

Guide to Cutting Conditions for Vibration Cutting

Spindle speed

Use standard circumference speed for conventional cutting. The spindle speed may be automatically adjusted after specifying the LFV command according to the vibration conditions.

Tools used

Type D tools (55°) with a nose radius of R0.2 are recommended. When the cutting allowance is large, try tools with a nose radius of R0.4. As for breaker shapes, U breakers with sharp edges are effective.

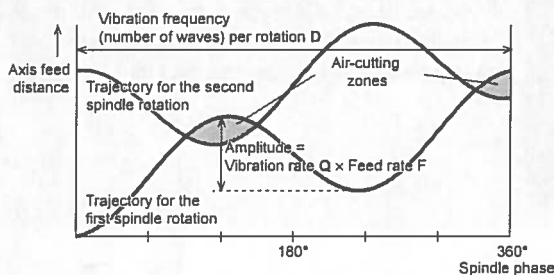
Coolant

Use of coolant with a low viscosity (20 mm²/s or lower) is recommended.

LFV Mode 1

Generally speaking ...

This mode is used to break chips up into short lengths. The maximum permissible feed rate F is approximately 0.03 mm/rev.



1

Initially, specify the following arguments.

G165 **P1** **Q1.5** **D1.5**
 Mode 1 Vibration rate Vibration frequency

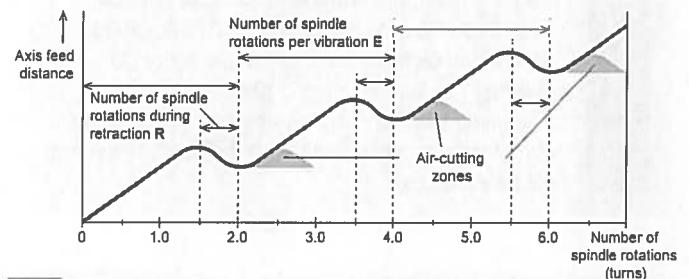
2

If the cutting results are not satisfactory with the above values ...

- Chips do not break
 Try increasing Q , the vibration rate gradually, 0.1 at a time.
 This increases the amplitude, enlarging the air-cutting zones.
 Setting range of Q : 0.01 to 2.50
- Chips do break but too long
 Increase D , the vibration frequency, to break chips into shorter lengths.
 The recommended settings of D are 0.25, 0.5, 0.75, 1.5, 2.5 and 3.5.
 Setting range of D : 0.10 to 6.50
- Chips do break but too short
 Decrease D , the vibration frequency, to break chips into longer lengths.
 The recommended settings of D are 0.25, 0.5, 0.75, 1.5, 2.5 and 3.5.
 Or, try using LFV mode 2.

LFV Mode 2

This mode is used for small diameter drilling ($\phi 3$ mm or smaller), machining that requires a high circumference speed, or adjusting chip lengths. The maximum permissible feed rate F is approximately 0.05 mm/rev.



1

Initially, specify the following arguments.

G165 **P2** **E2.0** **R0.5**
 Mode 2 Number of spindle rotations per vibration Number of spindle rotations during retraction

2

If the cutting results are not satisfactory with the above values ...

- Chips do not break
 Gradually increase R , the number of spindle rotations during retraction, by 0.1 at a time.
 Setting range of R : 0.5 to 1.0
 If chips do not break even with the maximum setting of 1.0, try using LFV mode 1.
- Chips do break but too long
 Change E , the number of spindle rotations per vibration, to 1.5.
 Setting range of E : 1.5 to 6.0
 If the chips are still too long, switch to vibration cutting in LFV mode 1 and try increasing D , the vibration frequency.
- Chips do break but too short
 Increase E , the number of spindle rotations per vibration, by 0.5 at a time.
 Setting range of E : 1.5 to 6.0

First select the mode and start with the settings given in **1** above, then try the fine adjustments described in **2**. For details, refer to the Instruction Manual.

Q1. Does the machining time change when the cutting feed rates specified are the same as those for standard cutting?

A1 The machining time does not change if the same spindle speeds and cutting feed rates as those for standard cutting are used. However, there may be differences in cutting time because the spindle speed may be automatically adjusted in LFV cutting.

Q2. Is there any way to achieve better surface roughness?

A2 In LFV cutting, the surface roughness may be deteriorated due to the unique tool paths and tool nose travel distances. If this happens, try (1) lowering the feed rate or (2) performing rough machining with LFV cutting and finish machining with standard cutting, although the machining time will be extended.

Q3. Is there any way to achieve better roundness?

A3 In LFV cutting, the status of uncut parts caused by the tool nose radius does not stabilize, due to the unique tool paths, and this may deteriorate the roundness when compared to standard cutting. It is advisable to use D0.5 for LFV mode 1 and E2.0 R0.5 for LFV mode 2.

Q4. I want to adjust the chip length.

A4 In LFV mode 1, the chip length can be increased by setting a smaller D value than the current value.
Example: Change the current value of D1.5 to D0.5.
In LFV mode 2, the chip length can be increased by setting a larger E value than the current value.
Example: Change the current value of R2.0 to R3.0.

Q5. The service lives of inserts have become shorter.

A5 In LFV mode 1, there is a possibility that the set amplitude is excessive. Try decreasing the Q value.

Q6. The service lives of drills have become shorter.

A6 If you are using LFV mode 1, try using LFV mode 2. In addition, use of high-pressure coolant and oil-supplied drills is recommended for LFV drilling.

Q7. Is there any adverse effect if finish machining is carried out at the back side while LFV cutting is in progress at the front side?

A7 There may be an adverse effect depending on the conditions of the LFV cutting at the front side. In LFV mode 1, reduce vibration by adjusting the Q and D values to smaller values. If this does not improve the situation, or when LFV mode 2 is used, change the timing of the finish machining at the back side.