INTERNATIONAL STANDARD

ISO 4210-8

Second edition
2023-01

Cycles — Safety requirements for bicycles —

Part 8: Pedal and drive system test methods

Cycles — Exigences de sécurité pour les bicyclettes —

Partie 8: Méthodes d'essai des pédales et du système de transmission

Reference number
ISO 4210-8:2023(E)

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Published in Switzerland

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Foreword

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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 4210-8:2014), which has been technically revised.

The main changes are as follows:

— improvement of 4.1;

— improvement of 4.2;

— improvement of 4.5;

— improvement of 4.6.2.

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 8: Pedal and drive system test methods

1 Scope

This document specifies pedal and drive system 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 4210-3:2023, *Cycles — Safety requirements for bicycles — Part 3: Common test methods*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

3 Terms and definitions

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

4.1 Pedal — Static strength test

Screw the pedal spindle securely into a suitable rigid fixture with its axis horizontal, as shown in Figure 1. Place a steel U-shaped loading block, dimensioned as shown in Figure 1, so that its edge is located at 40 mm from the end of the pedal. The width of the U-shaped block shall be such that its edges are aligned with the edges of the pedal. The loading block shall be free to rotate as shown in Figure 1 to ensure a constant contact with the pedal.

For pedals with binding systems, the force may instead be applied to a cleat fitted onto the pedal.

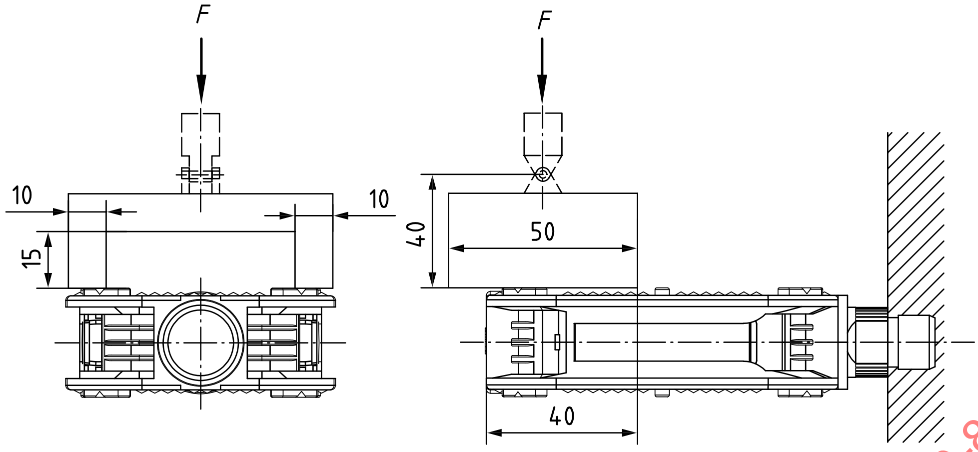
Apply a vertically downward force of 1 500 N for 5 min to the centre of the U-shaped loading block, as shown in Figure 1. Release the force and examine the pedal assembly and the spindle.

For folding pedals, check for any changes to the setting of the folding mechanism.

If the folding pedal has two different riding sides, the test shall be applied on each side.

For pedals with a single riding side, the test shall be applied only on the riding side.

Dimensions in millimetres



Key

F vertically downward force, 1 500 N

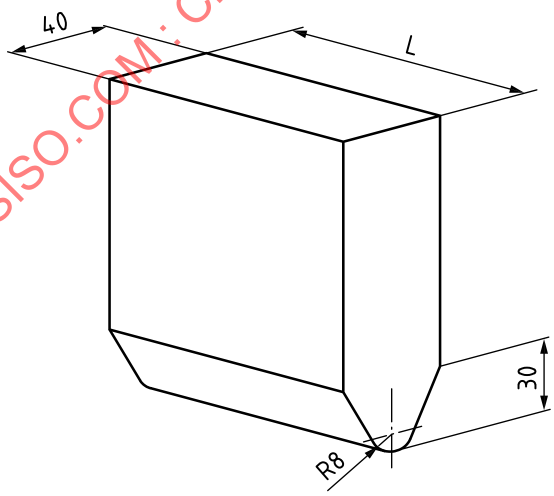
Figure 1 — Pedal/pedal-spindle assembly — Static strength test

4.2 Pedal — Impact test

Screw the pedal-spindle securely into a suitable rigid fixture with its axis horizontal as shown in Figure 3 and release a striker of the design shown in Figure 2 and mass of 15 kg from a height of 400 mm to strike the pedal at the centre of the pedal. The length of the striker shall be equal to or wider than the length of the tread surface. For pedals with binding systems, the cleat shall be attached and the cleat length shall be used instead of the tread surface length.

NOTE See ISO 4210-3:2023, Annex B.

Dimensions in millimetres



Key

L length of the striker

Figure 2 — Striker dimensions

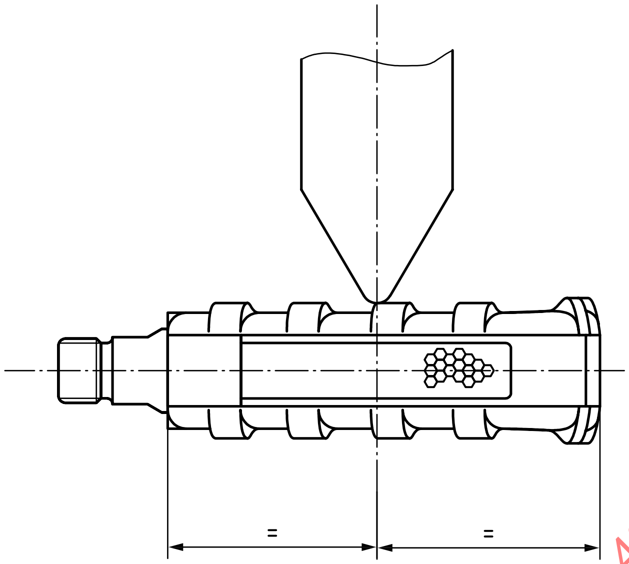


Figure 3 — Position of impact

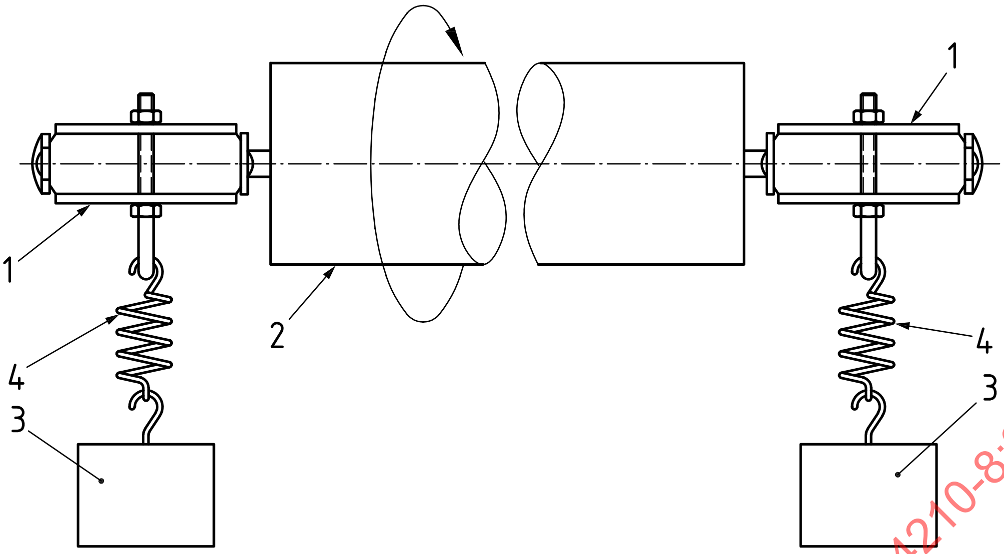
4.3 Pedal — Dynamic durability test

Screw each pedal securely into a threaded hole in a rotatable test shaft as shown in Figure 4 and suspend a weight with a mass, *m*, at the centre of the pedal width by means of a tension spring to each pedal, the object of the springs being to minimize oscillations of the load. The masses are given in Table 1.

Drive the shaft at a speed not exceeding 100 min^{-1} for a total of 100 000 revolutions. If the pedals are provided with two tread surfaces, they shall be turned through 180° after 50 000 revolutions.

Table 1 — Masses on pedal

Bicycle type	City and trekking bicycle	Young adult bicycle	Mountain bicycle	Racing bicycle
Mass, *m* kg	80	80	90	90



Key

1 pedal
2 test shaft
3 mass
4 tension spring

Figure 4 — Pedal/pedal-spindle — Dynamic durability test

4.4 Drive system — Static strength test

4.4.1 Test method for drive system with chain

4.4.1.1 General

Conduct the drive system static load test on an assembly comprising the frame, pedals, transmission system, rear wheel assembly, and, if appropriate, the gear-change mechanism. Support the frame with the central plane vertical and with the rear wheel held at the rim to prevent the wheel from rotating.

4.4.1.2 Single-speed system

With the non-drive side crank in the forward position, apply a force, F_1, increasing gradually to 1 500 N vertically downwards to the centre of the non-drive side pedal. Maintain this force for 1 min.

Should the system yield or the drive-sprockets tighten, such that the crank rotates while under load to a position more than 30° below the horizontal, remove the test force, return the crank to the horizontal position or some appropriate position above the horizontal to take account of yield or movement, and repeat the test.

On completion of the test on the non-drive side crank, repeat the test with the drive side crank in the forward position and with the force applied to the drive side pedal.

4.4.1.3 Multi-speed system

a) Conduct the tests described in 4.4.1.2 with the transmission correctly adjusted in its highest gear.

b) Conduct the tests generally as described in 4.4.1.2 with the transmission correctly adjusted in its lowest gear but, where appropriate, with the maximum force, F_1, adjusted to suit the particular gear ratio. Thus:

The maximum force, F_1, shall be a function of the lowest gear ratio, N_c/N_s,

where

F_1 is the force applied to the pedal, expressed in newton (N);

N_c is the number of teeth on the smallest chain wheel (front);

N_s is the number of teeth on the largest sprocket (rear).

Where the ratio N_c/N_s has a value equal to or greater than 1, the force, F_1, shall be 1 500 N; but where the ratio N_c/N_s has a value less than 1, the force, F_1, shall be reduced in proportion to the lowest gear ratio. Thus:

F_1 is 1 500 × N_c/N_s.

4.4.2 Test method for drive system with belt

The sample in its fully finished condition (with teeth, if any) shall be submitted to a water spray conditioning equivalent to IPX4 specified in IEC 60529:2001, 14.2.4 during 10 min. Application of the loading shall be done within 20 min after conditioning.

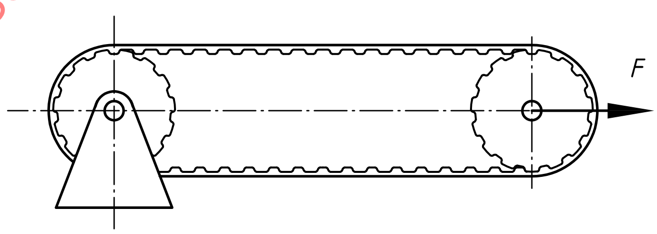
a) If the drive system is a single-speed system, conduct the tests as described in 4.4.1.2.

b) If the drive system is a multi-speed system, conduct the tests as described in 4.4.1.3.

4.5 Drive belt — Tensile strength test

Set up a fixture with two drive pulleys that are similar or identical as shown in Figure 5. At least one pulley should be free to rotate. Increase the tensile load gradually until the tension load of the belt reaches 8 000 N.

NOTE 8 000 N is the tension load within the belt and requires a load F of 16 000 N to achieve this tension load.



Key

F load, 16 000 N

Figure 5 — Drive belt — Tensile strength test

4.6 Crank assembly — Fatigue test

4.6.1 General

Two types of fatigue test are specified for mountain bicycles: the first test with the cranks positioned at 45° to the horizontal to simulate the forces due to pedalling, and the second test with the cranks positioned at 30° to the horizontal, which has been found to simulate the forces due the rider standing on the pedals during the descent of hills. The two tests shall be conducted on separate assemblies.

4.6.2 Test method with the cranks at 45° to the horizontal

Mount the crank assembly located on its production bearings in a fixture with bearing housings representative of the bottom-bracket [as shown in Figure 6 a)]. The drive side crank arm shall be 180° from the non-drive side crank arm. Position the crankset so that the drive side crank arm is at 45° below the horizontal [as shown in Figure 6 a)]. Attach a pedal-spindle adaptor to drive side crank arm. The non-drive side crank is not attached to any pedal-spindle adaptor.

Prevent rotation by locating a suitable length of drive chain around the largest or only chain wheel and securing it firmly to a suitable rear support, or, for any other type of transmission (e.g. belt- or shaft-drive) by securing the first stage of the transmission. Attach the chain so that it is horizontal (±10°) to represent a real drivetrain [as shown in Figure 6 a)].

Stage 1: Apply repeated, vertical downward, dynamic force of F_2 to the pedal-spindle adaptors of the drive side crank at a distance of 65 mm from the outboard face of the crank for C test cycles [as shown in Table 2 and Figure 6 a)] where one test cycle consists of loading and unloading the drive side crank once.

The assembly shall not be disassembled between test phases.

Stage 2: After C test cycles, rotate the crank assembly 180° so that the non-drive side crank arm is in the 45° forward downward position. The crankset assembly shall not be disassembled to perform transition from Stage 1 to Stage 2. The drive side crank is not attached to any pedal-spindle adaptor. Resume the test by applying a repeated, vertical downward, dynamic force of F_2 to the pedal-spindle adaptor of the non-drive side crank at a distance 65 mm from the outboard face of the crank for C test cycles [see Table 2 and Figure 6 b)]. The maximum test frequency shall be maintained as specified in ISO 4210-3:2023, 4.5.

Table 2 — Forces on pedal-spindle and test cycles

Bicycle type	City and trekking bicycle	Young adult bicycle	Mountain bicycle	Racing bicycle
Force, F_2 N	1 300	1 300	1 800	1 800
Test cycles, C	100 000	100 000	50 000	100 000