

**AMENDMENT NO. 1
TO
AIS – 073 (Part 2)
Automotive Vehicles – Wheel Rims for Two and Three Wheeled Vehicles –
Sheet Metal Wheel Rims –Method of Test and Requirements**

1.0 Page No. III, Introduction:
Substitute “AIS 037 : Procedure for Type Approval and Establishing Conformity of Production for Safety Critical Components”

For “ IS: 10694 (Part 4): 1987 General requirements for rims for Automotive Vehicles - Part 4 - Scooters and scooter derivative rims”

2.0 Page No. 1/9, cl. 2.2 :
Substitute “ AIS - 037 : Procedure for Type Approval and Establishing Conformity of Production for Safety Critical Components”
for “ IS:10694 (Pt- 4):1983- General Requirements for Rims for Automotive Vehicles- Scooters and Scooter Derivatives Rims

3.0 Page No. 1/9, cl. 4.0 :
Substitute following text for existing text of entire clause 4.0
“ **4.0 MARKING**
4.1 Marking shall be as per AIS-037 as and when AIS-037 is mandated for this standard.”

4.0 Page No. 3/9, cl. 6.2.3.3, Bending Moment Determination :
Substitute following text for the existing text:
Bending moment determination - The bending moment M (force x moment arm) in newton metres, is determined from the formula:

Vehicle Type	Bending Moment
Three wheeled vehicle	$M = (R \cdot \mu + d) F \times S$
Two wheeled vehicle	$M = S m \times \mu \times F \times R$

Where

R = Maximum Static loaded radius in metres for which wheel rim is designed;

μ = Assumed coefficient of friction developed between tyre and road.

S_m = Coefficient equal to 0.7

d = Inset or Outset of the wheel rim in metres;

F = Maximum design load of wheel rim in Newtons (N);

S = Accelerated test factor

Note - For values of μ and S, see Appendix A.

5.0 Page No. 3/9, cl. 6.2.3.4, Failure Criteria :

Substitute following text for the existing text:

6.2.3.4. Failure Criteria

6.2.3.4.1. For Three Wheeled Vehicles:

- a) Inability of the wheel rim to sustain load
- b) A fatigue crack penetrating through a section of the wheel rim
- c) The wheel rim shall withstand a minimum of 18000 load cycles without failure.

6.2.3.4.2. For Two Wheeled Vehicles:

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

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THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA
P.B. NO. 832, PUNE 411 004

ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLE RULES - TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

April 2007

AUTOMOTIVE INDUSTRY STANDARD

**Automotive Vehicles – Wheel Rims for
Two and Three Wheeled Vehicles –
Sheet Metal Wheel Rims –Method of
Test and Requirements**

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(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

December 2005

Status Chart of the Standard to be used by the purchaser
for updating the record

Sr. No.	Corr-igenda	Amend-ment	Revision	Date	Remark	Misc.

General Remarks:

INTRODUCTION

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standard Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their web site.

Sheet metal wheel rims are being widely used for scooters and scooter derivatives. Considering the importance of the wheel as a critical part influencing the driving safety, this standard has been prepared.

Considerable assistance has been taken from following National and International standards.

IS: 10694 (Part 1): 1993	Automotive Vehicles - Rims - General requirements Part 1 - Nomenclature, designation, marking and measurement.
IS: 10694 (Part 4): 1987	General requirements for rims for Automotive Vehicles - Part 4 - Scooters and scooter derivative rims.
IS: 9436: 1980	Performance requirements and method of tests for wheels for passenger cars.

The Automotive Industry Standards Committee responsible for preparation of this standard is given in Annex - C

Automotive Vehicles – Wheel Rims for Two and Three Wheeled Vehicles – Sheet Metal Wheel Rims –Method of Test and Requirements

1.0 SCOPE

- 1.1 This standard prescribes the general and performance requirements of sheet metal wheel rims intended for use on two and three wheeled motor vehicles with or without side car.

2.0 REFERENCES

- 2.1 IS:10694 (Pt-1):1993- Automotive Vehicles- Rims-General Requirements-Nomenclature, Designation, Marking and Measurement.
- 2.2 IS:10694 (Pt-4):1983- General Requirements for Rims for Automotive Vehicles- Scooters and Scooter Derivatives Rims

3.0 DEFINITION AND NOMENCLATURE

- 3.1 Definition and nomenclature of wheel rim shall be in accordance with IS 10694 (Pt-1): 1993

4.0 MARKING

- 4.1 The wheel rim shall be marked with the following
- a) Size designation shall be as per IS 10694 (Pt-4)-1983
 - b) Name or trade mark of the rim manufacturer
 - c) The letter “HD” for rims designed for three wheeled goods carriages.
- 4.2 The marking shall be recessed and without sharp edges and letters shall not be smaller than 3 mm and impressed/engraved to a depth or embossed in a legible manner.
- 4.3 The marking shall be marked on outside surface so that marking shall be visible after the tyre is mounted and inflated.

5.0 TYPE APPROVAL

- 5.1 The manufacturer shall submit the details as specified in Annex B
- 5.2 Number of wheel rims to be provided shall be minimum 2 numbers (one with tyre and tube assembly) or at the discretion of test agency
- 5.3 The type of the wheel rim submitted for approval in pursuance of this standard, if meets the requirements of this standard, approval for that type of wheel rim shall be granted.

6.0 REQUIREMENTS RELATING TO WHEEL RIMS**6.1 General requirements**

6.1.1 The wheel rim shall have a smooth contour free from sharp edges on the tyre side.

6.1.2 The valve hole edges on the wheel rims shall be free from burrs.

6.2 Performance strength requirements

6.2.1 Only fully processed new wheels rims, which are representative of wheel rims intended for the vehicle, shall be used for the tests. No wheels rim shall be used for more than one test.

6.2.2 **Tests-** Following two tests shall be carried out on wheel rims

- a) Dynamic cornering fatigue test, and
- b) Dynamic radial fatigue test

6.2.3 Dynamic Cornering Fatigue Test (CFT)

6.2.3.1 **Equipment-** The test machine shall have a driven rotatable device whereby either the wheel rim rotates under the influence of a stationary bending moment or the wheel rim is stationary and is subjected to a rotating bending moment (see Fig 1)

6.2.3.2 Procedure

- (a) **Preparation-** The rim flange of the wheel rim shall be clamped securely to the test fixture. The face by which the wheel centre is supported on the testing machine shall have the same fixation characteristics as the face of the hub used on the vehicle. If a tyre and wheel assembly is used as a combination for the test, the tyre pressure shall be higher for clamping purposes. The load arm and adapter assembly shall be attached to the mounting surface of the wheel using non-lubricated studs and nuts (or bolts), in good condition, representative of those used on the vehicle. These wheel nuts (or bolts) shall be tightened at the beginning of the test to the vehicle/wheel manufacturer's specified torque values. Wheel bolts or nuts may be retorqued once during the test. Tightening torque shall not fall below 50 percent of its initial value when the minimum load cycle number has been attained. The bending moment shall be maintained within ± 2.5 percent. In the final clamped position, the wheel shall be concentric to the rotating device within 0.25 mm Max (TIR) at the point of loading in the unloaded condition.
- (b) **Bending moment-** To impart a bending moment to the wheel rim, a force may be applied either perpendicular or parallel to the plane of the mounting surface of the wheel at a specified distance (moment arm).

6.2.3.3 **Bending moment determination-** The bending moment M (force x moment arm) in newton metres, is determined from the formula:

$$M = (R \cdot \mu + d) F \times S$$

Where

R = Maximum static loaded radius in metres for which wheel rim is designed;

μ = Assumed coefficient of friction developed between tyre and road;

d = Inset or Outset of the wheel rim in metres;

F = Maximum design load of wheel rim in Newtons (N);

S = Accelerated test factor

Note - For values of μ and S , see Annex A.

6.2.3.4 **Failure criteria**

- a) Inability of the wheel rim to sustain load
- b) A fatigue crack penetrating through a section of the wheel rim
- c) The wheel rim shall withstand a minimum of 18000 load cycles without failure.

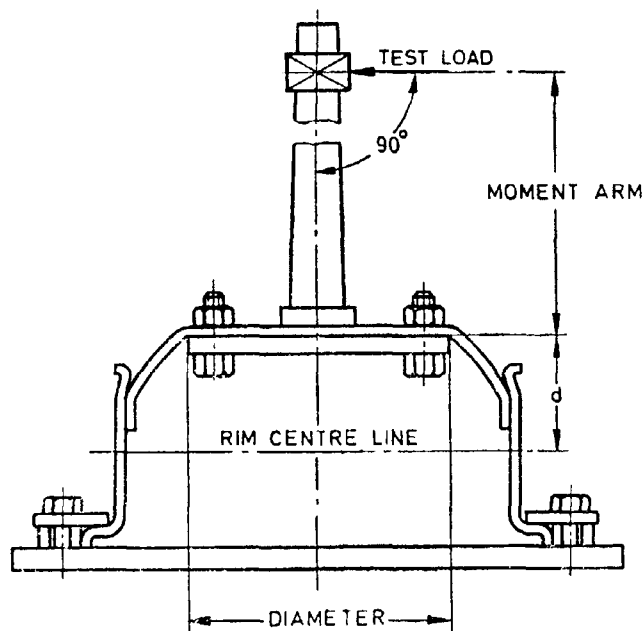


Fig 1 Model Equipment for Cornering Fatigue Test

6.2.4 Dynamic Radial Fatigue Test (RFT)

6.2.4.1 **Equipment-** The test machine shall be equipped with a means of imparting a constant radial load only as the wheel rim rotates. The suggested equipment incorporates a driven rotatable drum set which presents a smooth surface wider than the loaded test tyre section width. The diameter of the drum is 1700 mm with tolerance of $\pm 1\%$. (see Fig 2).

6.2.4.2 **Procedure-** The tyre selected for this wheel rim test shall be representative of the maximum size and type specified by the vehicle/wheel rim manufacturer or at the discretion of the testing agency. The recommended cold inflation pressure of the tyre will be equal or higher than the maximum recommended Inflation Pressure.

There will be a slight increase in pressure during the test. This increase is normal and no adjustment is necessary. The loading system shall maintain the specified load within ± 2.5 percent.

6.2.4.3 **Radial load determination-** The radial load F_r , in newtons, is determined as follows:

$$F_r = F_v \times K$$

Where

F_v = Maximum design load of wheel rim in newtons (N)and

K = Accelerated test factor.

Note- For values of K , see Annex A

6.2.4.4 Failure criteria

- a) Inability of wheel rim to sustain load
- b) A fatigue crack penetrating through a section of the wheel rim
- c) The wheel rim shall withstand a minimum of 400000 test cycles without failure.

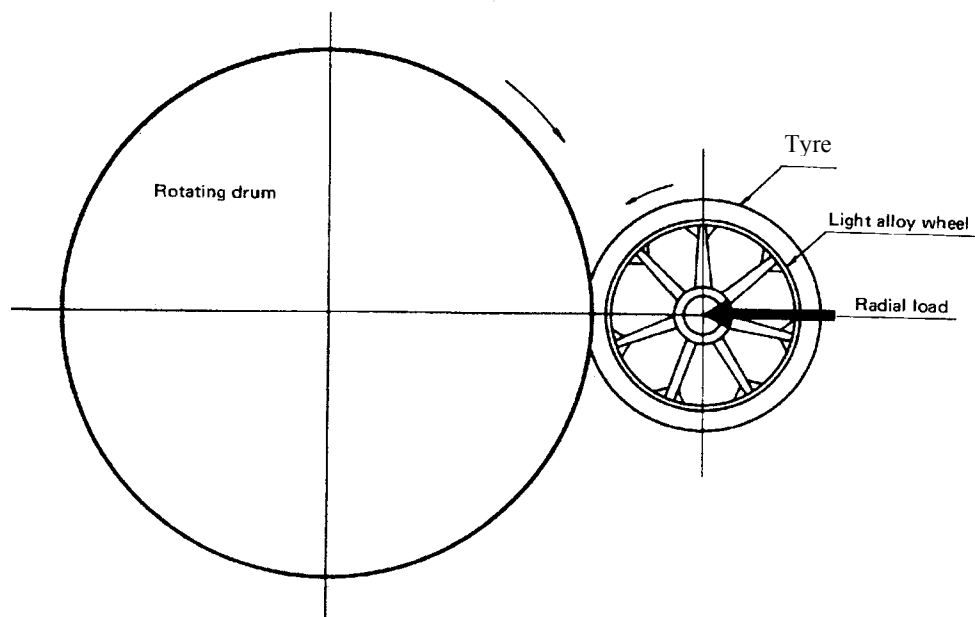


Fig 2 Model Equipment for Radial Fatigue Test

7.0 MODIFICATION AND EXTENTION OF APPROVAL OF WHEEL RIM TYPE.

7.1 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

7.1.1 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

7.1.2 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 7.3 (criteria for extension of type approval) may be followed.

7.1.3 In case of 7.1.2, check for those parameters which are affected by modifications, only need to be carried out.

7.2 In the event of 7.1.1 or in case of 7.1.2 after successful compliance to the requirements, a certificate of compliance shall be validated for the modified version.

7.3 Criteria for extension of type approval

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

7.3.1.1 Increase in the load carrying capacity

7.3.1.2 Any change in the design of the wheel rim

7.3.1.3 Any change in the material of the wheel rim

7.3.1.4 Any change in the thickness of the wheel rim

7.3.1.5 Any change in the inset/outset of the wheel rim

ANNEX A

(Clauses 6.2.3.3 and 6.2.4.3)

TEST FACTORS

A-1. To permit a uniform application of the test methods specified, the test factors given in the following table should be used when conducting the tests.

Test	Accelerated Test Factors
Dynamic cornering fatigue $\mu = 0.7$ (see 6.2.3.3)	$S = 1.60$
Dynamic radial fatigue (see 6.2.4.3)	$K = 2.25$

ANNEX B
(See 5.1)

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.	Maximum Design Load of Wheel Rim	
14.	Maximum Static loaded radius (R) for which wheel rim is designed for, in meters (m)	
15.	Engineering Drawing of Wheel rims giving details of profile, relevant dimensions, tightening torque for wheel bolts, Inset/outset, markings etc., in triplicate	

ANNEX C
(See Introduction)
COMMITTEE COMPOSITION *

Automotive Industry Standards Committee

Chairman	
Shri B. Bhanot	Director The Automotive Research Association of India, Pune
Members	Representing
Shri Alok Rawat	Ministry of Shipping, Road Transport & Highways, New Delhi
Shri Sushil Kumar	Department of Heavy Industry, Ministry of Heavy Industries & Public Enterprises, New Delhi
Shri Chandan Saha	Office of the Development Commissioner, Small Scale Industries, Ministry of Small Scale Industries, New Delhi
Shri S. Dasgupta Shri S. K. Bhatia (Alternate)	Bureau of Indian Standards, New Delhi
Shri A. S. Lakra Shri D. P. Saste (Alternate)	Central Institute of Road Transport, Pune
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Dr. C. L. Dhamejani Dr. N. Karuppaiah (Alternate)	Vehicles Research & Development Establishment, Ahmednagar
Shri Dilip Chenoy	Society of Indian Automobile Manufacturers
Shri T.C. Gopalan Shri Ramakant Garg (Alternate)	Tractor Manufacturers Association, New Delhi
Shri K.N.D. Nambudiripad	Automotive Components Manufacturers Association New Delhi
Shri G. P. Banerji	Automotive Components Manufacturers Association New Delhi

Member Secretary
Mrs. Rashmi Urdhwareshe
Deputy Director
The Automotive Research Association of India, Pune

* At the time of approval of this Automotive Industry Standard (AIS)