INTERNATIONAL STANDARD

ISO 5347-17

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Methods for the calibration of vibration and shock pick-ups —

Part 17: Testing of fixed temperature sensitivity

Méthodes pour l'étalonnage de capteurs de vibrations et de chocs —

Partie 17: Essai de sensibilité de température fixe

Reference number
ISO 5347-17:1993(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5347-17 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Sub-Committee SC 3, *Use and calibration of vibration and shock measuring instruments*.

ISO 5347 consists of the following parts, under the general title *Methods for the calibration of vibration and shock pick-ups*:

— *Part 0: Basic concepts*

— *Part 1: Primary vibration calibration by laser interferometry*

— *Part 2: Primary shock calibration by light cutting*

— *Part 3: Secondary vibration calibration*

— *Part 4: Secondary shock calibration*

— *Part 5: Calibration by Earth's gravitation*

— *Part 6: Primary vibration calibration at low frequencies*

— *Part 7: Primary calibration by centrifuge*

— *Part 8: Primary calibration by dual centrifuge*

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— *Part 9: Secondary vibration calibration by comparison of phase angles*

— *Part 10: Primary calibration by high-impact shocks*

— *Part 11: Testing of transverse vibration sensitivity*

— *Part 12: Testing of transverse shock sensitivity*

— *Part 13: Testing of base strain sensitivity*

— *Part 14: Resonance frequency testing of undamped accelerometers on a steel block*

— *Part 15: Testing of acoustic sensitivity*

— *Part 16: Testing of mounting torque sensitivity*

— *Part 17: Testing of fixed temperature sensitivity*

— *Part 18: Testing of transient temperature sensitivity*

— *Part 19: Testing of magnetic field sensitivity*

— *Part 20: Primary vibration calibration by the reciprocity method*

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Methods for the calibration of vibration and shock pick-ups —

Part 17:
Testing of fixed temperature sensitivity

1 Scope

ISO 5347 comprises a series of documents dealing with methods for the calibration of vibration and shock pick-ups.

This part of ISO 5347 lays down detailed specifications for the instrumentation and procedure to be used for fixed temperature sensitivity testing. It applies to rectilinear pick-ups.

This part of ISO 5347 is applicable for the following parameters:

— frequency range: 20 Hz to 1 250 Hz;

— dynamic range:

0,1 µm to 10 mm (frequency-dependent);

1 mm/s to 1 m/s (frequency-dependent);

10 m/s^2 to 1 000 m/s^2 (frequency-dependent);

— temperature range: – 45 °C to + 800 °C.

The uncertainty applicable is ± 10 % of reading.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 5347. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5347 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5347-3:1993, *Methods for the calibration of vibration and shock pick-ups — Part 3: Secondary vibration calibration.*

3 Apparatus

3.1 Equipment capable of maintaining room temperature at 23 °C ± 3 °C.

3.2 Vibration equipment, complying with the equipment specified for secondary vibration calibration (see ISO 5347-3).

The vibrator shall have a fixture with thermal barrier so the test pick-up can be placed inside a temperature chamber and the reference pick-up outside the chamber at laboratory conditions.

The temperature influence on the reference pick-up and the fixture transfer function error shall be less than ± 0,5 % of reading.

3.3 Temperature chamber, designed so that the air temperature in the working space is evenly constant within ± 3 °C for temperatures between – 65 °C and + 100 °C and within ± 5 °C above 100 °C. The temperature of the chamber walls shall not differ from the test temperature by more than 10 °C at any point. Forced air circulation is recommended.

The temperature sensors shall be protected against heat radiation and shall measure the air temperature before the air reaches the pick-up.

3.4 Sensor, for measuring the pick-up temperature, protected against heat radiation. The sensor shall be mounted on the pick-up or, if that is not feasible, on the heat-conducting plate.

4 Preferred amplitudes, frequencies and temperatures

Six levels equally covering the pick-up range shall be chosen from the following series.

a) **Amplitude**, in metres per second squared:

1; 2; 5; 10; and their multiples of ten;

b) **Frequency**, in hertz:

20; 40; 80; 160; 315; 630; 1 250;

NOTE 1 In cases where a connecting rod is used between the vibrator and temperature chamber, care should be taken to avoid test frequencies at which high transverse motion of the rod occurs.

c) **Temperature**, in degrees Celsius:

– 65; – 50; – 40; – 25; – 10; 0; + 5; + 40; + 70; + 100; + 155; + 200; + 250; + 400; + 800.

Preferred values: – 25 and + 70.

5 Method

5.1 Test procedure

Calibrate the test pick-up in the temperature chamber at laboratory temperature in accordance with a calibration method, usually the secondary vibration calibration (see ISO 5347-3).

Check calibration frequencies and amplitudes so that limits given for distortion, transverse, bending and rocking acceleration, hum, noise and relative motion are complied with for the two pick-ups.

Then adjust the temperature within the chamber to the specified value and maintain this temperature until the specimen has reached temperature stability, i.e. when the ratio of two consecutive time intervals necessary in order to change the temperature of the pick-up by 3 °C exceeds a factor of 1,7.

Record the temperature of the reference accelerometer casing.

Then measure the calibration factor at specified frequencies and amplitudes.

5.2 Expression of results

Estimate the temperature sensitivity as a percentage deviation of the calibration factor relative to the calibration factor at laboratory temperature and at reference frequency and amplitude.

Calculate the calibration factor and the uncertainty in accordance with the calibration method chosen (see the relevant part of ISO 5347).

Errors caused by the temperature influence on the reference pick-up and the fixture transfer function error which have not been compensated for shall be added to the errors in the relevant uncertainty calculations.

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