149

INTERNATIONAL STANDARD

ISO 4210

Third edition
1989-10-01

Cycles — Safety requirements of bicycles

Cycles — Conditions de sécurité des bicyclettes

Reference number
ISO 4210 : 1989 (E)

Contents

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4210 was prepared by Technical Committee ISO/TC 149, *Cycles*.

This third edition cancels and replaces the second edition (ISO 4210 : 1982), which has been revised to incorporate Amendment 1 of 1984 and draft Amendment 2 of 1986.

Annexes A and B of this International Standard are given for information only.

Introduction

In producing this International Standard, 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 test conditions specified for the test method for braking performance under wet conditions (see 2.2.5.2) are more severe than are encountered in practice; the resulting braking distances are therefore in excess of those that would be obtained under actual rainy conditions.

Notwithstanding the requirements specified in this International Standard, any new designs, constructions, materials and assembly methods which cannot be tested in accordance with the requirements of this International Standard but which give an equivalent degree of safety and durability may be regarded as complying with this International Standard until an amendment or addendum to this International Standard is published.

The scope has been limited to safety considerations, and has specifically avoided standardization of components.

Cycles — Safety requirements of bicycles

Section 1 : General

1.1 Scope

This International Standard specifies safety and performance requirements for the design, assembly and testing of bicycles and sub-assemblies, and lays down guidelines for instructions on the use and care of bicycles.

It applies to bicycles intended for use on public roads, and on which the saddle can be adjusted to provide a saddle height of 635 mm or more.

It does not apply to specialized types of bicycle such as tradesmen's delivery bicycles, tandems, toy bicycles and bicycles designed and equipped for use in sanctioned competitive events.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6742-1 : 1987, *Cycles — Lighting and retro-reflective devices — Photometric and physical requirements — Part 1: Lighting equipment.*

ISO 6742-2 : 1985, *Cycles — Lighting and retro-reflective devices — Photometric and physical requirements — Part 2: Retro-reflective devices.*

ISO 7636 : 1984, *Bells for bicycles and mopeds — Technical specifications.*

1.3 Definitions

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

1.3.1 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.

1.3.2 bicycle : Two-wheeled cycle.

1.3.3 delivery bicycle : Bicycle designed for the primary purpose of carrying goods.

1.3.4 tandem : Bicycle with saddles for two or more riders, one behind the other.

1.3.5 saddle height : Dimension from the ground plane to the top of the saddle, measured in the centre of the seating area normal to the ground plane when the bicycle is upright.

1.3.6 braking distance : Distance travelled in bringing a bicycle to rest from the moment of application of the brakes.

1.3.7 stopping distance : Sum of the braking distance and the distance travelled during the rider's reaction time.

1.3.8 gear development : Distance travelled by a bicycle during one revolution of the pedal cranks.

1.3.9 exposed protrusion : Protrusion that can be contacted by the central 75 mm of the lateral surface of a cylinder 250 mm long and 83 mm in diameter (simulating a limb). See figure 1.

1.3.10 (pedal) tread surface : Surface of a pedal that is presented to the underside of the foot, the design of which incorporates a slip-resistant characteristic.

Dimensions in millimetres

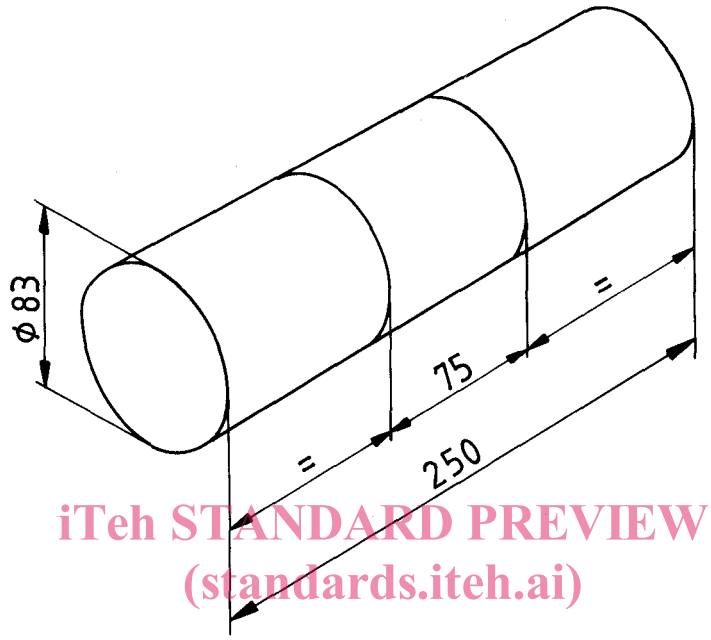

Figure 1 — Exposed protrusion test cylinder

Section 2 : Requirements of sub-assemblies

2.1 General

2.1.1 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.

2.1.2 Protrusions

Any exposed protrusion longer than 8 mm after assembly shall terminate in a radius of not less than 6,3 mm. Such protrusions shall have a major end dimension greater than 12,7 mm and a minor end dimension greater than 3,2 mm.

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.

A screw thread that is an exposed protrusion (see 1.3.9) shall be limited to a protrusion length of one major diameter of the screw beyond the internally threaded mating part.

2.2 Brakes

2.2.1 Braking system

A bicycle shall be equipped with a braking system, or systems, to ensure compliance with 2.2.5. Where one braking system is provided, this shall operate on the rear wheel; where two separate systems are provided, one shall operate on the front wheel and one on the rear wheel.

2.2.2 Hand-operated brakes

2.2.2.1 Brake lever position

The brake levers for front and rear brakes shall be positioned on those sides of the handlebar appropriate to the country in which the bicycle is to be used.

2.2.2.2 Brake lever dimensions

The maximum grip dimension, d (see figure 2) 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 90 mm between points A and B, and 100 mm between points B and C.

Dimensions in millimetres

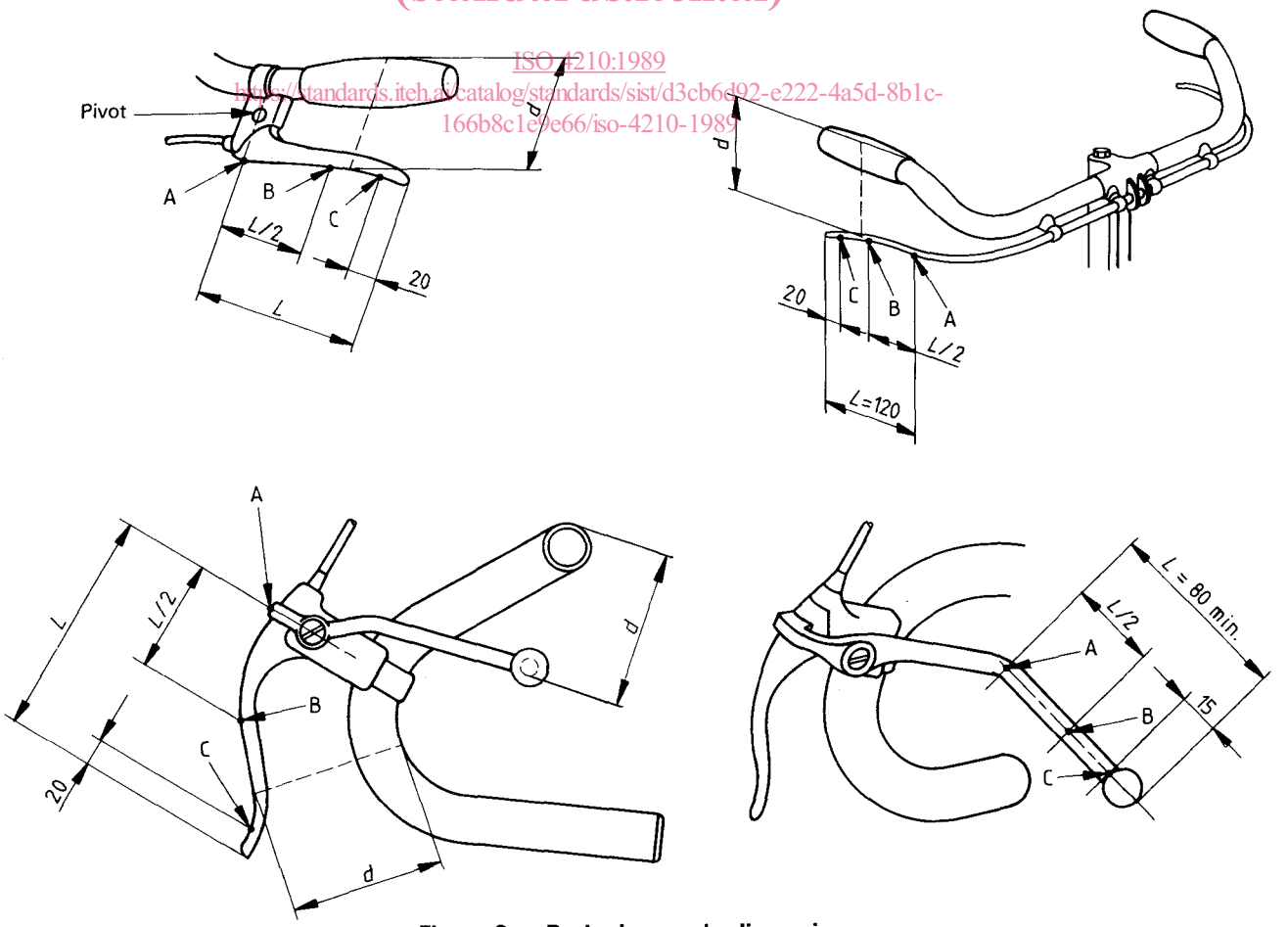

Figure 2 — Brake lever grip dimensions

2.2.2.3 Cable-brake assembly

When a bicycle is equipped with cable brakes of whatever type, the screws for attaching to the frame or fork shall be provided with a suitable locking device, for example lockwasher, locknut or stiffnut.

The brake system shall operate without binding.

The cable pinch-bolt shall not cut any of the cable strands, when assembled to the manufacturer's instructions.

2.2.2.4 Brake pad assembly

The brake friction pad shall be securely attached to the backing plate or holder and there shall be no failure of the friction pad assembly when tested by the method specified in 4.1. The brake system shall be capable of meeting the braking performance requirements of 2.2.5.1 and 2.2.5.2 after completion of the test specified in 4.1.

2.2.2.5 *Brake adjustment*

The brakes shall be capable of adjustment to an efficient operating position until the brake pads have worn to the point of requiring replacement as recommended in the literature provided by the manufacturer.

When correctly adjusted, the brake pad shall not contact anything other than the intended braking surface.

2.2.3 Back-pedal brakes

The brake shall be actuated by the operator's foot applying force to the pedal in a 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 at least 14 N·m.

2.2.4 Strength of brake system

2.2.4.1 Hand-operated brakes

When tested by the method described in 4.2.1, there shall be no failure of the brake system or of any component thereof.

2.2.4.2 Back-pedal brakes

When tested by the method described in 4.2.2, there shall be no failure of the brake system or any component thereof.

2.2.5 Braking performance

2.2.5.1 Braking under dry conditions

When tested by the method described in 4.3,

a) a bicycle having a gear development, in its highest gear, of 5 m or more shall be brought to a smooth safe stop within a distance of 5,5 m from a velocity of 24 km/h;

b) a bicycle having a gear development, in its highest gear, of less than 5 m shall be brought to a smooth safe stop within a distance of 5,5 m from a velocity of 16 km/h.

NOTE — The braking distance of 5,5 m includes a margin of human and instrument error associated with current test methods, and may be reviewed at a later date in the light of experience gained in testing.

2.2.5.2 Braking under wet conditions

When tested by the method described in 4.3, a bicycle shall be brought to a smooth, safe stop within a distance of 15 m from a velocity of 16 km/h.

2.2.5.3 Linearity of back-pedal brake

When tested by the method described in 4.4, the brake force shall be linearly proportional (within 20 %) to a pedal force of from 90 N to 300 N and shall be not less than 150 N for a pedal force of 300 N.

2.3 Steering

2.3.1 Handlebars

The handlebars shall have an overall width between 350 mm and 700 mm. The vertical distance between the top of the handlebar grips in their highest position and the seat surface of the saddle in its lowest position shall not exceed 400 mm.

The ends of the handlebars shall be fitted with handgrips or end plugs that will withstand a removal force of 70 N.

2.3.2 Handlebar stem

The handlebar stem shall contain a permanent mark that clearly indicates the minimum insertion depth of the handlebar stem into the fork stem, or alternatively a positive and permanent means of ensuring the minimum insertion depth shall be provided. The insertion mark, or insertion depth, shall be not less than 2,5 times the shaft diameter from the lower end of the stem, and there shall be at least one shaft diameter's length of contiguous circumferential shaft material below the mark. An insertion mark shall not detract from the strength of the handlebar stem.

2.3.3 Expander bolt for handlebar stem

The minimum failure torque of the bolt shall be at least 50 % greater than the manufacturer's maximum tightening torque.

2.3.4 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.

Recommendations for steering geometry are given in annex B.

2.3.5 Strength of steering assembly

The handlebar stem shall be capable of withstanding without fracture the tests described in 4.5.1.1 and 4.5.1.2.

When tested by the method described in 4.5.2, there shall be no movement of the handlebar relative to the stem.

When tested by the method described in 4.5.3, there shall be no movement of the handlebar stem relative to the fork stem other than that movement required to take up tolerances before any locking faces abut. Such movement shall not exceed 5°.

2.4 Frame/fork assembly

2.4.1 Impact test (falling mass)

When tested by the method described in 4.6.1, there shall be no visible evidence of fracture, and the permanent deformation of the assembly, measured between the centre-lines of the axles, shall not exceed 40 mm.

2.4.2 Impact test (falling frame/fork assembly)

When tested by the method described in 4.6.2, there shall be no visible evidence of fracture.

2.5 Front fork

The slots or other means of location for the front axle within the front fork shall be such that when the axle or cones are firmly abutting the top face of the slots, the front wheel remains central within the front fork.

2.6 Wheels

2.6.1 Rotational trueness

This is defined in ISO 1101[1] in terms of circular run-out tolerance (axial). The run-out tolerances given below 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.

2.6.1.1 Concentricity tolerance

For bicycles equipped with rim brakes, the run-out shall not exceed 2 mm when measured perpendicular to the axle at a suitable point along the rim.

For bicycles not equipped with rim brakes, the run-out shall not exceed 4 mm.

2.6.1.2 Squareness tolerance

For bicycles equipped with rim brakes, the run-out shall not exceed 2 mm when measured parallel to the axle at a suitable point along the rim.

For bicycles not equipped with rim brakes, the run-out shall not exceed 4 mm.

2.6.2 Clearance

Alignment of the wheel assembly in a bicycle shall allow not less than 2 mm clearance between the tyre and any frame or fork element.

2.6.3 Static load test

When a fully assembled wheel is tested by the method described in 4.7, there shall be no failure of any of the components of the wheel, and the permanent deformation, measured at the point of application of the force on the rim, shall not exceed 1,5 mm.

2.6.4 Wheel retention

Wheels shall be secured to the bicycle frame with a positive locking device and shall be tightened to the manufacturer's specification.

2.6.4.1 Front wheel retention

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

2.6.4.2 Rear wheel retention

There shall be no relative motion between the axle and the frame when a force of 1 780 N is applied symmetrically to the axle for a period of 30 s in the direction of removal of the wheel.

2.7 Tyres and tubes

2.7.1 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-moulded tyres are excluded from this requirement.

1) ISO 1101 : 1983, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

2.7.2 Compatibility

The tyre and tube shall be compatible with the rim design. When inflated to 110 % of the recommended inflation pressure for a period of not less than 5 min, the tyre shall remain intact on the rim.

2.8 Pedals and pedal/crank drive system

2.8.1 Pedal tread

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

2.8.1.2 Pedals intended to be used without toe-clips, or for optional use with toe-clips, 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.

2.8.1.3 Pedals designed to be used only with toe-clips shall have toe-clips securely attached and need not comply with the requirements given in 2.8.1.2 a) and b).

2.8.2 Pedal clearance

2.8.2.1 Ground clearance

With the bicycle unladen, 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 25° from the vertical before any part of the pedal touches the ground.

When a bicycle is equipped with a sprung suspension, this measurement shall be taken with the suspension in a depressed position such as would be caused by a rider weighing 85 kg.

2.8.2.2 Toe clearance

Bicycles not equipped with positive foot-retaining devices (such as toe clips) shall have at least 89 mm clearance between the pedal and the 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 results in the least clearance. See figure 3.

Where a bicycle front fork has features that are designed to permit the fitting of a front mudguard, the toe clearance shall be measured with a suitable mudguard so fitted.

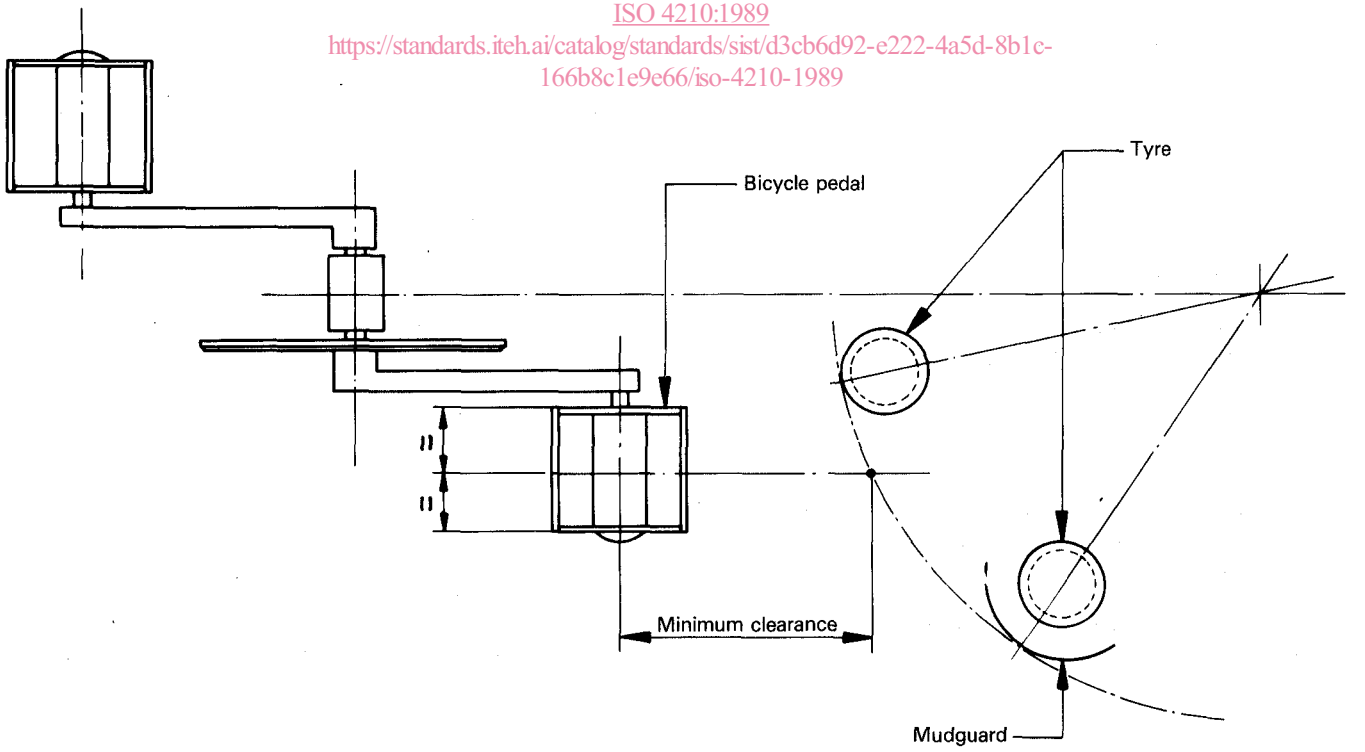

Figure 3 — Toe clearance