

AUTOMOTIVE INDUSTRY STANDARD

**Classification and Test Requirements
for Automotive Rubber Gaskets**

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ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLES RULES – TECHNICAL STANDING COMMITTEE

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

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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, the erstwhile Ministry of Surface Transport (MoST) has constituted a permanent Automotive Industry Standards 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 Website.

The present automotive standard is prepared to provide procedure for automotive rubber gasket materials and as a guideline for selection of test methods, defining acceptance criteria, performance requirement.

Considerable assistance has been taken from the following National / International Standards

- 1 SAE J 90-95 : Standard Classification System for Non - Metallic Automotive Gasket Materials
- 2 ASTM F 104-1995 : Standard Classification System for Non-Metallic Gasket Materials
- 3 IS: 3400 : Methods of Test for Vulcanized Rubbers (Relevant Part)

The Automotive Industry Standards Committee (AISC) responsible for preparation of this standard is given in Annex : I.

Classification and Test Requirements for Automotive Rubber Gaskets

1. SCOPE

The standard is being prepared for automotive rubber gasket materials. The standard provides guideline for selection of test methods, defining acceptance criteria, performance requirement which are essential for consistency and durability of associated components and minimize the failure of component/s or system in service.

The standard does not include cylinder head gasket materials, which are subjected to high temperature and creep relaxation characteristics.

2. REFERENCES

- 2.1 SAE J 90-95 : Standard Classification System for Non - Metallic Automotive Gasket Materials
- 2.2 ASTM F 104-1995 : Standard Classification System for Non-Metallic Gasket Materials
- 2.3 IS: 3400 : Methods of Test for Vulcanized Rubbers (Relevant Part)

3. SIGNIFICANCE AND USE

Rubber gasket materials such as cork and elastomers, cork and cellular elastomer and elastomeric treated materials are covered up in the standard for physical and mechanical characteristic requirements. The standard also provides test methods applicable for specific property test and guideline for selection of specification.

4. CLASSIFICATION AND TEST REQUIREMENTS OF RUBBER GASKETS

“Line Call out” as described in SAE J 90-95 and ASTM F 104-95 shall be used to classify rubber gasket materials in six digit number as shown in Table 1 and Table 2.

Table 1
Basic Physical and Chemical Characteristics

Basic six digit number	Basic Characteristic
First Numeral	2 = to cork 3 = cellulose 4 = Fluoro Carbon polymer
Second Numeral	When first numeral is “2”, second numeral : <ul style="list-style-type: none"> • 2 = cork and elastomeric (Class 2). • 3 = cork and cellular rubber (Class 3). When first numeral is “3” second numeral : <ul style="list-style-type: none"> • 3 = elastomeric treated (Class 3). When first numeral is “4” second numeral : <ul style="list-style-type: none"> • 0 = not specified. • 9 = as specified.
Third Numeral	Compressibility characteristics determined in accordance with IS 3400: Part X : 1977 shall confirm to the percentage indicated by the third numeral of the basic six digit number

Basic six digit number	Basic Characteristic
	0 = not specified 5 = 20 to 30% 1 = 0 to 10% 6 = 25 to 40% 2 = 5 to 15% 7 = 30 to 50% 3 = 10 to 20% 8 = 40 to 60% 4 = 15 to 25% 9 = as specified *7 to 17% for compressed sheeter process
Fourth Numeral	Thickness increase when immersed in ASTM No. 3 Oil : determined in accordance with IS:3400; Part 6:1983 shall conform to the percent indicated by fourth numeral of the basic six-digit number. 0 = not specified 5 = 20 to 40% 1 = 0 to 15% 6 = 30 to 50% 2 = 5 to 20% 7 = 40 to 60% 3 = 10 to 25% 8 = 50 to 70% 4 = 15 to 30% 9 = as specified
Fifth Numeral	Weight increase when immersed in ASTM No. 3 Oil : determined in accordance with IS:3400; Part 6:1983 shall conform to the percent indicated by fifth numeral of the basic six-digit number. 0 = not specified 5 = 40%, max. 1 = 10%, max. 6 = 60%, max. 2 = 15%, max. 7 = 80%, max. 3 = 20%, max. 8 = 100%, max. 4 = 30%, max. 9 = as specified
Sixth Numeral	Weight increase when immersed in Water: determined in accordance with IS:3400; Part 6:1983 shall conform to the percent indicated by sixth numeral of the basic six-digit number. 0 = not specified 5 = 40%, max. 1 = 10%, max. 6 = 60%, max. 2 = 15%, max. 7 = 80%, max. 3 = 20%, max. 8 = 100%, max. 4 = 30%, max. 9 = as specified

Table 2
Supplementary Physical and Mechanical Characteristics

Suffix Symbol	Supplementary Characteristics
E 00 through E99	Weight and thickness change after immersion in ASTM Fuel B shall be determined in accordance with IS:3400, Part 6:1983. Weight increase shall not exceed the standard rating number indicated by the first numeral of the two-digit number of the E-symbol. Thickness increase shall not exceed the standard rating number indicated by the second numeral of the E-symbol.

Suffix Symbol	Supplementary Characteristics
	Weight Increase, (first numeral) Thickness Increase, % (second numeral) E0_ = not specified E_0 = not specified E1_ = 10 E_1 = 0 to 5 E2_ = 15 E_2 = 0 to 10 E3_ = 20 E_3 = 0 to 15 E4_ = 30 E_4 = 5 to 20 E5_ = 40 E_5 = 10 to 25 E6_ = 60 E_6 = 15 to 35 E7_ = 80 E_7 = 25 to 45 E8_ = 100 E_8 = 30 to 60 E9_ = as specified E_9 = as specified
H	Adhesion characteristics shall be determined in accordance with IS:3400, Part 24:2001.
M1 through M9	Tensile strength characteristics shall be determined in accordance with IS:3400, Part 1:1987. Results in MPa (psi) shall be no less than the value indicated by the numeral of the M-symbol.
S9	Volume change characteristics, when immersed in ASTM No. 1 Oil, ASTM No. 3 Oil, and ASTM Reference Fuel A, shall be determined in accordance with IS: 3400, Part 6:1983. Results shall be as specified on engineering drawing or other supplement to this classification.

The classification identifies rubber material used for gasket, specific property desired for the given component and its combination with property values. One of the example to understand the classification system is described below :

33424E1M2S9	
where,	
3	– Cellulose
3	– Elastomeric treated
4	– Compressibility 15 to 25%
2	– Thickness increase in ASTM Oil 3, 5 to 20%
4	– Weight increase in ASTM Oil 3, 30% max.
E1	– Weight and thickness increase in ASTM Fuel B, 10% max.
M2	– Tensile strength, 17.24Kg/cm ² max.
S9	– Volume change in ASTM Oil 1 and 3, ASTM Reference Fuel A

5. SAMPLING AND CONDITIONING

- 5.1 The number of test specimens, sample size and shape and conditioning prior to performing specified test shall be as per respective IS 3400 specification and as per agreement between vehicle manufacturer and rubber component supplier.

- 5.2 Acceptance criteria shall be based on characteristics given in Table 1 and Table 2. The selection of test and criteria shall be as per agreement between vehicle manufacturer and rubber component supplier for the given gasket component based on its end application and performance requirement for the given type of vehicle. The requirements shall be specified by the vehicle manufacturer on engineering drawing of the component. As a guideline for the selection criteria, Table 3 shall also be followed.

Table 3
Typical Test for Type of Rubber Gasket Materials

Properties, Characteristics and Test Methods	Cork and Cellular Rubber Type 1	Cork and Cellular Rubber Type 2	Cellulose or Other Organic Fibers
Compressibility : 1000-psi load (Test Method F 36, Procedure G) 100-psi load (Test Method F 36, Procedure F) 400-psi load (Test Method F 36, Procedure B) Tensile Strength	--- --- X X	--- X --- X	X --- --- X
Resistance to exposure in ASTM No. 3 Oil: Volume change, 70 h. at 212°F Weight increase, 22 h at 70 to 85°F	X ---	X ---	--- X
Thickness increase 22 h at 70 to 85°F 5 h at 300°F	--- ---	--- ---	X ---
Resistance to exposure in ASTM Fuel B			
Weight increase 22 h at 70 to 85°F	---	---	X
Thickness change 22 h at 70 to 85°F	---	---	X
Resistance to exposure in ASTM No. 1 Oil Volume Change, 70 h at 212°F	X	X	---
Resistance to exposure in ASTM Fuel A Volume Change, 22 h at 70 to 85°F	X	X	---
Resistance to exposure in distilled water Weight increase, 22 h at 70 to 85°F Thickness change, 22 h at 70 to 85°F	--- ---	--- ---	X X

ANNEX I
(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
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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)