



TAGA

Ultrasonic Elliptical Vibration Control Device  
General Catalog

# SONIC IMPULSE *EL-50 series*

Ultrasonic Elliptical Vibration Cutting Unit



No polished mirror finish

Ultra-precision machining of hardened steel

27th JSPE Technology Award



Model:EL-50 Σ



Model:EL-50jw



Model:EL-50jz

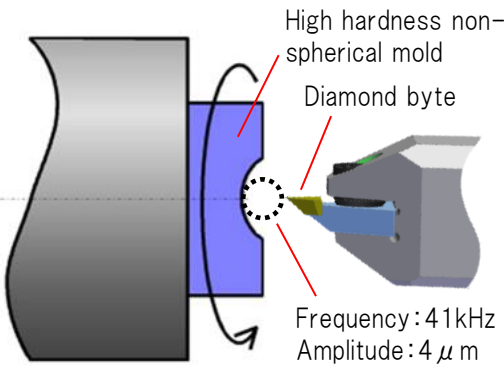
By using the “elliptical vibration cutting”, you can achieve ultra-precision machining of high hardness mold steel, which has been impossible until now.

○ What is the vibration cutting?

The vibration cutting is a way of processing applying ultrasonic vibration to the cutting edge. Since the cutting is intermittent, it can significantly reduce the cutting resistance.

○ What is the elliptical vibration cutting?

Cutting resistance is reduced to 1/30 or less by elliptical vibration of the cutting edge with a combination of bending vibration mode and a longitudinal vibration mode. In particular thrust force becomes almost zero. This enables ultra-precision cutting of STAVAX using a diamond byte (hardened steel).

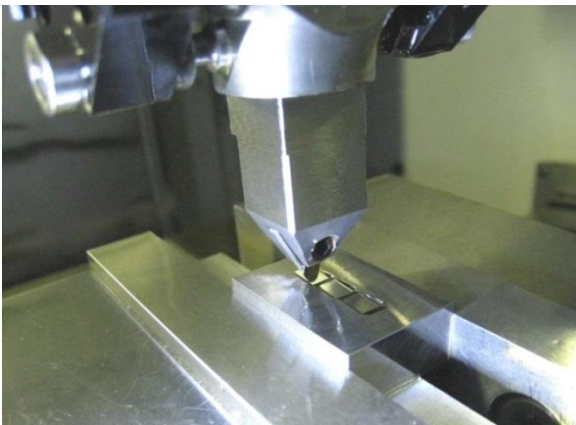


Example: Turning (Model: EL-50Σ)

**Characteristic**

- Using a diamond tool, it can be a practical ultra-precision cutting of against hardened steel.
  - Plating and without polishing, can easily be obtained the surface roughness of the Ra2 ~ 5nm.
- Processing of the fine grooves and sharp edges (corner processing) is possible
  - It enables difficult microfabrication in grinding.
- Equivalent to the end mill of one blade of the rotation number 2.46 million rpm in diameter φ4 μm
  - Various problems caused by small-diameter grinding wheel can be eliminated.

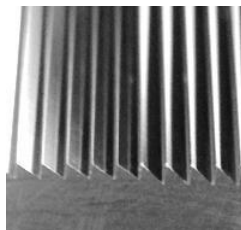
■ **EL-50Σ**



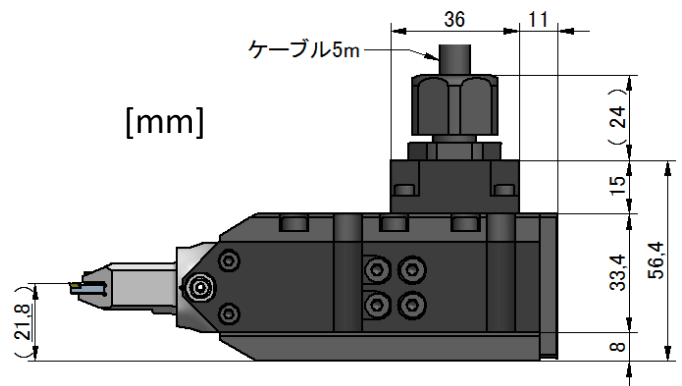
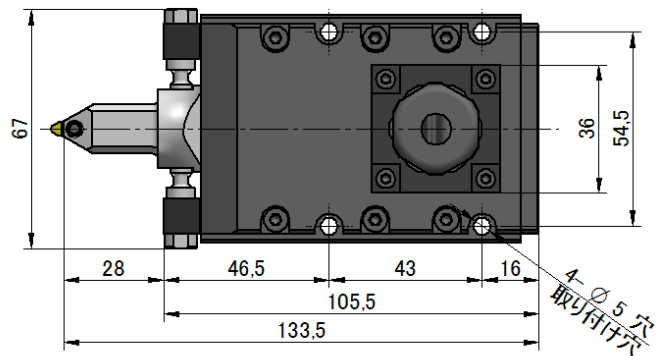
Machining example



Lens mold



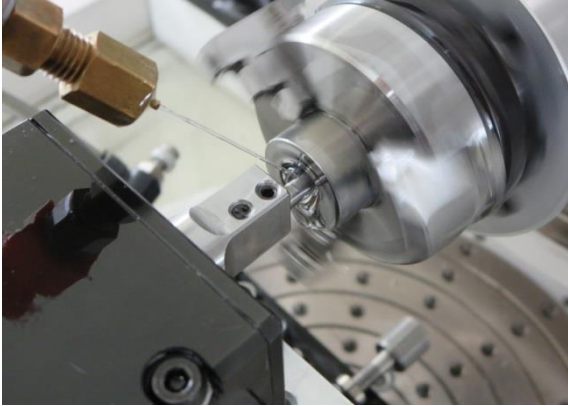
Reflector mold



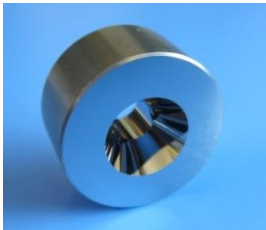
Transducer Dimensions

## EL-50jw

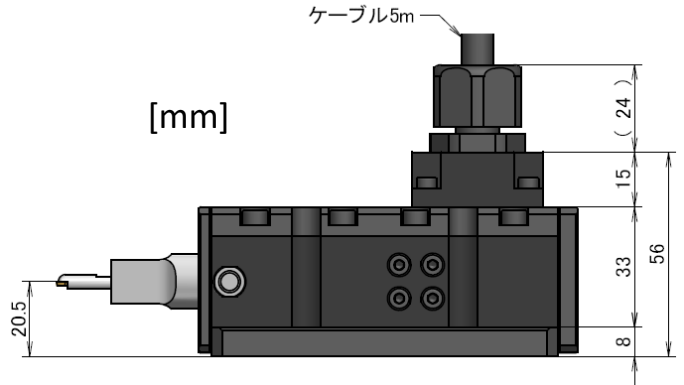
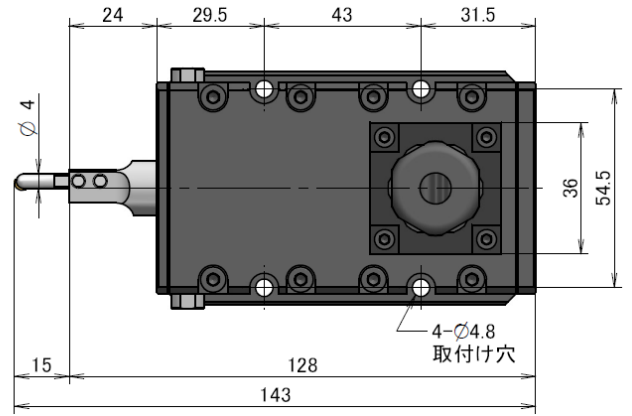
- ◇ You can mirror finish of the inside diameter without polish. (Minimum processing diameter  $\Phi 5$ )
- ◇ You get the equivalent of the surface roughness and the EL-50  $\Sigma$ .



### Machining example



-Inner diameter turning-  
 Material: STAVAX HRC52  
 Tool: Single crystal diamond  
 Inner diameter  $\Phi 5$ , An inner diameter of the tapered, Processing the end face

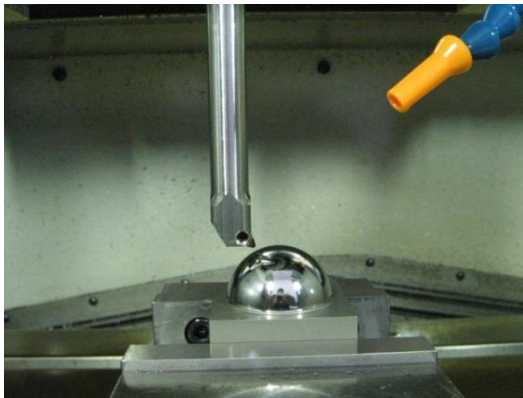


Transducer Dimensions

※ Mounted on a machining center by changing the case part of the vibrator, it can also processing of the rotation axis control.

## EL-50jz

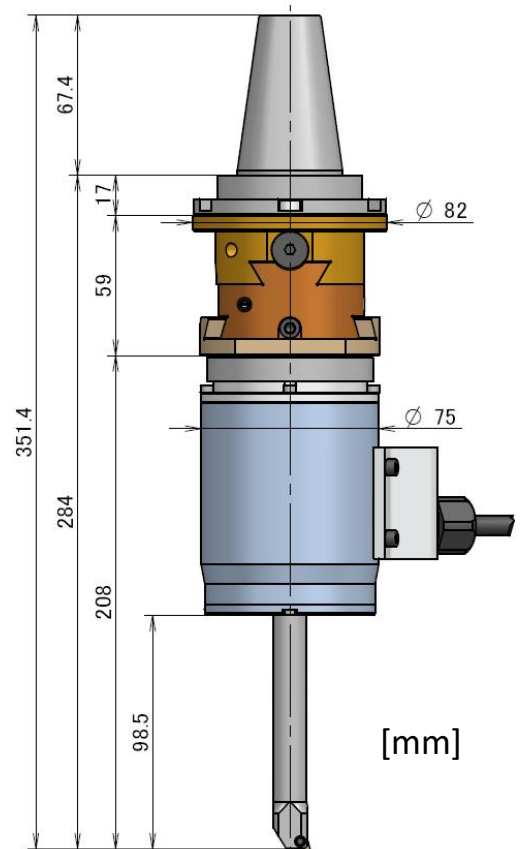
- ◇ Mounted on the machining center, you can mirror finish of the rotation axis control without polishing.
- ◇ It is equipped with a rotating mechanism. Therefore, you do not need a rewinding operation of the cable.



### Machining example



-Rotation axis control processing-  
 Material: STAVAX HRC52  
 Tool: Single crystal diamond  
 Processing the R20 semi-spherical

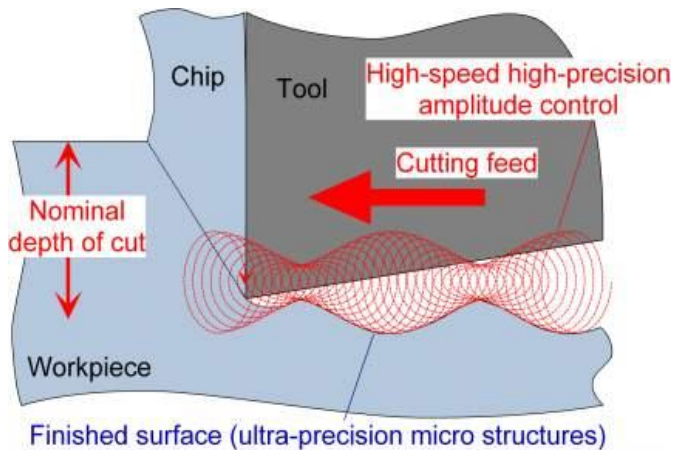


Transducer Dimensions

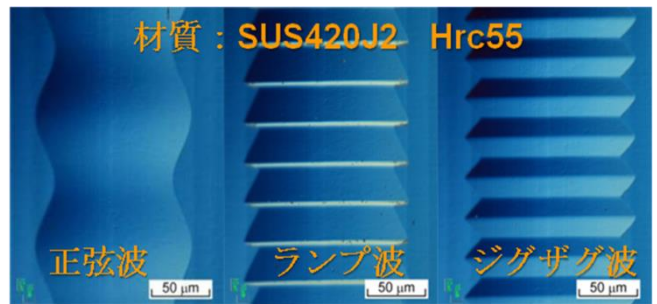
**Processing of texture** ~Processing method for varying the cutting depth utilizing the amplitude control~

Actively control the vibration amplitude of the cutting depth direction → cutting depth variation (application as FTS)

Maximum step  $2.5 \mu\text{m}$



Processing principle of texture



※ Response frequency of the sine wave is a maximum of 300Hz. Response frequency of the other of the waveform is a maximum of 100Hz.

Provides: Nagoya University Shamoto Suzuki laboratory

■ Equipment specification

Name of product	EL-50 $\Sigma$	EL-50jw	EL-50jz
Oscillation frequency	41.0 kHz $\pm$ 1.5 kHz	37.0 kHz $\pm$ 1.5 kHz	34.0 kHz $\pm$ 1.5 kHz
Elliptical vibration amplitude (Normal processing)	1.0 $\mu\text{m}$ ~ 4.0 $\mu\text{m}$	1.0 $\mu\text{m}$ ~ 4.0 $\mu\text{m}$	4.0 $\mu\text{m}$ p-p
Elliptical vibration amplitude (Processing of texture)	Axial direction: 1~6 $\mu\text{m}$ External control by the voltage	—	—
Ultrasonic Controller dimension	W437×H153×L472 15 kgs 1set		W439×H150×L374 14 kgs 1set
Amplifier dimension	W200×H261×L400 16 kgs 2sets		— (Built-in Controller)
Transducer dimension	W67×H56.4×L133.5 1.5 kg 1set	W66×H56×L128 1.5 kg 1set	$\phi$ 82×L267 5.0 kg 1set
Available tools	Dedicated diamond bytes	Dedicated diamond bytes (Shank diameter $\Phi$ 4)	Dedicated diamond bytes (The same as the EL-50 $\Sigma$ )
Corresponding shank	— (In the case of a mounted in the MC, it responds to consultation separately)		BT-40、HSK-A63 (It responds to consultation)
Power-supply voltage	AC100V 50/60Hz 1phase (It is responds to consultation)		
Operating temperature range	0~40 °C		

- Without notice, there is a possibility to change the part of the appearance and specifications.
- When you purchase, please check the latest specifications.