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Passenger cars — Sled test procedure for evaluating adult restraint systems in simulated frontal collisions

Voitures particulières — Procédure d'essai sur chariot servant à l'évaluation des systèmes de retenue pour adultes lors de collisions frontales simulées

Reference number
ISO 7862:1992(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 7862 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Sub-Committee SC 12, *Restraint systems*.

Annexes A, B and C form an integral part of this International Standard.

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Passenger cars — Sled test procedure for evaluating adult restraint systems in simulated frontal collisions

1 Scope

This International Standard specifies a method for dynamic testing of adult restraint systems simulating impacts against fixed, rigid barriers with 0° or 30° angles.

Its main purposes are

— improvement of test methods for evaluation of restraint systems efficiency;

— harmonization of existing test methods, especially to enable comparison of the results of tests carried out in different laboratories.

Deviations from the strict requirements of this International Standard are permitted where they have no significant effect on the results of the test.

This International Standard applies to restraint systems for adult occupants used within the structure of a passenger car as defined in ISO 3833.

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 3833:1977, *Road vehicles — Types — Terms and definitions.*

ISO 6487:1987, *Road vehicles — Measurement techniques in impact tests — Instrumentation.*

ISO 6549:1980, *Road vehicles — Procedure for H-point determination.*

49 CFR Part 572, *Anthropomorphic Test Dummy.*[1]

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 occupant restraint system: Arrangement of components which is intended to diminish the risk of injury to the occupant in the event of a vehicle collision by controlling the occupant displacement.

3.2 seat: Structure complete with trim, intended to provide a seating position for one adult person.

3.3 bench seat: Structure which may or may not be integral with the vehicle structure complete with trim, intended to provide a seating position for more than one adult person seated side by side.

3.4 H-point; R-point: (See the relevant regulation or ISO 6549.)[2]

3.5 sled: Rigid guided platform which can be accelerated or decelerated within specified limits and on which the vehicle or its structure can be mounted.

1) CFR: Code of Federal Regulations, issued by the National Highway Traffic Safety Administration, Department of Transportation, USA.

2) The meaning of H and R points is identical in known regulations and in ISO 6549, but the actual localization of each of these points may be slightly different from one given regulation to another and in relation to ISO 6549.

3.6 pulse-generating device: Device to submit the sled to speed variation according to a predetermined curve.

3.7 attachment system: Arrangement of components which is intended to attach and to secure the vehicle structure on the sled.

3.8 equivalent pulse: Velocity/time relationship representative of the body of one specific vehicle in an impact against a barrier. (See annex A.)

3.9 standardized pulse: Acceleration/time relationship intended for general use. (See annex B.)

4 Test equipment

4.1 Anthropomorphic test dummies

The dummies to be used for testing occupant restraint systems shall comply with the specification defined for the 50th percentile adult male dummies described in part 572, subpart B or subpart E, of 49 CFR.

4.2 Instrumentation

The instrumentation shall comply with ISO 6487.

4.3 Measurements

4.3.1 Dummy measurements should be carried out in accordance with a forthcoming Technical Report.

4.3.2 Measurements on the sled are made with accelerometers located as described in 5.3.15.

4.4 Sled

The sled shall be guided in such a way that, during simulation of the impact, the angular deviation of the sled is less than 2°.

4.5 Pulse-generating device

The pulse-generating device shall be such that a pulse can be produced as follows:

— Equivalent pulse: as specified in annex A;

— Standardized pulse: as specified by the example in annex B .

5 Preparation for test

5.1 Vehicle components

In principle all vehicle components which can influence the test results shall be present, particularly the steering system, doors, windscreen, dashboard, gearlever, sun-roof (see also 5.3.11).

NOTE 1 The doors may be replaced by other constructions if it can be demonstrated that the test results are not affected.

5.2 Attachment of vehicle structure on sled

5.2.1 The method of attachment shall not modify the performance of the safety device involved.

5.2.2 The vehicle structure shall be firmly attached to the sled so that no relative displacement occurs during the test.[3] In order to achieve this, the vehicle structure may be strengthened in the attachment area.

NOTE 2 It is recommended that the structure should rest on supports arranged approximately in line with the wheel axes, or failing this, in line with the suspension attachment points.

5.3 Positioning and adjustment of components

5.3.1 Steering-wheel and foot controls

When adjustable, the steering-wheel and foot controls shall be set as close as possible to the range mid-point for normal use, as specified by the vehicle manufacturer.

5.3.2 Windows

Normally the tests shall be carried out with the windows closed. For measurement purposes some windows, but not the windscreen, may be removed.

5.3.3 Doors

The doors or replacement structures (see 5.1 NOTE) shall be closed but not locked.

5.3.4 Gearlever

The gearlever shall be placed in a "drive" position.

5.3.5 Sun-visors

The sun-visors shall be in the folded away position.

3) Work is in progress to define a procedure reproducing a pitching motion of the vehicle rear body.

5.3.6 Rear-view mirror

The interior rear-view mirror shall be in the normal use position.

5.3.7 Arm-rests

Arm-rests, where fitted and adjustable, shall be in the normal use position (folded out) unless the installation of dummies in the vehicle does not allow it.

5.3.8 Head-restraints

Where adjustable head-restraints are fitted, they shall be adjusted to suit the dummy in accordance with the manufacturer's user information instructions. Where such instructions are not explicit, the head-restraint shall be adjusted as close as possible to the back of the dummy's head with the head-restraint centre at the head centre of gravity level.

5.3.9 Seat positioning and adjustment

The driver's seat shall be adjusted to put the dummy's H-point as close as possible to a point 50 mm forward of the R-point. If the vertical adjustment is independent, it shall be set as close as possible to the range mid-point for normal driving, as specified by the vehicle manufacturer.

The front passenger seat shall be adjusted so that it is as near as possible in the same transverse vertical and horizontal planes as the driver's seat.

If the front seat is a bench seat, it shall be adjusted according to the procedure for the driver's seat.

Rear seats, if adjustable, shall be as far to the rear as possible.

Lumbar support and other inflatable/adjustable devices on seating systems such as cushion thigh rolls and knee supports shall be adjusted in accordance with manufacturer's recommendations.

5.3.10 Seat-back adjustment

The seat-back, if adjustable for inclination, shall be adjusted in accordance with the manufacturer's instructions. In the absence of any such specification, it shall be locked to produce a torso line angle as near as possible to 25° to the vertical when measured using the three-dimensional dummy specifed in ISO 6549.

5.3.11 Convertibles and sun-roofs

In the case of convertibles, the test shall be carried on with the roof up. If there is a sunroof it shall be in the closed position.

5.3.12 Other components

Components which do not figure here and may have an influence during the simulation of impact, if they are adjustable, shall be placed in their normal use position when the vehicle is in motion.

5.3.13 Test dummy adjustment

The dummy shall be adjusted in accordance with the specification in 4.1.

5.3.14 Number of test dummies

The number of test dummies and their location depends on the barrier test to be simulated.

5.3.15 Arrangement and installation of dummies

Arrangement and installation of the dummies shall be made in accordance with annex C.

5.3.16 Occupant restraint system

The occupant restraint system shall be installed and adjusted in accordance with the manufacturer's or installer's specification.

5.3.17 Location of accelerometers

Accelerometers shall be mounted on the sled and set to measure sled acceleration in the sled travel direction. (See also A.2.)

6 Test conditions

6.1 Car structure orientation on the sled

To represent a 0° barrier test, the longitudinal median plane of the car structure shall be oriented at 0° relative to the sled path.

To represent a 30° angle barrier test, the orientation shall be at a standard angle[4] of 15° so that the motion of the occupant is forward and towards the car corner which receives the first impact.

6.2 Conditions at start of simulation of impact

Immediately before the simulation of the impact, the positions of the dummies and components and the occupant restraint system configuration shall be in

4) The standard angle is intended to be representative for all models. To cover other cases, a future method for calculating an equivalent angle, which would be specific to each model, will be prepared.

the initial positions as specified respectively in 5.3.1 to 5.3.16.

In particular, in the case of seat belts incorporating an emergency locking retractor, the locking mechanism shall be in the unlocked state, at this instant.

6.3 Simulated impact pulse shape

The shape of the pulse obtained from the accelerometer defined in 5.3.15 shall be either the equivalent pulse shape defined in annex A or a standard pulse shape as defined in annex B.

Annex A
(normative)

Equivalent pulse

A.1 General

This annex describes the method for simulating a barrier impact test when the impact is required to be more representative of a specific vehicle than is possible using the standard pulse described in annex B.

The barrier impact is simulated using a velocity/time history as the reference. This is the most appropriate parameter to use since the function of any occupant restraint system is to control the velocity difference between the occupant and vehicle.

The velocity/time curve shall be obtained by the usual practice of integrating the acceleration/time pulse.

A.2 Barrier impact data acquisition

The barrier test vehicle(s) shall have instruments to provide longitudinal horizontal acceleration data representative of that experienced in the passenger compartment.

The transducer measuring vehicle acceleration shall be located on the sill near the B pillar. The parameter to be used is the horizontal longitudinal component of the acceleration.

In a 0° angle barrier test, the accelerometer situated on the driver's side shall be used, whereas in a 30° angle barrier test, the accelerometer situated on the side first impacted shall be used.

The instrumentation and measurements shall comply with the requirements of ISO 6487.

A.3 Determination of target waveform

The number of barrier tests selected (one or more) shall be sufficient to establish an acceleration/time history representative of the vehicle model being studied.

A.3.1 Acceleration/time history

The acceleration signal from the transducer is filtered with a channel frequency class 180 filter.

If data from two or more vehicles are available, the installer of the restraint system will decide which is the more representative.

A.3.2 Velocity/time history

The reference velocity/time history is calculated by integrating the acceleration/time history up to the time of maximum velocity change, Δv; it is expressed as a relative velocity starting from 0 (see figure A.1).

A.4 Sled test

A.4.1 Duplication of test conditions

For each sled test, the velocity/time history is developed in the same way as earlier described for barrier tests. The characteristics of the methods for doing this, such as filter type and integration technique, shall be considered and preferably be as similar as possible to those used for the barrier tests, in order to obtain the best possible comparability between the barrier and sled test results.

A.4.2 Requirements

The velocity/time history of the sled test shall be within $\pm$ 1 m/s of the reference velocity/time history (see figure A.1).

In addition, the sled overall velocity change shall be within $\pm$ 0,5 m/s of the reference velocity/time history.

It is permitted to shift the sled velocity/time history in time to obtain the best fit.

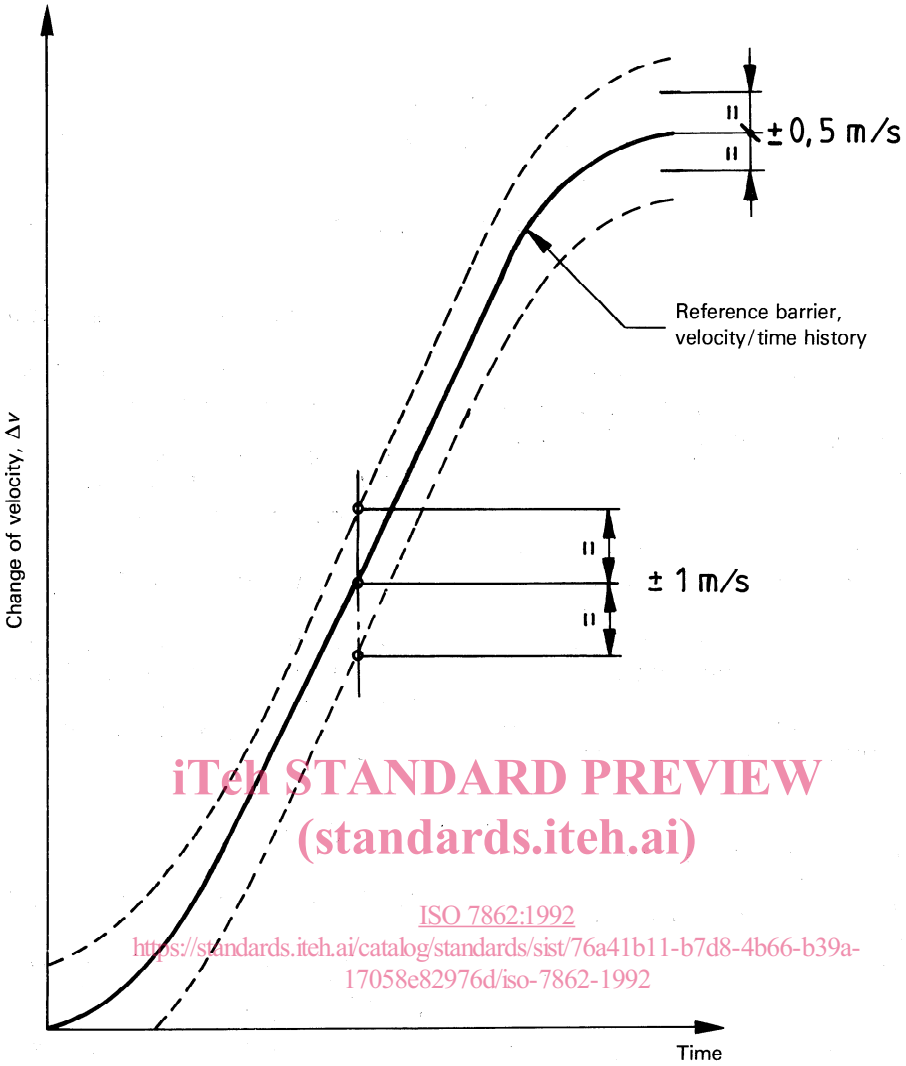

Figure A.1 — Equivalent pulse — Construction of tolerance band for reference velocity/time history

Annex B
(normative)

Standard pulse

B.1 Data acquisition

The sled is fitted with instruments to provide longitudinal horizontal acceleration data.

The instrumentation and measurements shall comply with the requirements of ISO 6487.

The acceleration signal from the transducer is filtered with a channel frequency class 60 filter.

B.2 Example of standard pulse

Figure B.1 shows an example of a standard pulse.

The acceleration pulse in figure B.1 is given as the appropriate standard pulse to reproduce a 0° angle barrier test with Δv of 50 km/h $^{0}_{-2}$ km/h.

For other values of Δv, different curves will be necessary.

Stopping distance: 650 mm ± 30 mm

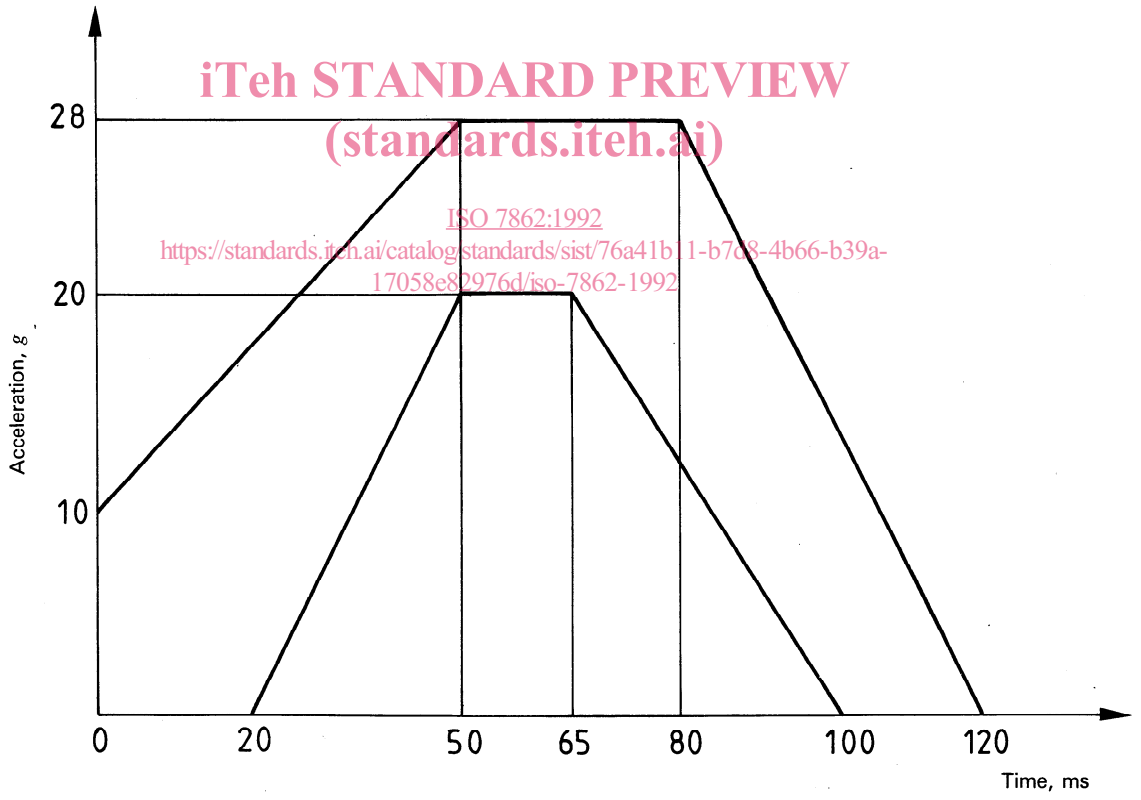

Figure B.1 — Standard pulse