INTERNATIONAL STANDARD

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Motorcycles — Light-alloy wheels — Test method

Motocycles — Roues en alliages légers — Méthodes d'essai

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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.

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ISO 8644 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

This second edition cancels and replaces the first edition (ISO 8644:1988), which has been technically revised.

Introduction

It is recognized that there are three types of somewhat different equipment for radial impact testing. Application of any of the types of test equipment is effective in this International Standard.

Motorcycles — Light-alloy wheels — Test method

1 Scope

This International Standard specifies methods for determining the performance of light-alloy road wheels for motorcycles under normal road use.

This International Standard is applicable to wheels for motorcycles with two or three wheels (including motorcycles equipped with side-cars) as defined in ISO 3833, of the following types:

— unit construction light-alloy wheels; and

— composite construction light-alloy wheels.

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*

3 Terms and definitions

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

3.1
unit construction light-alloy wheel
wheel of which rim and spokes, or disc, are manufactured as a single unit

3.2
composite construction light-alloy wheel
wheel of which rim is made of light alloy, and of which support structure of light alloy or other metals is then assembled

3.3
single mass impact test equipment
impact test equipment in which a single striker can be dropped freely

3.4
pendulum impact test equipment
pendulum impact test equipment in which striker can be swung freely

3.5
double mass impact test equipment
impact test equipment in which both main and auxiliary striker weights are joined together with coil springs and can be dropped freely to give a combined force

4 Test

The tests to be carried out shall be the following:

a) rotational bending fatigue test (see Clause 5);

b) radial load durability test (see Clause 6);

c) radial impact resistance test (see Clause 7);

d) torsional fatigue test (see Clause 8);

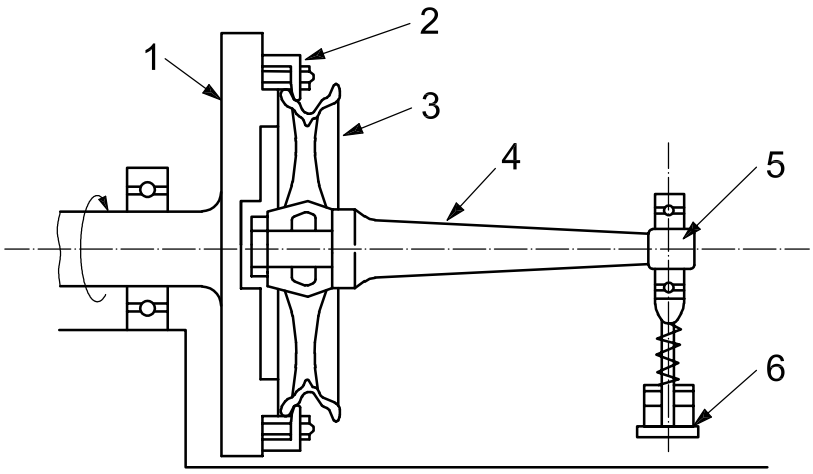
e) air leak test (applicable only to wheels designed and marked for use with tubeless tyres; see Clause 9).

A different wheel may be used for each test.

5 Rotational bending fatigue test

5.1 Test equipment

The test equipment shall be planned to produce a constant bending moment on the centre of the light-alloy wheel which rotates at a constant velocity. An example of such equipment is shown in Figure 1.



Key

1 rotary disc
2 fastening
3 light-alloy wheel
4 loading arm
5 pivot point
6 weight

Figure 1 — Example of equipment for rotational bending fatigue test

5.2 Test conditions

5.2.1 Bending moment

The bending moment, M, in newton metres, applied in accordance with 5.3, shall be determined by the following equation:

$$M = 0{,}7 \times \mu \times Fv \times R$$

where

μ is the friction coefficient between tyre and road, equal to 0,7;

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

R is the maximum static radius, in metres, of the largest applicable tyre, or the tyre specified by the vehicle or wheel manufacturer.

5.2.2 Loading arm length

It is recommended that the length of the loading arm be equal to the radius of the tyre determined in accordance with 5.2.1.

5.3 Test procedure

Rotate the test equipment with the bending moment, M, determined in accordance with 5.2.1, applied after the rim flange of the light-alloy test wheel has been fixed to the driven rotating disc (see Figure 1). A loading arm of sufficient rigidity shall be attached to the wheel by the same method as the wheel is normally attached to the vehicle.

6 Radial load durability test

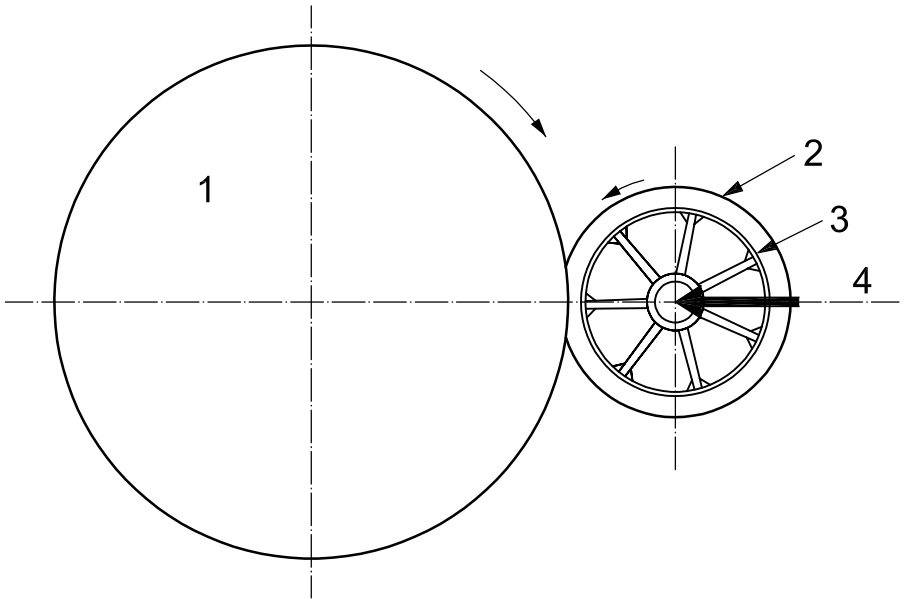
6.1 Test equipment

The test equipment, of which Figure 2 shows an example, shall meet the following requirements:

a) the test equipment shall have a drum, of diameter 400 mm or bigger, with a smooth surface which is wider than the overall width of the tyre used in the test;

b) the drum specified in a) shall rotate at a constant velocity;

c) the test equipment shall permit a radial load to be applied to the wheel and shall be such that the wheel is maintained in contact with the drum under constant load.



Key

1 rotating drum
2 tyre
3 light-alloy wheel
4 radial load

Figure 2 — Example of equipment for radial load durability test

6.2 Test conditions

6.2.1 Static radial load

The radial load, Q, in newtons, to be applied as in 6.3, shall be determined by the following equation:

$$Q = 2{,}25 \times Fv$$

where

Fv is the maximum vertical static load on the wheel or the wheel load rating, in newtons, as specified by the vehicle or wheel manufacturer.

6.2.2 Tyre air pressure

The air pressure before the test, in kilopascals, shall be at least that corresponding to the design maximum load of the tyre to be used in the test.

6.2.3 Tolerance for load fluctuation

The tolerance for load fluctuation during the test shall be $\pm$ 5 %.

6.2.4 Tyre failure

In case of tyre failure, the test shall be continued after replacing the tyre.

6.3 Test procedure

Fit the light-alloy wheel with an appropriate tyre to the test equipment (see Figure 2) according to the method used to attach the wheel to the vehicle. The drum shall then be rotated while the radial load, Q, determined in accordance with 6.2.1, is applied.

7 Radial impact resistance test

7.1 Test equipment

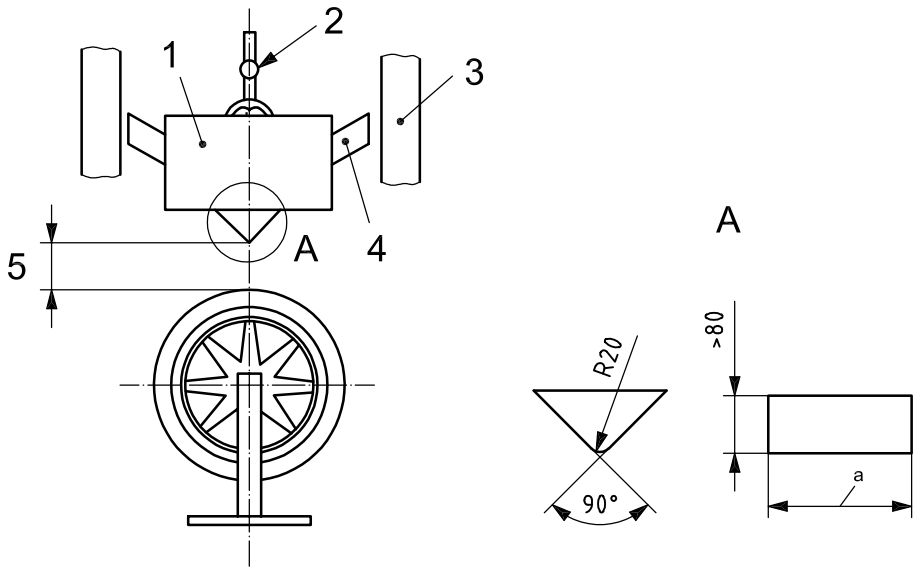
The equipment striker shall provide the following characteristics:

a) the mount on which the wheel is anchored shall have sufficient stiffness and strength;

b) a striker of width at least 1,5 times the width of the rim shall be dropped freely to strike the wheel/tyre assembly.

Examples of the test equipment are shown in Figure 3 a), b) and c).

In the case of equipment using a pendulum [Figure 3 b)], the minimum length of the pendulum arm shall be not less than 800 mm measured from the pivot point to the edge of the striker. Figure 3 c) shows an example of double mass impact test equipment, where the combined spring constant of two coil springs shall be 3 000 ± 100 N/cm and the stroke between the auxiliary striker weight and the main weight shall be 100 ± 5 mm.



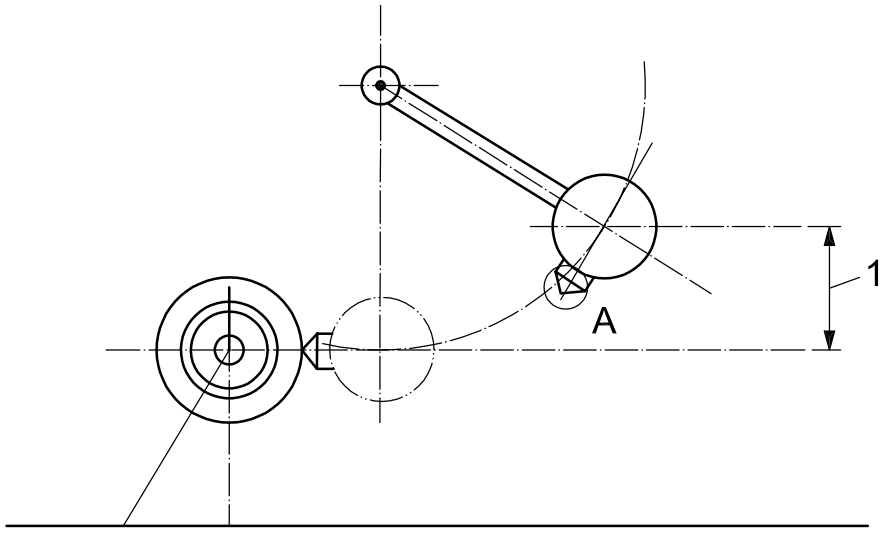
Key

1 striker weight
2 quick-release mechanism
3 frame
4 guide
5 dropping height

[a] 1,5 × rim width.

a) Single mass

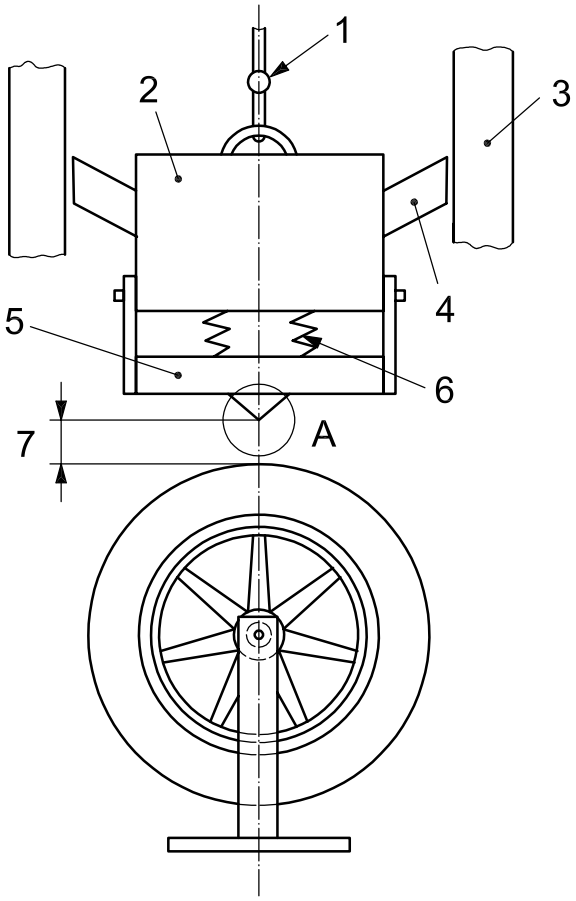
Figure 3 — Example of radial impact resistance test equipment



Key

1 dropping height

b) Pendulum



Key

1 quick-release mechanism
2 main weight
3 frame
4 guide
5 auxiliary weight
6 coil springs (2 pieces)
7 dropping height

c) Double mass

Figure 3 (*continued*)

7.2 Test conditions

7.2.1 Impact load

7.2.1.1 Single mass and pendulum impact resistance test equipment

The mass of the striker, M_s, shall be within a range of ± 2 % of the mass determined by the following equation:

$$M_s = K \times \frac{Fv}{g}$$

where

M_s is the mass of the striker, in kilograms, ± 2 %;

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

g is the gravitational acceleration (9,8 m/s^2);

K is the coefficient; 1,0 for both front and rear wheels.

7.2.1.2 Double mass impact resistance test equipment

The total mass of two strikers, M_d, in kilograms, shall be within a range of ± 2 % of the mass determined by the following equation:

$$M_d = K \times \frac{Fv}{g}$$

where

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

g is the gravitational acceleration (9,8 m/s^2);

K is the coefficient; 2,5 for front wheel or 1,5 for rear wheel.

The mass of the main striker, m_1, shall be determined by the following equation:

$$M_d = m_1 + m_2$$

where

M_d is the total mass of two strikers, in kilograms, as determined above;

m_1 is the mass of the main striker, in kilograms;

m_2 is the mass of the auxiliary striker including the mass of the springs, which is equal to 40 kg.

7.2.2 Tyre inflation pressure

The tyre inflation pressure, P, in kilopascals shall be within in a range of $\pm$ 10 kPa of the pressure determined by the following equation:

$$P = p \times 1{,}15$$

where

p is the air pressure corresponding to the design maximum load of the tyre to be used in the test, in kilopascals.

7.3 Test procedure

Fit the smallest applicable tyre, or the tyre specified by the vehicle or wheel manufacturer. Then mount the combination on the support according to the method used to attach the wheel to the vehicle. The relative position shall be so determined that at the moment of the impact the speed vector passes through the centre of the wheel (see Figure 3). The impact test should be applied at the weakest part of the rim.

Determine the striker mass in accordance with 7.2.1.1 or 7.2.1.2 and the tyre inflation pressure in accordance with 7.2.2.

The striker weight shall be dropped from the following height:

a) in the case of the single mass striker and pendulum impact test equipment:

— front wheel: 180 mm;

— rear wheel: 120 mm;

b) in the case of the double mass impact test equipment:

— front/rear: 150 mm.

8 Torsional fatigue test

8.1 Test equipment

The test equipment shall permit a torsional moment to be applied between the hub and the rim. Figure 4 shows examples of such equipment.

8.2 Test conditions

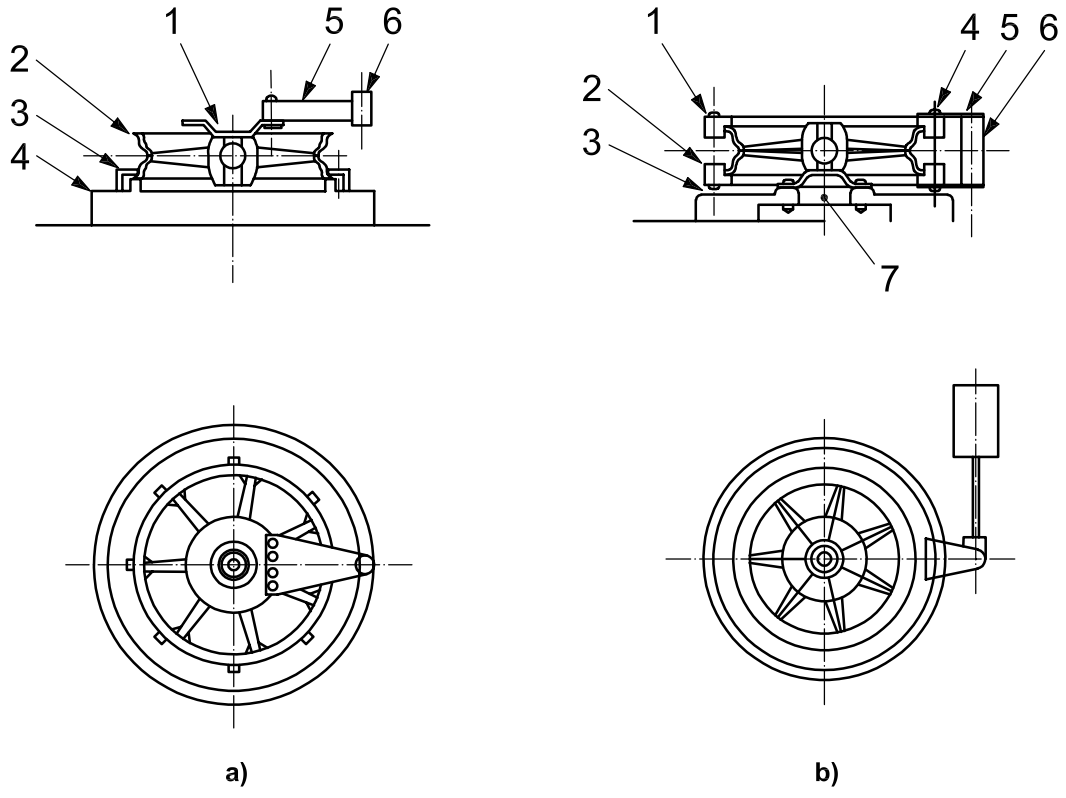
The torsional moment, T, in newton metres, applied as in 8.3, shall be determined by the following equation:

$$T = Fv \times R$$

where

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

R is the maximum static radius, in metres, of the largest applicable tyre, or the tyre specified by the vehicle or wheel manufacturer.



a) **b)**

Key

1 connecting bolt (nut)
2 wheel
3 fastener
4 support
5 loading arm
6 pivot point

Key

1 wheel
2 ring
3 support
4 fastener
5 loading arm
6 pivot point
7 connecting bolt

Figure 4 — Examples of equipment for torsional fatigue test

8.3 Test procedure

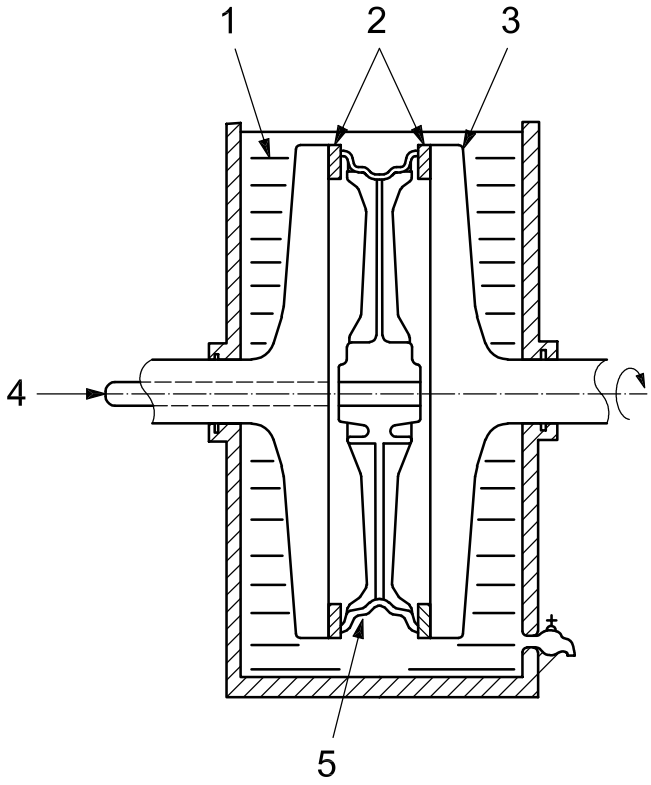
Fix the flange of the wheel rim to the support [see Figure 4 a)] and apply the torsional moment, determined according to 8.2, in to-and-fro directions through the contact face of the hub. The length of the loading arm is recommended to be equal to the radius of the tyre determined in accordance with 5.2.1.

It is also permissible to fix the wheel to the support through the contact face of the hub and apply the torsional moment to the wheel rim by means of an annular ring rigidly attached to the rim [see Figure 4 b)].

9 Air leak test

9.1 Test equipment

Figure 5 shows an example of test equipment suitable for the test given in 9.3.



Key

1 water
2 packing
3 pressure plate
4 pressurized air inlet
5 light-alloy wheel

Figure 5 — Example of equipment for air leak test

9.2 Test conditions

The air pressure to be applied in accordance with 9.3 shall be over 300 kPa.

9.3 Test procedure

Tightly close both sides of the flange by the pressure plate (see Figure 5) and supply the pressurized air as indicated in 9.2 to the inside of the wheel in order to confirm the airtightness of the rim.

Alternatively, for rims of divided construction where sealing rings are used, the rim may be fitted with a tyre, the tyre inflated and the whole assembly immersed in water.

10 Performance

10.1 Durability against bending moment

After being subjected to at least 10^5 cycles, or 10^6 cycles in the case of Heavy Duty (HD) wheels, according to the test specified in Clause 5, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints. (Heavy Duty wheels are used for the three-wheeled vehicles specifically designed to carry goods, and it is recommended that such wheels are marked with the letters “HD”.)

10.2 Durability against radial load

After being subjected to at least 5×10^5 cycles of the test specified in Clause 6, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints.

10.3 Impact resistance

After being subjected to the test specified in Clause 7, there shall be no evidence of harmful cracks, significant deformation, any abnormal looseness at joints or sudden air leakage (more than 50 % of test pressure within 30 s).

10.4 Durability against torsional moment

After being subjected to at least 10^5 cycles of the test specified in Clause 8, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints.

10.5 Airtightness of rims

There shall be no leakage of air as indicated by bubbles through the rim of the wheel after application of the test pressure in accordance with Clause 9 for a minimum period of 2 min.

ICS 43.140

Price based on 11 pages