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

Part 2:

Mechanical subsystems

iTeh STANDARD PREVIEW

(standards.iteh.ai)
*Véhicules routiers — Conception et spécifications de performance pour
le mannequin mondial (WorldSID), 50^e percentile homme, de choc
latéral —*

ISO 15830-2:2005
Partie 2: Sous-systèmes mécaniques

<https://standards.iteh.ai/catalog/standards/sist/2725f062-5ac-4691-9d7d-cad7858104c2/iso-15830-2-2005>



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 15830-2:2005

<https://standards.iteh.ai/catalog/standards/sist/2725f062-f3ac-4691-9d7d-cad7858104c2/iso-15830-2-2005>

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	vi
Introduction.....	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Mechanical requirements for WorldSID	2
4.1 Head	2
4.1.1 General description	2
4.1.2 Drawings and specifications	2
4.1.3 Certification	2
4.2 Neck	3
4.2.1 General description	3
4.2.2 Drawings and specifications	3
4.2.3 Certification	3
4.3 Thorax/abdomen/shoulder	4
4.3.1 General description	4
4.3.2 Drawings and specifications	4
4.3.3 Certification	4
4.4 Full arms	6
4.4.1 General description	6
4.4.2 Drawings and specifications	6
4.5 Half arms	6
4.5.1 General description	6
4.5.2 Drawings and specifications	6
4.6 Lumbar spine and pelvis	7
4.6.1 General description	7
4.6.2 Drawings and specifications	7
4.6.3 Certification	7
4.7 Upper legs	7
4.7.1 General description	7
4.7.2 Drawings and specifications	7
4.8 Lower leg, ankle, and foot	8
4.8.1 General description	8
4.8.2 Drawings and specifications	8
4.9 Clothing	8
4.9.1 General description	8
4.9.2 Drawings and specifications	8
4.10 Whole dummy	8
5 Certification test procedures	8
5.1 Head	8
5.1.1 Principle	8
5.1.2 Apparatus	9
5.1.3 Sensors	9
5.1.4 Preparation	9
5.1.5 Procedure	12
5.1.6 Test report	12
5.2 Neck	12
5.2.1 Principle	12
5.2.2 Materials	12

5.2.3	Apparatus	12
5.2.4	Sensors	12
5.2.5	Preparation	13
5.2.6	Procedure	13
5.2.7	Calculation procedures	14
5.2.8	Test reports	15
5.3	Thorax/abdomen/shoulder full body tests	15
5.3.1	Full body test setup	15
5.3.2	Shoulder test	17
5.3.3	Thorax with half arm	19
5.3.4	Thorax without arm	20
5.3.5	Abdomen test	22
5.3.6	Pelvis test	24
5.4	Data zero values	25
Annex A	(normative) Support equipment	26
A.1	Specialized WorldSID support equipment	26
A.2	Other support equipment typically available in test laboratories	26
Annex B	(normative) Drawings and specifications, PDF and STP files	28
Annex C	(informative) Drawing list	29

Figures

Figure 1 — Head centre of gravity location	2
Figure 2 — Lateral head drop angle	10
Figure 3 — Head bracket installation for lateral drops	10
Figure 4 — Frontal head drop angle	11
Figure 5 — Head bracket installation for frontal drops	11
Figure 6 — Front view of setup for full dummy certification tests	16
Figure 7 — Side view of setup for full dummy certification tests	17
Figure 8 — Using an inclinometer with the H-point tool to check pelvis angle	17
Figure 9 — Shoulder test, dummy and arm position	18
Figure 10 — Thorax test without arm, dummy and arm position	21

Tables

Table 1 — WorldSID head certification specifications	3
Table 2 — WorldSID neck certification specifications	4
Table 3 — WorldSID shoulder certification specifications	5
Table 4 — WorldSID thorax with half-arm certification specifications	5
Table 5 — WorldSID thorax without arm certification specifications	5
Table 6 — WorldSID abdomen certification specifications	6
Table 7 — WorldSID pelvis certification specifications	7

Table 8 — Sensors for neck assembly	12
Table 9 — Neck test preconditions	13
Table 10 — Pendulum arm deceleration pulse	14
Table 11 — Filter specification for neck test	14
Table 12 — Dummy full body test preconditions.....	15
Table 13 — Relationship between mechanical measurement indicators and the tilt sensors	16
Table 14 — Dummy set up criteria.....	16
Table 15 — Sensors for shoulder test.....	18
Table 16 — Filter specifications for shoulder test	19
Table 17 — Sensor specifications for thorax with half arm test	19
Table 18 — Filter specifications for thorax with half arm test.....	20
Table 19 — Sensor specifications for thorax without arm test.....	21
Table 20 — Filter specifications for thorax without half arm test.....	22
Table 21 — Simulated armrest specifications.....	22
Table 22 — Sensor specifications for abdomen test.....	23
Table 23 — Filter specifications for abdomen test.....	23
Table 24 — Sensor specifications for pelvis test.....	24
Table 25 — Filter specifications for pelvis test.....	24
Table A.1 — Specialized WorldSID support equipment.....	26
Table A.2 — Other standard support equipment.....	27
Table C.1 — WorldSID drawing list.....	29
Table C.2 — WorldSID fasteners	39

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*.

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*

[ISO 15830-2:2005](https://standards.iteh.ai/catalog/standards/sist/2725f062-3ac-4691-9d7d-cad7858104c2/iso-15830-2-2005)

<https://standards.iteh.ai/catalog/standards/sist/2725f062-3ac-4691-9d7d-cad7858104c2/iso-15830-2-2005>

Introduction

This first edition of ISO 15830 (all parts) has been prepared on the basis of the existing design, specifications and performance of the WorldSID 50th percentile adult male (PAM) 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 PAM 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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 15830-2:2005

<https://standards.iteh.ai/catalog/standards/sist/2725f062-f3ac-4691-9d7d-cad7858104c2/iso-15830-2-2005>

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

ISO 15830-2:2005

<https://standards.iteh.ai/catalog/standards/sist/2725f062-f3ac-4691-9d7d-cad7858104c2/iso-15830-2-2005>

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 standard 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, and
- 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

<https://standards.iteh.ai/catalog/standards/sist/2725f062-bac-4691-9d7d-3ad-85810462/iso-15830-2-2005>

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 male side impact dummy — Part 1: Terminology and rationale*

ISO 15830-3:2005, *Design and performance specifications for the WorldSID 50th percentile male side impact dummy — Part 3: Electronic subsystems*

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

SAE J211-1:2003, *Instrumentation for impact test — Part 1: Electronic instrumentation*

SAE J2570:2001, *Reference specification for anthropomorphic test device transducers*

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.

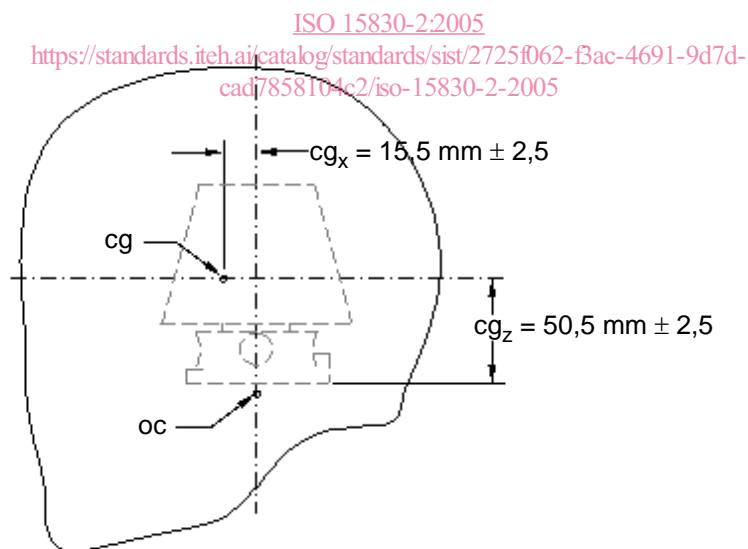


Figure 1 — Head centre of gravity location

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

ISO 15830-2:2005

<https://standards.iteh.ai/catalog/standards/sist/2725f062-3ac-4691-9d7d-d2b318250000/iso-15830-2-2005>

- 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)	4,7 to 6,4
Peak T4 acceleration along y axis (G)	24 to 33
Peak T12 acceleration along y axis (G)	20 to 28
Peak thorax rib 1 deflection (mm)	35 to 47
Peak thorax rib 2 deflection (mm)	42 to 57
Peak thorax rib 3 deflection (mm)	40 to 54

ISO 15830-2:2005

<https://standards.iteh.ai/catalog/standards/sist/2725f062-3ac-4691-9d7d-cad7858104c2/iso-15830-2-2005>

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 3,9
Peak T4 acceleration along y axis (G)	12 to 17
Peak T12 acceleration along y axis (G)	15 to 21
Peak thorax rib 1 deflection (mm)	34 to 43
Peak thorax rib 2 deflection (mm)	34 to 43
Peak thorax rib 3 deflection (mm)	34 to 43

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.

Table 6 — WorldSID abdomen certification specifications

Variable	Absolute value
Peak abdomen rib 1 deflection (mm)	33 to 41
Peak abdomen rib 2 deflection (mm)	31 to 39
Peak pendulum force (kN)	2,6 to 3,3
Peak T12 acceleration along y axis (G)	15 to 20

4.4 Full arms

4.4.1 General description

The full arm assembly may be installed on either side of the dummy. If installed, it shall consist of the components and assemblies listed in full arm assembly drawings W50-61000.pdf (left) and W50-61001.pdf (right) (see Annex B).

4.4.2 Drawings and specifications

- The full arm assembly and components shall conform to full arm assembly drawings W50-61000.pdf (left) and W50-61001.pdf (right) (see Annex B) and the subassemblies and component drawings listed therein.
- The total assembly shall have a mass of $3,72 \text{ kg} \pm 0,15 \text{ kg}$.
- The materials used in the construction of the full arm 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 full arm assembly shall include a secure strain relief mechanism.

4.5 Half arms

4.5.1 General description

The half arm assembly shall consist of the components and assemblies listed in half arm assembly W50-62000.pdf (see Annex B).

4.5.2 Drawings and specifications

- The half arm assembly shall conform to half arm assembly drawing W50-62000.pdf (see Annex B) and the subassemblies and component drawings listed therein.
- The total assembly shall have a mass of $1,77 \text{ kg} \pm 0,09 \text{ kg}$.
- The materials used in the construction of the half arm assembly shall not contain lead or lead alloys.
- The flesh material and/or external surface characteristics shall enable positive attachment of adhesive targets.

4.6 Lumbar spine and pelvis

4.6.1 General description

The lumbar spine and pelvis assembly shall consist of the components and assemblies listed in lumbar spine and pelvis assembly drawing W50-40000.pdf (see Annex B).

4.6.2 Drawings and specifications

- The lumbar spine and pelvis assembly shall conform to lumbar spine and pelvis assembly drawing W50-40000.pdf (see Annex B) and the subassemblies and component drawings listed therein.
- The total assembly shall have a mass of 17,75 kg \pm 0,90 kg.
- The materials used in the construction of the pelvis 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 pelvis assembly shall include a secure strain relief mechanism.

4.6.3 Certification

When assembled according to ISO 15830-4, and tested using the procedure specified in 5.3.1 and 5.3.6, the pelvis assembly shall meet the specifications given in Table 7.

Table 7 — WorldSID pelvis certification specifications

Variable	Absolute value
Peak acceleration along y axis (G)	41 to 51
Peak pelvis pendulum force (kN)	6,3 to 7,8
Peak T12 acceleration along y axis (G)	10 to 14

4.7 Upper legs

4.7.1 General description

The upper leg assembly shall consist of the components and assemblies listed in upper leg assembly drawings W50-51000.pdf (right) and W50-51050.pdf (left) (see Annex B).

4.7.2 Drawings and specifications

- The upper leg assembly and components shall conform to upper leg drawings W50-51000.pdf (right) and W50-51050.pdf (left) (see Annex B) and the subassemblies and component drawings listed therein.
- The total assembly shall have a mass of 6,71 kg \pm 0,30 kg.
- The materials used in the construction of the upper leg 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 upper leg assembly shall include a secure strain relief mechanism.