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**Cycles — Safety requirements for  
bicycles —**

**Part 6:  
Frame and fork test methods**

*Cycles — Exigences de sécurité des bicyclettes —*

*Partie 6: Méthodes d'essai du cadre et de la fourche*

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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](http://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](http://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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 149, *Cycles*, Subcommittee SC 1, *Cycles and major sub-assemblies*.

This first edition of ISO 4210-6, together with ISO 4210-1, ISO 4210-2, ISO 4210-3, ISO 4210-4, ISO 4210-5, ISO 4210-7, ISO 4210-8, and ISO 4210-9, cancels and replaces ISO 4210:1996, which has been technically revised.

ISO 4210 consists of the following parts, under the general title *Cycles — Safety requirements for bicycles*:

- *Part 1: Terms and definitions*
- *Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*
- *Part 3: Common test methods*
- *Part 4: Braking test methods*
- *Part 5: Steering test methods*
- *Part 6: Frame and fork test methods*
- *Part 7: Wheels and rims test methods*
- *Part 8: Pedals and drive system test methods*
- *Part 9: Saddles and seat-post test methods*

This corrected version of ISO 4210-6:2014 incorporates a correction in Figure 3.

## Introduction

This International Standard has been developed in response to demand throughout the world, and the aim has been to ensure that bicycles manufactured in compliance with this International Standard 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 is to be used on public roads, national regulations apply.

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# Cycles — Safety requirements for bicycles —

## Part 6: Frame and fork test methods

### 1 Scope

This part of ISO 4210 specifies the frame and fork test methods for ISO 4210-2.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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: Terms and definitions*

ISO 4210-2:2014, *Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

ISO 4210-3:2014, *Cycles — Safety requirements for bicycles — Part 3: Common test methods*

### 3 Terms and definitions

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

### 4 Frame test methods

#### 4.1 Frame — Impact test (falling mass)

##### 4.1.1 General

Manufacturers of frames are permitted to conduct the test with a dummy fork (see [Annex A](#)) fitted in place of a front fork.

Where a frame is convertible for male and female riders by the removal of a bar, test it with the bar removed.

Where a suspension fork is fitted, test the assembly with the fork extended to its unloaded free length. Where a rear suspension system is incorporated in the frame, secure the suspension in a position equivalent to that which would occur with an 80 kg rider seated on the bicycle. For young adult bicycles, secure the suspension in a position equivalent to that which would occur with a 40 kg rider seated on the bicycle; if the type of suspension system does not permit it to be locked, then replace the spring/damper unit by a solid link of the appropriate size and with end fittings similar to those of the spring/damper unit.

##### 4.1.2 Test method

Assemble a roller of mass less than or equal to 1 kg and with dimensions conforming to those shown in [Figure 1](#) in the fork. The hardness of roller shall be not less than 60 HRC at impact surface. If a dummy fork is used in place of a fork, the bar shall have a rounded end equivalent in shape to the roller. Hold the

frame-fork or frame-bar assembly vertically with clamping to a rigid fixture by the rear-axle attachment points as shown in [Figure 1](#).

Rest a striker of mass 22,5 kg on the roller in the fork dropouts or on the rounded end of the dummy fork and measure the wheelbase. Raise the striker to a height of  $h_1$  above the low-mass roller and release it to strike the roller or the steel bar at a point in line with the wheel centres and against the direction of the fork rake or rake of the bar. The drop heights are given in [Table 1](#). The striker will bounce and this is normal. When the striker has come to rest on the roller or dummy fork, measure the wheelbase again.

If the fork fails, the frame shall be tested with a dummy fork.

NOTE See ISO 4210-3:2014, Annex B.

**Table 1 — Drop heights**

Dimensions in millimetres

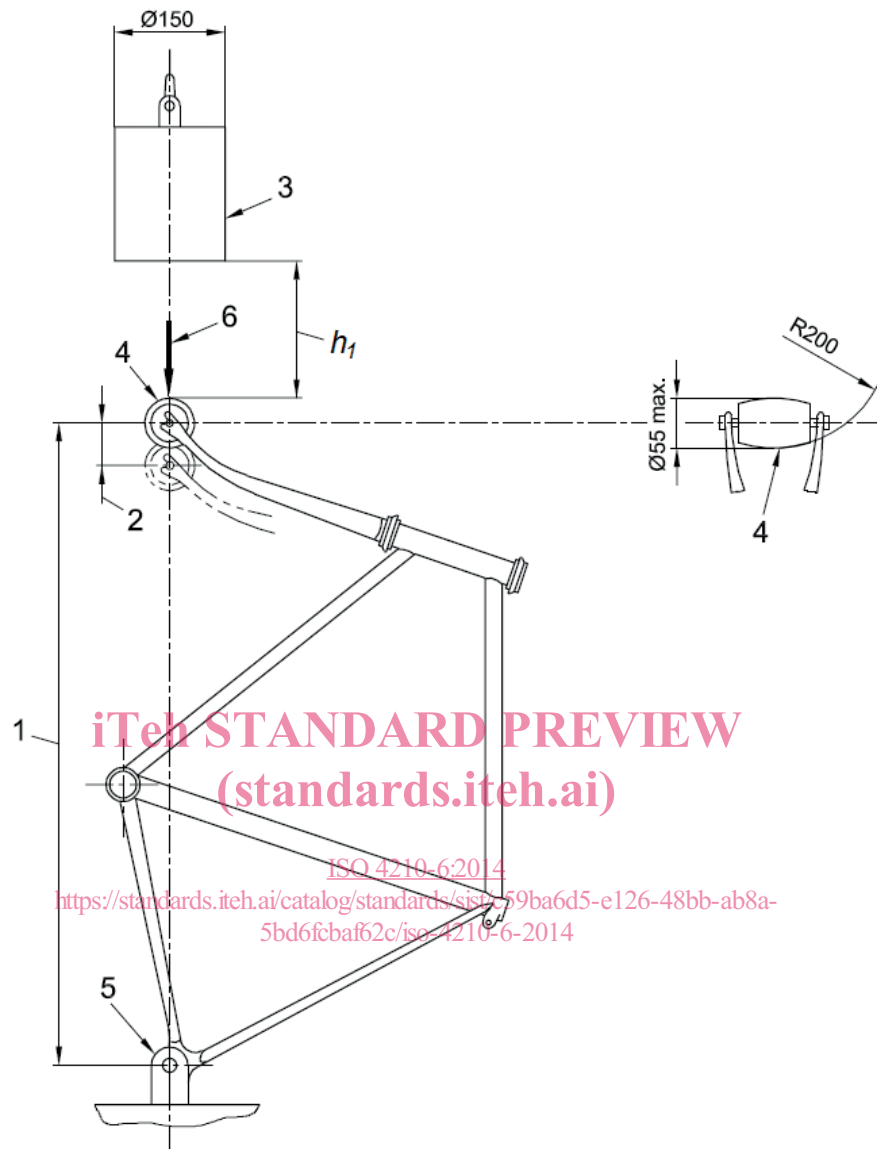
Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Drop height, $h_1$	180	180	360	212

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**Key**

- $h_1$  drop height
- 1 wheelbase
- 2 permanent deformation
- 3 22,5 kg striker
- 4 low-mass roller (1 kg max.)
- 5 rigid mounting for rear-axle attachment point
- 6 direction of rearward impact

**Figure 1 — Frame and front fork assembly — Impact test (falling mass)**

## 4.2 Frame and front fork assembly — Impact test (falling frame)

### 4.2.1 General

Manufacturers of complete bicycles shall conduct the test with the frame fitted with the appropriate front fork.

For manufacturers of frames, where the fork intended for the frame is not available, the test can be conducted with the frame fitted with a fork which meets the requirements of the fork impact test as described in ISO 4210-2:2014, 4.9.5.

Where a frame is convertible for male and female riders by the removal of a bar, test it with the bar removed.

Where a suspension fork is fitted, it shall be at its unloaded length prior to the impact. If the spring/damper unit can be locked, it shall be locked in its unloaded length position. If the spring/damper cannot be locked, use one of the two following alternative procedures:

- secure the fork at its extended length by an external locking method, or
- replace the fork by a rigid fork which is known to meet the requirements of the impact test described in ISO 4210-2:2014, 4.9.5 and of a length which is consistent with an 80 kg (in case of young adult bicycles, apply 40 kg) rider seated in a normal riding position on the bicycle when it is equipped with the suspension fork.

Where a rear suspension system is incorporated in the frame, secure the spring/damper unit in a position equivalent to that which would occur with an 80 kg (in case of young adult bicycles, apply 40 kg) rider seated on the bicycle; if the type of suspension system does not permit it to be locked, then replace the spring/damper unit by a solid link of the appropriate size and with end fittings similar to those of the spring/damper unit.

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### 4.2.2 Test method

Conduct the test on the assembly used for the test in ISO 4210-2:2014, 4.8.2 or, in the case of a frame manufacturer who does not make forks, with the same frame with a suitable fork fitted (see 4.2.1).

As shown in [Figure 2](#), mount the frame-fork assembly at its rear axle attachment points so that it is free to rotate about the rear axle in a vertical plane. Support the front fork on a flat steel anvil so that the frame is in its normal position of use. Securely fix mass  $M_1$  to the seat-post as shown in [Figure 2](#) with the centre of gravity at distance  $D$  ( $= 75$  mm) along the seat-post axis from the insertion point, and fix masses of  $M_2$  and  $M_3$  ([Table 2](#)) to the top of the steering head and the bottom bracket, respectively, as shown in [Figure 2](#).

Measure the wheelbase with the three masses in place. Rotate the assembly about the rear axle until the distance between the low-mass roller and the anvil is  $h_2$ , then allow the assembly to fall freely to impact on the anvil.

Repeat the test and then measure the wheelbase again with the three masses in place and the roller resting on the anvil.

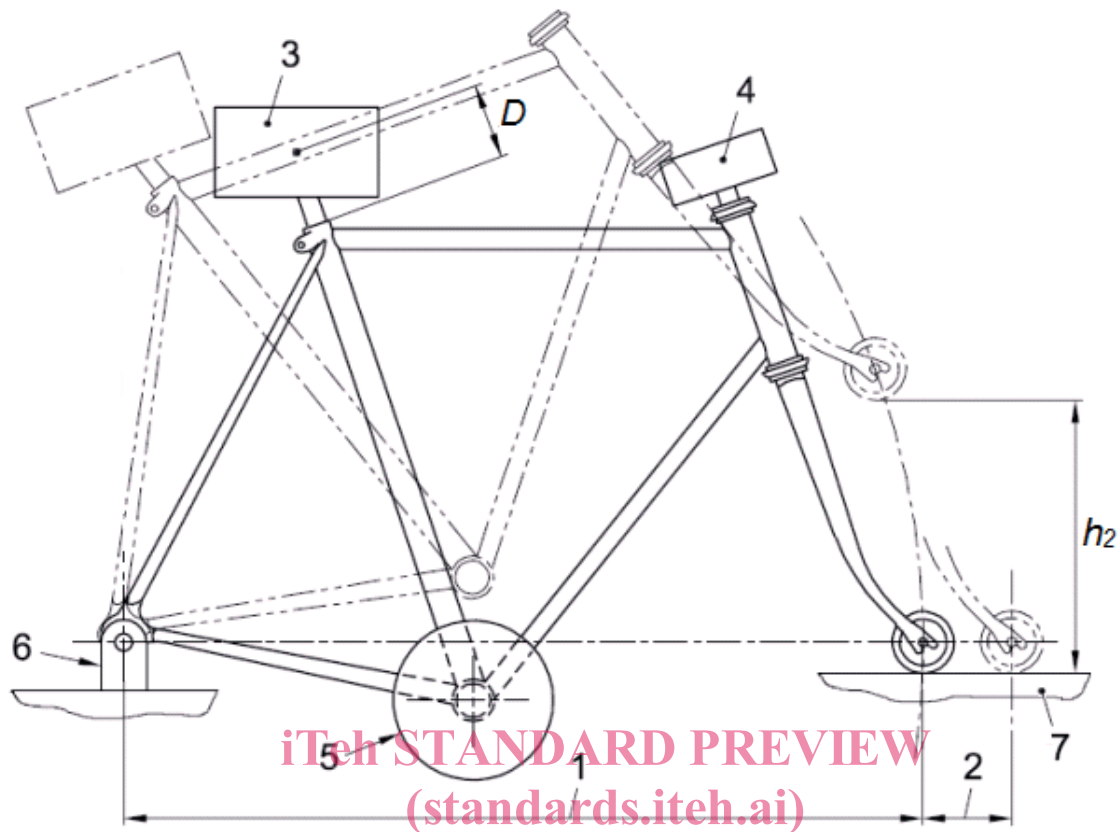
**Table 2 — Drop heights and distribution of masses at seat post, steering head, and bottom bracket**

Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Mass 1 Seat-post, $M_1$ kg	50	40	30	30
Mass 2 Steering head, $M_2$ kg	10	10	10	10
Mass 3 Bottom bracket, $M_3$ kg	30	20	50	50
Drop height, $h_2$ mm	200	200	300	200

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**Key**

- 1 wheelbase
- 2 permanent deformation
- 3 mass 1 ( $M_1$ )
- 4 mass 2 ( $M_2$ )
- 5 mass 3 ( $M_3$ )
- 6 rigid mounting for rear-axle attachment point
- 7 steel anvil
- $D$  distance to the centre of gravity (75 mm)
- $h_2$  drop height

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**Figure 2 — Frame and front fork assembly — Impact test (falling frame)**

**4.3 Frame — Fatigue test with pedalling forces**

**4.3.1 General**

All types of frame shall be subjected to this test.

In tests on suspension frames with pivoted joints, adjust the spring, air pressure, or damper to provide maximum resistance, or, for a pneumatic damper in which the air pressure cannot be adjusted, replace the suspension unit with a rigid link, ensuring that its end fixings and lateral rigidity accurately simulate those of the original unit. For suspension frames in which the chain stays do not have pivots but rely on flexing, ensure that any dampers are set to provide the minimum resistance in order to ensure adequate testing of the frame.