

問題Problem	原因Possible Cause	解決方法Solution
<ul style="list-style-type: none"> • Breakage • 刀具斷裂 	<ul style="list-style-type: none"> • Feed too fast • 進料太快 • Too high stock removal • 排屑量過高 • Too long flute length or overall length • 刃長過長或總長過長 • Too much wear • 磨損過多 	<ul style="list-style-type: none"> • Slow down speed • 降低進料速度 • Decrease feed per tooth. • 降低每齒的進給率 • Hold shank deeper, use shorter end mill. • 固定刀柄較深；使用較短的端銑刀 • Regrind at early stage • 早期研磨
<ul style="list-style-type: none"> • Wear • 磨損 	<ul style="list-style-type: none"> • Speed too fast • 速度過快 • Hard work material • 較硬的工件 • Biting chips • 切屑堆積在刃上 • Improper feed and speed (too slow) • 不正確的進料及速度(太慢) • Improper cutting angle • 不正確的切角 • Too small primary relief angle • 主要隙角太小 	<ul style="list-style-type: none"> • Slow down, use another coolant • 降低速度；使用另一種潤滑劑 • Use higher grade tool material and coating • 使用等級較高的工具材質和鍍層 • Change feed and speed. Change chip size or clear chips with coolant or air pressure. • 改變進料率及速度。改變切屑大小或是以潤滑劑或空壓機來清除切屑。 • Increase feed and speed. Try down-cut. • 增加進料率和速度。試用下切的方式進刀。 • Change to correct cutting angle • 改用正確的切角 • Change to larger relief angle. • 改用較大的隙角
<ul style="list-style-type: none"> • Short tool life (dull teeth) • 工具壽命短 (刀刃鈍化) 	<ul style="list-style-type: none"> • Too much cutting friction • 切削時的摩擦力太高 • Tough work material • 工件較韌 • Improper cutting angle • 不正確的切角 	<ul style="list-style-type: none"> • Regrind at earlier stage • 早期研磨 • Use premium tool steel (particle metallurgy). • 使用高級工具鋼 (分子金屬聚合物) • Change to correct cutting angle and primary relief. • 改用正確的切角和隙角
<ul style="list-style-type: none"> • Chipping • 刀刃缺口 	<ul style="list-style-type: none"> • Feed too fast • 進料太快 • Feed too fast on first cut • 初次切削時進料太快 • Not enough rigidity of machine, tool and holder • 機器、工具或是固定具剛性不足 • Loose hold (tool) • 工具固定不牢 • Loose hold (workpiece) • 工件固定不牢 • Lack of rigidity • 缺乏剛性 • Teeth too sharp • 刀刃過於銳利 	<ul style="list-style-type: none"> • Slow down to proper feed • 降低到適當的進料率 • Slow down on first bite • 初次切削時降速 • Change to rigid machine tool or holder • 改用剛性較佳的機器、工具或固定具 • Correct to tight hold • 確實固定 • Correct to tight hold. • 確實固定 • Use shortest end mill available, hold shank deeper, try down cut • 使用最短的端銑刀，固定刀柄較深，試用下切方式進刀 • Decrease primary relief and cutting angle • 減少隙角及切角

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<ul style="list-style-type: none"> • Chip packing • 切屑堆積 	<ul style="list-style-type: none"> • Too high stock removal rate • 切屑移除過快 • Not enough chip space • 排屑空間不足 • Not enough coolant • 潤滑不足 	<ul style="list-style-type: none"> • Adjust feed or speed • 調整進料率或速度 • Use less end mill flutes • 使用較少刀刃 • Use air pressure • 使用空壓機
<ul style="list-style-type: none"> • Burrs • 毛邊 	<ul style="list-style-type: none"> • Too much wear on primary relief • 主要隙角過度磨損 • Incorrect conditions • 不正確的銑切設定 • Improper cutting angle • 不適當的切角 	<ul style="list-style-type: none"> • Regrind at earlier stage • 早期研磨 • Correct milling conditions • 更正銑切設定 • Change to correct cutting angle • 改用正確切角
<ul style="list-style-type: none"> • No perpendicularity on side • 邊緣無垂直度 	<ul style="list-style-type: none"> • Feed too fast • 進料太快 • Excessive cutting • 過度切削 • Length of flutes or overall length too long • 刃長或總長過長 • Too less flutes • 刃數太少 	<ul style="list-style-type: none"> • Slow down to correct speed • 降低到正確的速度 • Decrease depth and width of cut. • 減低切削時的深度及寬度 • Use proper length of tool, hold shank deeper. • 使用適當的工具長度，固定刀柄較深 • Use multi flute end mills • 使用多刃端銑刀
<ul style="list-style-type: none"> • No dimensional accuracy • 尺寸不夠精準 	<ul style="list-style-type: none"> • Excessive cutting • 過度切削 • Lack of accuracy (machine and holder) • 機器或固定具缺乏準度 • Not enough rigidity (machine and holder) • 機器或固定具缺乏剛性 • Too less flutes • 刃數太少 	<ul style="list-style-type: none"> • Decrease depth and width of cut • 減低切削時的深度及寬度 • Repair machine or holder • 修理機器及固定具 • Change machine, holder or cutting conditions. • 改變機器、固定具或是切削設定 • Use multi flutes end mills • 使用多刃端銑刀
<ul style="list-style-type: none"> • Chattering • 嘈雜 	<ul style="list-style-type: none"> • Feed and speed too fast • 進料率及速度過快 • Not enough rigidity (machine and holder) • 機器及固定具剛性不足 • Too great relief angle • 隙角過大 • Loose hold of workpiece • 工件固定不良 • Cutting too deep • 切削過深 	<ul style="list-style-type: none"> • Correct feed and speed. • 更正進料率及速度 • Use better machine or tool holder or change conditions. • 使用較佳的機器或工具固定具或是改變設定 • Decrease relief angle, make margin (touch primary with oil stone). • 減少隙角，作邊緣處理(以油石塗主要隙角) • Hold workpiece tightly • 確實固定工件 • Decrease depth of cut. • 減少切削深度