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Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side-impact dummy —

Part 2: Mechanical subsystems

Véhicules routiers — Conception et spécifications de performance pour le mannequin mondial (WorldSID), 50e percentile homme, de choc latéral —

Partie 2: Sous-systèmes mécaniques

[Revision of first edition (ISO 15830-2:2005)]

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 15830-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*.

This second edition cancels and replaces the first edition (ISO 15830-2:2005) which has been technically revised. Technical amendments have been incorporated throughout all four parts, resulting from extensive experience with the standard and design changes.

ISO 15830 consists of the following parts, under the general title *Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side impact dummy*:

- *Part 1: Terminology and rationale*
- *Part 2: Mechanical subsystems*
- *Part 3: Electronic subsystems*
- *Part 4: User's manual*

Introduction

This first edition of ISO 15830 has been prepared on the basis of the existing design, specifications and performance of the WorldSID 50th percentile adult male side impact dummy. The purpose of ISO 15830 is to document the design and specifications of this side impact dummy in a form suitable and intended for worldwide regulatory use.

In 1997, ISO/TC22/SC12 initiated the WorldSID 50th percentile adult male dummy development, with the aims of defining a global-consensus side impact dummy, having a wider range of human-like anthropometry, biofidelity and injury monitoring capabilities, suitable for regulatory use. Participating in the development were research institutes, dummy and instrumentation manufacturers, governments, and vehicle manufacturers from around the world.

With regard to potential regulatory, consumer information or research and development use of ISO 15830, users will need to identify which of the permissive (i.e., optional) sensors and other elements defined in Part 3 are to be used in a given application.

In order to apply ISO 15830 properly, it is important that all four parts be used together.

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Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side-impact dummy —

Part 2: Mechanical subsystems

1 Scope

This part of ISO 15830 specifies requirements for mechanical components, drawings and specifications, certification tests, and support equipment for the WorldSID 50th percentile side impact dummy, a standardized anthropomorphic dummy for side impact testing of road vehicles. It is applicable to impact tests involving

- Passenger vehicles of category M₁ and goods vehicles of category N₁
- Impacts to the side of the vehicle structure
- Impact tests involving use of an anthropomorphic dummy as a human surrogate for the purpose of evaluating compliance with vehicle safety standards

2 Normative references

The following referenced documents are indispensable for the application 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 6487, *Road vehicles - Measurement techniques in impact tests – Instrumentation*

ISO 15830-1, *Design and performance specifications for the WorldSID 50th percentile adult male side impact dummy — Part 1: Terminology and rationale*

ISO 15830-3, *Design and performance specifications for the WorldSID 50th percentile adult male side impact dummy — Part 3: Electronic subsystems*

ISO 15830-4, *Design and performance specifications for the WorldSID 50th percentile adult male side impact dummy — Part 4: User's manual*

SAEJ211-1:2007, *Instrumentation for impact test – Part 1: Electronic instrumentation*

SAEJ2570:2001, *Performance specifications for anthropomorphic test device transducers*

UN/ECE/TRANS/WP 29/78, *Consolidated resolution on the construction of vehicle (R E 3)*

49 CFR Part 572, subpart E, *Anthropomorphic test dummies, United States of America Code of Federal Regulations issued by the National Highway Traffic Safety Administration (NHTSA). Washington, DC, US*

3 Terms and definitions

For the purposes of this document the terms and definitions given in ISO 15830-1 apply.

4 Mechanical requirements for WorldSID

4.1 Head

4.1.1 General description

The head assembly shall consist of the components and assemblies listed in head assembly drawing W50-10000.pdf (see Annex B).

4.1.2 Drawings and specifications

- The head assembly and components shall conform to head assembly drawing W50-10000.pdf (see Annex B) and the subassembly and component drawings listed therein.
- The total assembly shall have a mass of $4,22 \text{ kg} \pm 0,05 \text{ kg}$.
- The centre of gravity shall be located as indicated in Figure 1.
- The materials used in the construction of the head assembly shall not contain lead or lead alloys.
- The flesh material and/or external surface characteristics shall enable positive attachment of adhesive targets.
- If present, cables exiting the head assembly shall exit at the rear and include a secure strain relief mechanism.

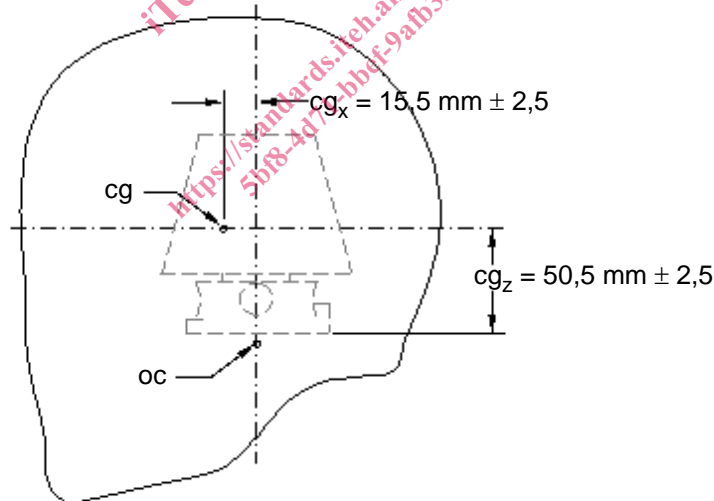


Figure 1 — Head centre of gravity location

4.1.3 Certification

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.1, the head assembly shall meet the specifications given in Table 1.

Table 1 — WorldSID head certification specifications

Frontal drop	
Variable	Absolute value
Peak resultant acceleration (G)	225 to 275
Peak lateral acceleration (a_y) (G)	<15
Maximum percentage, subsequent-to-main peak (%)	<10
Lateral drop	
Variable	Absolute value
Peak resultant acceleration at CG (G)	99 to 121
Peak longitudinal acceleration (a_x) (G)	<15
Maximum percentage, subsequent-to-main peak (%)	<10

4.2 Neck

4.2.1 General description

The neck assembly shall consist of the components and assemblies listed in neck assembly drawing W50-20000.pdf (see Annex B).

4.2.2 Drawings and specifications

- The neck assembly and components shall conform to neck assembly drawing W50-20000.pdf (see Annex B) and the subassembly and component drawings listed therein.
- The total assembly shall have a mass of 3,23 kg \pm 0,15 kg.
- The materials used in the construction of the neck assembly shall not contain lead or lead alloys.
- The flesh material and/or external surface characteristics shall enable positive attachment of adhesive targets.
- If present, cables exiting the neck assembly shall include a secure strain relief mechanism.

4.2.3 Certification

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.2, the neck assembly shall meet the specifications given in Table 2.

Table 2 — WorldSID neck certification specifications

Variable	Absolute value
Maximum angular displacement of the head form relative to the pendulum, β (degrees)	50 to 61
Decay time of β to 0 degrees (ms)	58 to 72
Peak moment at occipital condyle (Nm)	55 to 68
Peak moment decay time to 0 Nm (ms) ^a	71 to 87
Peak forward potentiometer angular displacement (degrees)	32 to 39
Time of peak forward potentiometer angular displacement (ms) ^a	56 to 68
Peak rearward potentiometer angular displacement, θ_R (degrees)	30 to 37
Time of peak rearward potentiometer angular displacement, θ_R (ms) ^a	56 to 68

a T=0 s at initial pendulum contact with honeycomb or alternative products which can be shown to lead to the same results.

4.3 Thorax/abdomen/shoulder

4.3.1 General description

The thorax/abdomen/shoulder assembly shall consist of the components and assemblies listed in thorax/abdomen/shoulder assembly drawing W50-30000.pdf (see Annex B).

4.3.2 Drawings and specifications

- The thorax/abdomen/shoulder assembly and components shall conform to thorax/abdomen/shoulder assembly drawing W50-30000.pdf (see Annex B) and the subassembly and component drawings listed therein.
- The total assembly shall have a mass of 20,55 kg \pm 1,0 kg.
- The materials used in the construction of the thorax/abdomen/shoulder assembly shall not contain lead or lead alloys
- The flesh material and/or external surface characteristics shall enable positive attachment of adhesive targets
- If present, cables exiting the thorax/abdomen/shoulder assembly shall include a secure strain relief mechanism

4.3.3 Certification

4.3.3.1 Shoulder

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.3.1 and 5.3.2, the shoulder assembly shall meet the specifications given in Table 3.

Table 3 — WorldSID shoulder certification specifications

Variable	Absolute value
Peak pendulum force (kN)	2,6 to 3,3
Peak shoulder rib deflection (mm)	35 to 44

4.3.3.2 Thorax with half arm

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.3.1 and 5.3.3, the thorax with half-arm assembly shall meet the specifications given in Table 4.

Table 4 — WorldSID thorax with half-arm certification specifications

Variable	Absolute value
Peak pendulum force (kN)	4,9 to 5,8
Peak T4 acceleration along y axis (G)	28 to 37
Peak T12 acceleration along y axis (G)	22 to 28
Peak thorax rib 1 deflection (mm)	35 to 47
Peak thorax rib 2 deflection (mm)	46 to 56
Peak thorax rib 3 deflection (mm)	39 to 46

4.3.3.3 Thorax without arm

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.3.1 and 5.3.4, the thorax without arm assembly shall meet the specifications given in Table 5.

Table 5 — WorldSID thorax without arm certification specifications

Variable	Absolute value
Peak pendulum force (kN)	3,2 to 3,8
Peak T4 acceleration along y axis (G)	14 to 20
Peak T12 acceleration along y axis (G)	14 to 22
Peak thorax rib 1 deflection (mm)	33 to 43
Peak thorax rib 2 deflection (mm)	35 to 43
Peak thorax rib 3 deflection (mm)	32 to 40

4.3.3.4 Abdomen

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.3.1 and 5.3.5, the abdomen without arm assembly shall meet the specifications given in Table 6.