	3,051	0.02889	352.6
12	3601	0.05715	823	2,770	0.04318	478.4	3,996	0.04318	690.1	2,770	0.03366	372.9	2,543	0.03366	342.3
16	2700	0.07620	823	2,077	0.05842	485.4	2,997	0.05842	700.3	2,077	0.04572	379.9	1,907	0.04572	348.8
20	2344	0.07874	738	1,803	0.06096	439.7	2,601	0.06096	634.3	1,803	0.04826	348.1	1,655	0.04826	319.6
25	1648	0.08636	569	1,268	0.06350	322.0	1,829	0.06350	464.6	1,268	0.05080	257.6	1,164	0.05080	236.5
Depth of cut															

SPEED TIGER

CUTTING CONDITION - 400 PLUS SERIES

Side Milling 	SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 601, 617, 625, Incoly 800, Monel 400			SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 718, 750X, Incoly 925, Waspalloy, Hastelloy, Rene			TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si			TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		
	Hardness BRINELL	≤ 300			> 300			≤ 350			> 350 ≤ 440	
HRC	≤ 32.1			≤ 32.1								
Vc (SFM)	22	(21-23)		17	(16-18)		63	(60-65)		22	(21-23)	
ae/ap	ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D		
MILL DIA. (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
3	2,235	0.00508	45.4	1,756	0.00254	17.8	6,385	0.00508	129.7	2,235	0.00508	45.4
4	1,907	0.00635	48.4	1,498	0.00381	22.8	5,448	0.00699	152.2	1,907	0.00699	53.3
6	1,271	0.00953	48.4	999	0.00699	27.9	3,632	0.01175	170.7	1,271	0.01175	59.7
8	953	0.01524	58.1	749	0.01016	30.4	2,724	0.01905	207.6	953	0.01905	72.7
10	763	0.02096	63.9	599	0.01334	32.0	2,179	0.02635	229.7	763	0.02635	80.4
12	636	0.02413	61.4	499	0.01651	33.0	1,816	0.03112	226.0	636	0.03112	79.1
16	477	0.03302	63.0	375	0.02286	34.3	1,362	0.04064	221.4	477	0.04064	77.5
20	414	0.03556	58.9	325	0.02540	33.0	1,182	0.04318	204.2	414	0.04318	71.5
25	291	0.03810	44.3	229	0.02794	25.6	831	0.04572	152.0	291	0.04572	53.2
Depth of cut												



CUTTING CONDITION - 400 PLUS SERIES

Slot Milling	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536			ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		
Hardness BRINELL	≤ 275			≤ 375			≤ 375			≥ 375 ≤ 475			≥ 475 ≤ 655		
HRC	≤ 28.5			≤ 39.8			≤ 39.8			≥ 39.8 ≤ 49.1			≥ 50 ≤ 65		
Vc (SFM)	125	(120-130)		57	(55-60)		29	(28-30)		48	(46-50)		20	(19-21)	
ae/ap	ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D		
MILL DIA. (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
3	12,770	0.01016	519.0	5,832	0.00762	177.77	3,007	0.01270	153	4,853	0.01016	197.2	2043	0.00508	41.5
4	10,897	0.01397	608.9	4,977	0.00889	176.98	2,566	0.01715	176	4,141	0.01397	231.4	1744	0.00699	48.7
6	7,265	0.02350	682.7	3,318	0.01842	244.41	1,711	0.02826	193	2,761	0.02350	259.4	1162	0.01175	54.6
8	5,449	0.03683	802.7	2,489	0.02794	278.12	1,283	0.04445	228	2,070	0.03683	305.0	872	0.01842	64.2
10	4,359	0.05017	874.6	1,991	0.03715	295.82	1,026	0.06064	249	1,656	0.05017	332.4	697	0.02508	70.0
12	3,632	0.05969	867.3	1,659	0.04509	299.19	855	0.07176	246	1,380	0.05969	329.6	581	0.02985	69.4
16	2,724	0.07874	858.0	1,244	0.06096	303.40	642	0.09906	254	1,035	0.08128	336.6	436	0.04064	70.9
20	2,365	0.08128	768.9	1,080	0.06350	274.34	557	0.10668	238	899	0.08890	319.6	378	0.04445	67.3
25	1,663	0.08890	591.3	759	0.06858	208.33	392	0.12700	199	632	0.09652	243.9	266	0.04826	51.4
Depth of cut															


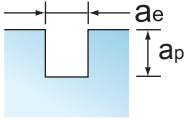
SPEED TIGER

CUTTING CONDITION - 400 PLUS SERIES


Slot Milling	CAST IRONS (LOW&MEDIUM ALLOY) Gray, Malleable, Ductile			CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile			STAINLESS STEELS (FREE MACHINING) 304, 416,420F,430F,440F			STAINLESS STEELS (DIFFICULT) 304, 304L,316,316L			STAINLESS STEELS(PH) 13-8 PH,15-5PH,17-4PH, Custom 450		
Hardness BRINELL	≦ 220			≧ 220 ≦ 260			≦ 275			≦ 275			≦ 325		
HRC	≦ 18.8			≧ 18.8 ≦ 26.6			≦ 28.5			≦ 28.5			≦ 34.4		
Vc (SFM)	64	(62-67)		61	(59-64)		88	(84-92)		61	(59-64)		56	(54-59)	
ae/ap	ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D		
MILL DIA. (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
3	8,114	0.01016	330	6,242	0.00762	190.2	9,005	0.00762	274.5	6,242	0.00508	126.8	5,730	0.00508	116.4
4	6,924	0.01397	387	5,326	0.01016	216.5	7,684	0.01016	312.3	5,326	0.00762	162.3	4,890	0.00762	149.0
6	4,616	0.02350	434	3,551	0.01651	234.5	5,123	0.01651	338.3	3,551	0.01397	198.4	3,260	0.01397	182.2
8	3,462	0.03556	492	2,663	0.02667	284.1	3,842	0.02667	409.9	2,663	0.02159	230.0	2,445	0.02159	211.1
10	2,770	0.04763	528	2,131	0.03683	313.9	3,074	0.03683	452.8	2,131	0.02889	246.2	1,956	0.02889	226.0
12	2,308	0.05715	528	1,775	0.04318	306.7	2,561	0.04318	442.4	1,775	0.03366	239.0	1,630	0.03366	219.4
16	1,731	0.07620	528	1,332	0.05842	311.2	1,921	0.05842	448.9	1,332	0.04572	243.5	1,222	0.04572	223.6
20	1,503	0.07874	473	1,156	0.06096	281.9	1,668	0.06096	406.6	1,156	0.04826	223.1	1,061	0.04826	204.8
25	1,057	0.08636	365	813	0.06350	206.4	1,172	0.06350	297.8	813	0.05080	165.1	746	0.05080	151.6
Depth of cut															





CUTTING CONDITION - 400 PLUS SERIES


Slot Milling 	SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 601, 617, 625, Incoly 800, Monel 400			SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 718, 750X, Incoly 925, Waspalloy, Hastelloy, Rene			TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si			TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		
Hardness BRINELL	≤ 300			> 300			≤ 350			> 350 ≤ 440		
HRC	≤ 32.1			≤ 32.1								
Vc (SFM)	14	(13-15)		11	(10-12)		40	(38-42)		14	(13-15)	
ae/ap	ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D		
MILL DIA. (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
3	1,433	0.00508	29.1	1,126	0.00254	11.4	4,093	0.00508	83.2	1,433	0.00508	29.1
4	1,222	0.00635	31.0	960	0.00381	14.6	3,493	0.00699	97.6	1,222	0.00699	34.2
6	815	0.00953	31.0	640	0.00699	17.9	2,328	0.01175	109.4	815	0.01175	38.3
8	611	0.01524	37.3	480	0.01016	19.5	1,746	0.01905	133.1	611	0.01905	46.6
10	489	0.02096	41.0	384	0.01334	20.5	1,397	0.02635	147.3	489	0.02635	51.5
12	407	0.02413	39.3	320	0.01651	21.1	1,164	0.03112	144.9	407	0.03112	50.7
16	306	0.03302	40.4	240	0.02286	22.0	873	0.04064	141.9	306	0.04064	49.7
20	265	0.03556	37.7	208	0.02540	21.2	758	0.04318	130.9	265	0.04318	45.8
25	187	0.03810	28.4	147	0.02794	16.4	533	0.04572	97.5	187	0.04572	34.1
Depth of cut												

CUTTING CONDITION - PVE1T/PLVE1T

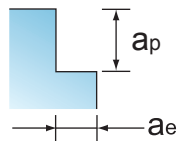
type	PVE1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT)		
	Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc	60		
ae/ap	ae=0.4D ap=1.5D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes
4	4,775	0.0159	303.2
5	3,820	0.0238	363.7
6	3,183	0.0318	404.3
8	2,388	0.0397	378.7
10	1,910	0.0429	327.5
12	1,592	0.0582	370.6
16	1,194	0.0642	306.5
20	955	0.0762	291.1

type	PVE1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT)		
	Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc	50		
ae/ap	ae=1D ap=1.25D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes
4	3,980	0.0119	189.5
5	3,184	0.0190	242.5
6	2,653	0.0265	280.8
8	1,990	0.0297	236.7
10	1,592	0.0333	212.3
12	1,327	0.0423	224.6
16	995	0.0494	196.5
20	796	0.0572	182.0

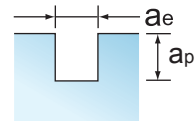
type	PLVE1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT)		
	Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc	60		
ae/ap	ae=0.2D ap=1.8D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes
4	4775	0.0119	227.4
5	3820	0.0238	363.7
6	3183	0.0265	336.9
8	2388	0.0297	284.0
10	1910	0.0381	291.1
12	1592	0.0476	303.2
16	1194	0.0593	282.9
20	955	0.0667	254.7

type	PLVE1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT)		
	Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc	50		
ae/ap	ae=1D ap=1.5D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes
4	3980	0.0079	126.4
5	3184	0.0143	181.9
6	2653	0.0212	224.6
8	1990	0.0248	197.3
10	1592	0.0286	182.0
12	1327	0.0370	196.6
16	995	0.0444	176.9
20	796	0.0524	166.8

Depth of cut





Depth of cut







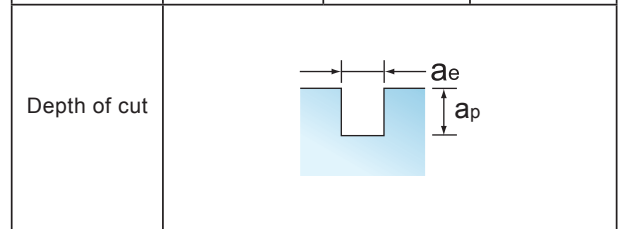
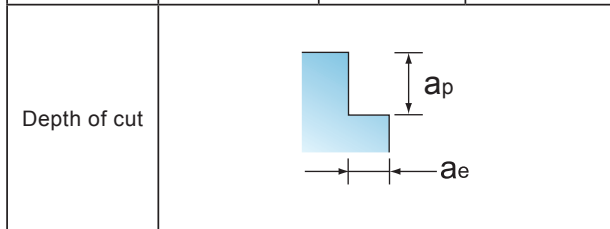
CUTTING CONDITION - PNVE1T/PLNVE1T/PVR1T

type	PNVE1T, PLNVE1T			PNVE1T, PLNVE1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3					
Hardness BRINELL	≅ 300					
HRC	≅ 31					
Vc	60			50		
ae/ap	ae=0.65D ap=1D			ae=0.4D ap=1.5D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
4	4,775	0.0119	227.4	3,980	0.0119	189.5
5	3,820	0.0238	363.7	3,184	0.0190	242.5
6	3,183	0.0318	404.3	2,653	0.0212	224.6
8	2,388	0.0397	378.7	1,990	0.0248	197.3
10	1,910	0.0429	327.5	1,592	0.0333	212.3
12	1,592	0.0635	404.3	1,327	0.0423	224.6
16	1,194	0.0642	306.5	995	0.0494	196.5
20	955	0.0714	272.9	796	0.0572	182.0


type	PNVE1T, PLNVE1T			PNVE1T, PLNVE1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3					
Hardness BRINELL	≅ 300					
HRC	≅ 31					
Vc	50			40		
ae/ap	ae=1D ap=0.9D			ae=1D ap=1.25D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes	RPM	Fz	Feed 4 flutes
4	3,980	0.0119	189.5	3,185	0.0079	101.1
5	3,184	0.0190	242.5	2,548	0.0143	145.5
6	2,653	0.0265	280.8	2,123	0.0212	179.8
8	1,990	0.0347	276.2	1,593	0.0248	157.9
10	1,592	0.0429	272.9	1,274	0.0286	145.6
12	1,327	0.0529	280.8	1,062	0.0423	179.8
16	995	0.0593	235.8	796	0.0444	141.5
20	796	0.0667	212.3	637	0.0524	133.5

type	PVR1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≅ 300		
HRC	≅ 31		
Vc	18		
ae/ap	ae=0.4D ap=1.5D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes
4	3,980	0.0119	189.5
5	3,184	0.0190	242.5
6	2,653	0.0212	224.6
8	1,990	0.0248	197.3
10	1,592	0.0333	212.3
12	1,327	0.0423	224.6
16	995	0.0494	196.5
20	796	0.0572	182.0

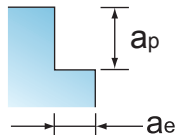
type	PVR1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≅ 300		
HRC	≅ 31		
Vc	18		
ae/ap	ae=1D ap=1.25D		
MILL DIA (Metric)	RPM	Fz	Feed 4 flutes
4	3,185	0.0079	101.1
5	2,548	0.0143	145.5
6	2,123	0.0212	179.8
8	1,593	0.0248	157.9
10	1,274	0.0286	145.6
12	1,062	0.0423	179.8
16	796	0.0444	141.5
20	637	0.0524	133.5



CUTTING CONDITION - 400 PLUS SERIES

Side Milling 	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536			ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		
	Hardness BRINELL	≤ 275			≤ 375			≤ 375			≥ 375 ≤ 475			≥ 475 ≤ 655	
HRC	≤ 28.5			≤ 39.8			≤ 39.8			≥ 39.8 ≤ 49.1			≥ 50 ≤ 65		
Vc (SFM)	555	(442-662)		315	(253-378)		405	(324-486)		210	(168-252)		90	(72-108)	
ae/ap	ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8	16,894	0.00040	27.0	9,629	0.00030	11.56	12,332	0.00050	24.7	6,420	0.00040	10.3	2,703	0.00020	2.2
9/64	15,017	0.00048	28.5	8,559	0.00028	9.42	10,962	0.00059	25.8	5,706	0.00048	10.8	2,403	0.00024	2.3
5/32	13,515	0.00055	29.7	7,704	0.00035	10.78	9,866	0.00068	26.6	5,136	0.00055	11.3	2,162	0.00028	2.4
11/64	12,286	0.00063	30.7	7,003	0.00043	11.91	8,969	0.00076	27.4	4,669	0.00063	11.7	1,966	0.00031	2.5
3/16	11,262	0.00070	31.5	6,420	0.00050	12.84	8,222	0.00085	28.0	4,280	0.00070	12.0	1,802	0.00035	2.5
13/64	10,396	0.00078	32.2	5,926	0.00058	13.63	7,589	0.00094	28.5	3,951	0.00078	12.2	1,663	0.00039	2.6
7/32	9,654	0.00085	32.8	5,503	0.00065	14.31	7,047	0.00103	28.9	3,668	0.00085	12.5	1,545	0.00043	2.6
15/64	9,010	0.00093	33.3	5,136	0.00073	14.89	6,577	0.00111	29.3	3,424	0.00093	12.7	1,442	0.00046	2.7
1/4	8,447	0.00100	33.8	4,815	0.00080	15.41	6,166	0.00120	29.6	3,210	0.00100	1.3	1,351	0.00005	0.3
17/64	7,950	0.00113	35.8	4,531	0.00088	15.86	5,803	0.00134	31.0	3,021	0.00113	13.6	1,272	0.00056	2.9
9/32	7,508	0.00123	36.9	4,280	0.00095	16.26	5,481	0.00148	32.3	2,853	0.00123	14.0	1,201	0.00061	2.9
19/64	7,113	0.00134	38.1	4,054	0.00103	16.62	5,193	0.00161	33.5	2,703	0.00134	14.5	1,138	0.00067	3.0
5/16	6,757	0.00145	39.2	3,852	0.00110	16.95	4,933	0.00175	34.5	2,568	0.00145	14.9	1,081	0.00073	3.1
21/64	6,436	0.00156	40.2	3,668	0.00118	17.24	4,698	0.00189	35.5	2,446	0.00156	15.3	1,030	0.00078	3.2
11/32	6,143	0.00168	41.3	3,502	0.00125	17.51	4,485	0.00203	36.3	2,334	0.00168	15.6	983	0.00084	3.3
23/64	5,876	0.00178	41.8	3,349	0.00133	17.75	4,290	0.00216	37.1	2,233	0.00178	16.0	940	0.00089	3.4
3/8	5,631	0.00190	42.8	3,210	0.00140	17.97	4,111	0.00230	37.8	2,140	0.00190	16.3	901	0.00095	3.4
25/64	5,406	0.00198	42.7	3,081	0.00146	18.03	3,946	0.00239	37.7	2,054	0.00198	16.2	865	0.00099	3.4
13/32	5,198	0.00205	42.6	2,963	0.00153	18.07	3,795	0.00248	37.6	1,975	0.00205	16.2	832	0.00103	3.4
27/64	5,006	0.00213	42.5	2,853	0.00159	18.12	3,654	0.00256	37.5	1,902	0.00213	16.2	801	0.00106	3.4
7/16	4,827	0.00220	42.5	2,751	0.00165	18.16	3,524	0.00265	37.3	1,834	0.00220	16.1	772	0.00110	3.4
29/64	4,660	0.00228	42.4	2,656	0.00171	18.20	3,402	0.00274	37.3	1,771	0.00228	16.1	746	0.00114	3.4
15/32	4,505	0.00235	42.3	2,568	0.00178	18.23	3,289	0.00283	37.2	1,712	0.00235	16.1	721	0.00118	3.4
31/64	4,360	0.00243	42.3	2,485	0.00184	18.26	3,183	0.00291	37.1	1,657	0.00243	16.1	698	0.00121	3.4
1/2	4,223	0.00250	42.2	2,407	0.00190	18.30	3,083	0.00300	37.0	1,605	0.00250	16.0	676	0.00125	3.4
9/16	3,754	0.00210	31.5	2,140	0.00215	18.40	2,741	0.00345	37.8	1,427	0.00285	16.3	601	0.00143	3.4
5/8	3,379	0.00310	41.9	1,926	0.00240	18.49	2,466	0.00390	38.5	1,284	0.00320	16.4	541	0.00160	3.5
11/16	3,072	0.00315	38.7	1,751	0.00245	17.16	2,242	0.00405	36.3	1,167	0.00335	15.6	491	0.00168	3.3
3/4	2,816	0.00320	36.0	1,605	0.00250	16.05	2,055	0.00420	34.5	1,070	0.00350	15.0	450	0.00175	3.2
7/8	2,413	0.00335	32.3	1,376	0.00260	14.31	1,762	0.00460	32.4	917	0.00365	13.4	386	0.00183	2.8
1	2,112	0.00350	29.6	1,204	0.00270	13.00	1,542	0.00500	30.8	802	0.00380	12.2	338	0.00190	2.6

Depth of cut






CUTTING CONDITION - 400 PLUS SERIES

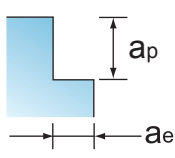
SideMilling	CAST IRONS LOW&MEDIUM ALLOY Gray, Malleable, Ductile			CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile			STAINLESS STEELS (FREE MACHINING) 304, 416,420F,430F,440F			STAINLESS STEELS (DIFFICULT) 304, 304L,316,316L			STAINLESS STEELS(PH) 13-8 PH,15-5PH,17-4PH, Custom 450		
Hardness BRINELL	≦ 220			≧ 220 ≦ 260			≦ 275			≦ 275			≦ 325		
HRC	≦ 18.8			≧ 18.8 ≦ 26.6			≦ 28.5			≦ 28.5			≦ 34.4		
Vc (SFM)	355	(284-426)		340	(272-408)		490	(392-588)		340	(272-408)		310	(248-372)	
ae/ap	ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8	10,812	0.00040	17.3	10,305	0.00030	12.40	14,866	0.00030	17.8	10,305	0.00020	8.2	9,460	0.00020	7.6
9/64	9,611	0.00048	18.3	9,160	0.00035	12.80	13,215	0.00035	18.5	9,160	0.00025	9.2	8,409	0.00025	8.4
5/32	8,650	0.00055	19.0	8,244	0.00040	13.20	11,893	0.00040	19.0	8,244	0.00030	9.9	7,568	0.00030	9.1
11/64	7,863	0.00063	19.7	7,495	0.00045	13.50	10,812	0.00045	19.5	7,495	0.00035	10.5	6,880	0.00035	9.6
3/16	7,208	0.00070	20.2	6,870	0.00050	13.70	9,911	0.00050	19.8	6,870	0.00040	11.0	6,307	0.00040	10.1
13/64	6,654	0.00078	20.6	6,342	0.00055	14.00	9,149	0.00055	20.1	6,342	0.00045	11.4	5,822	0.00045	10.5
7/32	6,178	0.00085	21.0	5,889	0.00060	14.10	8,495	0.00060	20.4	5,889	0.00050	11.8	5,406	0.00050	10.8
15/64	5,766	0.00093	21.3	5,496	0.00065	14.30	7,929	0.00065	20.6	5,496	0.00055	12.1	5,046	0.00055	11.1
1/4	5,406	0.00100	21.6	5,153	0.00070	14.40	7,433	0.00070	20.8	5,153	0.00060	12.4	4,730	0.00060	11.4
17/64	5,088	0.00110	22.4	4,849	0.00079	15.30	6,996	0.00079	22.0	4,849	0.00066	12.9	4,452	0.00066	11.8
9/32	4,805	0.00120	23.1	4,580	0.00088	16.00	6,607	0.00088	23.1	4,580	0.00073	13.3	4,205	0.00073	12.2
19/64	4,552	0.00130	23.7	4,339	0.00096	16.70	6,260	0.00096	24.1	4,339	0.00079	13.7	3,983	0.00079	12.5
5/16	4,325	0.00140	24.2	4,122	0.00105	17.30	5,947	0.00105	25.0	4,122	0.00085	14.0	3,784	0.00085	12.9
21/64	4,119	0.00150	24.7	3,926	0.00114	17.90	5,663	0.00114	25.8	3,926	0.00091	14.3	3,604	0.00091	13.2
11/32	3,932	0.00160	25.2	3,747	0.00123	18.40	5,406	0.00123	26.5	3,747	0.00098	14.6	3,440	0.00098	13.4
23/64	3,761	0.00170	25.6	3,584	0.00131	18.80	5,171	0.00131	27.1	3,584	0.00104	14.9	3,291	0.00104	13.7
3/8	3,604	0.00180	25.9	3,435	0.00140	19.20	4,955	0.00140	27.8	3,435	0.00110	15.1	3,153	0.00110	13.9
25/64	3,460	0.00188	25.9	3,298	0.00145	19.10	4,757	0.00145	27.6	3,298	0.00114	15.0	3,027	0.00114	13.8
13/32	3,327	0.00195	25.9	3,171	0.00150	19.00	4,574	0.00150	27.4	3,171	0.00118	14.9	2,911	0.00118	13.7
27/64	3,204	0.00203	25.9	3,053	0.00155	18.90	4,405	0.00155	27.3	3,053	0.00121	14.8	2,803	0.00121	13.6
7/16	3,089	0.00210	25.9	2,944	0.00160	18.80	4,248	0.00160	27.2	2,944	0.00125	14.7	2,703	0.00125	13.5
29/64	2,983	0.00218	25.9	2,843	0.00165	18.80	4,101	0.00165	27.1	2,843	0.00013	1.5	2,610	0.00013	1.3
15/32	2,883	0.00225	25.9	2,748	0.00170	18.70	3,964	0.00170	27.0	2,748	0.00133	14.6	2,523	0.00133	13.4
31/64	2,790	0.00233	25.9	2,659	0.00175	18.60	3,837	0.00175	26.9	2,659	0.00136	14.5	2,441	0.00136	13.3
1/2	2,703	0.00240	25.9	2,576	0.00180	18.50	3,717	0.00180	26.8	2,576	0.00140	14.4	2,365	0.00140	13.2
9/16	2,403	0.00270	25.9	2,290	0.00205	18.80	3,304	0.00205	27.1	2,290	0.00160	14.7	2,102	0.00160	13.5
5/8	2,162	0.00300	25.9	2,061	0.00230	19.00	2,973	0.00230	27.4	2,061	0.00180	14.8	1,892	0.00180	13.6
11/16	1,966	0.00305	24.0	1,874	0.00245	18.40	2,703	0.00245	26.5	1,874	0.00185	13.9	1,720	0.00185	12.7
3/4	1,802	0.00310	22.3	1,718	0.00240	16.50	2,478	0.00240	23.8	1,718	0.00190	13.1	1,577	0.00190	12.0
7/8	1,545	0.00325	20.1	1,472	0.00245	14.40	2,124	0.00245	20.8	1,472	0.00195	11.5	1,351	0.00195	10.5
1	1,351	0.00340	18.4	1,288	0.00250	12.90	1,858	0.00250	18.6	1,288	0.00200	10.3	1,183	0.00200	9.5

Depth of cut

CUTTING CONDITION - 400 PLUS SERIES

SideMilling 	SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 601, 617, 625, Incoly 800, Monel 400			SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 718, 750X, Incoly 925, Waspalloy, Hastelloy, Rene			TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si			TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		
	Hardness BRINELL	≤ 300			> 300			≤ 350			> 350 ≤ 440	
HRC	≤ 32.1			≤ 32.1								
Vc (SFM)	80	(64-96)		62	(50-74)		215	(172-258)		75	(60-90)	
ae/ap	ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D			ae=0.5D ap=1.5D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8	2,365	0.00020	1.9	1,858	0.00010	0.70	6,757	0.00020	5.4	2,365	0.00020	1.9
9/64	2,102	0.00023	1.9	1,652	0.00013	0.80	6,007	0.00024	5.7	2,102	0.00024	2.0
5/32	1,892	0.00025	1.9	1,487	0.00015	0.90	5,406	0.00028	5.9	1,892	0.00028	2.1
11/64	1,720	0.00028	1.9	1,351	0.00018	0.90	4,915	0.00031	6.1	1,720	0.00031	2.2
3/16	1,577	0.00030	1.9	1,239	0.00020	1.00	4,505	0.00035	6.3	1,577	0.00035	2.2
13/64	1,455	0.00033	1.9	1,144	0.00023	1.00	4,158	0.00039	6.4	1,455	0.00039	2.3
7/32	1,351	0.00035	1.9	1,062	0.00025	1.10	3,861	0.00043	6.6	1,351	0.00043	2.3
15/64	1,261	0.00038	1.9	991	0.00028	1.10	3,604	0.00046	6.7	1,261	0.00046	2.3
1/4	1,183	0.00040	1.9	929	0.00030	1.10	3,379	0.00050	6.8	1,183	0.00050	2.4
17/64	1,113	0.00045	2.0	874	0.00033	1.10	3,180	0.00057	7.2	1,113	0.00057	2.5
9/32	1,051	0.00050	2.1	826	0.00035	1.20	3,003	0.00063	7.6	1,051	0.00063	2.6
19/64	996	0.00055	2.2	782	0.00038	1.20	2,845	0.00069	7.8	996	0.00069	2.7
5/16	946	0.00060	2.3	743	0.00040	1.20	2,703	0.00075	8.1	946	0.00075	2.8
21/64	901	0.00065	2.3	708	0.00043	1.20	2,574	0.00081	8.4	901	0.00081	2.9
11/32	860	0.00070	2.4	676	0.00045	1.20	2,457	0.00088	8.6	860	0.00088	3.0
23/64	823	0.00075	2.5	646	0.00048	1.20	2,350	0.00094	8.8	823	0.00094	3.1
3/8	788	0.00080	2.5	619	0.00050	1.20	2,252	0.00100	9.0	788	0.00100	3.2
25/64	757	0.00083	2.5	595	0.00053	1.20	2,162	0.00104	9.0	757	0.00104	3.1
13/32	728	0.00085	2.5	572	0.00055	1.30	2,079	0.00108	8.9	728	0.00108	3.1
27/64	701	0.00088	2.5	551	0.00058	1.30	2,002	0.00111	8.9	701	0.00111	3.1
7/16	676	0.00090	2.4	531	0.00060	1.30	1,931	0.00115	8.9	676	0.00115	3.1
29/64	652	0.00093	2.4	513	0.00063	1.30	1,864	0.00119	8.9	652	0.00119	3.1
15/32	631	0.00095	2.4	496	0.00065	1.30	1,802	0.00123	8.8	631	0.00123	3.1
31/64	610	0.00098	2.4	480	0.00068	1.30	1,744	0.00126	8.8	610	0.00126	3.1
1/2	591	0.00100	2.4	465	0.00070	1.30	1,689	0.00130	8.8	591	0.00130	3.1
9/16	526	0.00115	2.4	413	0.00080	1.30	1,502	0.00145	8.7	526	0.00145	3.0
5/8	473	0.00130	2.5	372	0.00090	1.30	1,351	0.00160	8.6	473	0.00160	3.0
11/16	430	0.00135	2.3	338	0.00095	1.30	1,229	0.00165	8.1	430	0.00165	2.8
3/4	394	0.00140	2.2	310	0.00100	1.20	1,126	0.00170	7.7	394	0.00170	2.7
7/8	338	0.00145	2.0	265	0.00011	0.10	965	0.00175	6.8	338	0.00175	2.4
1	296	0.00150	1.8	232	0.00110	1.00	845	0.00180	6.1	296	0.00180	2.1

Depth of cut

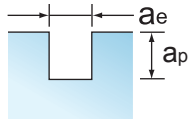




CUTTING CONDITION - 400 PLUS SERIES


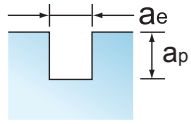
Slot Milling	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536			ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2			TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		
Hardness BRINELL	≦ 275			≦ 375			≦ 375			≧ 375 ≧ 475			≧ 475 ≧ 655		
HRC	≦ 28.5			≦ 39.8			≦ 39.8			≧ 39.8 ≧ 49.1			≧ 50 ≧ 65		
Vc (SFM)	440	(352-528)		252	(201-303)		320	(256-384)		170	(136-204)		70	(56-84)	
ae/ap	ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8	13,515	0.00040	21.6	6,163	0.00030	7.40	9,866	0.00050	19.7	5,136	0.00040	8.2	2,162	0.00020	1.7
9/64	12,013	0.00048	22.8	5,478	0.00028	6.03	8,770	0.00059	20.6	4,565	0.00048	8.7	1,922	0.00024	1.8
5/32	10,812	0.00055	23.8	4,930	0.00035	6.90	7,893	0.00068	21.3	4,109	0.00055	9.0	1,730	0.00028	1.9
11/64	9,829	0.00063	24.6	4,482	0.00043	7.62	7,175	0.00076	21.9	3,735	0.00063	9.3	1,573	0.00031	2.0
3/16	9,010	0.00070	25.2	4,109	0.00050	8.22	6,577	0.00085	22.4	3,424	0.00070	9.6	1,442	0.00035	2.0
13/64	8,317	0.00078	25.8	3,793	0.00058	8.72	6,071	0.00094	22.8	3,160	0.00078	9.8	1,331	0.00039	2.1
7/32	7,723	0.00085	26.3	3,522	0.00065	9.16	5,638	0.00103	23.1	2,935	0.00085	10.0	1,236	0.00043	2.1
15/64	7,208	0.00093	26.7	3,287	0.00073	9.53	5,262	0.00111	23.4	2,739	0.00093	10.1	1,153	0.00046	2.1
1/4	6,757	0.00100	27.0	3,081	0.00080	9.86	4,933	0.00120	23.7	2,568	0.00100	1.0	1,081	0.00005	0.2
17/64	6,360	0.00113	28.6	2,900	0.00088	10.15	4,643	0.00134	24.8	2,417	0.00113	10.9	1,018	0.00056	2.3
9/32	6,007	0.00123	29.6	2,739	0.00095	10.41	4,385	0.00148	25.9	2,283	0.00123	11.2	961	0.00061	2.4
19/64	5,691	0.00134	30.5	2,595	0.00103	10.64	4,154	0.00161	26.8	2,162	0.00134	11.6	910	0.00067	2.4
5/16	5,406	0.00145	31.4	2,465	0.00110	10.85	3,946	0.00175	27.6	2,054	0.00145	11.9	865	0.00073	2.5
21/64	5,149	0.00156	32.1	2,348	0.00118	11.03	3,758	0.00189	28.4	1,956	0.00156	12.2	824	0.00078	2.6
11/32	4,915	0.00168	33.0	2,241	0.00125	11.21	3,588	0.00203	29.1	1,868	0.00168	12.5	786	0.00084	2.6
23/64	4,701	0.00178	33.5	2,144	0.00133	11.36	3,432	0.00216	29.7	1,786	0.00178	12.8	752	0.00089	2.7
3/8	4,505	0.00190	34.2	2,054	0.00140	11.50	3,289	0.00230	30.3	1,712	0.00190	13.0	721	0.00095	2.7
25/64	4,325	0.00198	34.2	1,972	0.00146	11.54	3,157	0.00239	30.2	1,643	0.00198	13.0	692	0.00099	2.7
13/32	4,158	0.00205	34.1	1,896	0.00153	11.57	3,036	0.00248	30.1	1,580	0.00205	13.0	665	0.00103	2.7
27/64	4,004	0.00213	34.0	1,826	0.00159	11.60	2,923	0.00256	30.0	1,522	0.00213	12.9	641	0.00106	2.7
7/16	3,861	0.00220	34.0	1,761	0.00165	11.62	2,819	0.00265	29.9	1,467	0.00220	12.9	618	0.00110	2.7
29/64	3,728	0.00228	33.9	1,700	0.00171	11.65	2,722	0.00274	29.8	1,417	0.00228	12.9	597	0.00114	2.7
15/32	3,604	0.00235	33.9	1,643	0.00178	11.67	2,631	0.00283	29.7	1,370	0.00235	12.9	577	0.00118	2.7
31/64	3,488	0.00243	33.8	1,590	0.00184	11.69	2,546	0.00291	29.6	1,325	0.00243	12.9	558	0.00121	2.7
1/2	3,379	0.00250	33.8	1,541	0.00190	11.71	2,466	0.00300	29.6	1,284	0.00250	12.8	541	0.00125	2.7
9/16	3,003	0.00210	25.2	1,370	0.00215	11.78	2,192	0.00345	30.3	1,141	0.00285	13.0	481	0.00143	2.7
5/8	2,703	0.00310	33.5	1,233	0.00240	11.83	1,973	0.00390	30.8	1,027	0.00320	13.1	432	0.00160	2.8
11/16	2,457	0.00315	31.0	1,121	0.00245	10.98	1,794	0.00405	29.1	934	0.00335	12.5	393	0.00168	2.6
3/4	2,252	0.00320	28.8	1,027	0.00250	10.27	1,644	0.00420	27.6	856	0.00350	12.0	360	0.00175	2.5
7/8	1,931	0.00335	25.9	880	0.00260	9.16	1,409	0.00460	25.9	734	0.00365	10.7	309	0.00183	2.3
1	1,689	0.00350	23.7	770	0.00270	8.32	1,233	0.00500	24.7	642	0.00380	9.8	270	0.00190	2.1

Depth of cut




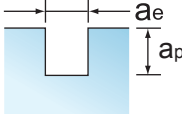
SPEED TIGER

CUTTING CONDITION - 400 PLUS SERIES


Slot Milling 	CAST IRONS (LOW&MEDIUM ALLOY) Gray, Malleable, Ductile			CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile			STAINLESS STEELS (FREE MACHINING) 304, 416, 420F, 430F, 440F			STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L			STAINLESS STEELS(PH) 13-8 PH, 15-5PH, 17-4PH, Custom 450		
Hardness BRINELL	≦ 220			≧ 220 ≦ 260			≦ 275			≦ 275			≦ 325		
HRC	≦ 18.8			≧ 18.8 ≦ 26.6			≦ 28.5			≦ 28.5			≦ 34.4		
Vc (SFM)	284	(356-534)		272	(216-324)		390	(312-468)		270	(216-324)		250	(200-300)	
ae/ap	ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8	6,920	0.00040	11.1	6,595	0.00030	7.90	9,515	0.00030	11.4	6,595	0.00020	5.3	6,055	0.00020	4.8
9/64	6,151	0.00048	11.7	5,862	0.00035	8.20	8,457	0.00035	11.8	5,862	0.00025	5.9	5,382	0.00025	5.4
5/32	5,536	0.00055	12.2	5,276	0.00040	8.40	7,612	0.00040	12.2	5,276	0.00030	6.3	4,844	0.00030	5.8
11/64	5,032	0.00063	12.6	4,797	0.00045	8.60	6,920	0.00045	12.5	4,797	0.00035	6.7	4,403	0.00035	6.2
3/16	4,613	0.00070	12.9	4,397	0.00050	8.80	6,343	0.00050	12.7	4,397	0.00040	7.0	4,036	0.00040	6.5
13/64	4,258	0.00078	13.2	4,059	0.00055	8.90	5,855	0.00055	12.9	4,059	0.00045	7.3	3,726	0.00045	6.7
7/32	3,954	0.00085	13.4	3,769	0.00060	9.00	5,437	0.00060	13.0	3,769	0.00050	7.5	3,460	0.00050	6.9
15/64	3,690	0.00093	13.7	3,517	0.00065	9.10	5,074	0.00065	13.2	3,517	0.00055	7.7	3,229	0.00055	7.1
1/4	3,460	0.00100	13.8	3,298	0.00070	9.20	4,757	0.00070	13.3	3,298	0.00060	7.9	3,027	0.00060	7.3
17/64	3,256	0.00110	14.3	3,104	0.00079	9.80	4,477	0.00079	14.1	3,104	0.00066	8.2	2,849	0.00066	7.6
9/32	3,075	0.00120	14.8	2,931	0.00088	10.30	4,229	0.00088	14.8	2,931	0.00073	8.5	2,691	0.00073	7.8
19/64	2,914	0.00130	15.2	2,777	0.00096	10.70	4,006	0.00096	15.4	2,777	0.00079	8.7	2,549	0.00079	8.0
5/16	2,768	0.00140	15.5	2,638	0.00105	11.10	3,806	0.00105	16.0	2,638	0.00085	9.0	2,422	0.00085	8.2
21/64	2,636	0.00150	15.8	2,512	0.00114	11.40	3,625	0.00114	16.5	2,512	0.00091	9.2	2,307	0.00091	8.4
11/32	2,516	0.00160	16.1	2,398	0.00123	11.80	3,460	0.00123	17.0	2,398	0.00098	9.4	2,202	0.00098	8.6
23/64	2,407	0.00170	16.4	2,294	0.00131	12.00	3,309	0.00131	17.4	2,294	0.00104	9.5	2,106	0.00104	8.7
3/8	2,307	0.00180	16.6	2,198	0.00140	12.30	3,172	0.00140	17.8	2,198	0.00110	9.7	2,018	0.00110	8.9
25/64	2,214	0.00188	16.6	2,110	0.00145	12.20	3,045	0.00145	17.7	2,110	0.00114	9.6	1,938	0.00114	8.8
13/32	2,129	0.00195	16.6	2,029	0.00150	12.20	2,928	0.00150	17.6	2,029	0.00118	9.5	1,863	0.00118	8.8
27/64	2,050	0.00203	16.6	1,954	0.00155	12.10	2,819	0.00155	17.5	1,954	0.00121	9.5	1,794	0.00121	8.7
7/16	1,977	0.00210	16.6	1,884	0.00160	12.10	2,718	0.00160	17.4	1,884	0.00125	9.4	1,730	0.00125	8.6
29/64	1,909	0.00218	16.6	1,819	0.00165	12.00	2,625	0.00165	17.3	1,819	0.0013	9.9	1,670	0.0013	9.9
15/32	1,845	0.00225	16.6	1,759	0.00170	12.00	2,537	0.00170	17.3	1,759	0.00133	9.3	1,615	0.00133	8.6
31/64	1,786	0.00233	16.6	1,702	0.00175	11.90	2,455	0.00175	17.2	1,702	0.00136	9.3	1,563	0.00136	8.5
1/2	1,730	0.00240	16.6	1,649	0.00180	11.90	2,379	0.00180	17.1	1,649	0.00140	9.2	1,514	0.00140	8.5
9/16	1,538	0.00270	16.6	1,466	0.00205	12.00	2,114	0.00205	17.3	1,466	0.00160	9.4	1,345	0.00160	8.6
5/8	1,384	0.00300	16.6	1,319	0.00230	12.10	1,903	0.00230	17.5	1,319	0.00180	9.5	1,211	0.00180	8.7
11/16	1,258	0.00305	15.3	1,199	0.00245	11.80	1,730	0.00245	17.0	1,199	0.00185	8.9	1,101	0.00185	8.1
3/4	1,153	0.00310	14.3	1,099	0.00240	10.60	1,586	0.00240	15.2	1,099	0.00190	8.4	1,009	0.00190	7.7
7/8	989	0.00325	12.9	942	0.00245	9.20	1,359	0.00245	13.3	942	0.00195	7.3	865	0.00195	6.7
1	865	0.00340	11.8	824	0.00250	8.20	1,189	0.00250	11.9	824	0.00200	6.6	757	0.00200	6.1
Depth of cut															





CUTTING CONDITION - 400 PLUS SERIES


Slot Milling 	SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 601, 617, 625, Incoly 800, Monel 400			SUPER ALLOYS (NICKEL, COBALT, IRON, BASE) Inconel 718, 750X, Incoly 925, Waspalloy, Hastelloy, Rene			TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si			TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		
Hardness BRINELL	≤ 300			> 300			≤ 350			> 350 ≤ 440		
HRC	≤ 32.1			≤ 32.1								
Vc (SFM)	65	(52-78)		50	(40-60)		170	(136-204)		60	(48-72)	
ae/ap	ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D			ae=1D ap=1D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8	1,514	0.00020	1.2	1,189	0.00010	0.50	4,325	0.00020	3.5	1,514	0.00020	1.2
9/64	1,345	0.00023	1.2	1,057	0.00013	0.50	3,844	0.00024	3.7	1,345	0.00024	1.3
5/32	1,211	0.00025	1.2	951	0.00015	0.60	3,460	0.00028	3.8	1,211	0.00028	1.3
11/64	1,101	0.00028	1.2	865	0.00018	0.60	3,145	0.00031	3.9	1,101	0.00031	1.4
3/16	1,009	0.00030	1.2	793	0.00020	0.60	2,883	0.00035	4.0	1,009	0.00035	1.4
13/64	931	0.00033	1.2	732	0.00023	0.70	2,661	0.00039	4.1	931	0.00039	1.4
7/32	865	0.00035	1.2	680	0.00025	0.70	2,471	0.00043	4.2	865	0.00043	1.5
15/64	807	0.00038	1.2	634	0.00028	0.70	2,307	0.00046	4.3	807	0.00046	1.5
1/4	757	0.00040	1.2	595	0.00030	0.70	2,162	0.00050	4.3	757	0.00050	1.5
17/64	712	0.00045	1.3	560	0.00033	0.70	2,035	0.00057	4.6	712	0.00057	1.6
9/32	673	0.00050	1.3	529	0.00035	0.70	1,922	0.00063	4.8	673	0.00063	1.7
19/64	637	0.00055	1.4	501	0.00038	0.80	1,821	0.00069	5.0	637	0.00069	1.8
5/16	605	0.00060	1.5	476	0.00040	0.80	1,730	0.00075	5.2	605	0.00075	1.8
21/64	577	0.00065	1.5	453	0.00043	0.80	1,648	0.00081	5.4	577	0.00081	1.9
11/32	550	0.00070	1.5	432	0.00045	0.80	1,573	0.00088	5.5	550	0.00088	1.9
23/64	526	0.00075	1.6	414	0.00048	0.80	1,504	0.00094	5.6	526	0.00094	2.0
3/8	505	0.00080	1.6	396	0.00050	0.80	1,442	0.00100	5.8	505	0.00100	2.0
25/64	484	0.00083	1.6	381	0.00053	0.80	1,384	0.00104	5.7	484	0.00104	2.0
13/32	466	0.00085	1.6	366	0.00055	0.80	1,331	0.00108	5.7	466	0.00108	2.0
27/64	448	0.00088	1.6	352	0.00058	0.80	1,281	0.00111	5.7	448	0.00111	2.0
7/16	432	0.00090	1.6	340	0.00060	0.80	1,236	0.00115	5.7	432	0.00115	2.0
29/64	418	0.00093	1.5	328	0.00063	0.80	1,193	0.00119	5.7	418	0.00119	2.0
15/32	404	0.00095	1.5	317	0.00065	0.80	1,153	0.00123	5.7	404	0.00123	2.0
31/64	391	0.00098	1.5	307	0.00068	0.80	1,116	0.00126	5.6	391	0.00126	2.0
1/2	378	0.00100	1.5	297	0.00070	0.80	1,081	0.00130	5.6	378	0.00130	2.0
9/16	336	0.00115	1.5	264	0.00080	0.80	961	0.00145	5.6	336	0.00145	2.0
5/8	303	0.00130	1.6	238	0.00090	0.90	865	0.00160	5.5	303	0.00160	1.9
11/16	275	0.00135	1.5	216	0.00095	0.80	786	0.00165	5.2	275	0.00165	1.8
3/4	252	0.00140	1.4	198	0.00100	0.80	721	0.00170	4.9	252	0.00170	1.7
7/8	216	0.00145	1.3	170	0.00011	0.10	618	0.00175	4.3	216	0.00175	1.5
1	189	0.00150	1.1	149	0.00110	0.70	541	0.00180	3.9	189	0.00180	1.4
Depth of cut												

CUTTING CONDITION - IPVE1T/IPLVE1T

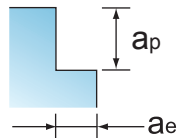
type	IPVE1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc (SFM)	198		
ae/ap	ae=0.4D ap=1.5D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes
1/8"	6,016	0.0006	15.0
3/16"	4,013	0.0009	15.0
1/4"	3,008	0.0013	15.0
5/16"	2,409	0.0016	15.0
3/8"	2,005	0.0017	13.5
1/2"	1,504	0.0023	13.8
5/8"	1,209	0.0025	12.2
3/4"	1,003	0.0030	12.0

type	IPVE1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc (SFM)	165		
ae/ap	ae=1D ap=1.25D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes
1/8"	5,014	0.0005	9.4
3/16"	3,345	0.0007	10.0
1/4"	2,507	0.0010	10.4
5/16"	2,008	0.0012	9.4
3/8"	1,671	0.0013	8.8
1/2"	1,254	0.0017	8.4
5/8"	1,008	0.0019	7.8
3/4"	836	0.0023	7.5

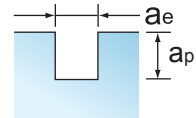
type	IPLVE1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc (SFM)	198		
ae/ap	ae=0.2D ap=1.8D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes
1/8"	6016	0.0005	11.3
3/16"	4013	0.0009	15.0
1/4"	3008	0.0010	12.5
5/16"	2409	0.0012	11.3
3/8"	2005	0.0015	12.0
1/2"	1504	0.0019	11.3
5/8"	1209	0.0023	11.3
3/4"	1003	0.0026	10.5

type	IPLVE1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc (SFM)	165		
ae/ap	ae=1D ap=1.5D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes
1/8"	5014	0.0003	6.3
3/16"	3345	0.0006	7.5
1/4"	2507	0.0008	8.4
5/16"	2008	0.0010	7.8
3/8"	1671	0.0011	7.5
1/2"	1254	0.0015	7.3
5/8"	1008	0.0017	7.1
3/4"	836	0.0021	6.9

Depth of cut





Depth of cut




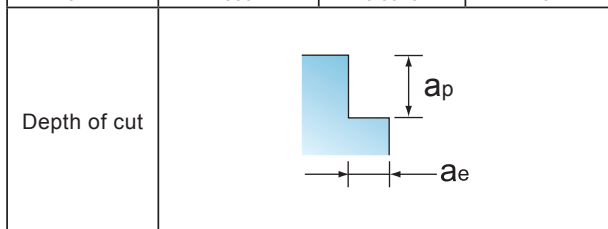



CUTTING CONDITION - IPNVE1T/IPLNVE1T/IPVR1T

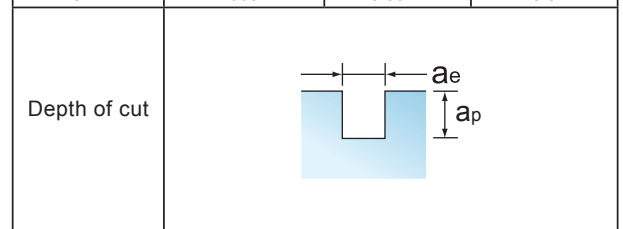
type	IPNVE1T, IPLNVE1T			IPNVE1T, IPLNVE1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3					
Hardness BRINELL	≤ 300					
HRC	≤ 31					
Vc (SFM)	198			165		
ae/ap	ae=0.65D ap=1D			ae=0.4D ap=1D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8"	6,016	0.0005	11.3	5,014	0.0005	9.4
3/16"	4,013	0.0009	15.0	3,345	0.0007	10.0
1/4"	3,008	0.0013	15.0	2,507	0.0008	8.4
5/16"	2,409	0.0016	15.0	2,008	0.0010	7.8
3/8"	2,005	0.0017	13.5	1,671	0.0013	8.8
1/2"	1,504	0.0025	15.0	1,254	0.0017	8.4
5/8"	1,209	0.0025	12.2	1,008	0.0019	7.8
3/4"	1,003	0.0028	11.3	836	0.0023	7.5

type	IPNVE1T, IPLNVE1T			IPNVE1T, IPLNVE1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3					
Hardness BRINELL	≤ 300					
HRC	≤ 31					
Vc (SFM)	165			132		
ae/ap	ae=1D ap=0.9D			ae=1D ap=0.8D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes	RPM	Fz	Feed (IPM) 4 flutes
1/8"	5,014	0.0005	9.4	4,013	0.0003	5.0
3/16"	3,345	0.0007	10.0	2,676	0.0006	6.0
1/4"	2,507	0.0010	10.4	2,006	0.0008	6.7
5/16"	2,008	0.0014	11.0	1,607	0.0010	6.3
3/8"	1,671	0.0017	11.3	1,338	0.0011	6.0
1/2"	1,254	0.0021	10.4	1,003	0.0017	6.7
5/8"	1,008	0.0023	9.4	806	0.0017	5.6
3/4"	836	0.0026	8.8	669	0.0021	5.5

type	IPVR1T		
Side Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc (SFM)	60		
ae/ap	ae=0.4D ap=1.5D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes
1/8"	5,014	0.0005	9.4
3/16"	3,345	0.0007	10.0
1/4"	2,507	0.0008	8.4
5/16"	2,008	0.0010	7.8
3/8"	1,671	0.0013	8.8
1/2"	1,254	0.0017	8.4
5/8"	1,008	0.0019	7.8
3/4"	836	0.0023	7.5



type	IPVR1T		
Slot Milling 	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3		
Hardness BRINELL	≤ 300		
HRC	≤ 31		
Vc (SFM)	60		
ae/ap	ae=1D ap=1.25D		
MILL DIA. (inch)	RPM	Fz	Feed (IPM) 4 flutes
1/8"	4,013	0.0003	5.0
3/16"	2,676	0.0006	6.0
1/4"	2,006	0.0008	6.7
5/16"	1,607	0.0010	6.3
3/8"	1,338	0.0011	6.0
1/2"	1,003	0.0017	6.7
5/8"	806	0.0017	5.6
3/4"	669	0.0021	5.5



SPEED TIGER

 ■ Coating Classifying and advantage 立銑刀的塗層種類及特點 *end mill expert*

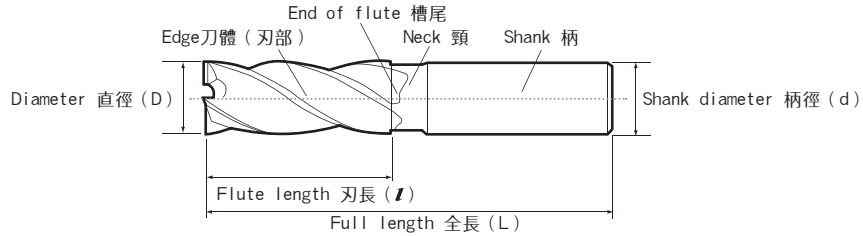
項目 Item	塗層種類 Coating type	μ AlTiN	μ TiAlN	nACRo	nACo	TiSiN	RS	ATS	TB
特性 Characteristic	表面硬度 (HV) Hardness (HV)	~ 3200	~ 2800	42 (Gpa)	45 (Gpa)	~ 3600	~ 2800	45 (Gpa)	> 6000
	塗層厚度 (μ m) Thickness (μ m)	2.5~3	2.5~3	3	3	2.0~2.5	2.0~2.5	2.5~3	~1
	耐氧化溫度 (°C) Oxidation Temp.(°C)	900	800	1100	1200	1100	1000	1200	500
	摩擦係數 Friction Coefficient	0.3	0.3	0.35	0.45	0.4	0.3	0.4	< 0.1
	顏色 Color	黑 Black	紫 Violet	銀灰 Gray	藍 Blue	棕 Copper	銀 Silver	黑 Black	金屬黑 Black
適用材質 Application	碳鋼 Carbon Steel	◎	◎	◎	◎	◎	◎	◎	X
	合金/工具/高速鋼 Alloy / Tool / High Speed Steel	◎	◎	◎	◎	◎	◎	◎	X
	不 鋼 Stainless Steel	○	○	◎	○	○	◎	○	X
	合 金 Alloy	◎	○	◎	◎	◎	○	◎	X
	銅 / 鋁 Copper / Aluminum	X	X	○	X	X	○	X	◎
	高溫合金 Inconel	◎	○	○	◎	◎	○	◎	X
	鈦合金 Titanium	○	○	○	○	○	○	○	◎
	塑膠/複合材料/木材/紙 Plastic / Composites / Wood / Paper	X	X	X	X	X	X	X	◎
切削方式 Cutting Way	乾 式 Dry Cutting	◎	◎	◎	○	◎	◎	○	○
	濕 式 Wet Cutting	○	○	◎	○	○	◎	○	◎
	油 霧 Oil Spray	○	◎	◎	◎	○	◎	◎	○

符號說明 Icon : ◎ 最適合 Recommend ○ 適合 Suitable X 不建議 Not Recommend

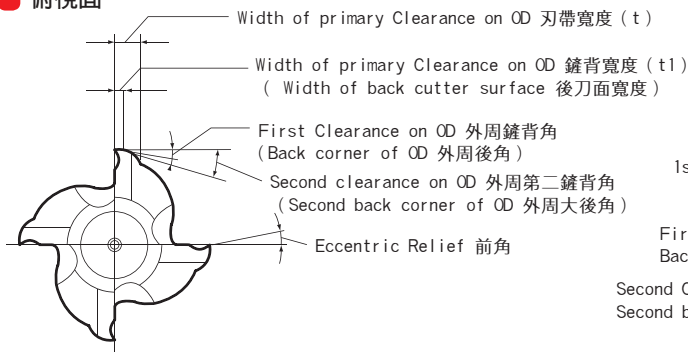


Detail of the end mill 立銑刀各部份名稱

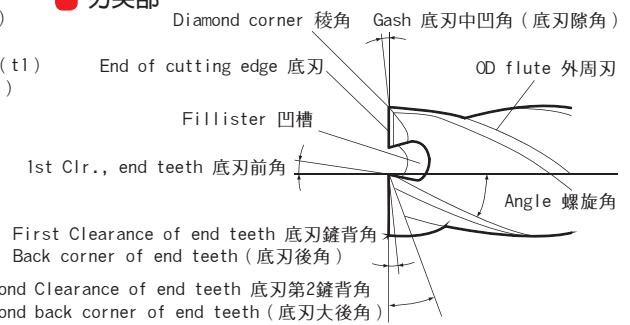
● 側視面



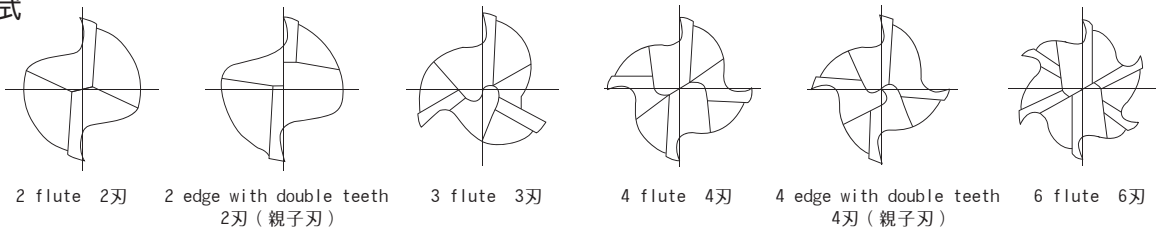
● 俯視面



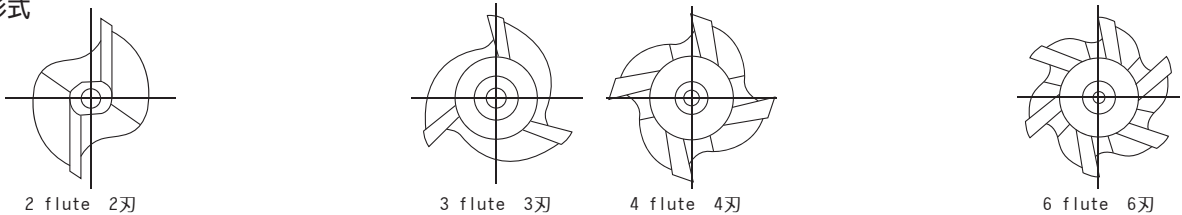
● 刃尖部



● 刀刃形式



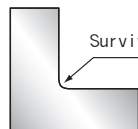
● 刀刃形式



Shape in end teeth of the end mill 立銑刀的底刃形狀

● Tip protection 尖角保護

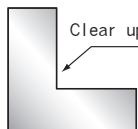
During the tip protection 尖角保護時



- Batter rigidity of the tip, protecting the edge. 尖角部剛性好·不易崩刃。
- Tip sharp drop. 尖角部鋒利度下降。

● Tip 尖角

During the tip 尖角型時



- Use for clear up tipe. 工作直角時使用。
- Sharp tip, easy to break. 尖角部鋒利·但易崩刃。
- Can be use in carbone steel and steel, specially using in Aluminum and non-ferrous material. 碳素鋼和調質鋼也能使用·尤其廣泛應用於鋁材等非鐵材質的加工·對於高硬度的工件·因崩刃而無法適用。

SPEED TIGER

■ End mill working condition calculation method

立銑刀加工中切削條件計算方法

■ 切削條件的計算公式

● 切削速度（線速度）

Calculation VC

立銑刀刀刃圓周面上的某1點在每一分鐘內移動的距離，可通過下述公式求出。

$$V = \frac{\pi \times D \times N}{1000}$$

V = Cutting speed 切削速度 (m/min)

 $\pi = 3.14$ (圓周率)

D = Diameter 立銑刀刃徑 (mm)

N = Rotating speed 轉速 (min^{-1})

● Rotation speed 轉速

Calculation of Rotation speed

裝夾立銑刀的機械主軸在每一分鐘內旋轉的轉數，可通過下述公式求出。

$$N = \frac{1000 \times V}{\pi \times D}$$

N = Rotating speed 轉速 (min^{-1})

V = Cutting speed 切削速度 (m/min)

 $\pi = 3.14$ (圓周率)

D = Diameter 立銑刀刃徑 (mm)

● Feed rate 進給速度

Calculation of Feed rate

每一分鐘內工作台進給的速度，可通過下述公式求出。

$$F = N \times Z \times f$$

F = Feed rate 進給速度 (mm/min)

N = Rotating speed 轉速 (min^{-1})

Z = Number of flute 立銑刀刃數

f = Feed rate of the flute 每刃進給量 (mm/1刃)

● Feed for teeth 每刃進給量

Calculation of the Feed of teeth

立銑刀刀刃圓周面上的某1點在每一分鐘內移動的距離，可通過下述公式求出。

$$f = \frac{F}{N \times Z}$$

f = Feed rate of the flute 每刃進給量 (mm/1刃)

F = Feed rate 進給速度 (mm/min)

N = Rotating speed 轉速 (min^{-1})

Z = Number of flute 立銑刀刃數

● Working time 加工時間

Calculation of the Working time

切削工件材料所需的時間，可通過下述公式求出。

$$T_c = \frac{L}{F}$$

Tc = Working time 加工時間 (min)

L = Total working length 工作台總進給長度
(工作材料長度+立銑刀刃徑D)

F = Feed rate 進給速度 (mm/min)



The standard cutting conditions published on each products page.

Cutting will be influenced by work piece, machine and software; the above-mentioned data are only for reference.


Failure analyzed and solvent

Item	Fault	Reason	Solution	
● Precision of cutting surface	● Rough surface	● Vibration	<ul style="list-style-type: none"> ▶ Fix the working material as well as posible ▶ Adjust the failed part of machine ▶ Reduce rotating speed ▶ Downcut ▶ Tools minimum lenght out of fixture 	
		● The heterogeneity in hardness of working material	▶ measuring the hardness of working material	
		● The tip was unsuitable	<ul style="list-style-type: none"> ▶ Tool rake angle and clearance angle ▶ Improve cutting roughness 	
		● Chip lump and fuse attach material	<ul style="list-style-type: none"> ▶ Remove chip lump and fuse attach material ▶ Check on the degenerative condition of cutting fluids 	
		● Passivation of cutting edge	▶ Determine the adequate time to regrinding	
		● Cutting rate (speed) too fast	▶ Reduce the cutting rate (speed)	
	● Buckling cracking of the of machined surface	● Buckling cracking of the of machined surface	● Misfit cutting fluids or deficient of cutting fluids	▶ Change cutting fluids
			● Unbalance friction of cutting edge	▶ Regrinding to reduce friction
			● Fuse attach material on the cutting edge	<ul style="list-style-type: none"> ▶ Remove fuse attach material ▶ Change cutting fluids
	● The corrugation of machined surface	● The corrugation of machined surface	● Cutting edge deformation	▶ To pay attention to use and safekeeping
			● lesser cutting flute	▶ Increase the number of flutes from 2 flutes to 4 flutes and then 6 flutes
			● Bigger cutting depth and feed rate	▶ To Reduce the Feed Rate of Machine
● Shape precision	● Perpendicularity	● A larger Helix Angle	▶ Decrease the Helix Angle	
		● Cutting depth and feed rate is too large	▶ Reduce the depth of cutting and feed rate	
		● Tool stretches out over longer	▶ Use the end mill stretches out shortest from chuck	
● End mill life	● Shorter life for regrinding end mill	● Perpendicularity of holder not reach	▶ Improve the perpendicularity of holder	
		● Work material hardness too high	<ul style="list-style-type: none"> ▶ Improve to suitable hardness by heat treatment process ▶ Reduce the feed rate for high hardness work material or change more hardness tool 	
		● Unsuitable feed rate	▶ Adjust to suitable feed rate	
		● Chip lump and fuse attach material	<ul style="list-style-type: none"> ▶ Remove chip lump and fuse attach material ▶ Use suitable cutting liquid 	
	● Huge friction of cutting edge	● Huge friction of cutting edge	● Unsuitable cutting liquid	<ul style="list-style-type: none"> ▶ Use suitable cutting liquid ▶ Use enough cutting liquid
			● The fault of work material	<ul style="list-style-type: none"> ▶ Uchieve the average of inside form of work material ▶ clear up unbalance hardness
			● Unsuitable edge angle	▶ Regrind to suitable angle
			● End mill cutting function go down	▶ Surface treatment
			● Unsuitable cutting liquid	<ul style="list-style-type: none"> ▶ Adjust to suitable cutting liquid ▶ Adjust offer method of liquid
	● Flute damage	● Flute damage	● Unsuitable regrind schedule	▶ Manage the regrind schedule
			● Vibration	▶ Strengthen the install tool of work material
			● The fault of work material	<ul style="list-style-type: none"> ▶ Achieve the average of working material structure ▶ Use suitable hardness , clear up unbalance hardness ▶ Check the material may mix other hardness substance or gravel
			● Unsuitable feed rate	▶ Reduce the feed rate
			● Cutter become dull	▶ Regrind the tools
	● Break	● Break	● Cutting liquid go off	▶ Change the cutting liquid
			● Work material unsuitable fixed	<ul style="list-style-type: none"> ▶ Ineed fix the work material ▶ Improve install tool
			● Cutter become dull	▶ Regrind process
			● End mill with uncorrect operation	▶ Be careful of keep and operate
		● Chip jam	▶ Use cutting liquid in large, during dry milling use air blow to remove chips	




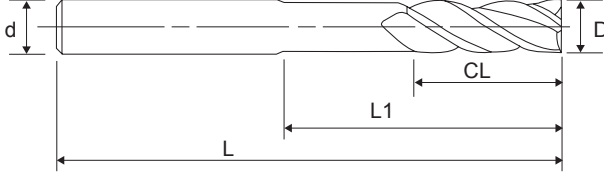
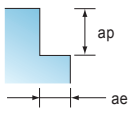
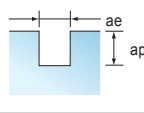
■ 立銑刀故障分析與對策

end mill expert

項目	故障	原因	對策	
● 加工面精度	● 加工面較粗	● 振動、顫振	<ul style="list-style-type: none"> ▶ 提高工件安裝剛性 ▶ 改正機械的不良部位 ▶ 降低立銑刀的轉速 ▶ 進行逆銑 ▶ 將立銑刀的刃長伸出長度控制在最小範圍 	
		● 加工工件的硬度不均一	▶ 測量硬度後進行選擇適合的刀具	
		● 先端形狀不合適	<ul style="list-style-type: none"> ▶ 採用合適的前角、後角 ▶ 改善磨削面的表面粗糙度 	
		● 有積屑瘤、熔附物	<ul style="list-style-type: none"> ▶ 除去積屑瘤、熔附物 ▶ 檢查切削液的變質情況 	
		● 刃尖鈍化	▶ 確定適當的再研磨時期	
		● 切削速度過快	▶ 減慢切削速度	
		● 切削液不適、不足	▶ 改變切削液或供給方法	
	● 加工面擠裂	● 切削刃的摩擦不均衡	▶ 通過再研磨除去摩擦	
		● 刃部有熔附物	<ul style="list-style-type: none"> ▶ 除去熔附物 ▶ 更換切削液 	
		● 切削刃有打痕	▶ 注意使用、保管	
	● 加工面波紋	● 刃數較少	▶ 按2刃→4刃→6刃增加刃數	
		● 切入量、進給量過大	▶ 減小切深、進給量	
		● 螺旋角過大	▶ 減小螺旋角	
	● 形狀精度	● 垂直度	● 切入量、進給量過大	▶ 減小切深、進給量
			● 伸出長度過長	▶ 使用刃長伸出長度最短的立銑刀
● 安裝用具的工件支撐面垂直度不夠			▶ 改善支撐面垂直度	
● 立銑刀的壽命	● 再研磨後的壽命較短	● 工件材料的硬度較高	<ul style="list-style-type: none"> ▶ 熱處理為適合的硬度 ▶ 工件材料為高硬度時減小進給量或者更換為更高硬度刀具材料 	
		● 進給量不適	▶ 改變為適合的進給量	
		● 有積屑瘤、熔附物	<ul style="list-style-type: none"> ▶ 除去積屑瘤、熔附物 ▶ 選擇合適的切削液 	
		● 切削液不適	<ul style="list-style-type: none"> ▶ 選擇合適的切削液 ▶ 使用足量的切削液 	
	● 切削刃的摩擦過大	● 加工工件材料的缺陷	<ul style="list-style-type: none"> ▶ 實現工件材料內部組織的平均化 ▶ 消除硬度不均 	
		● 刃尖角度不適合	▶ 再研磨為適合的前角、後角	
		● 立銑刀的切削性能下降	▶ 進行表面處理	
		● 切削液不適	<ul style="list-style-type: none"> ▶ 變更為合適的切削液 ▶ 變換給油方式 	
		● 再研磨時期不適	▶ 對再研磨時間進行管理	
	● 刀刃缺損	● 振動、顫振	▶ 加強加工工件安裝用具	
		● 工件材料的缺陷	<ul style="list-style-type: none"> ▶ 實現內部組織的平均化 ▶ 使用合適的硬度、消除硬度不均 ▶ 檢查是否有硬質異物、砂等混入材料 	
		● 進給量不適	▶ 減少進給量	
		● 切削刃鈍化	▶ 實施再研磨	
		● 切削液劣化	▶ 更換切削液	
	● 折斷	● 工件固定不當	<ul style="list-style-type: none"> ▶ 確實固定加工工件 ▶ 改善安裝用具 	
		● 切削刃鈍化	▶ 實施再研磨	
		● 立銑刀使用不當	▶ 注意保管、使用	
		● 切屑堵塞	▶ 大量使用切削液、乾式時用高壓空氣吹去切屑	



Custom Tool Design Inquiry Form

Work piece Material				
Hardness	<input type="checkbox"/> HRC____ <input type="checkbox"/> HB____ <input type="checkbox"/> Other_____			
Type of Coating	<input type="checkbox"/> ST standard(refer to our catalogue) <input type="checkbox"/> Uncoated <input type="checkbox"/> Customers Requirement _____			
Type of Flute Spiral	<input type="checkbox"/> Right <input type="checkbox"/> Left			
No of Flutes	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> Other_____			
Type of End Cut	 <input type="checkbox"/> Square	 <input type="checkbox"/> Corner Radius r=_____	 <input type="checkbox"/> Ball R=_____	
Type of Shank	<input type="checkbox"/> No Side Lock <input type="checkbox"/> Side Lock			
Specification				
	D_____ CL_____ L1_____ L_____ d_____			
Application	<input type="checkbox"/> Side Milling	Common side milling	<input type="checkbox"/> Side milling (側銑) 	ap:_____
		Cavity		ae:_____
	<input type="checkbox"/> Slotting		<input type="checkbox"/> Slotting (溝銑) 	ap:_____
	<input type="checkbox"/> Drilling & Milling			ae:_____
	Machine Processing	<input type="checkbox"/> Finishing <input type="checkbox"/> Roughing <input type="checkbox"/> General Purpose <input type="checkbox"/> Other_____		
	Coolant Type	<input type="checkbox"/> Soluble <input type="checkbox"/> Oil Coolant <input type="checkbox"/> Oil Mist <input type="checkbox"/> Dry Cutting <input type="checkbox"/> Air Cooling <input type="checkbox"/> Other_____		
	Tool Life Standard	<input type="checkbox"/> Cutting Time <input type="checkbox"/> Load of Machine <input type="checkbox"/> Finish <input type="checkbox"/> Tool Wear <input type="checkbox"/> Vibration and Sound <input type="checkbox"/> Other_____		
	Desired Life			
Finish Requirement	<input type="checkbox"/> Required Roughness_____ <input type="checkbox"/> Not Required			
Other	Special Requirement			



SPEED TIGER PRECISION TECHNOLOGY Co.,Ltd.

震虎精密科技股份有限公司

No.5, 35th Rd., Industrial Park, Xitun Dist.,
Taichung City 407, Taiwan (R.O.C.)

台灣台中市西屯區工業區三十五路5號

TEL: +886-4-2350-3022 FAX: +886-4-2350-3083

No.10, Jingke 2nd Rd., Nantun Dist., Taichung
City 408, Taiwan (R.O.C.),

台中市南屯區精科二路10號

TEL: +886-4-2359-7736