Laser Doppler Vibrometry-Based Testing System for Medical Ultrasonic Scalpels

The **MotionGo laser vibrometer** by **Omnisensing Photonics** is a non-contact vibration measurement instrument designed for rapid sample changeover, synchronized measurement, and automatic result analysis. It enables precise characterization of ultrasonic vibration properties in medical ultrasonic devices and serves as a powerful solution for full-line inspection of ultrasonic scalpel production. Thanks to its exceptional performance, the MotionGo series sensors also provide an all-in-one measurement solution for various demanding applications involving high-speed, high-frequency, and large-amplitude vibrations.

Despite its compact size, the MotionGo delivers robust performance. The accompanying video demonstrates MotionGo's capability to measure in high-vibration scenarios. Ultrasonic scalpel tips exhibit intense vibrational energy, with typical frequencies around 55 kHz, amplitudes exceeding 50 microns, and vibration velocities reaching beyond 20 meters per second. The small, curved geometry of the blade tip further complicates measurement, as the return signal can vary dramatically. These conditions pose significant challenges for conventional Doppler vibrometers based on discrete components. For example, Polytec's VibroGo has a maximum measurable vibration velocity of 6 m/s, making it unsuitable for such measurements.

In contrast, MotionGo leverages a patented demodulation algorithm to easily and rapidly perform accurate measurements, showcasing its superior capability and reliability in high-performance environments.

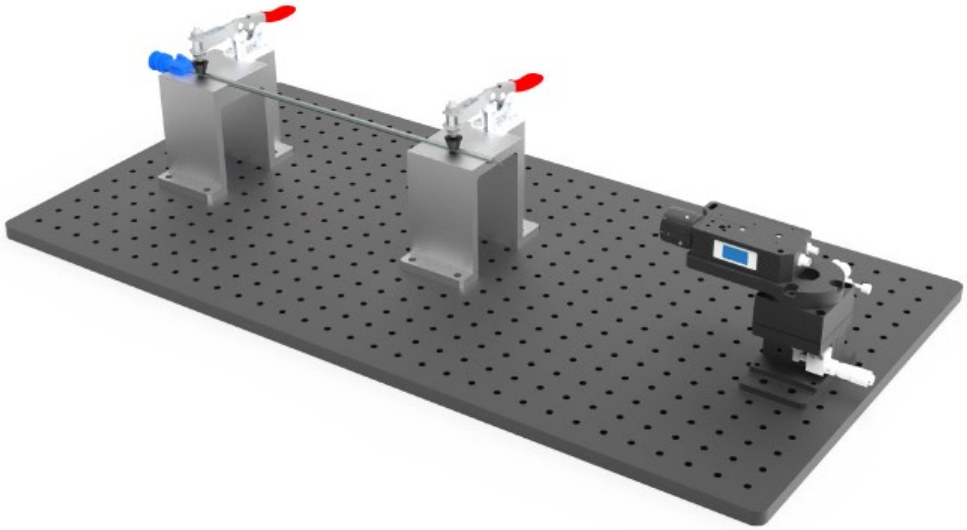

Fig 1. Test solution of Ultrasonic scalpels

Ultrasonic surgical scalpels achieve tissue coagulation and hemostasis through heat generated by high-frequency frictional vibrations at the blade tip. The amount of heat produced is directly related to both the vibration frequency and amplitude. At a given frequency, the vibration amplitude has a direct impact on cutting performance. Therefore, amplitude is a critical parameter in the research, development, and manufacturing of ultrasonic scalpels.

Figure 2 presents a case study of vibration testing for an ultrasonic hemostatic scalpel, along with a custom-designed fixture developed for accurate measurement. Figure 3 shows the measurement results displayed by the software paired with the laser vibration sensor. Through this measurement process, key parameters such as spectral characteristics, peak frequency, and peak vibration amplitude of the device under test can be obtained.

As demonstrated in the video, the customized fixture system enables MotionGo to perform rapid blade replacements, synchronized measurements, and real-time data analysis within seconds. This streamlined process provides an efficient and practical solution for full-line inspection in the production of medical ultrasonic scalpels.

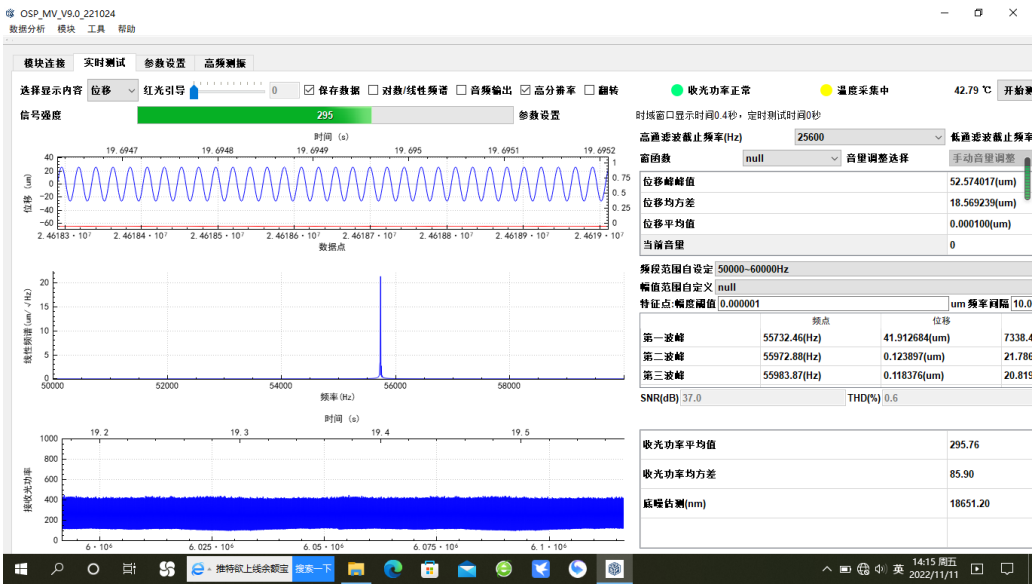

Figure 2 Example of Measured Result

About Omnisensing Photonics

Omnisensing Photonics is a globally recognized leader in the development and manufacturing of Laser Doppler Vibrometers (LDVs). Distinct from conventional LDV solutions, Omnisensing's systems are built on proprietary photonic integrated chip technology. This innovation enables the company to deliver low-power, ultra-compact, and highly cost-effective LDV solutions that dramatically improve testing efficiency and scalability across applications.

Omnisensing's LDV systems are trusted and widely deployed in a range of sectors, including industrial manufacturing, medical diagnostics, and scientific research. The versatility and precision of their technology make it suitable for both routine and advanced vibration measurement tasks. Over the past several years, Omnisensing has successfully delivered thousands of LDV units to customers worldwide, demonstrating its reliability, scalability, and strong market adoption.

For more information, visit https://ospmotiongo.com/ or contact Globalsales@osphotonics.com.

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