



TANZANIA STANDARD

Motor vehicle brake fluids — Specification

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TANZANIA BUREAU OF STANDARDS

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Foreword

This Draft Tanzania Standard was prepared by Petroleum and Petroleum Products Technical Committee which is under the supervision of Chemicals Divisional Standards Committee

This Draft Tanzania Standard covers polyglycol-based automotive brake fluid (non-petroleum type and silicone type and Petroleum based type) for use in hydraulic braking systems for motor vehicles. The performance requirements shall be based on DOT (Department of Transport) and U.S. Federal Motor Vehicle Safety Standard (FMVSS-116) and Liquide Hydraulique Minéral (LHM). Under this performance classification, the minimum level shall be DOT4.

This third edition cancels and replaces the third edition (TZS 667:2017) which was technically revised in the parameters of dry and wet Equilibrium Reflux Boiling Point (ERBP).

For the purpose of deciding whether a particular requirement of this Tanzania Standard is complied with the final value, observed, or calculated, expressing the result of a test or analysis shall be rounded off in accordance with TZS 4 (see clause 3).

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1. Scope

This Draft Tanzania Standard specifies the requirements, sampling and test methods for automotive brake fluids of the petroleum type, non-petroleum type and silicone type for use in the hydraulic braking systems and clutches of motor vehicles.

2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TZS 4, *Rounding off numerical values*

TZS 668 -1: 2017/ISO: 1998 -1:1998 Petroleum Industry - Terminology - Raw materials and products

ASTM D1120 Standard test method for boiling point of engine coolants

ISO 3104 Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity

ASTM D1500 Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)

ASTM D 664 Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration

ISO 4926 Road vehicle — Hydraulic braking systems — Non petroleum base reference fluids

ASTM D130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

ISO 7308, Road vehicles, petroleum-based brake fluids for stored energy hydraulic brakes – Specification published by International Organization for Standardization.

ISO 4925 Road vehicles — Specification of non-petroleum-based brake fluids for hydraulic systems

ISO 2160 Petroleum products — Corrosiveness to copper — Copper strip test

ISO 3405 Petroleum and related products from natural or synthetic sources — Determination of distillation characteristics at atmospheric pressure

ISO 7536, Petroleum products — Determination of oxidation stability of gasoline — Induction period method

ASTM D 892 Standard Test Method for Foaming Characteristics of Lubricating Oils

ISO 1817:2024 Rubber, vulcanized or thermoplastic — Determination of the effect of liquids

ASTM D2240 Standard Test Method for Rubber Property—Durometer Hardness

ASTM D1744 Standard Test Method for Determination of Water in Liquid Petroleum Products by Karl Fischer Reagent

ISO 7309 Road vehicles — Hydraulic braking systems — ISO reference petroleum base fluid viscosity and calculation of dynamic viscosity

3. Terms and definitions

For the purpose of this Tanzania Standard, the following definitions and those given in TZS 668 -1: 2017/ISO: 1998 -1:1998 shall apply:

3.1 blister

cavity or sac on the surface of a brake cup

3.2 scuffing

outer surface of a brake cup visible to the naked eye

3.3 sloughing

presence of carbon black loosely held on the surface of the brake cup. When such a cup is placed beneath a 500 g weight and drawn across a sheet of bond paper on a firm surface, a black line is produced.

3.4 stickiness

condition on the surface of a brake cup that pulls fibres from a wad of USP-grade or BP-grade absorbent cotton wool when it is drawn across the surface of the cup

4. Classification of brake fluids

The classification of brake fluids shall be based on FMVSS 116 which classifies brake fluid into DOT (see foreword) on the bases of an Equilibrium Reflux Boiling Point (ERBP), Wet-ERBP and kinematic viscosity (see table 1).

- a. DOT 4 — Non-petroleum type-based brake fluids
- b. DOT 5 — Silicone based brake fluids (SBBF)
- c. DOT 5.1 — Non-petroleum type of brake fluids (non-SBBF)
- d. LHM – Petroleum based type
- e. LHM+ - Petroleum based type

5. Performance level of brake fluids

Non-petroleum type and silicone type of brake fluids, imported or manufactured in the country shall have a minimum performance level of DOT4, and other parameters as specified in table 1, while minimum performance level of petroleum-based type of brake fluids LHM as specified in table 2.

6. Requirements

6.1 these fluids shall be in conjunction with the recommendations of the manufacturers of the motor vehicles in which the fluid is to be used.

6.2 The physical and chemical properties of the brake fluid shall be such that will enable the fluid to comply with table 1 or table 2.

Table 1 — Brake fluid characteristics for non-petroleum based and silicone-based type

Property	DOT specification			Test method
	4	5	5.1	
ERBP dry °C <i>min</i>	230	260	260	ASTM D1120
ERBP wet °C <i>min</i>	155	180	180	
Kinematic viscosity mm ² /s				ISO 3104
- at - 40 °C <i>max.</i>	1800	900	900	
- at 100 °C <i>min</i>	1.5	1.5	1.5	
pH	7.0 – 11.5			ASTM D 664
Colour	report			ASTMD 1500
Fluid stability °C				ISO 4926
- ERBP change – High temperature <i>max.</i>	5 °C			
- ERBP change – Chemical stability <i>max.</i>	5 °C			
Corrosion – Change in mass of test strip mg/cm ² <i>max.</i>				ISO 2160 / ASTM D130
- tinned iron, steel, cast iron	0.2			
- aluminium	0.1			
- brass, copper, zinc	0.4			
Corrosion-Sedimentation of fluid/water mixture % (v/v)	0.10			
Corrosion-pH of fluid/water mixture after test	7.0-11.5			
Corrosion-rubber cup				
- hardness decrease	15 IRHD			
- base diameter increase (<i>mm</i>)	1.4			
- volume increase percent	16			
Corrosion – Appearance of metal strip	No visible crystalline deposit, pitting or etching staining or discolouration is permitted.			
Corrosion				ISO 3405/ ISO 4925/ ISO 7536
- appearance of fluid/water mixture at 23 ± 5 °C	No gelling			
- appearance of glass jar walls	No crystalline deposit			
- appearance of rubber cups	No disintegration by sloughing or blisters			
Evaporation				ISO 3405/ ISO 4925/ ISO 7536
- decrease in mass – percentage (<i>max</i>)	80			
- residue pour point (°C) <i>max.</i>	-5			
- residue texture	No gritting or abrasive precipitate			
Resistance to oxidation Change in mass - aluminium – mg/cm ² - cast iron - mg/cm ² Appearance of metal strip	0.05 0.3 No pitting or etching visible to the naked eye. No more than a trace of gum			

Fluidity		ISO 3405/ ISO 4925
- bubble flow time at -40 °C – (s) <i>max.</i>	10	
- bubble flow time at -50 °C - (s) <i>max.</i>	35	
- appearance at low temperature	No stratification, sedimentation or crystallization. Cloudiness is permissible.	
- appearance at warning	The fluid shall resume the appearance and fluidity it had before chilling.	

Property	DOT Specification	Test method
Water tolerance at -40 °C for 22h		ISO 4925/ASTM D 1744
- fluid appearance	No sedimentation, sludging, crystallization or stratification.	
- bubble flow time – (s) <i>max.</i>	10	
- fluid appearance on return to room temperature	Fluid shall regain original fluidity and clarity, without stratification.	
Water tolerance at 60 °C for 22h		
- fluid appearance	No stratification	
- sediment (v/v) percent <i>max</i>	0.05	
Compatibility at -40 °C for 22h		ISO 4926
- appearance	No pitting or etching visible to the naked eye. No more than a trace of gum.	
Compatibility at 60 °C for 22h		
- fluid appearance	No stratification	
- sediment	0.05	
Effect on rubber		ISO 1817
- base diameter increase, SBR cup at 70 °C and 120 °C mm	0.15-1.40	
- volume increase at 70 °C and 120 °C percent		
- SBR cup	1-16	
- EPDM slab stock	0-10	
- EPDM Functional seals	0-10	
Hardness decrease, SBR <i>max</i>		
- at 70 °C	10 IRHD	
- at 120 °C	15 IRHD	
Hardness decrease, EPDM <i>max.</i>		
- at 70 °C	10 IRHD	
- at 120 °C	15 IRHD	
- hardness increase, SBR/EPDM at 70 °C and 120 °C	NIL	
- appearance, SBR/EPDM at 70 °C and 120 °C	No disintegration by blisters, stickiness or sloughing	
Volume increase at 70 °C after 70 h immersion in test brake fluid containing 1.5 % water		ISO 4925/ASTM D2240
- SBR cup percent	1-16	
- EPDM slab stock percent	0-10	
- EPDM functional seals percent	0-10	
Volume increase at 70 °C after 700 h immersion in test brake fluid containing 1.5 % water		ISO 4925/ASTM D2240

- SBR cup percent	1-16	ISO 4925/ASTM D2240
- EPDM slab stock percent	0-10	
- EPDM functional seals percent	0-10	
Simulated service performance		ISO 1817
- appearance of metal parts	No visible pitting or roughening, but staining or discolouration is permitted. No more than a trace of gum shall be deposited on metal parts during test. The brake cylinders shall be free of deposits which are abrasive or which cannot be removed when rubbed with a cloth wetted with ethanol.	
Positions and cylinder bore		
- diameter change mm. <i>max</i>	0.13	
- performance	Shall not freeze nor function improperly	ISO 1817
Rubber cups - appearance	No cups shall be in an unsatisfactory operating condition as evidenced by excessive amounts of scoring, scuffing, blistering, cracking, chipping or change in shape from original appearance.	
Decrease in hardness (each of the cups), max.	15 IRHD	
Base diameter increase (mm), max.	0.9	
Lip diameter interference set (average of all the cups) percent, max.	65	
Fluid		
- appearance	No sludging, gelling or abrasive grittiness in fluid.	
Volume loss during period of 24 000 strokes (ml), max.	36	ISO 7308
Volume loss during final 100 strokes (ml), max.	36	
Sediment after centrifuging percent (v/v), max	1.5	

Table 2 — Brake fluid characteristics for petroleum-based type

Property	Requirement	Test method	
Appearance	Clear, free from sediment, suspended matter, or phase separation	ASTM D1500	
Kinematic viscosity at 100 °C, mm ² /s, min	6	ISO 3104 / ASTM D445	
Equilibrium reflux boiling point (ERBP), °C, min	150	ASTM D1120	
pH (aqueous extract)	6.5 – 9.5	ASTM D 664	
Corrosion (tinned iron, steel, mg/cm ² ; copper, brass, aluminum, zinc alloy)	Mass change ≤ 0.2 No pitting or visible corrosion	ISO 2160 / ASTM D130	
Rubber compatibility (natural rubber, SBR, EPDM), %	Volume change 0 – 10; No disintegration or excessive softening	ISO 1817	
Oxidation stability, °C	No sludge formation; ERBP change ≤ 5	ASTM D2619	
Low-temperature flow, °C	Pumpable at –40 °C; no gelling or crystallization	ISO 7308	
Water content, % (m/m)	0.005	ASTM D 1744	
Hygroscopicity, %, max	0.1	ISO 7308	
Foaming, max	i), at 24°C	100	ASTM D 892
	ii) at 93 °C	200	
	iii) at 24 °C (after test at 93 °C)	100	
Compatibility,	i), at -40 °C	The fluid shall show no stratification or Sedimentation.	ISO 7309
	ii) at 60 °C, after centrifusing %, v/v, max	0.05	
boiling point, °C min,	235	ISO 3405	

7. Packaging and marking

7.1 Packaging

Brake fluids shall be stored and transported in containers which are sound, clean, dry and capable of suitable sealing and resealing. Tamper-proof seals shall be provided on all containers up to 1 L capacity. The material of the containers and seals shall be such that they will not be adversely affected by the fluid and shall have no adverse effect on the fluid.

7.2 Marking

The containers shall be clearly and indelibly marked/or suitably affixed to the container with the following information:

7.2.1 trade name or trademark of manufacturer or supplier;

7.2.2 product description including base fluid type and performance level e.g. DOT4, LHM, etc;

7.2.3 batch number, and;

7.2.4 date of manufacture;

7.2.5 safety warning in respect of the following items:

- 7.2.5.1 effect of fluid contamination;
- 7.2.5.2 effect of water uptake after opening;
- 7.2.5.3 toxicity;
- 7.2.6 instructions for use
- 7.2.7 country of origin.

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Annex A

(informative)

Care and handling of brake fluids

A.1 General

To date experience has not shown functional incompatibility between the silicone and non- petroleum (polyglycol) types, but not all combinations or circumstances of use have yet been investigated. The performance characteristics of brake systems which have been designed to use polyglycol type fluids may be altered if silicone type brake fluids are used in these systems. Consequently, the two fluid types should not be mixed or interchanged.

Experience has shown that one of the major causes of brake failure is abrasive dirt and foreign material introduced when removing and replacing the caps of the container and vehicle reservoirs. Extreme care is necessary to ensure that the caps and adjacent areas are thoroughly cleaned before removal and that the caps are left in an appropriate dry, clean area during these operations.

A.2 Manufacturer's recommendations

The recommendations of vehicle manufacturers regarding selection of grade, fluid change periods, and care of the braking system should be followed. In the absence of any such recommendation, vehicle manufacturers and TBS shall be consulted.

A.3 Fluid incompatibility

Brake fluids of the non-petroleum/polyglycol type and the silicone type fluids are chemically and physically different. They are essentially immiscible and differ particularly in water tolerance, effect on rubber, corrosion, compressibility and temperature/viscosity characteristics.

A.4 Fluid contamination

Contamination of brake fluid with mineral oil or petroleum-derived products such as petrol and kerosene or solvents such as mentholated spirits and carbon tetrachloride should be avoided. Small concentrations of these materials can cause swelling and deterioration of the rubber parts fitted to brake systems which may result in the complete failure of the braking system. Absolute cleanliness should be observed when handling brake fluid and repairing brake systems. Hands should be washed with soap and water to remove dirt, grease and oil, and only clean dispensing equipment should be used.

A.5 Fluid water uptake

Polyglycol based brake fluids may absorb water, and depending on prevailing atmospheric conditions, water concentrations as high as 3 % may occur after a relatively short period of service. Absorption of water lowers the ERBP of the fluid and is a factor contributing to corrosion and brake failure.

To reduce the level of water absorption, replacement brake fluids should be drawn directly from original sealed containers and container should be re-sealed immediately after use. Fluid held in partially broached and resealed containers shall be discarded after 12 months.

When commercial brake bleeders are fitted to commercial drums, care should be taken to ensure that moist air cannot enter the drum.

A.6 Re-use of fluid

Fluid bled or drained from a system that has been in service may be contaminated with corrosion sludges, water, road dirt and similar and is therefore unsuitable for further use. This fluid should be discarded.

A.7 Toxicity

Brake fluid should not be permitted to contact the skin and eyes.

Bibliography

SAE J 1705 Petroleum based brake fluids

FMVSS 116, Motor Vehicle Brake Fluids

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