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STANDARD

**10227**

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## **Human/human surrogate impact (single shock) testing and evaluation — Guidance on technical aspects**

*Essais et évaluation des chocs (chocs simples) sur l'homme ou un substitut d'homme — Lignes directrices concernant les aspects techniques*



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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 10227 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock*.

Annex A of this International Standard is for information only.

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## Introduction

The vehicular environment in which people are operators or passengers should not only provide comfortable and efficient means of operation and transportation, but should also minimize occupant injury due to impact forces that may be experienced in a crash-type collision. Criteria for the design, testing and evaluation of safe vehicle design requires an understanding of the human and human surrogate/analogue mechanical response to shock and acceleration forces. This response is a complex function of the interaction of the driving forces with the vehicle, the effects of the seating and restraint systems on the propagated forces, and the initial position and orientation of the subject. An understanding of this response involves the experimental impact testing of human subjects and human surrogates.

In experimental testing, the response of a human or human surrogate/analogue is correlated to specific anatomical segments and readily identifiable landmarks, and is usually not restricted to simple linear motion. This demands careful instrumentation and data analysis techniques for an adequate analytical description. Another perplexing technical problem is to assure adequate coupling between the sensor used to monitor responses and the anatomical segment which is being monitored. Additionally, the monitoring procedure may alter the measured response, biasing the dose-response relationship. Interpretations and conclusions regarding response mechanisms, injury modalities and propagated frequencies should reflect an understanding of these issues.

This International Standard is intended to provide guidelines for formulating experimental protocols and reporting experimental results to ease comparisons among various research efforts. It is not intended to limit either the scope of experimental protocols or the exposure levels to which human subjects or human analogues are to be subjected. It does not limit and/or recommend acceleration environments as they relate to comfort, task proficiency, health and safety.

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# Human/human surrogate impact (single shock) testing and evaluation — Guidance on technical aspects

## 1 Scope

This International Standard defines technical aspects of experiments dealing with human or human surrogate testing and procedures for collecting and reporting biomechanical data. Recommended practices regarding measurements, instrumentation and reporting of results are outlined. These recommended practices are provided as guide for ease of interpretation and comparison of data among different organizations.

This International Standard is limited to experiments involving indirect (inertial) impact and does not address direct impact with vehicle surfaces or the use of the airbag-type of active restraining device.

## 2 Normative references

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

ISO 5805:—<sup>1)</sup>, *Mechanical vibration and shock affecting man — Vocabulary.*

ISO 8727:—<sup>2)</sup>, *Mechanical vibration and shock — Human exposure — Biodynamic coordinate systems.*

1) To be published. (Revision of ISO 5805:1981)

2) To be published.

## 3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5805 and the following definitions apply.

**3.1 test subject:** Human being or human surrogate (e.g. cadaver, animal, manikin) that serves as the test occupant of the vehicle.

**3.2 test subject coordinate system:** Right-handed orthogonal coordinate system ( $x, y, z$ ), in accordance with ISO 8727, which is used to locate the position of the instrumented segments of the test subject.

**3.3 vehicle:** Structure to which the driving force or impact is delivered. This includes all elements of the system which transmit forces to the test subject, including any integrated support/seat and restraint system.

**3.4 vehicle coordinate system:** Right-handed orthogonal coordinate system ( $x, y, z$ ) which is used to locate the occupant position and restraint or impact surface configuration. Its origin should be defined relative to a rigid structure (one that is not significantly deformed during the test) on the vehicle.

## 4 Measurement requirements

### 4.1 Initial conditions

All measurements of location and orientation should be transformable to the vehicle coordinate system.