CCS J 04

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 20485.32-2021

Methods for the calibration of vibration and shock transducers - Part 32: Resonance testing - Testing the frequency and the phase response of accelerometers by means of shock excitation

Issued on: August 20, 2021 **Implemented on: March 1, 2022**

Issued by: State Administration for Market Regulation, China National Standardization Administration

Table of Contents

Foreword

GB/T 20485 "Vibration and Shock Sensor Calibration Method" has or plans to publish the following parts.

---Part 1.Basic concepts;

---Part 11.Absolute Vibration Calibration by Laser Interferometry;

---Part 12.Absolute Vibration Calibration by Reciprocity Method;

---Part 13.Absolute calibration of impact by laser interferometry;

---Part 15.Absolute calibration of angular vibration by laser interferometry;

---Part 16.Earth Gravity Method Calibration;

---Part 17.Centrifuge method absolute calibration;

---Part 21.Vibration comparison method calibration;

---Part 22.Impact comparison method calibration;

---Part 31.Transverse vibration sensitivity test;

---Part 32.Resonance test uses shock excitation to test the frequency and phase response of the accelerometer;

---Part 33.Magnetic Sensitivity Test;

---Part 41.Laser Vibrometer Calibration;

---Part 42.Gravitational acceleration method calibration of high-precision seismometers;

---Part 43.Accelerometer calibration based on model parameter recognition.

This part is part 32 of GB/T 20485 "Vibration and shock sensor calibration method".

This section was drafted in accordance with the rules given in GB/T 1.1-2009.

The translation method used in this part is equivalent to ISO 16063-32.2016 ``Vibration and Shock Sensor Calibration Method Part 32.Resonance Measurement

Try impact excitation to test the frequency and phase response of accelerometers.

The Chinese documents that have a consistent correspondence with the international documents cited in this section are as follows.

---GB/T 2298-2010 Mechanical vibration, shock and condition monitoring vocabulary (ISO 2041.2009, IDT);

---GB/T 13823.20-2008 Vibration and shock sensor calibration method accelerometer resonance test general method

(ISO 5347-22.1997, IDT);

---GB/T 14412-2005 Mechanical installation of mechanical vibration and shock accelerometer (ISO 5348.1998, IDT).

This part is proposed and managed by the National Mechanical Vibration, Shock and Condition Monitoring Standardization Technical Committee (SAC/TC53).

Drafting organizations of this section. Beijing Institute of Aerospace Metrology and Testing Technology, China Institute of Metrology, Zhejiang University, Zhengzhou Institute of Machinery

Limited company.

1 Scope

This part of GB/T 20485 specifies the instruments and procedures for testing the frequency and phase response of accelerometers with shock excitation.

This section applies to piezoelectric, piezoresistive and variable capacitance accelerometers with a damping ratio of less than 1, and the frequency range is up to 150kHz.

The accelerometer under test that requires this method to obtain frequency and phase response needs to have a good mechanical installation as stated in ISO 5348

Characteristics, and the mass of the reference impact ball exceeds at least three times the mass of the measured accelerometer.

The phase response of the measured accelerometer obtained by this method assumes that the accelerometer has input and output signals at a frequency of 0 Hz.

There is zero phase shift between.

Note 1.The user may notice that the frequency and phase response of the same accelerometer used in the field may be different, depending on the quality of the test structure,

Consistency and installation method. This method can only qualitatively evaluate the frequency and phase response of the accelerometer.

Note 2.Compared to focusing on sufficient dynamic range characteristics, users may not pay much attention to the initial part of the measured accelerometer frequency and phase response.

Resolution. The biggest advantage of obtaining accelerometer frequency and phase response through this method is to obtain the best number of spectral lines in the initial part of the above-mentioned characteristics.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article

Pieces. For undated reference documents, the latest version (including all amendments) is applicable to this document.

ISO 2041 Mechanical vibration, shock and condition monitoring vocabulary (Mechanicalvibration, shockandconditionmonito-

ring-Vocabulary)

ISO 5347-22 Vibration and shock sensor calibration method Part 22.Accelerometer resonance test general method (Methods

forthecalibrationofvibrationandshockpick-ups-Part 22.Accelerometerresonancetesting-General

methods)

ISO 5348 Mechanical vibration and shock-mechanical installation of accelerometers (Mechanical vibration and shock-Mechanical

mountingofaccelerometers).

3 Factors affecting measurement repeatability

The uncertainty limits of frequency response measurement are as follows.

For the resonant frequency of the measured accelerometer, the absolute uncertainty is equal to the resolution of the frequency analysis, which is the long time record of the accelerometer signal

The reciprocal of degrees. This method suggests that the minimum number of spectral lines in the frequency domain is 400.Assuming that the resonant frequency is in the middle of the frequency band, the standard of the resonant frequency is not accurate

The fixed degree is about 0.5%.

Note 1.This uncertainty is assumed to be uniformly distributed within the frequency resolution range.

For the damping ratio of the measured accelerometer, the uncertainty depends on the signal-to-noise ratio measured in the time domain.

Suppose that when the measurement is performed, the maximum value of the signal is close to the upper limit of the dynamic range of the measuring instrument and the typical damping ratio of the piezoelectric accelerometer is about