

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

Part 8: Documentation and reports

ICS 43.140

National foreword

This British Standard is the UK implementation of ISO 13232-8:2005+A1:2012. It supersedes BS ISO 13232-8:2005, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/14, Motor cycles and mopeds.

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.

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

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INTERNATIONAL STANDARD

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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 motorcycles, visant à la
protection des motocyclistes contre les collisions —*

Partie 8: Documentation et rapports



Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

ISO 13232-8 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

This second edition cancels and replaces the first version (ISO 13232-8:1996), which has been technically revised.

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: Motorcyclist 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*

Introduction

ISO 13232 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 motorcycles 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 all of the methods and recommendations contained in ISO 13232 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 ISO 13232, a clear explanation of how the used procedures differ from the basic methodology should be provided.

ISO 13232 was prepared by ISO/TC 22/SC 22 at the request of the United Nations Economic Commission for Europe Group for Road Vehicle General Safety (UN/ECE/TRANS/SCI/WP29/GRSG), based on original working documents submitted by the International Motorcycle Manufacturers Association (IMMA), and comprising eight interrelated parts.

This revision of ISO 13232 incorporates extensive technical amendments throughout all the parts, resulting from extensive experience with the standard and the development of improved research methods.

In order to apply ISO 13232 properly, it is strongly recommended that all eight parts be used together, particularly if the results are to be published.

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

Part 8: Documentation and reports

1 Scope

This part of ISO 13232 provides a common basis for:

- 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; and
- the recommended minimum contents of publications which describe tests done according to ISO 13232.

ISO 13232 specifies the minimum requirements for research into the feasibility of protective devices fitted to motorcycles, which are intended to protect the rider in the event of a collision.

ISO 13232 is applicable to impact tests involving:

- two-wheeled motorcycles;
- 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 motorcycle;
- 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 motorcycles fitted and not fitted with the proposed devices).

ISO 13232 does not apply to testing for regulatory or legislative purposes.

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 any amendments) applies.

ISO 13232-1, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 1: Definitions, symbols, and general considerations*

ISO 13232-2, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 2: Definition of impact conditions in relation to accident data*

ISO 13232-3, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 3: Motorcyclist anthropometric impact dummy*

ISO 13232-4, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 4: Variables to be measured, instrumentation, and measurement procedures*

ISO 13232-5, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 5: Injury indices and risk/benefit analysis*

ISO 13232-6, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 6: Full-scale impact test procedures*

ISO 13232-7, *Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 7: Standardized procedures for performing computer simulations of motorcycle 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 ISO 13232 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 ISO 13232 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 ISO 13232 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 ISO 13232 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 ISO 13232 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 ISO 13232 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 ISO 13232, and which cites ISO 13232 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 ISO 13232 and which cites ISO 13232 in the text of the publication.

3.4.1 Full-scale test publications

Any publications concerning full-scale tests which are intended to meet ISO 13232, 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.

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:

- d) 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;
- e) 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.

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);

EXAMPLE "In four out of seven test pairs the neck maximum torsion moment increased, in two out of seven test pairs it remained the same, and in one out of seven test pairs it decreased, when the protective device was fitted."

- if zero precedes "out of" in the summary statement (e.g., "in zero out of seven 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 ISO 13232 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
Neck NII;	Entire
Neck PAIS;	Entire
Chest PAIS;	Entire
Abdomen PAIS;	Entire
Number of femur fractures;	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;	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 motorcycle 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 compiled checklist of procedures. A.8 contains the resulting test data.

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

According to ISO 13232

Test number: _____

Motorcycle/protective device: _____

Impact configuration code: _____

Test number to which this test is being compared: _____

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.

A.2 Motorcycle 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)		☐ ☐
At the time of the test, the motorcycle was in sound condition with no structural damage or alteration except those related to the fitment of the protective device, if present:		Yes No ☐ ☐

A.3 Protective device information (if fitted)

Device description:		
Photographs or scale drawings in two views are attached:	☐	☐

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

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

Test weight (with test equipment per ISO 13232-6, 5.2.1):		Left front:	kg
		Right front:	kg
		Left rear:	kg
		Right rear:	kg
		Total:	kg
Measured overall length:	cm	Reference OV curb mass:	kg
Measured overall width:	cm	Reference OV curb mass:	kg
Measured overall height:	cm		
			Yes No
Pre-test photographs attached (side, front views):			☐ ☐

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

A.5.1 Dummy mechanical

	Yes No
The test dummy meets the requirements of ISO 13232-3:	☐ ☐
Notes:	
Number of full-scale impact tests since calibration of (ISO 13232-6, 4.3.1):	
head:	
neck:	
thorax:	
knee, L:	
knee, R:	
Total dummy mass, including sensors, DAS, and permanently mounted cables.	

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:				

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

	Yes	No
The verification test described in 4.3.3 and 5.3.1 was done and the time history plots are attached:	☐	☐

A.5.4 Joint tensions (ISO 13232-6)

	Yes	No
All joint tensions were set according to Annex A	☐	☐

A.5.5 Helmet (ISO 13232-6)

Manufacturer:	Serial number:	Lot number:
Model:	Size: ☐ S (56 cm);	☐ M (58 cm)
		Yes No
Meets all requirements of 4.3.7:		☐ ☐
The helmet was installed on the dummy according to Annex D:		☐ ☐
Dimension A of the helmet alignment tool was not modified:		☐ ☐
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 ^a							
Head:							
a_1		$\pm 400\text{ g}$	1				
a_2		$\pm 400\text{ g}$	1				
a_3		$\pm 400\text{ g}$	1				
a_4		$\pm 400\text{ g}$	2				
a_5		$\pm 400\text{ g}$	2				
a_6		$\pm 400\text{ g}$	2				
a_7		$\pm 400\text{ g}$	3				

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
a_8		$\pm 400\text{ g}$	3				
a_9		$\pm 400\text{ g}$	3				
Chest:							
l_{uL}		$\pm 60\text{ mm}$	6				
l_{uR}		$\pm 60\text{ mm}$	6				
l_{lL}		$\pm 60\text{ mm}$	6				
l_{lR}		$\pm 60\text{ mm}$	6				
Upper neck:							
$F_{x,n}$		$\pm 15\text{ kN}$	4				
$F_{y,n}$		$\pm 15\text{ kN}$	4				
$F_{z,n}$		$\pm 30\text{ kN}$	4				
$M_{x,n}$		$\pm 700\text{ N} \cdot \text{m}$	5				
$M_{y,n}$		$\pm 1000\text{ N} \cdot \text{m}$	5				
$M_{z,n}$		$\pm 700\text{ N} \cdot \text{m}$	5				
Upper femurs (required for leg protective device research):							
$F_{z,uF,L}$		$\pm 12\text{ kN}$	7				
$M_{x,uF,L}$		$\pm 600\text{ N} \cdot \text{m}$	7				
$M_{y,uF,L}$		$\pm 600\text{ N} \cdot \text{m}$	7				
$F_{z,uF,R}$		$\pm 12\text{ kN}$	8				
$M_{x,uF,R}$		$\pm 600\text{ N} \cdot \text{m}$	8				
$M_{y,uF,R}$		$\pm 600\text{ N} \cdot \text{m}$	8				
Upper tibias (required for leg protective device research):							
$M_{x,uT,L}$		$\pm 400\text{ N} \cdot \text{m}$	9				
$M_{y,uT,L}$		$\pm 400\text{ N} \cdot \text{m}$	9				

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
$M_{x,uT,R}$		$\pm 400 \text{ N} \cdot \text{m}$	9				
$M_{y,uT,R}$		$\pm 400 \text{ N} \cdot \text{m}$	9				

Permissible 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
Lumbar spine:							
$F_{x,l}$		$\pm 5 \text{ kN}$	10				
$F_{y,l}$		$\pm 5 \text{ kN}$	10				
$F_{z,l}$		$\pm 10 \text{ kN}$	10				
$M_{x,l}$		$\pm 500 \text{ N} \cdot \text{m}$	11				
$M_{y,l}$		$\pm 500 \text{ N} \cdot \text{m}$	11				
$M_{z,l}$		$\pm 250 \text{ N} \cdot \text{m}$	11				
Upper femurs:							
$M_{z,uF,L}$		$\pm 400 \text{ N} \cdot \text{m}$	7				
$M_{z,uF,R}$		$\pm 400 \text{ N} \cdot \text{m}$	8				
Lower femurs:							
$F_{z,lF,L}$		$\pm 12 \text{ kN}$	12				
$M_{x,lF,L}$		$\pm 500 \text{ N} \cdot \text{m}$	12				
$M_{y,lF,L}$		$\pm 500 \text{ N} \cdot \text{m}$	12				
$M_{z,lF,L}$		$\pm 300 \text{ N} \cdot \text{m}$	12				
$F_{z,lF,R}$		$\pm 12 \text{ kN}$	13				
$M_{x,lF,R}$		$\pm 500 \text{ N} \cdot \text{m}$	13				
$M_{y,lF,R}$		$\pm 500 \text{ N} \cdot \text{m}$	13				
$M_{z,lF,R}$		$\pm 300 \text{ N} \cdot \text{m}$	13				
Upper tibias:							