Taiwan Bicycle Industry Standard

TBIS

4210-3

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Cycles — Safety requirements for bicycles —

Part 3:
Common test methods

Reference number:
TBIS 4210-3:2015 (FDTS)

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Foreword

Taiwan Bicycle Industry Standard (TBIS) is approved and announced by Taiwan Bicycle Association (TBA). The preparatory work of "Taiwan Bicycle Industry Standard" is carried out by the technical expert committee from TBIS. When TBA members are interested in the related standard that has been announced, and after they are approved by the R&D and patent committee of TBA, they will become the member of the technical expert committee of TBIS. TBA and Cycling & Health Tech Industry R&D Center (CHC) are in close cooperation to handle all matters applied and established by TBIS.

The structure, establishing process and revising of this standard should be proposed to and get determined by the R&D and Patent Committee of TBA. This standard is implemented after the announcement of TBA. Please be aware, some part of this document may involve patent rights. TBIS has no legal obligation to mark out where all or part of the patent is involved.

Background description:

After 2015, The International Organization for Standardization 4210: 2014 (ISO 4210:2014) will be the most commonly used safety standard in global bicycle industry. Although ISO 4210 is not a mandatory inspection standard in various economic markets, they are still requesting their bicycle products suppliers to follow the basis of ISO 4210 safety requirements. However, this phenomenon represents that they are unable to differentiate the quality and grade differences between bicycles and spare parts. In order to keep up the competitiveness of our bicycle industry in the international market, the technical expert committee of TBIS uses ISO 4210 as their investigation basis and propose a higher level of product safety and standard service, to establish TBIS especially for this purpose. To highlight on the quality, performance and reliability of those components that has passed TBIS inspection, which have already exceeded the international standard. In the meantime, TBIS is developing on the safety standard and testing technology on those bicycle parts that are excluded in ISO 4210, to ensure the product and identify the differences between product performance, which has become an important reference to drive the improvement on Taiwan bicycle industry Research & Design units.

Establishment History

1st: [TBIS General Meeting (rev. NP) Discussion] Total 13 companies and 18 industry experts participate, 2015.06.25.

2nd: [TBIS Working Draft (rev. WD) Discussion] Total 13 companies and 18 industry experts participate, 2015.06.25.

3rd: [TBIS Committee Draft (rev.CD) Discussion] Total 14 companies and 22 industry experts participate, 2015.07.21.

4th: [TBIS Enquiry stage (rev. DTS) Discussion] Total 15 companies and 19 industry experts participate, 2015.09.02.

5th: [TBIS Approval Stage (rev. FDTS) Discussion] Total 17 companies and 19 industry experts participate, 2015.10.28.

6th: [TBIS Subject Meeting] Total 17 companies and 19 industry experts participate, 2015.10.28.

Introduction

The purpose of this TBIS is to build the world's leading bicycle industry standards and norms bicycle manufacturing process to ensure product safety and external benefits effectively (including announcing internationally, producing high-valued products, and leading the R&D of bicycle industry, etc.), highlighting the product inspected by TBIS is in compliance with a higher safety requirement. While riding the bicycle on public roads, the laws and regulations of the country will be applicable.

TBIS 4210 consists of the following parts, under the general title *Cycles — Safety requirements for bicycles*:

— *Part 1: Terms and definitions*

— *Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

— *Part 3: Common test methods*

— *Part 4: Braking test methods*

— *Part 5: Steering test methods*

— *Part 6: Frame and fork test methods*

— *Part 7: Wheels and rims test methods*

— *Part 8: Pedals and drive system test methods*

— *Part 9: Saddles and seat-post test methods*

Reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4210-1, *Cycles — Safety requirements for bicycles — Part 1: Terms and definitions*

ISO 4210-3:2014, *Cycles — Safety requirements for bicycles — Part 3: Common test methods*

ISO 4210-4:2014, *Cycles — Safety requirements for bicycles — Part 4: Braking test methods*

ISO 4210-5:2014, *Cycles — Safety requirements for bicycles — Part 5: Steering test methods*

ISO 4210-6:2014, *Cycles — Safety requirements for bicycles — Part 6: Frame and fork test methods*

ISO 4210-7:2014, *Cycles — Safety requirements for bicycles — Part 7: Wheel and rim test methods*

ISO 4210-8:2014, *Cycles — Safety requirements for bicycles — Part 8: Pedal and drive system test methods*

ISO 4210-9:2014, *Cycles — Safety requirements for bicycles — Part 9: Saddle and seat-post test methods*

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

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

Cycles — Safety requirements for bicycles —

Part 3:
Common test methods

1 Scope

This part of TBIS 4210 specifies the common test methods for TBIS 4210-2.

2 Normative references

The following referenced 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.

TBIS 4210-1, *Cycles — Safety requirements for bicycles — Part 1: Terms and definitions*

TBIS 4210-2:2016, *Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

TBIS 4210-4:2016, *Cycles — Safety requirements for bicycles — Part 4: Braking test methods*

3 Terms and definitions

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

4 Test methods

4.1 Brake tests and strength tests

4.1.1 Definition of brake tests

Brake tests to which accuracy requirements apply, as in 4.1.4, are those specified in TBIS 4210-2:2016, 4.6.3 to 4.6.6, TBIS 4210-4:2016, 4.2, and TBIS 4210-4:2016, 4.6.3.3.

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 TBIS 4210-2:2016, 4.7 to 4.13, TBIS 4210-2:2014, 4.16, and TBIS 4210-2:2016, 4.20.2.

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 these 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. It should be noted that if more than one test is conducted on the same sample, earlier tests 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.

4.1.4 Accuracy tolerances of test conditions for brake tests and strength tests

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 %

4.2 Front mudguard test methods

4.2.1 Front mudguard with stays test methods

4.2.1.1 Stage 1: Test method — Tangential obstruction

Insert a 12-mm-diameter steel rod between the spokes, in contact with the rim and below the front mudguard stays as shown in Figure 1, and rotate the wheel to apply a tangentially upward force of 160 N, against the front mudguard stays; maintain this force for 1 min.

Remove the rod and determine whether or not the wheel is free to rotate and whether or not any damage to the front mudguard adversely affects wheel rotation (blocking of the wheel) and the steering.

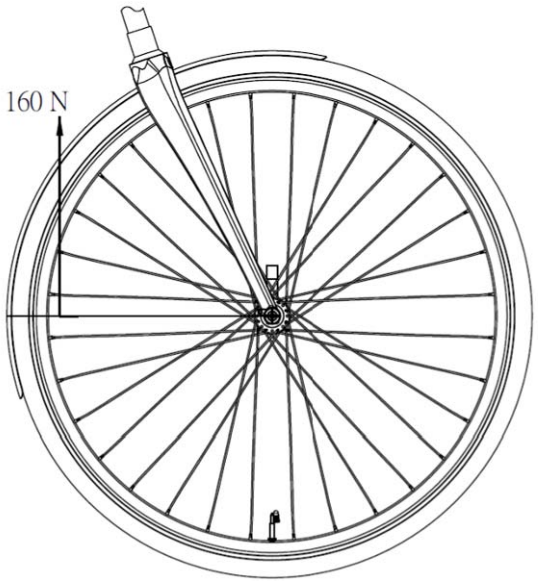


Figure 1 — Front mudguard — Tangential obstruction test

4.2.1.2 Stage 2: Test method — Radial force

Press the front mudguard at a distance of 20 mm from its free end (not taking the flap into consideration) with a 20-mm-diameter, flat-ended tool radially towards the tyre with a force of 80 N as shown in Figure 2.

Dimensions in millimetres

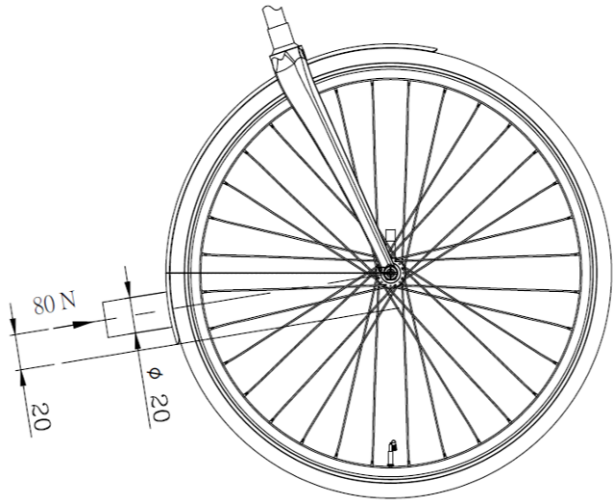


Figure 2 — Front mudguard — Radial force test

While the force is maintained, rotate the wheel manually in the direction of forward movement of the bicycle and determine whether or not the wheel is free to rotate, and whether or not any damage to the front mudguard adversely affects wheel rotation (blocking of the wheel) and the steering.

4.2.2 Front mudguard without stays test methods

Press the front mudguard at a distance of 20 mm from its free end with a 20-mm-diameter, flat-ended tool radially towards the tyre with a force of 80 N as shown in Figure 2.

While the force is maintained, rotate the wheel manually in the direction of forward movement of the bicycle and determine whether or not the front mudguard is rolled up the wheel, and whether or not any damage to the front mudguard adversely affects wheel rotation (blocking of the wheel) or obstructs the steering. Contact between tyre and mudguard is allowed.

4.3 Road test on a fully assembled bicycle test methods

First, check and adjust, if necessary, each bicycle selected for the road test to ensure that the steering and wheels rotate freely without slackness and that brakes are correctly adjusted and do not impede wheel rotation. Check and adjust wheel alignment and, if necessary, inflate tyres to the maximum inflation pressure. Check and correct, if necessary, transmission-chain adjustment, and check any gear controls for correct and free operation.

Carefully adjust the saddle and handlebar positions to suit the rider.

The test shall be carried out with the permissible total weight specified by the manufacturer in TBIS 4210-2:2016, Clause 5 item h). Ensure that the bicycle is ridden for at least 1 km.

4.4 Marking test

4.4.1 Durability test of marking

Rub the marking by hand for 15 s with a piece of cloth soaked in water and again for 15 s with a piece of cloth soaked in petroleum spirit.

4.4.2 Safety requirement of marking

The paint component should meet the requirements of RoHS.

4.5 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 the dynamic requirements of 4.1.4.

NOTE Examples of suitable methods are listed in Reference [1].

4.6 Fatigue test for composite components

For fatigue test for composite components, the initial value of displacement (peak-to-peak value) is taken after 1 000 cycles and before 2 000 cycles.

4.7 Impact test

For all vertical impact tests, the striker shall be guided in such a way that the efficiency will permit to reach at least 95 % of the free-fall velocity.

NOTE See Annex B.

4.8 Plastic material test ambient temperature

All strength tests involving any plastic materials shall be pre-conditioned for 2 h and tested at an ambient temperature of 23 °C ± 5 °C.

Annex A
(informative)

Structural integrity of the fully assembled bicycle

A.1 Requirement

When tested by the method described in A.2, there should be no system or component failure and no loosening or misalignment of the saddle, handlebar, controls, lighting equipment, or reflectors.

A.2 Machine test

Mount a fully assembled bicycle on a test machine. The following weights should be applied:

— one 36 kg weight with a pin for insertion in the seat-post and divided into two halves to be hung, one on each side;

— two 18 kg weights with fixtures for attaching them to the cranks in place of the pedals;

— two 6,75 kg weights with fixtures for attaching them to each side of the handlebar;

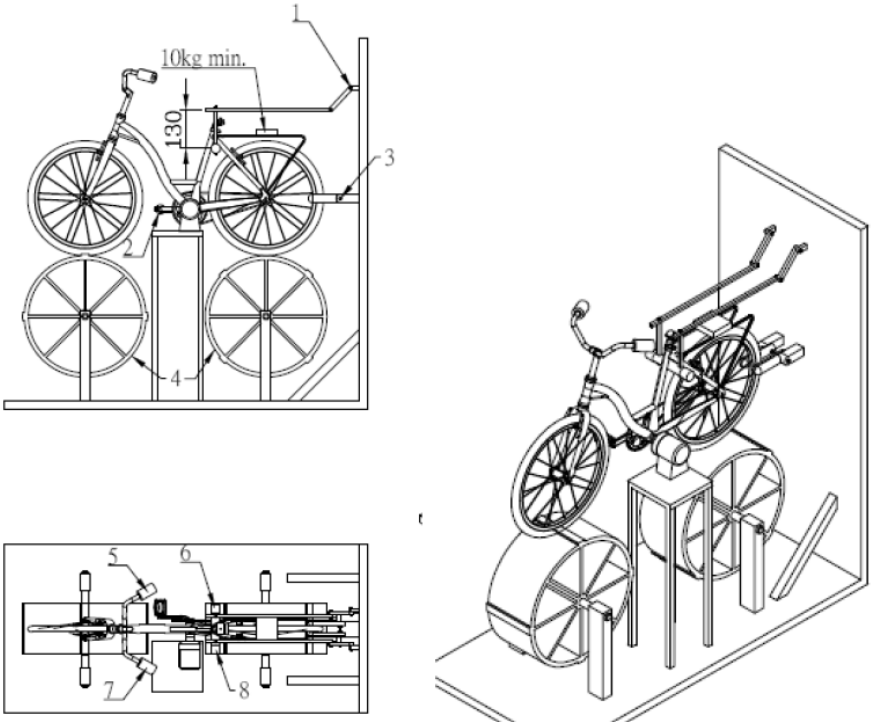
— one 10 kg, 18 kg, or 25 kg weight with the dimensions 240 mm × 240 mm on the luggage carrier.

An example of a test arrangement is shown in Figure A.1, in which the bicycle is mounted on two drums. The diameter of the drums should be in a range from 500 mm to 1 000 mm, and the slots should have a width of 50 mm ± 2,5 mm, a thickness of 10 mm ± 0,25 mm, and 45° chamfered edges of half their thickness. The circumferential spacing between the centrelines of two consecutive slots should be not less than 400 mm.

Rotate the drums to give a linear surface speed of 8 km/h (±10 %) for a period of 6 h.

The tyres of the bicycle should be inflated to the maximum inflation pressure.

Dimensions in millimetres



Key

1 adjustable height
2 weight, 18 kg
3 height adjustable
4 drum diameter, 760 mm
5 weight, 6,75 kg
6 weight, 18 kg
7 weight, 6,75 kg
8 weight, 18 kg

Figure A.1 — Dynamic strength test on a fully assembled bicycle

Annex B
(informative)

Verification of free-fall velocity

For all vertical impact tests, the striker shall be guided in such a way that the efficiency will permit to reach at least 95 % of the free-fall velocity.

The free-fall velocity is calculated using Formula (B.1):

$$v = \sqrt{2gh} \tag{B.1}$$

where

v is the free-fall velocity (m/s);

g is the gravitational acceleration (m/s^2) (i.e. = 9,806 65 m/s^2);

h is the falling height (m).

The efficiency is equal to Formula (B.2)

$$\mu = \frac{v_i}{v} \times 100 \tag{B.2}$$

where

μ is the efficiency (%);

vi is the measured speed at impact (m/s).

Bibliography

[1] ASTM E467, *Standard Practice for Verification of Constant Amplitude Dynamic Forces in an Axial Fatigue Testing System*