



SURFACE VEHICLE STANDARD

J2884™

JUN2023

Issued 2009-09
Revised 2023-06

Superseding J2884 JUN2014

Thermoset Elastomer Specification System

RATIONALE

Routine scheduled review. Minor edits to reflect current materials and specification names.

FOREWORD

An alternate to SAE J200. No global equivalent standard exists.

1. SCOPE

This document provides a method/procedure for specifying the properties of vulcanized elastomeric materials (natural rubber or synthetic rubbers, alone or in combination) that are intended for, but not limited to, use in rubber products for automotive applications.

This document covers materials that do not contain any re-use, recycled, or regrind materials unless otherwise agreed to by manufacturer and end user. The use of such materials, including maximum percent, must be specified using a "Z" suffix.

This classification system covers thermoset High Consistency Elastomers (HCEs) only. Thermoplastic Elastomer (TPE) materials are classified using SAE J2558. Silicone Formed In Place Gasket (FIPG) systems such as Room Temperature Vulcanized (RTV) Silicones, and Liquid Silicone Rubber (LSR) systems are classified using ASTM F2468.

1.1 Purpose

This classification system is an alternative document to SAE J200.

This document utilizes certain elements of SAE J200, SAE J2236, and SAE J2558 along with new elements to build a line call out without the need for laboratory round robins to generate data for table creation/modification.

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2023 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://www.sae.org

SAE WEB ADDRESS:

Full document details: SAE J2884_202306

For more information on this standard, visit
https://www.sae.org/standards/content/J2884_202306/

Documents

Document Sharing Hub

1.2 Document Basis

The basis for a line call out for any material using this document includes:

Elastomer Chemistry
Material Hardness
Tensile Strength
Elongation
Continuous Upper Temperature Resistance (CUTR)
IRM 903 Oil Volume Change

1.3 Requirements and Recommendations

The creator of a line call out, prior to material testing, must have a good grasp of the application requirements and elastomeric material principles.

Certain polymer description and physical property characteristics are required in a line call out and are covered in 1.2 and Section 3. Additional physical property characteristics are discretionary based on the needs of the application and are covered in Section 4.

It is recommended to utilize this document to classify elastomeric materials for specific applications in order to maintain a minimum length line call out.

It is recommended the material manufacturer and the user develop a final line call out for a functioning material based on 30 data points (minimum for statistical analysis) per requirement from six different production batch runs minimum for large scale production.

Development of a line call out for low volume/small scale production in which six different production batch runs may not be feasible. In these cases, development may be based on 20 data points per requirement from at least one production batch and three laboratory lots (or any combination totaling four lots, as long as one production lot is included). If using this alternative, it is recommended that each production lot be validated to the full line call out prior to use.

Production batch runs must be prepared using the production intent equipment parameters (type, size, and other compounding parameters).

Test plaques used for physical property evaluations should, as close as possible, mimic the production process, including state of cure.

1.4 Example Format

The format of examples used in each section/subsection lists the basic requirements along with the applicable suffix requirement. The examples shall resemble as close as possible, real life materials. The portion of the example to be defined for each subsection are shown in bold print.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J200	Classification System for Rubber Materials
SAE J369	Flammability of Polymeric Interior Materials - Horizontal Test Method
SAE J1681	Gasoline, Alcohol, and Diesel Fuel Surrogates for Materials Testing
SAE J2236	Standard Method for Determining Continuous Upper Temperature Resistance of Elastomers
SAE J2558	Classification System for Thermoplastic Elastomers
SAE J2665	Test Procedure to Measure the Fuel Permeability of Materials by the Cup Weight Loss Method
SAE J2979	Test Method for Vulcanized Rubber and Thermoplastic Elastomer Determination of Compressive Stress Relaxation (CSR) Response

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org

ASTM D297	Test Methods for Rubber Products - Chemical Analysis
ASTM D395	Test Methods for Rubber Property - Compression Set
ASTM D412	Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D430	Test Methods for Rubber Deterioration - Dynamic Fatigue
ASTM D471	Test Method for Rubber Property - Effects of Liquids
ASTM D573	Test Method for Rubber Property - Deterioration in Air Oven
ASTM D624	Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D865	Test Method for Rubber - Deterioration by Heating in Air (Test Tube Enclosure)
ASTM D925	Test Methods for Rubber Property - Staining of Surfaces (Contact, Migration, and Diffusion)
ASTM D1053	Test Methods for Rubber Property - Stiffening at Low Temperatures: Flexible Polymers and Coated Fabrics
ASTM D1149	Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D1329	Test Method for Evaluating Rubber Property - Retraction at Lower Temperatures (TR Test)
ASTM D1349	Practice for Rubber - Standard Temperatures for Testing
ASTM D1418	Practice for Rubber and Rubber Latices - Nomenclature
ASTM D2240	Test Method for Rubber Property - Durometer Hardness
ASTM D2632	Test Method for Rubber Property - Resilience by Vertical Rebound
ASTM D6147	Test Method for Vulcanized Rubber and Thermoplastic Elastomer - Determination of Force Decay (Stress Relaxation) in Compression

ASTM D7426 Standard Test Method for Assignment of the DSC Procedure for Determining T_g of a Polymer or an Elastomeric Compound

ASTM F2468 Specifying Silicone Adhesives and Sealants Transportation Applications

2.1.3 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 3795 Road vehicles, and tractors and machinery for agriculture and forestry—Determination of burning behaviour of interior materials

2.1.4 FMVSS Publications

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

FMVSS 302 Flammability of Interior Materials

3. BASIC REQUIREMENTS

Basic requirements must be specified in all line call outs. The basic requirements of a line call out contain a series of letters to describe the Elastomer Chemistry followed by ten numbers to describe the various basic physical properties of the elastomer system. A space must be left between the acronym(s) and 1st number set, and each subsequent number set that is used in describing a property.

3.1 Specifying Basic Physical Properties

Basic requirements must be specified as *Non-Zero* letters/values.

IRM 903 is the only exception since non-polar materials are *not* expected to have resistance to volume swell in non-polar oils such as the IRM 903 (also the Fluid Aging Property Change Table in 4.4.3 *does* allow a “0” indicating “No Requirement”). Polar materials will have a measure of IRM 903 oil resistance and must contain a non-zero value.

No zeros (0s) may be used as place holders for any other basic requirement.

In a line call out, the aged portion (168 hour volume change in IRM 903 Oil) cannot be modified by suffix requirements (EOC). If used, an EOC suffix requirement is in *addition* to the basic requirements.

3.1.1 Elastomer Chemistry

This is specified using the appropriate acronym(s) as listed in the table in 3.2.

3.1.2 Hardness, Type A Durometer

Expressed as Points ± 5 per ASTM D2240 – 1st and 2nd numbers.

NOTE: *Delay used in readings is a common source of correlation between laboratories. Materials tested and specified using this document must follow ASTM D2240, which specifies a delay of 1 second ± 0.1 second as the default delay, unless an alternate delay is agreed on between supplier and user, and specified using a “Z” (i.e., Z_n = ASTM D2240 determined using a 5 second delay).*

3.1.3 Tensile Strength

Expressed as MPa minimum per ASTM D412 Die C – 3rd and 4th numbers. For this basic requirement only, tensile requirements less than 10 MPa may be expressed using a decimal. As such as a tensile requirement of 8.5 MPa would be allowable, but 11.7 MPa would not, unless done so using a “Z” Special Requirements modifier.

3.1.4 Ultimate Elongation

Expressed as % minimum per ASTM D412 Die C – 5th, 6th, and 7th numbers.

3.1.5 Continuous Upper Temperature Resistance (CUTR) as Determined per SAE J2236

8th and 9th number representing temperature from the “Aging Duration and Temperature” table in Section 4.

3.1.6 IRM 903 Oil Aged Volume Change

Expressed as % maximum taken from the “Fluid Aging Property Change Table - Volume Change” column in 4.4.3. Material aged for 168 hours at 150 °C. If the material CUTR is less than 150 °C, the aging shall be done at the CUTR - 10th number.

3.2 Specifying Elastomer Chemistry

Table 1 lists the elastomer acronyms per ASTM D1418 with the corresponding reference to their generic material names.

Table 1 - ASTM D1418 acronyms and generic material description

Acronym	Elastomer Generic Name	Acronym	Elastomer Generic Name
ACM	Polyacrylate	FKM (3)	Vinylidene Fluoride – Tetrafluoroethylene – Fluorinated Vinyl Ether Terpolymer
AEM	Ethylene Acrylate	FKM (4)	Vinylidene Fluoride – Tetrafluoroethylene – Propylene Terpolymer
AFMU	Tetrafluoroethylene – Trifluoronitrosomethane – Nitrosoperfluorobutyric Acid Terpolymer	FKM (5)	Hexafluoropropylene – Vinylidene Fluoride – Tetrafluoroethylene – Fluorinated Vinyl Ether – Ethylene Pentapolymer
ANR	Acrylonitrile Acrylate (Ethyl or other) Co-polymer	FVMQ	Fluoro Vinyl Methyl Silicone (Fluorosilicone Rubber)
AU	Polyester Urethane	FZ	Fluoroalkoxyphosphazene
BIIR	Bromo-Isobutene-Isoprene Rubber	GECO	Epichlorohydrin – Ethylene Oxide – Allyl Glycidyl Ether Terpolymer
BIMSM	Brominated Isobutylene p-Methylstyrene Copolymer	GPO	Propylene Oxide – Allyl Glycidyl Ether Copolymer
BR	Butadiene Rubber	HNBR	Hydrogenated Acrylonitrile Butadiene Rubber
CFM	Polychloro-Trifluoro-Ethylene	IIR	Isobutene – Isoprene Rubber
CIIR	Chloro-Isobutene-Isoprene Rubber	IR	Isoprene Rubber
CM	Chloro-Polyethylene	MQ	Methyl Silicone Rubber
CO	Polychloromethyl Oxirane (Epichlorohydrin)	NBR	Acrylonitrile Butadiene Rubber
CR	Chloroprene Rubber	NIR	Acrylonitrile – Isoprene Copolymer
CSM	Chloro-Sulfonyl-Polyethylene	NR	Natural rubber
ECO	Ethylene Oxide-Chloromethyl Oxirane (Epichlorohydrin Copolymer)	NRG	Guayule Natural Rubber
ENR	Epoxidized Natural Rubber	PBR	Vinylpyridine – Butadiene Copolymer
ENRG	Epoxidized Guayule Natural Rubber	PMQ	Phenyl Methyl Silicone Rubber
EOM	Ethylene Octene Copolymer	PSBR	Vinylpyridine – Styrene - Butadiene Terpolymer
EOT	Ethylene Polysulfide Ether	PVMQ	Phenyl Vinyl Methyl Silicone Rubber
EPDM	Ethylene Propylene Diene Terpolymer	PZ	Phenoxyphosphazene Rubber
EPM	Ethylene Propylene Copolymer	RBR	Reclaim
EU	Polyether Urethane	SBR	Styrene Butadiene Rubber
EVM	Ethylene Vinyl Acetate Copolymer	SIR	Styrene – Isoprene Rubber
FEPM	Tetrafluoroethylene – Propylene Copolymer; or Tetrafluoroethylene – Perfluorinated Vinyl Ether – Ethylene Terpolymer	T	Polysulfide Rubber
FMQ	Fluoromethyl Silicone	VMQ	Methyl Silicone Rubber
FFKM	Perfluoroelastomer	XBR	Carboxylic – Butadiene Rubber
FKM (1)	Hexafluoropropylene – Vinylidene Fluoride Copolymer	XNBR	Carboxylic – Acrylonitrile - Butadiene Rubber
FKM (2)	Hexafluoropropylene – Vinylidene Fluoride – Tetrafluoroethylene Terpolymer	XSBR	Carboxylic – Styrene - Butadiene Rubber

3.2.1 Single Elastomer Systems

Single Elastomer Chemistry Systems are designated by use of one acronym at the beginning of a line call out.

Example:

EPDM 58 10 275 10 0

EPDM = Ethylene Propylene Diene Terpolymer (per Table 1).

58 = 58 ± 5 points Type A Hardness ASTM D2240 Type A.

10 = 10 MPa Tensile Strength minimum ASTM D412 Die C.

275 = 275% Ultimate Elongation minimum ASTM D412 Die C.

10 = 150 °C CUTR (per the "Aging Duration and Temperature" table in Section 4) SAE J2236.

0 = No Requirement (per the "Fluid Aging Property Change Table - Volume Change" column in 4.4.3).

Example (Showing Tensile less than 10 MPa):

EPDM 58 8.5 275 10 0

EPDM = Ethylene Propylene Diene Terpolymer (per Table 1).

58 = 58 ± 5 points Type A Hardness ASTM D2240 Type A.

8.5 = 8.5 MPa Tensile Strength minimum ASTM D412 Die C.

275 = 275% Ultimate Elongation minimum ASTM D412 Die C.

10 = 150 °C CUTR (per the "Aging Duration and Temperature" table in Section 4) SAE J2236.

0 = No Requirement (per the "Fluid Aging Property Change Table - Volume Change" column in 4.4.3).

Example:

ACM 55 07 175 10 5

ACM = Polyacrylate (per Table 1).

55 = 55 ± 5 points Type A Hardness ASTM D2240 Type A.

07 = 7 MPa Tensile Strength minimum ASTM D412 Die C.

175 = 175% Ultimate Elongation minimum ASTM D412 Die C.

10 = 150 °C CUTR (per the "Aging Duration and Temperature" table in Section 4) SAE J2236.

5 = 25% Volume Change maximum in IRM 903 oil after 168 hours at 150 °C (per the "Fluid Aging Property Change Table - Volume Change" column in 4.4.3) ASTM D471.

3.2.1.1 Single Elastomer System – Fluorocarbon Elastomers

Fluorocarbon elastomers are sub-divided into five types. The type shall be included in the line call out in parentheses immediately following the acronym.

NOTE: All basic requirement fields must be occupied. Only the bolded portion of the line call out pertinent to this section is defined in the following examples.

Example:

FKM(3) 75 10 140 14 1

FKM = Fluorocarbon (per Table 1).

(3) = Chemistry based on Vinylidene Fluoride – Tetrafluoroethylene – Fluorinated Vinyl Ether Terpolymer (per Table 1).

3.2.2 Multiple Elastomer Systems – Blends

The elastomers shall be listed in order of highest to lowest ratio.

A formulation must contain at least 7 Parts per Hundred Rubber (PHR) of any component, based on total elastomer content, to be considered a blend.

Example – Compound Ingredient versus Blend:

SBR (95 PHR) and BR (5 PHR) per definition within this document **is not** considered a blend, only as a compound ingredient, and is not to be indicated in the line call out. The call out would be written as:

SBR 70 07 200 05 0

If the BR level was adjusted to 7 PHR or higher, it would be considered a blend and would be shown as:

SBR/BR 70 07 200 05 0

3.2.2.1 Two Elastomer Systems

Example – Blend of Two Elastomers of Differing Ratios:

Blend of NR (60 PHR) and BR (40 PHR) shall be shown in the line call out as:

NR/BR 50 10 400 05 0

NR/BR = Natural Rubber (highest ratio)/Butadiene Rubber (Lowest ratio).

In the case of an elastomer blend of the same ratio, the elastomers shall be listed in alphabetical order with a forward slash (“/”) separating them.

Example – Blend of Two Elastomers of the Same Ratio:

Blend of NR (50 PHR) and BR (50 PHR) shall be shown in the line call out as:

BR:NR 50 10 400 05 0

BR:NR = Butadiene Rubber, Natural Rubber blend of equal ratio.

3.2.2.2 Three or More Elastomer Systems

Systems that are a blend of three or more elastomers follow the same ratio rules as *Two Elastomer Systems*.

Example – Blend of Three Elastomers:

Blend of NR (60 PHR), SBR (30 PHR), BR (10 PHR), shall be shown in the line call out as:

NR/SBR/BR 50 10 400 05 0

NR/SBR/BR = Natural Rubber (highest ratio)/Styrene Butadiene Rubber (next highest ratio)/Butadiene Rubber (lowest ratio).