BS EN ISO 4210-5:2014

Incorporating corrigendum February 2015

BSI Standards Publication

Cycles — Safety requirements for bicycles

Part 5: Steering test methods (ISO 4210-5:2014)

National foreword

This British Standard is the UK implementation of EN ISO 4210-5:2014. Together with BS EN ISO 4210-1:2014, BS EN ISO 4210-2:2014, BS EN ISO 4210-3:2014, BS EN ISO 4210-4:2014, BS EN ISO 4210-6:2014, BS EN ISO 4210-7:2014, BS EN ISO 4210-8:2014, BS EN ISO 4210-9:2014 it supersedes BS EN 14764:2005, BS EN 14766:2005 and BS EN 14781:2005, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GME/25, Cycles.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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31 March 2015	Implementation of ISO corrected text 1 February 2015. Change to Figure 6 and a correction of the format of all tables.

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July 2014

ICS 43.150

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Cycles - Safety requirements for bicycles - Part 5: Steering test methods (ISO 4210-5:2014)

Cycles - Exigences de sécurité des bicyclettes - Partie 5: Méthodes d'essai de guidage (ISO 4210-5:2014)

Fahrräder - Sicherheitstechnische Anforderungen an Fahrräder - Teil 5: Prüfverfahren für die Lenkung (ISO 4210-5:2014)

This European Standard was approved by CEN on 21 June 2014.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

This document (EN ISO 4210-5:2014) has been prepared by Technical Committee ISO/TC 149 "Cycles" in collaboration with Technical Committee CEN/TC 333 “Cycles” the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by July 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14764:2005, EN 14766:2005, EN 14781:2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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Endorsement notice

The text of ISO 4210-5:2014 has been approved by CEN as EN ISO 4210-5:2014 without any modification.

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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).

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).

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 4210-5, together with ISO 4210-1, ISO 4210-2, ISO 4210-3, ISO 4210-4, ISO 4210-6, 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 4210-5:2014 incorporates a change in Figure 6 and a correction of the format of all tables.

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.

Cycles — Safety requirements for bicycles —

Part 5:
Steering test methods

1 Scope

This part of ISO 4210 specifies the steering 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

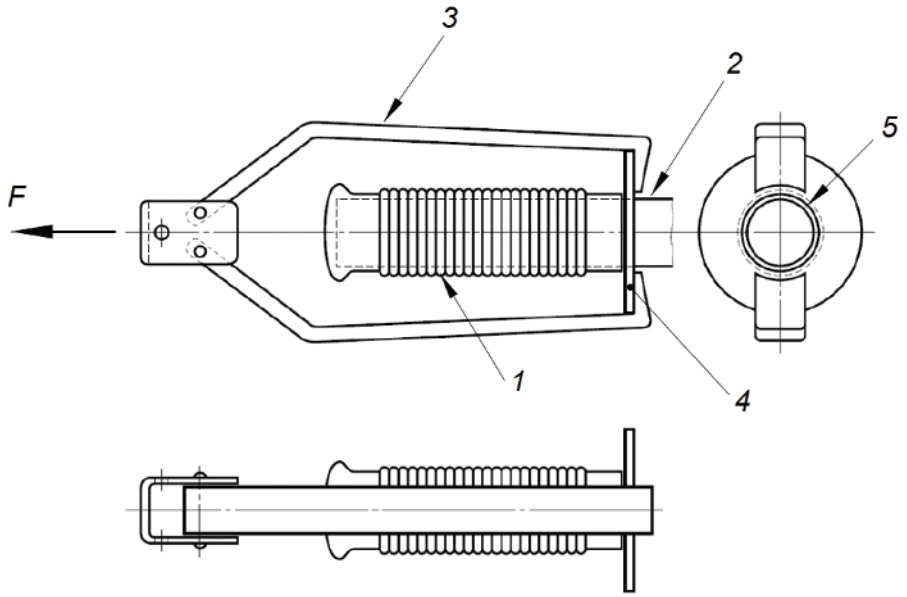
For the purposes of this document, the terms and definitions given in ISO 4210-1 apply.

4 Test methods

4.1 Handlebar grips and plugs

4.1.1 Freezing test

Immerse the handlebar, with handlebar grips or plugs fitted, in water at room temperature for 1 h and then place the handlebar in a freezer until the handlebar is at a temperature lower than −5 °C. Remove the handlebar from the freezer and allow the temperature of the handlebar to reach −5 °C, and then apply a force of 70 N to the grip or plug in the loosening direction as shown in Figure 1. Maintain the force until the temperature of the handlebar has reached +5 °C. It shall be permitted to create a hole in the plug to allow for the testing fixture to be fitted so long as the hole does not affect the seat of the plug in the handlebar and the fixture does not contact the handlebar during the test.



Key

1 handlebar grip
2 handlebar
3 drawing attachment
4 hooking ring
5 clearance

NOTE The hooking ring can be divided.

Figure 1 — Example of handlebar grip drawing attachment

4.1.2 Hot water test

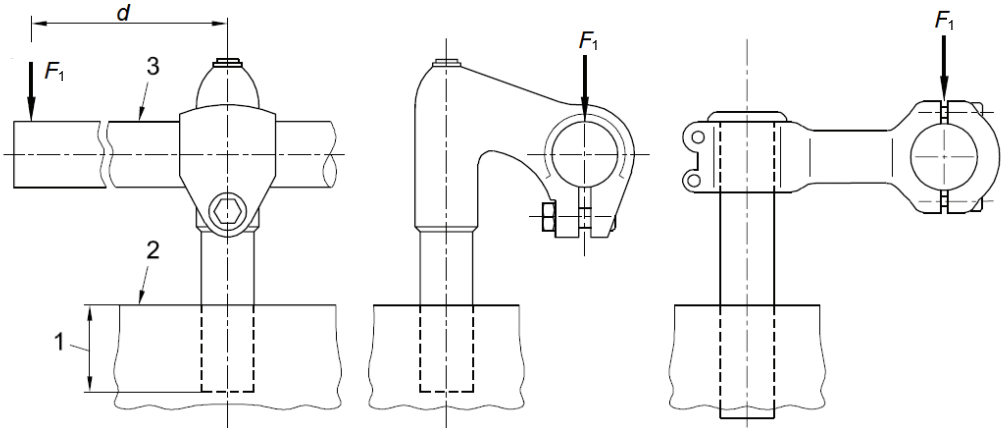
Immerse the handlebar, with handlebar grips fitted, in hot water of +60 °C ± 2 °C for 1 h. Remove the handlebar from the hot water, allow the handlebar to stabilize at ambient temperature for 30 min, and apply a force of 100 N to the grip in the loosening direction as shown in Figure 1. Maintain this force for 1 min.

4.2 Handlebar stem — Lateral bending test

For stems which have a quill for insertion into a fork steerer, clamp the quill securely in a fixture to the minimum insertion depth as specified in ISO 4210-2:2014, 4.7.3, or for stem extensions which clamp directly on to an extended fork steerer, attach the extension to a fork steerer according to the manufacturer's instructions and clamp this fork steerer securely in a fixture to the appropriate height. Assemble a test bar to the stem, and apply a force of F_1 at a distance of d from the axis of the stem as shown in Table 1 and Figure 2. Maintain this force for 1 min.

Table 1 — Forces and distances on handlebars

Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Force, F_1 N	600	600	1 000	1 000
Distance, d mm	300	300	300	230



a) Combined stem and quill **b) Stem extension**

Key

1 minimum insertion depth
2 clamping block
3 solid-steel bar

Figure 2 — Handlebar stem — Lateral bending test

4.3 Handlebar and stem assembly — Lateral bending test

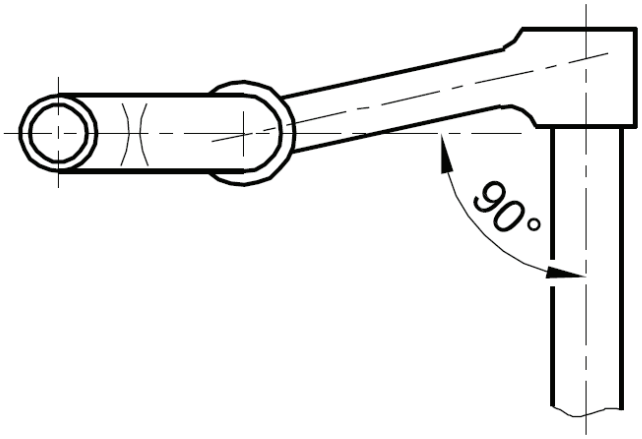
Assemble the handlebar and stem in accordance with the manufacturer's instructions and, unless the handlebar and stem are permanently connected, e.g. by welding or brazing, align the grips portion of the handlebar in a plane perpendicular to the stem axis [see Figure 3 a) or Figure 4 a)]. For stems which have a quill for insertion into a fork steerer, clamp the quill securely in a fixture to the minimum insertion depth, or for stem extensions which clamp directly on to an extended fork steerer, attach the extension to a fork steerer according to the manufacturer's instructions and clamp this fork steerer securely in a fixture to the appropriate height. Apply a force of F_2 (see Table 2) at a distance of 50 mm from the free end of the handlebar and parallel to the axis of the fork steerer as shown in Figures 3 or 4. Maintain this force for 1 min.

Table 2 — Forces on handlebars

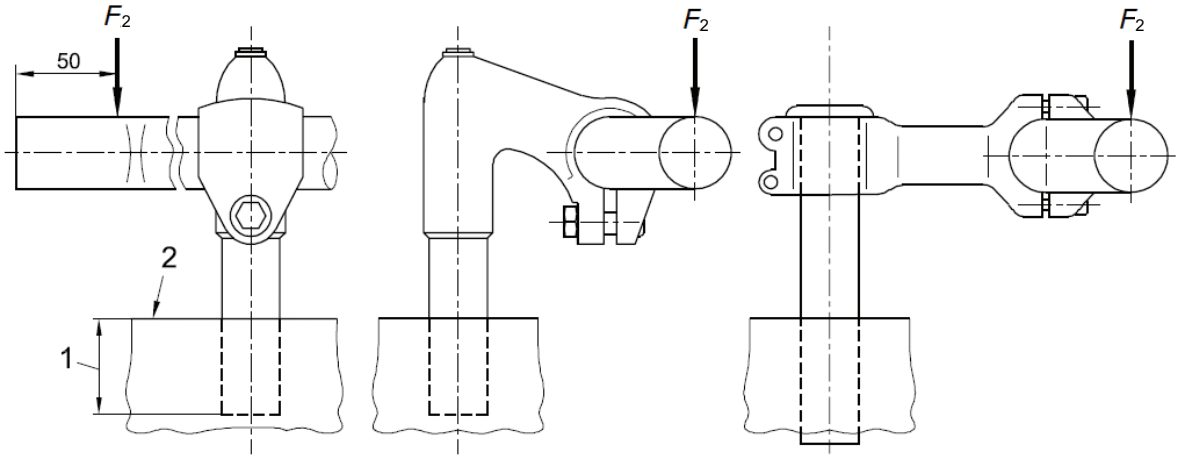
Forces in newtons

Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Force, F_2	600	600	1 000	1 000

Dimensions in millimetres



a) Orientation of adjustable handlebars



b) Combined stem and quill

c) Stem extension

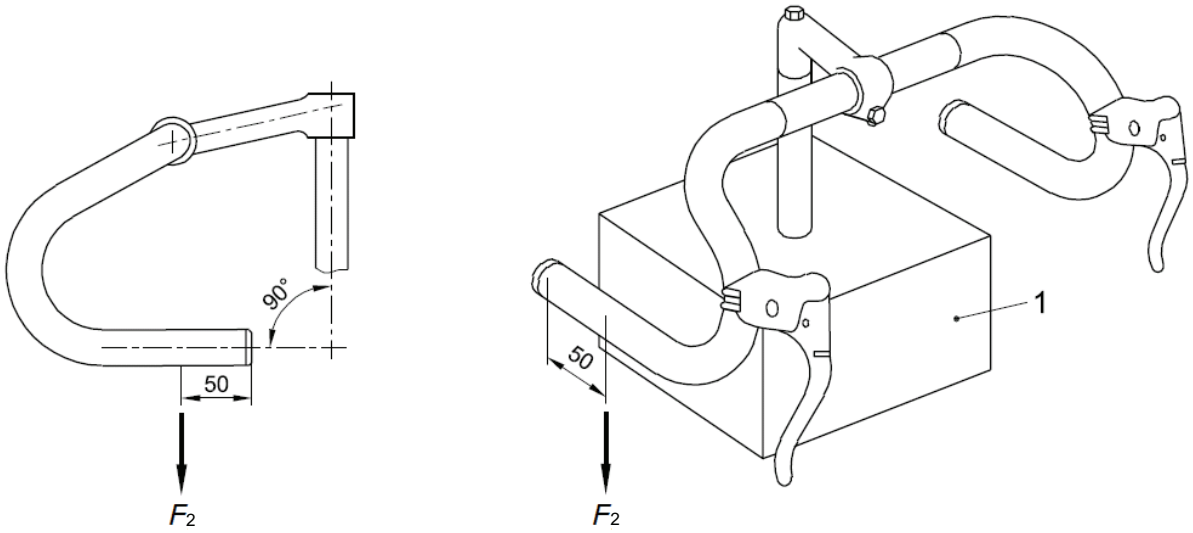
Key

1 minimum insertion depth

2 clamping block

Figure 3 — Handlebar and stem assembly — Lateral bending test for city and trekking, young adult, and mountain bicycles

Dimensions in millimetres



a) Orientation of adjustable handlebars **b) Position of applied forces**

Key

1 clamping fixture

Figure 4 — Handlebar and stem assembly — Lateral bending test for racing bicycles

4.4 Handlebar stem — Forward bending test

4.4.1 Test method for stage 1

For stems which have a quill for insertion into a fork steerer, clamp the quill securely in a fixture to the minimum insertion depth, or for stem extensions which clamp directly on to an extended fork steerer, clamp the handlebar stem extension securely on to a suitable, solid-steel bar and clamp the bar in securely in a fixture, the projecting length of the bar not being critical.

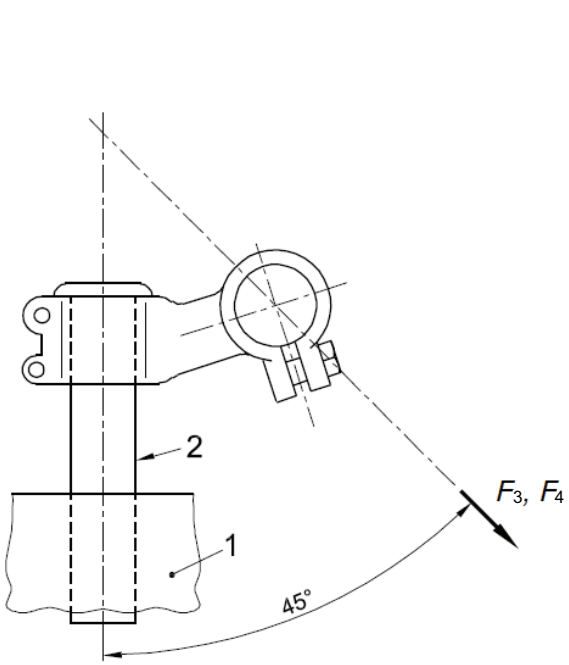
Apply a force of F_3 through the handlebar attachment point in a forward and downward direction and at 45° to the axis of the quill or steel bar as shown in Figure 5 and maintain this force for 1 min. The forces are given in Table 3. Release the test force and measure any permanent deformation as specified in ISO 4210-2:2014, 4.7.6.3.2.

If the handlebar stem meets the requirement of ISO 4210-2:2014, 4.7.6.3.2, conduct stage 2 of the test.

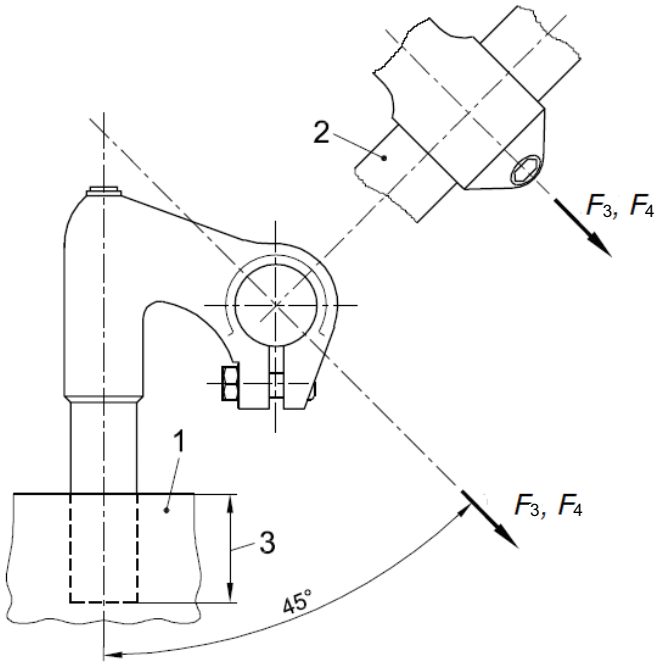
Table 3 — Forces on stems

Forces in newtons

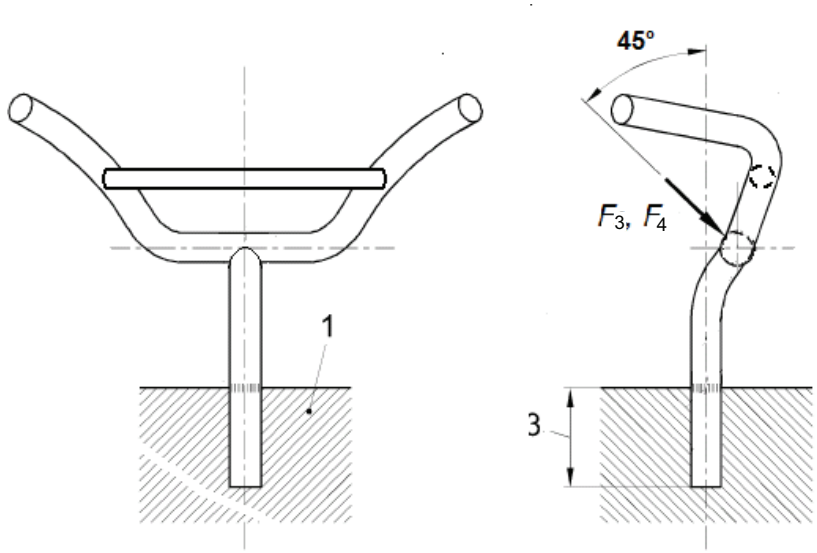
Bicycle type		City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Stage 1	Force, F_3	1 600	1 600	1 600	1 600
Stage 2	Force, F_4	2 000	2 000	2 600	2 300



a) Stem extension



b) Combined stem and quill



c) One piece stem-handlebar

Key

1 clamping fixture
2 solid-steel bar
3 minimum insertion depth

Figure 5 — Handlebar stem — Forward bending test

4.4.2 Test method for stage 2

With the handlebar stem mounted as in stage 1 (see 4.4.1), apply a progressively increasing force in the same position and direction as in 4.4.1 until either the force reaches a maximum of F_4 or until the handlebar stem deflects 50 mm measured at the point of application of the test force and in the direction of the test force. If the stem does not yield or continue to yield, maintain the force for 1 min. The forces are given in Table 3.

4.5 Handlebar to handlebar stem — Torsional security test

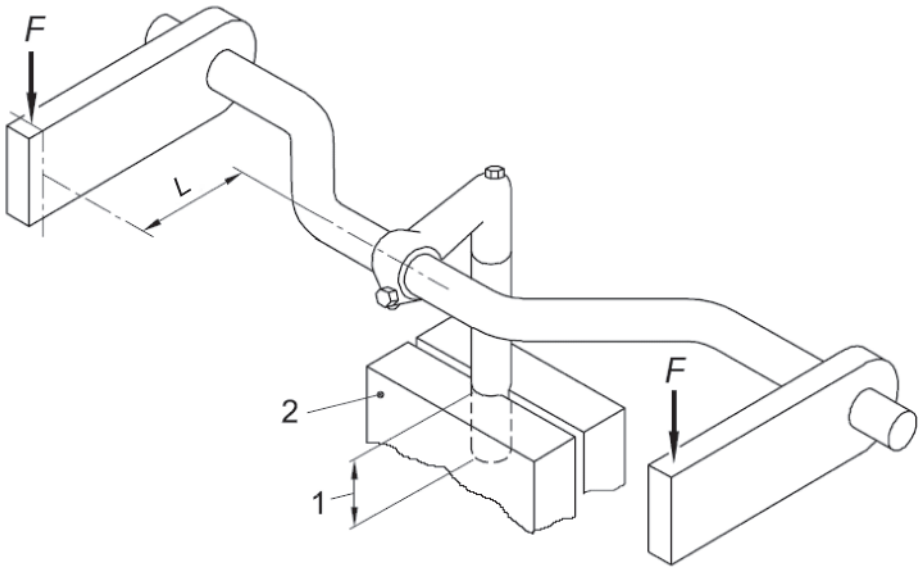
Assemble the handlebar correctly in the handlebar stem with the locking system tightened in accordance with the manufacturer's instructions and clamp the handlebar stem securely in a fixture to the minimum insertion depth and with its axis vertical. Apply a torque of T_1 about the centreline of the stem-clamp. Divide the torque equally by vertically, downward forces applied to both sides of the handlebar and maintain the forces for 1 min. The torque is given in Table 4.

NOTE The exact method of applying the torque will vary with the type of handlebar, and an example is shown in Figure 6 ($T_1 = F \times L$).

Table 4 — Torque on handlebar

Torques in newton metres

Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Torque, T_1	60	60	80	60



Key

1 minimum insertion depth

2 clamping block

Figure 6 — Handlebar to handlebar stem — Torsional security test for applying forces to clamping block

4.6 Handlebar stem to fork steerer — Torsional security test

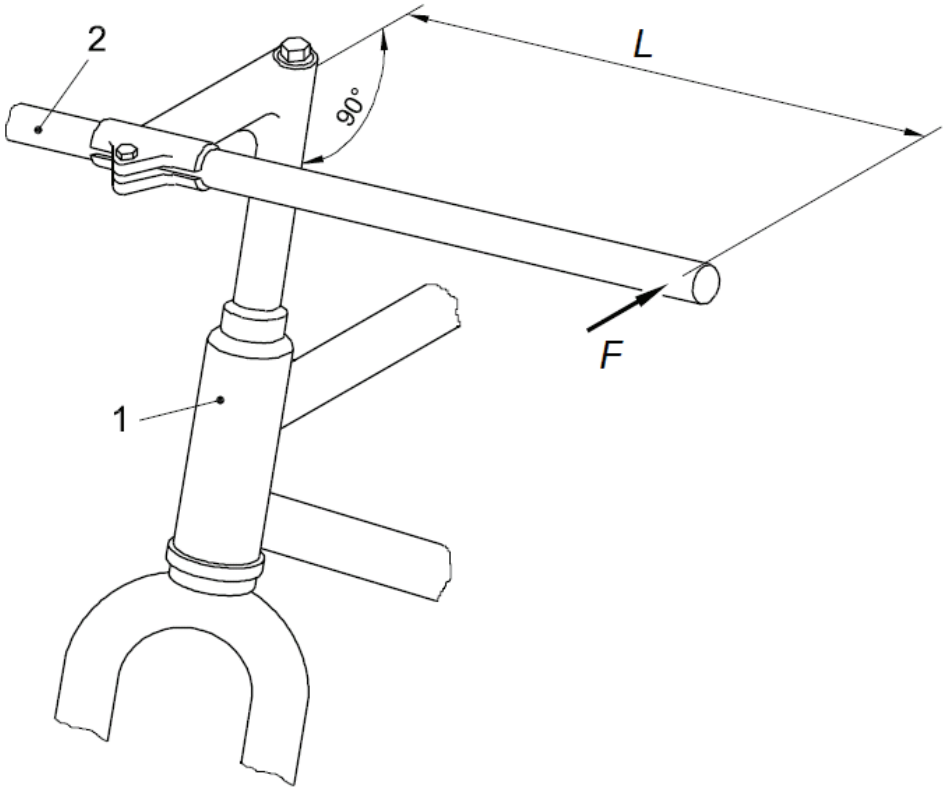
Assemble the fork steerer correctly in the frame and attach the handlebar stem to the fork steerer with the locking system tightened in accordance with the manufacturer's instructions, and apply a torque of

T_2 once in each direction of possible rotation by applying a force on the test bar in a plane perpendicular to the axis of the fork steerer/handlebar stem. Maintain each torque for 1 min. The torque is given in Table 5. The exact method of applying the torque can vary, and an example is shown in Figure 7.

Table 5 — Torque on handlebar stem

Torques in newton metres

Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Torque, T_2	40	40	50	40



Key

1 frame and fork assembly

2 solid-steel bar

Figure 7 — Handlebar stem to fork steerer — Torsional security test

4.7 Bar end to handlebar — Torsional security test

Secure the handlebar in a suitable fixture and assemble the bar end on the handlebar tightening the fixings in accordance with the bar end manufacturer's instructions. Apply a force of F_5 (see Table 6) to the following position:

a) if the bar end's length is more than 100 mm, at a distance of 50 mm from the free end of the bar end [see Figure 8 a)];

b) if the bar end's length is from 50 mm to 100 mm, at a distance of 50 mm from the axis of the handlebar [see Figure 8 b)];

c) if the bar end's length is less than 50 mm, apply a load to the mid-point of the bar end [see Figure 8 c)].

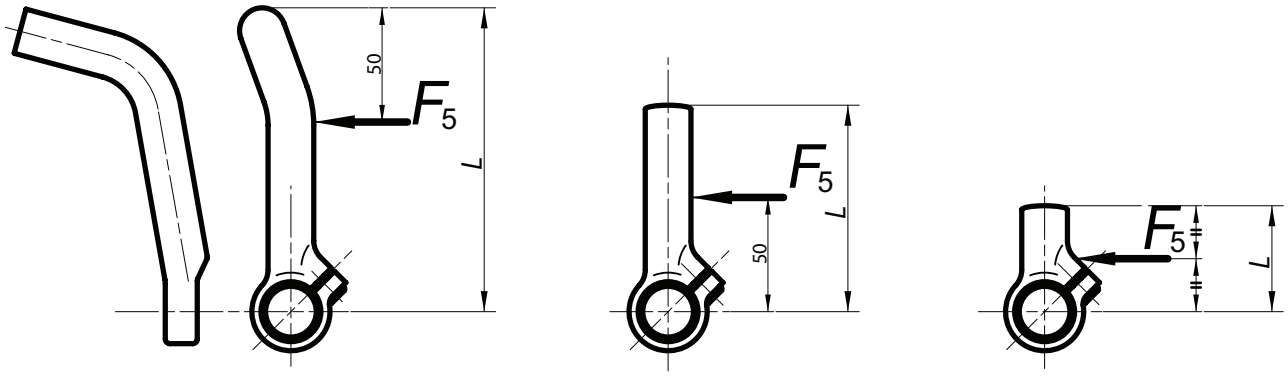
Maintain this force for 1 min.

Table 6 — Forces on bar end

Forces in newtons

Bicycle type	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Force, F_5	300	300	500	300

Dimensions in millimetres



a) $L > 100$ **b) $100 \geq L \geq 50$** **c) $50 > L$**

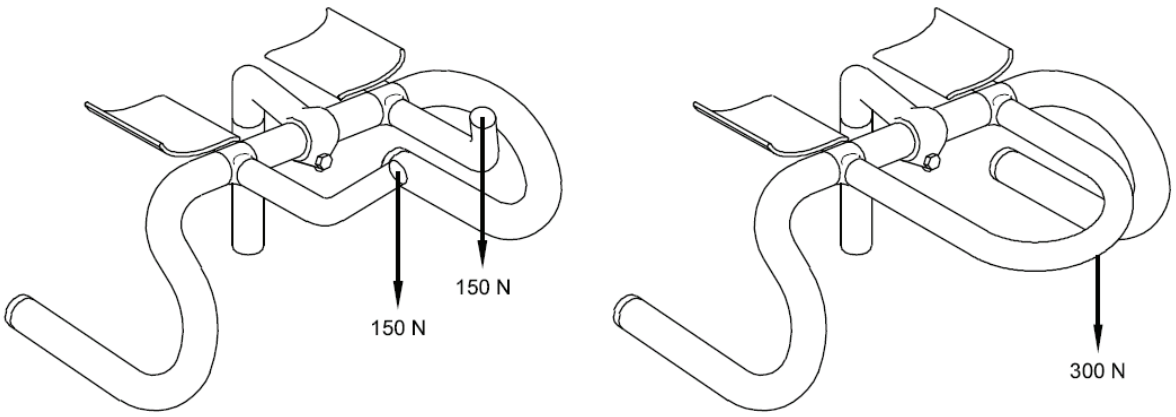
Key

L bar end's length

Figure 8 — Bar end to handlebar — Torsional security test

4.8 Aerodynamic extensions to handlebar — Torsional security test

Secure the handlebar in the stem intended for use and assemble the extension on the handlebar tightening all the fixings in accordance with the extension, handlebar, and handlebar stem manufacturer's instructions. The steering axis should be vertical. Apply a vertical force of 300 N to the extension on the position giving the maximum torque to the clamps as shown in Figures 9 a) and b). The exact method of applying the force can vary with the type of aerodynamic extension, and an example is shown in Figure 9.



a) Type A **b) Type B**

Figure 9 — Aerodynamic extension to handlebar — Torsional security test

4.9 Handlebar and stem assembly — Fatigue test

4.9.1 Test method for city and trekking, young adult, and mountain bicycles

4.9.1.1 Test method for stage 1

Unless the handlebar and stem are permanently connected, e.g. by welding or brazing, align the grips of portion of the handlebar in a plane perpendicular to the stem axis [see Figure 3 a)] and secure the handlebar to the stem according to the manufacturer's instructions.

Clamp the handlebar stem securely in a fixture to the minimum insertion depth as specified in ISO 4210-2:2014, 4.7.3, or in the case of a stem extension which is intended to be clamped to an extended fork steerer, secure the extension using the manufacturer's recommended tightening procedure to an extended fork steerer which is secured in fixture to the appropriate length.

For handlebars where the manufacturer states that they are not intended for use with bar ends, apply fully reversed forces of F_6 at a position 50 mm from the free end for each side of the handlebar for 100 000 cycles, with the forces at each end of the handlebar being out of phase with each other and parallel to the axis of the fork steerer as shown in Figure 10 a). The forces are given in Table 7. The maximum test frequency shall be maintained as specified in ISO 4210-3:2014, 4.5.

Where a bicycle manufacturer fits bar ends, fit the bar ends to the handlebar according to the manufacturer's tightening instructions but with the bar ends located in a plane perpendicular to the handlebar stem axis and apply the out-of-phase forces to the bar ends, as shown in Figure 8 and Figure 11 a).

Where a handlebar manufacturer specifies that his handlebars are suitable for use with bar ends, conduct the test with the out-of-phase forces applied to simulated bar ends, as shown in Figure 11 b).

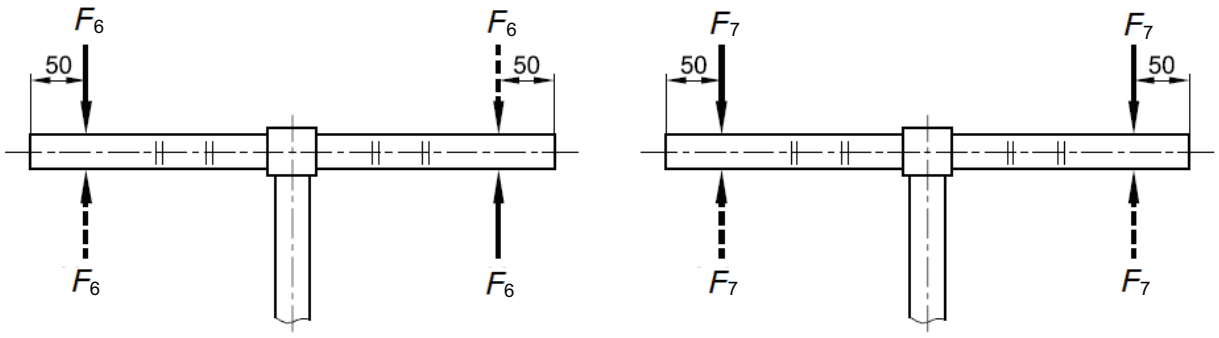
If the handlebar meets the requirement as specified in ISO 4210-2:2014, 4.7.7.2, remove any bar ends and conduct stage 2 of the test with the assembly in the same mountings.

Table 7 — Forces on handlebars and bar ends

Forces in newtons

Bicycle type		City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
Stage 1	Force, F_6	200	200	270	280
Stage 2	Force, F_7	250	250	450	400

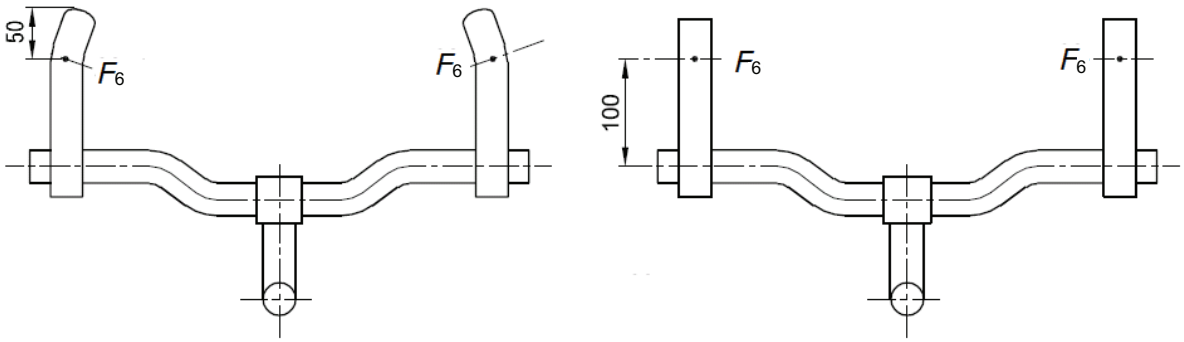
Dimensions in millimetres



a) Stage 1 — Out-of-phase loading **b) Stage 2 — In-phase loading**

Figure 10 — Handlebar and stem — Fatigue tests for city and trekking, young adult, and mountain bicycles

Dimensions in millimetres



a) Test for handlebar fitted with bar ends (plan view) **b) Test for handlebar intended for bar ends (plan view)**

Figure 11 — Handlebar incorporating bar ends — Out of phase fatigue tests for city and trekking, young adult, and mountain bicycles

4.9.1.2 Test method for stage 2

Apply fully reversed forces of F_7 at a position 50 mm from the free end for each side of the handlebar for 100 000 cycles, with the forces at each end of the handlebar being in phase with each other and parallel to the axis of the handlebar stem, as shown in Figure 10 b). The maximum test frequency shall be maintained as specified in ISO 4210-3:2014, 4.5.

4.9.2 Test method for racing bicycles

4.9.2.1 Test method for stage 1

Unless the handlebar and stem are permanently connected, e.g. by welding or brazing, align the hand grips or the equivalent parts of the handlebar in a plane perpendicular to the steering axis (see Figure 12), and secure the handlebar to the stem according to the manufacturer's instructions.

Clamp the handlebar stem securely in a fixture to the minimum insertion depth as specified in ISO 4210-2:2014, 4.7.3, or in the case of a stem extension which is intended to be clamped to an extended fork steerer, secure the stem-extension using the manufacturer's recommended tightening procedure, to an extended fork steerer which is secured in the fixture with the appropriate length projecting.

Attach to the handlebar two suitable devices that reproduce the brake-lever fixtures without either reducing or increasing the local handlebar strength. Each device shall incorporate a pin for connection to a ball joint with its axes located 15 mm from the outer surface of the handlebar, or such greater distance which accurately reproduces the position of the appropriate brake lever pivot (see Figure 12).

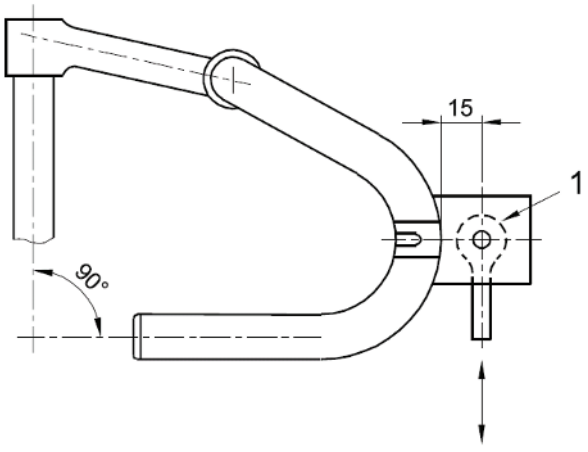
Through the ball joints, apply reversed forces of F_6 to the pin of the device on each side of the handlebar for 100 000 cycles, with the forces at each side of the handlebar being out of phase with each other and parallel to the axis of the fork steerer as shown in Figure 13 a). The forces are given in Table 7. The maximum test frequency shall be maintained as specified in ISO 4210-3:2014, 4.5.

If the assembly meets the requirement as specified in ISO 4210-2:2014, 4.7.7.2, conduct stage 2 of the test on the same assembly, in the same mountings.

4.9.2.2 Test method for stage 2

Through the ball joints, apply reversed forces of F_7 to the pin of the device on each side of the handlebar for 100 000 cycles, with the forces at each side of the handlebar being in phase with each other and parallel to the axis of the handlebar stem of the fork steerer, as shown in Figure 13 b). The forces are given in Table 7. The maximum test frequency shall be maintained as specified in ISO 4210-3:2014, 4.5.

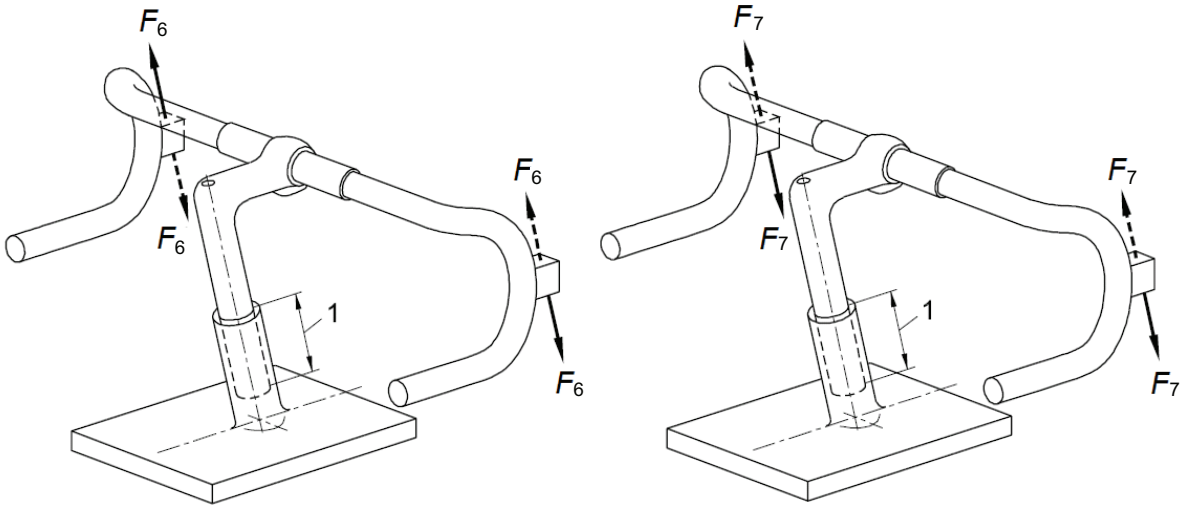
Dimensions in millimetres



Key

1 ball joint

Figure 12 — Device reproducing the brake fixture for racing bicycles



a) Stage 1 — Out-of-phase loading **b) Stage 2 — In-phase loading**

Key

1 minimum insertion depth

Figure 13 — Handlebar and stem assembly — Fatigue test for racing bicycles

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