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Road vehicles — Light alloy wheels — Lateral impact test

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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).

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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 33, *Vehicle dynamics and chassis components*.

This fourth edition cancels and replaces the third edition (ISO 7141:2005), which has been technically revised.

The main changes are as follows:

- editorial modifications;
- addition of subclause 5.1 and corresponding [Annex A](#);
- [Clause 7](#) failure criteria, clarification and insertion of examples in [Figure 3](#).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The purpose of this document is to improve the repetitious accuracy and the application for increasing wheel diameters and static wheel loads.

Therefore, it is necessary to describe the test rig in more details and include additional descriptions for failure criteria.

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Road vehicles — Light alloy wheels — Lateral impact test

1 Scope

This document specifies a laboratory test procedure to evaluate the axial (lateral) kerb impact collision properties of a wheel manufactured either wholly or partly of light alloys. It is intended for passenger car applications, and special vehicle applications where there is a possibility of the wheel impacting the kerb, with the purpose of screening and/or quality control of the wheel.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3911, *Wheels and rims for pneumatic tyres — Vocabulary, designation and marking*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3911 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Test equipment

4.1 New wheels, fully processed, representative of wheels intended for vehicle application, fitted with a tyre. Tyres and wheels used in the tests should not be used subsequently on a vehicle.

4.2 Impact loading test machine with a vertically acting steel striker having an impacting face, in accordance with [Figure 1](#). The striker mass, m , within a tolerance of $\pm 2\%$, expressed in kilograms, shall be as follows:

$$m = 0,6W + 180$$

where W is the maximum vertical static load which is specified by the wheel or the vehicle manufacturer, expressed in kilograms. In the absence of such specification, the largest value of the load rating of the tyre which can be applied to the wheel for the application.

4.3 Mass of 1 000 kg.

5 Calibration

Ensure, by means of a test calibration adapter, that the 1 000 kg mass ([4.3](#)) applied vertically to the centre of the wheel fixing as shown in [Figure 2](#) causes a deflection of $(7,5 \pm 0,75)$ mm when measured at the centre of the beam.

The drop height should be 230 ± 2 mm. It is the height that a mass shall be measured by a time of $(12,31 + 0,3)$ ms to pass through a distance of 25,4 mm prior to tyre contact.

A reduction in impact velocity due to friction in the test equipment can be compensated for by adjusting the drop height (ADH) until a velocity is measured that replicates 230 mm of free fall. A velocimeter and a light curtain can be used in combination to measure the velocity of the striker mass just prior to striking the tyre. The calibration is to start at 230 mm of drop height and increment in 2 mm increases until the time it takes to go through the light curtain is $12,31 \text{ ms} + 0,3/-0 \text{ ms}$. If the increase in drop height found in the calibration exceeds 10 mm the test machine should be taken out of service and maintenance performed to reduce friction in the system. All tests on a specific test machine are to be dropped at the ADH until the next calibration.

[Annex A](#) gives guidelines and a practical example to measure the time to pass through a distance.

6 Test procedure

6.1 Mount the test wheel ([4.1](#)) and tyre in the test machine ([4.2](#)) such that the impact loading is applied to the rim flange of the wheel. The wheel shall be mounted with its axis at an angle of $(13 \pm 1)^\circ$ to the vertical with its highest point presented to the striker.

The tyre mounted on the test wheel shall be specified by the vehicle manufacturer. If no tyre is specified, the tyre shall be the smallest nominal section width tubeless radial ply tyre intended for use on that wheel. The inflation pressure shall be that specified by the vehicle manufacturer or in the absence of such specification, it shall be 200 kPa.

The temperature of the test environment shall remain within the range (10 to 30) °C throughout the test period.

6.2 Ensure that the wheel is mounted on the hub fixture with dimensionally representative fixings such as would be used on a vehicle. Manually tighten the fixings to a value or by a method recommended by the vehicle or wheel manufacturer.

Because the design of wheel centre members can vary, test a sufficient number of locations on the wheel rim circumference to ensure that the integrity of the centre members is assessed. Use new wheels each time.

6.3 Ensure that the striker is over the tyre and overlaps the rim flange by (25 ± 1) mm. Raise the striker to the $\text{ADH} \pm 2$ mm (as found in the last calibration) above the highest part of the rim flange and allow it to fall. The striker plate width shall be larger than the tyre section as measured 25 mm below the high point of the rim flange (see section B-B of [Figure 1](#)).

If it is observed that one of the acceptance criteria is not met due to subsequent impacts caused by the mass rebounding or the mass resting on the tyre, a retest is allowed. Only one impact is intended. Test equipment additions to prevent rebound impacts to the wheel-tyre assembly are allowed if they do not influence the initial impact.

7 Failure criteria

The wheel is considered to have failed the test if any of the following apply:

- a) visible fracture(s) (not by dye penetrant) penetrating through a section of the centre member of the wheel assembly as shown in [Figure 3](#);
- b) the centre member separates from the rim;
- c) the tyre loses all air pressure within 1 min.

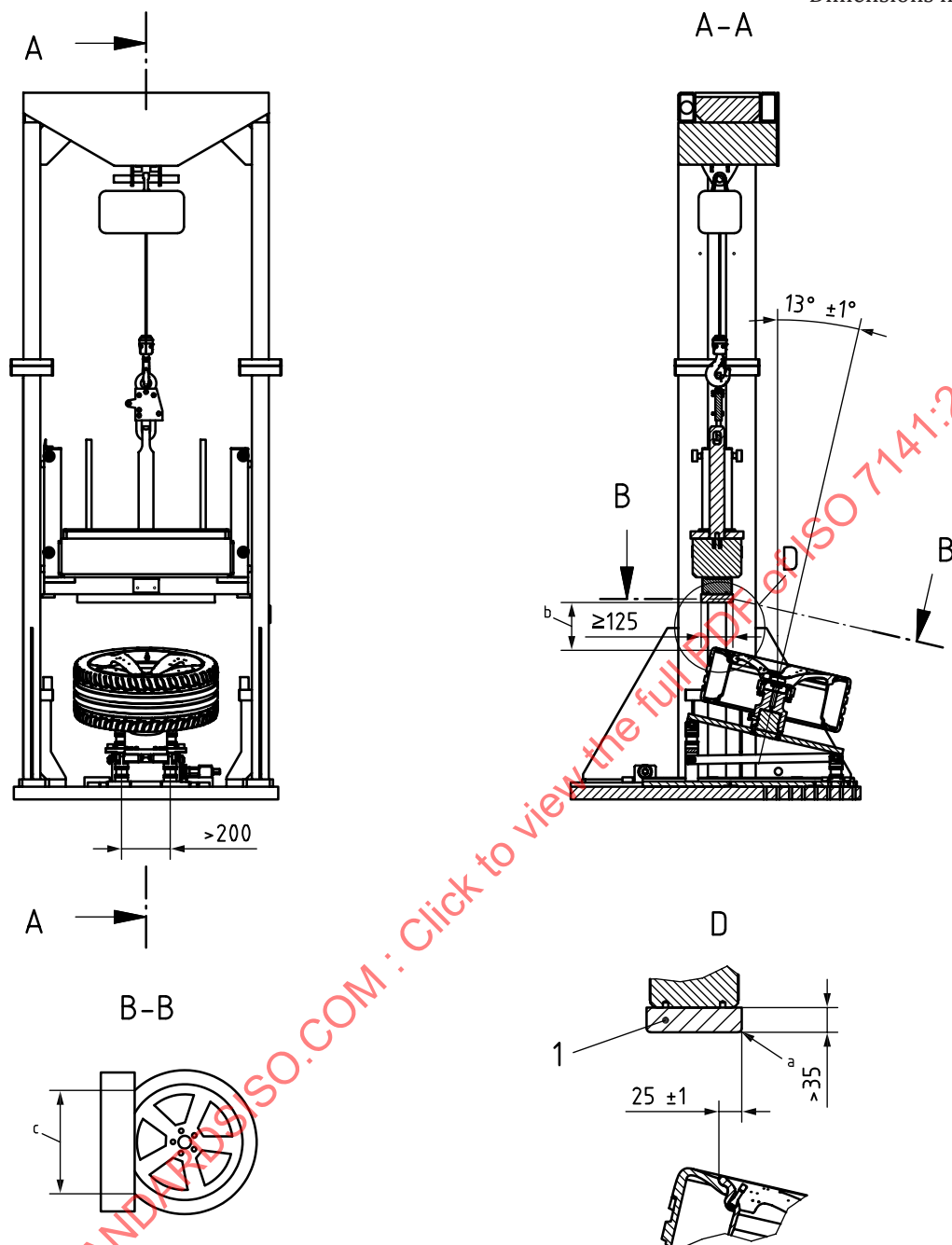
The wheel is not considered to have failed the test by deformation of the wheel assembly or by fractures in the area of the rim section struck by the face plate of the striker.

NOTE 1 Fractures in the area of the rim under the striker including separation of the flange as shown in [Figure 3](#) (outer rim horn) do not constitute failure to meet the acceptance criteria.

NOTE 2 Non-adhering material (for example, aero blades) or additional styling and aero elements will not be scored.

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Dimensions in millimetres

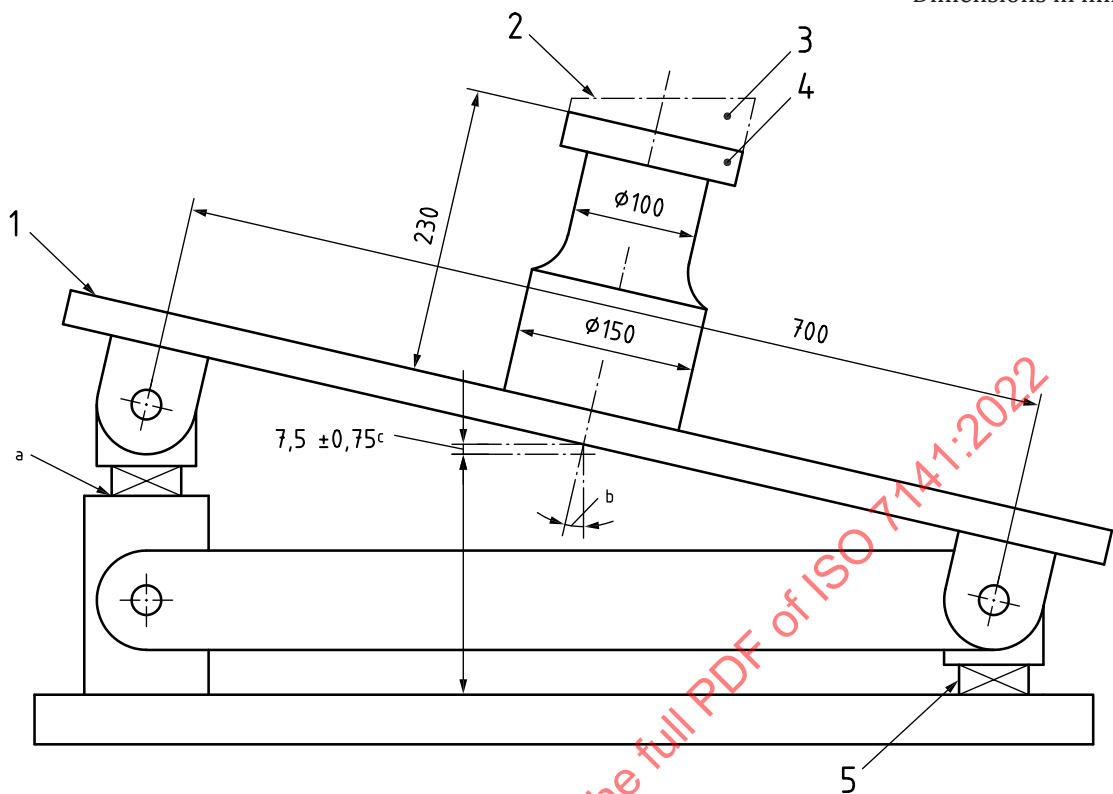


Key

- 1 steel striker
- a Sharp edge broken by radius (up to 1 mm) or chamfer, $45^\circ \times 0,5$ mm up to 1,0 mm.
- b $230 \text{ mm} \pm 2 \text{ mm}$ or ADH (230 mm to $240 \text{ mm} \pm 2 \text{ mm}$).
- c Minimum striker plate width.

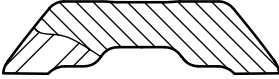
Figure 1 — Impact loading test machine

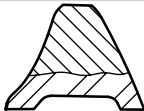
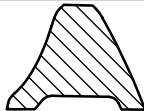
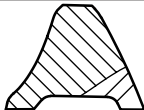
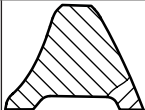
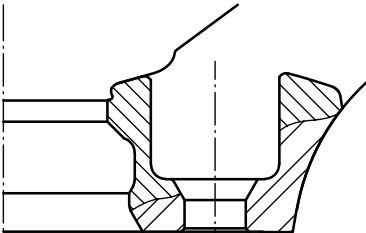
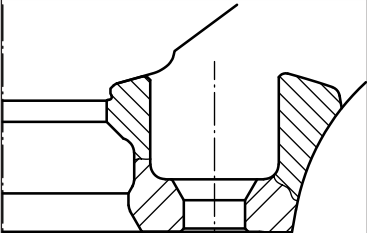
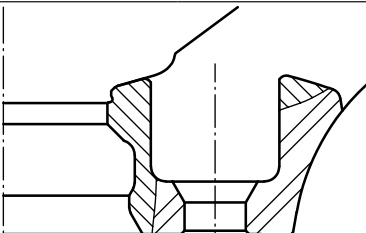
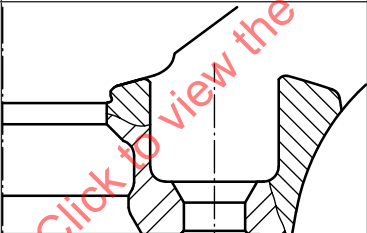
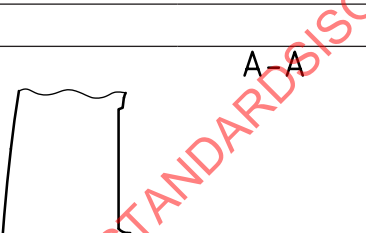
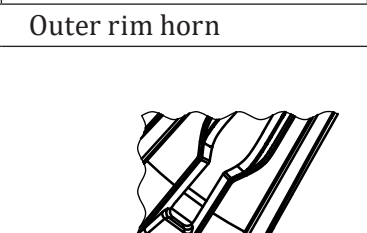
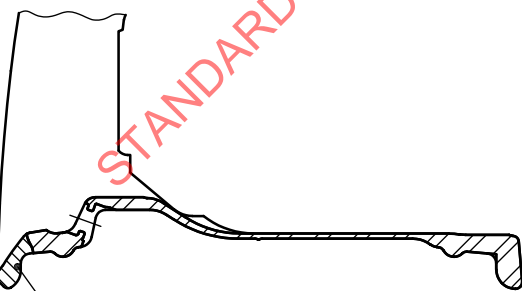
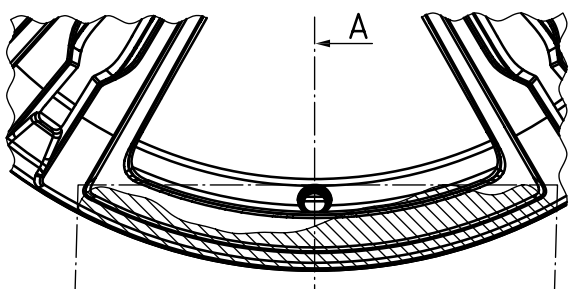
Dimensions in millimetres



- Key**
- 1 steel beam (minimum 400 MPa yield), $200 \pm 0,5 \times 25 \pm 0,3$
 - 2 1 000 kg calibration load
 - 3 calibration adapter
 - 4 wheel hub adapter
 - 5 four natural rubber mounts (or equivalent): hardness, 50 Shore; diameter, 51; uncompressed height, 27
 - a Adjust for 13°.
 - b 13° before calibration.
 - c Vertical deflection measured from base.

Figure 2 — Application of loading to centre of wheel mount

Spoke section		
Acceptable		Not acceptable
		
a) Spoke section	b) Spoke section	c) Spoke section
		
d) Spoke section	e) Spoke section	f) Spoke section

											
g) Spoke section				h) Spoke section				i) Spoke section			
											
j) Spoke section				k) Spoke section							
Hub section											
Acceptable						Not acceptable					
											
1 2 l) Hub section						1 2 m) Hub section					
											
1 2 o) Hub section						1 2 p) Hub section					
											
1 2 q) Hub section						1 2 r) Hub section					
Outer rim horn											
											
3 v) Outer rim horn						3 w) Outer rim horn					