

PD ISO/TR 12349-2:2015



BSI Standards Publication

# Road vehicles — Dummies for restraint system testing

Part 2: Child dummies

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**National foreword**

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# TECHNICAL REPORT

PD ISO/TR 12349-2:2015

# ISO/TR 12349-2

Second edition  
2015-07-01

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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.

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](http://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](http://www.iso.org/patents)).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 36, *Safety aspects and impact test*.

This second edition cancels and replaces the first edition (ISO/TR 12349-2:1999), of which it constitutes a minor revision.

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

- *Part 1: Adult dummies*
- *Part 2: Child dummies*

## Introduction

Some experts of ISO/TC 22/SC 36 reviewed the widely available infant and child crash test dummies on the basis of biofidelity, repeatability and reproducibility, durability, instrumentation capabilities, and ease of use. Implementation of a crash test dummy in a regulation or consumers test is not a basis for recommendation in this Technical Report. Infant and child dummies whose designs were protected intellectual property at the time of review were not considered. Crash test dummies are continually being evaluated and those that are not currently recommended may be recommended in the next update of this Technical Report. Consensus was not reached to recommend infant or child dummies for side impact tests. This Technical Report represents the best recommendation of widely available infant and child crash test dummies at the time of publication.

The dummy instrumentation specified as required or optional in ISO test procedures for sled and OOP tests were reviewed. Infant and child dummy instrumentation recommended in this Technical Report consists of all instrumentation that are required by at least one test procedure. Some optional instrumentation and some instrumentation not specified in any ISO test procedure are also recommended in this Technical Report.





# Road vehicles — Dummies for restraint system testing —

## Part 2: Child dummies

### 1 Scope

This Technical Report specifies the infant and child crash test dummies that are recommended by ISO for use in evaluating child restraints in frontal impacts and out-of-position interactions with frontal or side airbags.

### 2 Symbols and abbreviated terms

#### 2.1 Symbols

$A_x, A_y, A_z$  linear acceleration along 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

$F_x, F_y, F_z$  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

$\omega_x, \omega_y, \omega_z$  rotational velocity about the positive x, y and z axes of the dummy

#### 2.2 Abbreviated terms

ASIS anterior superior iliac spine

C.G. centre of gravity

OOP out-of-position

### 3 Recommended dummies

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

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

- CRABI 12-month old;
- Hybrid III 3-year old for forward-facing child restraints only;
- Q3.

### 3.2 Infant and child dummies recommended for out-of-position airbag tests with frontal or side airbags

The following dummies are recommended for use in tests to evaluate OOP interactions with frontal or side airbags:

- CRABI 12-month old;
- Hybrid III 3-year old;
- Hybrid III 6-year old.

## 4 Recommended dummy instrumentation

### 4.1 Instrumentation recommended for infant dummy in frontal impact tests or OOP tests with frontal impact airbags

[Table 1](#) gives the instrumentation that should be used with the recommended infant dummy in ISO frontal impact test procedures and OOP test procedures with frontal impact airbags (see Reference [\[1\]](#)).

**Table 1 — Instrumentation recommended for infant dummy**

Dummy instrumentation	CRABI 12-month old
<b>Head</b>	
Linear acceleration at C.G.	$A_x, A_y, A_z$
<b>Neck</b>	
Head/C1 loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$
C7/torso loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$
<b>Thorax</b>	
Spine acceleration	$A_x, A_y, A_z$
<b>Lumbar</b>	
Loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$
<b>Pelvis</b>	
Acceleration	$A_x, A_y, A_z$

### 4.2 Instrumentation recommended for child dummies in frontal impact tests or OOP tests with airbags

[Table 2](#) gives the instrumentation that should be used with the recommended child dummies in ISO frontal impact test procedures (see Reference [\[1\]](#)) and OOP test procedures with frontal airbags (see Reference [\[2\]](#)) and side impact torso or curtain airbags (see Reference [\[3\]](#)).

**Table 2 — Instrumentation recommended for child dummies**

Dummy instrumentation	Hybrid III 3-year old	Q3	Hybrid III 6-year old
<b>Head</b>			
Linear acceleration at C.G.	$A_x, A_y, A_z$	$A_x, A_y, A_z$	$A_x, A_y, A_z$
Linear acceleration at rear	$A_z$	—	—
Rotational velocity	—	$\omega_x, \omega_y, \omega_z$	—
<b>Neck</b>			
Head/C1 loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$

**Table 2 (continued)**

<b>Dummy instrumentation</b>	<b>Hybrid III 3-year old</b>	<b>Q3</b>	<b>Hybrid III 6-year old</b>
C7/torso loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$
<b>Thorax</b>			
Spine acceleration	$A_x, A_y, A_z$	$A_x, A_y, A_z$	$A_x, A_y, A_z$
Spine acceleration	$A_x$ (at rib 3)	—	$A_x$ (at ribs 1 and 6)
Sternum acceleration	$A_x$ (at ribs 1 and 3)	—	$A_x$ (at ribs 1 and 6)
Sternum deflection	$\delta_x$	$\delta_x$	$\delta_x$
<b>Lumbar</b>			
Loads and moments	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$	$F_x, F_y, F_z, M_x, M_y, M_z$
<b>Pelvis</b>			
Acceleration	$A_x, A_y, A_z$	$A_x, A_y, A_z$	$A_x, A_y, A_z$
ASIS loads (left and right)	$F_x$ (upper and lower)	—	$F_x$ (upper and lower)
Acetabulum load (left and right)	$F_y$	—	—
<b>Lower extremities (left and right)</b>			
Femur loads and moments	—	—	$F_x, F_y, F_z, M_x, M_y, M_z$

## Bibliography

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







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