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

Part 10:

Primary calibration by high impact shocks

*Méthodes pour l'étalonnage de capteurs de vibrations et de chocs —
Partie 10: Étalonnage primaire de chocs à impact élevé*



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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 5347-10 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*

Annexes A and B form an integral part of this part of ISO 5347.

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

Part 10:

Primary calibration by high impact shocks

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 primary high impact shock calibration of accelerometers. It applies to rectilinear accelerometers, mainly of the piezoelectric and piezoresistive type, to primary standards and working accelerometers.

This part of ISO 5347 is applicable for a time range from $10\ \mu\text{s}$ to $100\ \mu\text{s}$ and a dynamic range from $10^3\ \text{m/s}^2$ to $10^5\ \text{m/s}^2$.

The limit of uncertainty applicable is $\pm 10\%$ 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 5347-1:1993, *Methods for the calibration of vibration and shock pick-ups — Part 1: Primary vibration calibration by laser interferometry*.

3 Apparatus

3.1 Equipment capable of maintaining room temperature at $23\ ^\circ\text{C} \pm 3\ ^\circ\text{C}$.

3.2 High impact shock machine, with two long thin steel rods, one acting as a hammer and the other as an anvil to which the accelerometer is attached.

The hammer-rod can be shot or permitted to fall freely and to strike the anvil-rod which is permitted to accelerate freely and later to be caught up by a spring or braking device.

At the strike, the longitudinal resonance frequency is excited in the anvil-rod.

The contact of the two rod surfaces and the cushion material between them shall be made so that the generated stress pulse approximates a half-sine pulse having a duration equal to half the period of resonance of the rod in its fundamental longitudinal mode.

A number of anvil-rods shall be used, one for each desired pulse duration.

The resonance period of the rod, T , in seconds, can be estimated from the following formula:

$$T = \frac{l}{2\ 500}$$

where l is the rod length, in metres.

In order to avoid coupling of reflected stress pulses in the hammer-rod into the anvil-rod at the moment of impact, the length of the hammer-rod should be about half the length of the anvil-rod.

Strain gauges, having a maximum effective length of 0,3 mm, shall be mounted on the anvil-rod in order to