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Road vehicles — Dummies for restraint system testing — Part 2: Child dummies

Véhicules routiers — Mannequins pour essais de systèmes de retenue — Partie 2: Mannequins enfants

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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.

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ISO/TR 12349-2 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/TR 12349-2:1999), which has been technically revised.

ISO/TR 12349 consists of the following parts, under the general title *Road vehicles — Dummies for restraint system testing*:

— *Part 1: Adult dummies*

— *Part 2: Child dummies*

Road vehicles — Dummies for restraint system testing — Part 2: Child dummies

1 Scope

This Technical Report describes the infant and child crash test dummies which are recommended by ISO for use in evaluating child restraints and their interactions with deploying airbags. This Technical Report represents the best recommendation of widely available child crash test dummies at the time of publication.

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 amendments) applies.

SAE J2861, *CRABI 12- and 18-month old infant dummies user's manual*, Warrendale, PA, USA.

SAE J2857, *Hybrid III 3-year-old child dummy user's manual*, Warrendale, PA, USA.

SAE J2706, *Hybrid III 6-year-old child dummy user's manual*, Warrendale, PA, USA.

ISO TR 24997, *Road vehicles – Hybrid 3 chest potentiometer calibration procedure*

SAE J2517, *Hybrid III family chest potentiometer calibration procedure*, Warrendale, PA, USA.

SAE J2570, *Performance specifications for anthropomorphic test device transducers*, Warrendale, PA, USA.

ISO 6487, *Road vehicles – Measurement techniques in impact - Instrumentation*

SAE J211-1, *Instrumentation for impact test – Part 1 – Electronic instrumentation*, Warrendale, PA, USA.

SAE J733, *Sign convention for vehicle crash testing*, Warrendale, PA, USA.

ISO TR 27957, *Road vehicles – Temperature measurement in anthropomorphic test devices – Definition of temperature sensor locations*

SAE J1727, *Calculation guidelines for impact testing*, Warrendale, PA, USA.

ISO/TR 7861, *Road vehicles – Injury risk curves to evaluate occupant protection in frontal impact*

3 Symbols and abbreviated terms

3.1 Symbols

For the purposes of this Technical Report, the following symbols apply:

— A_x , A_y , A_z – linear acceleration along the positive x, y and z axes of the dummy

- $\alpha_x, \alpha_y, \alpha_z$ – angular acceleration about the positive x, y and z axes of the dummy
- F_x, F_y, F_z – force along the positive x, y and z axes of the dummy
- M_x, M_y, M_z – moment about the positive x, y and z axes of the dummy
- $\delta_x, \delta_y, \delta_z$ – deflection along the positive x, y and z axes of the dummy

3.2 Abbreviated terms

For the purposes of this Technical Report, the following abbreviations apply:

- ASIS – anterior superior iliac spine
- OOP – out-of-position

4 Recommended Dummies

A review of the widely available child crash test dummies was carried out by the experts of ISO/TC 22/ SC 12/ Working Group 5, *Anthropomorphic Test Devices*. Child dummies whose designs were protected intellectual property at the time of review were not considered.

4.1 Infant and child dummies recommended for restraint system evaluation in frontal impact tests

The following dummies are recommended for use in tests to evaluate restraint systems:

- Infant: CRABI 12-month-old
- 3-year-old: Hybrid III¹⁾, Q3
- 6-year-old:

4.2 Child dummies recommended for out-of-position airbag tests

The following dummies are recommended for use in tests to evaluate out-of-position interactions with airbags:

- Infant: CRABI 12-month-old
- 3-year-old: Hybrid III
- 6-year-old: Hybrid III

5 Dummy Instrumentation

5.1 Instrumentation for infant dummy

Table 1 lists the instrumentation that is used with the recommended infant dummy.

1) Recommended for use in forward-facing child restraints only

Table 1 — Instrumentation for infant dummy

Dummy Instrumentation	CRABI 12-month-old
Head	
Linear acceleration	A_x, A_y, A_z
Neck	
Head/C1 loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$
C7/T1 loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$
Shoulder	
Loads (left & right)	F_x, F_z
Thorax	
Spine acceleration	A_x, A_y, A_z
Lumbar	
Loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$
Pelvis	
Acceleration	A_x, A_y, A_z
Pubis load	F_x, F_z

5.2 Instrumentation for child dummies

Table 2 lists the instrumentation that is used with the recommended child dummies.

Table 2 — Instrumentation for child dummies

Dummy Instrumentation	3-year-old		6-year-old
	Hybrid III	Q3	Hybrid III
Head			
Linear acceleration	A_x, A_y, A_z	A_x, A_y, A_z	A_x, A_y, A_z
Linear accel. to calculate rotational	A_z (at rear)	-	-
Rotational acceleration	-	$\alpha_x, \alpha_y, \alpha_z$	-
Neck			
Head/C1 loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$
C7/T1 loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$
Shoulder			
Loads (left & right)	F_x, F_z	-	-
Thorax			
Spine acceleration	A_x, A_y, A_z (at T1, T4 & T12)	A_x, A_y, A_z	A_x, A_y, A_z
Sternum acceleration	A_x (at rib 3)	-	A_x (at ribs 1 & 6)
Sternum deflection	δ_x	δ_x	δ_x
Lumbar			
Loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$
Pelvis			
Acceleration	A_x, A_y, A_z	A_x, A_z	A_x, A_y, A_z
ASIS loads (left & right)	F_x (upper & lower)	-	F_x (upper & lower)
Acetabulum load (left & right)	F_y	-	-
Pubis load	F_x, F_z	-	-
Lower extremities (left & right)			
Femur loads and moments	-	-	$F_x, F_y, F_z, M_x, M_y, M_z$

Bibliography

1. **ISO/TR 14933.** *Road vehicles - Test procedures for evaluating occupant interactions with deploying side impact airbags.*
2. **ISO/TR 10982.** *Road vehicles - Test procedures for evaluating out-of-position vehicle occupant interactions with deploying air bags.*
3. **ISO 14645.** *Road vehicles - Test procedures for evaluating child restraint system interactions with deploying airbags.*