

PD ISO/TS 18506:2014



BSI Standards Publication

Procedure to construct injury risk curves for the evaluation of road user protection in crash tests

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of ISO/TS 18506:2014.

The UK participation in its preparation was entrusted to Technical Committee AUE/7, Automobile occupant restraint systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014. Published by BSI Standards Limited 2014

ISBN 978 0 580 83771 5

ICS 43.020

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 September 2014.

Amendments issued since publication

Date	Text affected
------	---------------

**Procedure to construct injury risk
curves for the evaluation of road user
protection in crash tests**

*Procédure de construction des courbes de risques pour l'évaluation de
la protection des usagers de la route dans les essais de choc*





COPYRIGHT PROTECTED DOCUMENT

© ISO 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested 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	iv
1 Scope	1
2 Terms and definitions	1
3 Methodology	2
3.1 General.....	2
3.2 Collect the relevant data.....	2
3.3 Assign the censoring status.....	2
3.4 Check for single injury mechanism.....	2
3.5 Estimate the coefficients.....	3
3.6 Identify overly influential observations.....	3
3.7 Check the distribution assumption.....	3
3.8 Choose the best distribution.....	3
3.9 Check the validity of the prediction.....	3
3.10 95 % confidence intervals and its relative size.....	4
3.11 Quality index.....	4
3.12 Recommendation of the injury risk curves.....	4
4 Related electronic documents	5
Bibliography	6

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).

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).

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 12, *Passive safety crash protection systems*.

Procedure to construct injury risk curves for the evaluation of road user protection in crash tests

1 Scope

The aim of this Technical Specification is to provide a procedure to develop injury risk curves for biomechanical samples. These samples are often heavily censored and limited in size, such that specific steps and checks are required when developing injury risk curves. Moreover, several statistical methods were historically used to build injury risk curves. The curves resulting from the different methods could be rather close or fairly different, depending on the biomechanical samples. It is therefore of major importance to recommend a consensual method to be used. Otherwise, injury thresholds candidates to be included into regulations could be highly influenced by the statistical method used. These different methods were compared in a statistical simulation study^[10]. The conclusions of this study were used to recommend the survival analysis.

This Technical Specification identifies steps to be followed to develop injury risk curves. It recommends preliminary checks, statistical method, and recommendation process of the injury risk curve. Guidelines on the type of the samples to be used (cadaver, animal, or dummy), as well as the variables to be used, and the injury severity level are beyond the scope of this Technical Specification.

2 Terms and definitions

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

2.1

injury risk curve

curve giving the probability, for a defined population and for a given input, to sustain a specified severity of injury

2.2

injury risk function

mathematical function that relates a value of an injury criterion and possible additional factors (variables) to a risk of sustaining an injury of a certain level

2.3

injury criterion

physical parameter which correlates well with a scale of injury severity of the body region under consideration

2.4

injury value

value of an injury criterion

2.5

injury mechanism

mechanical behavior leading to an injury

2.6

abbreviated injury scale

AIS

scale allowing for the classification of injury severity

2.7

variable

parameters which contribute to the prediction of the injury severity