



铣削加工刀片

MILLING

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铣削刀片命名 F003

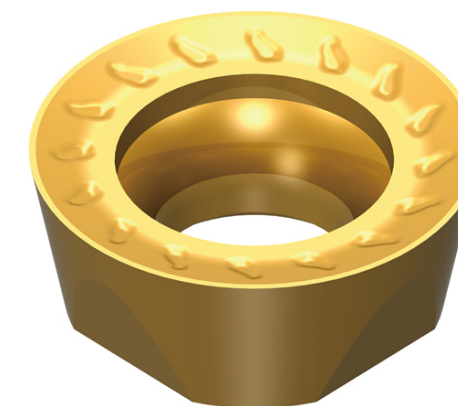
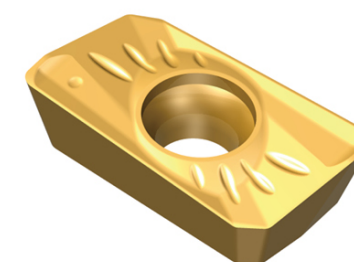
铣削刀片规格 F004

方肩铣刀系列 F005

面铣刀系列 F006-F009

螺旋立铣刀系列 F010

大进给铣刀系列 F011-F012



F

铣削加工刀片

A P M T 11 35

1 2 3 4 5 6
形状代号 后角代号 公差代号 断屑槽及孔型代号 切削刃长度代号 刀片厚度代号

P D E R - PM

7 8 9 10
主偏角代号 修光刃后角代号 刃口类型代号 切削方向代号 断屑槽型号

1 A P M T 11 35 P D E R - PM

| 形状代号 | | | | | |
|------|---|---|---|----|---|
| | | | | | |
| A | B | C | D | E | H |
| | | | | | |
| K | L | M | O | P | R |
| | | | | 其他 | |
| S | T | V | W | Z | |

2 A P M T 11 35 P D E R - PM

| 后角代号 | |
|------|------|
| A | F |
| B | G |
| C | N |
| D | P |
| E | O 其他 |

3 A P M T 11 35 P D E R - PM

| 公差代号 | | | | | | | | | | | | | | | | |
|------|----------------|------------------|--------------|--------------|-------|-------|-------|-------|-------|------------------|-------|-------|-------|-------|-------|-------|
| 代号 | 刀尖高度 m 公差 (mm) | 内接圆 øL.C 公差 (mm) | 厚度 S 公差 (mm) | 刀尖高度公差 m(mm) | | | | | | 内接圆 øL.C 公差 (mm) | | | | | | |
| | | | | 内接圆 | 正三角形 | 正方形 | 80°菱形 | 55°菱形 | 35°菱形 | 内接圆 | 正三角形 | 正方形 | 80°菱形 | 55°菱形 | 35°菱形 | 圆形 |
| A | ±0.005 | ±0.025 | ±0.025 | 内接圆 | 正三角形 | 正方形 | 80°菱形 | 55°菱形 | 35°菱形 | 内接圆 | 正三角形 | 正方形 | 80°菱形 | 55°菱形 | 35°菱形 | 圆形 |
| B | ±0.005 | ±0.013 | ±0.025 | 6.35 | ±0.08 | ±0.08 | ±0.08 | ±0.11 | ±0.16 | 6.35 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | — |
| C | ±0.013 | ±0.025 | ±0.025 | 9.525 | ±0.08 | ±0.08 | ±0.08 | ±0.11 | ±0.16 | 9.525 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 |
| H | ±0.013 | ±0.013 | ±0.025 | 12.7 | ±0.13 | ±0.13 | ±0.13 | ±0.15 | — | 12.7 | ±0.08 | ±0.08 | ±0.08 | ±0.08 | — | ±0.08 |
| E | ±0.025 | ±0.025 | ±0.025 | 15.875 | ±0.15 | ±0.15 | ±0.15 | ±0.18 | — | 15.875 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | — | ±0.10 |
| G | ±0.025 | ±0.025 | ±0.13 | 19.05 | ±0.15 | ±0.15 | ±0.15 | ±0.18 | — | 19.05 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | — | ±0.10 |
| J | ±0.005 | ±0.05-±0.13 | ±0.025 | 25.4 | — | ±0.18 | — | — | — | 25.4 | — | ±0.13 | — | — | — | ±0.13 |
| *K | ±0.013 | ±0.05-±0.13 | ±0.025 | | | | | | | | | | | | | |
| *L | ±0.025 | ±0.05-±0.13 | ±0.025 | | | | | | | | | | | | | |
| *M | ±0.08-±0.18 | ±0.05-±0.13 | ±0.13 | | | | | | | | | | | | | |
| *N | ±0.08-±0.18 | ±0.05-±0.13 | ±0.025 | | | | | | | | | | | | | |
| *U | ±0.13-±0.38 | ±0.08-±0.25 | ±0.13 | | | | | | | | | | | | | |

*表示侧面不研磨的刀片

4 A P M T 11 35 P D E R - PM

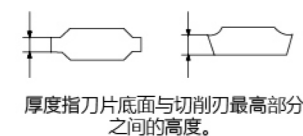
| 断屑槽及孔型代号 | | | | | | | | | | | |
|----------|----------|---|----------|---|----------|---|----------|---|----------|---|----------|
| B | 有孔 无断屑槽 | W | 有孔 无断屑槽 | N | 无孔 无断屑槽 | H | 有孔 单面断屑槽 | T | 有孔 单面断屑槽 | R | 无孔 单面断屑槽 |
| C | 有孔 无断屑槽 | Q | 有孔 无断屑槽 | F | 无孔 双面断屑槽 | J | 有孔 双面断屑槽 | U | 有孔 双面断屑槽 | A | 有孔 无断屑槽 |
| M | 有孔 单面断屑槽 | G | 有孔 双面断屑槽 | | | | | | | | |

5 A P M T 11 35 P D E R - PM

| 内接圆 (mm) | 切削刃长度代号 | | | | | | |
|----------|---------|----|----|----|----|----|----|
| | C | D | R | S | T | V | W |
| 3.97 | 03 | 04 | | 03 | 06 | | 02 |
| 5.00 | | | 05 | | | | |
| 5.56 | 05 | 06 | | 05 | 09 | 09 | 03 |
| 6.00 | | | 06 | | | | |
| 6.35 | 06 | 07 | | 06 | 11 | 11 | 04 |
| 8.00 | | | 08 | | | | |
| 9.525 | 09 | 11 | 09 | 09 | 16 | 16 | 06 |
| 10.00 | | | 10 | | | | |
| 12.00 | | | 12 | | | | |
| 12.70 | 12 | 15 | 12 | 12 | 22 | 22 | 08 |
| 15.875 | 16 | | 15 | 15 | 27 | | 10 |
| 16.00 | | 19 | 16 | | | | |
| 19.05 | 19 | | 19 | 19 | 33 | | 13 |
| 20.00 | | | 20 | | | | |
| 25.00 | 25 | 25 | 25 | | | | |
| 25.40 | | | 25 | 25 | 44 | | |
| 31.75 | 32 | | 31 | 31 | 54 | | |
| 32.00 | | | 32 | | | | |

6 A P M T 11 35 P D E R - PM

| 刀片厚度代号 | | |
|-------------|-------------|-------------|
| 01 = 1.59mm | T1 = 1.98mm | 02 = 2.38mm |
| T2 = 2.78mm | 03 = 3.18mm | T3 = 3.97mm |
| 04 = 4.76mm | T4 = 4.96mm | 05 = 5.56mm |
| T5 = 5.95mm | 06 = 6.35mm | T6 = 6.75mm |
| 07 = 7.94mm | 09 = 9.52mm | T9 = 9.72mm |



7 A P M T 11 35 P D E R - PM

| 主偏角代号 | | | |
|---------|---------|---------|--|
| A = 45° | D = 60° | E = 75° | |
| F = 85° | P = 90° | Z = 其他 | |

8 A P M T 11 35 P D E R - PM

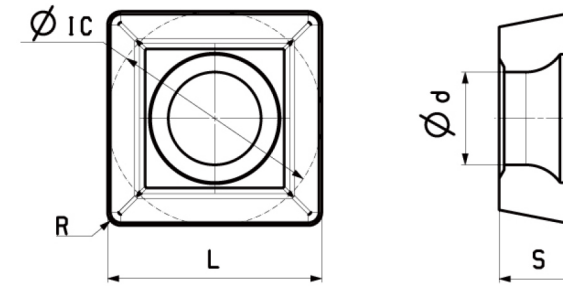
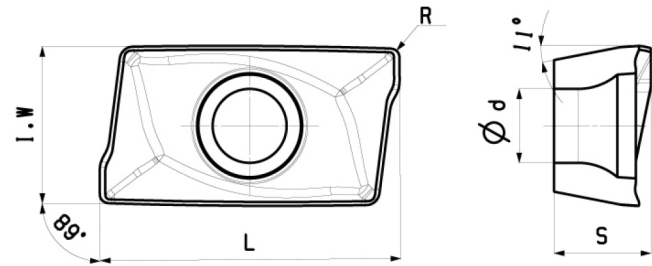
| 修光刃后角代号 | | | |
|---------|---------|---------|--|
| A = 3° | B = 5° | C = 7° | |
| D = 15° | E = 20° | F = 25° | |
| G = 30° | N = 0° | P = 11° | |
| Z = 其他 | | | |

9 A P M T 11 35 P D E R - PM

| 刃口类型代号 | |
|--------|-----|
| E = | 倒圆 |
| F = | 锋利 |
| T = | 倒棱 |
| S = | 复合型 |

10 A P M T 11 35 P D E R - PM

| 切削方向代号 | | |
|--------|--------|--------|
| L = 左手 | R = 右手 | N = 双向 |



切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

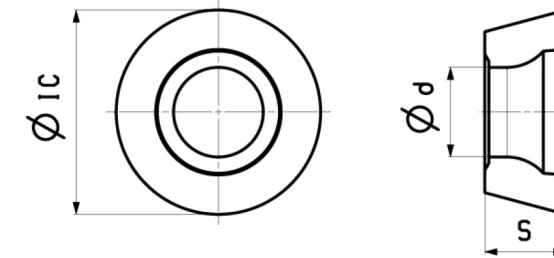
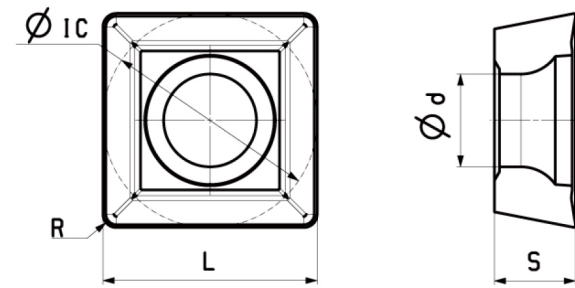
| 形状 | 型号 | 基本尺寸 (mm) | | | | | PVD 涂层 | | | | | |
|-----|------|---------------|--------|------|------|-----|--------|---|---|---|---|---|
| | | L | LW | S | ød | R | ⊕ | ● | ● | ● | ● | |
| 半精铣 | APKT | 11T304-PM | 12.24 | 6.5 | 3.6 | 2.8 | 0.4 | | | | | |
| | | 11T308-PM | 12.24 | 6.5 | 3.6 | 2.8 | 0.8 | | | | | |
| | | 160408-PM | 17.877 | 9.33 | 5.76 | 4.4 | 0.8 | ● | | | | ● |
| 半精铣 | APMT | 1135PDER-KA | 11.35 | 6.2 | 3.5 | 2.8 | 0.8 | ● | | | | ● |
| | | 1604PDER-KA | 17.35 | 9.3 | 5.26 | 4.4 | 0.8 | ● | | | | ● |
| 半精铣 | APMT | 1135PDER-PM | 11.25 | 6.2 | 3.5 | 2.8 | 0.8 | ● | | | | ● |
| | | 160408PDER-PM | 17.25 | 9.2 | 4.76 | 4.4 | 0.8 | ● | | | | ● |
| 粗硬铣 | APMT | 1135PDER-PR | 11.25 | 6.2 | 3.5 | 2.8 | 0.8 | ● | | | | ● |
| | | 160408PDER-PR | 17.25 | 9.2 | 4.76 | 4.4 | 0.8 | ● | | | | ● |

● 标准库存品

切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

| 形状 | 型号 | 基本尺寸 (mm) | | | | | PVD 涂层 | | | | | |
|-----|------|-----------|------|------|------|-----|--------|---|---|---|---|---|
| | | L | øI.C | S | ød | R | ⊕ | ● | ● | ● | ● | |
| 半精铣 | SEET | 12T3-GM | 13.4 | 13.4 | 3.97 | 4.1 | 2.55 | | ● | | | ● |
| | | 12T3-TM | 13.4 | 13.4 | 3.97 | 4.1 | 2.55 | | ● | | | ● |
| | | 12T3-KM | 13.4 | 13.4 | 3.97 | 4.1 | 2.55 | | | | | |
| 粗硬铣 | SEET | 12T3-GR | 13.4 | 13.4 | 3.97 | 4.1 | 2.55 | | ● | | | ● |
| | | 12T3-TR | 13.4 | 13.4 | 3.97 | 4.1 | 2.55 | | ● | | | ● |
| | | 12T3-KR | 13.4 | 13.4 | 3.97 | 4.1 | 2.55 | | | | | |

● 标准库存品



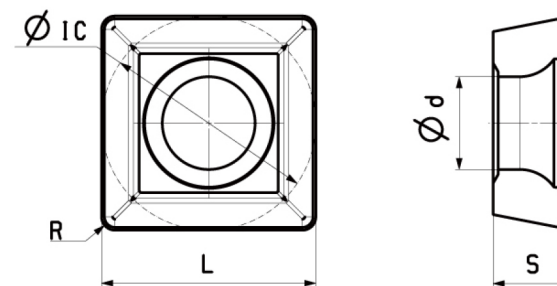
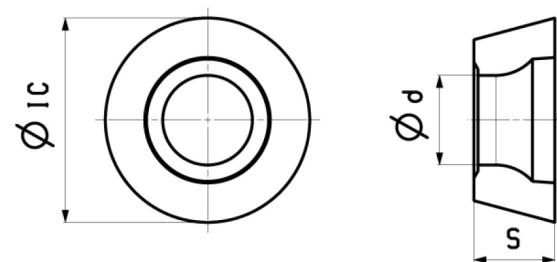
切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

| 形状 | 型号 | 基本尺寸 (mm) | | | | | PVD 涂层 | | | | | |
|-----|------|---------------|-------------|--------|----------|-----|----------|-----------|----------|----------|----------|--|
| | | L | ϕ_{IC} | S | ϕ_d | R | ⊕ RX2000 | ● RX2000S | ● RP9225 | ● RP9320 | ● RP9325 | |
| 半精铣 | SEMT | 09T308PER-PM | 9.525 | 9.525 | 4.01 | 3.3 | 0.8 | | | | | |
| | | 120308PER-PM | 13.308 | 13.308 | 4.04 | 4.1 | 0.8 | ● | | | ● | |
| 粗硬铣 | SEMT | 09T308PDER-PR | 9.525 | 9.525 | 4.01 | 3.3 | 0.8 | | | | | |
| | | 120308PDER-PR | 13.308 | 13.308 | 4.04 | 4.1 | 0.8 | ● | | | ● | |

● 标准库存品

切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

| 形状 | 型号 | 基本尺寸 (mm) | | | PVD 涂层 | | | | | |
|-----|------|-------------|------|----------|----------|-----------|----------|----------|----------|---|
| | | ϕ_{IC} | S | ϕ_d | ⊕ RX2000 | ● RX2000S | ● RP9225 | ● RP9320 | ● RP9325 | |
| 半精铣 | RCKT | 10T3MO-PM | 10.0 | 3.97 | 4.4 | | ● | | | ● |
| | | 1204MO-PM | 12.0 | 4.76 | 4.0 | | | | | |
| | | 1606MO-PM | 16.0 | 6.35 | 5.56 | | | | | |
| 半精铣 | RCKT | 1204MO-PR | 12.0 | 4.76 | 4.0 | | ● | | | ● |
| | | 1606MO-PR | 16.0 | 6.35 | 5.56 | | | | | |
| | | 2006MO-PR | 20.0 | 6.35 | 6.55 | | | | | |
| 半精铣 | RCKT | 1204MO-MR | 12.0 | 4.76 | 4.0 | | ● | | | ● |
| | | 1606MO-MR | 16.0 | 6.35 | 5.56 | | | | | |
| | | 2006MO-MR | 20.0 | 6.35 | 6.55 | | | | | |



切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

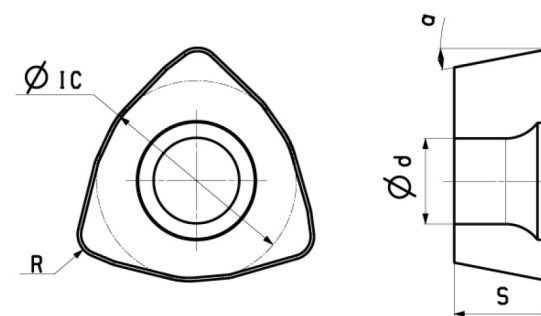
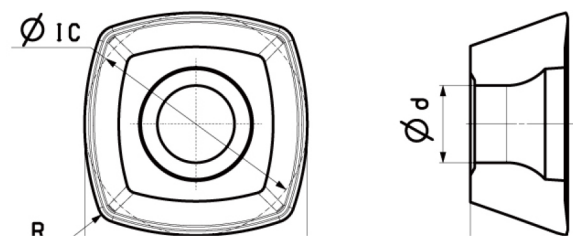
| 形状 | 型号 | 基本尺寸 (mm) | | | PVD 涂层 | | | | | |
|--------|------|------------|------|------|--------|--------|--------|--------|--------|---|
| | | ØI.C | S | Ød | ⊕ | ● | ● | ● | ● | |
| | | | | | RX2000 | RX2005 | RP9225 | RP9320 | RP9325 | |
| 通用 | RPMW | 08T2MO | 8.0 | 2.78 | 3.5 | | | | | |
| | | 1003MO | 10.0 | 3.18 | 4.4 | | ● | | | ● |
| | | 1204MPO | 12.0 | 4.76 | 4.4 | | ● | | | ● |
| 粗、半精铣 | RPMT | 08T2MO-GM | 8.0 | 2.78 | 3.5 | | | | | |
| | | 10T3MO-GM | 10.0 | 3.18 | 4.4 | | ● | | | ● |
| | | 1204MPO-GM | 12.0 | 4.76 | 4.4 | | ● | | | ● |
| 通用 | RDKW | 0803MO | 8.0 | 3.18 | 3.4 | | | | | |
| | | 10T3MO | 10.0 | 3.97 | 4.4 | | ● | | | ● |
| | | 1204MO | 12.0 | 4.76 | 4.4 | | ● | | | ● |
| | | 1604MO | 16.0 | 4.76 | 5.5 | | ● | | | ● |
| | | 1605MO | 16.0 | 5.56 | 5.5 | | ● | | | ● |
| | | 1606MO | 16.0 | 6.35 | 5.5 | | | | | |
| 2006MO | 20.0 | 6.35 | 6.5 | | | | | | | |

● 标准库存品



切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

| 形状 | 型号 | 基本尺寸 (mm) | | | | | PVD 涂层 | | | | | |
|-----|------|-----------|------|------|------|-----|--------|--------|--------|--------|--------|---|
| | | L | ØI.C | S | Ød | R | ⊕ | ● | ● | ● | ● | |
| | | | | | | | RX2000 | RX2005 | RP9225 | RP9320 | RP9325 | |
| 半精铣 | SPMT | 120408-PM | 12.7 | 12.7 | 4.76 | 5.5 | 0.8 | | ● | | | ● |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 半精铣 | SPMT | 120408-KM | 12.7 | 12.7 | 4.76 | 5.5 | 0.8 | | ● | | | ● |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

● 标准库存品





切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

| 形状 | 型号 | 基本尺寸 (mm) | | | | | PVD 涂层 | | | | |
|--|------|-----------|-------------|--------|----------|-----|--------|---|---|---|---|
| | | L | ϕ_{IC} | S | ϕ_d | R | ⊕ | ● | ● | ● | ● |
|  大进给 | SDMT | 120512-HR | 12.7 | 12.7 | 5.56 | 4.4 | 1.2 | ● | | | ● |
| | | 150512-HR | 15.875 | 15.875 | 5.56 | 5.5 | 1.2 | ● | | | ● |
|  大进给 | SDMT | 06T208-HH | 6.35 | 6.35 | 2.58 | 2.5 | 0.8 | | | | |
| | | 09T312-HH | 9.525 | 9.525 | 3.97 | 4.0 | 1.2 | | | | |
| | | 120412-HH | 12.7 | 12.7 | 4.67 | 4.4 | 1.2 | ● | | | ● |
| | | 150520-HH | 15.875 | 15.875 | 5.56 | 5.5 | 2.0 | ● | | | ● |
| | | | | | | | | | | | |

● 标准库存品

切削形态 (标准): ● 稳定切削 ● 一般切削 ⊕ 不稳定切削

| 形状 | 型号 | 基本尺寸 (mm) | | | | | PVD 涂层 | | | | |
|--|------|--------------|-------|----------|-----|-----|--------|---|---|---|---|
| | | ϕ_{IC} | S | ϕ_d | R | a | ⊕ | ● | ● | ● | ● |
|  大进给 | WPMT | 050315R-HR | 7.94 | 3.5 | 4.0 | 1.5 | 11° | | | | |
| | | 060415R-HR | 9.525 | 4.2 | 4.4 | 1.5 | 11° | ● | | | ● |
| | | 080615R-HR | 12.85 | 6.35 | 5.5 | 1.5 | 11° | ● | | | ● |
| | | 090725R-HR | 15 | 7 | 5.5 | 2.5 | 11° | | | | |
|  大进给 | WDMW | 080520ZTR-HH | 13 | 5.5 | 5 | 2.0 | 15° | ● | | | ● |
| | | | | | | | | | | | |

● 标准库存品

V_c : 切削速度 (m/min) V_f : 工作台进给量 (进给速度) (mm/min) D_c : 铣刀公称直径 (mm)
 f_z : 每齿进给量 (mm/z) n : 主轴转速 (rev/min) 圆周率 ≈ 3.14
 Z_n : 刃数 T_c : 加工时间 (min) Q : 金属去除率 (cm³/min)
 f_n : 每转进给量 (mm/rev) L : 实际走刀距离 (mm)

• 切削速度

$$V_c = \frac{\pi \times D_c \times n}{1000} \text{ (m/min)}$$

• 主轴转速

$$n = \frac{1000 \times V_c}{\pi \times D_c} \text{ (rev/min)}$$

• 工作台进给量 (进给速度)

$$V_f = f_z \times n \times Z_n \text{ (mm/min)}$$

• 每齿进给量

$$f_z = \frac{V_f}{n \times Z_n} \text{ (mm/z)}$$

• 每转进给量

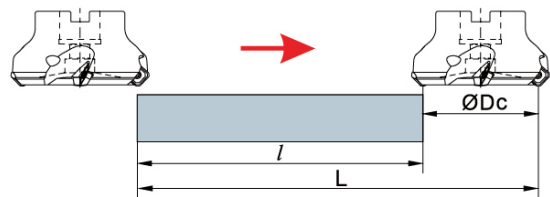
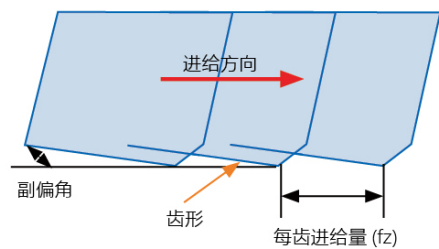
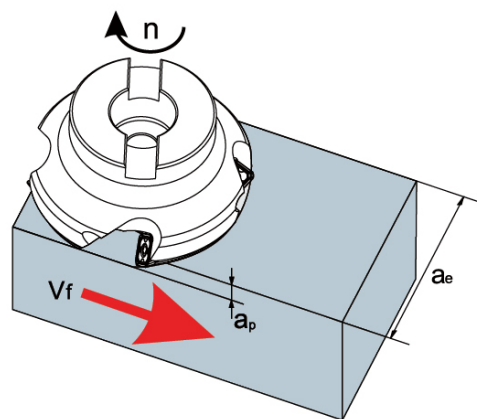
$$f_n = \frac{V_f}{n} \text{ (mm/rev)}$$

• 加工时间

$$T_c = \frac{L}{V_f} \text{ (min)}$$

• 金属去除率

$$Q = \frac{a_p \times a_e \times V_f}{1000} \text{ (cm}^3\text{/min)}$$



| 故障内容 | 主要原因 | 刀具材料选择 | | 切削条件 | | | 刀具形状 | | | | | 机床装夹 | | |
|----------|----------|----------|--------|----------|--------|----|------|----|----|----|----|--------------|-------|---|
| | | 硬度更高的材料 | 韧性好的材料 | 耐冲击性好的材料 | 耐粘性好材料 | 提高 | 降低 | 增大 | 减小 | 增多 | 减少 | 提高工件、刀具的安装刚性 | 减小悬伸量 | |
| 寿命下降 | 刀片磨损快 | 刀具材料不合适 | ▲ | | | | | | | | | | | |
| | | 切削刃形状不合适 | | | | | | | | ▲ | ▲ | ▲ | | |
| | | 切削速度不合适 | | | | ▲ | | | | | | | | |
| 寿命下降 | 切削刃破损崩刃 | 刀具材料不合适 | ▲ | | | | | | | | | | | |
| | | 切削条件不合适 | | | | ▲ | ▲ | | | | | | | |
| | | 切削刃强度不足 | | | | | | | | | ▲ | | | |
| | | 产生热龟裂 | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | | | |
| | | 产生积屑瘤 | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | | | |
| 刚性不足 | | | | | | | | | | ▲ | ▲ | ▲ | ▲ | |
| 表面精度恶化 | 表面粗糙度大 | 切削条件不合适 | ▲ | | | ▲ | ▲ | | | | | | | |
| | | 产生粘结 | | | ▲ | ▲ | | | ▲ | ▲ | | | | |
| | | 振摆精度差 | | | | | | | | | | ▲ | ▲ | |
| | 平面度平行度恶化 | 产生颤振 | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| | | 工件弯曲 | | | | ▲ | ▲ | | | | | ▲ | | |
| 毛刺及崩碎、剥落 | 产生毛刺 | 刀具位置偏移 | | | | | | | | | ▲ | ▲ | ▲ | ▲ |
| | | 背分力大 | | | | | | | | | ▲ | ▲ | ▲ | ▲ |
| | | 切屑过厚 | | | | ▲ | ▲ | ▲ | | | | | | |
| | 发生崩碎、剥落 | 刀具直径过大 | | | | | | | | | ▲ | | | |
| | | 切削锋利性差 | | | | | | | | | ▲ | ▲ | | |
| 切屑处理 | 切屑缠绕堵塞 | 余偏角大 | | | | | | | | | ▲ | | | |
| | | 切削条件不合适 | | | | ▲ | ▲ | | | | | | | |
| | | 切削锋利性差 | | | | | | | | | ▲ | ▲ | | |
| | | 余偏角小 | | | | | | | | | | ▲ | | |
| | | 产生颤振 | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| 产生粘结 | | | | ▲ | ▲ | | | | | | | | | |
| 切屑太薄 | | | | ▲ | ▲ | | | | | | | | | |
| 刀具直径过小 | | | | | | | | | | ▲ | | | | |
| 切屑排出不畅 | | | | | | | | ▲ | ▲ | | ▲ | | | |