

KES

Fuel Hose

KES E-H001

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1. Scope of Application

This standard specifies fuel hose (hereinafter referred to as the "hose") used for low pressure fuel systems of automobiles (main, return, evaporation, breather, drain, etc.).

Remark : The high pressure fuel hose shall conform to KES E-H014.

2. Construction

The construction of the hose shall conform to Table 1.

Table 1

Construction	Content
Single layer	Rubber layer
2 layers	Inner rubber layer and outer rubber layer
3 layers	Inner rubber layer, reinforcing layer and outer rubber layer

3. Type, Material and Application Standard

The type, material and application standard of the hose shall conform to Table 2 according to heat resistant temperature and fuel-shield treated articles.

Table 2

Type	Construction	Type Number		Material *1	Heat Resistant Temp. (℃)	Fuel-Shield Treated Articles	Application Standard				
		Length (mm)					Main return	Breather drain evaporation (Tank system)	Evaporation (Engine system)		• Vacuum & Boost • Air-conditioner • EGR • Inlet/Outlet shutter V • Supercharging pressure CONT
		Less than 1000	1000 to less than 2000						SHED applied	SHED not applied	
Type 1	Single layer	99340	99341	R-BG 607-Y011	100	Not applied	○ DE car only	○ DE car only	-	-	-
		99351	9935A	R-CG 610-Y121	120	Not applied	-	○ 06 size or less	○ 05 size or less	○	○ *3
Type 2	2 Layers	99357 *2	99353 *3	R-BG 710-Y117	100	Applied	-	○ 08 size or less	○ 06 size or less	-	-
Type 3	3 Layers	99358	99354	R-BG 710-Y118	100	Applied	○ Low pressure	-	-	-	-
		99359 Maintenance free	99360	R-CG 710-Y119	120	Applied	○ Low pressure	-	-	-	-

*1. The material symbol shall conform to KES B-1.005

*2. The hoses whose nominal numbers are 03, 04 and 05 of 99357 and 99353 shall not be used. (See Table 3.)

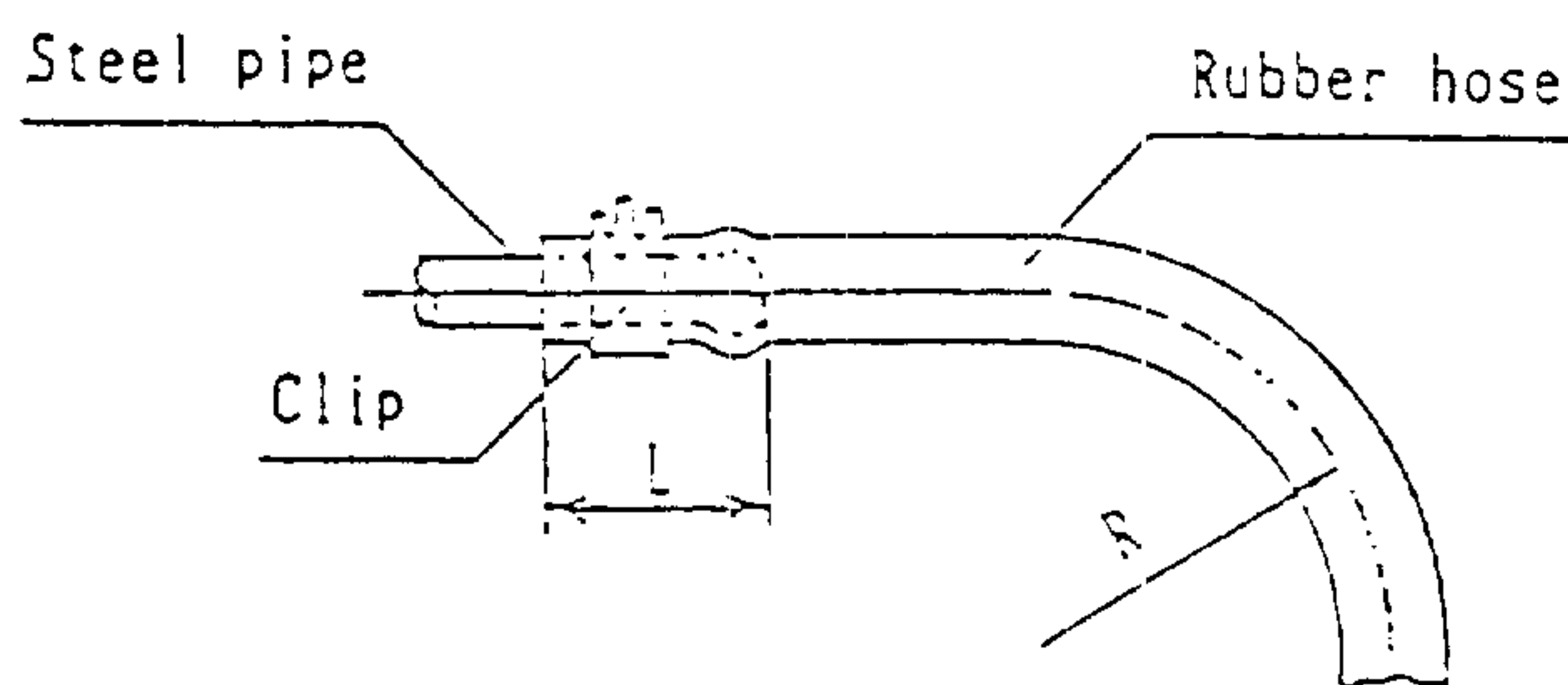
*3. Only hose for vacuum control

Remark 1. Types and materials of the hose which shall not be used from new establishment shall conform to the following table.

Type	Construction	Type Number		Material
		Length (mm)		
		Less than 1000	1000 to less than 2000	
Type 2	2 layers	99346	99347	R-BG710-Y112
Type 3	3 layers	99348	99349	R-BG710-Y113

2. The bending standard for the straight hose shall conform to the following.

Fig.



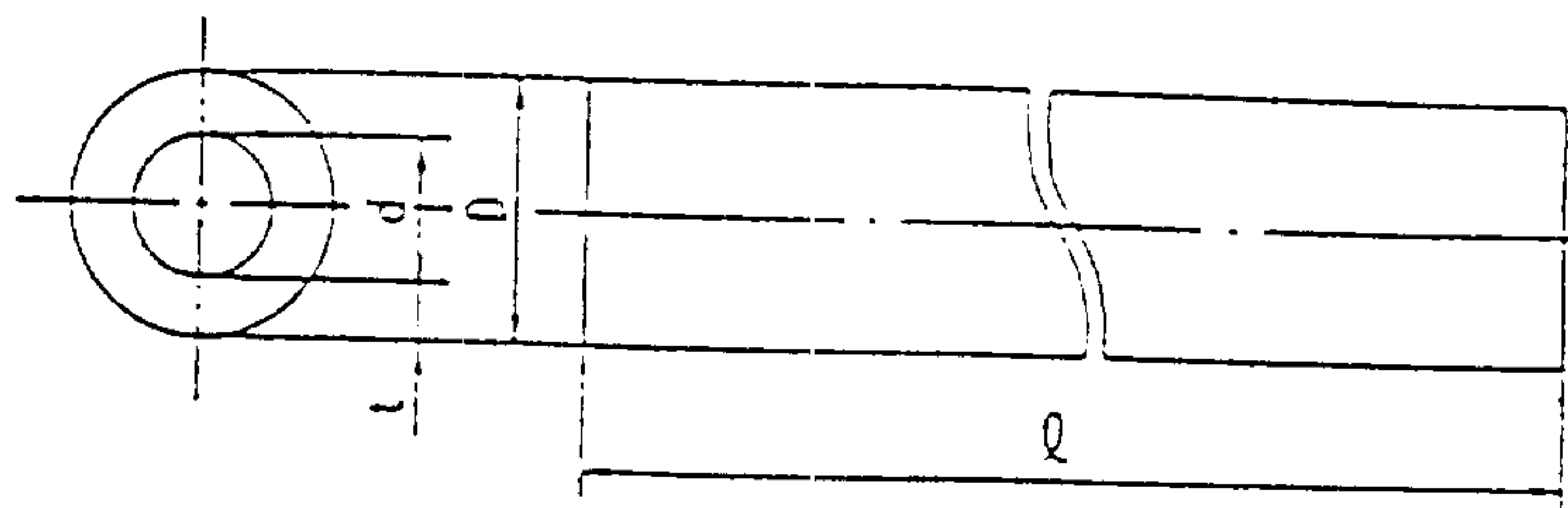
$$L \geq 25$$

$$R > 4D \text{ (D : Hose diameter)}$$

4. Shape and Size

The shape and size of the hose shall conform to Table 3.

Table 3 Shape and size of hose



Unit: mm

Application Range			Nominal Number	Nominal Size	C (Inside Diameter)		Tolerance	D (Outside Diameter)	Thickness of Outside Rubber	Length Number 1 → 030 to 990 1 → 000 to 990	
Type 1	Type 2	Type 3			Standard size	Tolerance					
*1 ○	-	-	-	60	59	5.9	±0.3	3.7	-	Division of Length Tolerance	
*1 ○	-	-	-	06	6	6.5		3.5			
-	○	×	-	03	3	2.7		2.9			
*1 ○	○	×	-	04	4	3.7		2.3			
-	○	×	○	05	5	4		3			
*1 ○	-	-	-	05	5	5.5	±0.4	3	0.2 to 1	100 to less than 200	±3
-	○	○	○	06	6	5.8		10		200 to less than 300	±4
-	○	○	○	08	8	6.9		11.5		300 to less than 500	±5
-	○	○	○	10	10	9.3		12.2		500 or more	±1%
-	○	○	○	12	12	11.3		13.5			
-	○	○	○	14	14	13.3		16.3			
-	○	○	○					18.3			
								20.3			

99358, 99354 *2, 99355, 99356 *2 (MF)

99357, 99353 *2 Size 03, 04 and 05 marked with × Shall not be used.

99351, 9935A *2

99340, 99341 *2

*1. Type 1 99340 and 99341 shall be applied to only DE car.

*2. As for the hoses of 99354, 99356, 99353, 9935A and 99341, add 1000 mm to the length indicated by the length number.

Remark 1. The application standard shall conform to Table 2.

2. The combination table of the hose clip shall conform to E-F013.

3. The hoses marked with ○ in application range can be applied.

4. In case of no color indication, the 10th digit shall be 0.

5. The hose length shall increase in 10mm steps in principle.

However, length of the hose whose nominal number is 04 to 99351 shall conform to the following table.

Length Number	Length (mm)	Length Number	Length (mm)	Length Number	Length (mm)	Length Number	Length (mm)
03	(30) *3	12	120	30	300	60	600
04	40	14	140	32	320	65	650
05	(50) *3	16	160	35	350	70	700
06	60	18	180	38	380	75	750
07	(70) *3	20	200	41	410	80	800
08	80	22	220	44	440	85	850
09	(90) *3	24	240	47	470	90	900
10	100	26	260	50	500	95	950
-	-	28	280	55	550	The hose length over 1 m shall increase in 50mm steps.	

*3. The hoses whose length are parenthesized shall not used newly for parts communization.

5. Appearance

Appearance of the hose shall meet the following requirements on visual inspection.

- (1) The hose shall have uniform inner diameter and wall thickness and smooth inner surface.
- (2) The hose shall be flexible and free from flaws, bubbles and other defects harmful to use.

6. Quality

The qualities of rubber material and the hose shall be as follows.

Remark : Definition of quality rank shall conform to KES Q-A002

Possibility of Use	Construction	Type Number	Qualities of Rubber Material and Hose
Will be used in future	1 layer	99340- 99341- DE car only	Conform to Table 8.
		99351 9935A	Conform to Table 4 and Table 5. For permeation amount, conform to Table 6. For extraction amount, conform to Table 7. The plasticizer of phthalic acid ester shall not be applied to the rubber which will contact the fuel directly.
	2 layers	99357 99353	
	3 layers	99358 * 99354 * 99355 99356	
Not used in future	2 layers	(99346) (99347)	Conform to Table 9.
	3 layers	(99348) (99349)	

- * The allowable contamination of the formed hose of type number 99358 (or 99354) shall conform to KES C-G011 (Contamination Standard of Formed Fuel Hoses).
- 6.1 Quality of rubber material : Quality of rubber material shall conform to Table 4.

Table 4 Quality of rubber material

Items	Construction	Single Layer	2 Layers		3 Layers				Quality Requirement	Test Method
	Type Number	99351	99387		99358		99385			
	Material	R-CG710 Y121	R-BG710 Y117		R-BG710 Y118		R-CG710 Y115			
	Rubber Layer	-	Inner Rubber	Outer Rubber	Inner Rubber	Outer Rubber	Inner Rubber	Outer Rubber		
Tensile strength kgf/cm ² {N/cm ² }		100 {980} or more	100 {980} or more	70 {686} or more	100 {980} or more	70 {686} or more	100 {980} or more	70 {686} or more	A	7.1.2
Elongation %		250 or more	250 or more	250 or more	250 or more	250 or more	250 or more	250 or more		
Hardness (JIS Spring type) Hs		65 ± 5	70 ± 5	60 ± 5	70 ± 5	60 ± 5	70 ± 5	60 ± 5		
Tear strength kgf/cm ²		30 or more	30 or more	20 or more	30 or more	30 or more	30 or more	30 or more	A	7.1.4
Heat resistance	Test condition	120 ℃ 70 h	100 ℃ 70 h	120 ℃ 70 h	100 ℃ 70 h	120 ℃ 70 h	120 ℃ 70 h	130 ℃ 70 h	A	7.1.5
	Tensile strength change %	± 30	± 30	± 30	-25 to 30	-30 to 30	-25 to 30	-30 to 30		
	Elongation change %	Within -50	Within -40	Within -50	Within -40	Within -50	Within -40	Within -50		
	Hardness change Hs	0 to 15	0 to 15	0 to 15	-5 to 15	0 to 15	-5 to 15	0 to 15		
Special heat resistance	Test condition	120℃ 200h	-	-	-	-	-	-	A	7.1.5
	Elongation %	100 or more	-	-	-	-	-	-		
	Hardness change Hs	Within 85	-	-	-	-	-	-		
Compression permanent set	Test condition	120 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	120 ℃ 70 h	130 ℃ 70 h	A	7.1.6
	Compression permanent set rate %	Within 80	Within 60	Within 80	Within 30	Within 70	Within 30	Within 45		
Fuel oil resistance	Tensile strength change %	-60 to 30	-50 to 30	-	-50 to 30	-	-50 to 30	-	A	7.1.7
	Elongation change %	Within -50	Within -50	-	Within -50	-	Within -50	-		
	Hardness change Hs	-40 to 0	-40 to 0	-	-40 to 0	-	-40 to 0	-		
	Volume change %	0 to 40	0 to 35	-	0 to 35	-	0 to 35	-		
Sour gasoline resistance	Tensile strength change %	-	-	-	-75 to 30	-	-75 to 30	-	A	7.1.8
	Elongation change %	-	-	-	Within -70	-	Within -70	-		
	Hardness change Hs (180° bending)	-	-	-	-15 to 15 (Nothing unusual)	-	-15 to 15 (Nothing unusual)	-		
	Volume change %	-	-	-	0 to 35	-	0 to 35	-		

Table 4: Quality of rubber material

Items		Construction	Single Layer	2 Layers		3 Layers				Quality Rank	Test Method
		Type Number	99351	99357		99358		99359			
		Material	R-CG610-Y121	R-BG710-Y117		R-BG710-Y118		R-CG710-Y115			
		Rubber Layer	-	Inner Rubber	Outer Rubber	Inner Rubber	Outer Rubber	Inner Rubber	Outer Rubber		
Oil resistance	Test condition	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	100 ℃ 70 h	120 ℃ 70 h	A	7.1.9
	Tensile strength change %	-	-	-	Within -40	Within -50	Within -40	Within -50			
	Elongation change %	-	-	-	Within -40	Within -40	Within -40	Within -40			
	Hardness change Hs	-	-	-	-	-	-10 to 20	-20 to 15			
	Volume change %	-5 to 25	-5 to 25	0 to 100	-5 to 25	0 to 100	-5 to 25	0 to 20			
Mixed gasoline with alcohol resistance	Tensile strength change %	-	-	-	-50 to 0	-	-50 to 0	-	A	7.1.10	
	Elongation change %	-	-	-	Within -50	-	Within -50	-			
	Hardness change Hs	-	-	-	-40 to 0	-	-40 to 0	-			
	Volume change %				0 to 70	-	0 to 70	-			
Cold resistance (Brittleness temperature) ℃					-25 or less	-30 or less	-25 or less	-35 or less	A	7.1.11	

6.2. Quality of hose : Quality of hose shall conform to Table 5.

Table 5 : Quality of hose

Items	Construction		Single Layer	2 Layers	3 Layers		Quality Rank	Test Method
	Type Number		99351	99357	99358*	99355		
	Material		R-CG610-Y121	R-BG710-Y117	R-BG710-Y118	R-CG710-Y115		
Size			-	-	-	-	B	7.2.1
Pressure resistance	Test pressure kgf/cm ² (N/cm ²)		0.5 {4.9}	1.0 {9.8}	2.0 {19.6}	3.0 {29.4}	A	7.2.2
	Appearance		No water leak nor partial swelling					
	Length change %		-	-	-10 to 10	-10 to 10		
	Outside diameter change %		-	-	0 to 10	0 to 10		
Bursting pressure kgf/cm ² (N/cm ²)			1 {9.8} or more	3 {29.4} or more	10 {98} or more	10 {98} or more	A	7.2.3
Sealing pressure kgf/cm ² (N/cm ²)			-	-	5 {49} or more	5 {49} or more	A	7.2.4
Vacuum resistance	Test condition		-250 mmHg 30 sec	-250 mmHg 30 sec	-250 mmHg 30 sec	-660 mmHg 30 sec	A	7.2.5
	Outside diameter change %		Within -20	Within -20	Within -20	Within -20		
Drawing force kgf (N)			5 {49} or more	5 {49} or more	10 {98} or more	10 {98} or more	A	7.2.6
Flexibility			Nothing unusual	Nothing unusual	Nothing unusual	Nothing unusual	A	7.2.7
Elongation %			-	-	8 or more	20 or more	A	7.2.8
Inserting force kgf (N)			-	-	15 {147} or less	15 {147} or less	B	7.2.9
Bending properties mm			Within allowable amount of Table 10	Within allowable amount of Table 10	Within allowable amount of Table 10	Within allowable amount of Table 10	B	7.2.10
Adhesiveness kgf/cm ² (N/cm ²)			-	-	1.1 {10.78} or more	1.1 {10.78} or more	A	7.2.11
Break of thread			-	-	Nothing unusual	Nothing unusual	A	7.2.12
Heat resistance	Test condition		120℃ 200h	100℃ 200h	100℃ 200h	130℃ 200h	A	7.2.13
	Appearance		Nothing unusual	Nothing unusual	Nothing unusual	Nothing unusual		
Cold resistance			Nothing unusual	Nothing unusual	Nothing unusual	Nothing unusual	A	7.2.14
Ozone resistance	Test condition		100 pphm 72 h	100 pphm 72 h	100 pphm 72 h	100 pphm 72 h	A	7.2.15
	Static		Nothing unusual	Nothing unusual	Nothing unusual	Nothing unusual		
	Dynamic		-	-	-	Nothing unusual		
Flammability			-	-	Self - extinguishability	Self - extinguishability	A	7.2.16

Table 5: Quality of hose

Items	Construction	Single Layer	2 Layers	3 Layers		Quality Rank	Test Method
	Type Number	99351	99357	99358*	99355		
	Material	R-CG610-Y121	R-BG710-Y117	R-BG710-Y118	R-CG710-Y115		
Sour gasoline resistance (Oxygen pressure method)		-	-	Nothing unusual	Nothing unusual	A	7.2.17
Cover tearing resistance		Nothing unusual	Nothing unusual	Nothing unusual	Nothing unusual	A	7.2.18
Permeation amount g/h		-	Table 6	Table 6	Table 6	A	7.2.19
Extraction amount g/m ²		Table 7	Table 7	Table 7	Table 7	A	7.2.20
Solvent crack resistance % (Critical extension rate)		25 or more	25 or more	25 or more	25 or more	A	7.2.21
Metal corrosion resistance	Test condition	-	-	6 cycles	2 cycles	A	7.2.22
	Film strength kgf/cm ²	-	-	0.1 {9.8} or less	0.1 {9.8} or less		
	Sedimer amount	-	-	50 or less	50 or less		

* The allowable contamination of the formed hose of type number 99358 (or 99354) shall conform to KES C-G011 (Contamination Standard of Formed Fuel Hoses).

Table 5 (Continued)

Items		Construction	3 Layers				Quality Rank	Test Method
		Type Number	99353		99355			
		Material	R-BG710 Y118		R-CG710 Y115			
Performance after combined deterioration	Test condition		1 cycles	2 cycles	2 cycles	4 cycles	A	7.2.23
	Pressure resistance % (Outside diameter change)		-	0 to 10	-	0 to 10		
	Bursting pressure kgf/cm ²		-	10 or more {98}	-	10 or more {98}		
	Sealing pressure kgf/cm		-	5 or more {49}	-	5 or more {49}		
	Drawing force kgf		-	10 or more {98}	-	10 or more {98}		
	Flexibility		-	Nothing unusual	-	Nothing unusual		
	Elongation %		-	5 or more	-	8 or more		
	Adhesiveness kgf/cm		-	1.1 or more {10.78}	-	1.1 or more {10.78}		
	Break of thread		-	Nothing unusual	-	Nothing unusual		
	Cold resistance °C		-30 or less	-	-30 or less	-		
	Ozone re-sistance	Static	-	Nothing unusual	-	Nothing unusual		
		Dynamic	-	Nothing unusual	-	Nothing unusual		

Table 6 Permeation amount

Nominal Size	Standard Value (Permeation amount of fuel oil g/h)			Test Method	Filling Amount of Test Oil (ml)
	99357	99358	99355		
5 (4)	-	0.16 or less	0.16 or less	C method	60
6 (5.8)	0.13 or less	0.17 or less	0.17 or less		
8 (6.9)	0.15 or less	0.18 or less	0.18 or less		
14 (13.3)	0.13 or less	-	-	B method	

Table 7 Extraction amount

Nominal Size (Inside diameter)	Standard Value (g/m ²)				
	99340	99351	99357	99358	99355
03	-	-	-	-	-
04	14 or less	2 or less	-	-	-
05	28 or less	-	-	1 or less	1 or less
60	29 or less	-	-	-	-
06	33 or less	4 or less	3 or less	1 or less	2 or less
08	-	4 or less	3 or less	2 or less	2 or less
10	-	5 or less	3 or less	-	-
12	-	6 or less	-	2 or less	3 or less
14	-	-	5 or less	-	-