TECHNICAL REPORT 8461

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Rubber, vulcanized — Classification — Rubber materials

Caoutchouc vulcanisé — Classification — Matériaux caoutchouc

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— type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development requiring wider exposure;

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Technical reports are accepted for publication directly by ISO Council. Technical reports types 1 and 2 are subject to review within three years of publication, to decide if they can be transformed into International Standards. Technical reports type 3 do not necessarily have to be reviewed until the data they provide is considered no longer valid or useful.

ISO/TR 8461 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

The reasons which led to the decision to publish this document in the form of a technical report type 2 are explained in the Introduction.

0 Introduction

Work on the classification of vulcanized rubber was carried out by Working Group 8 of Technical Committee ISO/TC 45, *Rubber and rubber products*, over many years. This resulted in the circulation in 1980 of ISO/DIS 4632, *Rubber, vulcanized — Classification system*. This large document covered both the classification system and an extensive number of tables of rubber materials.

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The comments on DIS 4632 were examined by WG 8 at its 1980 meeting in Dubrovnik. The comment that the document was too complicated for use by industry was accepted and it was resolved by TC 45 that ISO/DIS 4632 be divided into two parts

Part 1: Description of the classification system.

Part 2: Rubber materials.

ISO 4632/1 was published in 1982.

It was agreed that the second part should be issued as a type 2 Technical Report, (TC 45 Resolution 1293) and Working Group 8/TG 2 was formed for the purpose of examining the text of this report. The amended draft was circulated in 1981 and the comments discussed at the 1981 meeting in Boston. Following extensive discussion, many of the comments, including some of those accompanying the United Kingdom disapproval, were taken into account. As a result it was agreed that the second part as amended by the Task Group and duly edited be submitted to ISO Central Secretariat for issue as a Technical Report. The amendments included a reconsideration by the Czechoslovak, Swedish, United Kingdom and USA national bodies of the standard vulcanizates submitted by them in the light of comments received.

The reasons for publication as a Technical Report are as follows:

a) the list of rubber materials is complex and extensive. It has already been simplified and it is hoped that during the next 3 years further steps can be taken to eliminate little used grades and combine grades having similar properties;

b) table 1 contains materials submitted by Czechoslovakia, Sweden and USA only. It is necessary to ensure that the list of materials represents those required in all national standards;

c) table 1 does not include materials described in documents under the jurisdiction of ISO/TC 45. Consequently WG 8/TG 2 will seek out such materials and solicit further national rubber materials to be included in the proper format for the intended transformation of ISO/TR 8461 into ISO 4632/2.

1 Scope and field of application

This Technical Report contains the list of properties of rubber materials submitted by member bodies of ISO/TC 45. They are classified and designated by the methods described in ISO 4632/1.

NOTE — The tests employed in this system have been chosen for their reproducibility and ability to control the properties of elastomeric materials. They are not intended to simulate service tests which, because of variability in test conditions, may be unsatisfactory for control purposes. It is recommended that the selection of a rubber material for a given application should be discussed between the user and the supplier so that all relevant operating factors may be considered.

2 References

ISO 1433, *Rubber, vulcanized — Preferred gradation of properties.*

ISO 1629, *Rubbers and latices — Nomenclature.*

ISO 4632/1, *Rubber, vulcanized — Classification — Part 1: Description of the classification system.*

3 Outline

3.1 Sources and classification

3.1.1 The properties of certain commercially available solid vulcanized rubber materials based upon various national standards are listed in table 1. These materials are intended to cover the majority of applications. The sources of the standards are indicated in table 1 under the following code:

CS Czechoslovakia

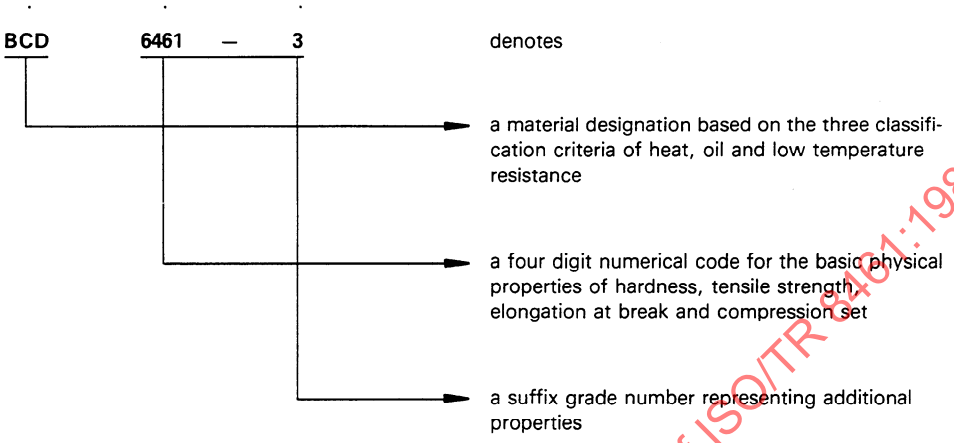
SE Sweden

US United States of America

3.1.2 The classification system, methods of test, test conditions and properties to be tested are specified in ISO 4632/1.

3.1.3 As far as possible the values of properties given in this Technical Report have been brought into line with the list of preferred gradations in ISO 1433.

3.1.4 Each material listed in table 1 has its own code consisting of a combination of letters and digits. This code can be used for information retrieval by punched cards or digital computer. An example is shown in the figure.



Figure

3.2 Composition and manufacture

This classification system applies to materials manufactured from natural rubber, synthetic rubber or reclaimed rubber, alone or in combination, together with added compounding ingredients of such nature and quantity as to produce vulcanizates that comply with the specified requirements. All materials and workmanship shall be in accordance with good commercial practice, and the resulting product shall be free of porous area, weak sections, bubbles, foreign matter or other defects affecting serviceability.

3.3 Sampling and inspection

3.3.1 A lot, unless specified otherwise, shall consist of all products of the same material submitted for inspection at the same time.

3.3.2 When proof of conformance with a specification based on this classification system is required, the supplier shall, upon request of the purchaser at the time of ordering, furnish a sufficient number of samples to perform the required tests. Test pieces shall be prepared as specified in ISO 4632/1. The samples shall be warranted to have equivalent cure and to be from the same run or batch of compound used in the lot.

3.3.3 When differences arise due to the method of processing or to the difficulty in obtaining suitable test pieces from a finished rubber product the values of properties may differ from those obtained from standard test pieces. Such differences in the values of properties for the rubber product shall be reported in an appropriate manner as agreed between the supplier and purchaser. Such differences in values can be determined by comparing results from standard test pieces with those obtained on actual rubber products.

3.4 Reporting

The specification code of a material taken from this Technical Report shall be prefaced by a reference to ISO/TR 8461. An example is as follows:

Rubber material, ISO/TR 8461 BAD 5373-3

or if the full line call out designation is required

Rubber material, ISO/TR 8461 BAD 5373-3 A14 C42 EA14 F10 F70 F80

4 Rubber materials

Rubber materials are listed in table 1.

NOTE — It is intended that rubber materials specified in any documents under the jurisdiction of ISO/TC 45 will be included in table 1.

Table 1 — Standard rubber materials

Classification criteria : AAC										
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**	**Grade No. 5**	**Grade No. 6**	**Grade No. 7**
CS 4163 CS 5153 CS 6162 CS 7373 CS 8143 SE 9323 CS 9323	No. 4 No. 4 Nos. 4; 5 No. 6 No. 7 No. 2 No. 3	A13	Heat resistance, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.			+ 10 − 20 − 20	+ 15 − 30 − 40	+ 10 − 30 − 30	+ 10 − 20 − 20	+ 10 − 20 − 20
		A23	Heat resistance, 7 days at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		+ 10 − 30 − 40	+ 10 − 30 − 30				
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C — threshold strain, %, min.			20				
		C42	Ozone resistance, 200 pphm, 96 h at 40 °C — threshold strain, %, min.					40		
		F10	Low temperature resistance — brittleness temperature, °C, max.		− 30					
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.	Basic properties only — no additional requirements	− 35					
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		− 10					
		G11	Tear strength — crescent, kN/m, min.		60	60				
		O11	Electrical resistivity — Ω·cm							5×10^{11} to 5×10^{14}
		O21	Electrical insulation — resistance, MΩ, min.							1×10^{10}
		O31	Breakdown voltage — kV/mm, min.							15
		R11	Resilience — Lupke, %, max.						20	
		S71	Compression flexometer — temperature rise, °C, max. — creep, %, max. — set, %, max.						80 60 20	

Table 1 — Standard rubber materials (*continued*)

Classification criteria: AAD									
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**	**Grade No. 5**	**Grade No. 6**
SE 3483 SE 4586 US 4793 US 5573 SE 5586 US 6353 SE 6576 US 6673 SE 7143 SE 7343 SE 7566 US 8543	No. 3 No. 2 No. 4 No. 4 No. 5 No. 2 No. 5 No. 4 No. 6 No. 6 No. 5 No. 2	A13	Heat resistance, 70 h at 70 °C	Basic properties only — no additional requirements					
			— hardness change, IRHD, max.		+ 10		+ 10		
			— tensile change, %, max.		− 30		− 30		
			— elongation change, %, max.		− 30		− 30		
		A23	Heat resistance, 7 days at 70 °C						
			— hardness change, IRHD, max.		+ 10	+ 10		+ 10	+ 10
			— tensile change, %, max.		− 30	− 30		− 30	− 30
			— elongation change, %, max.		− 40	− 40		− 30	− 40
		B13	Compression set, 22 h at 70 °C						
			— %, max.		25		25		
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C						
			— threshold strain, %, min.		20	10	10	20	10
		C42	Ozone resistance, 200 pphm, 96 h at 40 °C						
			— threshold strain, %, min.		40				
		EA14	Aqueous fluid resistance, distilled water, 70 h at 100 °C						
			— volume change, %, max.		10		10		
		F10	Low temperature resistance						
			— brittleness temperature, °C, max.		− 50	− 50		− 50	
		F70	Low temperature resistance						
			— retraction temperature, TR-10, °C, max.		− 45	− 50	− 40	− 40	− 30
		F80	Low temperature resistance						
			— retraction temperature, TR-30, °C, max.		− 35	− 40	− 30	− 25	− 20
		G11	Tear strength						
			— crescent, kN/m, min.		90	60		120	60
		K11	Adhesion to metals						
			— two plate method, MPa, min.		— *		— *		

* Materials can be bonded to metal during vulcanization. Because of the wide variety of compounds in use and manifold end-use requirements, values should be agreed between supplier and user.

Table 1 — Standard rubber materials (*continued*)

Classification criteria : AAE					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
SE 3483	No. 2	A13	Heat resistance, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		 + 10 − 20 − 20
		A23	Heat resistance, 7 days at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		 + 10 − 30 − 40
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C — threshold strain, %, min.	Basic properties only — no additional requirements	 10
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		 − 50
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		 − 40
		G11	Tear strength — crescent, kN/m, min.		 60

Table 1 — Standard rubber materials (*continued*)

Classification criteria: ABD									
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**	**Grade No. 5**	**Grade No. 6**
CS 5383 CS 6473 CS 6585 CS 7363 CS 7574	No. 1 Nos. 4; 6 Nos. 3; 5 No. 2 No. 3	A13	Heat resistance, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		+ 10 − 20 − 30	+ 15 − 30 − 30	+ 10 − 20 − 20	+ 10 − 40 − 40	+ 5 − 20 − 20
		C42	Ozone resistance, 200 pphm, 96 h at 40 °C — threshold strain, %, min.		120				
		G21	Tear strength — angle, kN/m, min.			5			
		H11	Resistance to flex cracking (De Mattia) — kilocycles, min.			10			
		J11	Abrasion resistance — index, min.	Basic properties only — no additional requirements		60			
		O11	Electrical resistivity — Ω · cm						5×10^6 to 1×10^{10}
		O21	Electrical insulation — resistance, MΩ, min.						5×10^{10}
		R11	Resilience — Lupke, %, min.				20	50	
		S71	Compression flexometer — temperature rise, °C, max. — creep, %, max. — set, %, max.				60 60 20	60 40 15	

Table 1 — Standard rubber materials (*continued*)

Classification criteria : ABE						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
CS 4483 CS 4583 CS 6574	No. 2 No. 2 No. 3	A13	Heat resistance, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		+ 15 − 10 − 30	+ 10 − 20 − 20
		G21	Tear strength — angle, kN/m, min.	Basic properties only — no additional requirements		20
		H11	Resistance to flex cracking (De Mattia) — kilocycles, min.			60
		J11	Abrasion resistance — index, min.			90

Table 1 — Standard rubber materials (*continued*)

Classification criteria : ACD						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
CS 5373	Nos. 2; 3	A13	Heat resistance, 70 h at 70 °C			
			— hardness change, IRHD, max.		+ 10	+ 10
			— tensile change, %, max.		− 30	− 30
			— elongation change, %, max.		− 30	− 30
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C			
			— threshold strain, %, min.		20	
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C			
			— hardness change, IRHD, max.			− 10
			— tensile change, %, max.			− 20
			— elongation change, %, max.			− 30
			— volume change, %, max.			+ 15
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C			
			— hardness change, IRHD, max.			− 20
			— tensile change, %, max.	Basic properties only — no additional requirements		− 40
			— elongation change, %, max.			− 50
			— volume change, %, max.			+ 80
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C			
			— hardness change, IRHD			− 5 to + 10
			— tensile change, %, max.			− 20
			— elongation change, %, max.			− 30
			— volume change, %			− 15 to + 10
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C			
			— hardness change, IRHD			− 10 to + 10
			— tensile change, %, max.			− 30
			— elongation change, %, max.			− 30
			— volume change, %			− 10 to + 20
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C			
			— hardness change, IRHD, max.			− 15
			— tensile change, %, max.			− 30
			— elongation change, %, max.			− 40
			— volume change, %, max.			+ 50

Table 1 — Standard rubber materials (*continued*)

Classification criteria: AHC							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
CS 6253 CS 6365 CS 8536	No. 3 No. 2 No. 4	A13	Heat resistance, 70 h at 70 °C				
			— hardness change, IRHD, max.		+ 10	+ 10	+ 10
			— tensile change, %, max.		− 20	− 20	− 10
			— elongation change, %, max.		− 20	− 20	− 30
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C				
			— hardness change, IRHD (max.)		− 5 to 0	0 to − 5	(− 10)
			— tensile change, %, max.		− 10	− 10	− 20
			— elongation change, %, max.		− 10	− 10	− 20
			— volume change, %, max.		+ 5	+ 5	+ 10
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C				
			— hardness change, IRHD (max.)		(− 20)	(− 20)	0 to − 20
			— tensile change, %, max.		− 40	− 35	− 40
			— elongation change, %, max.		− 40	− 35	− 40
			— volume change, %, max.	Basic properties only — no additional requirements	+ 40	+ 40	+ 50
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C				
			— hardness change, IRHD		− 10 to + 10	− 5 to + 10	− 10 to + 10
			— tensile change, %, max.		− 20	− 20	− 20
			— elongation change, %, max.		− 20	− 20	− 30
			— volume change, %		− 15 to + 5	− 10 to + 5	− 15 to + 5
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C				
			— hardness change, IRHD		− 5 to + 15	− 5 to + 5	− 10 to + 10
			— tensile change, %, max.		− 20	− 10	− 20
			— elongation change, %, max.		− 30	− 10	− 30
			— volume change, %		− 20 to + 5	− 5 to + 10	− 15 to + 5
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C				
			— hardness change, IRHD		− 10 to + 5	− 10 to + 10	
			— tensile change, %, max.		− 20	− 20	
			— elongation change, %, max.		− 20	− 30	
			— volume change, %, max.		+ 15	+ 20	
		F10	Low temperature resistance				
			— brittleness temperature, °C, max.				− 15

Table 1 — Standard rubber materials (*continued*)

Classification criteria : AKB					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
CS 9424	No. 2	A13	Heat resistance, 70 h at 70 °C		
			— hardness change, IRHD, max.		+ 10
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 20
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C		
			— hardness change, IRHD		− 5 to + 10
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 20
			— volume change, %		− 10 to + 5
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C		
			— hardness change, IRHD		− 10 to 0
			— tensile change, %, max.		− 30
			— elongation change, %, max.		− 30
			— volume change, %, max.		+ 30
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C	Basic properties only — no additional requirements	
			— hardness change, IRHD		− 5 to + 10
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 20
			— volume change, %		− 10 to + 5
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C		
			— hardness change, IRHD		− 20 to + 5
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 30
			— volume change, %		− 15 to + 5
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C		
			— hardness change, IRHD		− 10 to + 10
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 30
			— volume change, %		− 10 to + 10
		F10	Low temperature resistance		
			— brittleness temperature, °C, max.		− 20

Table 1 — Standard rubber materials (*continued*)

Classification criteria: AKC							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
US 4173 US 5173 US 6263 CS 6263 US 7323 CS 8434	No. 2 No. 2 No. 2 No. 3 No. 2 No. 4	A13	Heat resistance, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.			+ 10 − 20 − 30	+ 10 − 20 − 40
		A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		+ 15 − 20 − 40		
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.			− 5 − 10 − 10 + 5	− 5 − 10 − 10 + 5
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.		+ 30	− 10 − 20 − 30 + 15	
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C — hardness change, IRHD (max.) — tensile change, %, max. — elongation change, %, max. — volume change, %	Basic properties only — no additional requirements		(− 15) − 20 − 30 0 to − 20	+ 10 to − 10 − 30 − 40 + 5 to − 15
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %		− 5 to + 5	− 15 − 20 − 30 0 to − 20	+ 15 − 30 − 40 0 to − 15
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %			− 5 to + 10 − 20 − 20 − 10 to + 5	+ 10 to − 10 − 30 − 30 + 10 to − 10
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max.		− 5 to + 10 − 30 − 50		
		F10	Low temperature resistance — brittleness temperature, °C, max.		− 40		

Table 1 — Standard rubber materials (*continued*)

Classification criteria : AKD					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
CS 7323	No. 2	A13	Heat resistance, 70 h at 70 °C		
			— hardness change, IRHD, max.		+ 10
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 40
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C		
			— hardness change, IRHD, max.		− 5
			— tensile change, %, max.		− 10
			— elongation change, %, max.		− 10
			— volume change, %		+ 5
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C		
			— hardness change, IRHD, max.		− 15
			— tensile change, %, max.		− 30
			— elongation change, %, max.	Basic properties only — no additional requirements	− 30
			— volume change, %, max.		+ 30
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C		
			— hardness change, IRHD, max.		+ 10
			— tensile change, %, max.		− 30
			— elongation change, %, max.		− 30
			— volume change, %		− 10 to 0
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C		
			— hardness change, IRHD, max.		+ 15
			— tensile change, %, max.		− 30
			— elongation change, %, max.		− 40
			— volume change, %		− 15 to 0
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C		
			— hardness change, IRHD		+ 5 to − 5
			— tensile change, %, max.		− 10
			— elongation change, %, max.		− 10
			— volume change, %		+ 5 to − 5

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BAC						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
US 3473*	No. 2	A14	Heat resistance, 70 h at 100 °C			
US 4473*	No. 2		— hardness change, IRHD, max.		+ 10	+ 10
US 5473*	No. 2		— tensile change, %, max.		− 30	− 30
US 6463*	No. 2		— elongation change, %, max.	Basic properties only — no additional requirements	− 30	− 30
US 7453*	No. 2	B13	Compression set, 22 h at 70 °C			
US 7563*	No. 2		— %, max.		25	
US 8423*	No. 3					
US 9423*	No. 3	F10	Low temperature resistance			
			— brittleness temperature, °C, max.		− 40	− 40

* Compression set is based on 22 h at 70 °C.

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BAD										
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**	**Grade No. 5**	**Grade No. 6**	**Grade No. 7**
US 3373*	No. 4	A14	Heat resistance, 70 h at 100 °C							
US 3473*	No. 4		— hardness change, IRHD, max.		+ 15	+ 10	+ 10	+ 10	+ 10	+ 10
US 4473*	No. 4		— tensile change, %, max.		− 30	− 30	− 30	− 30	− 30	− 30
CS 5373	Nos. 2; 3; 7		— elongation change, %, max.		− 30	− 50	− 30	− 50	− 50	− 30
SE 5373	No. 5	B13	Compression set, 22 h at 70 °C							
CS 6363	Nos. 3; 7		— %, max.				25			
SE 6363	No. 5									
US 6573	No. 4	C42	Ozone resistance, 200 pphm, 96 h at 40 °C							
SE 7343	No. 5		— threshold strain, %, min.			40		40	40	40
US 7563	No. 4									
SE 8323	No. 6	EA14	Aqueous fluid resistance, distilled water, 70 h at 100 °C	Basic properties only — no additional requirements						
			— volume change, % (max.)		(+ 10)	(+ 10)		0 to + 5	0 to + 5	
		F10	Low temperature resistance							
			— brittleness temperature, °C, max.			− 50	− 55	− 50	− 50	
		F70	Low temperature resistance							
			— retraction temperature, TR-10, °C, max.			− 45		− 45	− 40	
		F80	Low temperature resistance							
			— retraction temperature, TR-30, °C, max.			− 30		− 30	− 25	
		G11	Tear strength							
			— crescent, kN/m, min.					60	60	

* Compression set is based on 22 h at 70 °C.

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BAE							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
US 3473*	No. 2	A14	Heat resistance, 70 h at 100 °C				
US 4473*	No. 2		— hardness change, IRHD, max.		+ 10	− 10	− 10
US 5473*	No. 2		— tensile change, %, max.		− 30	− 30	− 30
CS 6473	No. 4		— elongation change, %, max.		− 30	− 40	− 30
CS 6772	No. 3	B13	Compression set, 22 h at 70 °C				
			— %, max.		25		
		F10	Low temperature resistance				
			— brittleness temperature, °C, max.	Basic properties only — no additional requirements		− 60	
		G21	Tear strength				
			— angle, kN/m, min.			20	15
		H11	Resistance to flex cracking (De Mattia)				
			— kilocycles, min.			100	100
		J11	Abrasion resistance				
			— index, min.			90	90
		K21	Adhesion to metals				
			— one plate method, MPa, min.		— **		

* Compression set is based on 22 h at 70 °C.

** Materials can be bonded to metal during vulcanization. Because of the wide variety of compounds in use and manifold end-use requirements, values should be agreed between supplier and user.

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BCD							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
US 3161	No. 2	A14	Heat resistance, 70 h at 100 °C				
US 3481	No. 2		— hardness change, IRHD, max.		+ 15	+ 15	+ 15
US 4371	No. 2		— tensile change, %, max.		− 20	− 20	− 20
US 4481	No. 2		— elongation change, %, max.		− 40	− 40	− 40
US 5161	No. 2						
US 5461	No. 2	B14	Compression set, 22 h at 100 °C				
US 5681	No. 2		— %, max.		35	35	35
US 6161	No. 3	EO14	Oil resistance, oil No. 1, 70 h at 100 °C				
US 6461	No. 3		— hardness change, IRHD	Basic properties only — no additional requirements	− 10 to + 10	− 10 to + 10	− 10 to + 10
US 6671	No. 3		— tensile change, %, max.		− 30	− 30	− 30
US 7141	No. 3		— elongation change, %, max.		− 30	− 30	− 30
US 7441	No. 3		— volume change, %		− 10 to + 15	− 10 to + 15	+ 10 to + 15
US 7661	No. 3						
US 8221	No. 4	EO34	Oil resistance, oil No. 3, 70 h at 100 °C				
US 8421	No. 4		— tensile change, %, max.		− 70	− 60	− 50
US 9321	No. 4		— elongation change, %, max.		− 60	− 50	− 30
US 9421	No. 4		— volume change, %, max.		+ 120	+ 100	+ 80
		K21	Adhesion to metals				
			— one plate method, MPa, min.		— *	— *	— *

* Materials can be bonded to metal during vulcanization. Because of the wide variety of compounds in use and manifold end-use requirements, values should be agreed between supplier and user.

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BCE					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
US 3161 US 3481 US 4371 US 4481 US 5361 US 5461 US 6161 US 6461 US 7147 US 7451	No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		 + 15 − 20 − 40
		B14	Compression set, 22 h at 100 °C — %, max.		 35
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %	Basic properties only — no additional requirements	 − 10 to + 10 − 30 − 30 − 10 to + 15
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — tensile change, %, max. — elongation change, %, max. — volume change, %, max.		 − 60 − 60 + 100
		K21	Adhesion to metals — one plate method, MPa, min.		 — *

* Materials can be bonded to metal during vulcanization. Because of the wide variety of compounds in use and manifold end-use requirements, values should be agreed between supplier and user.

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BDC									
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**	**Grade No. 5**	**Grade No. 6**
SE 4483 SE 5363 SE 5478 SE 6363 SE 6466 SE 6573	No. 2 No. 3 No. 3 No. 4 No. 5 No. 6	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.	Basic properties only — no additional requirements	+ 10 − 20 − 40	+ 10 − 20 − 40	+ 10 − 20 − 40	+ 10 − 20 − 40	+ 10 − 20 − 20
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C — threshold strain, %, min.		40	40	40	40	40
		EA24	Aqueous fluid resistance, distilled water, 7 days at 100 °C — volume change, %		0 to + 50	0 to + 50	0 to + 50	0 to + 30	0 to + 30
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — volume change, %		0 to + 30	0 to + 15	0 to + 15	0 to + 15	0 to + 30
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — volume change, %		0 to + 100	0 to + 100	0 to + 100	0 to + 50	0 to + 100
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — volume change, %		− 10 to + 10 − 10 to + 10	− 10 to + 10 − 10 to + 10	− 10 to + 10 − 10 to + 10	− 10 to + 10 − 10 to + 10	− 10 to + 10 − 10 to + 10
		F10	Low temperature resistance — brittleness temperature, °C, max.		− 30	− 30	− 30	− 30	− 30
		F63	Low temperature resistance, 7 days at − 10 °C — hardness change, IRHD, max.		+ 10	+ 10	+ 10	+ 10	+ 10
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		− 30	− 30	− 30	− 30	− 30
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		− 25	− 25	− 20	− 20	− 20

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BDD					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
SE 4484	No. 2	A14	Heat resistance, 70 h at 100 °C		
			— hardness change, IRHD, max.		+ 10
			— tensile change, %, max.		− 20
			— elongation change, %, max.		− 40
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C	Basic properties only — no additional requirements	
			— volume change, %		0 to + 100
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C		
			— volume change, %		− 10 to + 10
		F10	Low temperature resistance		
			— brittleness temperature, °C, max.		− 50

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BEC						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
US 4384 US 5374 US 5474 US 6264 US 6464 US 7343 SE 7443 US 7543 SE 8423 US 8523	No. 3 No. 3 No. 3 No. 3 No. 3 No. 3 No. 2 No. 3 No. 2 No. 3	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.	Basic properties only — no additional requirements	 + 10 − 20 − 40	 + 15 − 20 − 40
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C — threshold strain, %, min.		 40	
		EA24	Aqueous fluid resistance, distilled water, 7 days at 100 °C — volume change, %		 0 to + 30	
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — volume change, %		 0 to + 15	
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — volume change, %		 0 to + 50	
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — volume change, %		 − 10 to + 10 − 5 to + 10	 − 10 to + 10 − 10 to + 15
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — tensile change, %, max. — elongation change, %, max. — volume change, %		 0 to + 80	 − 50 − 40
		F10	Low temperature resistance — brittleness temperature, °C, max.		 − 30	 − 40
		F63	Low temperature resistance, 7 days at − 10 °C — hardness change, IRHD, max.		 + 10	
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		 − 25	
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		 − 15	

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BED						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
US 4384 US 5374 US 5474 US 6264 US 6464 US 7343 CS 7343 US 7543 US 8433 US 8523 US 9323 US 9423	No. 2 No. 2 No. 2 No. 2 No. 2 No. 3 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		+ 15 − 20 − 40	+ 10 − 20 − 30
		B13	Compression set, 22 h at 70 °C — %, max.		25	
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.			− 10 − 30 − 30 + 15
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.	Basic properties only — no additional requirements		+ 30 − 40 − 40 + 70
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		− 10 to + 10 − 30 − 30 − 10 to + 15	− 10 to + 10 − 30 − 40 − 10 to + 15
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.			− 25 − 40 − 40 + 60
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — tensile change, %, max. — elongation change, %, max.		− 50 − 40	
		F10	Low temperature resistance — brittleness temperature, °C, max.			− 45

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BGC					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
US 4373 US 4473 US 5163 US 5463 US 5673 US 6563 US 7343 US 7563 US 8423 US 9423	No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2	B14	Compression set, 22 h at 100 °C — %, max.		 25
		EA14	Aqueous fluid resistance, distilled water, 70 h at 100 °C — hardness change, IRHD — volume change, %		 – 10 to + 10 – 15 to + 15
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		 – 10 to + 10 – 30 – 30 – 5 to + 10
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %	Basic properties only — no additional requirements	 0 to – 30 – 60 – 60 0 to + 40
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		 – 5 to + 15 – 30 – 50 – 10 to + 5
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		 – 10 to + 5 – 50 – 50 0 to + 25

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BGD						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
US 4373 US 4473 US 5163 US 5463 US 5673 US 6353 US 6563 US 7563 US 8123 US 8423 US 9323	No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 3 No. 3 No. 3	B14	Compression set, 22 h at 100 °C — %, max.	Basic properties only — no additional requirements	25	25
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		− 10 to + 10 − 30 − 30 − 5 to + 10	
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		0 to − 30 − 60 − 60 0 to + 40	
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		− 5 to + 10 − 30 − 50 − 10 to + 5	− 5 to + 15 − 30 − 50 − 10 to + 5
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		− 10 to + 5 − 50 − 50 0 to + 25	− 20 to 0 − 50 − 50 0 to + 35

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BGE						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
US 4373 US 4473 US 5363 US 5463 US 6353 US 6463 US 7343 US 7773 US 8423 US 8663	No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 3 No. 3 No. 3	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD (max.) — tensile change, % (max.) — elongation change, %, max.		(+ 15) (− 20) − 40	− 15 to + 15 − 20 to + 20 − 20
		B14	Compression set, 22 h at 100 °C — %, max.		25	50
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %	Basic properties only — no additional requirements	− 5 to + 15 − 30 − 50 − 10 to + 5	− 10 to + 5 − 20 − 40 − 5 to + 5
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		− 15 to 0 − 50 − 50 0 to + 35	− 10 to + 5 − 40 − 40 0 to + 10

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BHD							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
SE 4386 SE 5376 SE 6468	No. 2 No. 3 No. 4	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.	Basic properties only — no additional requirements	 + 15 − 40 − 50	 + 15 − 30 − 40	 + 10 − 20 − 40
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — volume change, %		0 to + 30	0 to + 50	0 to + 50
		EF31	Resistance to hydrocarbon liquids, liquid C, 70 h at 23 °C — volume change, %		0 to + 60	0 to + 60	0 to + 60
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — volume change, %		0 to + 15 − 15 to 0	0 to + 15 − 15 to 0	− 5 to + 10 − 10 to + 5
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — volume change, %		− 5 to + 10 − 5 to + 30	− 10 to + 5 − 5 to + 30	− 10 to + 5 0 to + 30
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		− 25	− 25	− 25
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		− 20	− 20	− 20

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BJB						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
CS 7346 SE 8428	No. 2 No. 3	A14	Heat resistance, 70 h at 100 °C			
			— hardness change, IRHD, max.		+ 10	+ 10
			— tensile change, %, max.		− 10	− 20
			— elongation change, %, max.		− 40	− 50
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C			
			— hardness change, IRHD, max.		− 15	
			— tensile change, %, max.		− 30	
			— elongation change, %, max.		− 30	
			— volume change, %, max.		+ 15	
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C			
			— hardness change, IRHD, max.		− 20	
			— tensile change, %, max.		− 40	
			— elongation change, %, max.		− 40	
			— volume change, % (max.)		(+ 40)	0 to + 30
		EF31	Resistance to hydrocarbon liquids, liquid C, 70 h at 23 °C			
			— volume change, %			0 to + 50
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C	Basic properties only — no additional requirements		
			— hardness change, IRHD		+ 10 to − 5	
			— tensile change, %, max.		− 30	
			— elongation change, %, max.		− 30	
			— volume change, %		− 10 to + 5	
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C			
			— hardness change, IRHD			0 to + 15
			— volume change, %			− 10 to + 5
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C			
			— hardness change, IRHD, max.		− 15	
			— tensile change, %, max.		− 30	
			— elongation change, %, max.		− 30	
			— volume change, %, max.		+ 15	
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C			
			— hardness change, IRHD			− 5 to + 10
			— volume change, %			0 to + 15
		F10	Low temperature resistance			
			— brittleness temperature, °C, max.		− 20	− 20
		F70	Low temperature resistance			
			— retraction temperature, TR-10, °C, max.			− 15
		F80	Low temperature resistance			
			— retraction temperature, TR-30, °C, max.			− 10

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BJC						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
CS 7436 CS 8793	No. 2 No. 3	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		 + 10 − 20 − 40	 + 10 − 20 − 10
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %, max.		 − 5 to + 5 − 20 − 20 − 10	
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — volume change, %, max.		 + 40	
		EO13	Oil resistance, oil No. 1, 70 h at 70 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %	Basic properties only — no additional requirements	 + 5 to − 15 − 30 − 30 − 5 to + 15	
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.		 − 15 − 30 − 30 + 20	
		F10	Low temperature resistance — brittleness temperature, °C, max.		 − 40	
		G21	Tear strength — angle, kN/m, min.			 30
		H11	Resistance to flex cracking (De Mattia) — kilocycles, min.			 50
		J11	Abrasion resistance — index, min.			 160

Table 1 — Standard rubber materials (*continued*)

Classification criteria : BJD							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
CS 5362 SE 7448 SE 7468	No. 2 No. 3 No. 4	A14	Heat resistance, 70 h at 100 °C				
			— hardness change, IRHD, max.		+ 15	+ 10	+ 10
			— tensile change, %, max.		− 20	− 20	− 20
			— elongation change, %, max.		− 40	− 40	− 30
		A15	Heat resistance, 70 h at 125 °C				
			— hardness change, IRHD, max.			+ 10	+ 10
			— tensile change, %, max.			− 20	− 20
			— elongation change, %, max.			− 50	− 40
		EF11	Resistance to hydrocarbon liquids, liquid A, 70 h at 23 °C				
			— hardness change, IRHD, max.		− 5		
			— tensile change, %, max.		− 10		
			— elongation change, %, max.		− 10		
			— volume change, %, max.		+ 5		
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C				
			— hardness change, IRHD, max.		− 20		
			— tensile change, %, max.		− 40		
			— elongation change, %, max.		− 40		
			— volume change, % (max.)		(+ 50)	0 to + 30	0 to + 40
		EF31	Resistance to hydrocarbon liquids, liquid C, 70 h at 23 °C	Basic properties only — no additional requirements			
			— volume change, %			0 to + 50	0 to + 60
		EO15	Oil resistance, oil No. 1, 70 h at 125 °C				
			— hardness change, IRHD (max.)		(+ 20)	0 to + 15	− 10 to + 5
			— tensile change, %, max.		− 40		
			— elongation change, %, max.		− 40		
			— volume change, % (max.)		(− 25)	− 15 to 0	− 10 to + 10
		EO33	Oil resistance, oil No. 3, 70 h at 70 °C				
			— hardness change, IRHD		+ 10 to − 10		
			— tensile change, %, max.		− 30		
			— elongation change, %, max.		− 40		
			— volume change, %		− 10 to + 10		
		EO35	Oil resistance, oil No. 3, 70 h at 125 °C				
			— hardness change, IRHD			− 15 to 0	− 10 to + 5
			— volume change, %			0 to + 15	0 to + 15
		F10	Low temperature resistance				
			— brittleness temperature, °C, max.			− 50	
		F70	Low temperature resistance				
			— retraction temperature, TR-10, °C, max.			− 45	− 30
		F80	Low temperature resistance				
			— retraction temperature, TR-30, °C, max.			− 35	− 25

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BKB							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
SE 7343 SE 7443 SE 9426	No. 2 No. 3 No. 4	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.	Basic properties only — no additional requirements	 + 15 − 20 − 50	 + 10 − 20 − 40	 + 10 − 20 − 50
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C — threshold strain, %, max.			20	
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — volume change, %		0 to + 30	0 to + 15	0 to + 30
		EF31	Resistance to hydrocarbon liquids, liquid C, 70 h at 23 °C — volume change, %		0 to + 50	0 to + 30	0 to + 50
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — volume change, %		0 to + 15 − 15 to 0	− 5 to + 10 − 15 to 0	− 5 to + 5 − 10 to + 5
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — volume change, %		− 5 to + 10 − 5 to + 10	− 5 to + 10 − 5 to + 10	− 5 to + 5 − 5 to + 10
		F10	Low temperature resistance — brittleness temperature, °C, max.		− 20	− 20	− 20
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		− 15	− 15	− 10
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		− 10	− 10	− 5

Table 1 — Standard rubber materials (*continued*)

Classification criteria: BKC									
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**	**Grade No. 5**	**Grade No. 6**
SE 5376 SE 6363 SE 6446 US 6143 US 6243 US 6353 US 6453 US 6563 US 6663 US 7133 US 7233 US 7343 US 7443 SE 7446 US 7553 US 7663 US 8123 US 8323 US 8423 US 8523 US 9113 US 9323 US 9423	No. 2 No. 3 No. 4 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 5 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6 No. 6	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.	Basic properties only — no additional requirements	+ 10 − 30 − 40	+ 10 − 20 − 40	+ 10 − 20 − 40	+ 10 − 20 − 40	+ 10 − 30 − 40
		B14	Compression set, 22 h at 100 °C — %, max.						25
		C12	Ozone resistance, 50 pphm, 96 h at 40 °C — threshold strain, %, min.			20			
		EF21	Resistance to hydrocarbon liquids, liquid B, 70 h at 23 °C — volume change, %		0 to + 30	0 to + 15	0 to + 30	0 to + 30	0 to + 30
		EF31	Resistance to hydrocarbon liquids, liquid C, 70 h at 23 °C — volume change, %		0 to + 60	0 to + 40	0 to + 50	0 to + 50	
		EO14	Oil resistance, oil No. 1, 70 h at 100 °C — hardness change, IRHD — volume change, %		− 5 to + 10 − 10 to + 5	0 to + 15 − 15 to 0	− 5 to + 10 − 10 to + 5	0 to + 15 − 10 to + 5	− 5 to + 5 − 10 to + 5
		EO34	Oil resistance, oil No. 3, 70 h at 100 °C — hardness change, IRHD — volume change, %		− 10 to + 5 − 5 to + 10	− 5 to + 10 − 5 to + 10	− 10 to + 5 − 5 to + 10	− 5 to + 10 − 5 to + 10	− 10 to + 5 − 5 to + 5
		F10	Low temperature resistance — brittleness temperature, °C, max.		− 30	− 30	− 30	− 30	
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		− 20	− 20	− 20	− 20	
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		− 15	− 15	− 15	− 15	

Table 1 — Standard rubber materials (*continued*)

Classification criteria : CAD							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
US 3481 US 4471 SE 6464 SE 7464 SE 8426 US 9422	No. 4 No. 4 No. 2 No. 3 No. 3 No. 4	A14	Heat resistance, 70 h at 100 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.		 + 10 − 30 − 50	 + 10 − 30 − 50	
		A15	Heat resistance, 70 h at 125 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.				 + 10 − 20 − 40
		B71	Tensile set under constant load — %, max.		10	10	
		C42	Ozone resistance, 200 pphm, 96 h at 40 °C — threshold strain, %, min.	Basic properties only — no additional requirements	40	40	
		EA24	Aqueous fluid resistance, distilled water, 7 days at 100 °C — volume change, %		0 to + 5	0 to + 5	
		F10	Low temperature resistance — brittleness temperature, °C, max.		− 50	− 50	
		F70	Low temperature resistance — retraction temperature, TR-10, °C, max.		− 40	− 40	
		F80	Low temperature resistance — retraction temperature, TR-30, °C, max.		− 30	− 25	

Table 1 — Standard rubber materials (*continued*)

Classification criteria: CBD							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
CS 6383 CS 7342 CS 7474	No. 2 No. 4 No. 3	A15	Heat resistance, 70 h at 125 °C				
			— hardness change, IRHD, max.		+ 15	+ 15	+ 15
			— tensile change, %, max.		− 20	− 30	− 20
			— elongation change, %, max.		− 20	− 40	− 30
		B25	Compression set, 70 h at 125 °C				
			— %, max.		60	40	
		EA13	Aqueous fluid resistance, distilled water, 70 h at 70 °C				
			— volume change, %, max.				+ 10
		F30	Low temperature resistance				
			— torsional modulus, T10, °C, max.		− 20	− 20	
		N13	Chemical resistance, 10 % (m/m) hydrochloric acid, 28 days at 70 °C				
			— tensile change, %, max.				− 20
			— elongation change, %, max.				− 20
			— volume change, %, max.				+ 10
		N43	Chemical resistance, 30 % (m/m) sulfuric acid, 28 days at 70 °C	Basic properties only — no additional requirements			
			— tensile change, %, max.				− 20
			— elongation change, %, max.				− 10
			— volume change, %				− 5 to + 5
		N53	Chemical resistance, 10 % (m/m) nitric acid, 28 days at 70 °C				
			— tensile change, %, max.				− 40
			— elongation change, %, max.				− 30
			— volume change, %, max.				+ 20
		N61	Chemical resistance, 40 % (m/m) nitric acid, 28 days at 23 °C				
			— tensile change, %, max.				− 30
			— elongation change, %, max.				− 30
			— volume change, %, max.				+ 10
		N83	Chemical resistance, 60 % (m/m) sodium hydroxide, 28 days at 70 °C				
			— tensile change, %, max.				− 20
			— elongation change, %, max.				− 20
			— volume change, %				− 5 to + 5

Table 1 — Standard rubber materials (*continued*)

Classification criteria : CED						
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**
US 5471 US 6461 US 6571 US 7341 CS 7341 US 7451 US 7561 US 8341 US 8451	No. 2 No. 2 No. 2 No. 2 No. 3 No. 2 No. 2 No. 2 No. 2	A15	Heat resistance, 70 h at 125 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.			 + 15 − 30 − 30
		A16	Heat resistance, 70 h at 150 °C — hardness change, IRHD — tensile change, % — elongation change, %, max.		 − 20 to + 20 − 30 to + 30 − 60	
		B15	Compression set, 22 h at 125 °C — %, max.		 60	
		EA13	Aqueous fluid resistance, distilled water, 70 h at 70 °C — volume change, %, max.			 + 20
		N13	Chemical resistance, 10 % (*m*/*m*) hydrochloric acid, 28 days at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.	Basic properties only — no additional requirements		 − 10 − 20 − 30 + 10
		N43	Chemical resistance, 30 % (*m*/*m*) sulfuric acid, 28 days at 70 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %			 + 5 − 20 − 20 − 5 to + 5
		N61	Chemical resistance, 40 % (*m*/*m*) nitric acid, 28 days at 23 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %, max.			 − 5 to + 5 − 20 − 30 + 10
		N83	Chemical resistance, 60 % (*m*/*m*) sodium hydroxide, 28 days at 70 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %			 − 5 to + 5 − 30 − 30 − 5 to + 5

Table 1 — Standard rubber materials (*continued*)

Classification criteria : CEE					
Basic physical properties	**Suffix grade number available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**
US 5471 US 6461 US 6571 US 7341 US 7451 US 7561 US 8341 US 8451	No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2 No. 2	A16 B15 	Heat resistance, 70 h at 150 °C — hardness change, IRHD — tensile change, % — elongation change, %, max. Compression set, 22 h at 125 °C — %, max.	Basic properties only — no additional requirements	– 20 to + 20 – 30 to + 30 – 60 60

Table 1 — Standard rubber materials (*continued*)

Classification criteria: DHB							
Basic physical properties	**Suffix grade numbers available**	**Suffix**	**Requirements**	**Grade No. 1**	**Grade No. 2**	**Grade No. 3**	**Grade No. 4**
US 4362 US 5352 US 6342 US 7221 US 7442 US 8332	No. 4 No. 4 No. 4 No. 2 No. 3 No. 3	A16	Heat resistance, 70 h at 150 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max.	Basic properties only — no additional requirements	 + 10 − 30 − 30	 + 10 − 30 − 30	 + 10 − 30 − 30
		B16	Compression set, 22 h at 150 °C — %, max.		 60	 30	 30
		EO16	Oil resistance, oil No. 1, 70 h at 150 °C — hardness change, IRHD — tensile change, %, max. — elongation change, %, max. — volume change, %		 − 5 to + 10 − 20 − 40 − 5 to + 5	 − 5 to + 10 − 20 − 30 − 5 to + 5	 − 5 to + 10 − 20 − 30 − 5 to + 5
		EO36	Oil resistance, oil No. 3, 70 h at 150 °C — hardness change, IRHD, max. — tensile change, %, max. — elongation change, %, max. — volume change, %, max.		 − 15 − 40 − 40 + 25	 − 15 − 30 − 30 + 25	 − 15 − 40 − 40 + 25