LFV technology

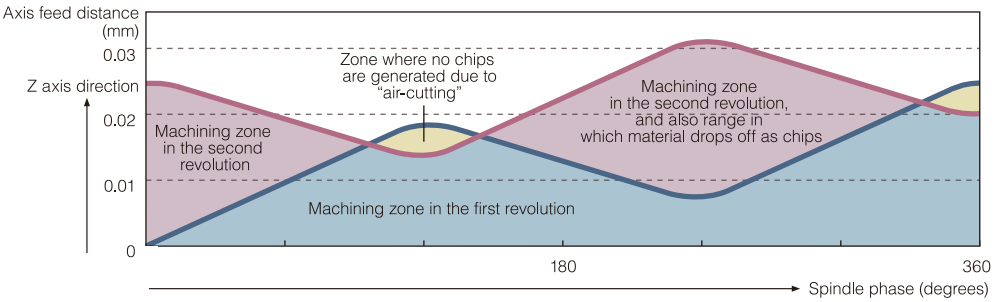
Low Frequency Vibration Cutting Technology

What is Low Frequency Vibration Cutting?

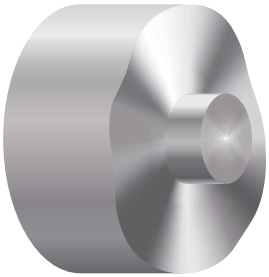
The servo axes are vibrated in the axial direction and cutting is performed while synchronizing this vibration with the rotation of the spindle. Because "air-cutting" times are provided during cutting, it is characterized by intermittent expulsion of chips.

This widely applicable cutting technology – able to handle a broad range of machining shapes and materials – is ideal for cutting difficult-to-cut materials like inconel, stainless steel and copper. It is state-of-the-art and suppresses various risks associated with these materials, such as entanglement of chips and built-up edges.

■ Z axis feed distance per spindle revolution and the low frequency vibration waveform



■ Representation of the cutting



Chip Shapes

Depending on the material being cut, a variety of problems can be caused by chips getting entangled with each other, including increased cutting resistance, scarring, changes in the texture of the machined surface, tool nose damage, and built-up edges due to cutting heat.

In low frequency vibration cutting, "air cutting" time provided during cutting serves to break chips up finely and expel them. This "air cutting" time also prevents the machining temperature rising, which both prolongs tool lives and gives relief from various problems caused by chips.

■ Shape differences of chips of the same weight (SUS304)

Chips generated by low frequency vibration cutting

Chips generated by conventional cutting

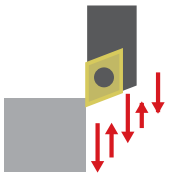
Variety of Machinable Geometries

Vibration cutting can handle a variety of types of machining in addition to linear machining on faces, including tapers, arcs, and drilling.

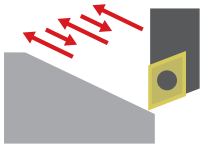
Vibration cutting can be turned ON and OFF just by inserting G codes into a program, giving relief from chip entanglement and problems with the tool nose, depending on the material being machined.

■ Horizontal face

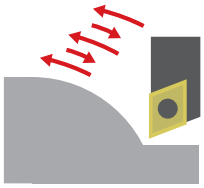
■ Vertical face



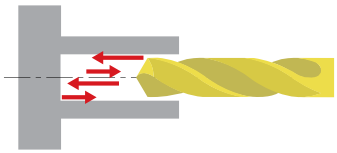
■ Taper



■ Arc



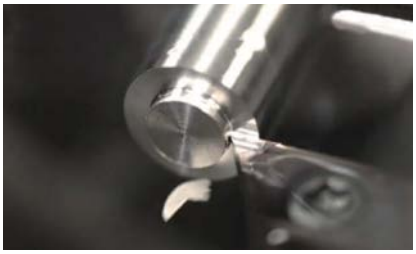
■ Drilling



Vibration Mode

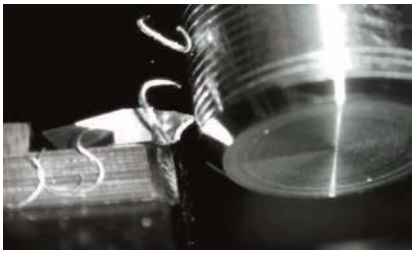
The optimum vibration mde can be selected depending on the purpose of machining.

Vibration mode 1
Breaking up chips



Vibration mode 2
Drilling, or turning where high peripheral speed is required

Vibration mode 3 (under development)
Breaking up chips in thread cutting



■ Micromachining example VC03

Micromachining leaving Ø0.2 mm pin

■ Deep hole drilling with an oil hole drill

The broken up chips are expelled along the flutes in the drill

Models that can be equipped with LFV

Model	Type	Front LFV (X1, Z1)	Back LFV (X2, Z2)
VC03		O	—
L20	VIII	O	O
	X, XII	O	X
L12	VII	O	O

*1

Model	Type	Module 1	Module 2	Module 3
MC20	III	O	O	O

The number of models that can be equipped with LFV will be gradually expanded - watch for changes.

*1. In principle, LFV machining in two axis control groups simultaneously is not possible.

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