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

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

Méthodes pour l'étalonnage de capteurs de vibrations et de chocs —
Partie 14: Essai de fréquence de résonance sur masse d'acier d'accéléromètres non amortis

Reference number
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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 5347-14 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 14:
Resonance frequency testing of undamped accelerometers on a steel block

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 resonance frequency testing. It is a very limited method applicable exclusively to undamped accelerometers, mainly of the piezoelectric type, having a mass of less than 30 g.

This part of ISO 5347 is applicable for a frequency range from 1 kHz to 50 kHz.

The general method for resonance frequency determination, by frequency sweeping and measuring sensitivity as a function of frequency, will be dealt with in a future part of ISO 5347.

2 Apparatus

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

2.2 Steel block, 28 mm × 28 mm × 28 mm, having a mass of about 180 g.

The surface of the block on which the accelerometer is to be mounted shall have a roughness value, expressed as the arithmetical mean deviation, R_a, of < 1 µm.

The flatness shall be such that the surface is contained between two parallel planes at a distance apart of 5 µm.

The drilled and tapped holes for connecting the pick-up shall have a perpendicularly tolerance to the surface of < 10 µm, i.e. the centreline of the hole shall be contained in a cylindrical zone of 10 µm diameter and a height equal to the hole depth.

2.3 Memory frequency analyser or **oscilloscope**, having the following characteristics:

— frequency range: 1 Hz to 50 Hz;

— uncertainty for frequency: ± 5 % of reading.

3 Method

3.1 Test procedure

Mount the accelerometer and its fixture on the steel block in accordance with the manufacturer's instructions.

Suspend the accelerometer by its cable and strike the steel block with a hammer.

Measure the lowest resonance frequency in the measuring and the transverse directions. It should be noted that it can be very difficult to distinguish between axial and transverse resonances.

The nature of the hammer surface and its dimensions may alter the results. More reliable results are obtainable by using a type of hammer instrumented by an accelerometer and a memory FFT analyser, and thus obtaining the results as a transfer function.

3.2 Expression of results

The results shall be reported as mounted resonance frequency, in kilohertz, on a 180 g steel block.

For frequencies above 50 kHz, the manufacturer shall specify the size, mass, material and first resonance frequency of the block.

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Descriptors: vibration, mechanical shock, transducers, sensors, tests, calibration.

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