INTERNATIONAL STANDARD

ISO 4210-7

Second edition
2023-01

Cycles — Safety requirements for bicycles —

Part 7: Wheel and rim test methods

Cycles — Exigences de sécurité pour les bicyclettes —

Partie 7: Méthodes d'essai des roues et des jantes

Reference number
ISO 4210-7:2023(E)

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Published in Switzerland

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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).

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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 149, *Cycles*, Subcommittee SC 1, *Cycles and major sub-assemblies*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 333, *Cycles*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 4210-7:2014), which has been technically revised.

The main changes are as follows:

— addition of 4.5;

— addition of 4.6;

— addition of 4.7.

A list of all parts in the ISO 4210 series can be found on the ISO website.

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

This document has been developed in response to demand throughout the world, and the aim has been to ensure that bicycles manufactured in conformity with this document will be as safe as is practically possible. The tests have been designed to ensure the strength and durability of individual parts as well as of the bicycle as a whole, demanding high quality throughout and consideration of safety aspects from the design stage onwards.

The scope has been limited to safety considerations and has specifically avoided standardization of components.

If the bicycle should be used on public roads, national regulations apply.

Cycles — Safety requirements for bicycles —

Part 7:
Wheel and rim test methods

1 Scope

This document specifies wheel and rim test methods for ISO 4210-2.

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 4210-1, *Cycles — Safety requirements for bicycles — Part 1: Vocabulary*

ISO 4210-2:2023, *Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

ISO 4210-3:2023, *Cycles — Safety requirements for bicycles — Part 3: Common test methods*

ISO 4210-4:2023, *Cycles — Safety requirements for bicycles — Part 4: Braking test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4210-1 apply.

ISO and IEC maintain terminological 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/

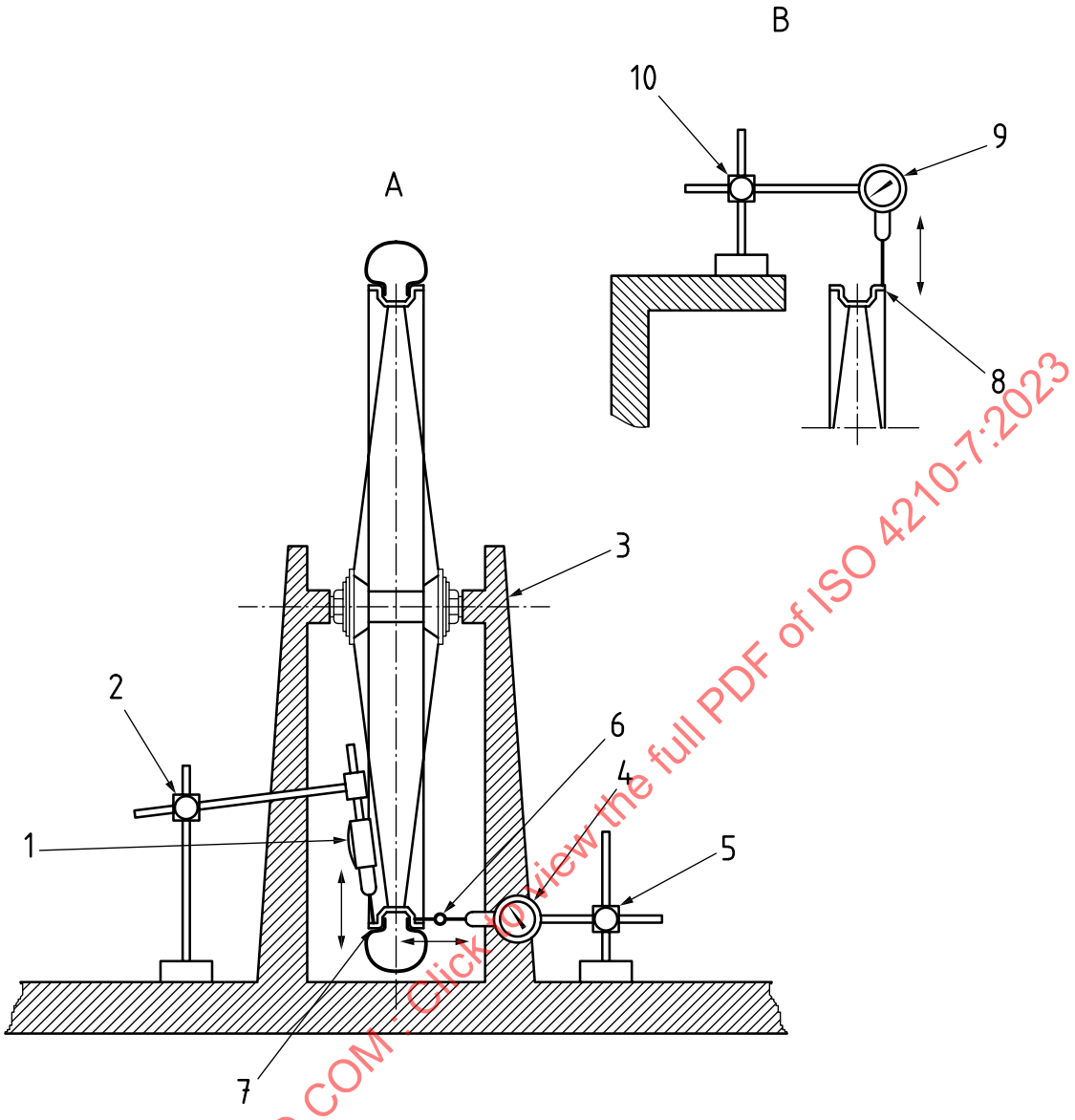
4 Test methods

4.1 Wheel and tyre assembly — Rotational accuracy

The run-out tolerances represent the maximum variation of the position of the rim when measured perpendicular to the axle at a suitable point along the rim (see Figure 1 and Figure 2) (i.e. full indicator reading) of a fully assembled and adjusted wheel during one complete revolution about the axle without axial movement. Both sides of the rim shall be measured and the maximum value shall be taken as result.

For city and trekking, mountain, and young adult bicycles, the measurement of both axial run-out (lateral) and radial run-out (concentricity) shall be done with a tyre fitted and inflated to the maximum inflation pressure, but for rims where concentricity cannot be measured with the tyre fitted, it is permissible to make measurements with the tyre removed.

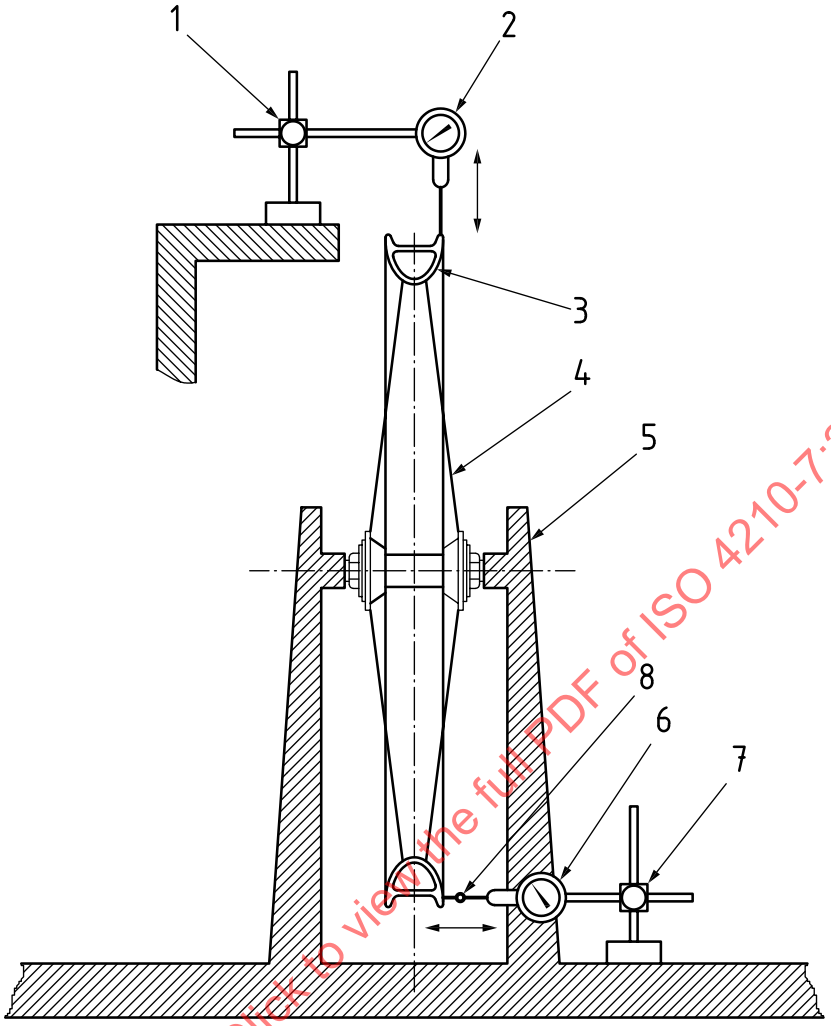
For racing bicycles, the measurement of both axial run-out (lateral) and radial run-out (concentricity) shall be measured at the same time as shown in Figure 2 and a tyre is not required to be fitted.



Key

A	rim with tyre	5	instrument stand
B	rim without tyre	6	roller indicator
1	dial-gauge (concentricity)	7	rim with tyre
2	instrument stand	8	rim without tyre
3	hub axle support	9	dial-gauge (concentricity; alternative positions)
4	dial-gauge (lateral run-out)	10	instrument stand

Figure 1 — Wheels and tyre assembly — Rotational accuracy for city and trekking, young adult, and mountain bicycles



Key

1	instrument stand	5	hub axle support
2	dial-gauge (concentricity)	6	dial-gauge (lateral run-out)
3	rim	7	instrument stand
4	spoke	8	roller indicator

Figure 2 — Wheel — Rotational accuracy for racing bicycles

4.2 Wheel and tyre assembly — Static strength test — Test method

Clamp and support the wheel suitably as shown in Figure 3. Apply a pre-load of 5 N on the rim at one spoke perpendicular to the plane of the wheel as shown in Figure 3. Record the zero position of the rim at the point of load application as shown. Then apply a static force of F given in Table 1 for a duration of 1 min. Reduce the load to 5 N and allow a 1 min settling time. After this settling time and with the 5 N load still applied, re-measure the position of the rim.

The wheel shall be fitted with the appropriate size tyre and inflated to the maximum inflation pressure.

In the case of a rear wheel, apply the force from the sprocket side of the wheel as shown in Figure 3.

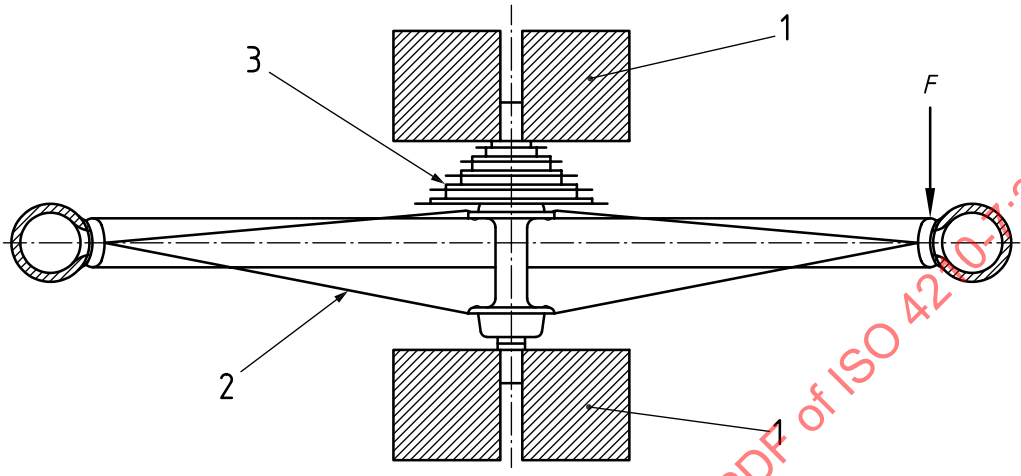
Repeat the above measurement once between two spokes.

See Annex A for fatigue testing.

Table 1 — Forces on rim

Forces in newtons

Bicycle type	City and trekking bicycle	Young adult bicycle	Mountain bicycle	Racing bicycle
Force *F*	250	250	370	250



Key

1 clamping fixture
2 wheel and tyre assembly
3 drive sprockets
F static force

Figure 3 — Wheel and tyre assembly — Static strength test

4.3 Wheels — Front/rear wheel retention devices secured — Test method

Apply a force of 2 300 N distributed symmetrically to both ends of the axle for a period of 1 min in the direction of the removal of the front and rear wheel independently.

4.4 Wheel and tyre assembly — Greenhouse effect test for composite wheels — Test method

A fully assembled wheel, fitted with the appropriate size tyre and inflated according to the lower value between maximum inflation pressure recommended on the rim or the tyre, shall be controlled before the test; lateral run-out shall be controlled according to ISO 4210-2:2023, 4.10.1 and maximum widths of the rim shall be reported. It is acceptable to assemble with a tube, even on a tubeless wheel assembly.

A specific bench as shown in Figure 5 may be used to measure the maximum width all around the rim with tyre and pressure (continuous measuring).

The wheel and tyre assembly is laid down on the ground of a climate chamber, which has been pre-heated at 80 °C, leant on axle and tyre support points, sprocket side of the wheel, as shown in Figure 4, during 4 h. At the end of 4 h, the wheel and tyre assembly should be taken out of the climate chamber and allowed to cool down at room temperature during 4 h to re-measuring the rim width and its conformance to ISO 4210-2:2023, 4.10.6.1 and 4.10.6.2.

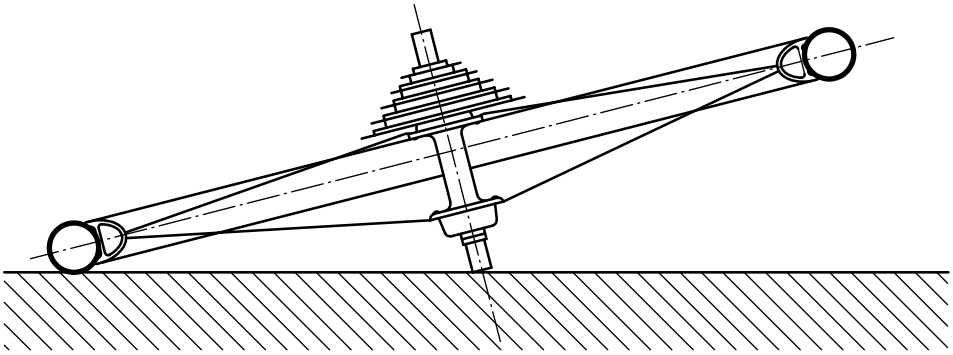
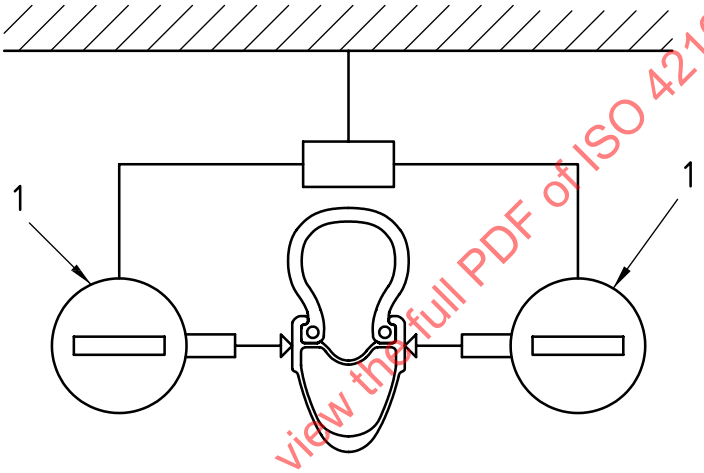


Figure 4 — Wheel laid down on tyre and axle



Key

1 dial-gauge

Figure 5 — Maximum rim width measurement

4.5 Wheel and tyre assembly — Heat-resistance test for composite rims used in conjunction with rim brake

In order to check after the test the requirement in ISO 4210-2:2023, 4.10.7.2.1, the rim shall be measured with the tyre inflated to the method described in 4.4. During this measurement at the beginning of the test, the tyre shall be inflated to the maximum rated pressure for either the rim or tyre, whichever is the lower maximum rating. Both the front and rear wheel shall be tested.

A new wheel with new brake pads (recommended by the rim manufacturer) and a new tyre (tubular tyre, tyre w/inner tube or tubeless tyre) shall be tested.

Drive the wheel by means of the drum and tyre assembly with the brake force applied as specified in ISO 4210-4:2023, 4.6.5.5 at a velocity of 25 km/h with a tolerance of ±5 % with a rearward cooling air-velocity of 25 km/h with a tolerance of ±10 %. Apply a braking force that will produce a total braking energy of 25 Wh with a tolerance of ±5 % measured at the brake calliper. The duration of the test shall be 3 min with a tolerance of ±10 %. Radial load shall be 70 kg on a rotating drum between 250 mm to 1 000 mm in diameter. Braking force shall be controlled and care taken to ensure that the tyre does not slip on the drum surface.

Calculate the braking energy from Formula (1).

$$E = F_{Br} \times V_{Br} \times t\,(\mathrm{Wh}) \tag{1}$$

where

F_{Br} is the braking force (N);

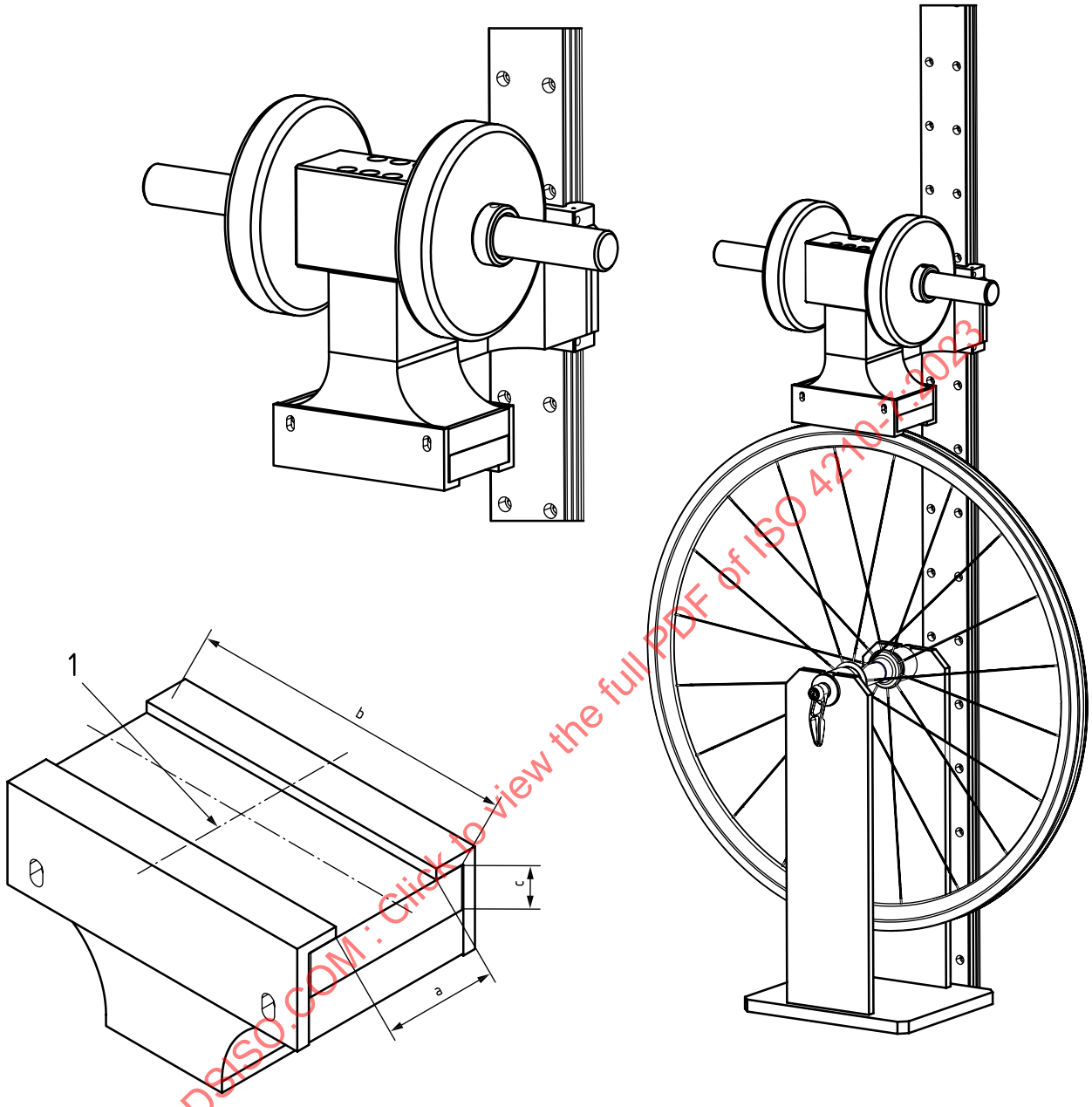
V_{Br} is the linear velocity of the periphery of the tyre (i.e. 25 km/h = 6,94 m/s) (m/s);

t is the duration of total test cycle (excluding interruptions) (i.e. 3 min = 0,05 h) (h).

After the test, the wheel shall sit until it has returned to ambient temperature and then shall be subjected to the width measurement method described in 4.4, in order to check that the requirements in ISO 4210-2:2023, 4.10.7.2.1 have been met.

4.6 Wheel — Impact test — Test method

Place the wheel in a secure fixture in which it is secured by the wheel hub/axle in a vertical (radial) position, as depicted in Figure 6. The tyre shall be removed from the rim wheel assembly after it has met the requirements in ISO 4210-2:2023, 4.10.7. Orient the wheel so that the valve stem hole is around 90° from the impact location and so the impact location is in between two spokes. The impact energy shall be 40 J ± 2 J of energy, with a velocity per ISO 4210-3:2023, 4.7, using the specified impact head and 20 mm rubber pad with hardness Shore A = 50 with a tolerance of ±10 %. Raise the impact fixture to a height (height dependent on mass) with a falling mass of (6 kg to 10 kg) and an impact head similar as described in Figure 6. Impact the wheel and allow the impact head to come to a stop (slight bouncing is normal), then verify if the requirements are met.



Key

1 symmetry axis of rubber pad and striker shall be aligned with the wheel axle

a Pad width: outer rim width + minimum 5 mm on both sides.

b Pad lengths: minimum 150 mm.

c Pad thickness: 20 mm.

Figure 6 — Wheel impact test setup

4.7 Wheel and tyre assembly — Overpressure test — Test method

4.7.1 Wheel and tyre assembly preparation

The test shall be carried out with the combination of wheel and tyre assembly parts used on the fully assembled bicycle. Tyre sealant may be used, per manufacturer's instructions.

4.7.2 Test method

Inflate the tyre to 110 % of the minimum of the maximum tyre pressure or maximum wheel pressure.

Maintain the air pressure for a minimum of 5 min.