

1994. 4. 3

# Rubber Material

**KES**

KES B-L005A

(EST.) 1981-01-30

(RES.) 1987-05-18

## Contents

1. Scope of Application
2. Type
3. Quality
4. Indication Method
5. Testing method
6. Inspection
7. Procedure of Establishment and Alteration of Rubber Material

**1. Scope of Application**

This standard specifies rubber materials<sup>(1)</sup> used in general for automobiles. However, hardened rubber (ebonite), bubble rubber, and tire tubes are excluded.

Note <sup>(1)</sup> Rubber parts, including those reinforced with cloth or cord, are specified.

**2. Type**

The types of rubber materials shall conform to the combination of basic performance in Table 4 and 5, and if required, the combination of additional performance in Table 6.

**3. Quality**

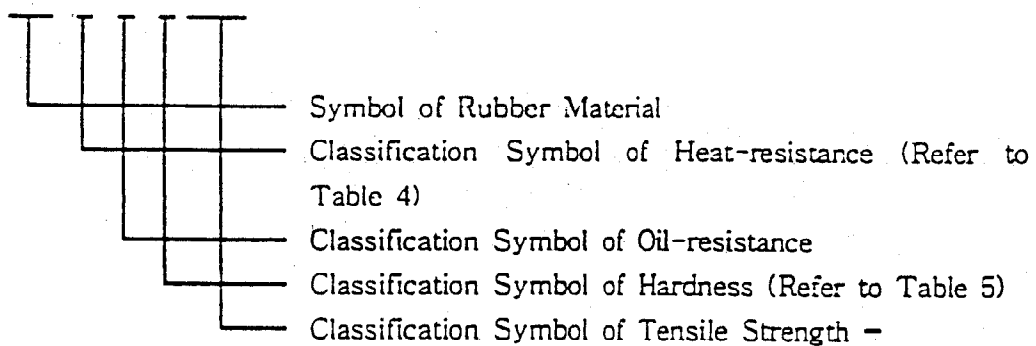
The quality of rubber materials shall be tested according to 5. Testing Method and conform to the specification of Table 4-5. When an additional performance is indicated, it shall conform to the specification of Table 6 or the specification in specification column. However, for those specified in both basic and additional performances, follow the specification of additional performances.

**4. Indication Method**

4.1 Indication method of basic performance

4.1.1 Structure of basic performance symbol

Example: R---B C--6 0 7



4.1.2 Classification symbol and its content.

(1) Heat-resistance classification symbol: Heat-resistance classification symbol shall be classified by the contents of Table 1 according to the test temperature.

Table 1.

Heat-Resistance Class. Symbol	Test Temperature (°C)
A	70 ± 1
B	100 ± 1
C	120 ± 1
D	130 ± 1
E	150 ± 1
F	175 ± 2
G	200 ± 2

## (2) Oil (fluid) - resistance classification symbol

The oil (fluid)-resistance classification symbol shall be classified by the contents of Table 2 according to the type of test oil (fluid).

Table 2.

Oil(Fluid)-Resistance Class Symbol	Test Oil(Fluid)
A	-
B	No. 1 Oil <sup>(1)</sup>
C	No. 2 Oil <sup>(1)</sup>
D	No. 3 Oil <sup>(1)</sup>
E	Brake fluid <sup>(2)</sup>
F	Coolant <sup>(3)</sup>
G	Fuel oil <sup>(4)</sup>
H	Light oil (Special No.3) <sup>(5)</sup>

Note <sup>(1)</sup> According to Attached Table 1.

Note <sup>(2)</sup> According to Attached Table 2.

Note <sup>(3)</sup> According to Attached Table 3.

Note <sup>(4)</sup> According to Attached Table 4.

Note <sup>(5)</sup> According to Attached Table 5.

Remark: The combination of the heat resistance classification symbol and the oil (fluid)-resistance classification symbol shall conform to Table 4 in principle. However, the combinations requiring oil-resistance other than this shall conform to those with 100°C or more of heat resistance testing temperature (heat-resistance classification symbol B - G).

(3) Hardness classification symbol

The hardness classification symbol indicates spring hardness and shall be indicated with the place of ten of the spring hardness in Table 5.

(4) Tensile strength classification symbol

The tensile strength classification symbol shall be indicated with the place of ten of the tensile strength in Table 5.

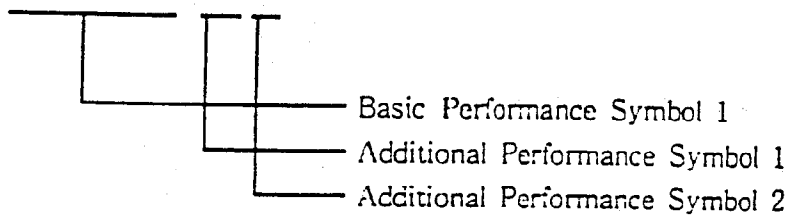
4.2 Indication method of additional performance

4.2.1 Component of symbol when designating additional performance

In case of designating additional performance other than basic performance, conform to the following:

Example:

R - BC 607 - F4K2



Remarks 1. Indicate additional performances one after another by inserting "-" at the end of the basic performance symbol.

2. Additional performance symbol shall consist of the additional symbol and number.

4.2.2 Additional performance

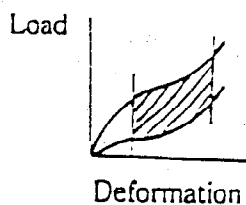
The additional performance symbol and its contents shall conform to Table 6. However, for special products, it shall conform to the following special performance symbol:

(1) Symbol of special performance(z)

In case of designating special performance not specified in Table 6, indicate its contents in the specification column using (z) as the additional symbol.

Example: R-BA 610-K1z

(Specification column) 1. Relationship between load and deflection on product shall be within the range of the following figure:



2. It shall not generate a bad smell when used in an atmosphere of 100°C.

(2) Symbol of special performance (O)

In case of changing the value specified in Table 6, use the related symbol in Table 6 as the additional symbol and use [O] as the number to indicate its contents in the specification column.

Example: R-BA607-FO/ISO K2

(Specification column) FO : Brittle temperature shall be  $-50^{\circ}\text{C}$  or less.

ISO: Hardness shall be  $65 \pm 5$ .

(3) Symbol of special performance (Y)

In case of applying basic and additional performance of separate material specification (including standard part specification) other than those listed here, indicate the product material specification number and class number indicated in table 3 and the additional performance symbol [Y] as follows. Class number shall be 1 for one class.

Example: R-BG 607--Y 01 1

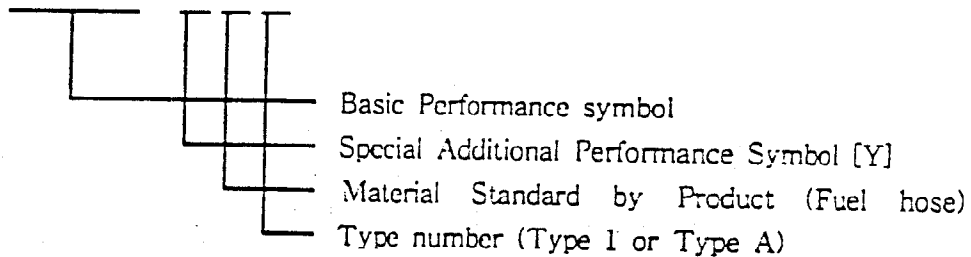


Table 3

2nd Place	0	1	2	3
1st Place				
0		Fuel hose	Water hose	Brake hose
1		Fuel oil-resistance rubber		
2		Weather strip (E.G.I hose for window)	Weather strip (for ventilator)	
3				
4				
5				
6				

## 5. Testing Method

### 5.1 Heat-resistance

Calculate the tensile strength change rate, elongation rate, and hardness rate according to 6 Aging Test of KES B-L006 (Testing Method of Rubber Materials).

However, the test time shall be continuous 70 hours and the test temperature shall conform to Table 1.

### 5.2 Oil (fluid)-resistance

Calculate the tensile strength change rate, elongation rate, hardness change, and volume change rate according to in 12 of KES B-L006, the oil(fuel)-resistance test method. However, test time shall be continuous for 70 hours, and the test temperature and test oil (fluid) shall conform to Table 4.

### 5.3 Hardness

Shall conform to 5: Hardness test of KES B-L006

### 5.4 Tensile strength

Shall conform to 3: Tensile test of KES B-L006

### 5.5 Elongation rate

Shall conform to 3: Tensile test of KES B-L006

### 5.6 Permanent set by compression

Should conform to 10: Permanent set by compression of KES B-L006.

### 5.7 Chemical resistance

Shall conform to 12: Oil (fluid) resistance test of KES B-L006. However, test condition shall be the one designated in the specification column and test time shall be 70 hours.

### 5.8 Volume change rate

Shall conform 12: Oil (fluid) resistance test of KES B-L006

### 5.9 Wear resistance rate

Shall conform to 23.4: William wear test of KES B-L006 for the additional performance symbols of E1 and E2. Shall conform to Par. 23.4: Acron wear test of KES B-L006 for the additional performance symbols of E3 and E4.

### 5.10 Brittle temperature, T50 temperature

Shall conform to 14.2: Impact brittle test of KES B-L006 for the additional performance symbols of E1 and E2. Shall conform to Par. 14.3: Low temperature twist

test of KES B-L006 for the additional performance symbols of E3 and E4.

5.11 Dynamic elasticity rate

Shall conform to 21: Dynamic properties test of KES B-L006

5.12 Static elasticity rate

Shall conform to 17: Elasticity test of KES B-L006

5.13 Heat resistance test

Shall conform to 9: Heat resistance test of KES B-L006.

5.14 Ozone resistance

Shall conform to 16: Ozone resistance test of KES B-L006. However, test time shall be 72 hours.

5.15 External appearance

Inspect visually

5.16 Combustion speed

Shall conform to 26: Combustion properties test of KES B-L006

5.17 Self-extinguishability

Shall conform to 22: Self-extinguishability of KES B-L006

5.18 Adhesion strength

Shall conform to 8: Adhesion test of metal and sulfur-added rubber of KES B-L006.

5.19 Peel-off strength

Shall conform to 7: Peel-off test of KES B-L006.

5.20 Repulsion elasticity

Shall conform to 11.2: Repulsion elasticity test of KES B-L006

5.21 Crack formation by fatigue

Shall conform to 15.2: Bending crack formation test of KES B-L for the additional performance symbols of T1 and T2. Shall conform to 15.3: Elongation crack formation of KES B-L for the additional performance symbols of T3 and T4. Shall conform to 15.4: Shear crack formation test of KES B-L for the additional performance symbols of T5 and T6.

5.22 Loss coefficient

Shall conform to 21: Dynamic properties test of KES B-L006.

5.23 Creep

Shall conform to 19: Creep test of KES B-L006.

5.24 Stress Relief

Shall conform to 20: Stress relaxation test of KES B-L006.

6. Inspection

Evaluate the quality of rubber material by performing the test according to 5: Inspection method. However, the sampling method of specimen shall be determined by a separate agreement.

7. Procedure of Establishment and Alteration of Rubber Material

Approval of our company shall be acquired in advance by submitting the sample, data of the separately designated number of units, report of the test results, raw materials, ingredients, and manufacturing process in the case of initial delivery, and by submitting samples, report of test results, reason and details of alteration in the case of alteration the sample, and the ingredients and manufacturing process of the rubber material in this specification.



Table 4. Classification symbol of heat-resistance and oil (fluid)-resistance properties and its contents (Basic performance-1)

Division of Group	Test Symbol	Heat-Resistance Properties				Oil (Fluid)-Resistance Properties					
		Test temperature (°C)	Hardness Change	Tensile Character Change Rate(x)	Elongation Change Rate(x)	Test Oil (Fluid)	Test temperature (°C)	Strength Change	Tensile Atrength Change Rate(x)	Elongation Change Rate(x)	Volume Change Rate(x)
Group 1	AA	70	-5 - 10	-20 - 20	within -30	-	-	-	-	-	-
	BA	100	-5 - 15	-25 - 30	within -40	-	-	-	-	-	-
	BB	"	"	"	"	No.1 Oil	100	-5 - 15	-20 - 30	within -50	-15 - 10
	BC	"	"	"	"	No.2 Oil	"	-10 - 15	-20 - 40	within -4	-15 - 15
	BE	"	"	"	"	Brake fluid	"	-10 - 10	-30 - 30	"	-15 - 10
	BF	"	"	"	"	Coolant	"	-5 - 10	-20 - 30	"	-10 - 10
	BG	"	"	"	"	Fuel Oil C	30	-40 - 0	-50 - 30	within -50	0 - 35
	BH	"	"	"	"	Light Oil (special No.3)	"	-25 - 10	"	"	0 - 30
	CA	120	-5 - 15	-30 - 30	within -50	-	-	-	-	-	-
	CB	"	"	"	"	No.1 Oil	120	-5 - 20	-20 - 30	within -50	-20 - 10
	CC	"	"	"	"	No.2 Oil	"	-10 - 20	-30 - 30	"	-15 - 15
	CE	"	"	"	"	Brake fluid	"	-10 - 10	"	within -40	-15 - 5
	CF	"	"	"	"	Coolant	100	-5 - 10	-20 - 30	"	-10 - 15
	CG	"	"	"	"	Fuel Oil C	30	-40 - 0	-50 - 30	within -50	0 - 35
CH	"	"	"	"	Diesel Oil	"	-25 - 10	"	"	0 - 35	
Group 2	DA	130	-5 - 20	-30 - 30	"	-	-	-	-	-	-
	DD	"	"	"	"	No.3 Oil	130	-20 - 15	-50 - 30	within -50	-50 - 30
	EA	150	"	"	"	-	-	-	-	-	-
	EB	"	"	"	"	No.1 Oil	150	-5 - 20	-40 - 30	within -60	-20 - 10
	ED	"	"	"	"	No.3 Oil	"	-20 - 15	-50 - 30	within -50	-5 - 30
	EE	"	"	"	"	Brake fluid	"	-15 - 15	-40 - 30	"	-15 - 5
	FA	175	"	-40 - 36	"	-	-	-	-	-	-
	FD	"	"	"	"	No.3 Oil	150	-20 - 15	-50 - 30	within -50	-5 - 30
	GA	200	-5 - 20	-40 - 30	"	-	-	-	-	-	-
GD	"	"	"	"	No.3 Oil	150	-20 - 15	-50 - 30	within -50	-5 - 30	

Table 5. Classification symbol of hardness, tensile strength and its contents (Basic performance-1)

Quality Item	Application		Group 1		Group 2			
	Spring Hardness HS	Tensile Strength (kgf/cm <sup>2</sup> ) or more)	Elongation (% or more)	Permanent Set by Compression (Test Temperature X 70hours) (% or more)	Spring Hardness HS	Tensile Strength (kgf/cm <sup>2</sup> ) or more)	Elongation (% or more)	Permanent Set by Compression (Test Temperature X 70hours) (% or less)
304	30 ± 5	40	300	60	30 ± 5	40	200	70
307	-	70	400	-	-	70	300	-
310	-	100	400	-	3 -	-	-	-
404	40 ± 5	40	300	50	40 ± 5	40	200	70
407	-	70	400	-	-	70	300	-
410	-	100	400	-	-	100	400	-
414	-	140	500	-	-	-	-	-
504	50 ± 5	40	250	75	50 ± 5	40	200	80
507	-	70	300	-	-	70	250	-
510	-	100	400	-	-	100	300	-
514	-	140	400	-	-	-	-	-
604	60 ± 5	40	200	80	60 ± 5	40	200	80
607	-	70	250	-	-	70	250	-
610	-	100	300	-	-	100	300	-
614	-	140	350	-	-	-	-	-
704	70 ± 5	40	150	-	70 ± 5	40	150	80
707	-	70	200	-	-	70	200	-
710	-	100	250	-	-	100	300	-
714	-	140	300	-	-	-	-	-
804	80 ± 5	40	100	70	80 ± 5	40	70	80
807	-	70	100	-	-	70	100	-
810	-	100	150	-	-	-	-	-
904	90 ± 5	40	70	-	90 ± 5	40	70	80
907	-	70	100	-	-	70	70	-
910	-	100	100	-	-	-	-	-

Remark: Groups in application column indicate the group classification of Table 4.

Additional Symbol	Additional Number Additional Performance	1	2	3	4	5	6
A	• Heat-resisting properties						
B	• Chemical-resisting properties	±15x max of hardness change. ±30x max of tensile strength change rate. -50x max of expansion change rate and ±10x max of volume change rate, especially without getting coarse on the surface.					
C	Permanent set by compression (x or less)	20	30	40			
D	Volume change rate(x)	-5 - 10	0 - 5	0 - 10	0 - 20		
		Wear test		Acryl wear test			
E	Friction-resistance rate	100	50	100	50		
F	Brittle temperature(°C or less)	Impact brittle test			Low temperature twist test		
	T 50 temperature	-30	-35	-40	-10	-20	-30
GD	Dynamic elasticity (kgf/cm <sup>2</sup> )	6±1	9±1.5	10±1.5	12±2	14±2	16±2.5
GS	Static elasticity (kgf/cm <sup>2</sup> )	6±1	8±1.5	10±1.5	12±2	14±2	16±2.5
HS	Range of hardness	±3					
J	Heat-resisting strength (kg/cm <sup>2</sup> or more)	30	50				
K	Ozone crack formation test (hours or more)	Method A	Method B				
		72	72				
L	External appearance						
M	Combustion speed (cm/min)	It shall remain within B max ≤ 9.0, B+3S ≤ 10.0. If flame goes out within 60 seconds and 5.0cm after passing bench mark A, it shall also be considered as satisfying the standard.					

Additional Symbol	Additional Number Additional Performance	7	8	9	10
A	• Heat-resisting properties				
B	• Chemical-resisting properties				
C	Permanent set by compression (x or less)				
D	Volume change rate(x)				
E	Friction-resistance rate				
F	Brittle temperature(°C or less) (°C or less) I 50 temperature	-40			
GD	Dynamic elasticity (kgf/cm <sup>2</sup> )	18 ± 2.5	20 ± 3	22 ± 3	
GS	Static elasticity (kgf/cm <sup>2</sup> )	18 ± 2.5	20 ± 3	22 ± 3	
HS	Range of hardness				
J	Heat-resisting strength (kg/cm or more)				
K	Ozone crack formation test (hours or more)				
L	External appearance				
M	Combustion speed (cm/min)				

Additional Symbol	Additional Number	1	2	3	4	5	6
N	Contamination properties (kg/cm <sup>2</sup> or more)	1	2	3			
P	Adhesion strength (kg/cm <sup>2</sup> or more) Peel-off strength (kg/cm or more)	Adhesion test			Peel-off test		
		50					
Q							
R	Repulsion elasticity (x)	20 or less	Over 20 40 or less	Over 40 60 or less	Over 60 80 or less	Over 80	
S							
T	Crack formation due to fatigue	Test condition (round)	Bending crack formation test 1 x 10 <sup>5</sup> 4 x 10 <sup>5</sup>		Expansion crack formation test 1 x 10 <sup>5</sup> 5 x 10 <sup>5</sup>		Shear crack formation test 1 x 10 <sup>5</sup> 5 x 10 <sup>5</sup>
		Evaluation standard	No cracks				
U	Coefficient of loss	0.05 or less	over 0.05 0.1 or less	over 0.1 0.2 or less	over 0.2 0.3 or less	over 0.3 0.4 or less	over 0.4
V	* Creep						
W	* Relaxation of stress						
X	* Reinforce with cloth or cord						
Y	Specified performance of material standard for each product						
Z	Other special performance						

Note <sup>(1)</sup> \*Additional number for the additional performance of phosphorus shall be 0, and its contents shall be entered in specification column  
<sup>(2)</sup> Additional number of the specified performance of material standard for each product shall conform to the specification in 4.4.2(3)

Additional Symbol	Additional Number	7	8	9	10
N	Contamination properties				
P	Adhesion strength (kg/cm <sup>2</sup> over)				
	Peel-off strength (kg/cm <sup>2</sup> over)				
Q					
R	Repulsion elasticity (%)				
S					
T	Crack formation due to fatigue	Test condition (round)			
		Evaluation Standard			
U	Coefficient of loss				
V	• Creep				
W	• Relaxation of stress				
X	• Reinforce with cloth or cord				
Y	Specified performance of material standard for each product				
Z	Other special performance				

Attached Table 1. Test Oil

Test Item	Type of Oil	No.1 Oil	No.2 Oil	No.3 Oil
Kinematic viscosity		(98.9℃) 18.71 - 21.05	(98.9℃) 19.19 - 21.52	(37.8℃) 31.96 - 34.18
Aniline point (℃)		124 ± 1	93 ± 3	69.5 ± 1
Ignition point (℃)		244 min	246 ± 6	166 ± 3

Attached Table 2. Brake Fluid for Testing

Component	Composition
Pure brake fluid	100%

Attached Table 2. Coolant for Testing

Volume: %

Component	Composition
Pure anti-freezing fluid*	25.0
Pure rust preventive fluid*	10.0
Anti-leaking fluid	1.5
De-ionized water	63.5

Note \* For aluminium engine

Attached Table 4. Fuel Oil for Testing

Volume: %

Type	Type of Fuel Oil	A	B	C	D
Iso octane *		100	70	50	60
Toluene *			30	50	40

Note \* Each shall satisfy the standard in 12.3.1 of KS M 6518.

Attached Table 5. Light Oil for Testing

Item	Reaction	Ignition Point (°C)	Flowing Point (°C)	10x Remaining Carbon	Ash (x) Content	90x Distilled Outflow Temperature	Kinematic Viscosity (37.8°C)	Sulfur (x)	Copper Corrosion (100°C/3h)	Cetane Value	Cetane Index <sup>(1)</sup>	(°C)
No. 1 SW	Neutral	40 or more	-10(-30) or less	0.15 or less	0.01 or less	290 or less	1.4 - 2.5	0.5 or less	1 or less	50 or more	50 or more	-18 or less
No. 2		50 or more	-5 or less	0.25 or less	0.01 or less	340 or less	2.0 - 5.8	1.0 or less	1 or less	45 or more	45 or more	-

Note <sup>(1)</sup> Cetane value can be substituted by cetane index by the agreement of the related parties.

<sup>(2)</sup> Testing method and other details shall conform to KS M 2610.