

Teknisk rapport

SIS-ISO/TR 14645:2015

Publicerad/Published: 2015-06-26
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 43.040.80

Vägfordon – Metod för utvärdering av interaktion mellan bilbarnstol och airbag (ISO/TR 14645:2015, IDT)

Road vehicles – Test procedures for evaluating child restraint system interactions with deploying air bags (ISO/TR 14645:2015, IDT)

This preview is downloaded from www.sis.se. Buy the entire standard via <https://www.sis.se/std-8014023>

Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

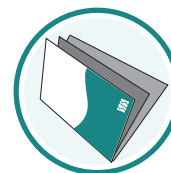
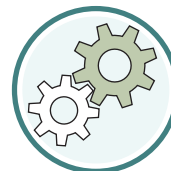
Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.



Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

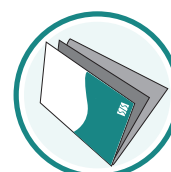
Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00



Denna tekniska rapport är inte en svensk standard. Detta dokument innehåller den engelska språkversionen av ISO/TR 14645:2015.

This Technical Report is not a Swedish Standard. This document contains the English version of ISO/TR 14645:2015.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Uppllysningar om sakinnehållet i detta dokument lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna uppllysningar om nationell och internationell standard.

Information about the content of this document is available from the SIS, Swedish Standards Institute, telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about national and international standards.

Dokumentet är framtaget av kommittén för Fordonssäkerhet, SIS/TK 237.

Har du synpunkter på innehållet i det här dokumentet, vill du delta i ett kommande revideringsarbete eller vara med och ta fram standarder inom området? Gå in på www.sis.se - där hittar du mer information.

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Test device	2
4.1 General.....	2
4.2 Six-month-old infant dummies.....	2
4.2.1 CRABI 6-month.....	2
4.3 Nine-month-old infant dummy.....	2
4.3.1 P-3/4.....	2
4.4 Twelve-month-old infant dummy.....	2
4.4.1 CRABI 12-month.....	2
4.5 Three-year-old child dummies.....	2
4.5.1 Three-year-old child Hybrid III.....	2
4.5.2 P-3.....	2
4.5.3 Q-3.....	2
4.6 Six-year-old child dummies.....	3
4.6.1 P-6.....	3
4.6.2 Hybrid-III six-year.....	3
4.6.3 Q-6.....	3
5 Instrumentation	3
5.1 Measurements.....	3
5.2 CRABI 6-month and 12-month.....	3
5.3 P-3/4 nine-month.....	3
5.4 Hybrid III three-year.....	3
5.5 P-3 three-year.....	4
5.6 Q-3 Three-year.....	4
5.7 Hybrid III six-year.....	4
5.8 P-6 six-year.....	5
5.9 Q-6 six-year.....	5
5.10 Dummy test temperature.....	5
6 Sled pulse	5
6.1 General.....	5
6.2 Mild-severity crash pulse.....	5
7 Static tests	6
7.1 General.....	6
7.2 Test set-up.....	6
8 Dynamic tests	6
8.1 General.....	6
8.2 Test set-up.....	6
8.3 Simulation of sensing time.....	7

Contents

Page

9	CRS configurations and dummy combinations	7
9.1	General.....	7
9.2	Rear-facing CRSs.....	8
9.2.1	General.....	8
9.2.2	CRS configuration R1	8
9.2.3	CRS rear facing ISOFIX/LATCH configuration R2.....	8
9.2.4	CRS configuration R3	8
9.3	Laterally-positioned CRSs.....	9
9.3.1	General.....	9
9.3.2	CRS configuration L1	9
9.3.3	CRS configuration L2.....	9
9.3.4	ISOFIX/LATCH L3.....	10
9.4	Forward-facing CRSs.....	10
9.4.1	General.....	10
9.4.2	CRS configuration F1	10
9.4.3	CRS configuration F2.....	10
9.4.4	CRS configuration F3.....	11
9.5	Boosters.....	11
9.5.1	General.....	11
9.5.2	CRS configuration B1	11
9.5.3	CRS configuration B2	11
9.5.4	CRS Configuration B3.....	12
10	Primary dummy measurements	12
11	CRABI fixture	12
	Bibliography	15

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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 document 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC 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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 testing*.

This second edition cancels and replaces the first edition (ISO/TR 14645:1998), which has been technically revised.

This document is published as a Technical Report, rather than as an International Standard, because of the general inexperience in testing the interaction between child restraint systems (CRS) and deploying air bags, and the lack of real-world accident data. When statistically significant, real-world data are available, in which air bags have contacted a variety of child restraints, and there is more testing experience with this interaction, it may be appropriate to develop an International Standard.

Introduction

During its inflation process, an air bag generates a considerable amount of kinetic energy and, as a result, substantial forces can be developed between the deploying air bag and the child restraint system (CRS). (For background on air bag design and deployment, see References [1] and [2]. With passenger air bags, laboratory tests have indicated that these forces can be sufficient to produce serious injury to the CRS occupant. The National Highway Traffic Safety Administration has recommended that rear-facing child restraints of current design be used only in the rear seat of vehicles equipped with such air bags (see Reference [3]). Even so, many children can be restrained in either rear- or forward-facing CRSs in the front seat of such vehicles, and the child and/or the CRS can interact with the air bag. These guidelines were developed to improve the understanding of such interactions and to aid in the assessment of future designs.

A mild-severity crash pulse is described in this Technical Report. This pulse is not vehicle-specific, but represents general acceleration-time histories. This mild-severity pulse approximates a crash that would just deploy a typical air bag. This pulse is used to evaluate the effect of the energy of the deploying air bag when the CRS and dummy are exerting the least amount of inertial force in the forward direction, but the dummy and/or CRS is moved forward by that inertial force. This generic pulse or other vehicle-specific pulses can be used as appropriate. Differences in shape between the generic and the vehicle-specific pulses are expected with corresponding differences expected in dummy responses.

This Technical Report encourages the use of a wide range of test configurations and conditions, while recognizing that the range of possible interactions is essentially limitless and beyond testing capability. Furthermore, measurements of primary importance for the various configurations are given in [Table 1](#), but performance limits are not specified. References [4] to [9] give some background on human impact tolerance and criteria, describe scaling techniques for different size occupants, and offer interpretations of dummy responses relative to human injury potential that can be helpful in the evaluation. These and additional background papers on air bag development and deployment can be found in References [10] and [11].

Road vehicles — Test procedures for evaluating child restraint system interactions with deploying air bags

1 Scope

This Technical Report describes dummies, procedures, and configurations that can be used to investigate the interactions that occur between a deploying air bag and a Child Restraint System (CRS) that would have been considered properly installed and used in the outer and centre front passenger positions. Static tests can be used to sort CRS/air bag interaction on a comparative basis in either an actual or a simulated vehicle environment. Systems that appear to warrant further testing can be subjected to an appropriate dynamic test at a speed near that needed to deploy an air bag or at a higher speed commonly used to evaluate CRS performance. No test matrix is specified at this time for evaluating either a CRS or an air bag during interaction with each other. Instead, engineering judgment based on prior experience with CRS and/or air bag testing should be used in selecting the tests to be conducted with each individual system. Such tests can be aimed not only at producing interactions with the most severe results but also at identifying those conditions that produce the least interaction and/or satisfactory CRS performance results. Baseline tests to indicate the performance of a CRS in the absence of air bag deployment are also recommended for comparison purposes.

2 Normative references

There are no normative references.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

rear-facing

R

child restraint that positions the child to face the rear of the vehicle

3.2

laterally-positioned

L

child restraint that positions a prone or supine child perpendicular to the direction of vehicle travel

3.3

forward-facing

F

child restraint that positions the child to face the front of the vehicle

3.4

booster

B

normally used to better position adult belt restraints on the child

3.5

ISOFIX/LATCH

“plug-in” system designed for fitting child safety seats in cars quickly and with ease per ISO 13216

4 Test device

4.1 General

Five sizes of child dummies, from six-month to age six, are available for CRS/air bag investigations. However, the recommended dummies for use in this testing are listed in Reference [19].

4.2 Six-month-old infant dummies

4.2.1 CRABI 6-month

With specifications from the SAE Infant dummy task group, a six-month size dummy has been developed that allows measurement of head, chest, and pelvic accelerations, as well as upper and lower neck and lumbar spine forces and moments. A special six-channel transducer has also been developed for use in any of the spinal locations.

4.3 Nine-month-old infant dummy

4.3.1 P-3/4

This dummy is specified in UN-ECE Regulation 44, annex 8, and has been incorporated without instrumentation in 49 CFR, Part 572, subpart J. It has main-joint articulation and has provision for head and chest accelerometers and for modeling clay in the abdomen to detect penetration. A three-channel neck transducer has been developed for use with this dummy.

4.4 Twelve-month-old infant dummy

4.4.1 CRABI 12-month

With specifications from the SAE Infant dummy task group, a twelve-month size dummy has been developed that allows measurement of head, chest, and pelvic accelerations, as well as upper and lower neck and lumbar spine forces and moments.

4.5 Three-year-old child dummies

The standard child dummy for FMVSS and CMVSS 213 testing is specified in 49 CFR Part 572, subpart C. This dummy has provision for head and chest accelerometers. Use of the “new” vinyl-covered fiberglass head, specified in part 572.16(a) (1), is recommended over the old head.

4.5.1 Three-year-old child Hybrid III

This dummy was developed for passenger air bag testing (see Reference [16]) by a task force of the SAE Human Biomechanics and Simulation Standards Committee and is commercially available.

4.5.2 P-3

This dummy is specified in UN-ECE Regulation 44, annex 8. It has main-joint articulation and provisions for head and chest accelerometers and for modelling clay in the abdomen to detect penetration.

4.5.3 Q-3

In 1993, the International Child Dummy Working Group started the development of a new series of child dummies as a successor to the P-series. This new series was called the Q-series. The development of the Q-series, directed by the International Child Dummy Working Group, resulted in a Q3 dummy in 1998, followed by the addition of the Q6 dummy in 1999, and the Q1 in 2000.

Part of the development of the Q-dummies has taken place within the European Research programs CREST (see Reference [1]) and CHILD (see Reference [2]), both aimed at improving child safety in cars.

4.6 Six-year-old child dummies

4.6.1 P-6

This dummy is specified in UN-ECE Regulation 44, annex 8. It has main-joint articulation and has provision for head and chest accelerometers and for modelling clay in the abdomen to detect penetration.

4.6.2 Hybrid-III six-year

This dummy was developed under a grant from the Centers for Disease Control (CDC), with input from SAE committees, and allows measurement of head, chest, and pelvic accelerations; neck, lumbar, and femur forces and moments; and chest displacement.

4.6.3 Q-6

The development of the Q-series, directed by the International Child Dummy Working Group, resulted in a Q3 dummy in 1998, followed by the addition of the Q6 dummy in 1999, and the Q1 in 2000.

Part of the development of the Q-dummies has taken place within the European Research programs CREST (see Reference [1]) and CHILD (see Reference [2]), both aimed at improving child safety in cars.

5 Instrumentation

5.1 Measurements

Measurements that can be made or calculated using the anthropomorphic test device for each age group as listed in 5.2 to 5.9. All measurements should be recorded and filtered according to ISO 6487 and SAE J 211 for body regions. These measurements should be continuous functions of time, so that other quantities referred to in the references may be derived.

5.2 CRABI 6-month and 12-month

- Head triaxial acceleration
- Head angular acceleration (one channel)
- Upper neck forces and moments (six channels)
- Lower neck forces and moments (six channels)
- Chest triaxial acceleration
- Lumbar spine forces and moments (six channels)
- Pelvic triaxial acceleration

5.3 P-3/4 nine-month

- Head triaxial acceleration (three channels)
- Upper neck forces (F_x , F_z) and moment (F_y)
- Chest triaxial acceleration

5.4 Hybrid III three-year