
**Motorcycles — Test and analysis
procedures for research evaluation of rider
crash protective devices fitted to
motorcycles —**

Part 8:

Documentation and reports

*Motorcycles — Méthodes d'essai et d'analyse de l'évaluation par la
recherche des dispositifs, montés sur les motocycles, visant à la protection
des motocyclistes contre les collisions —*

Partie 8: Documentation et rapports

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-6264953bd501/iso-13232-8-1996>



Contents

	Page
1 Scope	1
2 Normative references	1
3 Requirements	2
3.1 Documentation for full-scale impact tests	2
3.2 Documentation for computer simulations	2
3.3 Documentation for risk/benefit analysis	2
3.4 Recommendations regarding publication of results	2
Annexes	
A Forms for full-scale impact test documentation	6
B Forms for computer simulation documentation	37
C Forms for risk/benefit analysis documentation	53

ITeH STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996>

© ISO 1996

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@isocs.iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

Printed in Switzerland

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.

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.

This part of ISO 13232 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

At the request of the United Nations Economic Commission for Europe, Group for Road Vehicle General Safety (UN/ECE/TRANS/SCI/WP29/GRSG), this International Standard has been prepared by ISO/TC 22/SC 22, *Motorcycles*, as eight interrelated parts, on the basis of original working documents submitted by the International Motorcycle Manufacturers Association (IMMA).

This is the first version of the standard. [ISO 13232-8:1996](https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b26495380940/iso-13232-8-1996)

ISO 13232 consists of the following parts under the general title *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles*:

- *Part 1: Definitions, symbols and general considerations*
- *Part 2: Definition of impact conditions in relation to accident data*
- *Part 3: Anthropometric impact dummy*
- *Part 4: Variables to be measured, instrumentation and measurement procedures*
- *Part 5: Injury indices and risk/benefit analysis*
- *Part 6: Full-scale impact-test procedures*
- *Part 7: Standardized procedures for performing computer simulations of motorcycle impact tests*
- *Part 8: Documentation and reports*

Annexes A, B and C form an integral part of ISO 13232-8.

Introduction

This International Standard has been prepared on the basis of existing technology. Its purpose is to define common research methods and a means for making an overall evaluation of the effect that devices which are fitted to motor cycles and intended for the crash protection of riders, have on injuries, when assessed over a range of impact conditions which are based on accident data.

It is intended that the methods and recommendations contained in this International Standard should be used in all basic feasibility research. However, researchers should also consider variations in the specified conditions (for example, rider size) when evaluating the overall feasibility of any protective device. In addition, researchers may wish to vary or extend elements of the methodology in order to research issues which are of particular interest to them. In all such cases which go beyond the basic research, if reference is to be made to this International Standard, a clear explanation of how the procedures used differ from the basic methodology should be provided.

In order to apply the standard properly, it is strongly recommended that all eight parts be used together, particularly if the results are to be published.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 13232-8:1996](https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996)

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996>

Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles —

Part 8:

Documentation and reports

1 Scope

This International Standard specifies the minimum requirements for research into the feasibility of protective devices fitted to motor cycles, which are intended to protect the rider in the event of a collision.

This International Standard is applicable to impact tests involving

- two wheeled motor cycles;
- the specified type of opposing vehicle;
- either a stationary and a moving vehicle or two moving vehicles;
- for any moving vehicle, a steady speed and straight line motion immediately prior to impact;
- one helmeted dummy in a normal seating position on an upright motor cycle;
- the measurement of the potential for specified types of injury by body region;
- evaluation of the results of paired impact tests (i.e., comparisons between motor cycles fitted and not fitted with the proposed devices).

ISO 13232-8:1996

This part of ISO 13232 provides a common basis for <https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996>

- test and simulation documentation;
- data exchange;
- confirmation of results by other researchers;
- direct comparison of results between different facilities;
- enabling other researchers to reproduce the experiment;
- the recommended minimum contents of publications which describe tests done according to this International Standard.

This International Standard does not apply to testing for regulatory or legislative purposes.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 13232 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 13232-1: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 1 - Definitions, symbols and general considerations.

ISO 13232-2: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 2 - Definition of impact conditions in relation to accident data.

ISO 13232-3: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 3 - Motor cyclist anthropometric impact dummy.

ISO 13232-4: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 4 - Variables to be measured, instrumentation and measurement procedures.

ISO 13232-5: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 5 - Injury indices and risk/benefit analysis.

ISO 13232-6: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 6 - Full-scale impact test procedures.

ISO 13232-7: 1996, Motor cycles - Test and analysis procedures for research evaluation of rider crash protective devices fitted to motor cycles - Part 7 - Standardized procedures for performing computer simulations of motor cycle impact tests.

49 CFR Part 572, subpart E: 1993, Anthropometric test dummies, United States of America Code of Federal Regulations issued by the National Highway Traffic Safety Administration (NHTSA) Washington, D.C.

3 Requirements

3.1 Documentation for full-scale impact tests

All full-scale impact tests which are intended to meet this International Standard shall be documented to include the information specified on forms A.1 through A.8 in annex A.

The extent to which the requirements, recommendations, and procedures of this International Standard have or have not been followed shall be documented on form A.7.

A complete set of documentation for a full-scale test shall include the complete information in annex A, including still photographs and plots, plus copies of the films from the required high speed cameras.

3.2 Documentation for computer simulations

All computer simulations which are intended to meet this International Standard shall be documented to include the information specified on forms B.1 through B.8 in annex B.

The extent to which the requirements, recommendations, and procedures of this International Standard have or have not been followed shall be documented on form B.7.

3.3 Documentation for risk/benefit analysis

All risk/benefit analyses which are intended to meet this International Standard shall be documented to include the information specified on forms C.1 through C.3 in annex C.

The extent to which the requirements, recommendations, and procedures of this International Standard have or have not been followed shall be documented on form C.3.

3.4 Recommendations regarding publication of results

The test or computer simulation documentation forms described in annexes A or B, respectively, should be completed prior to publication of results of any test or computer simulation which is intended to meet this International Standard, and which cites this International Standard in the text of the publication.

The risk/benefit analysis documentation forms described in annex C should be completed prior to publication of results of any risk/benefit analysis which is intended to meet this International Standard and which cites this International Standard in the text of the publication.

3.4.1 Full-scale test publications

Any publications concerning full-scale tests which are intended to meet this International Standard, should include the following information, at a minimum.

3.4.1.1 Impact conditions

The publication should include

- a) a description and drawing of the nominal impact configuration, according to the conventions described in ISO 13232-2;
- b) photographs (or tracings of photographs) from the high speed camera film for MC top view and MC side view of the frame immediately preceding first MC/OV contact;
- c) data for each test measured according to the procedures defined in ISO 13232-4:
 - 1) MC impact speed,
 - 2) OV impact speed,
 - 3) OV contact point,
 - 4) relative heading angle,
 - 5) MC roll angle,
 - 6) change in dummy helmet centroid point and joint locations with respect to the MC relative to the pre-test set up photography.

STANDARD PREVIEW
(standards.iteh.ai)

3.4.1.2 Items not complied with

A list and explanation of all items not complied with, based upon form A.7, should be included in the publication.

3.4.1.3 Vehicle information

The following information should be included in the publication:

- OV make and model;
- MC make and model;
- photographs or scaled drawings of the protective device, in at least two views (from front, side, or top), as fitted, and deployed, if deployable.

3.4.1.4 Impact sequence information

The impact sequence data described in A.8.2 should be included in the publication.

3.4.1.5 Performance data

A listing of values for all of the injury assessment variables, injury potential variables, and injury indices described in ISO 13232-5 and listed in A.8.4 should be included in the publication.

3.4.1.6 Paired comparison information

Only tests which meet the impact condition requirements described in 4.5 of ISO 13232-6 should be published.

Only complete paired comparisons (i.e., results for both the standard MC and the MC with protective device) should be published.

If an out of tolerance test is published, the publication should clearly identify for each such test

- that the test was out of tolerance;
- the amount by which it was out of tolerance;
- that according to ISO 13232, such test is not considered to be a valid basis for a paired comparison.

The following minimum information should be included in the publication.

3.4.1.6.1 Paired comparisons summary statements

Within each paired comparison:

- a) if the injury assessment variables, injury potential variables, and injury indices all show the same kind of effect of the protective device (e.g., all variables show benefits, or all show harm, or all show no effect), then a statement of this should be included in the publication;
- b) if the variables are mixed with regard to the effect of the protective device, then a statement of this should be included. In this case, the result should be summarized in the publication by referring to the effect of the protective device on:
 - 1) the body region of interest (e.g., the head for a head protective device, or leg for a leg protective device),
 - 2) the head injury potential variables,
 - 3) the normalized probable injury cost.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.4.1.6.2 Comparisons across impact configurations summary statements

For each set of paired comparisons (i.e., involving more than one impact configuration), and for a given protective device, the following minimum information should be included in the publication:

- for all of the injury assessment variables, injury potential variables, and injury indices listed in table 1, summary statements of the following form should be included, depending on the test results (the following is an example);

"In 4 out of 7 test pairs the neck maximum torsion moment increased, in 2 out of 7 test pairs it remained the same, and in 1 out of 7 test pairs it decreased, when the protective device was fitted."
- if zero precedes "out of" in the summary statement (e.g., "in 0 out of 7 test pairs"), then the phrase containing the zero may be omitted;
- a statement referring to the need to evaluate protective devices across the population of impact configurations.

3.4.2 Risk/benefit analyses publications

Any publications concerning risk/benefit analysis which are intended to meet this International Standard should include the information in form C.2, and a list and explanation of all items not complied with, based upon form C.3, at a minimum.

Table 1. List of injury assessment variables, injury potential variables, and injury indices for inclusion in publications of paired comparisons

Injury assessment variable, injury potential variable, injury index	Time window
Head maximum GAMBIT	Entire
HIC	Entire
Head PAIS	Entire
For head protective device research:	
- neck shear injury index;	Entire
- neck tension injury index;	Entire
- neck compression injury index;	Entire
- neck flexion injury index;	Entire
- neck extension injury index;	Entire
- neck torsion injury index.	Entire
For all research:	
- chest PAIS;	Entire
- abdomen PAIS;	Entire
- number of femur fractures; ISO 13232-8:1996	Entire
- number of knee dislocations;	Entire
- number of tibia fractures;	Entire
- maximum vertical difference in helmet trajectory (protective device minus baseline);	Primary
- percentage change in helmet resultant velocity (protective device compared to baseline);	At first helmet/OV contact
- partial permanent incapacity index;	Entire
- probability of fatality, from GAMBIT;	Entire
- risk of life threatening brain injury, from HIC;	Entire
- total normalized injury cost.	Entire

Annex A (normative)

Forms for full-scale impact test documentation

The forms which are required to be completed for documentation of each full-scale impact test are given below.

Form A.1 is the document cover page. A.2 contains the motor cycle information. A.3 contains the protective device information. A.4 contains the opposing vehicle information. A.5 contains information on the dummy and instrumentation. A.6 contains impact condition information. A.7 contains a checklist of procedures complied with. A.8 contains the resulting test data.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 13232-8:1996](https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996)

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996>

A.1 Documentation for motor cycle/opposing vehicle full-scale impact test

According to ISO 13232

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 13232-8:1996

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996>

Test number: _____

Motor cycle/protective device: _____

Impact configuration code: _____

Test facility: _____

Note: Complete all information on the following pages. For items requiring yes/no responses, indicate "no" if the response is unknown or negative. Wherever a negative response (i.e., "no") is given, attach an explanation.

Test number _____

A.2 - Motor cycle information (ISO 13232-6, 5.2.2)

Manufacturer:	
Model:	
Year:	
Engine displacement:	cc
Optional accessories, as tested:	
Colour, as tested:	
Frame serial number:	
Weight (empty, no dummy, with test equipment and protective device, if fitted):	Front: kg
	Rear: kg
	Total: kg
Yes No	
Pre-test photographs (without dummy) are attached (side, front views) <input type="checkbox"/> <input type="checkbox"/>	
Yes No	
At the time of the test, the motor cycle was in sound condition with no structural damage or alteration except those related to the fitment of the protective device, if present: <input type="checkbox"/> <input type="checkbox"/>	

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284937bd501/iso-13232-8-1996>

A.3 - Protective device information (if fitted)

Device description:	
Yes No	
Photographs or scale drawings in two views are attached: <input type="checkbox"/> <input type="checkbox"/>	

A.4 - Opposing vehicle information (ISO 13232-6, 4.1)

Manufacturer:
Model:
Year:
Colour, as tested:
Vehicle identification number:

Test number _____

Weight (empty, with test equipment):	Left front:	kg
	Right front:	kg
	Left rear:	kg
	Right rear:	kg
	Total:	kg
Overall length:	cm	
Overall width:	cm	
Overall height:	cm	
Pre-test photographs attached (side, front views):	Yes <input type="checkbox"/>	No <input type="checkbox"/>

A.5 - Dummy and instrumentation information (ISO 13232-3, ISO 13232-4, ISO 13232-6)

A.5.1 Dummy mechanical

iTeh STANDARD PREVIEW

(standards.iteh.ai)

The test dummy meets the requirements of ISO 13232-3:	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Notes:	https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996	
Number of full-scale impact tests since calibration of (ISO 13232-6, 4.3.1):		
head:		
neck:		
thorax:		
knee, L:		
knee, R:		

Test number _____

A.5.2 Dummy frangible component conformity of production test data (ISO 13232-3)

Component	Manufacturer	Lot number	Initial and subsequent COP data attached	
			Yes	No
Abdominal insert:				
Frangible femurs:				
L				
R				
Frangible knee shear pins:				
L varus valgus				
L torsion				
R varus valgus				
R torsion				
Frangible knee compliance elements:				
L varus valgus				
L torsion				
R varus valgus				
R torsion				
Frangible tibias:				
L				
R				
All frangible components were new and not previously used:				

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 13232-8:1996

<https://standards.iteh.ai/catalog/standards/sist/b6a66201-4e05-40ba-b137-b284933bd501/iso-13232-8-1996>

A.5.3 Sensor, data acquisition and post processing systems verification (ISO 13232-6)

The verification test described in 4.3.3 and 5.3.1 was done and the time history plot is attached:	Yes <input type="checkbox"/>	No <input type="checkbox"/>
--	---------------------------------	--------------------------------

A.5.4 Joint tensions (ISO 13232-6)

All joint tensions were set according to annex A	Yes <input type="checkbox"/>	No <input type="checkbox"/>
--	---------------------------------	--------------------------------

Test number _____

A.5.5 Helmet (ISO 13232-6)

Manufacturer:	
Model:	Size: <input type="checkbox"/> M (56 cm); <input type="checkbox"/> L (58 cm)
Meets all requirements of 4.3.7:	Yes <input type="checkbox"/> No <input type="checkbox"/>
The helmet was installed on the dummy according to annex D:	<input type="checkbox"/> <input type="checkbox"/>
Dimension A of the helmet alignment tool was not modified:	<input type="checkbox"/> <input type="checkbox"/>
If modified, the new dimension was:	mm

A.5.6 Instrumentation (ISO 13232-4)

A.5.6.1 Electronic variables recorded (4.1)

Time histories for the following recorded variables are attached in A.8.3 in the following sequence:

Required electronic variables recorded:	Recorder channel	Full-scale recording and plotting range	Plot page sequence	Plot attached to A.8.3			
				Primary		Secondary	
				Yes	No	Yes	No
First MC/OV contact occurrence ¹⁾							
Head:	ISO 13232-8:1996						
a ₁		± 400 g	1				
a ₂		± 400 g	1				
a ₃		± 400 g	1				
a ₄		± 400 g	2				
a ₅		± 400 g	2				
a ₆		± 400 g	2				
a ₇		± 400 g	3				
a ₈		± 400 g	3				
a ₉		± 400 g	3				
Chest:							
l _{uL}		± 60 mm	6				
l _{uR}		± 60 mm	6				
l _{lL}		± 60 mm	6				
l _{lR}		± 60 mm	6				
Upper neck (for head protective device research):							
F _{x,n}		± 4 kN	4				
F _{y,n}		± 4 kN	4				
F _{z,n}		± 8 kN	4				
M _{y,n}		± 400 N · m	5				
M _{z,n}		± 60 N · m	5				

1) Label the first MC/OV contact signal on all plots on which it appears.