INTERNATIONAL STANDARD

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# Road vehicles — Passenger car wheels for road use — Test methods

*Véhicules routiers — Roues pour voitures particulières pour utilisation sur routes — Méthodes d'essai*

Reference number
ISO 3006:2005(E)

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# Foreword

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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.

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.

ISO 3006 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 19, *Wheels*.

This fourth edition cancels and replaces the third edition (ISO 3006:1995), which has been technically revised.

# Introduction

This International Standard was developed in response to requests to establish uniform test methods to evaluate certain fatigue strength characteristics of wheels used on passenger cars. Only laboratory test methods are given. No minimum performance levels are part of this International Standard.

# Road vehicles — Passenger car wheels for road use — Test methods

## 1 Scope

This International Standard specifies two laboratory methods for testing certain essential fatigue strength characteristics of wheels intended for road use on passenger cars as defined in ISO 3833.

The test methods are

— dynamic cornering fatigue test;

— dynamic radial fatigue test.

## 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 3833, *Road vehicles — Types — Terms and definitions*

ISO 3911, *Wheels and rims for pneumatic tyres — Vocabulary, designation and marking*

## 3 General

Only fully processed new wheels which are representative of wheels intended for the vehicle shall be used for the tests. No wheel shall be used for more than one test.

## 4 Dynamic cornering fatigue test

### 4.1 Equipment

The test machine shall have a driven rotatable device whereby either the wheel rotates under the influence of a stationary bending moment or the wheel is stationary and is subjected to a rotating bending moment (see Figure 1).

### 4.2 Procedure

#### 4.2.1 Preparation

Clamp the rim of the wheel securely to the test fixture. The adaptor face of the test machine shall have equivalent wheel mounting systems to those used on the vehicle. The mating surfaces of the test adaptor and wheel shall be free of excessive scoring and deformation, and excessive build-up of paint, dirt or foreign matter.

Attach the load arm and adaptor assembly to the mounting surface of the wheel using studs or bolts, and nuts which are in good condition, lubricated or non-lubricated in accordance with the intended vehicle application (as specified by the vehicle manufacturer), and are representative of those used on the vehicle. Tighten these wheel nuts or bolts at the beginning of the test to the vehicle or wheel manufacturer's specified torque values.

Wheel bolts or nuts may be retorqued once during the test.

#### 4.2.2 Bending moment application

To impart a bending moment to the wheel, apply a force parallel to the plane of the wheel mounting surface at a specified distance $l$ (moment arm) of 0,5 m to 1,4 m, as shown in Figure 1.

Maintain the bending moment within $\pm$ 2,5 % of the calculated value.

### 4.3 Bending moment determination

Determine the bending moment $M$ (force $\times$ moment arm), in newton metres, from the formula

$$M = \left(\mu R + d\right) F_{\mathrm{v}} S$$

where

$\mu$ is the assumed coefficient of friction developed between tyre and road (see Table A.1);

$R$ is the static loaded radius, in metres, of the largest tyre to be used on the wheel as specified by the vehicle or wheel manufacturer;

$d$ is the inset or outset (positive for inset; negative for outset) of the wheel, in metres (see ISO 3911);

$F_{\mathrm{v}}$ is the maximum vertical static load on the wheel or the wheel load rating in newtons, as specified by the vehicle or wheel manufacturer;

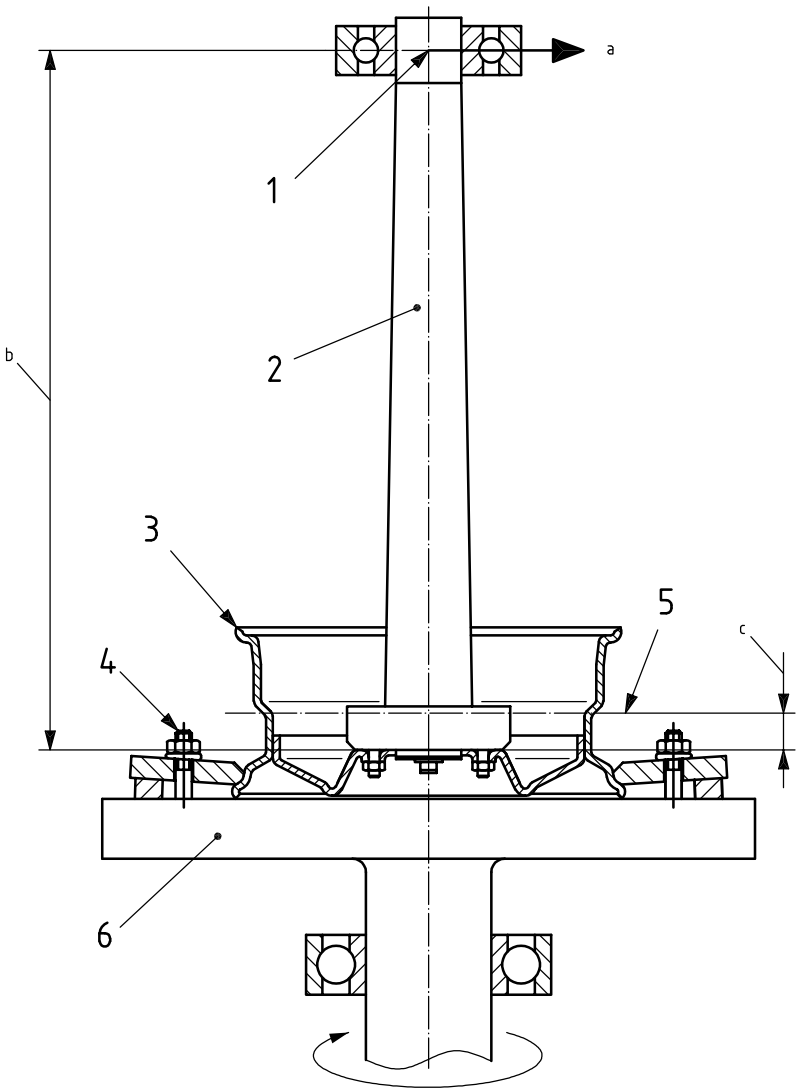
$S$ is the accelerated test factor (see Table A.1).

### 4.4 Test termination

The test shall be terminated in either of the two following circumstances:

— inability of wheel to sustain load;

— propagation of a crack or cracks existing prior to test or new visible stress-caused crack penetrating through a section of the wheel.




**Key**

1 pivot point
2 loading arm
3 wheel
4 fastener
5 rim centre plane
6 rotary disc

a Load, $F_V$.
b Moment arm, $l$ (0,5 m to 1,4 m).
c Inset, $d$.

**Figure 1 — Example of dynamic cornering fatigue test fixture**

# 5 Dynamic radial fatigue test

## 5.1 Equipment

The test machine shall be equipped with a means of imparting a constant radial load as the wheel rotates. There are many means of imparting radial loads: the suggested equipment incorporates a driven rotatable drum which presents a smooth surface wider than the loaded test tyre section width. The recommended minimum external diameter of the drum is 1 700 mm.

The test wheel (single application) and tyre fixture shall provide loading normal to the drum external surface and in line radially with the centre of the test wheel and the drum. The axes of the drum and test wheel shall be parallel (see Figure 2).

The mating surfaces of the test adaptor and wheel shall be free of excessive scoring and deformation, and excessive build-up of paint, dirt or foreign matter.

## 5.2 Procedure

Tyres selected for this wheel test shall meet the load rating, $F_V$, of the wheel or be representative of the maximum load capacity, size and type specified by the vehicle or wheel manufacturer, whichever is greater.

The test adaptor shall be representative of production hubs using studs or bolts and nuts which are in good condition, lubricated or non-lubricated in accordance with the intended vehicle application (as specified by the vehicle manufacturer), and are representative of those specified for the wheel.

The cold inflation pressure of the test tyre shall be in accordance with the values given in Table 1.

**Table 1 — Test inflation pressures**

| Service pressure kPa [a] | Test pressure kPa |
|---|---|
| up to 160 | 280 |
| 161 to 280 | 450 |
| 281 to 450 | 550 |
| [a] 100 kPa = 1 bar. | |

There will be an increase in pressure during the test. This increase is normal and no adjustment is necessary. The loading system shall maintain the specified load within ± 2,5 % of the calculated value.

## 5.3 Radial load determination

Determine the radial load $F_r$ in newtons, from the formula

$$F_r = F_v K$$

where

$F_v$ is the maximum vertical static load on the wheel or the wheel load rating, in newtons, as specified by the vehicle or wheel manufacturer;

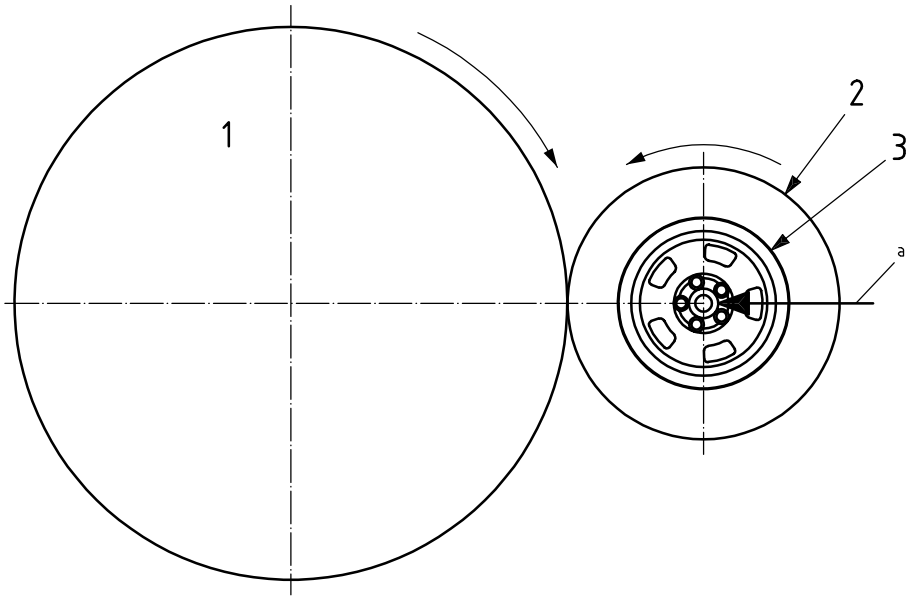
$K$ is the accelerated test factor (see Table A.2).

## 5.4 Test termination

The test shall be terminated in either of the two following circumstances:

— inability of the wheel to sustain the load or tyre pressure;

— propagation of a crack or cracks existing prior to test or new visible stress-caused cracks penetrating through a section of the wheel.




**Key**

1 driven drum
2 tyre
3 wheel

a Radial load, $F_r$.

**Figure 2 — Example of dynamic radial fatigue test fixture**

# Annex A
(normative)

# Recommended test factors

Accelerated test factors and cycle life requirements shall be determined by the vehicle or wheel manufacturer based on vehicle application and expected severity of usage. To permit uniform application of the test methods specified, one or more of the accelerated test factors shown in Table A.1 or A.2 shall be used when conducting tests.

**Table A.1 — Test factors for dynamic cornering fatigue test**

| Material | Size code and offset | Accelerated test factor $S$ | Coefficient of friction $\mu$ |
|---|---|---|---|
| Ferrous or aluminium | All | 2,13<br>2<br>1,7<br>1,6<br>1,5<br>1,35<br>1,33<br>1,26<br>1,1 | 0,7 |

**Table A.2 — Test factors for dynamic radial fatigue test**

| Material | Size code and offset | Accelerated test factor [a] $K$ |
|---|---|---|
| Ferrous or aluminium | All | 2,8<br>2,5<br>2,25<br>2,2<br>2<br>1,9<br>1,8<br>1,7<br>1,6<br>1,4 |

[a] Use load factor to achieve adequate tyre life to run the test.

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