
**Road vehicles — Collection of accident
data for evaluation of occupant
restraint performance**

*Véhicules routiers — Recueil de données des accidents pour évaluer
les performances de retenue des occupants*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 36, *Safety and impact testing*.

This second edition cancels and replaces the first edition (ISO 6546:2006), which has been technically revised. The main changes compared to the previous edition are as follows:

- in [5.6](#), items q) and r) have been added;
- in [5.8](#), item e) has been modified;
- in [6.2.1](#), new items a) and b) have been inserted;
- in [7.2.2](#), item c) has been modified and item d) has been added.

Introduction

This document was originally published as an ISO Technical Report in 1979 and specified information for the study of vehicle occupants wearing seat belts and included information on vehicle identification, pre-crash situation, vehicle damage, and accident reconstruction data (e.g. EES, Δv).

Because of a rapid development of more advanced occupant restraint features such as multi-stage airbags, ISO/TR 6546 was expanded and revised into an ISO standard, of which the first edition was published in 2006.

Data elements in this revision are grouped according to the Standardization of Accident and Injury Registration Systems (STAIRS) categorization scheme.

The data elements are not listed in priority order.

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Road vehicles — Collection of accident data for evaluation of occupant restraint performance

1 Scope

This document specifies information for the field collection of traffic accident data that is necessary or may assist in the evaluation of occupant restraint systems in passenger cars and trucks. The specific occupant restraints covered are seat belts, head restraints, knee protection, airbag systems and child restraint systems.

This document does not cover an assessment of the structural performance of the vehicle for which items such as crush, intrusion, and structural architecture may be necessary.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6813, *Road vehicles — Collision classification — Terminology*

ISO 12353-1, *Road vehicles — Traffic accident analysis — Part 1: Vocabulary*

ISO 13216-1, *Road vehicles — Anchorages in vehicles and attachments to anchorages for child restraint systems — Part 1: Seat bight anchorages and attachments*

ISO 13218, *Road vehicles — Child restraint systems — Report form for accidents involving child passengers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6813, ISO 12353-1, ISO 13216-1, and ISO 13218 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Vehicle data

Vehicle data shall be obtained for each case vehicle.

Beyond vehicle identification, pre-crash situation, crash configuration, vehicle damage/intrusion, collision partner, and impact severity data (e.g. EES, Δv), the following occupant restraint related data elements should be recorded:

- a) total number of deployed airbags;
- b) for each impact where an airbag deploys:
 - crash event sequence number;
 - CDC;

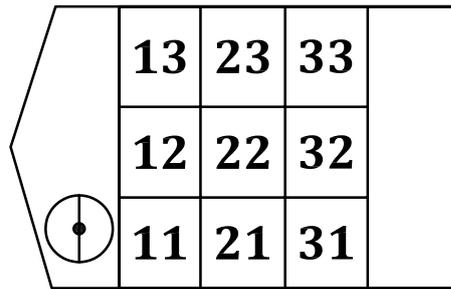
- longitudinal component of Δv ;
- lateral component of Δv ;
- c) setting of manual airbag deactivation switch (if applicable);
- d) type of automatic deactivation (if applicable):
 - occupant detection system;
 - child seat detection system;
- e) airbag diagnostic or warning lights/messages (post-crash);
- f) modifications or service performed on the airbag system or parts of the vehicle relevant to the operation of the airbag in this crash;
- g) whether the vehicle has been involved in previous traffic crashes;
- h) retrievable accident data (if available):
 - acceleration pulse (total, X, Y and Z directions as available);
 - change of velocity (total, X, Y and Z directions as available);
 - belt buckle latch engagement;
 - vehicle speed;
 - pre-impact braking;
 - pre-impact yawing and skidding;
 - deployments in prior accidents;
 - multiple event data;
 - rollover event data;
 - restraint deployment timing;
 - restraint deployment level (one-stage, two-stage, etc.);
 - deactivation or suppression of deployable restraint(s);
 - driver seat in forward track position status;
 - occupant detection status;
 - child seat detection/recognition status;
 - other, as applicable.

5 Restraint data by seating position

5.1 General

Beyond recording seat description (such as type, fabric), record the seat and restraint data elements in [5.2](#) to [5.8](#). Data is to be obtained for each seating position in vehicle.

For each set of seat and restraint data, also record the corresponding seating position code according to [Figure 1](#).



NOTE 1 Mirror image for right-hand drive.

NOTE 2 Seating matrix can be further expanded, if needed.

Figure 1 — Seating position codes

5.2 Seating

Factors to take into account for seating include the following:

- determine whether or not the seat was occupied;
- determine seat track adjusted position prior to impact (front, middle, back, exact);
- if seat is a multi-way powered seat, describe position in each axis of movement.

5.3 Head restraint and seat evaluation

Factors to take into account for head restraint and seat evaluation include the following:

- head restraint type (bolster, ladder, integral);
- active head restraint equipped (activated);
- other neck injury protection systems (activated);
- head restraint vertical adjustment at impact (up, mid, down, or exact position);
- distance from seat bight (lower front edge of the seat back) to top of head restraint;
- head restraint horizontal adjustment at impact;
- head restraint damage by occupant, other occupant, intrusion, interior loose item(s);
- seat cushion angle relative to horizontal;
- seat back angle relative to vertical (pre-impact and post-impact).

5.4 Knee protection evaluation

Factors to take into account for knee protection evaluation include the following:

- type and covering of knee protection (e.g. bolster, airbag);
- location of deformation;
- deformation by collision (with or without occupant contact);
- location of occupant knee contact.

5.5 Steering column/steering wheel

Factors to take into account concerning the steering column/steering wheel include the following:

- a) steering column/wheel type (e.g. diameter, number of spokes, energy absorption device available);
- b) tilt steering column (pre-crash) adjustment;
- c) telescoping steering column (pre-crash) adjustment;
- d) o'clock position of wheel at time of deployment;
- e) steering rim/spoke deformation;
- f) location of steering rim/spoke deformation;
- g) extent of energy absorption device function (if applicable).

5.6 Belt restraint system

Factors to take into account for belt restraint system include the following:

- a) belt system availability;
- b) belt system type (e.g. manual 2-point, 3-point, 4-point, integrated in seat);
- c) type of anchorages (wire loop, semi-rigid stalk, seat attached, etc.);
- d) automatic (motorized shoulder belt, etc.);
- e) geometry modifiers fitted (i.e. guide loop, comfort clip, etc.);
- f) retractor type and position (i.e. vehicle/belt/dual sensitivity);
- g) shoulder belt upper anchorage adjustment: available? position?;
- h) type of latch/ release mechanism;
- i) belt pre-tensioner: fitted? activated?;
- j) belt pre-tensioner type (mechanical, pyrotechnic, other);
- k) belt pre-tensioner location (buckle, retractor, B-pillar, etc.);
- l) belt pre-tensioner load limited?;
- m) belt load limiter: fitted? activated?;
- n) belt load limiter type (tear webbing, metal bending, torsion bar, other);
- o) webbing lock: fitted? activated?;
- p) occupant position control? functioned?;
- q) inflatable belt fitted? activated?;
- r) pre-crash belt pre-tensioner fitted? activated?;

5.7 Belt restraint usage

Factors to take into account for belt restraint usage include the following:

- a) belt system use, proper use?;

- b) belt system type (active, passive, etc);
- c) primary information source used in determining belt use;
- d) belt failure modes during impact, if any;
- e) police reported belt use.

5.8 Airbag system operation data

Record number of airbags and deployments at each seat position.

The following shall be obtained for each airbag:

- a) type of airbag (not equipped, original, replacement, retrofitted);
- b) size (in litres);
- c) deployed/activated;
- d) customer/user setting of airbag activation status;
- e) location of airbag:
 - steering wheel hub;
 - instrument panel;
 - lower instrument panel (knee airbag);
 - side door/quarter panel;
 - side seat mounted (specify inboard/outboard);
 - side header roof rail;
 - back of seat;
 - footwell area;
 - seat cushion (anti-submarining);
- f) Are there indications of airbag system problems?
- g) Did airbag cover flap(s) open at designated tear points?
- h) Were airbag cover flap(s) damaged?
- i) Was there damage to the airbag?
- j) Source of airbag damage?
- k) Was the airbag tethered?
- l) Did the airbag have vent ports?
- m) Was the airbag in this occupant's position contacted by another occupant?
- n) Was there damage to airbag support assembly?
- o) sketch damage and contact evidence on airbag (front and back);
- p) sketch and measure size of airbag cover flap(s);
- q) sketch of airbag vent ports and location.

6 Occupant data

6.1 General

This shall be obtained for each occupant in the vehicle, where relevant.

Beyond the occupant's demographics, seating location, ejection/entrapment, and injury severity/consequence data (such as death, maximum AIS, functional loss, and treatment), record the occupant restraint-related data elements in [6.2](#).

The items in this clause would ideally contribute to the assessment of restraint systems and injury mechanisms. However, it is recognized that many of them are regularly difficult or impossible to ascertain using contemporary methods of accident investigation.

6.2 Occupant physical description

6.2.1 General

This includes:

- a) stature and weight;
- b) age and gender;
- c) occupant dimensions (e.g. seated height, hip to knee, knee to foot bottom, arm length);
- d) medical history (cardiovascular, hearing, etc.) and relevant prior physical conditions or disabilities.

6.2.2 Occupant clothing

Factors to take into account for occupant clothing include the following:

- a) clothing style, upper garment (thick, thin);
- b) clothing style, lower garment (thick, thin);
- c) shoes.

6.2.3 Occupant body position

Factors to take into account for occupant body position include the following:

- a) Any pre-impact braking or other action likely to cause occupant to be out of position?
- b) Occupant's posture (sitting, lying, kneeling, standing);
- c) Where were occupant's upper torso and head in relation to normal position at time of impact?
- d) What was occupant's leg position at impact?
- e) What was position of occupant's arms at impact?
- f) How was occupant's head turned at impact?
- g) Did occupant brace with arms?
- h) Did occupant brace with legs?
- i) Did occupant rotate during impact?
- j) Post-crash position of occupant;