Supplementary Material

to "Leaf-geometry Characteristics of Monstera deliciosa: their Effects on the Tribological and Friction-induced Vibration Behavior of Rolling Bearings under Starved Lubrication"

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1 Methods

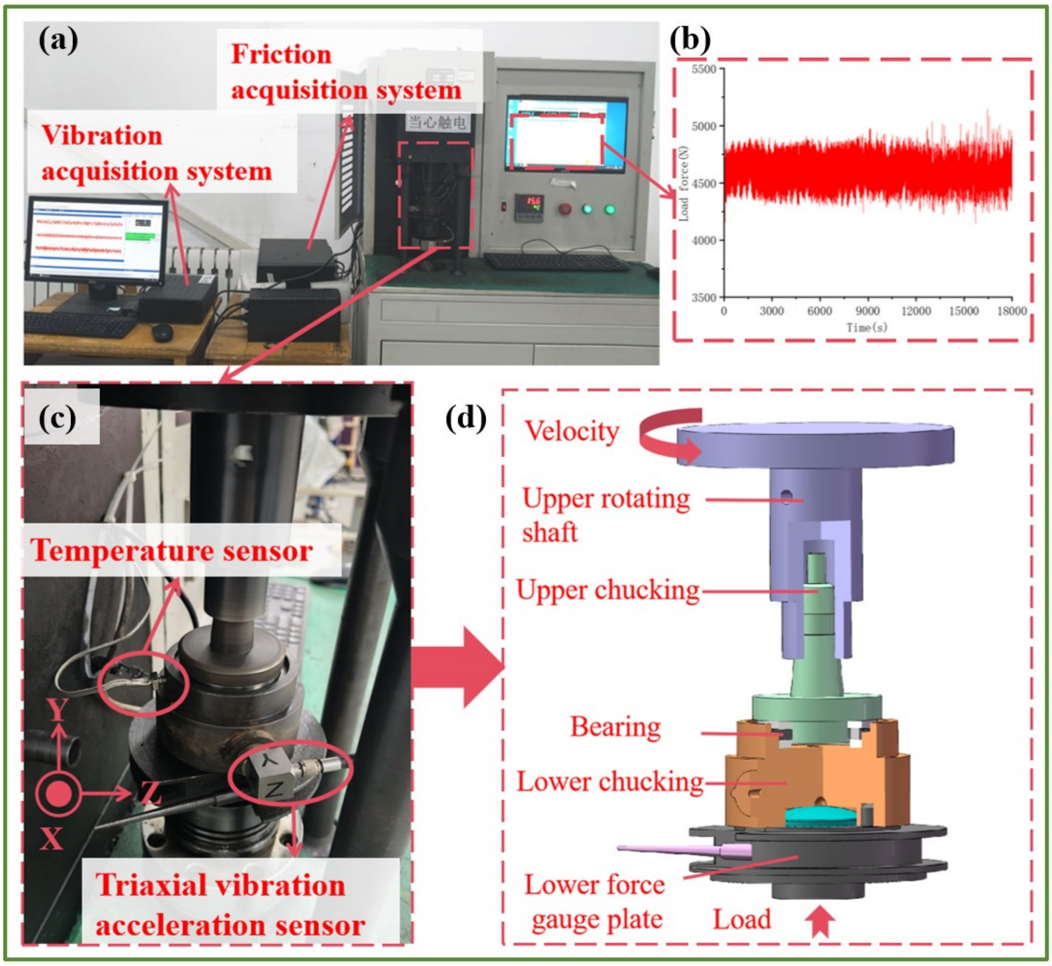

Fig. S1: (a) Photograph of wear tester and data acquisition system. (b) Test applied load (c) Photograph of the customized friction pair for 81107TN bearing and sensors. (d) 3D model of the customized friction-pair.

Lubricant parameters: kinematic viscosity 14.45 mm²/s; density 0.8678 kg/L at 30°C.

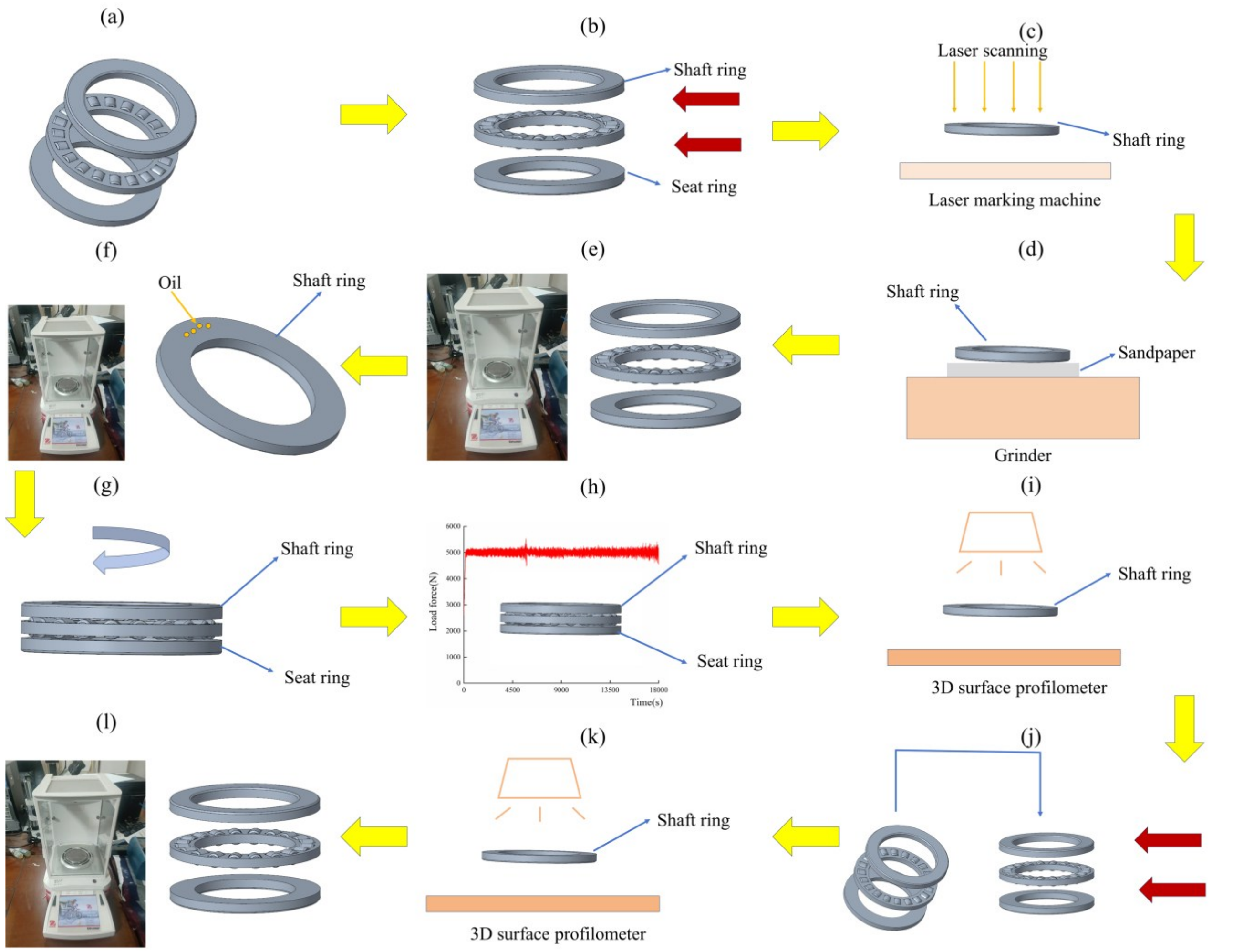

Fig. S2: Typical experimental steps of one wear test [1-2]: (a) Ultrasonic cleaning; (b) Hot air drying; (c) Laser ablation; (d) Surface polishing; (e) Weighing; (f) Adding oil; (g) Bearing fit and manual rotation; (h) Wear test; (i) Surface observation; (j) Ultrasonic cleaing and hot air drying; (k) Surface observation; (l) Weighing.

Table S1: The actual and the designed dimensions of the leaf-geometry parameters

	Vein width (μm)	Vein depth (μm)	Costal veins width (μm)	Costal veins depth (μm)	Semi-long axis A (μm)	Semi-short axis B (μm)
Design size	200	5	100	5	2400	600
Actual size	200±2	5±0.8	100±1.2	5±0.8	2400±20	600±10

2 Results

The Peak value represents the maximum amplitude of vibration, which can be used to detect transient shock vibration such as surface spalling and scraping on the working surface of the bearings, etc. The RMS value represents the average energy of the signals, which can accurately reflect the actual energy level and intensity of vibration, and can be used to assess the bearing wear faults. The Crest factor reflects the peak magnetization of the time-domain waveform, which increases with increasing faults, and is more effective than the RMS value in detecting localized spalling, scratching, wear and pitting [3-4].

To analyze the rolling bearing vibration signals in time and frequency domain, the time domain vibration signals can be converted into frequency domain signals by Fourier transform, and the frequency domain vibration signals are divided into three frequency bands, namely, low frequency (LF; 0 - 300 Hz), medium frequency (MF; 300 - 1800 Hz) and high frequency (HF; 1800 - 6400 Hz). The LF band mainly reflects the structural difference of the bearing system, the HF band mainly reflects the surface damage, and the prepared texturing unit mainly affects the MF band [4].

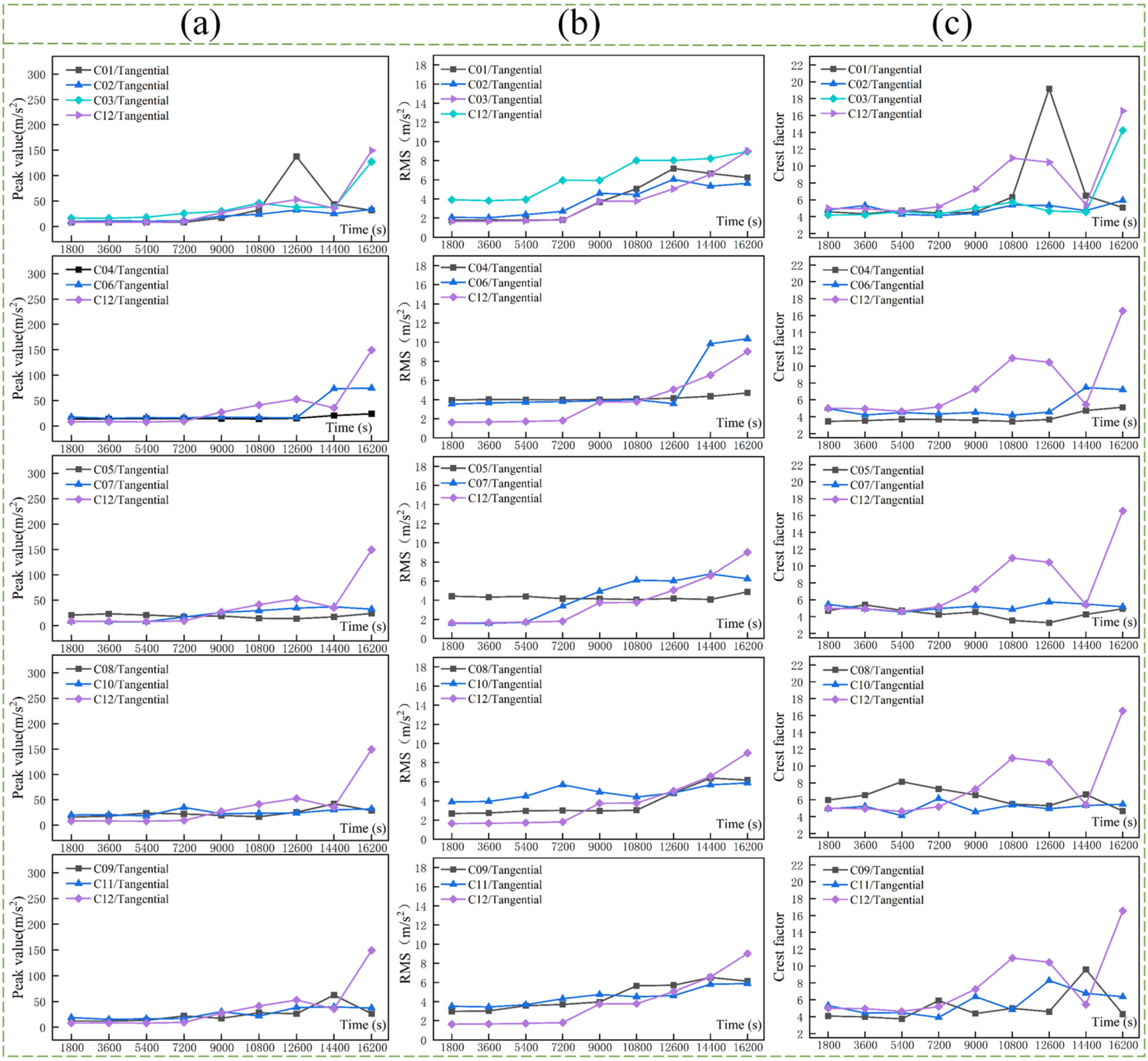

Fig. S3: Time-domain vibration characteristics (i.e., peak value, RMS and crest factor) curves in the X-axis/ Tangential directions: (a) peak value curves; (b) RMS curves; (c) crest factor curves.

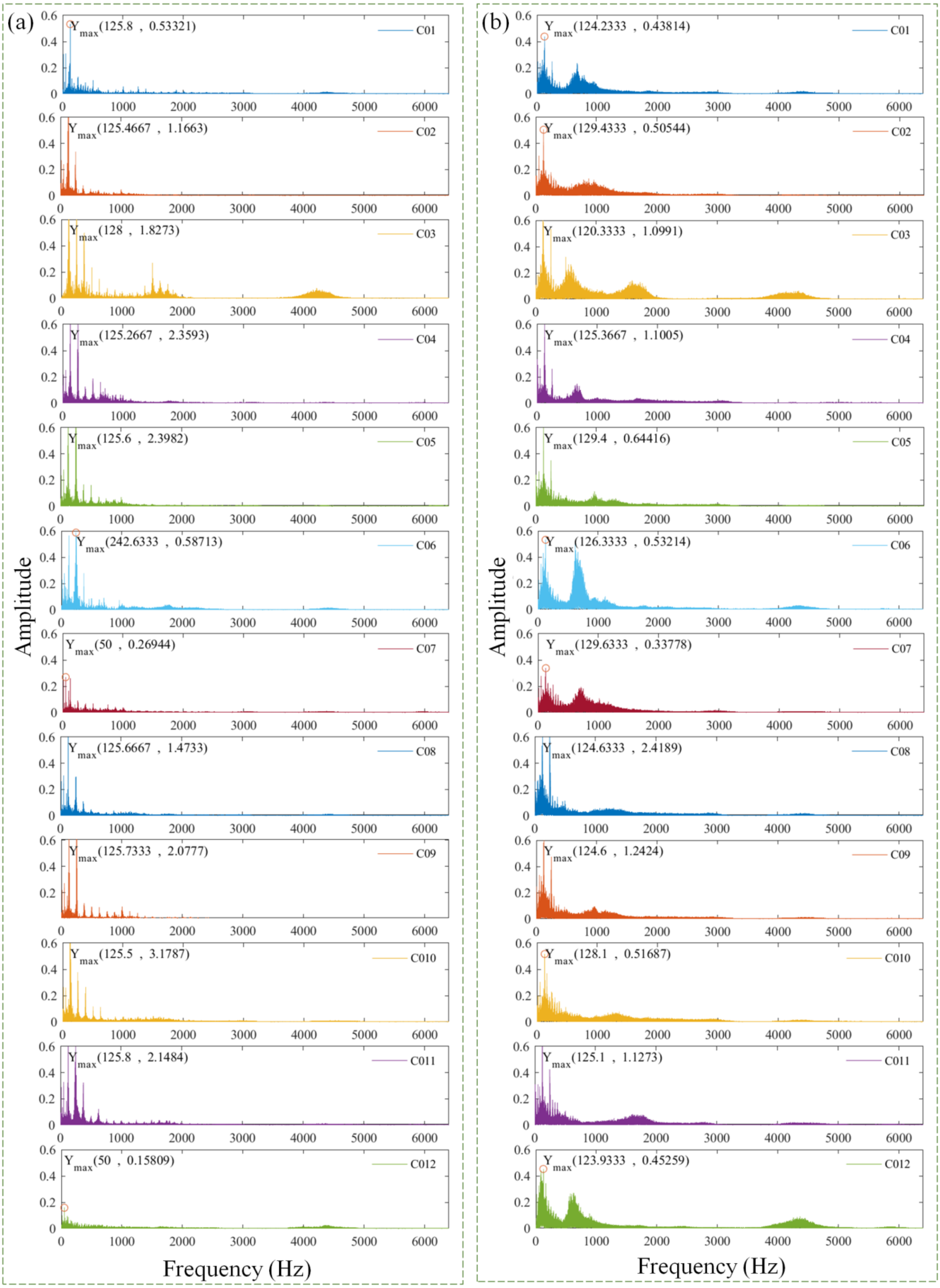

Fig. S4: Representative frequency-domain vibration signals of different groups in the Y-axis/ Normal direction at: (a) the 1800th s; (b) the 16200th s.

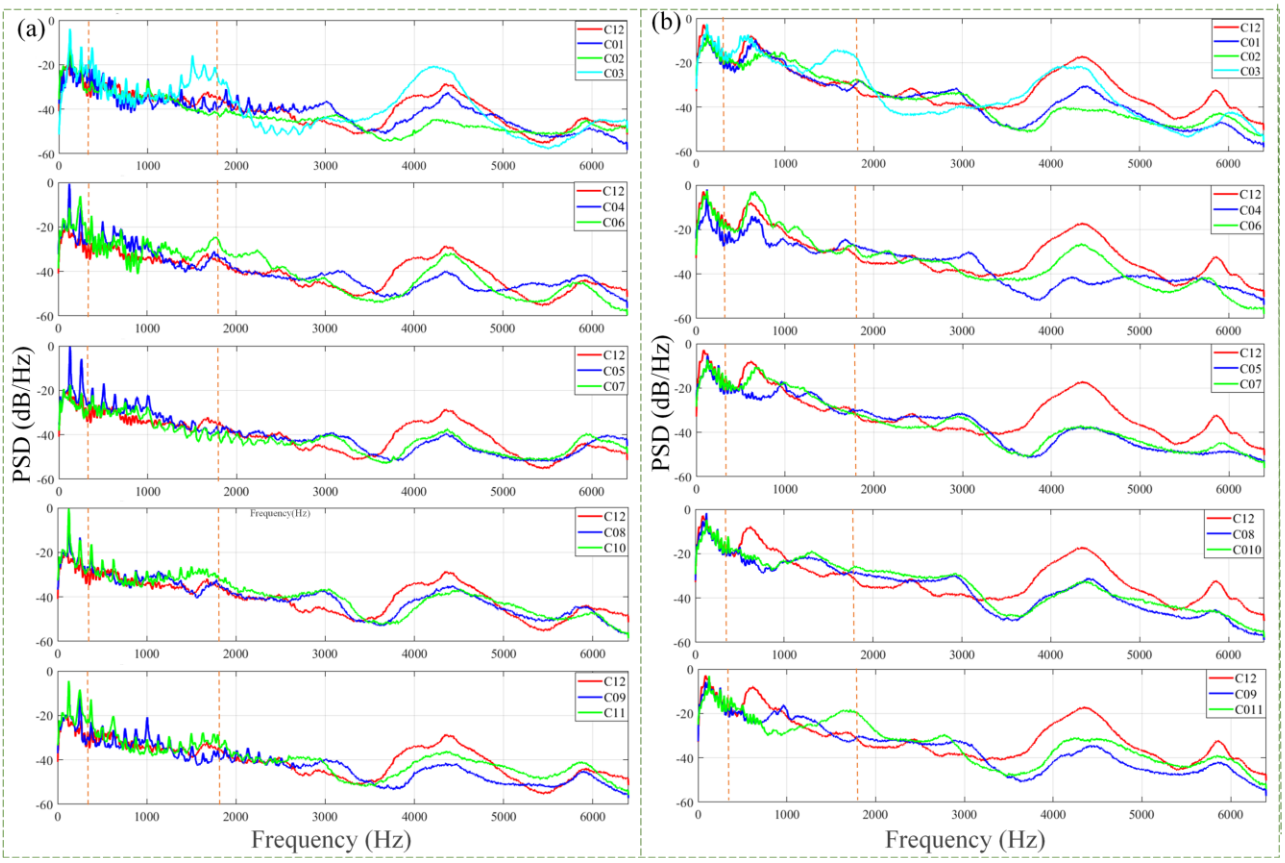

Fig. S5: PSD curves of different groups in the X-axis/ Tangential direction at: (a) the 1800th s; (b) the 16200th s.

3 References

[1] Long RS, Shang QY, Jin ZH, Zhang YM, Ju ZC, Li MH. Tribological behavior of laser textured rolling element bearings under starved lubrication. Ind Lubr Tribol 2022; 74: 453-462.

[2] Long RS, Sun YH, Zhang YM, Shang QY, M.Ramteke S, Marian M. Influence of micro-texture radial depth variations on the tribological and vibration characteristics of rolling bearings under starved lubrication. Tribol Int 2024; 194: 109545.

[3] Long RS, Ma Q, Jin ZH, Zhang YM, Han H, Sun SN, Du XY. Tribological behavior of dimples textured rolling element bearings under stepped load and starved lubrication. Industrial Lubrication and Tribology 2022; 74: 876-883.

[4] Long RS, Shang QY, Sun SN, Wang SW, Ma C, Zhang JW, Marian M. Influence of Monstera riedrichsthalii bionic textures on the tribological and vibration behavior of rolling bearings. Friction 2025; 13: 9440949.