



Endless Diamond Wire Cutting Principle Whitepaper

This whitepaper explains the working principle, mechanical structure, and advantages of Vimfun's Endless Diamond Wire Saw technology. It is intended for engineers, material scientists, and industrial users seeking high-precision solutions for cutting hard and brittle materials.

1. Cutting Principle

The Endless Diamond Wire Saw employs a closed-loop diamond wire that runs continuously in a single direction. Unlike traditional reciprocating wire saws that reverse motion after each stroke, the endless design eliminates direction changes, enabling smoother cutting, higher linear velocity, and improved stability.

- Wire Length: ~10 meters (looped configuration)
- Linear Speed: Up to 80 m/s
- Tension Range: 150–250 N
- Cutting Medium: Water or industrial white oil

2. Mechanical System Overview

The system consists of a driving pulley, tensioning pulley, guiding pulleys, and a precision-controlled wire loop. The wire is embedded with diamond abrasives, providing strong grinding capability on hard and brittle materials such as silicon, sapphire, ceramics, and graphite.

The driving motor maintains constant wire speed, while the servo-controlled tensioning unit compensates for thermal expansion and ensures uniform pressure across the cutting zone.

3. Comparison with Traditional Wire Saw

Compared with reciprocating or spool-type wire saws, the endless system achieves superior surface quality and cutting efficiency due to continuous motion.

Parameter	Traditional Wire Saw	Endless Diamond Wire Saw
Motion Type	Reciprocating / Back & Forth	Continuous One-Way Loop
Wire Length	>1000 m	2-10 m
Speed	≤30 m/s	Up to 80 m/s



Vibration	High due to reversal	Minimal
Maintenance	Frequent wire replacement	Long wire life
Surface Finish	Visible wire marks	Mirror-like surface

4. Advantages of Endless Wire System

- Low vibration and noise during operation
- Suitable for multi-axis precision cutting and integration with CNC/PLC control
- High cutting speed
- Simple operation
- High possibility to customize functions
- Long wire life and reduced maintenance cost
- High cutting accuracy and minimal kerf loss (as small as 0.35 mm)
- Low vibration and noise during operation
- Smooth surface finish without directional marks

5. Application Areas

Endless diamond wire cutting technology is applied in multiple high-value industries:

- Semiconductor wafer slicing (Silicon, SiC, GaAs)
- Optical and laser components
- Graphite and carbon composites
- Advanced ceramics (Al_2O_3 , ZrO_2)
- Research laboratories and prototyping centers

6. Summary

The Vimfun Endless Diamond Wire Saw represents the next generation of precision cutting technology. By combining mechanical, electrical, and software control expertise, Vimfun provides integrated solutions for high-performance material slicing, ensuring both productivity and quality.