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Cycles — Safety requirements for bicycles for young children

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

Reference number
ISO 8098:2002(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8098 was prepared by Technical Committee ISO/TC 149, *Cycles*, Subcommittee SC 1, *Cycles and major sub-assemblies*.

This second edition cancels and replaces the first edition (ISO 8098:1989), which has been technically revised.

Introduction

Safety requirements for bicycles intended to be ridden on public roads by adults and children aged about eight years and older (i.e. bicycles having saddle heights of 635 mm and above) are given in ISO 4210.

While ISO 8098 follows the lines of ISO 4210, it covers requirements for bicycles suitable for young children aged from about four to eight years. These bicycles are not intended to be ridden on public roads and should not be presumed to be suitably equipped for that purpose.

For safety requirements for toy bicycles intended for very young children aged up to about four years (i.e. bicycles having saddle heights up to 435 mm), see EN 71-1:1998^[1].

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 bicycles for young children of from about four to eight years of age, as well as these bicycles' sub-assemblies. 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 stunting (e.g. BMX bicycles).

2 Terms and definitions

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

2.1

cycle

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

2.2

bicycle

two-wheeled cycle

2.3

saddle height

vertical distance from the ground to the top of the seat surface, measured with the seat in a horizontal position and with the seat pillar set to the minimum insertion depth

2.4

braking force

force tangential to the tyre resisting rotation of the wheel when the brake is applied

2.5

(pedal) tread surface

surface of a pedal that is presented to the underside of the foot

2.6

maximum inflation pressure

maximum tyre pressure recommended by the manufacturer for safe and efficient performance

2.7

stabilizers

removable auxiliary wheels fitted to enable the rider to balance

2.8

exposed protrusion

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

3 Subassemblies

3.1 General

3.1.1 Sharp edges

Exposed edges that could come into contact with parts of the rider's body (e.g. hands and legs) during normal riding or normal handling and normal maintenance shall not be sharp.

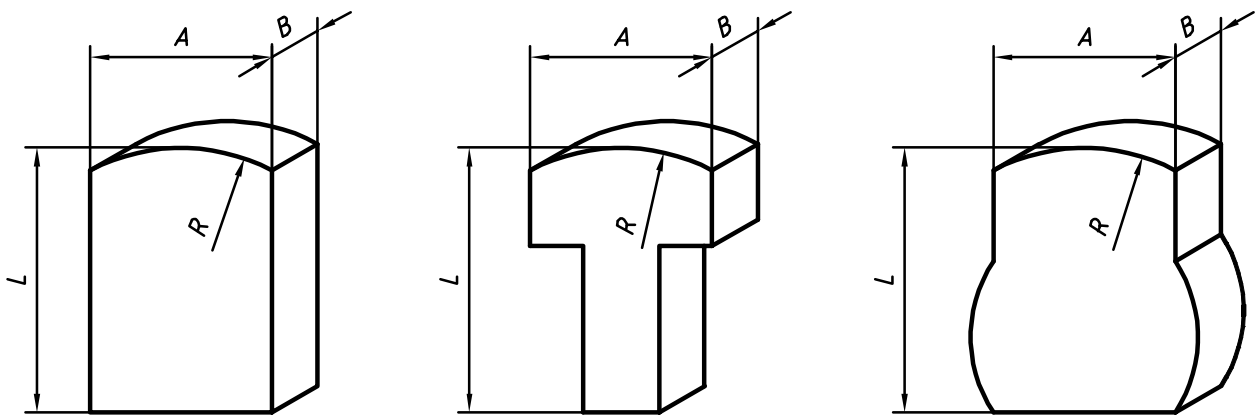
3.1.2 Protrusions

3.1.2.1 Exposed protrusions

Any rigid, exposed protrusion longer than 8 mm (see L in Figure 1) after assembly, with the exception of

- a) the front gear-change mechanism at the chainwheel,
- b) the rear gear-change mechanism below the chain-stay,
- c) the rim-brake mechanism at the front and rear wheels,
- d) a lamp-bracket fitted on the head-tube,
- e) reflectors, and
- f) toe-clips and toe straps,

shall terminate in a radius, R of not less than 6,3 mm. Such protrusions shall have a major end dimension, A , of not less than 12,7 mm, and a minor dimension, B , of not less than 3,2 mm. See Figure 1.



These shall apply when L is greater than 8 mm.

Figure 1 — Examples of min. dimensions of exposed protrusions

3.1.2.2 Exclusion zone, protective devices and screw threads

There shall be no protrusions on the top tube of a bicycle frame between the saddle and a point 300 mm forward of the saddle, with the exception that control cables no greater than 6,4 mm in diameter and cable clamps made from material no thicker than 4,8 mm may be attached to the top tube.

Foam pads attached to the bicycle frame to act as protective cushions are permitted, provided that the bicycle meets the requirements for protrusions when the pads are removed.

A screw thread that is an exposed protrusion shall be limited to a protrusion length of one major diameter of the screw beyond the internally threaded mating part.

3.1.2.3 Location of exposed protrusions

The location of exposed protrusions shall be established using a test-cylinder (simulating a limb) conforming to the dimensions shown in Figure 2.

Manoeuvre the cylinder in any convenient attitude toward any rigid protrusion on the bicycle. If the central 75 mm long section of the test cylinder comes into contact with any protrusion, that protrusion shall be considered an exposed protrusion and shall comply with the requirements of 3.1.2.1.

Dimensions in millimetres

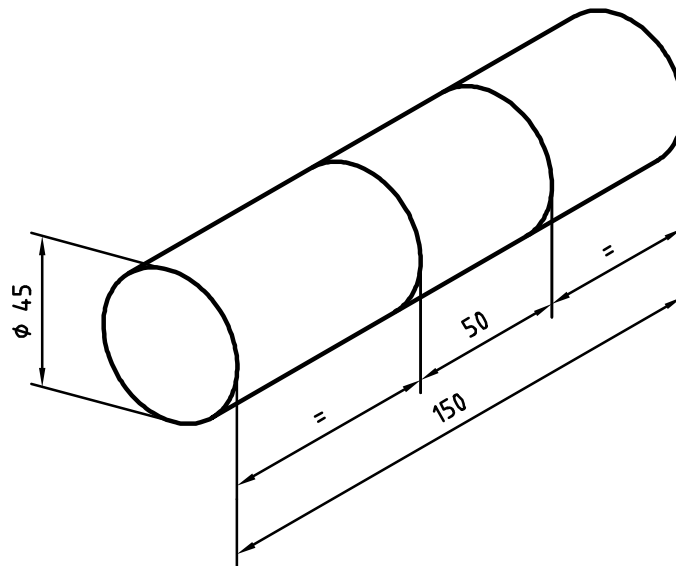


Figure 2 — Exposed protrusion test cylinder

Examples of exposed protrusions which do, and do not, need to comply with the requirements of 3.1.2.1 are shown in Figure 3.

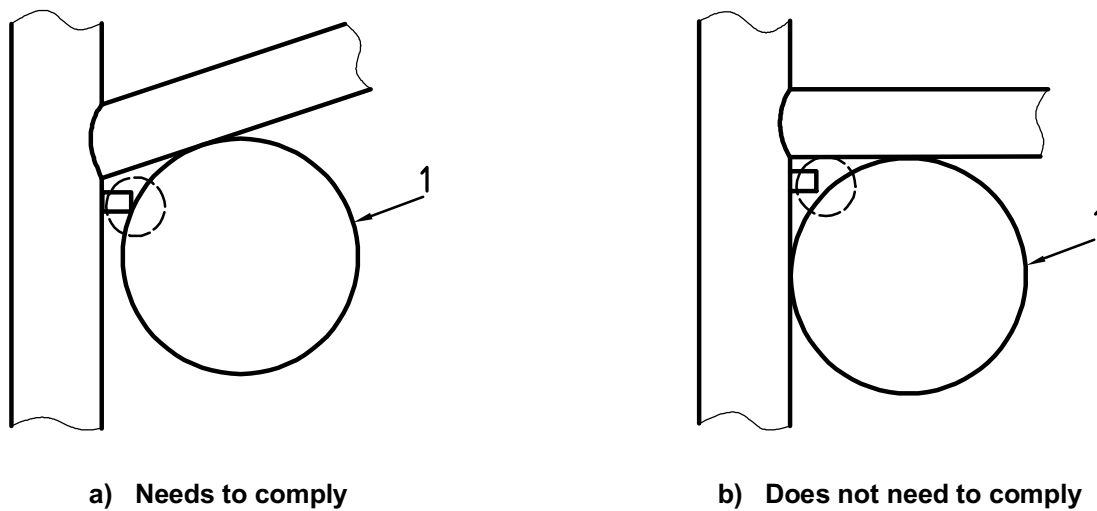
3.1.3 Security and strength of safety-related fasteners

3.1.3.1 Security of screws

Any screws used in the assembly of suspension systems, or screws used to attach generators, brake-mechanisms and mudguards to the frame, fork or handlebars, shall be provided with suitable locking devices (e.g. lock-washers, lock-nuts, stiff nuts).

3.1.3.2 Minimum failure torque

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



Key
 1 Test cylinder

Figure 3 — Examples of exposed protrusions

3.2 Brakes

3.2.1 Braking system

3.2.1.1 Bicycles with max. saddle height 560 mm or more

Bicycles with a maximum saddle height of 560 mm or more, whether or not they are fitted with a fixed transmitted drive, shall be equipped with two independent braking systems, one system operating on the front wheel and one on the rear.

It is recommended that the decision as to whether the rear braking system is operated by the rider's hand or foot be made in accordance with the legislation (or preference) of the country to which the bicycle is to be supplied.

3.2.1.2 Bicycles with maximum saddle height less than 560 mm

Bicycles with a maximum saddle height of less than 560 mm, whether or not they are fitted with a fixed transmitted drive, shall be equipped with at least one braking system. The system shall operate on either the front or the rear wheel.

It is recommended that, where a single braking system is used, the decision as to whether it operates on the front or the rear wheel be made in accordance with the legislation (or preference) of the country to which the bicycle is to be supplied.

Bicycles with two independent braking systems shall have one system operating on the front wheel and one on the rear.

It is recommended that the decision as to whether the rear braking system is operated by the rider's hand or foot be made in accordance with the legislation (or preference) of the country to which the bicycle is to be supplied.

3.2.2 Hand-operated brake

3.2.2.1 Brake lever position

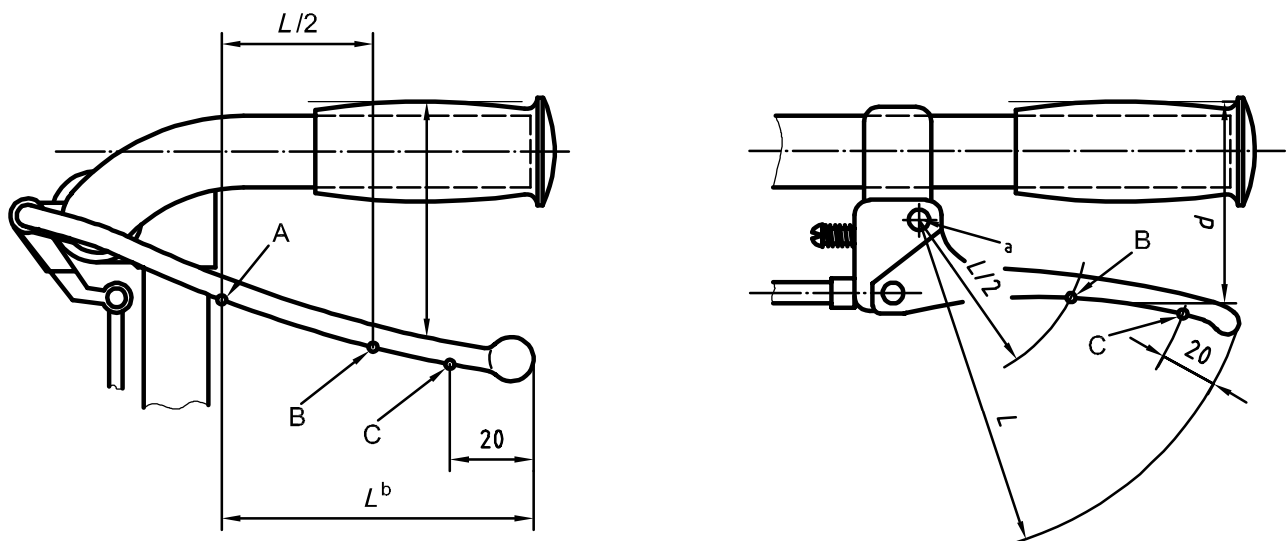
Brake levers for front and rear brakes shall be positioned on the side of the handlebar conventional to the country of use.

3.2.2.2 Brake lever dimensions

The maximum grip dimension, d , measured between the outer surfaces of the brake lever and the handlebar, or the handlebar grip or other covering if present, shall not exceed 60 mm between points A and B, and shall not exceed 75 mm between points B and C. See Figure 4.

The range of adjustable brake levers should permit these dimensions.

Dimensions in millimetres



- ^a Pivot A.
- ^b Lever length (= 80 mm).

Figure 4 — Hand-operated brake lever dimensions

3.2.2.3 Cable brake assembly

The braking system shall operate without binding.

The cable pinch bolt shall not sever the cable strands when assembled in accordance with the manufacturer's instructions.

The wires shall be protected against inner corrosion, for example, by a suitable, impervious liner to the outer casing.

The cable end shall be protected with a cap able to withstand a removal force of 20 N.

3.2.2.4 Brake block and holder assembly

The brake block shall be securely attached to the brake block holder and there shall be no failure of the brake block and holder assembly when tested to the method specified in 4.2. After completion of the test, the braking system shall be capable of meeting the braking performance requirements of 3.2.5.

3.2.2.5 Brake adjustment

The brakes shall be adjustable to an efficient operating position until the brake blocks have worn to the point of requiring replacement as recommended by the manufacturer.

When correctly adjusted, the brake block shall not come into contact with anything other than the intended braking surface.

3.2.3 Back-pedal brake

Back-pedal brakes shall be actuated by the rider's foot pedalling in the direction opposite to that of 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 torque of 14 N · m).

3.2.4 Strength of braking system

3.2.4.1 Hand-operated brake

When tested using the method specified in 4.3.1, there shall be no failure of the hand-operated braking system or any of its components.

3.2.4.2 Back-pedal brake

When tested using the method specified in 4.3.2, there shall be no failure of the back pedal braking system or any of its components.

3.2.5 Braking performance

3.2.5.1 Hand-operated brake performance test

When tested in accordance with 4.4, the average braking force of hand-operated braking systems shall increase progressively as the lever force is increased from 50 N to 90 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 N	Braking force at the tyre	
	min. N	max. (front brake only) N
50	40	120
90	60	200

3.2.5.2 Back-pedal brake performance test

When tested in accordance with 4.5, the average braking force of back-pedal braking systems transmitted to the rear wheel shall increase progressively as the pedal force is increased from 20 N to 100 N. The ratio of pedal force to braking force shall not exceed 2.

NOTE A braking force of 46,3 N equates to a theoretical braking distance of less than 2,5 m from a speed of 10 km/h with a total mass of bicycle and rider of 30 kg.

3.3 Steering

3.3.1 Handlebars

Handlebars shall have an overall width of between 300 mm and 550 mm. The vertical distance between the top of the handlebar grips in their highest position and the saddle height in its lowest position shall not exceed 250 mm.

3.3.2 Handlebar grips

The ends of the handlebars shall be fitted with handlebar grips that can withstand a removal force of 70 N. The handlebar grips shall be of resilient material and shall have an enlarged and covered end. Handlebar grips shall not obstruct the operation of brake levers.

NOTE The enlarged end is intended to minimize any possible penetration injury to the rider.

In countries where ambient temperature can fluctuate between -5°C and $+5^{\circ}\text{C}$ it is recommended that the following test be performed.

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, allow the temperature of the handlebar to reach -5°C and then apply a force of 70 N in the loosening direction. Maintain the force until the temperature of the handlebar has reached $+5^{\circ}\text{C}$.

3.3.3 Handlebar stem

The handlebar stem shall contain a permanent mark clearly indicating the minimum insertion depth into the fork stem or, alternatively, a positive and permanent means of ensuring that the minimum insertion depth is met. The insertion mark, or insertion depth, shall be not less than 2,5 times the stem diameter from the lower end of the stem, and there shall be not less than one stem diameter length of contiguous circumferential material below the mark.

3.3.4 Steering stability

The steering shall be free to turn through at least 60° on either side of the straight-ahead position, without exhibiting 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 seated on the saddle, with the saddle and rider in their rear-most positions

3.3.5 Strength of steering assembly

3.3.5.1 The handlebar stem shall not fracture or undergo permanent deformation in excess of 20 mm per 100 mm length when tested in accordance with 4.6.1.1 and 4.6.1.2.

3.3.5.2 The handlebar shall not move in relation to the stem when tested in accordance with 4.6.2.

3.3.5.3 The handlebar shall not move in relation to the fork stem when tested in accordance with 4.6.3.

3.4 Frame/fork assembly

3.4.1 Impact test (falling mass)

The frame/fork assembly shall not fracture or undergo permanent deformation (measured between the centrelines of the axles) in excess of 10 mm when tested in accordance with 4.7.1.

3.4.2 Impact test (falling frame/fork assembly)

The frame/fork assembly shall not fracture, and the permanent deformation between the centrelines before and after the test shall not exceed 10 mm, when tested in accordance with 4.7.2.

3.5 Front fork

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.

3.6 Wheels

3.6.1 Rotational trueness

3.6.1.1 General

The run-out tolerances in this International Standard represent the maximum permissible variation of position of the rim (i.e. full indicator reading) of a fully assembled wheel during one complete revolution about the axle without axial movement.

3.6.1.2 Radial run-out tolerance

Run-out for wheels shall not exceed 2 mm when measured perpendicular to the axle at a suitable point along the rim.

3.6.1.3 Axial run-out tolerance

Run-out for wheels shall not exceed 2 mm when measured parallel to the axle at a suitable point along the rim.

3.6.2 Clearance

The wheel assembly shall be aligned to allow a clearance of not less than 6 mm between the tyre and the frame, fork, mudguard or mudguard fixing.

3.6.3 Static load test

No component of fully assembled wheels shall fail, and the permanent deformation at the point of application of force on the rim shall not exceed 1,5 mm, when wheels are tested in accordance with 4.8.

3.6.4 Wheel retention

3.6.4.1 General

Wheels shall be secured with wheel nuts to the bicycle frame and forks so that, when adjusted in accordance with the manufacturer's recommendations, they conform to 3.6.4.2 and 3.6.4.3.

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

3.6.4.2 Front wheel retention

There shall be no relative motion between the axle and front fork when a force of 500 N is applied symmetrically to either side of the axle for a period of 30 s in the direction of removal of the wheel.

3.6.4.3 Rear wheel retention

There shall be no relative motion between the axle and frame when a force of 1 000 N is applied symmetrically to either side of the axle for a period of 30 s in the direction of removal of the wheel.

3.7 Tyres and tubes

3.7.1 Maximum inflation pressure

The maximum inflation pressure recommended by the manufacturer shall be permanently marked on the sidewall of the tyres and shall be readily visible when the tyre is assembled on the wheel.

Non-pneumatic tyres are excluded from this requirement.

3.7.2 Compatibility of inflatable tyres and rims

Tyres and tubes shall be compatible with the rim design so that when inflated to 110 % of the maximum inflation pressure recommended by the manufacturer for a period of not less than 5 min the tyre remains intact on the rim.

3.8 Pedals and pedal/crank assembly

3.8.1 Pedal tread

3.8.1.1 The pedal tread surface shall be secured against movement within the pedal assembly. The pedal shall turn freely on its axle.

3.8.1.2 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.

3.8.2 Pedal clearance

3.8.2.1 Ground clearance

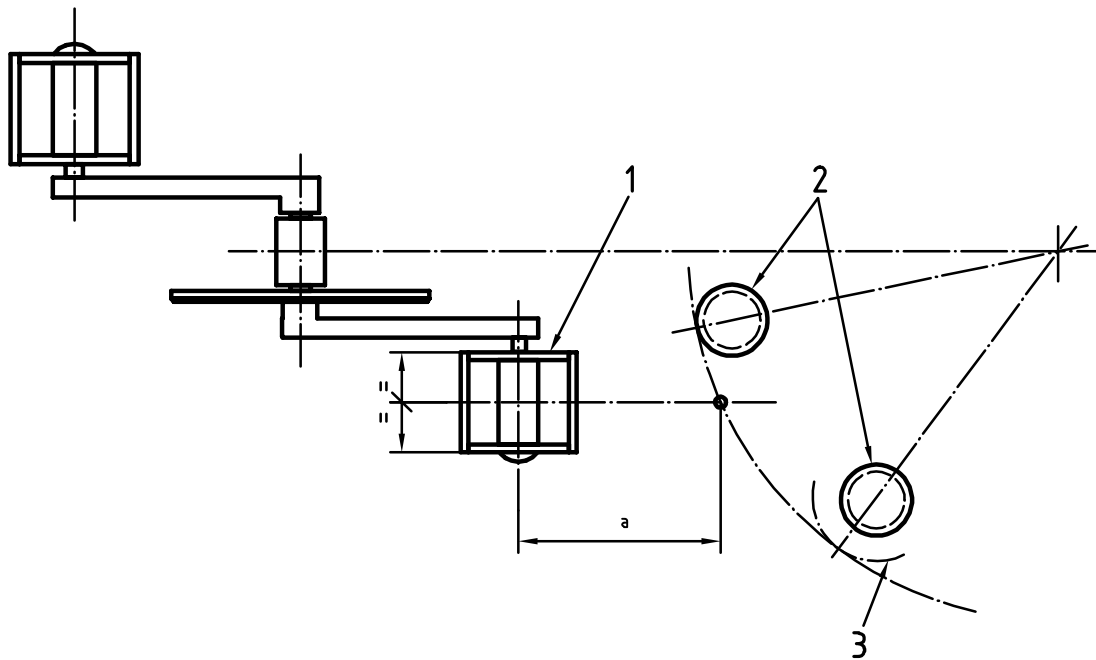
3.8.2.1.1 With the bicycle unladen, any stabilizers removed, and with the pedal at its lowest point and the tread surface parallel to the ground (and uppermost if it has only one tread surface), the bicycle shall be able to lean through an angle of 20° from the vertical without the pedal touching the ground.

3.8.2.1.2 Sprung suspension (if applicable) shall be depressed by application of a 30 kg mass to the saddle whilst the bicycle is held vertical. With the suspension clamped in this position, the ground clearance shall conform to 3.8.2.1.1.

3.8.2.2 Toe clearance

Bicycles shall have a clearance of at least 89 mm 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 by the mudguard, whichever is the lesser (see Figure 5).

Where the front fork is designed to permit fitting of a mudguard, but where no mudguard is fitted, the toe clearance measured in accordance with these requirements shall be a minimum of 100 mm.



- Key**
- 1 Bicycle pedal
 - 2 Tyre
 - 3 Mudguard
- ^a Minimum clearance.

Figure 5 — Toe clearance

3.8.3 Pedal/crank assembly kinetic test

Pedals and crank threads shall not fracture when tested in accordance with 4.9.

3.9 Saddle

3.9.1 Limiting dimensions

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

3.9.2 Seat pillar

The seat pillar shall contain a permanent mark clearly indicating the minimum insertion depth of the pillar into the frame. The insertion mark shall be positioned not less than two diameters of the pillar from the bottom of the full diameter of the pillar.

3.9.3 Saddle adjustment clamp

The saddle assembly shall not permanently move with respect to the pillar and the pillar shall not permanently move with respect to the frame when tested in accordance with 4.10.

Non-clamped saddle assemblies designed to pivot in a vertical plane with respect to the pillar shall be permitted to move within the design parameters, and shall pass the test in 4.10 without additional visible permanent movement.

3.9.4 Saddle strength

Neither the saddle cover nor the plastic moulding shall disengage from the steel wire chassis, nor shall the saddle assembly crack or permanently distort when tested in accordance with 4.14.

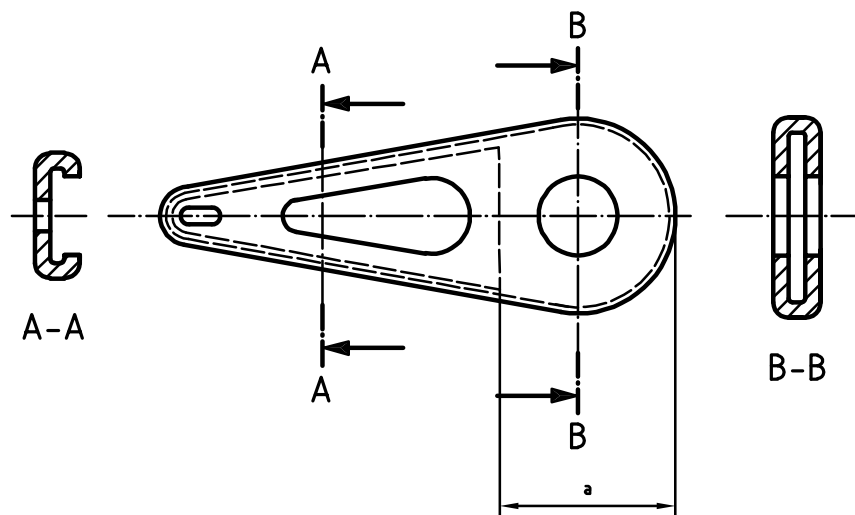
3.10 Drive system static load test

No component of the drive system shall fracture or permanently deform when tested in accordance with 4.11. Drive ability shall not be affected.

3.11 Chainguard

Bicycles with a maximum saddle height of 560 mm or more shall be equipped with a chainwheel disc or other protective device to shield the outside face of the upper junction of the chain and chainwheel. Chainwheel discs shall exceed in diameter the outside surface of the chain when the chain is positioned on the chainwheel. Protective devices other than a chainwheel disc shall shield the chain for a distance of at least 25 mm, measured along the chain prior to the point where the chainwheel teeth first pass between the side plates of the chain.

Bicycles with a maximum saddle height of less than 560 mm shall be equipped with a chainguard that fully shields the outside face and edge of the chain, chainwheel and rear sprocket, as well as the inside face of the chainwheel and junctions of the chain and chainwheel (see Figure 6).



^a Extent of cover on inside face.

Figure 6 — Chainguard

3.12 Stabilizers

3.12.1 Dimensions

When attached to the bicycle in accordance with the manufacturer's instructions

- the horizontal distance between the vertical plane through each stabilizer wheel and the vertical plane through the centreline of the bicycle frame shall be at least 175 mm, and
- the clearance between each stabilizer wheel and the ground shall not exceed 25 mm with the bicycle supported upright on a flat horizontal surface.

3.12.2 Vertical load test

The deflection under load and the permanent deformation shall not exceed 25 mm and 15 mm, respectively, when tested in accordance with 4.12.

3.12.3 Longitudinal load test

The permanent deformation shall not exceed 15 mm when tested in accordance with 4.13.

No component of the stabilizer assembly shall fracture in the test.

3.13 Instructions

Each bicycle shall be supplied with a set of instructions in the language of the country to which the bicycle will be supplied, containing information on the following:

- a) preparation for riding — how to adjust the saddle height and handlebar to suit the rider, with an explanation of the warning marks on the seat pillar and handlebar stem;
- b) recommended tightening of fasteners relating to handlebar, handlebar stem, saddle, seat pillar and wheels;
- c) lubrication — where and how often to lubricate, and the recommended lubricant;
- d) how to adjust the chain or other drive mechanism;
- e) brake adjustment and recommendations for replacement of brake blocks;
- f) gear adjustment;
- g) fitting, adjustment and removal of stabilizers;
- h) normal spares, i.e. tyres, tubes, brake-block holder assembly;
- i) recommendations on safe riding — use of helmets, regular checks on brakes, tyres and tyre inflation, and steering;
- j) the correct method for assembly of parts if supplied unassembled.

Any other relevant information may be included at the discretion of the manufacturer.

3.14 Marking

It is recommended that the bicycle be visibly and durably marked with

- a) ISO 8098, when electing to comply with this International Standard,
- b) the manufacturer's or vendor's name or trademark, and
- c) the serial number of the bicycle.

4 Test methods

4.1 General

All tests shall be carried out without stabilizers fitted, unless otherwise specified.

4.2 Brake block test

Conduct the brake block test on a fully assembled bicycle, with the brakes correctly adjusted, and with a mass of 30 kg on the saddle. Actuate each brake lever with a force of 130 N and maintain this force during the test.

Subject the bicycle to five forward and five rearward movements, each of not less than 75 mm.

4.3 Braking system load test

4.3.1 Hand-operated brake

Conduct the braking system load test on a fully assembled bicycle, ensuring that the braking system is correctly adjusted. Apply a force as follows to the brake lever, at a point 25 mm from the end of the lever and normal to the handlebar grip surface in the plane of travel of the lever, as shown in Figure 7. The force shall be either

- a) 300 N,
- b) sufficient to bring a cable-brake lever into contact with the handlebar grip surface if less than 300 N, or
- c) sufficient to bring a rod-operated brake lever level with the upper handlebar grip surface if less than 300 N.

Perform the test ten times on each brake lever.

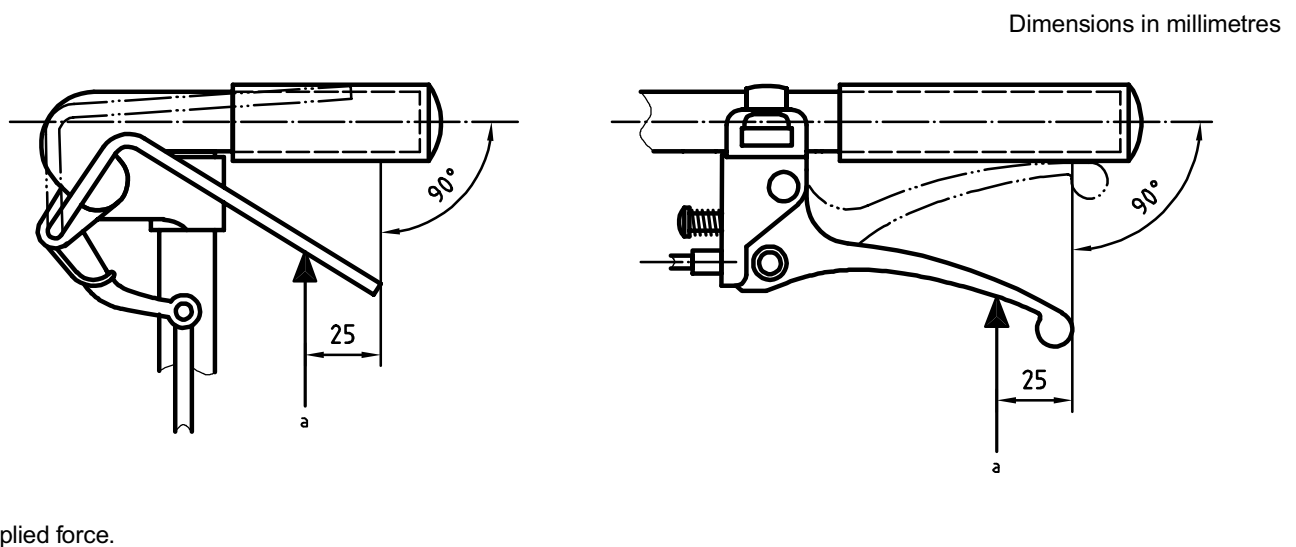


Figure 7 — Applied force on hand-operated brake levers

4.3.2 Back-pedal brake

Conduct this test on a fully assembled bicycle. Ensure that the braking system is correctly adjusted, and that the right-hand pedal crank is in a horizontal position. Gradually apply a vertical force of 600 N to the centre of the right-hand pedal axle, and maintain this for 15 s.

Perform the test ten times.

4.4 Hand-operated brake performance test

Conduct the hand-operated brake performance test on a bicycle with the saddle and seat pillar removed but otherwise fully assembled, and with the brake correctly adjusted.

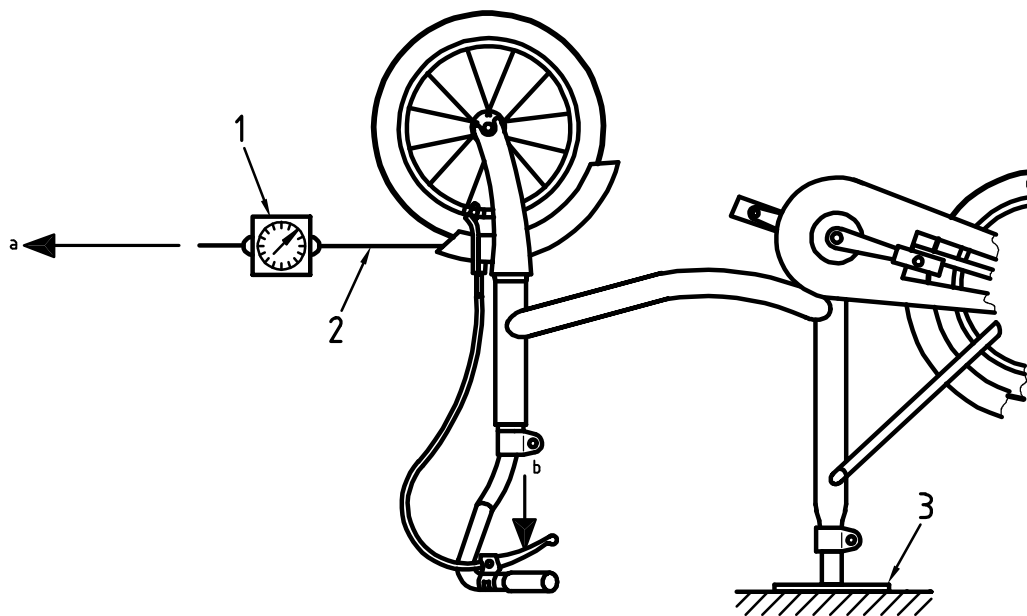
Secure the bicycle and attach a braking-force measuring device to the appropriate wheel, as shown in Figure 8.

Apply a force of between 50 N and 90 N to the appropriate brake lever, 25 mm from the end of the lever and normal to the handlebar grip in the plane of travel of the lever (see Figure 7).

Apply a steady pulling force to the wheel through the force-measuring device, tangentially to the circumference of the tyre and in the forward 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 m/s.

For each force on the lever, take the average of three readings. Repeat the test for not less than five different forces on the lever.



Key

- 1 Force measuring device
- 2 Suitable webbing wrapped around wheel circumference
- 3 Fixture
- ^a Applied force on wheel (braking force).
- ^b Applied force on lever.

Figure 8 — Measurement of braking force from hand-operated brake

4.5 Back-pedal brake performance test

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

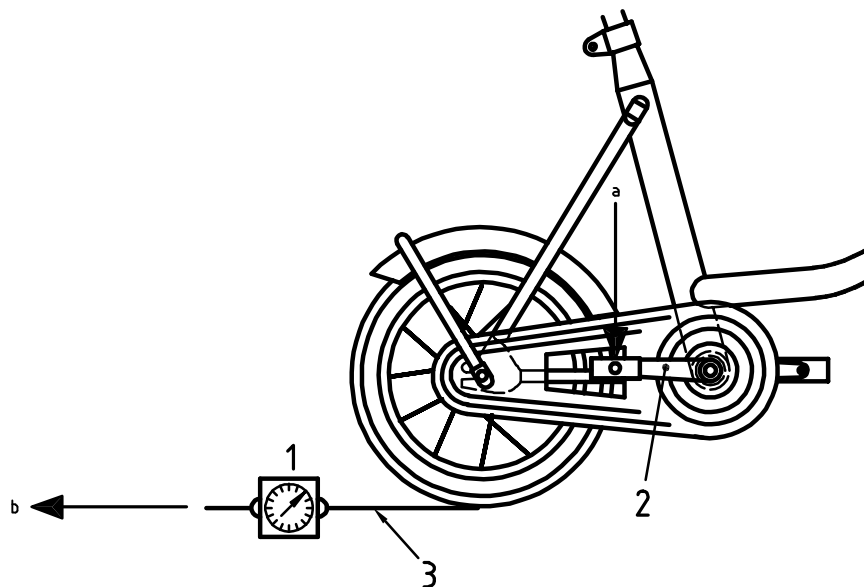
Secure the bicycle and attach a braking-force measuring device to the rear wheel as shown in Figure 9.

Apply a force of between 20 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 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 m/s.

For each force on the pedal, take the average of three readings. Repeat the test for not less than five different forces on the pedal.



Key

- 1 Force measuring device
- 2 Right hand crank
- 3 Suitable webbing wrapped around wheel circumference

- ^a Direction of applied force on pedal.
- ^b Applied force on wheel (braking force).

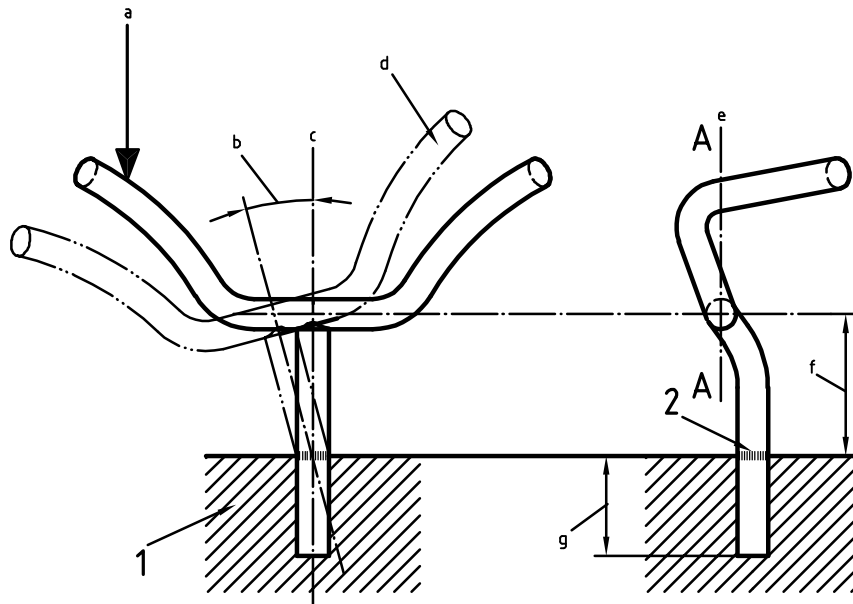
Figure 9 — Measurement of braking force from back-pedal brake

4.6 Steering assembly test

4.6.1 Handlebar stem

4.6.1.1 Torque test

With the handlebar stem securely clamped to the minimum insertion depth (see 3.3.3), and a test bar or handlebar securely assembled to the stem, apply a torque of 30 N · m to the stem via the test bar or handlebar assembly in a plane parallel to the stem and in the direction of the stem centreline (see Figure 10).



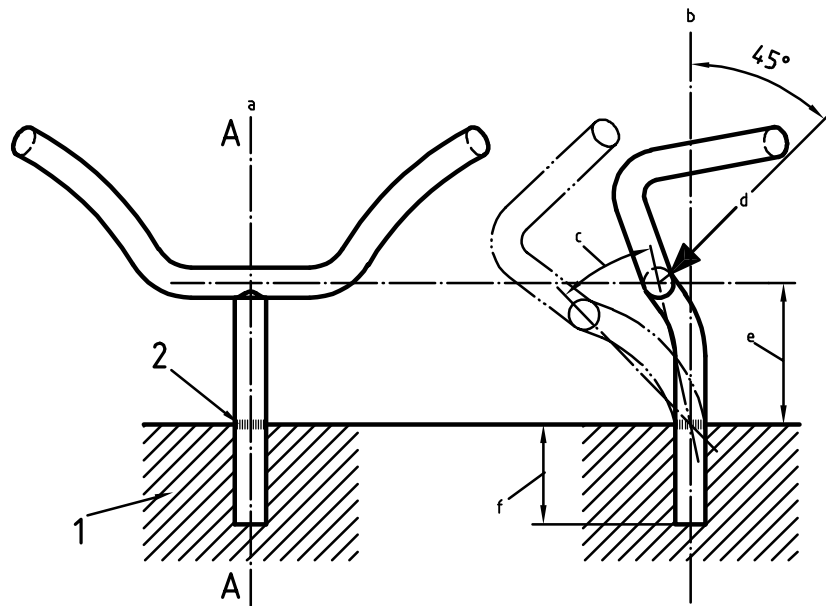
Key

- 1 Clamping fixture
- 2 Limit mark
- a Applied torque.
- b Permanent deformation.
- c Stem centreline.
- d Deflected shape.
- e Torque applied in plane A-A.
- f Free stem length.
- g Minimum insertion depth.

Figure 10 — Torque test on handlebar stem

4.6.1.2 Static load test

With the handlebar stem securely clamped to the minimum insertion depth (see 3.3.3), apply a force of 500 N through the handlebar attachment point in the forward direction, at 45° to the axis of the stem shank, in plane A-A (see Figure 11).



Key

- 1 Clamping fixture
- 2 Limit mark
- a Force applied in plane A-A.
- b Axis of stem shank.
- c Permanent deformation.
- d Applied force.
- e Free stem length.
- f Minimum insertion depth.

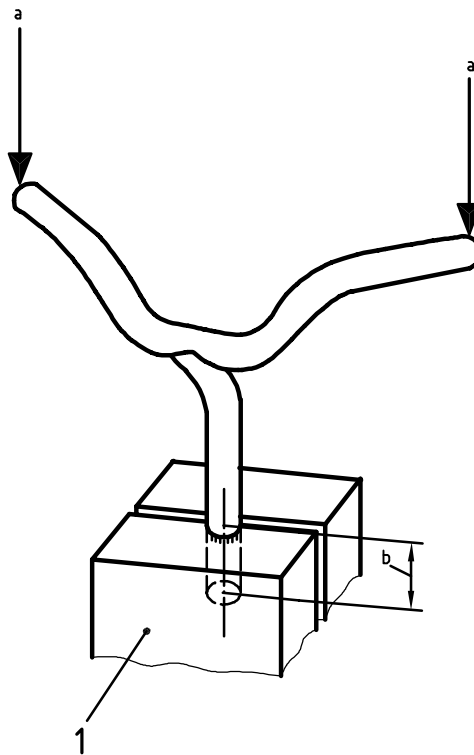
Figure 11 — Static load test on handlebar stem

4.6.2 Torque test — Handlebar and stem

With the stem of the handlebar assembly securely clamped to the minimum insertion depth (see 3.3.3), 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 12).

Depending on the shape of the handlebar, the forces may be applied in a direction different from those shown in Figure 12.

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



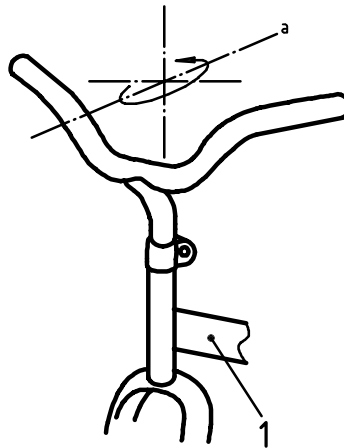
Key

- 1 Clamping block
- a Applied force.
- b Minimum insertion depth.

Figure 12 — Torque test on handlebar/stem assembly

4.6.3 Torque test — Handlebar stem and fork stem

With the handlebar stem correctly assembled in the frame and fork stem, and the clamping device tightened to the manufacturer's recommended minimum torque, apply a torque of 15 N · m to the handlebar/fork clamping device, as shown in Figure 13.



Key

1 Frame and fork assembly

^a Applied torque.

Figure 13 — Torque test on handlebar/fork clamping device

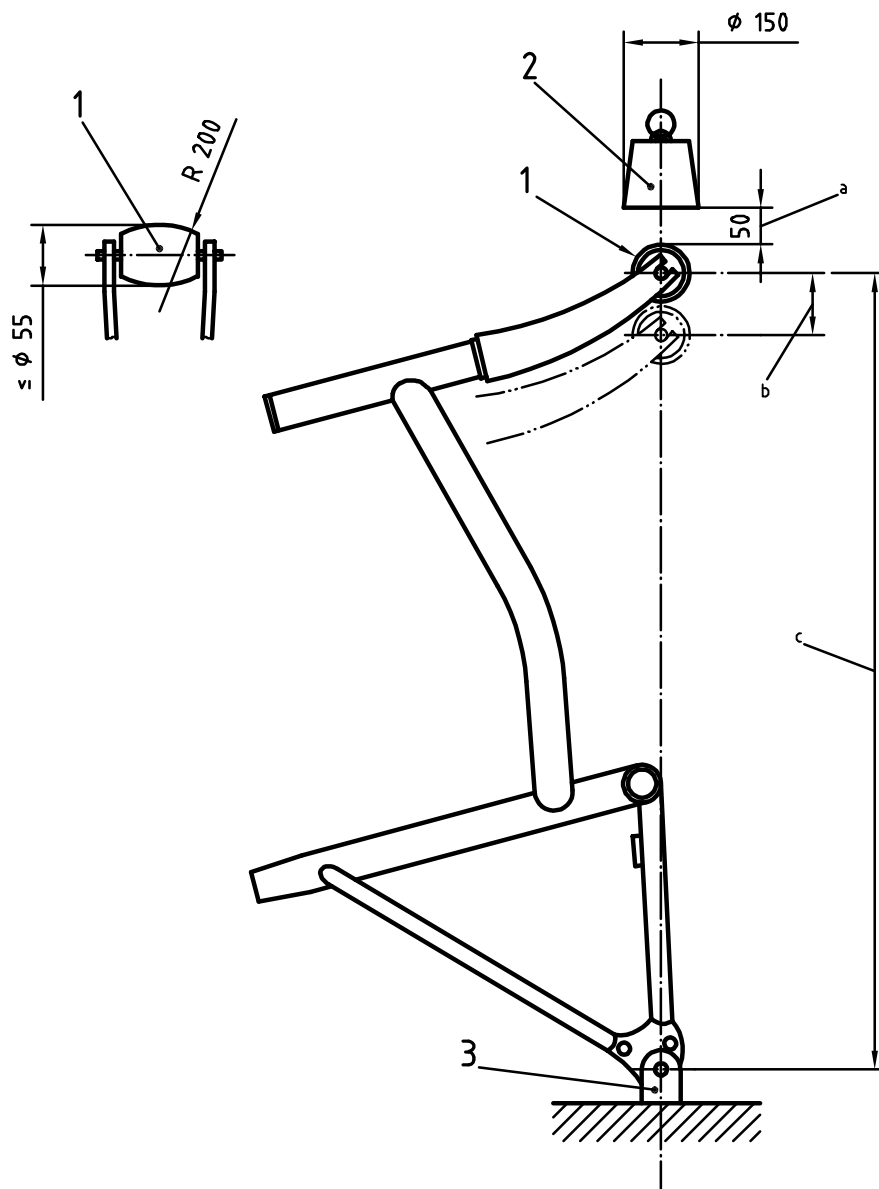
4.7 Impact tests on frame/fork assembly

4.7.1 Falling mass test

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 low-mass roller 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.

Drop a 22,5 kg mass 50 mm onto the low-mass roller at a point in-line with the wheel centres and against the direction of the fork rake.



Key

- 1 Low-mass roller
- 2 22,5 kg mass
- 3 Rigid mounting for rear axle attachment point

^a Drop height.

^b Permanent deformation.

^c Distance between axle centrelines (wheelbase).

Figure 14 — Impact test (falling mass)

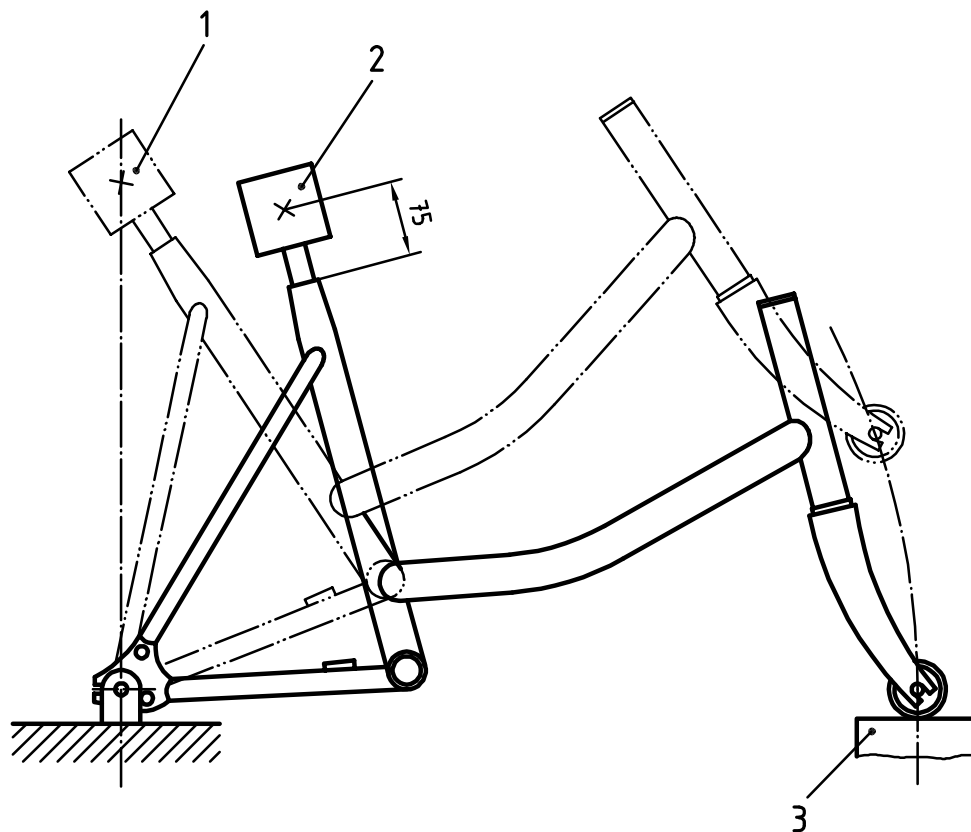
4.7.2 Falling frame/fork assembly test

Conduct the falling frame/fork assembly test on the frame/fork/roller assembly used in 4.7.1.

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 pillar, with the centre of gravity on the axis of the saddle tube and 75 mm from the top of the saddle tube along the axis. Rotate the assembly about the rear axle so that the centre of gravity of the 30 kg mass is vertically above the rear axle, then allow the assembly to fall freely onto the anvil (see Figure 15).

Perform the test twice.

Dimensions in millimetres



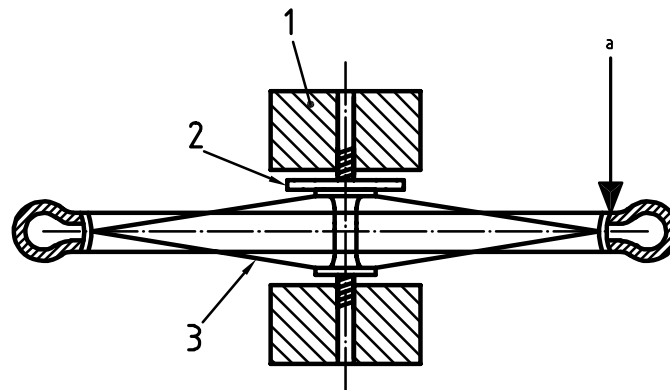
Key

- 1 Mass vertically above rear axle
- 2 30 kg mass
- 3 Steel anvil

Figure 15 — Falling frame/fork assembly test

4.8 Static load test: wheel

With the wheel suitably supported and clamped as shown in Figure 16, apply a force of 178 N on the side of the drive sprocket at a point on the wheel rim, perpendicular to the plane of the wheel, for 1 min.



Key

- 1 Clamping fixture
- 2 Drive sprocket
- 3 Wheel assembly
- ^a Applied force.

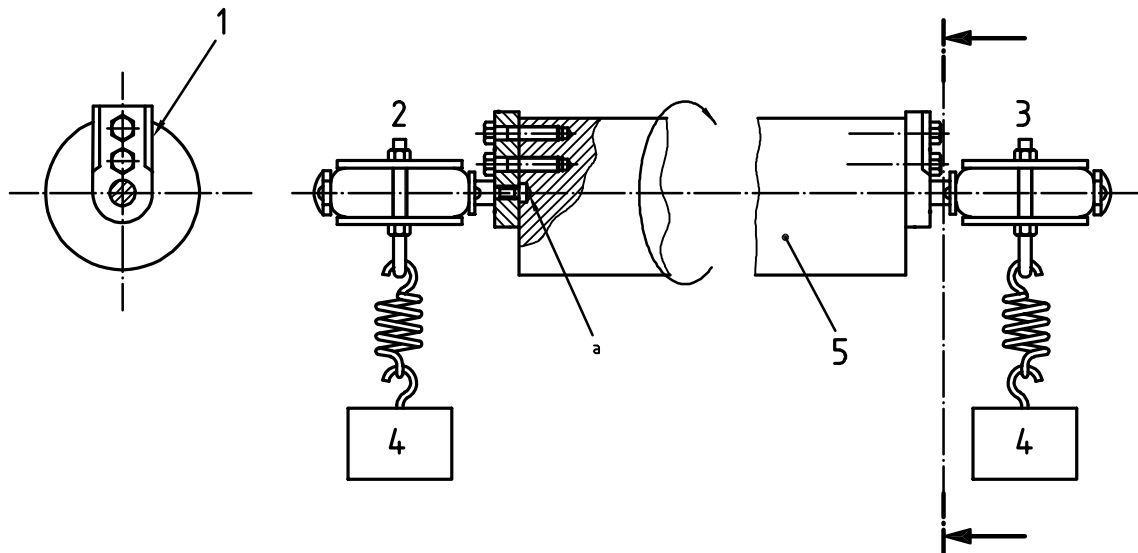
Figure 16 — Static load test — Wheel

4.9 Pedal/crank assembly kinetic test

With sections cut from a pair of cranks fitted to a test shaft, assemble a pair of pedals to the cranks. Suspend a 20 kg mass from each pedal using a spring, in order to minimize oscillation of the load, as shown in Figure 17.

Drive the shaft at a speed compatible with the material of the bearing surfaces, to avoid overheating, for 100 000 r.

If the pedals have two tread surfaces, turn them through 180° after 50 000 r.



Key

- 1 Section of crank bolted to test shaft
- 2 Left pedal
- 3 Right pedal
- 4 Total mass: 20 kg
- 5 Test shaft

^a Note clearance for pedal spindle.

Figure 17 — Kinetic test on pedal/crank assembly

4.10 Static load test — Saddle and pillar

With the saddle and pillar correctly assembled to the frame, and clamped to the recommended torque, apply a force of 300 N vertically downwards at a point within 25 mm from either the front or rear of the saddle, whichever produces the greater torque on the saddle clamp. Remove the force and apply a further force of 100 N horizontally to a point within 25 mm from either the front or rear of the saddle, whichever produces the greater torque on the saddle clamp.

4.11 Drive-system static load test

4.11.1 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.

4.11.2 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 600 N, to the centre of the left-hand pedal, and maintain the full force for 15 s.

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 applied to the centre of the right-hand pedal.

4.11.3 Multispeed system

Carry out the following.

- a) Conduct test procedure 4.11.2 a) with the transmission in the highest gear.
- b) Conduct test procedure 4.11.2 b) with the transmission in the lowest gear.

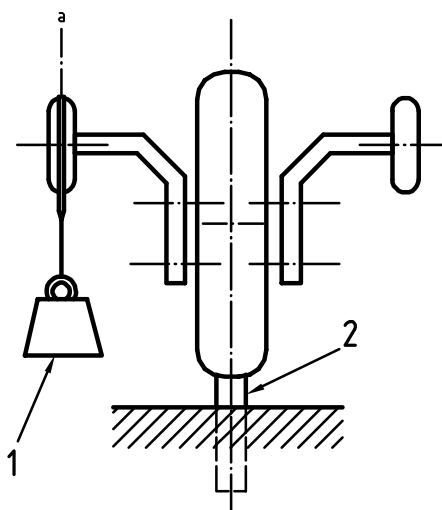
4.12 Stabilizers — Vertical load test

With the bicycle frame inverted and rigidly secured in the upright position via the seat pillar, suspend a 30 kg mass from one of the stabilizer wheels for 3 min (see Figure 18).

Measure the deflection under load at a point on the circumference of the stabilizer wheel.

Remove the mass and measure the permanent deformation at the same point after 1 min.

Repeat the test on the other stabilizer wheel.



Key

- 1 30 kg mass acting through centreline of tyre
- 2 Seat pillar secured in rigid fixture
- a Tyre centreline.

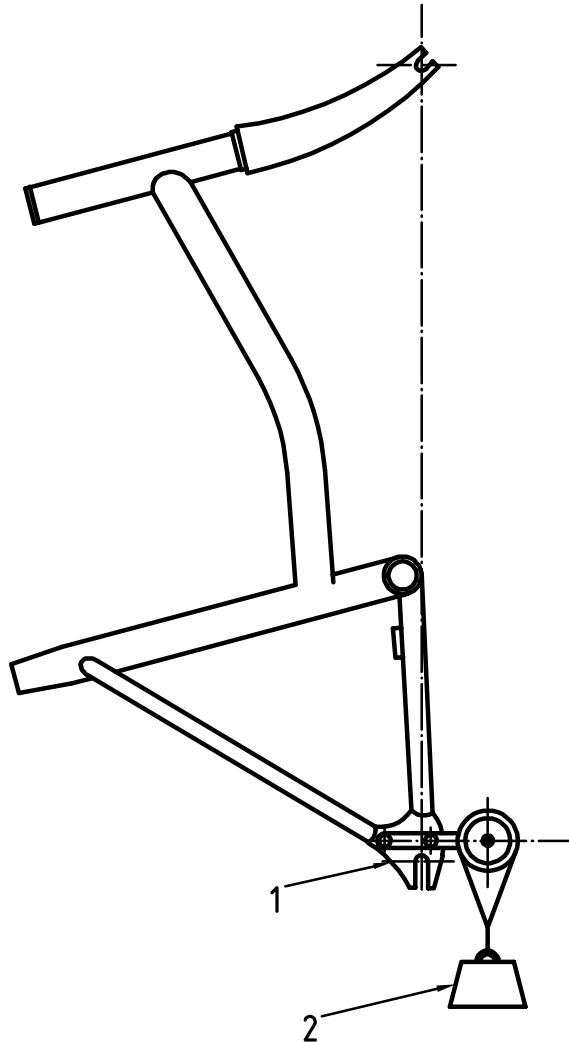
Figure 18 — Vertical load test

4.13 Stabilizers — Longitudinal load test

With the bicycle frame rigidly supported with the front wheel axle vertically above the rear wheel axle, suspend a mass of 30 kg from one of the stabilizer wheels, as shown in Figure 19, for 3 min.

Remove the mass and measure the permanent deformation at a point on the circumference of the stabilizer wheel after 1 min.

Repeat the test on the other stabilizer wheel.



Key

- 1 Frame rigidly secured in vertical position
- 2 30 kg mass acting through centreline of wheel

Figure 19 — Longitudinal load test

4.14 Saddle strength test

With the saddle clamped to a fixture at the recommended torque, apply a force of 400 N under the rear and nose of the saddle cover, as shown in Figure 20, without touching any part of the steel chassis of the saddle.

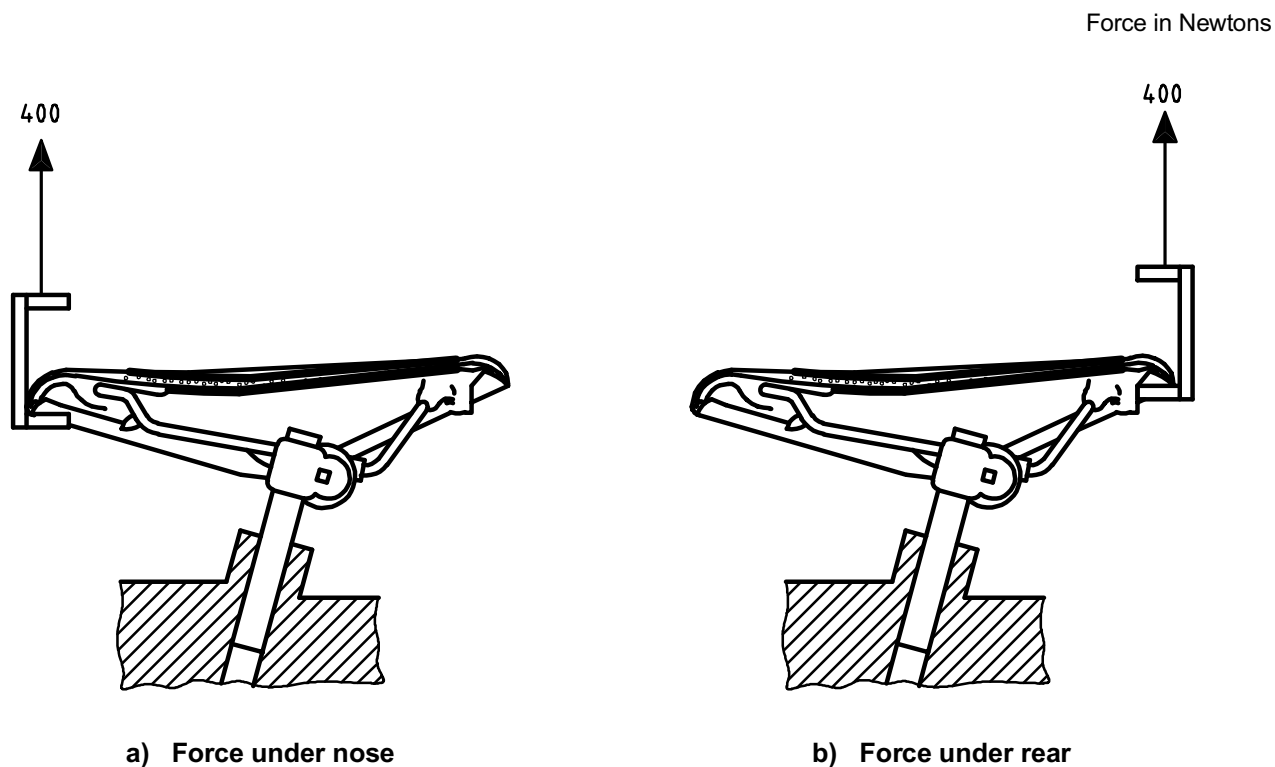


Figure 20 — Saddle strength test

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