Supplementary Material

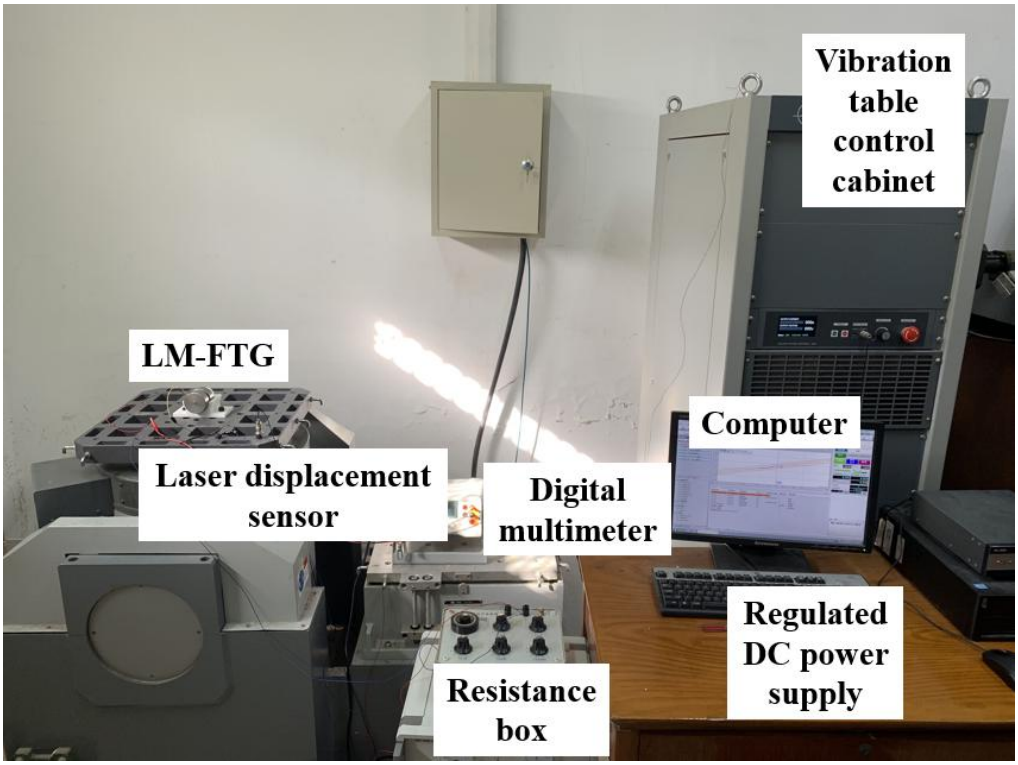
Supplementary picture S1

Structure	Size
Total weight	639g
Overall height	70mm
Aluminum alloy cover outer diameter	29.8mm
Sleeve height	51mm
Inner diameter of sleeve	36mm
liquid high of Liquid metal	9-13mm

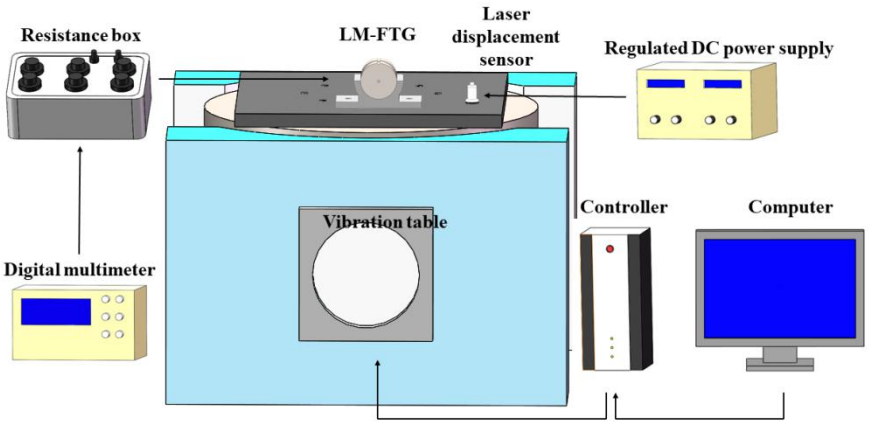
S1: Size of LM-FTG.

Supplementary picture S2

S2 show photos of experimental systems and schematic diagram under vibration table test.



(a)

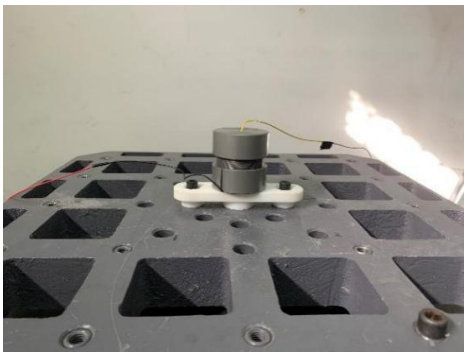


(b)

S2 : Experimental setup. (a) Physical; (b) Schematic diagram.

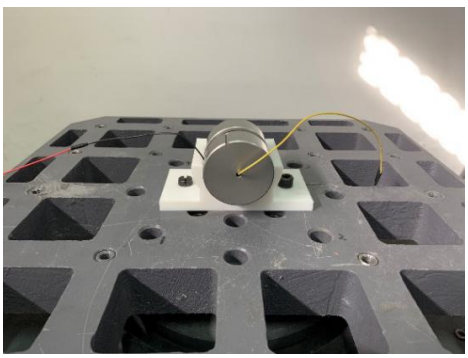
Supplementary picture S3

S3 show photos of four cases under the frequency-sweep experiment.



(a)

(b)



(c)

(d)

S3: (a)Liquid flow in VV mode; (b)Liquid flow in VH mode; (c) Liquid flow in HV mode; (d)Liquid flow in HH mode.

Supplementary picture S4

DH5909 dynamic signal analyzer and IEPE accelerometer are used to measure the acceleration of walking with a sampling frequency of 128 Hz. The measurement data can be processed to obtain spectrum information during walking.

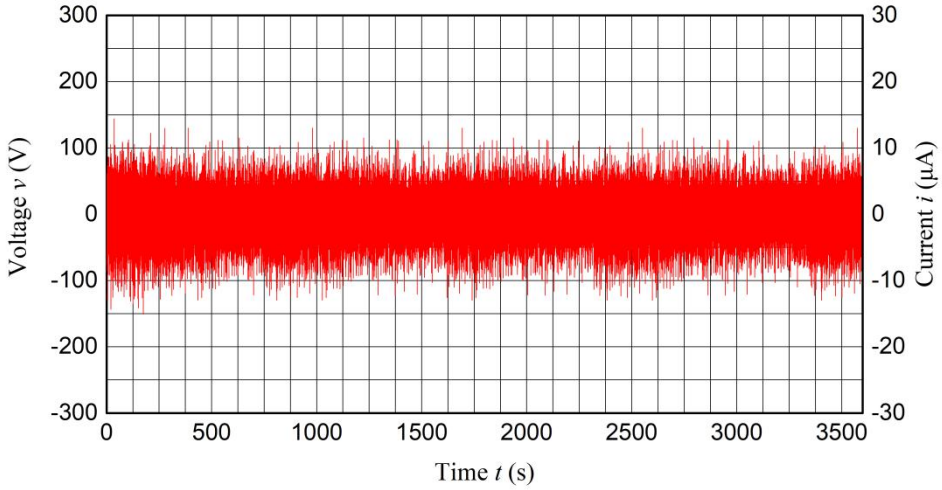
S4: Experimental setup of the walking.

Supplementary picture S5

In order to prove the stability of the device, we conducted a long-term testing of LM-FTG.The device is fixed horizontally on a horizontal vibration table and excited by inertial force. The excitation frequency of the vibrating table is 13.5 Hz, and the excitation peak-to-peak value is 13

mm. Under such severe vibration excitation conditions, we conducted a stability test of the LM-FTG for 3600 seconds. It should be noted that this kind of high-intensity continuous vibration excitation is difficult to appear in the actual environment, and its intensity far exceeds the random vibration in the actual environment.

S5(a) shows that the output of the device always maintains a stable voltage and current amplitude and is consistent with the data of the previous sweep experiment. S5(b) is the condition of the Kapton's surface after the endurance test and it can be seen that there is no debris attached to the surface. All experimental results fully proved the excellent stability, reliability and fatigue resistance of the designed equipment.



(a)

(b)

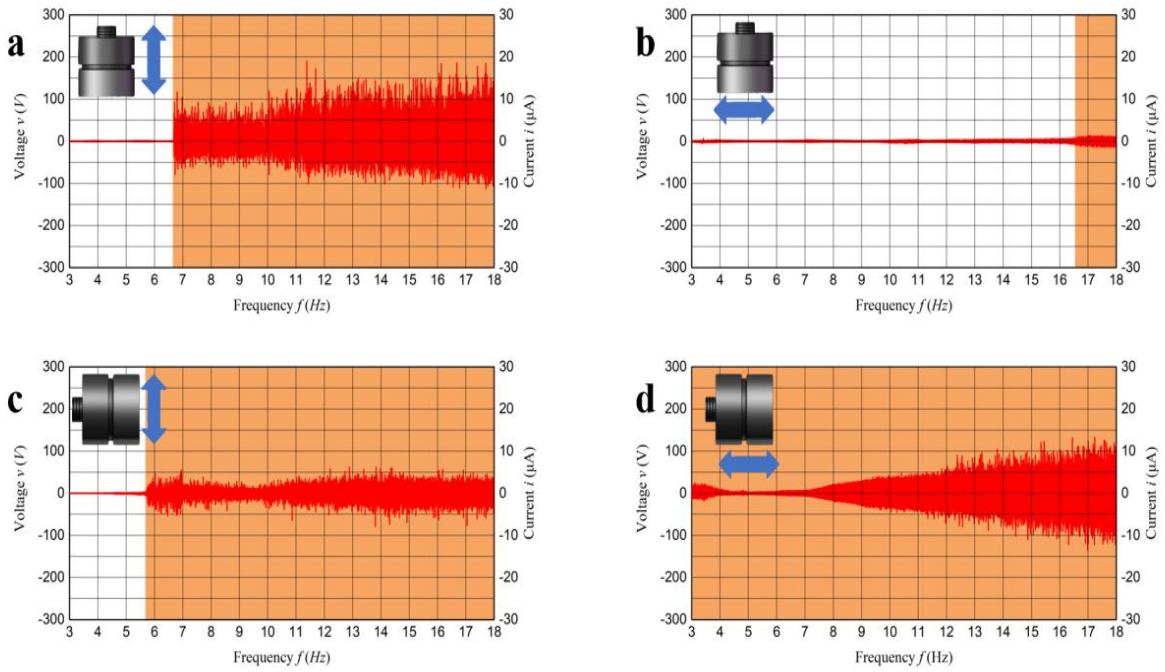
S5: Stability test

Supplementary picture S6

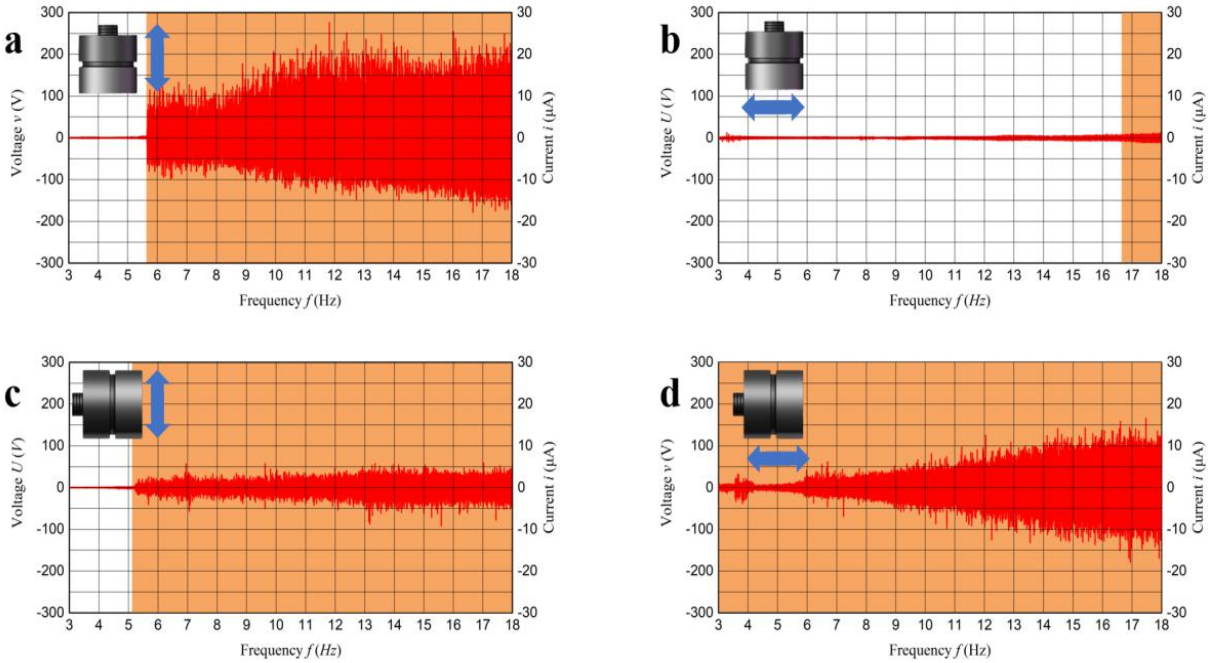
S6 shows the results for the frequency-domain performances of LM-FTG under an excitation which the peak-to-peak value is 9mm and 16mm, and the frequency f sweep from 3 to 18 Hz at a frequency rise rate of 0.05 Hz/s. Comparing the results when the amplitude is 13mm, it can be seen that the external amplitude hardly affects the output capability of LM-FTG in VH mode and HV mode, and the working frequency band

and the peak output are almost unchanged under the three external amplitudes.In VV mode, the peak output can reach 189.6V, 19.0μA at 9mm amplitude and the peak output can reach 265.4V, 26.5μA at 16mm amplitude. Although the working frequency band increases with the increase in amplitude, it is not obvious and can almost be ignored. For HH mode, LM-FTG can achieve full-band output under the three amplitudes, and the overall output increases as the amplitude increases.

The experimental results show that the increase in amplitude can indeed increase the output of LM-FTG, but the impact is not particularly large. LM-FTG can maintain good output under these amplitudes.



(a) 9mm



(b) 16mm

S6: Frequency-sweep experiment