

## Hydraulic Brake Fluid Standards

**IS : 8654 (1977) Specification for Automotive Hydraulic Brake Fluid, Heavy Duty, First Revision**

**ISO 4925 - 1978 (E) Road Vehicles - Non - petroleum base brake fluid.**

**SAE J1703 - NOV 83 Motor vehicle Brake fluid**

**FMVSS 116 Federal Motor vehicle Safety standards - DOT 3, DOT 4, DOT 5**

	<b>IS : 8654 - 1977</b>	<b>ISO - 4925 - 1978 (E)</b>	<b>SAE - J1703 - NOV 83</b>	<b>DOT 3</b>	<b>MVSS-116 DOT 4</b>	<b>DOT 5</b>
1. Colour	Colourless to amber (may contain red dye if mutually agreed between supplier & purchaser)	Colour should not be red or green		colourless to amber	colourless to amber	colourless to amber
2. Equilibrium Reflux boiling point, °C min	205	205	205	205	230	260
3. Wet Equilibrium Reflux boiling point °C min	140	140	140	140	155	180
4. Kinematic viscosity i) at -40°C cst, min ii) at 100°C cst, min	1500 1.5	1500 1.5	1800 1.5	1500 1.5	1800 1.5	900 1.5
5. pH	7.0 - 11.5	7.0 - 11.5	7.0 - 11.5	7.0 - 11.5	7.0 - 11.5	
6. Brake fluid stability						
i) High temp. stability change in ERBP after heating at 185±2°C for 120±5 min °C	3.0 + 0.05 for each deg. above 225°C	3.0 + 0.05 for each deg. above 225°C	5.0	3.0 + 0.05 for each . deg above 225°C max	3.0 + 0.05 for each . deg above 225°C max	3.0 + 0.05 for each deg. above 225°C max
ii) Chemical stability change in ERBP with compatibility fluid, °C max degree above 22	3.0 + 0.05 for each 5°C	2.0	5.0	3.0 + 0.05 for each deg 225°C	3.0 + 0.05 for each deg 225°C	3.0 + 0.05 for each deg 225°C
7. Corrosion test, 100°C for 120h						
i) weight change mg/cm <sup>2</sup> , max	0.2					
Tinned Iron	0.2	0.2	0.2	0.2	0.2	0.2
Steel	0.1	0.1	0.1	0.1	0.1	0.1
Aluminium	0.2	0.2	0.2	0.2	0.2	0.2
Cast Iron	0.4	0.4	0.4	0.4	0.4	0.4
Brass	0.4	0.4	0.4	0.4	0.4	0.4
Copper	-	0.4	0.4	0.4	0.4	0.4
Zinc		0.4	-	-	-	-

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ii) Pitting/Etching	None					
Tinned Iron	None	None	None	None	None	None
Steel	None	None	None	None	None	None
Aluminium	None	None	None	None	None	None
Cast Iron	None	None	None	None	None	None
Brass	None	None	None	None	None	None
Copper	-	None	None	None	None	None
Zinc	-	None	-	-	-	-
iii) Staining /discolouration						
Tinned Iron	No specification	Permissible	Permissible	No specification		
Steel	No specification	Permissible	Permissible	No specification		
Aluminium	No specification	Permissible	Permissible	No specification		
Cast Iron	No specification	Permissible	Permissible	No specification		
Brass	No specification	Permissible	Permissible	No specification		
Copper	No specification	Permissible	Permissible	No specification		
Zinc	-	-	-	-		
iv) Fluid Water Mixture						
a) Jelling at 23 + 5°C	None	None	None	None		
b) Crystalline deposits on glass jar walls or metal strips	None	None	None	None		
c) sediment % vol. max	0.10					
v) pH after the test	7.0 - 11.5	7.0 - 11.5	7.0 - 11.5	7.0 - 11.5	7.0 - 11.5	
vi) SBR cups						
a) Blisters	None	None	None	None		
b) Sloughing	None	None	None	None		
c) Hardness- decrease, IRHD max	15	15	15	15		
d) Base diameter - increase in mm max	1.4	1.4	1.4	1.4		
e) volume increase, max	16%	-	-	-		
8 Fluidity and appearance at low temp.						
i) At -40 ± 2°C for 144 ± 4hrs						
a) Sludging	None	None	None	None	None	
b) Stratification	None	None	None	None	None	
c) Sedimentation	None	None	None	None	None	
d) Crystallisation	None	None	None	None	None	
e) Bubble inversion time, sec, max	10	10	10	10	10	
f) Appearance - uniformity, clarit and fluidity			As original on warming to 23 ± 5°C	As original on warming at room temp.	As original on warming at room temp.	
9 Evaporation loss 100 ± 2 °C for 7 days max						

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a) weight loss, % max	80	80	80	80		
b) Gritty or abrasive residue	None	None	None	None		
c) Pour Point of the residue °C	below-5	below-5	below-5	below-5		
10. Water Tolerance Test						
i) at -40±2°C for 120±2hrs						
a) Clarity	Clear	Clear	Clear	Clear		
b) Sludging	None	None	None	None		
c) Sedimentation	None	None	None	None		
d) Crystallisation	None	None	None	None		
e) Stratification	None	None	None	None		
f) Bubble inversion time, sec, max	10	10	10	10		
ii) above sample at 60±2°C for 24±2 hrs						
a) Stratification	None	None	None	None	-	
b) Sediments % vol, max packed sample 0.05 for qualification sample	0.15 packed sample 0.05 for qualification sample	0.15 for	0.15	0.15	0.15	0.15
11 Compatibility Test						
i) at -40 ± 2°C for 24 ± 2hrs	22 ± 2hrs	22 ± 2hrs				
a) Clarity	Clear	Clear	Clear	Clear	Clear	Clear
b) Sludging	None	None	None	None	None	None
c) Sedimentation	None	None	None	None	None	None
d) Crystallisation	None	None	None	None	None	None
e) Stratification	None	None	None	None	None	None
ii) above sample at 60±2°C for 24±2 hrs	22 ± 2hrs	22 ± 2hrs				
a) Stratification	None	None	None	None	None	
b) Sediments % vol, max	0.05	0.05	0.05	0.05	0.05	0.05
12 Resistance to oxidation Metal strip assembly						

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	IS : 8654 - 1977	ISO - 4925 - 1978 (E)	SAE - J1703 - NOV 83	DOT 3	MVSS-116 DOT 4	DOT 5
<p>in test fluid maintained at <math>23 \pm 5^{\circ}\text{C}</math> for <math>70 \pm 2</math> hrs and then at <math>70 \pm 2^{\circ}\text{C}</math> for <math>168 \pm 2</math> hrs</p> <p>i) Change in wt, mg/cm<sup>2</sup>, max</p> <p>a) Aluminium</p> <p>b) Cast Iron</p> <p>ii) Condition of metal strips</p> <p>a) Gummy deposits</p> <p>b) Pitting</p> <p>c) Etching</p>	<p>0.05</p> <p>0.3</p> <p>None</p> <p>None</p> <p>None</p>	<p>0.05</p> <p>0.3</p> <p>traces</p> <p>None</p> <p>None</p>	<p>0.05</p> <p>0.3</p> <p>traces</p> <p>None</p> <p>None</p>	<p>0.05</p> <p>0.3</p> <p>traces</p> <p>None</p> <p>None</p>	<p>0.05</p> <p>0.3</p> <p>traces</p> <p>None</p> <p>None</p>	<p>0.05</p> <p>0.3</p> <p>traces</p> <p>None</p> <p>None</p>
<p>13. Effect on Rubber</p> <p>i) SBR cups, at <math>70 \pm 2^{\circ}\text{C}</math> for <math>70 \pm 2</math> hrs</p> <p>a) Blisters</p> <p>b) Sloughing</p> <p>c) Stickness</p> <p>d) Hardness decrease IRHD, max</p> <p>e) Base dia increase, mm</p> <p>f) volume increase, max</p> <p>ii) SBR cups, at <math>120 \pm 2^{\circ}\text{C}</math> for <math>70 \pm 2</math> hrs</p> <p>a) Blisters</p> <p>b) Sloughing</p> <p>c) Stickness</p> <p>d) Hardness decrease IRHD, max</p> <p>e) Base dia increase, mm</p> <p>f) volume increase</p> <p>iii) EPDM Slab Stock at <math>70 \pm 2^{\circ}\text{C}</math> for <math>70 \pm 2</math> hrs</p> <p>a) Blisters</p>	<p>None</p> <p>None</p> <p>None</p> <p>10</p> <p>0.17 - 1.6</p> <p>-</p> <p>None</p> <p>None</p> <p>None</p> <p>15</p> <p>0.17 - 1.6</p>	<p>None</p> <p>None</p> <p>None</p> <p>10</p> <p>0.15 - 1.4</p> <p>1-16%</p> <p>None</p> <p>None</p> <p>None</p> <p>15</p> <p>0.15 - 1.4</p> <p>1 - 16%</p>	<p>None</p> <p>None</p> <p>None</p> <p>10</p> <p>0.15 - 1.4</p> <p>None</p> <p>None</p> <p>None</p> <p>15</p> <p>0.15 - 1.4</p> <p>None</p>	<p>None</p> <p>None</p> <p>None</p> <p>10</p> <p>0.15 - 1.4</p> <p>None</p> <p>None</p> <p>None</p> <p>15</p>	<p>None</p> <p>None</p> <p>None</p> <p>10</p> <p>0.15 - 1.4</p> <p>None</p> <p>None</p> <p>None</p> <p>15</p>	<p>None</p> <p>None</p> <p>None</p> <p>10</p> <p>0.15 - 1.4</p> <p>None</p> <p>None</p> <p>None</p> <p>15</p>

	<b>IS : 8654 - 1977</b>	<b>ISO - 4925 - 1978 (E)</b>	<b>SAE - J1703 - NOV 83</b>	<b>DOT 3</b>	<b>MVSS-116 DOT 4</b>	<b>DOT 5</b>
b) Sloughing c) Stickness d) Hardness decrease IRHD, max e) Change in volume % max iv) EPDM Slab Stock at 120 ± 2°C for 70 ± 2hrs a) Blisters b) Sloughing c) Hardness decrease IRHD, max d) Stickness e) Change in volume % max v) Natural Rubber cups at 70 ± 2°C for 120 ± 2 hrs a) Blisters b) Sloughing c) Stickness d) Hardness decrease IRHD, max e) Base dia increase, mm f) volume increase, % max 14 Stimulated performance tes (stroking properties)	Shall pass the test Apparatus as per SAE J1703 -Jan 80 and FMVSS 116 - DOT 3	None None None 10  None None None 10  0.15 - 1.4  1 - 16  Shall pass the test Apparatus available from SAE	None 10  None None 15  None 10  Shall pass the test Apparatus as per SAE J1703-NOV 83 or SAE - J1703	Shall pass the test Apparatus as per SAE J1703/ FTWSS 116*	Shall pass the test Apparatus as per SAE J1703/ FTWSS 116*	Shall pass the test Apparatus as per SAE J1703/ FTWSS 116*

\* Standards : Requirement for stroking properties

- a) Metal parts of the test system shall show no pitting or etching to an extent discernible without magnification.
- b) The change in diameter of any cylinder or piston shall not exceed 0.13 mm. (0.005 inch)
- c) The average decrease in hardness of seven of the eight cups tested (six wheel cylinder and one master cylinder primary) shall not exceed 15 IRHD. Not more than one of the seven cups shall have a decrease in hardness greater than 17 IRHD.
- d) None of the eight cups shall be in an unsatisfactory operating condition as evidenced by stickiness, scuffing, blisters, cracking, chipping, or other change in shape from its original appearance.
- e) None of the eight cups shall show an increase in base diameter greater than 0.90 mm (0.035 inch).
- f) The average lip diameter set of eight cups shall not be greater than 65 percent.
- g) During any period of 24,000 strokes the volume loss of fluid shall not exceed 36 milliliters.
- h) The cylinder pistons shall not freeze or function improperly through out the test.
- i) The total loss of fluid during the 100 strokes at the end of the test shall not exceed 36 milliliters.
- j) The fluid at the end of the test shall show no formation of gels.
- k) At the end of the test the amount of sediment shall not exceed 1.5 per cent by volume.
- l) Brake cylinders shall be free of deposits that are abrasive or that cannot be removed when rubbed moderately with a non-abrasive cloth wetted with ethanol.