Trouble shooting for milling

Trouble	Causes	Solutions										
		Cutting conditions				Tool shape					Insert grade	
		Cutting speed	Depth of cut	Feed	Coolant	Rake angle	Relief angle	Approach angle	Chattering at cutting edge	Nose radius	Toughness	Hardness
Flank wear	• Improper insert grade • Improper cutting conditions • Chattering	↓		↑			↑	↓		↑		↑
Crater wear	• Improper cutting conditions • Improper insert grade	↓	↓	↓	●	↑				↓		↑
Chipping	• Lack of insert toughness • Excessive feed • Excessive cutting load			↓		↓	↓	↓		↑	↑	
Built-up edge	• Improper cutting conditions • Improper cutting edge shape • Improper insert grade	↑	↓	↑		↑				↓		
Chattering	• Improper cutting conditions • Lack of number of cutting teeth • Improper cutting edge shape • Bad chip flow • Unstable workpiece clamping		↓	↓	●	↑		↑	↓	↓		
Poor surface finish	• Built-up edge • Improper cutting conditions • Chattering • Bad chip flow	↑	↓	↓	●	↑			↓	↑		
Thermal crack	• Improper cutting conditions • Improper insert grade	↓	↓	↓	◉	↑				↑	↑	
Fracture	• Improper insert grade • Excessive cutting load • Bad chip flow • Chattering • Excessive overhang		↓	↓	●						↑	

↑ : Increase ↓ : Decrease ● : use ◉ : Correct use

General formulas for milling

● Machine efficiency rate (η)

Power transmission mode	Efficiency rate (E)	Reference
Principal axis direct connection driving	0.90	
Belt driving	0.85	Double connection : 0.85 × 0.85 ≒ 0.70
Starting driving	0.75	
Oil pressure driving	0.60~0.90	