भारतीय मानक
Indian Standard

IS 16192 (Part 1) : 2014

दो एवं तीन पहिये वाले स्वचल वाहनों के व्हील रिम

भाग 1 हल्के मिश्र धातु व्हील रिम —
परीक्षणों एवं अपेक्षाओं की पद्धति

Automotive Vehicles — Wheel Rims for Two and Three Wheeled Vehicles

Part 1 Light Alloy Wheel Rims — Method of Tests and Requirements

ICS 43.140

भारतीय मानक ब्यूरो
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June 2014 **Price Group 5**

Automotive Tyres, Tubes and Rims Sectional Committee, TED 07

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

This standard is one of the series of Indian Standards pertaining to requirements and method of tests of different wheel rims for two and three wheeled vehicles. The other parts in this series are:

(Part 2) Sheet metal wheel rims — Method of tests and requirements

(Part 3) Spoke wheel rims — Method of tests and requirements

In the formulation of this standard, considerable assistance has been derived from the following standards:

AIS-073 (Part 1) : 2005	Automotive vehicles — Wheel rims for two and three wheeled vehicles — Light alloy wheel rims — Method of test and requirements
JASO T 203 : 1985	Light alloy wheels for motorcycles issued by the Japanese Automotive Standards Organization (JASO)

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — WHEEL RIMS FOR TWO AND THREE WHEELED VEHICLES

PART 1 LIGHT ALLOY WHEEL RIMS — METHOD OF TESTS AND REQUIREMENTS

1 SCOPE

This standard (Part1) prescribes the general and performance requirements of light alloy wheel rim intended for use on two and three wheeled motor vehicles with or without side car.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
10694 (Part 1): 2009	Automotive vehicles — Rims — General requirements: Part 1 Nomenclature, designation, marking and measurement (*second revision*)
10694 (Part 5): 1987	General requirements for rims for automotive vehicles: Part 5 Moped, motorcycle and motorcycle derivative rims (*first revision*)

3 DEFINITIONS AND NOMENCLATURE

The definitions and nomenclature shall be as per IS 10694 (Part 1).

3.2 Typical Types of Light Alloy Wheel Rim

3.2.1 *Unit Construction Light Alloy Wheels* — Wheels of which the rim and spokes or the disc, are manufactured as single unit (*see* Fig.1).

3.2.2 *Composite Construction Light Alloy Wheel* — Wheels of which the rim is made of light alloy and the spokes or disc of light alloy are steel, which are then assembled (*see* Fig.1).

4 REQUIREMENTS RELATING TO WHEEL RIMS

4.1 General Requirements

4.1.1 The rims shall have a smooth contour free from sharp edges, on the tyre and tube-mounting surface.

4.1.2 The valve hole shall be clean, free from burrs and shall not have such shapes and surface condition which harm the functions of tyre, tube and valve.

4.1.3 The surface of the rim shall be free from any crack, crazing or any other similar structural defect.

4.1.4 Light alloy wheels for tubeless tyres shall not have any defects, such as pinholes, which are harmful for air tightness of the rims.

4.2 Rotation Bending Fatigue Test (Dynamic Cornering Fatigue Test)

4.2.1 Each type of wheel rim shall undergo rotation bending fatigue test carried out by the procedure described in Annex A.

4.2.2 After being subjected to 10^5 cycles according to the rotation bending fatigue test specified in Annex A, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints.

4.3 Radial Load Durability Test

4.3.1 Each type of wheel rim shall undergo radial load durability test carried out by the procedure described in Annex B.

4.3.2 After being subjected to 5×10^5 cycles of the radial load durability test specified in Annex B, there shall be no evidence of harmful cracks, significant deformation, or any abnormal looseness at joints.

4.4 Radial Impact Resistance Test

4.4.1 Each type of wheel rim shall undergo radial impact resistance test carried out by the procedure described in Annex C.

4.4.2 After being subjected to the radial impact resistance test specified in Annex C there shall be no evidence of harmful cracks, significant deformation, abnormal looseness at joints, or any sudden air leakage due to failure of the rim.

NOTE — Sudden air leakage shall be a case where the test pressure drops by more than 50 percent in less than 30s.

4.5 Torsion Moment Test

4.5.1 Each type of wheel rim shall undergo torsion moment test carried out by the procedure described in Annex D.

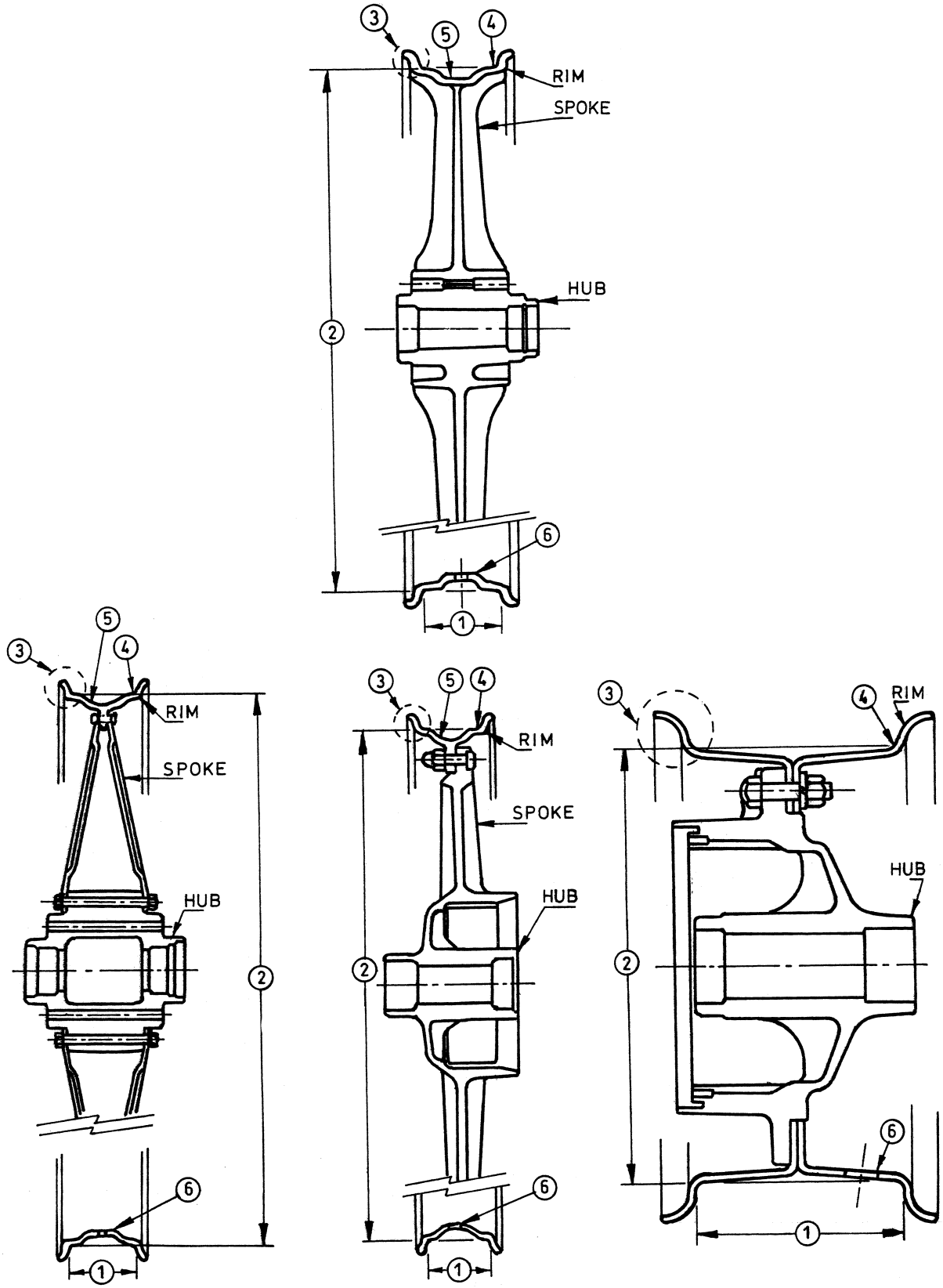

FIG. 1 TYPES OF LIGHT ALLOY WHEEL RIMS AND NOMENCLATURE

4.5.2 After being subjected to 105 cycles of the torsion test as specified in Annex D, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints.

4.6 Air Leak Test (Tubeless Tyres Wheel Rim)

4.6.1 Each type of wheel rim shall undergo air leak test carried out by the procedure described in Annex E.

4.6.2 There shall be no leakage of air as indicated by bubbles through the rim of the wheel after application of the test procedure in accordance with Annex E for a minimum period of 2 minutes.

NOTE — No wheel rim shall be used for more than one test for performance test mentioned in **4.2** to **4.6.**

5 IF COMPLIANCE IS TO ESTABLISHED FOR STATUTORY PURPOSES

5.1 Type Approval

5.1.1 The manufacturer should submit the details as specified in Annex F.

5.1.2 Number of rims to be provided shall be minimum 4 number for tube type tyre application (2 number with tyre and tube assembly) and 5 number for tubeless tyre application or at the discretion of testing agency.

5.1.3 If the type of wheel rim submitted for approval in pursuance of this standard meets the requirements of this standard, approval for that type of wheel rim shall be granted.

5.2 Modification and Extension of Approval of Wheel Rim Type

5.2.1 Every modification of the type of wheel rim shall be notified to testing agency, which has approved the type of wheel rim. The test agency may then either,

a) consider that the modification made are unlikely to have an appreciable adverse effect and that in any case, the wheel rim still complies with the requirement; or

b) require a further test report from the testing agency responsible for conducting the test.

For considering whether any further verification is required or not, guidelines given in **5.3** (criteria for extension of type approval) may be followed.

In case of **5.2.1**(b), check for those parameters which are affected by modifications, only need to be carried out.

5.2.2 In the event of **5.2.1**(a) or in case of **5.2.1** (b) after successful compliance to the requirements, a certificate of compliance shall be validated for the modified version.

5.3 Criteria for Extension of Approval

5.3.1 In case of following changes, testing shall be carried out for establishing compliance of the changed parameters to the requirements specified in this standard:

a) Increase in the load carrying capacity,

b) Any change in the design of the wheel rim,

c) Any change in the material of the wheel rim,

d) Any decrease in the thickness of the wheel rim, and

e) Any change in the inset/outset of the wheel rim.

6 MARKING

6.1 Wheel rims shall be durably and legibly marked with the following:

a) Size designation shall be as per IS 10649 (Part 5),

b) Name or trade-mark of the wheel rim manufacturer,

c) The letter ‘HD’ for rims designed for three wheeled goods carriages, and

d) Light alloy wheels for tubeless tyres application shall be marked with the words “TUBELESS or TUBELESS TYRE APPLICATION or SUTIABLE FOR TUBELESS TYRES”.

6.2 The marking shall be visible after the tyre is mounted and inflated.

6.3 BIS Certification Marking

The product may also be marked with the Standard Mark.

6.3.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 4.2)

ROTATION BENDING FATIGUE TEST

A-1 TEST EQUIPMENT

The test equipment shall have a driven rotatable device whereby either the wheel rim rotates under the influence of a stationary bending moment or wheel stationary and is subjected to a rotating bending moment.

An example of such equipments is shown in Fig. 2.

A-2 TEST CONDITIONS

A-2.1 Bending Moment

The bending moment M, in Nm applied, shall be determined by the following equation:

$$M = S_m \times \mu \times W \times r$$

where

S_m = coefficient equal to 0.7;

μ = friction coefficient between tyre and road, equal to 0.7; and

W = maximum design load of the wheel rim, in N; and

r = maximum static loaded radius for which wheel rim is designed; in m.

A-2.2 Loading Arm Length

The length of the loading arm shall be such that the calculated moment M, is obtained by applying a mass equal to W as defined in **A-2.1.**

A-2.3 The tolerance for M-moment fluctuation during the test shall be ± 2.5 percent.

A-3 TEST PROCEDURE

The wheel shall be rotated along with the test equipment or wheel rim shall be held stationary and subjected to rotating bending moment by applying a bending movement M, determined in accordance with **A-2.1**, after the rim flange of the light alloy test wheel has been fixed. A loading arm of the length specified in **A-2.2**, of sufficient rigidity shall be attached to the wheel by the same method as the wheel is normally attached to a vehicle.

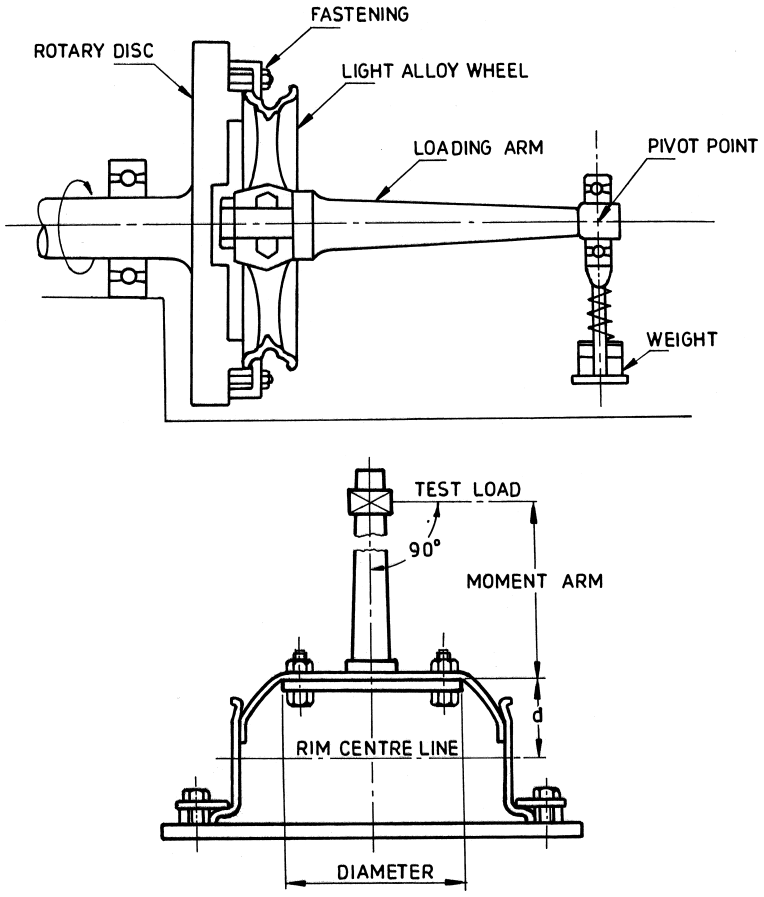

FIG. 2 MODEL EQUIPMENT FOR ROTATIONAL BENDING FATIGUE TEST

ANNEX B

(*Clause* 4.3)

RADIAL LOAD DURABILITY TEST

B-1 TEST EQUIPMENT

The test equipment shall meet the following requirements:

a) The test equipment shall have a drum with a smooth surface which is wider than the overall width of the tyre used in the test. The diameter of the drum shall be greater than or equal to 400 mm.

b) The drum specified in (a) shall rotate at a constant velocity.

c) The test equipment shall permit a radial load to be applied to the wheel.

The equipment shall be such that the wheel is maintained in contact with the drum under constant pressure.

Figure 3 shows the example of such equipment.

B-2 TESTING CONDITIONS

B-2.1 Static Radial Load

The radial load Q, in N, to be applied shall be determined by the equation:

$$Q = S_r.W$$

where

S_r = coefficient equal to 2.25; and

W = maximum design load of the wheel rim, in N.

B-2.2 Tyre Air Pressure

The air pressure before the test, in kPa, shall be at least that corresponding to the design maximum load of the tyre to be used in the test.

B-2.3 Tolerance for Load Fluctuation

The tolerance for load fluctuation during the test shall be ±5 percent.

B-2.4 Tyre Failure

In case of tyre failure, the test shall be continued after replacing the tyre.

B-3 TEST PROCEDURE

The wheel rim, fitted with a tyre the rated load of which is at least equal to the maximum design load of the wheel rim (*see* **A-2.1**), shall be mounted on the test equipment according to the method used for attaching the wheel to the vehicle. The drum shall then be rotated while the radial load Q, determined in accordance with **B-2.1** is applied.

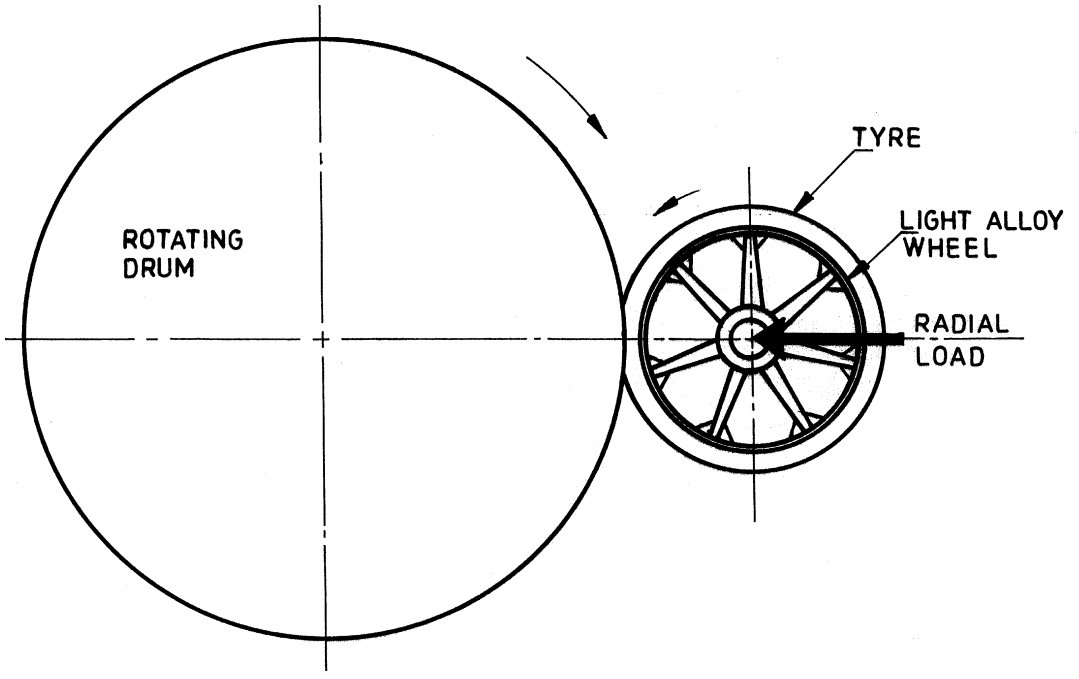

FIG. 3 MODEL EQUIPMENT FOR RADIAL LOAD DURABILITY TEST

ANNEX C

(*Clause* 4.4)

RADIAL IMPACT RESISTANCE TEST

C-1 TEST EQUIPMENT

The equipment shall have the following conditions:

a) The equipment shall be so constructed that the light alloy wheel with a tyre attached can be mounted on a stand having sufficient stiffness and strength, and a striker weight made of steel can be dropped freely and strike the wheel. An example of such equipment is shown in Fig. 4.

b) The combined spring constant of two coil spring shall be 2 942 ± 98 N/cm (300 ± 10 kgf/cm), and 100 mm stroke shall be provided for the auxiliary striker weight before it comes into contact with the main weight.

C-2 TEST CONDITIONS

C-2.1 Impact Load

By using the test equipment indicated in **C-1.1**, the striker weight shall be dropped to apply the impact load. The total mass of the striker weight shall be pursuant to the following equation:

$$m_1 + m_2 = K\frac{W}{g}$$

where

$m_1 + m_2$ = total mass of striker weight, in kg;

m_1 = the mass of main striker weight ± 2 percent, in kg;

m_2 = the mass of auxiliary striker weight (including the mass of the springs) 40 ± 2, in kg;

W = pursuant to the provisions of **A-2.1**;

K = coefficient equal to 1.5; and

g = gravitation acceleration 9.8, in m/s^2.

C-2.2 Tyre Inflation Pressure

The tyre inflation pressure, p, in kPa, shall be determined by the following equation:

p = (the air pressure corresponding to the design maximum load of the tyres to be used in the test ×1.15) ± 10.

NOTE — Testing agency will decide suitable tyres for this test.

C-3 TEST PROCEDURES

The light alloy wheel to be tested, being attached with the tyre specified in **C-2**, shall be mounted on the stand according to the attachment method to a vehicle; the relative positions shall be so determined that the centres of the rim and the striker weight may be aligned (*see* Fig. 4); and the striker weight shall be dropped from the height of 150 mm.

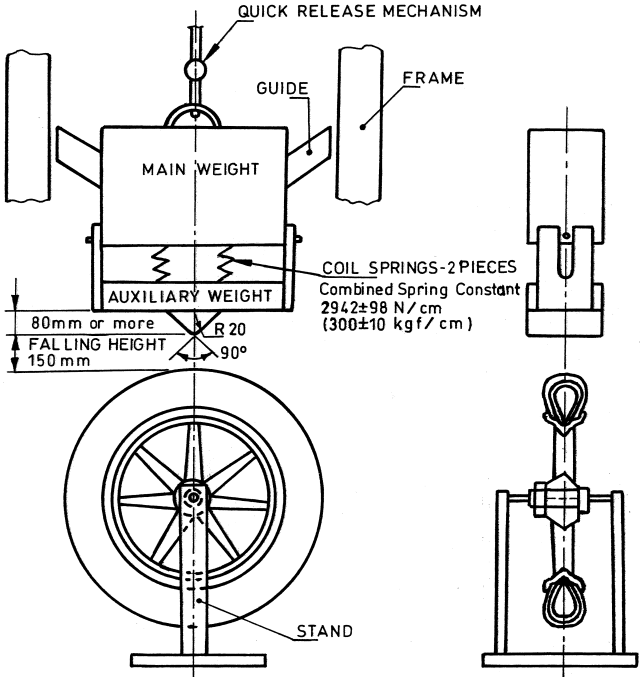

FIG. 4 MODEL EQUIPMENT FOR RADIAL IMPACT RESISTANCE TEST

ANNEX D

(*Clause* 4.5)

TORSION MOMENT TEST

D-1 TEST EQUIPMENT

D-1.1 The test equipment shall permit a torsional moment to be applied between the hub and the rim. Figure 5 shows the example of such equipment.

D-2 TEST CONDITIONS

D-2.1 The torsional moment, T in Nm shall be applied and shall be determined by the following equation:

$$T = \pm W . r$$

where

W = maximum design load of the wheel rim, in N; and

r = maximum static loaded radius for which wheel rim is designed; in m.

D-3 TEST PROCEDURE

D-3.1 The flange of the wheel rim shall be fixed to the support and the torsional moment determined according to **D-2** shall be applied repeatedly through the contact face of the hub. The length of the loading arm shall be equal to the radius of the smallest tyre suitable for the wheel.

It is also permissible to fix the wheel to the support through the contact face of the hub and apply the torsional moment to the wheel rim by means of an annular ring rigidly attached to the rim.

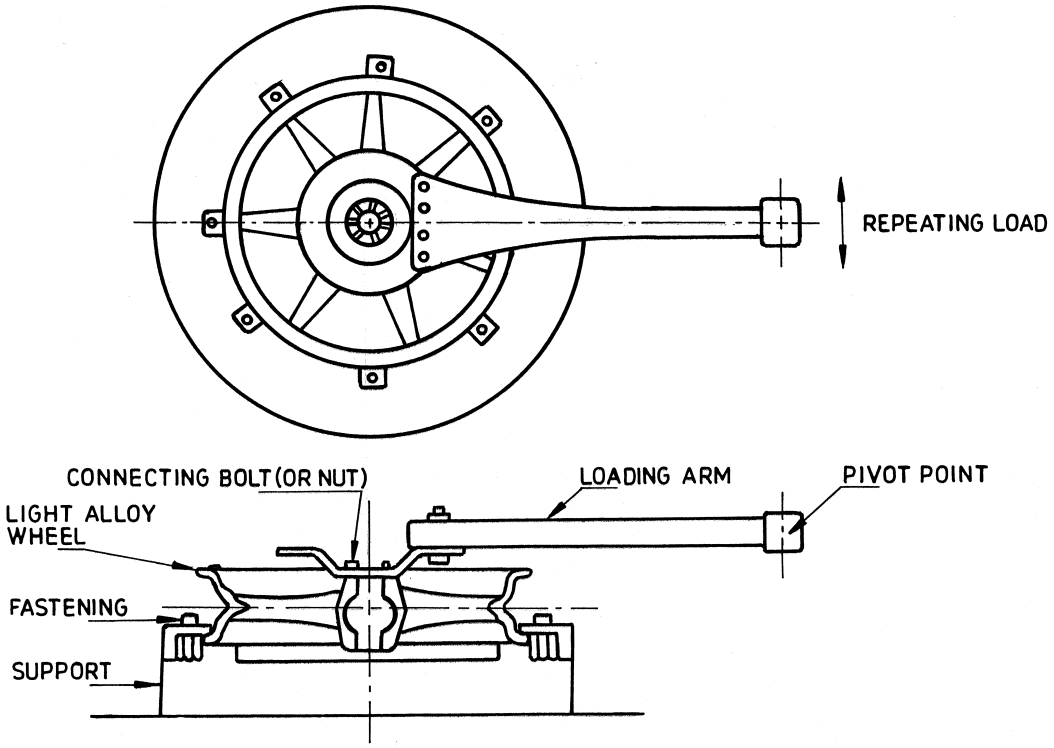

FIG. 5 MODEL EQUIPMENT FOR TORSION MOMENT TEST

ANNEX E

(*Clause* 4.6)

AIR LEAK TEST

E-1 This is applicable only to wheels designed and marked for use with tubeless tyres. Figure 6 shows the example of such equipment.

E-2 TEST EQUIPMENT—AIR LEAK TESTING EQUIPMENT

E-3 TEST CONDITIONS

The air pressure to be applied according to **E-4** shall be 300 kPa or more.

E-4 TEST PROCEDURE

E-4.1 Both sides of the flange shall be tightly closed by the pressure plates and the pressurized air as indicated in **E-3** shall be supplied to the inside of the wheel in order to confirm the air tightness of the rim.

E-4.2 Alternatively for rims of divided construction where sealing rings are used, the rim may be fitted with a tyre, the tyre inflated and the whole assembly immersed in water.

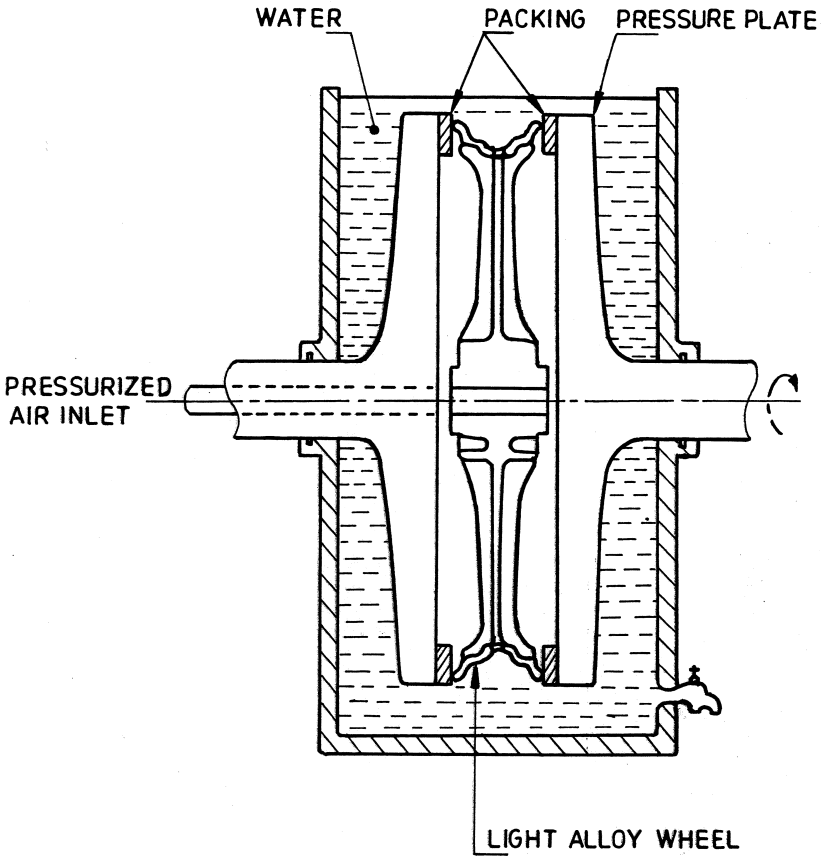

FIG. 6 MODEL EQUIPMENT FOR AIR LEAK TEST

ANNEX F

(*Clause* 5.1.1)

F-1 TECHNICAL INFORMATION TO BE SUBMITTED BY SUPPLIER

1. Name of supplier
2. Address of supplier
3. Telephone No.
4. FAX No.
5. E- mail address
6. Contact person
7. Wheel rim manufacturer name (In case different for supplier)
8. Address of wheel rim manufacturer (In case different for supplier)
9. The trade/brand name or mark
10. Wheel rim size designation
11. Type of wheel rim (To be specified)
12. Location rear/front/both
13. Whether the rim is intended to be used with tube or tubeless tyre
14. Maximum design load of wheel rim
15. Maximum static loaded radius (r) for which wheel rim is designed, in metre (m)
16. Engineering drawing of wheel rims giving details of profile, relevant dimensions, tightening torque for wheel rims, Inset/outset, markings, etc, in triplicat

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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