INTERNATIONAL STANDARD

ISO 15830-3

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

Part 3: Electronic subsystems

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

Partie 3: Sous-systèmes électroniques

Reference number
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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 15830-3 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*

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, the respective parties will need to define which of the permissive 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.

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

Part 3: Electronic subsystems

1 Scope

This part of ISO 15830 specifies requirements for electronic components of 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 categories M1 and goods vehicles of categories N1,

— impacts to the side of the vehicle structure, and

— impact tests involving the use of an anthropometric 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 male side impact dummy — Part 1: Terminology and rationale*

ISO 15830-2:2005, *Design and performance specifications for the WorldSID 50th percentile male side impact dummy — Part 2: Mechanical subsystems*

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

SAE J2570:2001, *Performance specifications for anthropomorphic test device transducers*

SAE J1733, *Sign convention for vehicle crash testing*

3 Terms and definitions

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

4 Electrical subsystems requirements

4.1 Permissible sensors

4.1.1 General

NOTE All sensors are specified as “permissible” (i.e., optional), because the decision to use or not to use a given sensor is to be left to the individual relevant regulatory authorities, consumer information organisations and research or test laboratories. In this way, a given regulation (or laboratory protocol) can indicate which of the permissible sensors described in this International Standard must be used in a given test.

The following sensors may be installed in the dummy. If installed, they shall comply with the specifications given in Table 1. If these sensors are not installed, then structural or mass replacements shall be installed in the dummy.

4.1.2 Locations and specifications

Table 1 — Permissible WorldSID sensor locations and specifications

Body region	Sensor	Sensor specification	Mounting specification	Maximum number of channels
Head	Linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.1	3
Head	Rotational accelerometer	4.1.3.3	ISO 15830-2:2005, 4.1	3
Head	Tilt sensor (about x and y axes)	4.1.3.4	ISO 15830-2:2005, 4.1	2
Head	Upper neck load cell	4.1.3.5	ISO 15830-2:2005, 4.1	6
Neck	Lower neck load cell	4.1.3.5	ISO 15830-2:2005, 4.2	6
Neck	T1 linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.2	3
Shoulder	Rib linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Shoulder	IR-TRACC	4.1.3.6	ISO 15830-2:2005, 4.3	1
Shoulder	Load cell (F_x, F_y, F_z)	4.1.3.7	ISO 15830-2:2005, 4.3	3
Full arm	Upper arm load cell	4.1.3.8	ISO 15830-2:2005, 4.4	6
Full arm	Lower arm load cell	4.1.3.8	ISO 15830-2:2005, 4.4	6
Full arm	Elbow load cell (M_x, M_y)	4.1.3.9	ISO 15830-2:2005, 4.4	2
Full arm	Elbow angular displacement	4.1.3.10	ISO 15830-2:2005, 4.4	1
Full arm	Elbow linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.4	3
Full arm	Wrist linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.4	3
Thorax	Upper rib linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Thorax	Middle rib linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Thorax	Lower rib linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Thorax	Upper rib IR-TRACC	4.1.3.6	ISO 15830-2:2005, 4.3	1
Thorax	Middle rib IR-TRACC	4.1.3.6	ISO 15830-2:2005, 4.3	1
Thorax	Lower rib IR-TRACC	4.1.3.6	ISO 15830-2:2005, 4.3	1
Spine	T4 linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Spine	T12 linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Spine	Rotational accelerometer (about x- and z-axes)	4.1.3.3	ISO 15830-2:2005, 4.3	2
Spine	Tilt sensor (about x- and y-axes)	4.1.3.4	ISO 15830-2:2005, 4.3	2
Abdomen	Upper rib linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3

Body region	Sensor	Sensor specification	Mounting specification	Maximum number of channels
Abdomen	Lower rib linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.3	3
Abdomen	Upper rib IR-TRACC	4.1.3.6	ISO 15830-2:2005, 4.3	1
Abdomen	Lower rib IR-TRACC	4.1.3.6	ISO 15830-2:2005, 4.3	1
Lumbar spine/pelvis	Lumbar load cell	4.1.3.11	ISO 15830-2:2005, 4.6	6
Lumbar spine/pelvis	Pelvis linear accelerometer	4.1.3.2	ISO 15830-2:2005, 4.6	3
Lumbar spine/pelvis	Pubic load cell (F_y)	4.1.3.12	ISO 15830-2:2005, 4.6	1
Lumbar spine/pelvis	Sacro-iliac load cell	4.1.3.13	ISO 15830-2:2005, 4.6	6
Lumbar spine/pelvis	Tilt sensor (about x- and y-axes)	4.1.3.3	ISO 15830-2:2005, 4.6	2
Upper leg	Femoral neck load cell (F_x, F_y F_z)	4.1.3.14	ISO 15830-2:2005, 4.7	3
Upper leg	Mid femur load cell	4.1.3.14	ISO 15830-2:2005, 4.7	6
Upper leg	Knee lateral outboard contact force load cell	4.1.3.16	ISO 15830-2:2005, 4.7	1
Upper leg	Knee lateral inboard contact force load cell	4.1.3.16	ISO 15830-2:2005, 4.7	1
Upper leg	Knee angular displacement	4.1.3.17	ISO 15830-2:2005, 4.7	1
Lower leg	Upper tibia load cell	4.1.3.15	ISO 15830-2:2005, 4.8	6
Lower leg	Lower tibia load cell	4.1.3.15	ISO 15830-2:2005, 4.8	6
Lower leg	Ankle angular displacement	4.1.3.18	ISO 15830-2:2005, 4.8	3
Spine box	Air temperature sensor	4.1.3.19	ISO 15830-2:2005, 4.3	1

4.1.3 Sensor specifications and mass

4.1.3.1 General

All load cells, accelerometers and angular displacement transducers shall comply with SAE J2570, and load cells shall comply with the capacities and sign conventions in Annex A.

Sensor sign convention should comply with SAE J1733 and all deviations shall be noted.

4.1.3.2 Tri-axial linear accelerometers

— If measured, tri-axial linear accelerations shall be measured using Endevco accelerometer, model 7268C-2000M1[1)].

— Tri-axial linear accelerometer assemblies shall have a mass of 8 g ± 1 g (not including cable).

4.1.3.3 Rotational accelerometers

— If measured, rotational accelerations shall be measured using Endevco accelerometer, model 7302BM4[2)].

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1) Accelerometer model 7268C-2000M1 is a product supplied by Endevco Corp. San Juan Capistrano, California, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

2) Accelerometer model 7302BM4 is a product supplied by Endevco Corp. San Juan Capistrano, California, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

— Rotational accelerometers shall have a mass of 35 g ± 4 g (not including cable).

4.1.3.4 Tilt angle sensors

4.1.3.4.1 Head tilt sensor

— If measured, head tilt angles shall be measured using either IES tilt sensor, model IES/1401 AT[3)], or MSC Automotive Gmbh tilt sensor, model 260D/GP-X[4)].

— Head tilt sensors shall have a mass of less than 25 g (not including cable).

4.1.3.4.2 Thorax and pelvis tilt sensor

— If measured, thorax and pelvis tilt angles shall be measured using either IES tilt sensor, model IES/1401 T[5)], or MSC Automotive Gmbh tilt sensor, model 260D/GP-X[4)].

— Thorax and pelvis tilt sensors shall have a mass of less than 25 g (not including cable).

4.1.3.5 Universal neck load cell

— If measured, upper and lower neck forces and moments shall be measured using Denton load cell, model W50-71000[6)].

— Upper and lower neck load cells shall have a mass of 346 g ± 20 g (not including attachment bolts or plug) or 361 g ± 25 g (including mating plug and 450 mm of cable).

4.1.3.6 Infra-Red Telescoping Rod for the Assessment of Chest Compression (IR-TRACC)

— If measured, rib deflections shall be measured using FTSS IR-TRACC, model IF-363[7)].

— IR-TRACCs shall have a mass of 117 g ± 15 g (including the connector and 300 mm of cable).

Calculation of IR-TRACC displacements shall be performed as described in 5.1.

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3) Head tilt sensor model IES/1401 AT is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

4) Tilt sensor model 260D/GP-X is a product supplied by MSC Automotive Gmbh. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

5) Thorax and pelvis tilt sensor model IES/1401 T is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

6) Load cell model W50-71000 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

7) IR-TRACC model IF-363 (see ISO 15830-2:2005, Annex C) is a product supplied by First Technology Safety Systems, Inc., Plymouth Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

4.1.3.7 Shoulder load cell

— If measured, shoulder forces shall be measured using Denton load cell, model W50-71090[8)].

— Shoulder load cell shall have a mass of 176 g ± 13 g (not including cable and mating connector).

4.1.3.8 Arm load cell

— If measured, upper and lower arm forces and moments shall be measured using Denton load cell, model W50-71070[9)].

— Upper and lower arm load cells shall have a mass of 385 g ± 30 g (not including cable and mating connector).

4.1.3.9 Elbow load cell

— If measured, elbow moments shall be measured using Denton load cell, model W50-71060[10)].

— Elbow load cell shall have a mass of 300 g ± 22 g (not including cable and mating connector).

4.1.3.10 Elbow rotational potentiometer

— If measured, elbow angular displacement shall be measured using Denton potentiometer, model W50-61027[11)].

— Elbow potentiometer shall have a mass of 15 g ± 2 g (not including cable and mating connector).

8) Load cell model W50-71090 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

9) Load cell model W50-71070 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

10) Load cell model W50-71060 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

11) Potentiometer model W50-61027 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

4.1.3.11 Lumbar load cell

— If measured, lumbar forces and moments shall be measured using Denton load cell, model W50-71120[12)].

— Lumbar load cell shall have a mass of 473 g ± 35 g (not including cable and mating connector).

4.1.3.12 Pubic load cell

— If measured, pubic forces and moments shall be measured using Denton load cell, model W50-71051[13)].

— Pubic load cell shall have a mass of 145 g ± 10 g (not including cable and mating connector).

4.1.3.13 Sacro-iliac load cell

— If measured, sacro-iliac forces and moments shall be measured using Denton load cell, model W50-71130[14)].

— Sacro-iliac load cell shall have a mass of 1062 g ± 75 g (not including cable and mating connector).

4.1.3.14 Femoral neck load cell

— If measured, femoral neck forces shall be measured using Denton load cell, model W50-71080[15)].

— Femoral neck load cell shall have a mass of 240 g ± 18 g (not including cable and mating connector).

4.1.3.15 Leg load cell

— If measured, upper and lower leg forces and moments shall be measured using Denton load cell, model W50-71010[16)].

— Upper and lower leg load cell shall have a mass of 470 g ± 36 g (not including cable and mating connector).

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12) Load cell model W50-71120 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

13) Load cell model W50-71051 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

14) Load cell model W50-71130 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

15) Load cell model W50-71080 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

16) Load cell model W50-71010 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

4.1.3.16 Knee contact load cell

— If measured, knee contact lateral force shall be measured using Denton load cell, model W50-71020[17)].

— Knee contact load cell shall have a mass of 77 g ± 6 g (not including cable and mating connector).

4.1.3.17 Knee rotational potentiometer

— If measured, knee angular displacement shall be measured using Denton potentiometer, model W50-61027[18)].

— Knee potentiometer shall have a mass of 15 g ± 2 g (not including cable).

4.1.3.18 Ankle rotational potentiometer

— If measured, ankle x, y, z angular displacements shall be measured using Denton potentiometer, models W50-54012, W50-54052, and W50-54051 respectively[19)].

— Ankle potentiometers shall have a mass of 7 g ± 5 g (not including cable).

4.1.3.19 Temperature sensor

— If measured, thoracic cavity temperature shall be measured using a Dallas temperature sensor, model DS192H/Z[20)].

— Temperature sensor assembly shall have a mass of 21 g ± 5 g (not including cable).

4.2 Permissible internal data acquisition system (DAS)

4.2.1 General

The following DAS may be installed in the dummy. If installed, it shall comply with the following specifications. If the DAS is not installed, then the DAS mass replacements shall be installed in the dummy.

4.2.2 DAS characteristics

— If installed, the DTS WorldSID G5 DAS[21)] shall be mounted in accordance with the drawings given in ISO 15830-2.

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17) Load cell model W50-71020 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

18) Potentiometer model W50-61027 (see ISO 15830-2:2005, Annex C) is a product supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

19) Potentiometer, models W50-54012, W50-54052, and W50-54051 (see ISO 15830-2:2005, Annex C) are products supplied by Robert A. Denton Inc., Rochester Hills Michigan, USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.

20) Temperature sensor, model DS192H/Z is a product supplied by Dallas Semiconductor. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Alternative products may be used if they can be shown to lead to the same results.