INTERNATIONAL STANDARD

**ISO 8098**

Third edition
2014-06-15

# Cycles — Safety requirements for bicycles for young children

*Cycles — Exigences de sécurité relatives aux bicyclettes pour jeunes enfants*



Reference number
ISO 8098:2014(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. www.iso.org/directives

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

This third edition cancels and replaces the second edition (ISO 8098:2002), which has been technically revised.

# 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 it 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.

For safety requirements for toy bicycles intended for very young children see national regulations and standards.

# Cycles — Safety requirements for bicycles for young children

## 1 Scope

This International Standard specifies safety and performance requirements and test methods for the design, assembly and testing of fully assembled bicycles and sub-assemblies for young children. It also provides guidelines for instructions on the use and care of the bicycles.

This International Standard is applicable to bicycles with a maximum saddle height of more than 435 mm and less than 635 mm, propelled by a transmitted drive to the rear wheel.

It is not applicable to special bicycles intended for performing stunts (e.g. BMX bicycles).

## 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 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 5775-1, *Bicycle tyres and rims — Part 1: Tyre designations and dimensions*

ISO 5775-2, *Bicycle tyres and rims — Part 2: Rims*

ISO 6742-2, *Cycles — Lighting and retro-reflective devices — Part 2: Retro-reflective devices*

ISO 11243, *Cycles — Luggage carriers for bicycles — Concepts, classification and testing*

## 3 Terms and definitions

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

**3.1**
**bicycle**
two-wheeled cycle

**3.2**
**brake-lever**
lever which operate the brake device

**3.3**
**braking force**
tangential rearward force between the tyre and the ground or the tyre and the drum or belt of the test machine

**3.4**
**crank assembly**
<fatigue testing> drive and non-drive crank arms, pedal-spindles or adaptors, bottom-bracket spindle, and the first component of the drive system, e.g. the chain-wheel cluster

**3.5**
**cycle**
any vehicle that has at least two wheels and is propelled solely or mainly by the muscular energy of the person on that vehicle, in particular by means of pedals

**3.6**
**exposed protrusion**
protrusion which through its location and rigidity could present a hazard to the rider either through heavy contact with it in normal use or should the rider fall onto it in an accident

**3.7**
**fracture**
unintentional separation into two or more parts

**3.8**
**highest gear**
gear ratio which gives the greatest distance travelled for one rotation of the cranks

**3.9**
**lowest gear**
gear ratio which gives the shortest distance travelled for one rotation of the cranks

**3.10**
**maximum inflation pressure**
maximum tyre pressure recommended by the tyre or rim manufacturer for a safe and efficient performance, and if the maximum rim pressure was marked on both the tyre and rim, maximum tyre pressure according to the lower marked maximum inflation pressure on the rim or tyre

**3.11**
**maximum saddle height**
vertical distance from the ground to the top of the saddle surface, measured with the saddle in a horizontal position with the seat-post set to the minimum insertion depth

**3.12**
**pedal tread surface**
surface of a pedal that is presented to the underside of the foot

**3.13**
**quick-release devices**
lever actuated mechanism that connects, retains, or secures a wheel or any other component

**3.14**
**stabilizers**
removable auxiliary wheels fitted to enable the rider to balance

**3.15**
**toe-clip**
device attached to the pedal to grip the toe end of the rider's shoe but permitting withdrawal of the shoe

**3.16**
**toe-strap**
device to securely locate a rider's shoe on a pedal

**3.17**
**visible crack**
crack which results from a test where that crack is visible to the naked eye

# 4 Requirements and test methods

## 4.1 Brake tests and strength tests — Special requirements

### 4.1.1 Definition of brake tests

Brake tests to which accuracy requirements apply, as in 4.1.4, are those specified in 4.7.2.3 to 4.7.8.4 inclusive.

### 4.1.2 Definition of strength tests

Strength tests to which accuracy requirements apply, as in 4.1.4, are those involving static, impact or fatigue loading as specified in 4.8 to 4.14 inclusive and 4.16.

### 4.1.3 Numbers and condition of specimens for the strength tests

In general, for static, impact and fatigue tests, each test shall be conducted on a new test sample, but if only one sample is available, it is permissible to conduct all of the tests on the same sample with the sequence of testing being fatigue, static and impact.

When more than one test is conducted on the same sample, the test sequence shall be clearly recorded in the test report or record of testing.

NOTE It should be noted that if more than one test is conducted on the same sample, earlier test can influence the results of subsequent tests. Also, if a sample fails when it has been subjected to more than one test, a direct comparison with single testing is not possible.

In all strength tests, specimens shall be in the fully finished condition.

It is permitted to carry out tests with dummy assemblies such as a fork or handlebar when carrying out frame or handlebar stem tests.

### 4.1.4 Tolerances

Unless stated otherwise, accuracy tolerances based on the nominal values shall be as follows:

— Forces and torques: 0/+5 %

— Masses and weights: ±1 %

— Dimensions: ±1 mm

— Angles: ±1°

— Time duration: ±5 s

— Temperatures: ±2 °C

— Pressures: ±5 %

### 4.1.5 Fatigue test

The force for fatigue tests is to be applied and released progressively, not to exceed 10 Hz. The tightness of fasteners according to manufacturer's recommended torque can be re-checked not later than 1 000 test cycles to allow for the initial settling of the component assembly. (This is considered applicable to all components, where fasteners are present for clamping.) The test bench shall be qualified to meet dynamic requirements of 4.1.4.

NOTE Examples of suitable methods are listed in Reference[7] in the Bibliography.

#### 4.1.6 Plastic material test ambient temperature

All strength tests involving any plastic materials shall be pre-conditioned for two hours and tested at an ambient temperature of 23 °C ± 5 °C.

#### 4.1.7 Impact test

For all vertical impact test, the striker shall be guided in such a way that the efficiency will allow a value of at least 95 % of the free velocity.

NOTE See Annex B.

### 4.2 Toxicity

Any items which come into intimate contact with the rider (i.e. causing any hazard due to sucking or licking) shall comply with national regulations specific to children's products.

### 4.3 Sharp edges

Exposed edges that could come into contact with the rider's hands, legs etc. during normal riding or normal handling and normal maintenance shall not be sharp, e.g. deburred, broken, rolled or processed with comparable techniques.

### 4.4 Security and strength of safety-related fasteners

#### 4.4.1 Security of screws

Any screws used in the assembly of suspension systems, bracket attached electric generators, brake-mechanisms and mud-guards to the frame or fork, and the saddle to the seat-post shall be provided with suitable locking devices to prevent unintentional loosening, e.g. lock-washers, lock-nuts, thread locking compound or stiff nuts.

Fasteners used to assemble hub and disc brakes should have heat-resistant locking devices.

NOTE The screws used to attach hub-generator are not included.

#### 4.4.2 Minimum failure torque

The minimum failure torque of bolted joints for the fastening of handlebars, handlebar-stems, bar-ends, saddles and seat-posts shall be at least 50 % greater than the manufacturer's recommended tightening torque.

#### 4.4.3 Quick-release devices

Quick-release devices shall not be fitted.

#### 4.4.4 Foot location devices

Toe-straps and toe-clips shall not be fitted.

#### 4.4.5 Folding bicycle mechanism

If folding bicycles mechanism is provided, it shall be designed so that the bicycle can be locked for use in a simple, stable, safe way and when folded no damage shall occur to any cables. No locking mechanism shall contact the wheels or tyres during riding, and it shall be impossible to unintentionally loosen or unlock the folding mechanisms during riding.

## 4.5 Crack detection methods

Standardised methods should be used to emphasize the presence of cracks where visible cracks are specified as criteria of failure in tests specified in this International Standard.

NOTE For example, suitable dye-penetrant methods are specified in ISO 3452 (all parts)[2][3][4][5].

## 4.6 Protrusions

These requirements are intended to address the hazards associated with the users of bicycles falling on projections or rigid components (e.g. handlebars, levers) on a bicycle possibly causing internal injury or skin puncture.

Tubes and rigid components in the form of projections which constitute a puncture hazard to the rider should be protected. The size and shape of the end protection has not been stipulated, but an adequate shape shall be given to avoid puncturing of the body. Screw threads which constitute a puncture hazard shall be limited to a protrusion length of one major diameter of the screw beyond the internally threaded mating part.

## 4.7 Brakes

### 4.7.1 Braking-systems

Bicycles, whether or not fitted with a fixed transmitted drive, shall be equipped with at least two independently actuated braking systems, one system operating on the front wheel and one on the rear. The decision on whether the rear braking system is operated by the rider's hand or foot should be made in accordance with the legislation, custom or preference of the country to which the bicycle is to be supplied.

Brake-blocks containing asbestos shall not be permitted.

### 4.7.2 Hand-operated brakes

#### 4.7.2.1 Brake-lever position

The brake-levers for front and rear brakes shall be positioned according to the legislation or custom and practice of the country in which the bicycle is to be sold, and the bicycle manufacturer shall state in the users instruction manual which lever operates the front brake and which operates the rear brake, see also Clause 5 b).

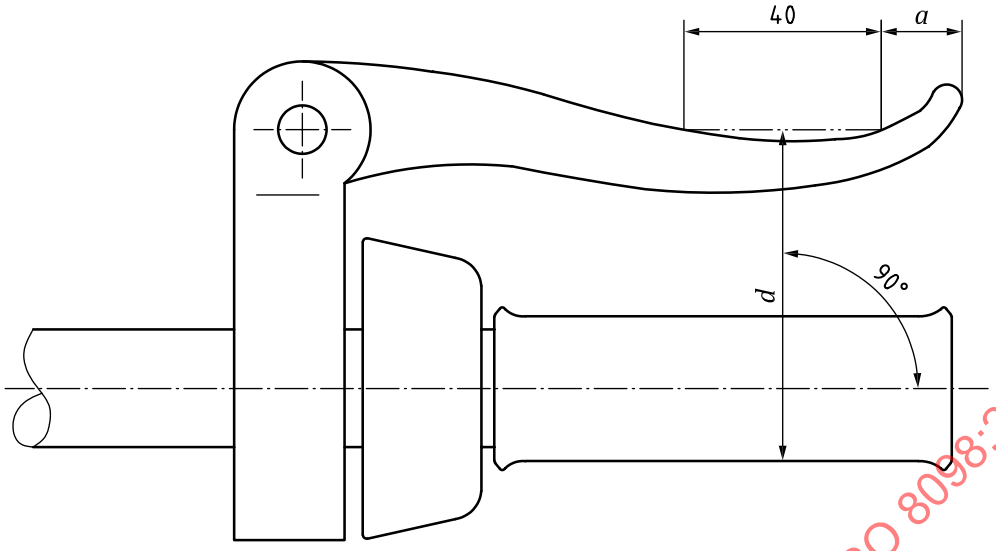
#### 4.7.2.2 Brake-lever grip dimensions

##### 4.7.2.2.1 Requirement

The maximum grip dimension, *d*, measured between the outer surfaces of the brake-lever and the handlebar, or the handlebar-grip or any other covering where present, shall not exceed 75 mm over a distance of 40 mm as shown in Figure 1. For dimension *a* see 4.7.2.2.2.

The brake-lever may be adjusted to permit these dimensions to be obtained.

Dimension in millimetres




**Key**

*a* distance between the last part of the lever intended for contact with the rider's fingers and the end of the lever

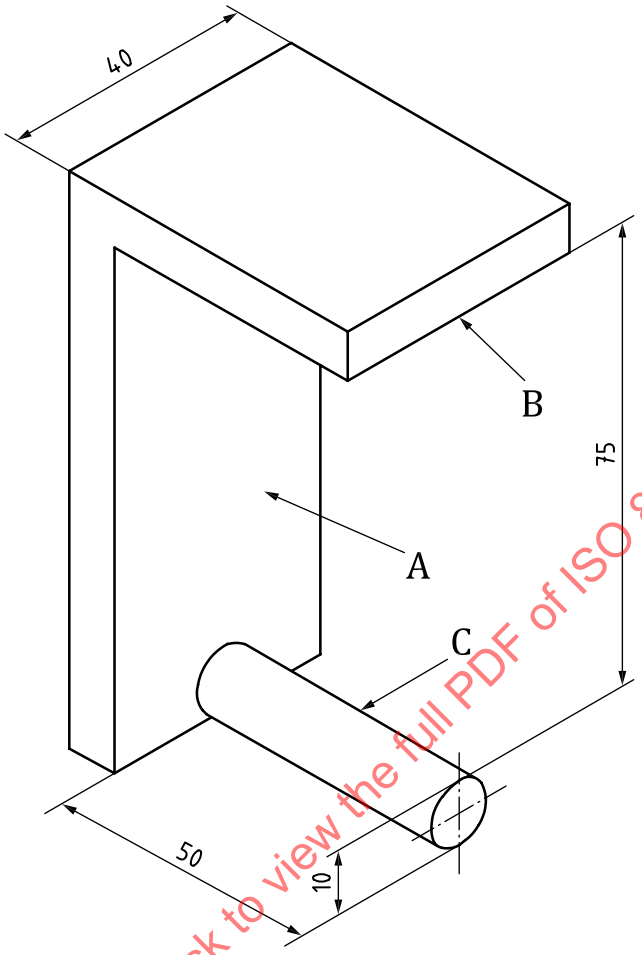
*d* brake-lever grip dimension

**Figure 1 — Brake-lever grip dimensions**

#### 4.7.2.2.2 Test method

Fit the gauge illustrated in Figure 2 over the handlebar and handlebar-grip and the brake-lever as shown in Figure 3 so that the face A is in contact with the handlebar grip and the side of the brake-lever. Ensure that the face B is in uninterrupted contact with the part of the brake-lever which is intended for contact with the rider's fingers and that the gauge does not cause any movement of the brake-lever towards the handlebar or handlebargrip. Measure the distance *a*, the distance between the last part of the lever intended for contact with the rider's fingers and the end of the lever (see 4.7.2.2.1 and 4.7.2.3).

Dimension in millimetres




**Key**

A face A
B face B
C rod

**Figure 2 — Brake-lever grip dimension gauge**

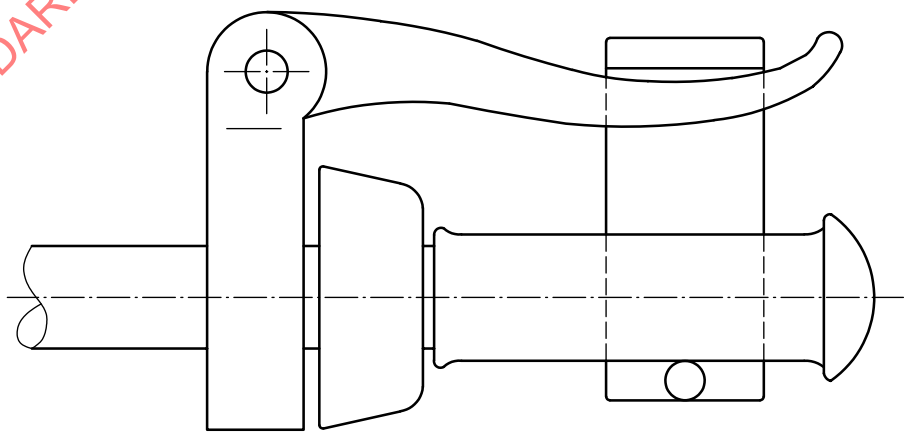
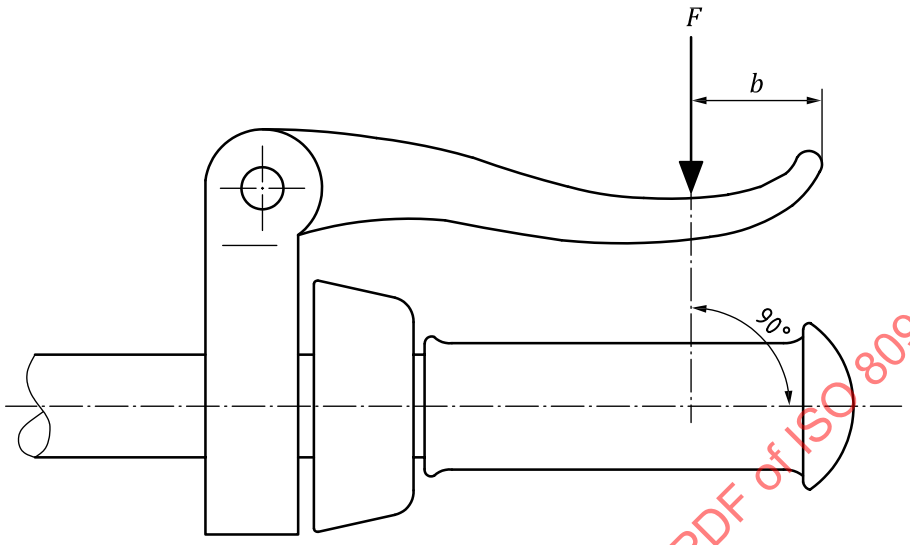


**Figure 3 — Method of fitting the gauge to the brake-lever and handlebar (minimum grip length is shown)**

#### 4.7.2.3 Brake-levers — Position of applied force

For the purposes of all braking tests in this International Standard the test force shall be applied at a distance, *b*, which is equal to either dimension *a* as determined in 4.7.2.2.2 or 25 mm from the free end of the brake-lever, whichever is the greater (see Figure 4).




**Key**

*F* applied force

*b* ≥ 25 mm

**Figure 4 — Position of applied force on brake-lever**



### 4.7.3 Attachment of brake assembly and cable requirements

Cable pinch-bolts shall not sever any of the cable strands when assembled to the manufacturer's instructions. In the event of a cable failing, no part of the brake mechanism shall inadvertently inhibit the rotation of the wheel.

The cable end shall either be protected with a cap that shall withstand a removal force of 20 N or be otherwise treated to prevent unraveling.

NOTE See 4.4 in relation to fasteners.

### 4.7.4 Brake-block and brake-pad assemblies — Security test

#### 4.7.4.1 Requirement

The friction material shall be securely attached to the holder, backing-plate, or shoe and there shall be no failure of the assembly when tested by the method specified in 4.7.4.2. The brake system shall be capable of meeting the strength test specified in 4.7.7 and the braking performance specified in 4.7.8.

#### 4.7.4.2 Test method

Conduct the test on a fully assembled bicycle with the brakes adjusted to a correct position with a rider or equivalent mass on the saddle. The combined mass of the bicycle and rider (or equivalent mass) shall be 30 kg.

Actuate each brake-lever with a force of 130 N applied at the point as specified in 4.7.2.3 or a force sufficient to bring the brake-lever into contact with the handlebar grip, whichever is the lesser. Maintain

this force while subjecting the bicycle to five forward and five rearward movements, each of which is not less than 75 mm distance.

#### 4.7.5 Brake adjustment

Each brake shall be capable of adjustment with or without the use of a tool to an efficient operating position until the friction material has worn to the point of requiring replacement as recommended in the manufacturer's instructions.

Also, when correctly adjusted, the friction material shall not contact anything other than the intended braking surface.

If brake adjustment can be achieved without the use of a tool, the adjuster shall be designed to prevent for incorrect use or incorrect operation.

#### 4.7.6 Back-pedal brake

Back-pedal brakes shall be actuated by the rider's foot pedaling in the opposite direction to the drive force. The brake mechanism shall function independently of any drive gear positions or adjustments. The differential between the drive and brake positions of the crank shall not exceed 60°.

The measurement shall be taken with the crank held against each position with a pedal force of at least 140 N. The force shall be maintained for 1 min in each position.

#### 4.7.7 Braking-system — Strength tests

##### 4.7.7.1 Hand-operated brake — Requirement

When tested by the method described in 4.7.7.2, there shall be no failure of the braking-system or of any component thereof.

##### 4.7.7.2 Hand-operated brake — Test method

Conduct the test on a fully assembled bicycle. After it has been ensured that the braking system is adjusted according to the recommendations in the manufacturer's instructions, apply a force at the point specified in 4.7.2.3 and normal to the axis of handlebar in the grip area in the plane of travel of the lever, as shown in Figure 4. The force shall be 300 N, or a lesser force required to bring:

a) a cable-brake lever into contact with the handlebar grip or the handlebar where the manufacturer does not fit a grip, or

b) a rod-operated brake lever level with the upper handlebar grip surface.

Repeat the test for a total of 10 times on each brake-lever.

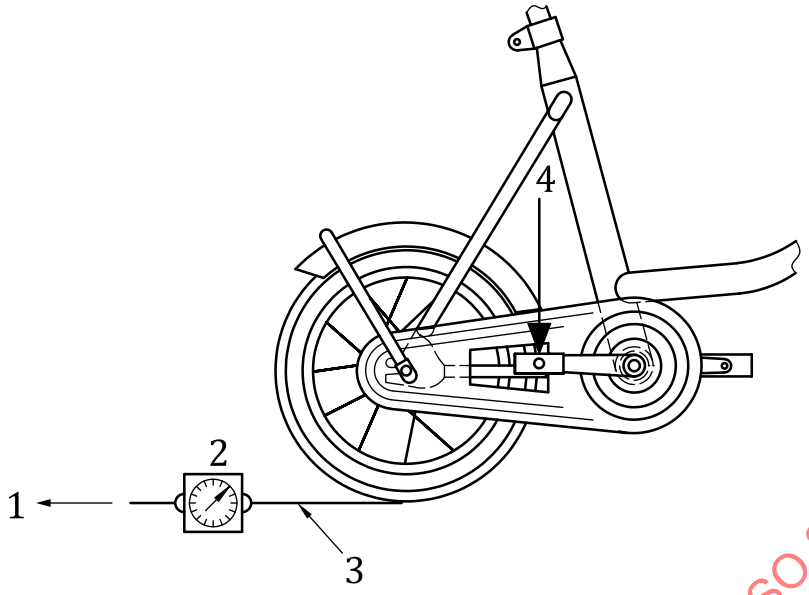
##### 4.7.7.3 Back-pedal brake — Requirement

When tested by the method described in 4.7.7.4, there shall be no failure of the back pedal braking system or any component thereof.

##### 4.7.7.4 Back-pedal brake — Test method

Conduct this test on a fully assembled bicycle. Ensure that the braking system is adjusted according to the recommendations in the manufacturer's instructions, and that a pedal crank is in a horizontal position (see Figure 5). Gradually apply a vertical force of 600 N to the centre of the pedal axe, and maintain for one min.

Repeat the test five times.




**Key**

1 applied force on wheel (braking force)
2 force measuring device
3 suitable webbing wrapped around wheel circumference
4 direction of applied force on pedal (see 4.7.7.4 and 4.7.8.4)

**Figure 5 — Measurement of braking force from back-pedal brake**

### 4.7.8 Braking performance

#### 4.7.8.1 Hand-operated brake performance test — Requirement

When tested in accordance with 4.7.8.2, the average braking force of hand operated braking systems shall increase progressively as the lever force is increased in steps of 10 N from 40 N to 80 N.

For front brakes, with the appropriate lever forces, the minimum and maximum braking forces shall conform to Table 1.

For rear brakes, with the appropriate lever forces, the minimum braking forces shall conform to Table 1.

**Table 1 — Brake lever input forces and braking forces at the tyre**

| Brake lever input force<br>N | Braking force at the tyre | |
|---|---|---|
| | min.<br>N | max. (front brake only)<br>N |
| 40 | 40 | 100 |
| 60 | 50 | 140 |
| 80 | 60 | 180 |

#### 4.7.8.2 Hand-operated brake performance test — Test method

Conduct the hand-operated brake performance test on a bicycle fully assembled, and with the brake correctly adjusted (the saddle and seat-post may be removed).

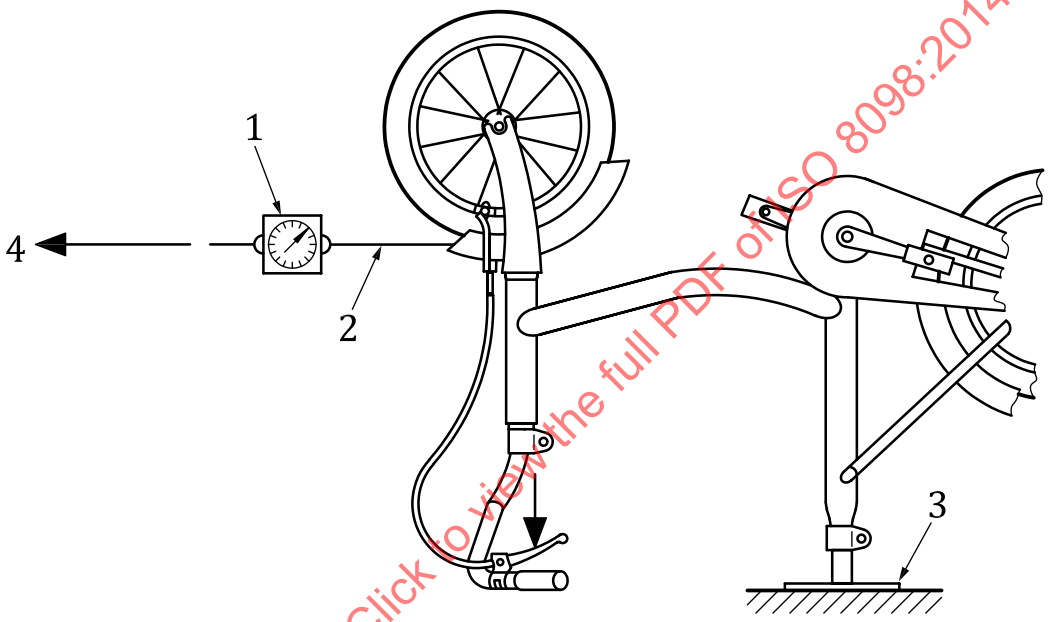
Secure the bicycle and attach a braking force measuring device to the appropriate wheel, as shown in Figure 6.

Apply forces of 40 N, 50 N, 60 N, 70 N and 80 N progressively to the appropriate brake lever at a point specified in 4.7.2.3 and normal to the handlebar grip in the plane of travel of the lever (see Figure 4).

For each handlever force apply a steady pulling force to the wheel through the force measuring device, tangentially to the circumference of the tyre and in the forward-travel direction of rotation.

After one half-revolution of the wheel, record the average braking force as the wheel rotates through a further revolution at a steady linear tyre surface speed of between 0,5 m/s and 2,0 m/s.

For each force on the lever, take the average of three readings.




**Key**

1 force measuring device
2 suitable webbing around wheel circumference
3 fixture
4 applied force

**Figure 6 — Measurement of braking force from hand-operated brake (typical arrangement)**



#### 4.7.8.3 Back-pedal brake performance test — Requirement

When tested in accordance with 4.7.8.4, the average braking force of back-pedal braking systems transmitted to the rear wheel shall increase progressively as the pedal force is increased in steps of 20 N from 20 N to 100 N. The ratio of pedal force to braking force shall not exceed 2.

#### 4.7.8.4 Back-pedal brake performance test — Test method

Conduct the back-pedal brake performance test on a fully assembled bicycle with the brake correctly adjusted.

Secure the bicycle and attach a braking force measuring device to the rear wheel as shown in Figure 5.

Apply forces of 20 N, 40 N, 60 N, 80 N and 100 N to the pedal at right angles to the crank and in the braking direction.

Apply a steady pulling force to the wheel through the force measuring device tangentially to the circumference of the tyre and in the forward-travel direction of rotation.

After one half-revolution of the wheel, record the average braking force as the wheel rotates through a further revolution at a steady linear tyre surface speed of between 0,5 m/s and 2,0 m/s.

For each force on the pedal, take the average of three readings.

## 4.8 Steering

### 4.8.1 Handlebar — Dimensions and end fittings

The handlebar shall have an overall width between 350 mm and 550 mm unless national regulations dictate otherwise. The vertical distance between the top of the handlebar grips, when assembled to the highest riding position according to the manufacturer's instructions and the saddle surface of the saddle at its lowest position shall not exceed 400 mm.

### 4.8.2 Handlebar grips

#### 4.8.2.1 Requirement

The ends of the handlebars shall be fitted with handlebar grips that can withstand removal when tested according to 4.8.2.2 and 4.8.2.3. The handlebar grips shall be of resilient material and shall have an enlarged and covered end not less than 40 mm in diameter. Handlebar grips shall not obstruct the operation of brake levers.

NOTE Regarding material see also 4.2.

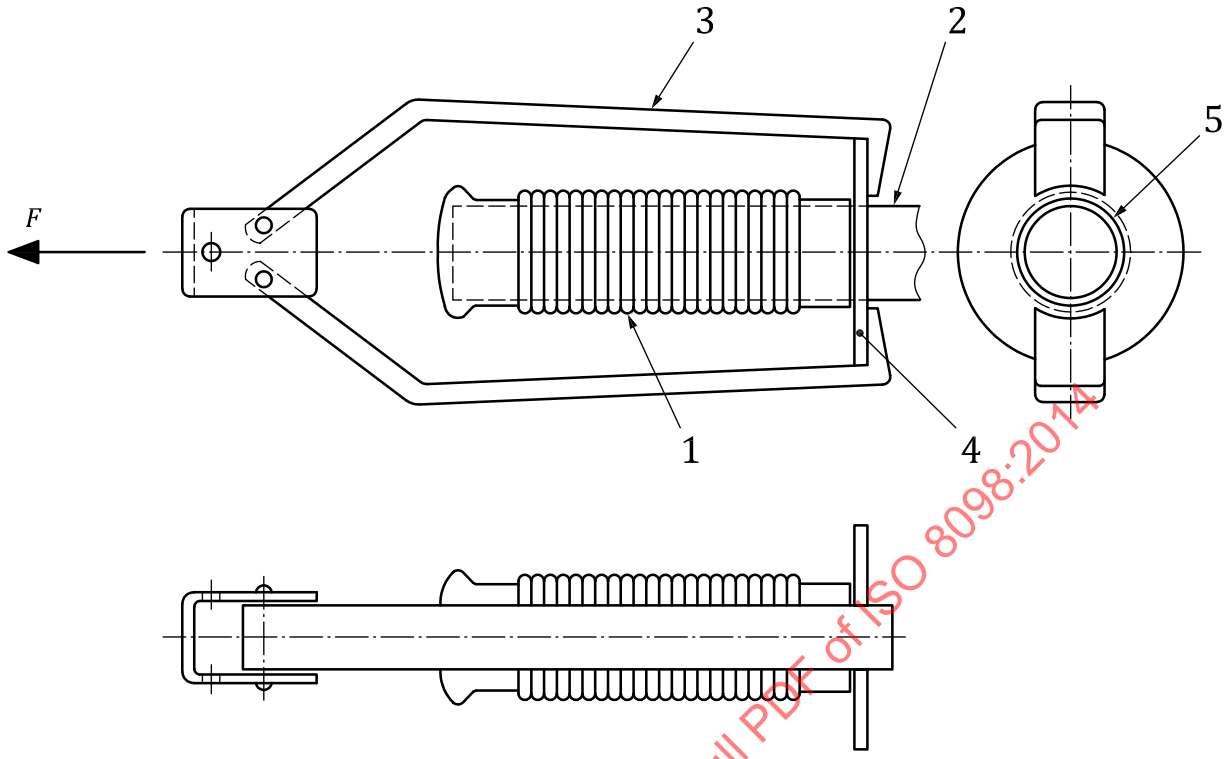
#### 4.8.2.2 Freezing test

Immerse the handlebar, with handlebar grips fitted, in water at room temperature for one hour and then place the handlebar in a freezing cabinet until the handlebar is at a temperature lower than –5 °C. Remove the handlebar from the freezing cabinet and allow the temperature of the handlebar to reach –5 °C, and then apply a force of 70 N in the loosening direction as shown in Figure 7. Maintain the force until the temperature of the handlebar has reached +5 °C.

It may 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.

#### 4.8.2.3 Hot water test

Immerse the handlebar, with handlebar grips fitted, in hot water of +60 °C ± 2 °C for one hour. Remove the handlebar from the hot water, allow the handlebar to stabilize at ambient temperature for 30 min, apply a force of 100 N to the grip in the loosening direction as shown in Figure 7. Maintain this force for 1 min.




**Key**

1 handlebar grip
2 handlebar
3 drawing attachment
4 hooking ring (can be divided)
5 clearance

**Figure 7 — Handlebar grip drawing attachment**



### 4.8.3 Handlebar-stem — Insertion depth mark or positive stop

The handlebar-stem shall be provided with one of the two following alternative means of ensuring a safe insertion depth into the fork steerer:

a) it shall contain a permanent, transverse mark, of length not less than the external diameter of the cross section of the handlebar-stem that clearly indicates the minimum insertion-depth of the handlebar-stem into the fork steerer. The mark shall be located not less than 2,5 times the external diameter of the handle-bar stem from the bottom of the handlebar-stem, and there shall be at least one stem diameter's length of contiguous circumferential stem material below the mark;

b) it shall incorporate a permanent stop to prevent it from being drawn out of the fork steerer such as to leave the insertion less than the amount specified in a) above.

### 4.8.4 Steering stability

The steering shall be free to turn through at least 60° either side of the straight-ahead position and shall exhibit no tight spots, stiffness or slackness in the bearings when correctly adjusted.

A minimum of 25 % of the total mass of the bicycle and rider shall act on the front wheel when the rider is holding the handlebar grips and sitting on the saddle, with the saddle and rider in their most rearward positions.

NOTE Recommendations for steering geometry are given in Annex A.

### 4.8.5 Steering assembly — Static strength and security tests

#### 4.8.5.1 Handlebar and stem assembly — Lateral bending test

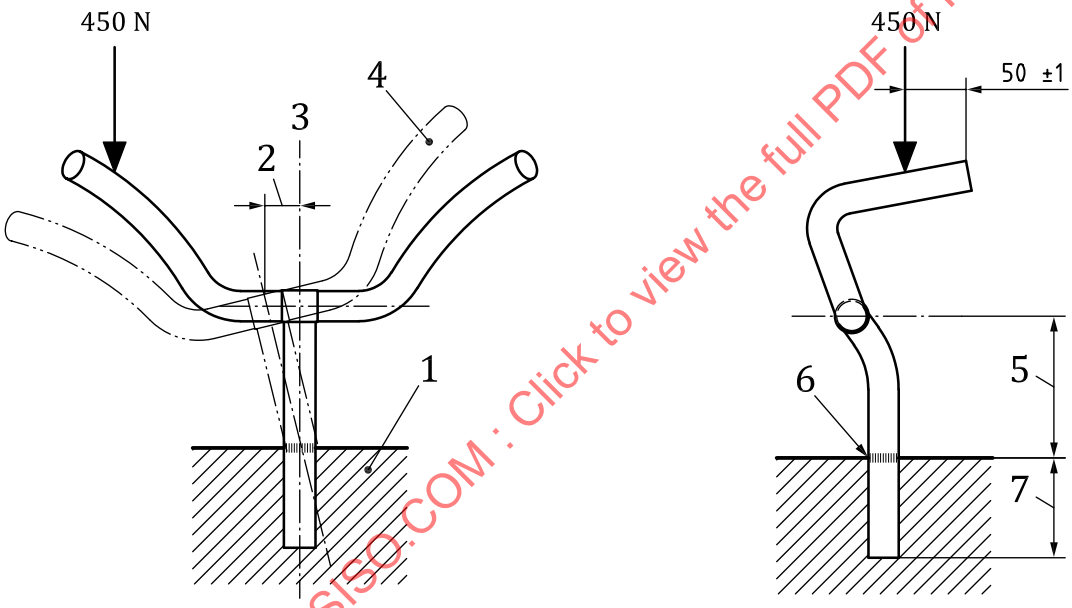
##### 4.8.5.1.1 Requirement

When tested by the method described in 4.8.5.1.2, there shall be no cracking or fracture of the handlebar or stem and the permanent set measured at the point of application of the test force shall not exceed 20 mm per 100 mm of the free stem length.

##### 4.8.5.1.2 Test method

Assemble the handlebar and stem in accordance with the manufacturer's instructions unless the stem and handlebar are permanently connected e.g. by welding or brazing, align the grips portion of the handlebar in a plane perpendicular to the stem axis. Clamp the stem securely at the minimum insertion depth and apply a vertical force of 450 N at a position 50 mm ± 1 mm from the free end of the handlebar as shown in Figure 8. Maintain this force for 1 min.

Dimension in millimetres






**Key**

1 clamping fixture
2 permanent set
3 stem centreline
4 deflected shape
5 free stem length
6 minimum insertion-depth mark
7 minimum insertion depth

**Figure 8 — Handlebar and stem assembly — Lateral bending test**

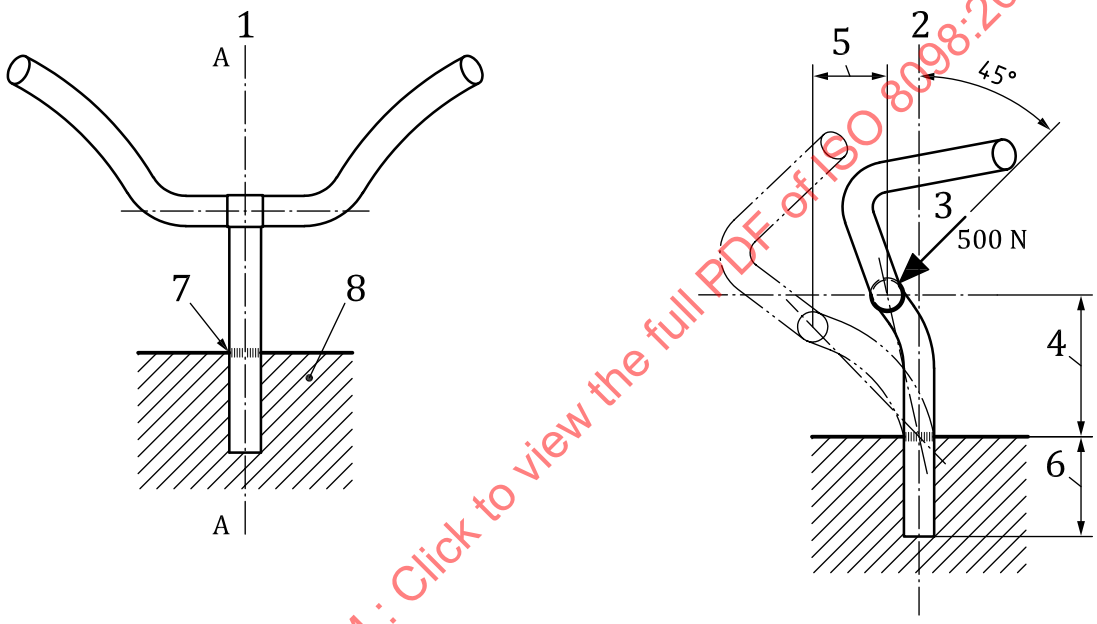
#### 4.8.5.2 Handlebar and stem assembly — Forward bending test

##### 4.8.5.2.1 Requirement

When tested by the method described in 4.8.5.2.2, there shall be no cracking or fracture of the handlebar or stem and the permanent set measurement at the point of application of the test force shall not exceed 20 mm per 100 mm of free stem length.

##### 4.8.5.2.2 Test method

With the handlebar stem securely clamped to the minimum insertion depth, apply a force of 500 N through the handlebar attachment point in the forward and downward direction at 45° to the axis of the stem shank, in plane A-A (see Figure 9). Maintain this force for 1 min.




**Key**

1 force applied in plane A-A
2 axis of stem shank
3 applied force
4 free stem length
5 permanent set
6 minimum insertion depth
7 minimum insertion-depth mark
8 clamping fixture

**Figure 9 — Handlebar and stem assembly — Forward bending test**

#### 4.8.5.3 Handlebar to handlebar stem — Torsional security test

##### 4.8.5.3.1 Requirement

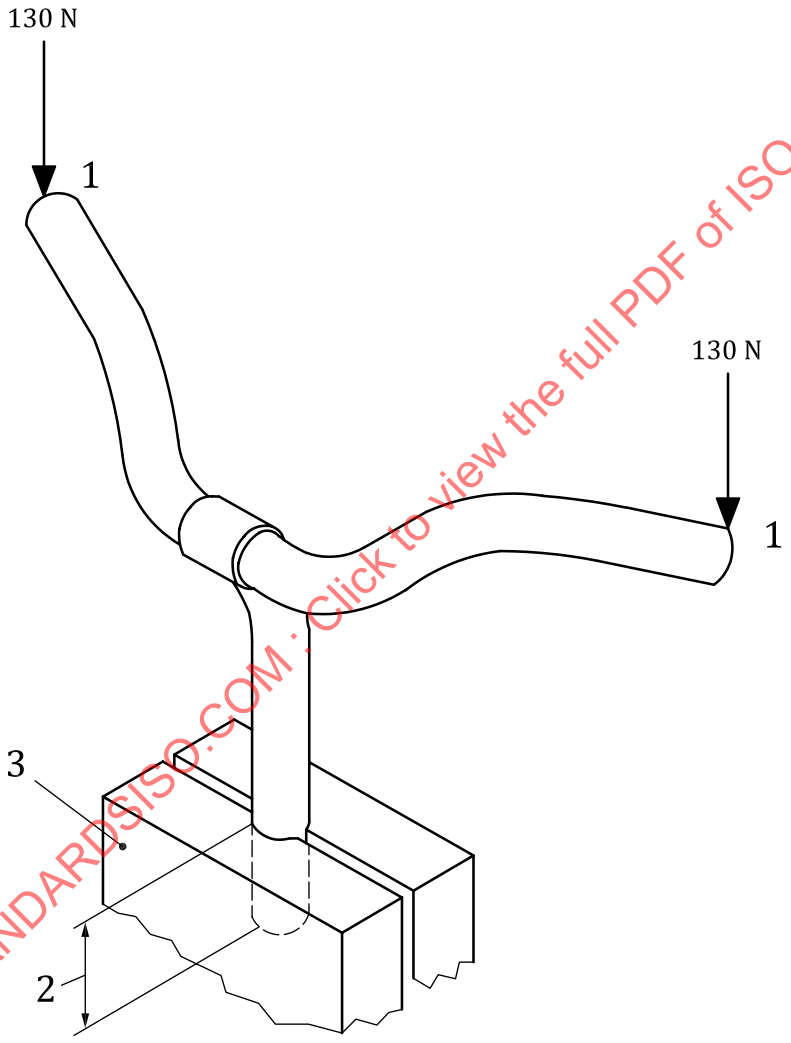
The handlebar shall not move in relation to the stem when tested in accordance with 4.8.5.3.2.

#### 4.8.5.3.2 Test method

With the stem of the handlebar assembly securely clamped to the minimum insertion depth, apply a force of 130 N simultaneously to each side of the handlebar, in a direction and at a point giving maximum torque at the junction of the handlebar and stem. If the point of application is at the end of the handlebar, apply the force as near to the end as practicable, but no more than 15 mm from the end (see Figure 10). Maintain this force for 1 min.

Depending on the shape of the handlebar, the forces may be applied in a different direction from those illustrated in Figure 10.

If the handlebar/stem assembly uses a clamp, the torque applied to the fastener shall not exceed the manufacturer's recommended minimum torque.






**Key**

1 applied force
2 minimum insertion depth
3 clamping block

**Figure 10 — Handlebar to handlebar stem — Torsional security test**

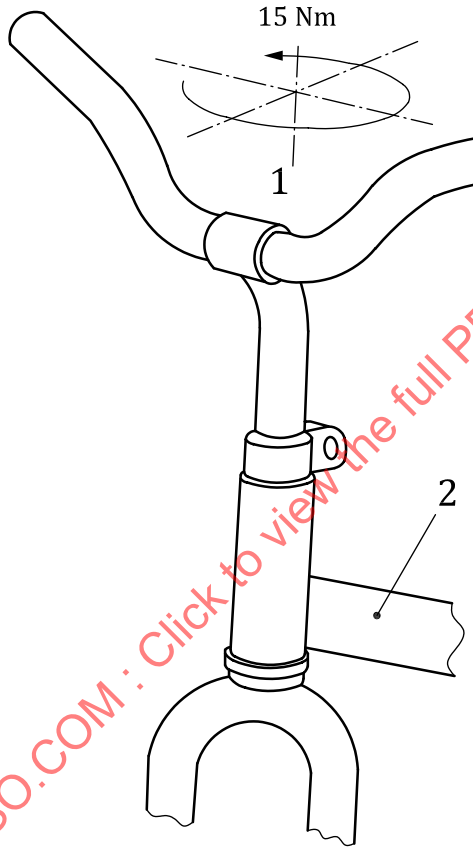
#### 4.8.5.4 Handlebar stem to fork steerer — Torsional security test

##### 4.8.5.4.1 Requirement

The handlebar shall not move in relation to the fork steerer when tested in accordance with 4.8.5.4.2.

##### 4.8.5.4.2 Test method

With the handlebar stem correctly assembled in the frame and fork steerer, and the clamping device tightened to the manufacturer's recommended minimum torque, apply a torque of 15 Nm to the handlebar/fork clamping device, as shown in Figure 11. Maintain this torque for 1 min.




**Key**

1 applied torque

2 frame and fork assembly

**Figure 11 — Handlebar stem to fork steerer — Torsional security test**



#### 4.8.6 Handlebar and stem assembly — Fatigue test

##### 4.8.6.1 General

Handlebar-stems can influence test failure of handlebars and for this reason, a handlebar and stem is always to be tested as an assembly.

Conduct the test in two stages on the same assembly as follows.

#### 4.8.6.2 Requirement for stage 1

When tested by the method described in 4.8.6.3, there shall be no visible cracks or fractures in any part of the handlebar and stem assembly.

#### 4.8.6.3 Test method for stage 1

Unless the handlebar and stem are permanently connected, e.g. by welding or brazing, align the grip of portions of the handlebar in a plane perpendicular to the stem axis (see Figure 12), secure the handlebar to the stem according to the manufacturer's recommendations.

Clamp the handlebar stem securely in a fixture to the minimum insertion depth.

Apply fully-reversed forces of 115 N at a position 50 mm from the free end each side of the handlebar and in a plane parallel to the stem axis 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 handlebar stem as shown in Figure 12. The maximum test frequency shall be 10 Hz.

Any resonant condition should be avoided.

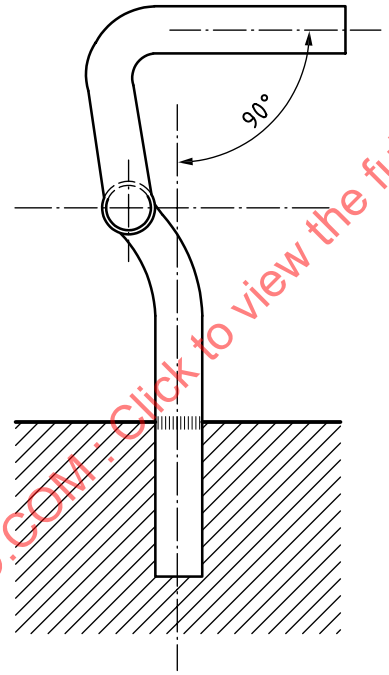
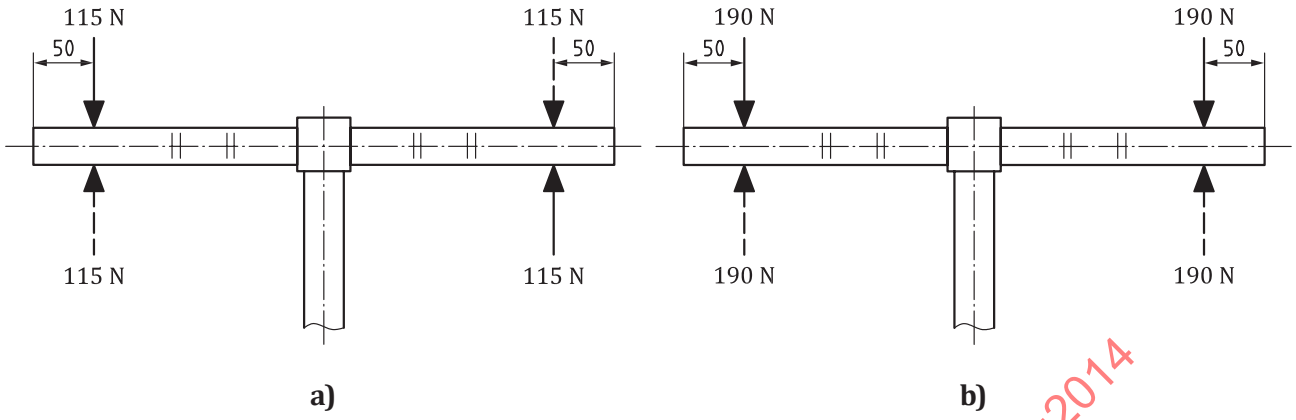



**Figure 12 — Adjustable handlebars — Orientation for test**

Dimension in millimetres




**Key**

a stage 1 — out-of-phase loading

b stage 2 — in-phase loading

**Figure 13 — Handlebar and stem — Fatigue tests**

#### 4.8.6.4 Requirement for stage 2

When tested by the method described in 4.8.6.5, there shall be no visible cracks or fractures in any part of the handlebar and stem assembly.

#### 4.8.6.5 Test method for stage 2

Apply fully-reversed forces of 190 N at a position 50 mm from the free end each side of the handlebar and in a plane parallel to the stem axis 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 13. The maximum test frequency shall be 10 Hz.

### 4.9 Frames

#### 4.9.1 Frame and front fork assembly — Impact test (falling mass)

#### 4.9.1.1 Requirement

When tested by the method described in 4.9.1.2, there shall be no visible cracks or fractures in any part of the frame/fork assembly.

The permanent set measured between the axes of the wheel axles (measured as the wheelbase, see Figure 14) shall not exceed 20 mm.

#### 4.9.1.2 Test method

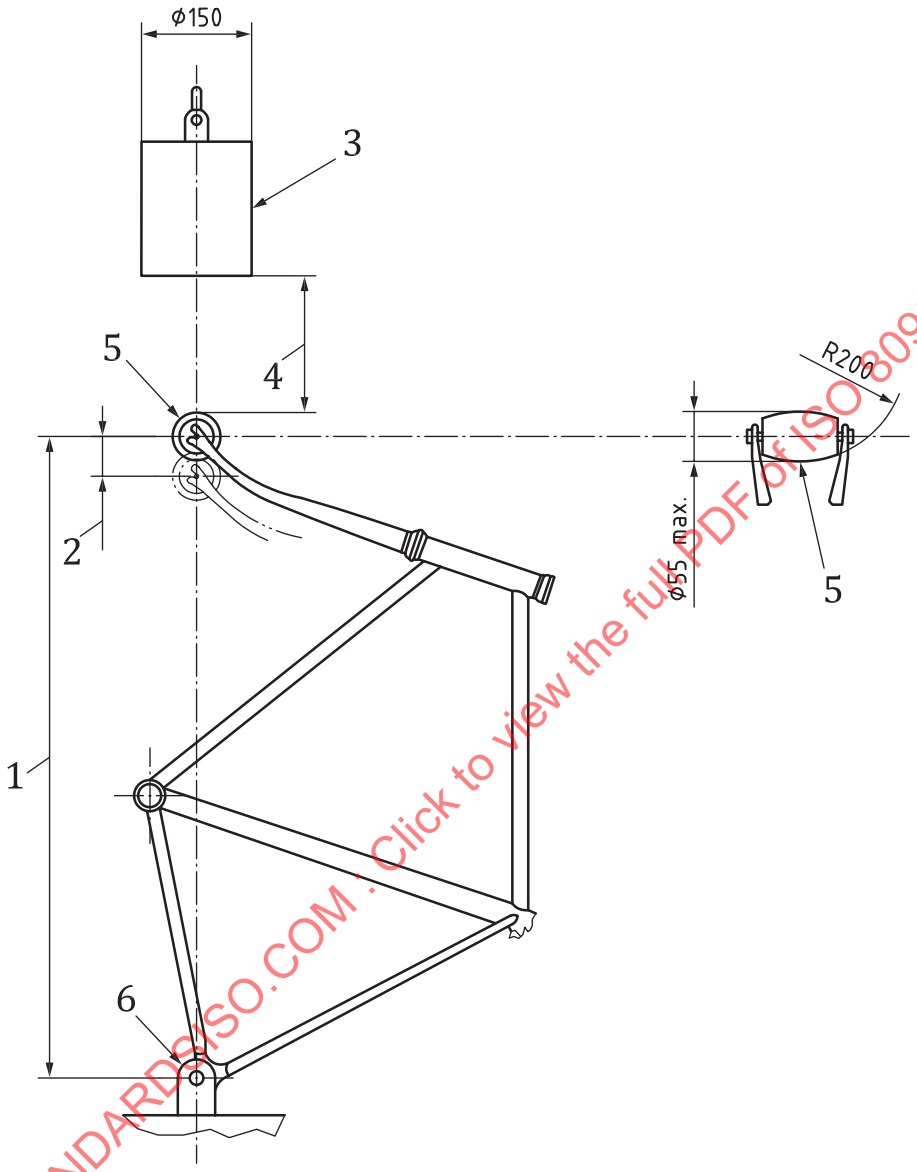
If the bicycle frame is convertible for male and female riders by removal of a bar, test the frame with the bar removed.

Measure the distance between the axle centrelines. Assemble a roller of mass less than or equal to 1 kg and with the dimensions conforming to those shown in Figure 14 in the front fork, and hold the frame/fork assembly vertically, clamped to a rigid fixture by the rear axle attachment points, as shown in Figure 14. The hardness of roller shall be not less than 60 HRC at impact surface.

Drop a striker of mass 22,5 kg from a height of 120 mm onto the low mass roller at a point in line with the wheel centres and against the direction of the fork rake.

NOTE See Annex B (informative) Verification of free fall velocity. [As same as ISO 4210]

Dimension in millimetres






**Key**

1 wheelbase
2 permanent set
3 22,5 kg striker
4 drop height 120 mm
5 low-mass roller (1 kg max)
6 rigid mounting for rear axle attachment point

**Figure 14 — Frame and front fork assembly — Impact test (falling mass)**

### 4.9.2 Frame and front fork assembly – impact test (falling frame)

#### 4.9.2.1 Requirement

When tested by the method described in 4.9.2.2, there shall be no visible cracks or fractures in any part of the frame/fork assembly.

The permanent set measured between the axes of the wheel axles (the wheelbase – see Figure 15) shall not exceed 20 mm.

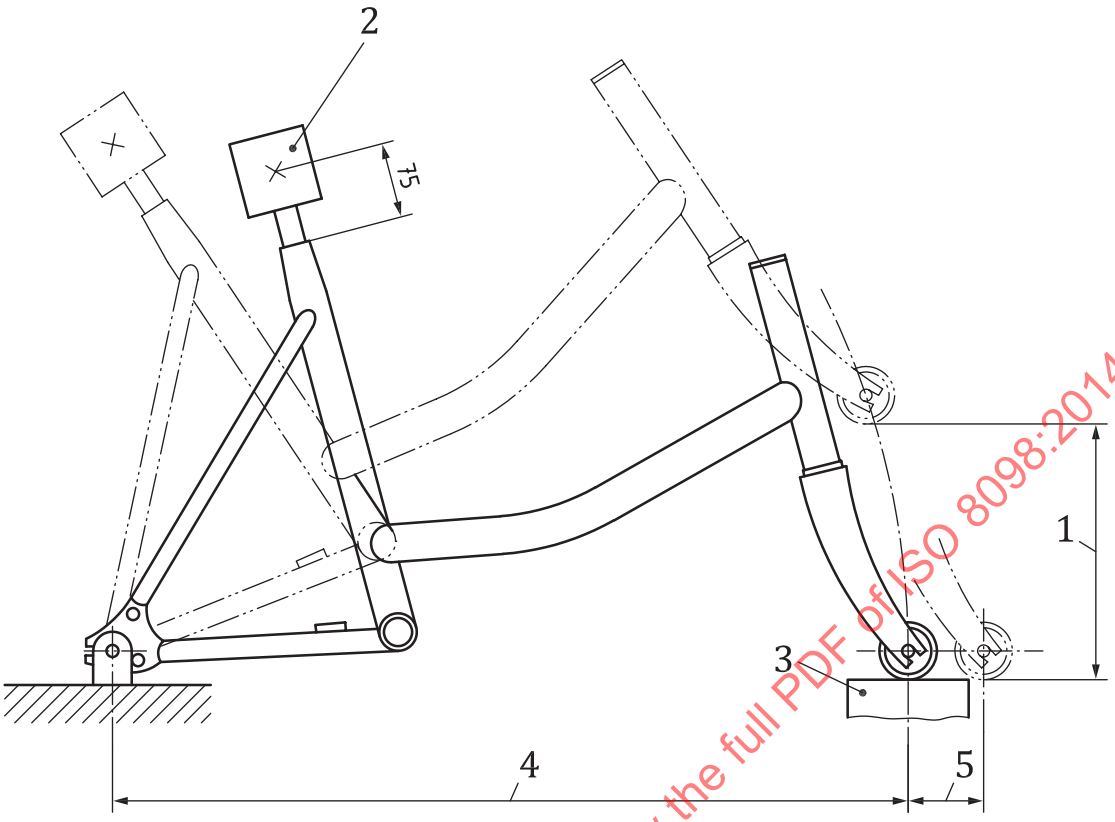
#### 4.9.2.2 Test method

Conduct the falling frame/fork assembly test on the frame/fork/roller assembly used in 4.9.1.

Mount the assembly at the rear axle attachment points so that it is free to rotate about the rear axle in the vertical plane. Support the front fork with a flat steel anvil so that the frame is in the normal position of use. Fix a 30 kg mass to the seat-post, with the centre of gravity on the axis of the seat tube and 75 mm from the top of the seat tube along the axis. Rotate the assembly around the rear axle until the distance between the low-mass roller and the anvil is 200 mm, then allow the assembly to fall freely onto the anvil (see Figure 15).

Perform the test twice.

Dimension in millimetres




**Key**

1 drop height
2 30 kg mass
3 steel anvil
4 wheelbase
5 permanent set

**Figure 15 — Frame and front fork assembly — Impact test (falling frame)**



## 4.10 Front fork

### 4.10.1 General

The slots or other receptors for the front axle in the front fork shall be aligned so that when the axle or cones firmly abut the top face, the front wheel is central within the fork.

### 4.10.2 Front fork — Bending fatigue test

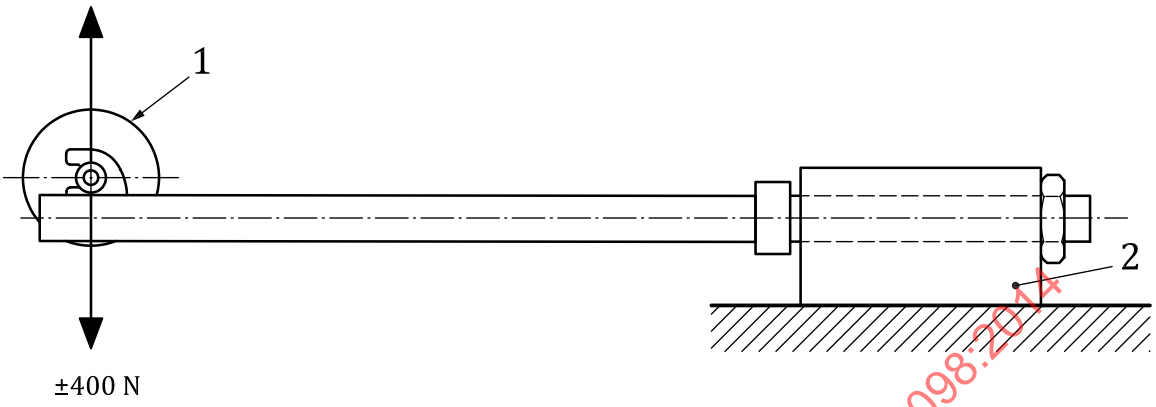
#### 4.10.2.1 Requirement

When tested by the method described in 4.10.2.2, there shall be no fractures or visible cracks in any part of the fork.

#### 4.10.2.2 Test method

Mount the fork in a fixture representative of the head-tube and gripped in the normal bearings as shown in Figure 16.

Apply cycles of fully reversed, dynamic forces of ±400 N (accurate to within 0/+5 %) in the plane of the wheel and perpendicular to the steerer-tube to a loading attachment and swivel on an axle located in the axle-slots of the blades for 100 000 test cycles with a test frequency not exceeding 10 Hz.




**Key**

1 pivoted force-application device

2 rigid mount incorporating head bearings

**Figure 16 — Front fork — Bending fatigue test**

## 4.11 Wheels

### 4.11.1 Rotational accuracy

#### 4.11.1.1 General

Rotational accuracy shall be as defined in ISO 1101 in terms of circular run-out tolerance (lateral). The run-out tolerances given in 4.11.1.2 and 4.11.1.3 represent the maximum variation of position of the rim (i.e. full indicator reading) of a fully assembled and adjusted wheel during one complete revolution about the axle without axial movement.

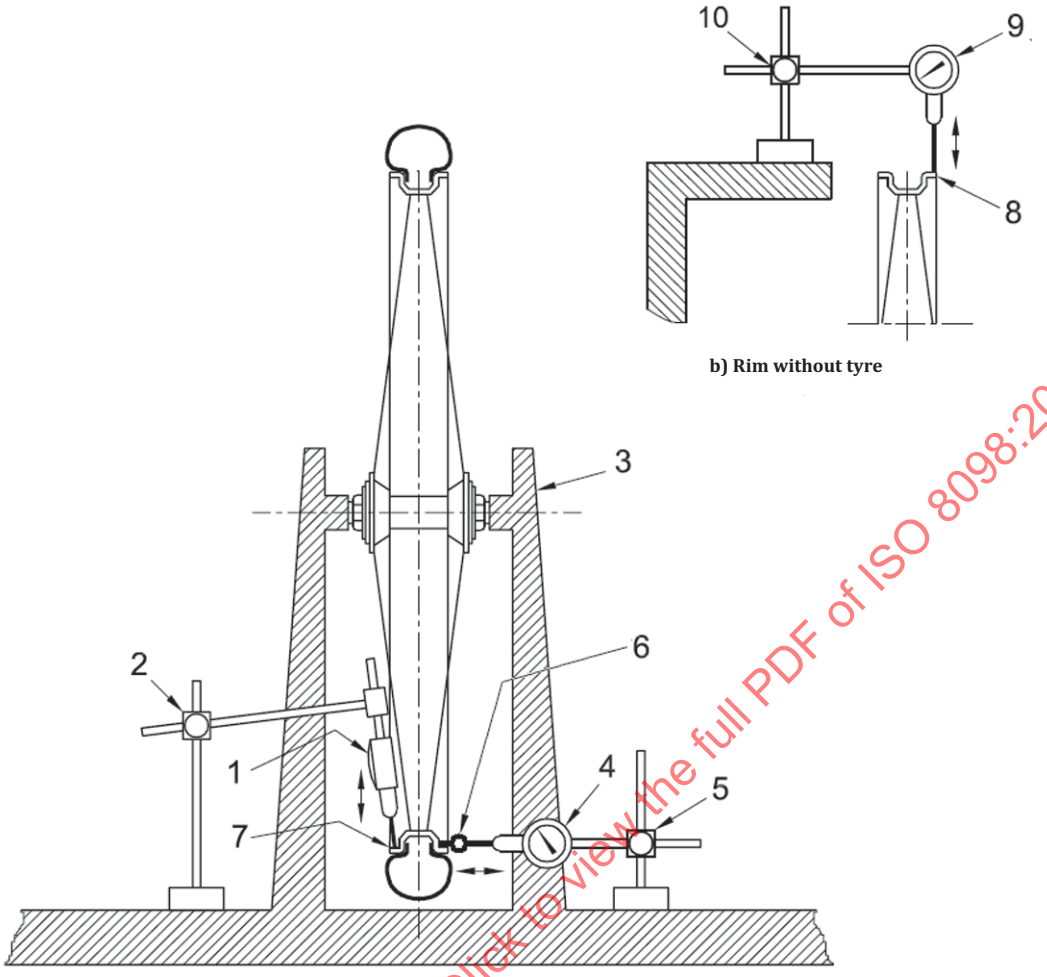
#### 4.11.1.2 Wheel/tyre assembly — Concentricity tolerance

For measurement of both axial run-out and radial run-out (concentricity) the wheel shall be fitted with a tyre inflated to the maximum pressure as marked on the tyre but, for rims where the concentricity cannot be measured with the tyre fitted, it is permissible to make measurements with the tyre removed.

The run-out shall not exceed 2 mm when measured perpendicular to the axle at a suitable point along the rim, see Figure 17.

#### 4.11.1.3 Wheel/tyre assembly — Lateral tolerance

The run-out shall not exceed 2 mm when measured parallel to the axle at a suitable point along the rim, see Figure 17.




b) Rim without tyre

a) Rim with tyre

**Key**

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

**Figure 17 — Wheels — Rotational accuracy**

### 4.11.2 Wheel/tyre assembly — Clearance

Alignment of the wheel assembly in a bicycle shall allow not less than 6 mm clearance between the tyre and any frame or fork element or a mudguard and its attachment bolts.

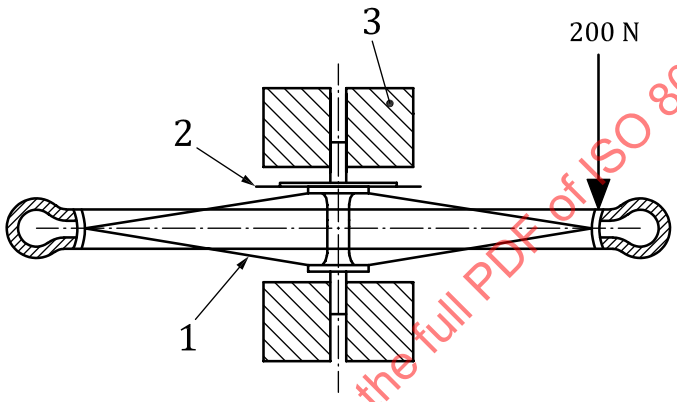
### 4.11.3 Wheel/tyre assembly — Static strength test

#### 4.11.3.1 Requirement

When a fully-assembled wheel fitted with a tyre inflated to the manufacturer's recommended pressure is tested by the method described in 4.11.3.2, there shall be no failure of any of the components of the wheel, and the permanent set, measured at the point of application of the force on the rim, shall not exceed 1,5 mm.

#### 4.11.3.2 Test method

Clamp and support the wheel suitably as shown in Figure 18 and apply a static force of 200 N at one point on the rim, perpendicular to the plane of the wheel. Apply the force once only for a duration of 1 min.




**Key**

1 wheel assembly
2 drive sprockets
3 clamping fixture

**Figure 18 — Wheels — Static strength test**



### 4.11.4 Wheel retention

#### 4.11.4.1 General

Wheels shall be secured to the bicycle frame and fork such that when adjusted to the manufacturer's recommendations they comply with 4.11.4.2 and 4.11.4.3.

Wheel nuts shall have a minimum removal torque of 70 % of the manufacturer's recommended tightening torque.

#### 4.11.4.2 Front wheel retention — Retention devices secured

#### 4.11.4.2.1 Requirement

When tested by the method described in 4.11.4.2.2, there shall be no relative motion between the axle and the front fork.

#### 4.11.4.2.2 Test method

Apply a force of 1 000 N distributed symmetrically to both ends of the axle for a period of 1 min in the direction of the removal of the wheel.

#### 4.11.4.3 Rear wheel retention — Retention devices secured

##### 4.11.4.3.1 Requirement

When tested by the method described in 4.11.4.3.2, there shall be no relative motion between the axle and the frame.

##### 4.11.4.3.2 Test method

Apply a force of 1 000 N distributed symmetrically to both sides of the axle for a period of 1 min in the direction of the removal of the wheel.

#### 4.11.4.4 Front wheel retention — Retention devices unsecured

##### 4.11.4.4.1 Requirement

When tested by the method described in 4.11.4.4.2, the wheel shall not detach from the fork.

##### 4.11.4.4.2 Test method

Unscrew the axle nuts by one complete turn from the finger-tight condition and apply a force of 100 N to the wheel for a period of 1 min in direction of removal of the wheel.

### 4.12 Rims, tyres and tubes

#### 4.12.1 Tyre inflation pressure

The maximum inflation pressure recommended by the manufacturer shall be moulded on the sidewall of the tyre so as to be readily visible when the latter is assembled on the wheel.

Non-pneumatic tyres are excluded from the requirements of 4.12.1.

NOTE It is recommended that the minimum inflation pressure specified by the manufacturer also be moulded on the sidewall of the tyre.

#### 4.12.2 Tyre and rim compatibility

Tyres shall comply with the requirements of ISO 5775-1 and rims shall comply with the requirements of ISO 5775-2.

Non-pneumatic tyres are excluded from the requirements of 4.12.2.

NOTE In the absence of suitable information from International or National Standards, other publications such as ETRTO standard manual and recommendation may be used (see References[8] and[9]).

The tyre, tube and rim-tape shall be compatible with the rim design.

When inflated to 110 % of the maximum inflation pressure for a period of not less than 5 min, the tyre shall remain intact on the rim.

### 4.13 Pedals and pedal/crank drive system

#### 4.13.1 Pedal tread

**4.13.1.1** The tread surface of a pedal shall be secured against movement within the pedal assembly.

The pedal shall turn freely on its axle.



**4.13.1.2** Pedals shall have

a) tread surfaces on the top and bottom surfaces of the pedal, or

b) a definite preferred position that automatically presents the tread surface to the rider's foot.

### 4.13.2 Pedal clearance

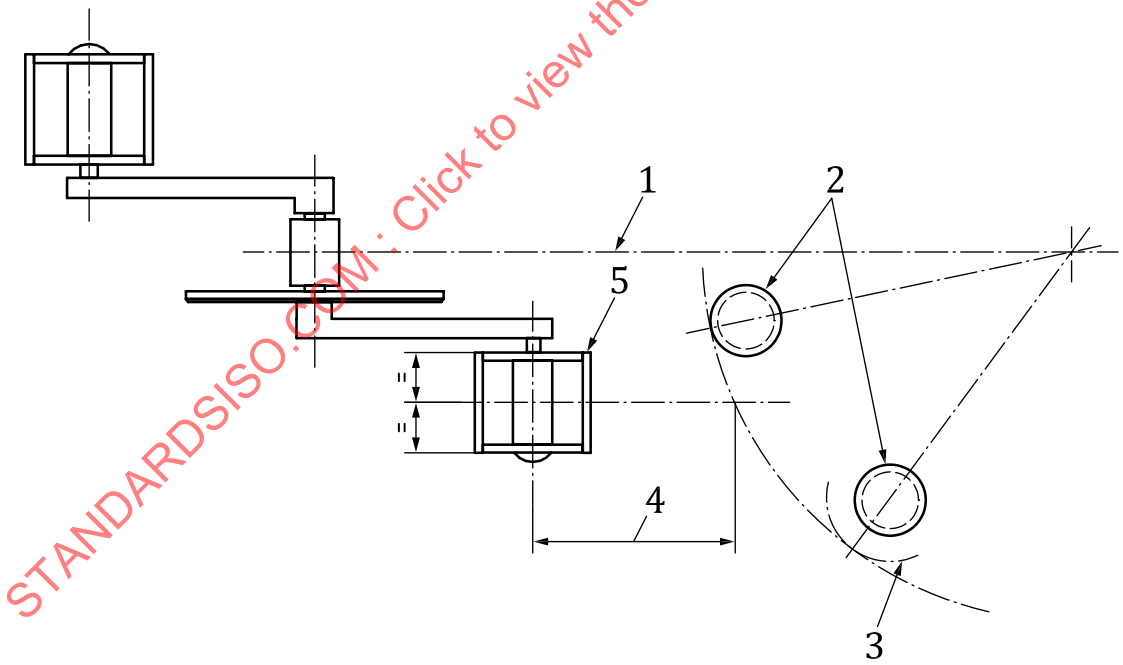
#### 4.13.2.1 Ground clearance

With the bicycle un-laden, with any stabilizers removed, the pedal at its lowest point and the tread surface of the pedal parallel to the ground (and uppermost where it has only one tread surface), the bicycle shall be capable of being leaned over at an angle of 23° from the vertical before any part of the pedal touches the ground.

Suspension devices (if applicable) shall be depressed by application of a 30 kg mass to the saddle while the bicycle is held vertical. With the suspension clamped in this position, the bicycle shall be capable of being leaned over at an angle of 23° from the vertical before any part of the pedal touches the ground.

#### 4.13.2.2 Toe clearance

Bicycles shall have at least 89 mm clearance between the pedal and front tyre or mudguard (when turned to any position). The clearance shall be measured forward and parallel to the longitudinal axis of the bicycle from the centre of either pedal to the arc swept by the tyre or mudguard, whichever is the lesser (see Figure 19).




**Key**

1 longitudinal axis
2 front tyre
3 mudguard
4 clearance
5 pedal

**Figure 19 — Toe clearance**

### 4.13.3 Pedal — Impact test

#### 4.13.3.1 Requirement

When tested by the method described in 4.13.3.2, there shall be no fractures of any part of the pedal body, the pedal-spindle or any failure of the bearing system.

#### 4.13.3.2 Test method

Screw the pedal-spindle securely into a suitable rigid fixture with its axis horizontal as shown in Figure 21 and release a striker of the design shown in Figure 21 and weighing 15 kg from a height of 200 mm to strike the pedal at the centre of the tread surface. The width of the striker shall be wider than the width of the tread surface.

Dimension in millimetres

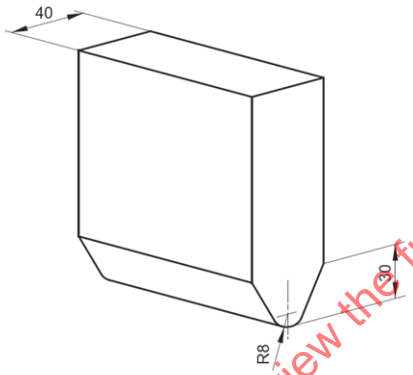



**Figure 20 — Striker dimensions**

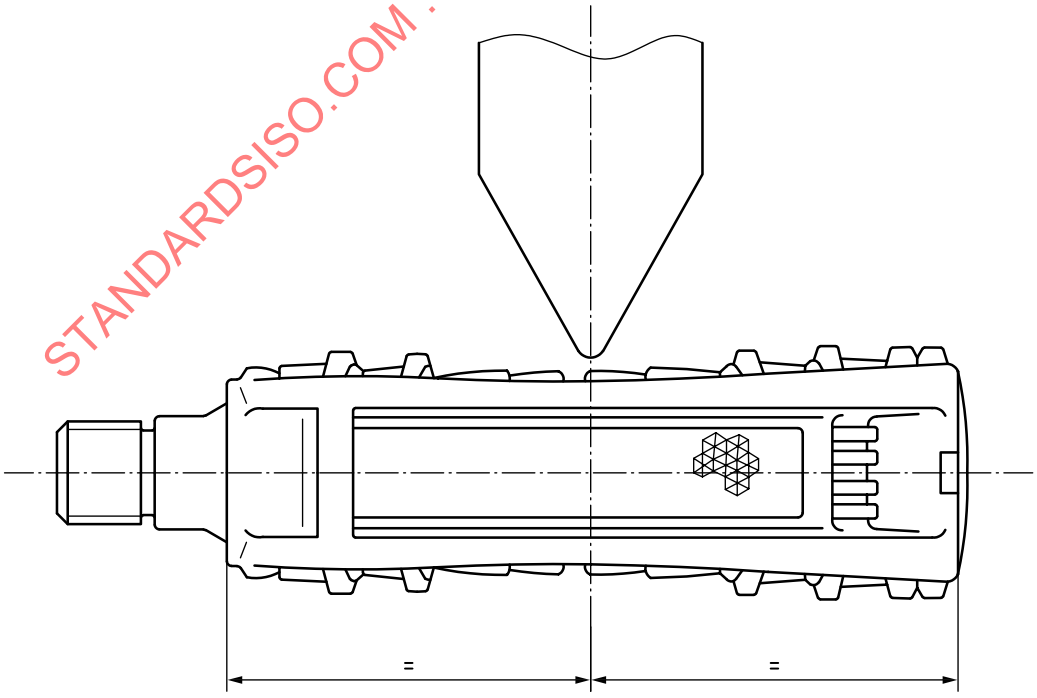



**Figure 21 — Position of impact**

### 4.13.4 Pedal/pedal-spindle — Dynamic durability test

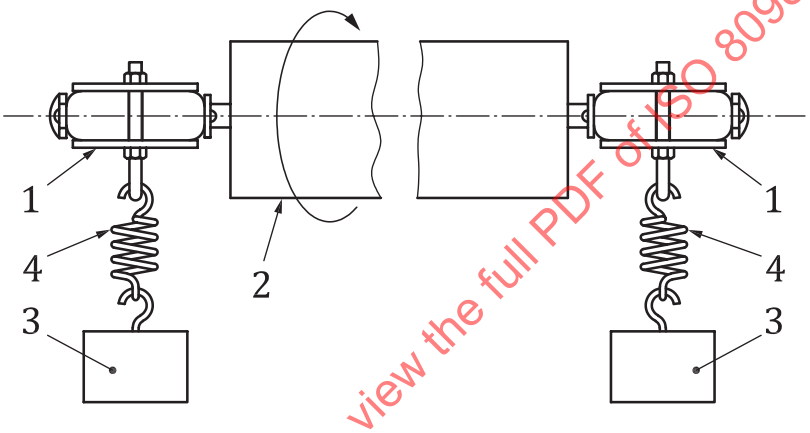
#### 4.13.4.1 Requirement

When tested by the method described in 4.13.4.2, there shall be no fractures or visible cracking of any part of the pedal or the pedal-spindle.

#### 4.13.4.2 Test method

Screw each pedal securely into a threaded hole in a rotable test-shaft and suspend a mass of 30 kg by means of a tension-spring to each pedal, the object of the springs being to minimize oscillations of the load (as shown in Figure 22).

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, rotate them through 180° after 50 000 revolutions.




**Key**

1 pedal
2 test-shaft
3 30 kg mass
4 tension spring

**Figure 22 — Pedal/pedal-spindle — Dynamic durability test**



### 4.13.5 Drive system static strength test

#### 4.13.5.1 Requirement

No component of the drive system shall fracture when tested in accordance with 4.13.5.2. Drive capability shall not be lost.

#### 4.13.5.2 Test method

##### 4.13.5.2.1 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 rotating.

#### 4.13.5.2.2 Single speed system

Carry out the following:

a) With the left-hand crank in the forward horizontal position, gradually apply a vertical downward force, increasing to 700 N, to the centre of the left-hand pedal, and maintain the full force for 1 min.

If the drive sprockets tighten so that the crank rotates under the load, return the crank to the horizontal position, after fully tightening, and repeat the test.

b) On completion of a), repeat the test with the right-hand crank in the forward horizontal position and the load.

#### 4.13.5.2.3 Multi-speed system

Carry out the following:

a) Conduct test 4.13.5.2.2 a) with the transmission in the highest gear;

b) Conduct test 4.13.5.2.2 b) with the transmission in the lowest gear.

### 4.13.6 Crank assembly — Fatigue tests

#### 4.13.6.1 Requirement

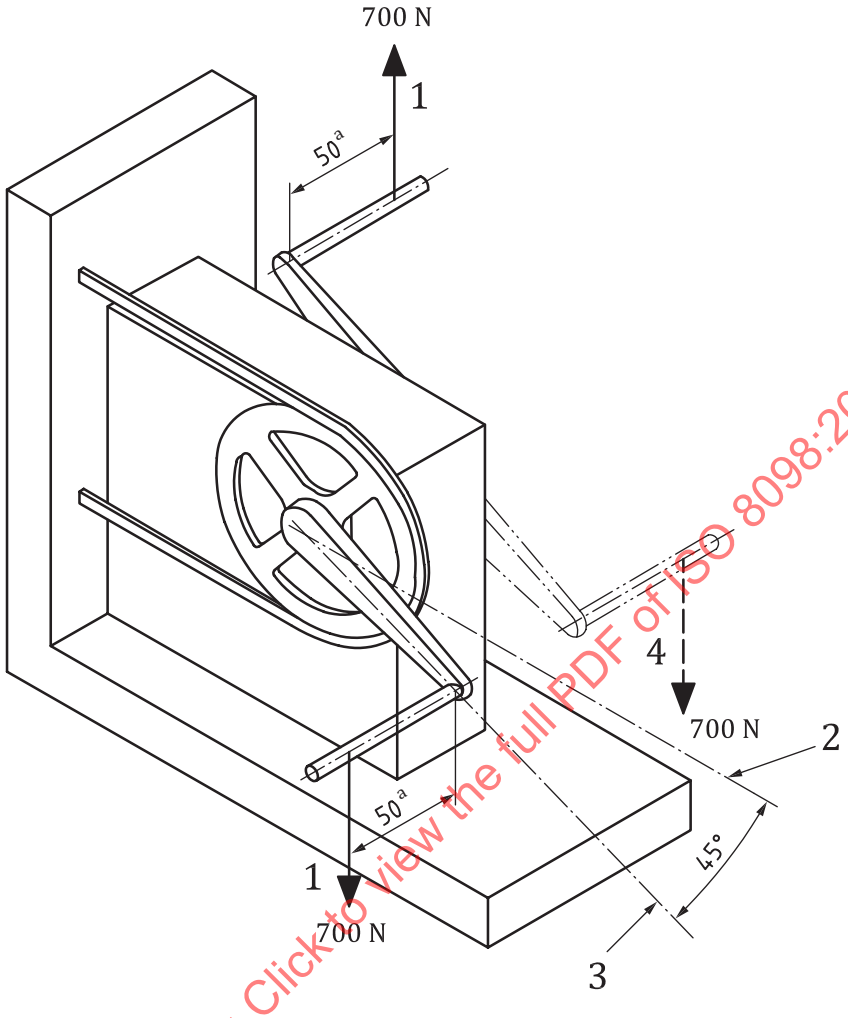
When tested by the method described in 4.13.6.2, there shall be no fractures or visible cracks in the pedal spindles, the cranks, the bottom-bracket spindle or any of the attachment features, or loosening or detachment of the chain wheel from the crank. Pedal-spindles may be replaced by suitable adaptors.

#### 4.13.6.2 Test method

Mount the assembly of the two pedal-spindles, the drive and non-drive crank arms, the chain wheel (or other drive component), and the bottom-bracket spindle located on its normal-production bearings in a fixture with bearing-housings representative of the bottom-bracket, as shown in Figure 23. It is permissible to perform the test with both cranks in the forward position, see hatched line in Figure 23. Incline the cranks at 45° to the horizontal. Prevent rotation of the assembly by locating a suitable length of drive-chain around the chain wheel and securing it firmly to a suitable support, or, for any other type of transmission (e.g. belt- or shaft-drive) by securing the first stage of the transmission.

Apply repeated, vertical, dynamic forces of 700 N alternately to the pedal-spindles of the left- and right-hand cranks at a distance of 50 mm from the outboard face of each crank (as shown in Figure 23) for 100 000 cycles (where one test cycle consists of the application of the two forces). If the cranks are assembled conventionally, the direction of the force on the right-hand crank shall be vertically downwards and that on the left-hand crank shall be vertically upwards. If the two cranks are in a forward position the direction of the force on both cranks shall be vertically downward. During application of these forces, ensure that the force on a "pedal-spindle" falls to 5 % or less of the peak force before commencing application of the test force to the other pedal-spindle.

Dimension in millimetres




**Key**

1 repeated test force
2 horizontal axis
3 axis of crank
4 alternative position for left crank
a From outboard face of crank.

**Figure 23 — Crank assembly — Fatigue test with cranks at 45° (typical test arrangement)**



## 4.14 Saddles and seat-posts

### 4.14.1 Limiting dimensions

No part of the saddle, saddle supports, or accessories to the saddle shall be more than 125 mm above the top saddle surface at the point where the saddle surface is intersected by the seat-post axis.

### 4.14.2 Seat-post – Insertion-depth mark or positive stop

The seat-post shall be provided with one of the two following alternative means of ensuring a safe insertion-depth into the frame:

a) it shall contain a permanent, transverse mark of length not less than the external diameter or the major dimension of the cross-section of the seat-post that clearly indicates the minimum insertion-

depth of the post into the frame. For a circular cross-section, the mark shall be located not less than two diameters of the post from the bottom of the post (i.e. where the diameter is the external diameter). For a non-circular cross-section, the insertion-depth mark shall be located not less than 65 mm from the bottom of the post (i.e. where the seat-post has its full cross-section);

b) it shall incorporate a permanent stop to prevent it from being drawn out of the frame such as to leave the insertion less than the amount specified in a) above.

### 4.14.3 Saddle and seat-post security test

#### 4.14.3.1 Requirement

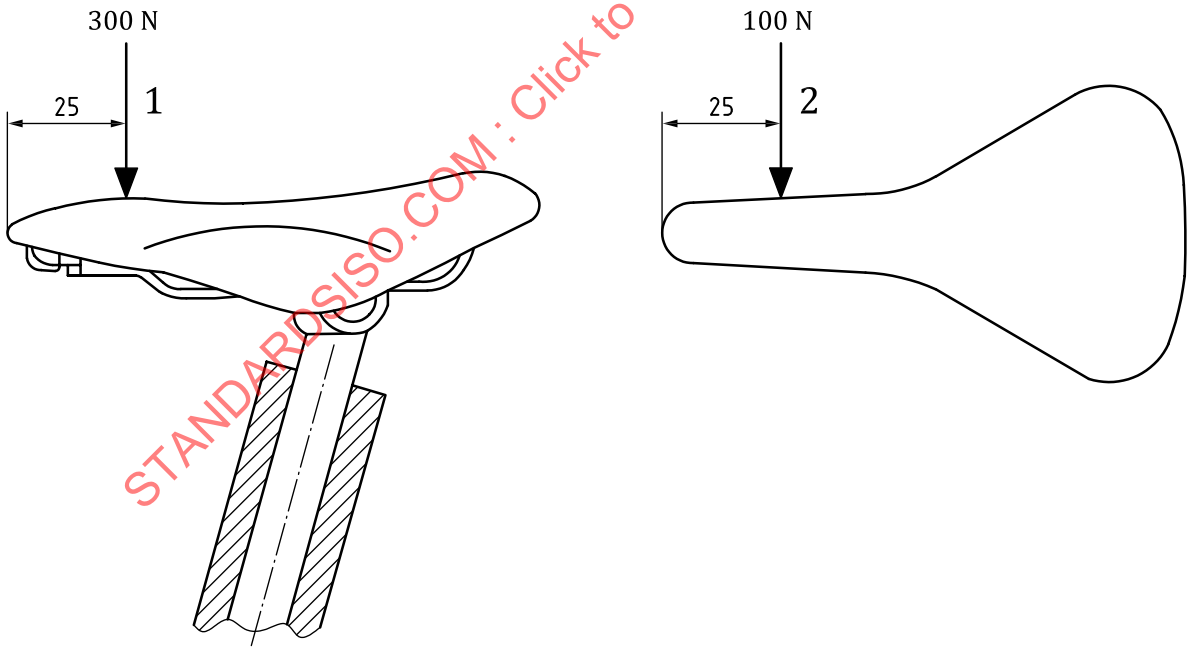
When tested by the method described in 4.14.3.2, there shall be no movement of the saddle adjustment clamp in any direction with respect to the post, or of the post with respect to the frame.

#### 4.14.3.2 Test method

With the seat-post correctly assembled to the bicycle frame at minimum insertion depth of the seat-post, and clamps tightened to the torque recommended by the bicycle manufacturer, apply a force of 300 N vertically downwards at a point of 25 mm from either the front or rear of the saddle, whichever produces the greater torque on the saddle-clamp. The saddle shall be positioned in the seat post clamp assembly as defined by the saddle manufacturer's rail markings or instructions. Maintain this force for 1 min. Remove this force and apply a lateral force of 100 N horizontally at a point 25 mm from either the front or rear of the saddle and maintain this force for 1 min, whichever produces the greater torque on the clamp (see Figure 24).

The fixture shall be such that it does not damage the surface of the saddle.

Dimension in millimetres




**Key**

1 vertical force

2 horizontal force

**Figure 24 — Saddle/seat-post security test**

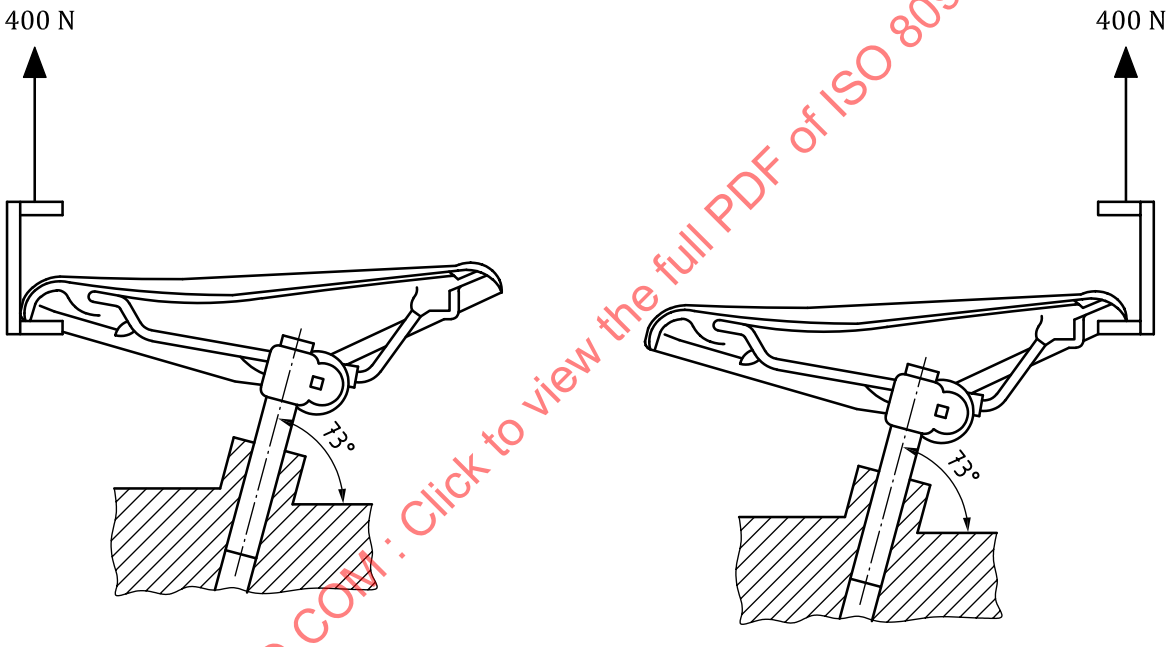
### 4.14.4 Saddle — Static strength test

#### 4.14.4.1 Requirement

When tested by the method described in 4.14.4.2, the wire chassis shall not disengage from the saddle cover and/or plastic moulding shall not disengage from the wire chassis and there shall be no cracking or permanent distortion of the saddle assembly.

#### 4.14.4.2 Test method

With the saddle positioned in a suitable fixture representative of a seat-post clamp assembly and in a maximum rearward direction as defined by the saddle manufacturer's rail markings or instructions, and the clamps tightened to the torque recommended by the bicycle manufacturer, apply forces of 400 N in turn, under the rear and nose of the saddle cover, as shown in Figure 25, ensuring that the force is not applied to any part of the chassis of the saddle. The forces shall be maintained for 1 min in each position.




a) Force under nose b) Force under rear

**Figure 25 — Saddle — Static strength test**



### 4.14.5 Saddle and seat-post assembly fatigue test

#### 4.14.5.1 General

In the following test, if a suspension seat-post is specified, the test may be conducted with the suspension system either free to operate or locked. If it is locked, the post shall be at its maximum length.

#### 4.14.5.2 Requirement

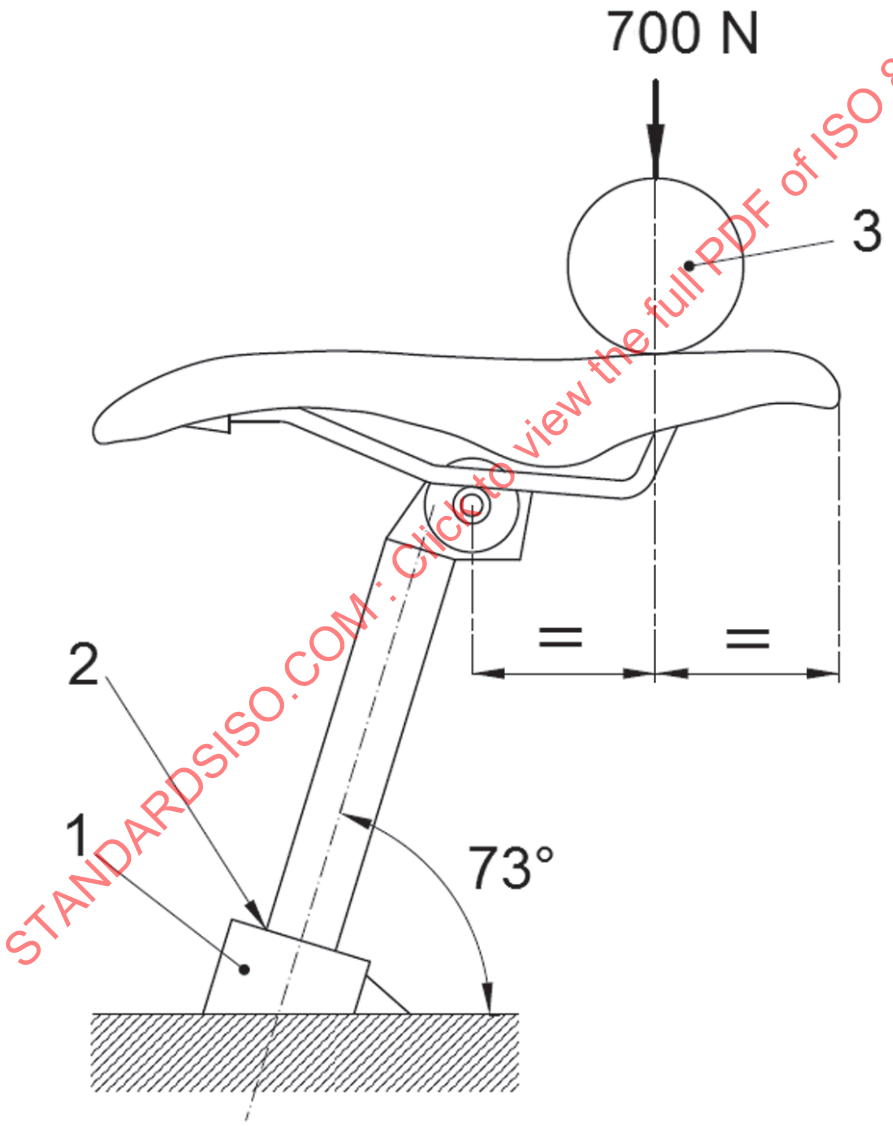
When tested by the method described in 4.14.5.3 there shall be no fractures or visible cracks in the seat-post, in the saddle or in the clamp.

#### 4.14.5.3 Test method

Insert the seat-post to its minimum insertion depth in a rigid mount representative of that on the bicycle and with its axis at 73° to the horizontal. The saddle shall be positioned in the seat post clamp assembly in a maximum rearward direction as defined by the saddle manufacturer's rail markings or instructions. Adjust the saddle to have its upper surface in a horizontal plane and tighten the clamp to the torque recommended by the bicycle manufacturer. Apply a repeated, vertically-downward force of 700 N for 100 000 cycles, in the position shown in Figure 26 by means of a pad 300 mm long × 80 mm diameter to prevent localized damage of the saddle cover. The maximum test frequency shall be maintained as specified in 4.1.5.

In case of saddles in which the saddle and the post are one part, the angle in Figure 26 shall be chosen in such a way that the saddle surface is horizontal.

Dimension in millimetres






**Key**

1 rigid mount
2 minimum insertion depth
3 pad (length = 300 mm, diameter = 80 mm)

**Figure 26 — Seat-post — Fatigue test**