

KES

Test Method of Rubber
Boots of Hydraulic Brake
Wheel Cylinders for
Automobiles

KES T – L476

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1. Applying purpose

This standard shall specify rubber boots (This shall be called just as boots for the following), which is assembled at the end of the drum brake wheel cylinder using non-mineral oil line brake solution to prevent from invasion of an alien substances or water inside the cylinder.

2. Classes

Types of boots shall be classified as Table 1.

Table 1. Classes

Classes	Symbol	Classification
1-class	-	Usable for normal temperature operating condition
2-class	H	Usable for high temperature operating condition

3. Quality

3.1 External appearance

There shall be no blister on the surface of the boots, no pinholes, no cracks, and no mixing of alien substances.

3.2 Performance

The performance of boots shall follow table 2 when testing 5.

Table 2. Performance

Items		Classes		Test Method
		1-Class	2-Class	
Condition	Solidity (Reference)	50 ± 5 or 60 ± 5 Hs		Following 5.1 condition test
Ageing	Temperature and time ⁽¹⁾	100 ± 2 °C 22 ± 1h	120 ± 2 °C 22 ± 1h	Following 5.2 ageing test
	Changes of the solidity (Reference)	-5 ~ +10 Hs		
	Condition	No cracks should show from bending boots until used state of the test. Also, no extreme adhesion.		
Internal fluidity	Temperature and time ⁽¹⁾	100 ± 2 °C 70 ± 1h	120 ± 2 °C 70 ± 1h	Following 5.3 internal fluidity test
	Test solution ⁽¹⁾	Appropriate solution for JIS K 2233 (Brake solution for automobiles), or standard solution which JIS K 2233 has specified		
	Changes of the volume	-15 ~ +15 %		
	Changes of the solidity (Reference)	-10 ~ +10 Hs		
High tempera-ture operation	Temperature and time ⁽¹⁾	100 ± 5 °C 22 ± 1h	120 ± 5 °C 22 ± 1h	Following 5.4 high temperature operating test
	Condition	No bending cracks of boots should show after the test, and should contain tightening holder on the attaching part of the cylinder or piston.		
Low tempera-ture operation	Temperature and time ⁽¹⁾	-40 ± 2 °C 70 ± 1h		Following 5.5 low temperature operating test
	Condition	No bending cracks of boots should show after the test, and boots should not be excluded on the attaching part of the cylinder or piston.		
Bending ability at low tempera-ture	Temperature and time ⁽¹⁾	-40 ± 2 °C 22 ± 1h		Following 5.6 low temperature bending test
	Condition	No cracks should show on the boots, should be under 1 minute.		
Permanent elongation	Temperature and time ⁽¹⁾	100 ± 2 °C 70 ± 1h	120 ± 2 °C 70 ± 1h	Following 5.7 permanent elongation test
	Ratio of elongation	15 ₋₃ ⁰ %		
	Ratio of permanent elongation	Less than 75%		
Ozone resistance	Density of ozone ⁽¹⁾	50 ± 5 pphm		Following 5.8 ozone resistance test
	Temperature and time ⁽¹⁾	40 ± 2 °C 70 ± 1h		
	Ratio of elongation (Regular capacity) ⁽¹⁾	15 ₋₃ ⁰ %		
	Condition	No cracks should show, which is visible in a doubled magnifying glass		

4. Material

The properties of the boots material's test piece shall follow Table 3 when testing by 6.

Table 3 Properties of the material

Items		Classes		Test Method
		1-Class	2-Class	
Condition	Solidity	50 ± 5 or 60 ± 5 Hs		Following 6.1 condition test
	Tension intensity	More than 100 kgf / cm ² {9.8 MPa}		
	Ratio of elongation	More than 300%		
Ageing	Temperature and time ⁽¹⁾	100 ± 2 °C 70 ± 1h	120 ± 2 °C 70 ± 1h	Following 6.2 ageing test
	Changes of the solidity	0 ~ +10 Hs		
	Changes of tension intensity	Less than -40%		
	Changes of elongation	Less than -40%		
Permanent change by pressure	Temperature and time ⁽¹⁾	100 ± 2 °C 22 ± 1h	120 ± 2 °C 22 ± 1h	Following 6.3 permanent change by pressure test
	Permanent change by pressure	Less than 30%	Less than 40%	
Internal fluidity	Temperature and time ⁽¹⁾	100 ± 2 °C 70 ± 1h	120 ± 2 °C 70 ± 1h	Following 6.4 internal fluidity test
	Test solution ⁽¹⁾	Appropriate solution for JIS K 2233 (Brake solution for automobiles), or standard solution which JIS K 2233 has specified		
	Changes of solidity	-10 ~ +10 HS		
	Changes of tension intensity	Less than -40%		
	Changes of elongation	Less than -40%		
	Changes of volume	-15 ~ +15%		
Bending ability at a low temperature	Temperature and time ⁽¹⁾	-40 ± 2 °C 22 ± 1h		Following 6.5 low temperature bending test
	Condition	No cracks should show		
Ozone resistance	Density of ozone ⁽¹⁾	50 ± 5 pphm		Following 6.6 ozone resistance test
	Temperat-ure ⁽¹⁾	40 ± 2 °C		
	Test time ⁽¹⁾	48 ± 1h or 72 ± 1h by agreement between related persons		
	Percentage of elongation (Regular capacity) ⁽¹⁾	20 .3 ⁰ %		
	Condition	Visible in 10 times magnifying glass, but invisible to the naked eye.		

Note⁽¹⁾ This item indicates test condition.

5. Efficiency test method

5.1 Condition test

5.1.1 Condition test shall follow solidity test (A type), which is specified by KES B-L006 (Rubber material test method) 5.2. Also it is available to follow the method, which ISO 48 has specified, by the decision of related persons. The number of measurement shall be the average of five numbers generally. In case for using rubber holder, the degree of inclination of the rubber holder should be in the same range of boot's degree. Put boots in the rubber holder and maintain the test piece vertical, and measure the notch marks by attaching the pressured surface in order to make pressure pin to be vertical to the side surface of the boots.

5.2 Ageing test

5.2.1 Terms of the test

Ageing test shall follow table 4.

5.2.2 Test method

Test method shall follow below.

(1) Measuring solidity

Measuring solidity shall follow 5.1.1 of measuring solidity (H_1) before the test, and then do the test 7. of KES B-L006 (Ageing test), measure the solidity after the test (H_2), in a same way. But, the test conditions shall follow table 4.

(2) Condition

After (1), examine the surface of the boots and cracks after bending them until the used condition.

5.2.3 Calculation

Calculation shall follow below.