KENYA STANDARD

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Second Edition

Engine coolant — Specification

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REVISION OF KENYA STANDARDS

In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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Foreword

This Kenya Standard was prepared by the Petroleum and Petroleum Products Technical Committee under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards

During the preparation of this standard, reference was made to the following documents:

BS 6580: 1992 Specification for corrosion inhibiting, engine coolant concentrates (‘Antifreeze’).

ASTM 6210-17: Standard specification for Fully Formulated Glycol Base Engine Coolant for Heavy duty engines

ASTM 3306-14: Standard specification for Glycol Base Engine Coolant for Automotive and Light duty service.

Acknowledgement is hereby made for the assistance derived from these sources.

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1 Scope

This Draft Kenya Standard specifies requirements for glycol-type compounds which, when added at adequate concentrations to water in engine cooling systems, provide protection against overheating, rust and corrosion.

2 Normative references

The following referenced documents referred to in the text in such a way that some or all of their content constitutes requirements 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.

ASTM D 92, *Standard test method for flash and fire points by Cleveland open cup tester*

ASTM D380, *Standard test methods for rubber hose*

ASTM D412, *Standard test methods for vulcanized rubber and thermoplastic elastomers — Tension*

ASTM D471, *Standard test method for rubber property — Effect of liquids*

ASTM D 1119, *Standard test method for percent ash content of engine coolants and antirust*.

ASTM D 1120, *Standard test method by boiling point of engine coolants*

ASTM D 1121, *Standard test method for reserve alkalinity of engine coolants and antirust*

ASTM D 1122, *Standard test method for density or relative density of engine coolant concentrates and engine coolants by the hydrometer*

ASTM D 1123, *Standard test methods for water in engine coolant concentrate by the Karl Fischer reagent method*

ASTM D 1176, *Standard practice for sampling and preparing aqueous solutions of engine coolants or antirust for testing purposes*

ASTM D 1177, *Standard test method for freezing point of aqueous engine coolants*

ASTM D 1287, *Standard test method for pH of engine coolants and antirust*

ASTM D 1384, *Standard test method for corrosion test for engine coolants in glassware*

ASTM D 1881, *Standard test method for foaming tendencies of engine coolants*

ASTM D 2570, *Standard test method for simulated service corrosion testing of engine coolants*

ASTM D 2809, *Standard test method for cavitation corrosion and erosion-corrosion characteristics of aluminum pumps with engine coolants*

ASTM D 4057, *Standard practice for manual sampling of petroleum products*

ASTM D 4177, *Standard practice for automatic sampling of petroleum and petroleum products*

ASTM D 4340, *Standard test method for corrosion of cast aluminum alloys in engine coolants under heat-rejecting conditions*

ASTM E 202, *Standard test methods for analysis of ethylene glycols and propylene glycols*

IP 36, *Determination of open flash and fire point — Cleveland method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
engine coolant concentrate
also known as antifreeze. A Glycol – type formulated liquid product intended to be diluted with water for use in engine cooling system

For the purpose of this document, this will be referred to as coolant concentrate.

3.2
engine coolant
a fluid used for heat transfer from the engine to the radiator, usually containing specific amounts of glycol , water, corrosion inhibitors and a foam suppressor

For the purpose of this document, two types of engine coolants are defined as

3.2.1
antifreeze coolant
an engine coolant that provides a lower freezing point and mitigates rusting and corrosion and foaming

3.2.2
tropical coolant/ summer coolant
an engine coolant without freeze protection that mitigates corrosion and foaming. Also known as a summer /tropical coolant

3.3
glycol
includes mono-ethylene glycol, mono-propylene glycol and other glycols

3.4
organic inhibitors
a formulation based on organic acids which reduces corrosion of the metals normally present in an engine cooling system

3.5
cavitation
highly localized corrosion of metal components resulting potentially in small pits or perforations (pitting)

3.6
batch
material from a single mix or, in the case of a continuous production process, material from a single day's production

4 Requirements

4.1 General

4.1.1 The engine coolant shall be formulated from acceptable glycols (or a mixture of acceptable glycols), water, corrosion inhibitors, dye and a foam suppressor.

4.1.2 The engine coolant shall be a homogeneous liquid free from suspended matter and sediment.

4.1.3 The engine antifreeze coolant shall contain at least 33% of the coolant concentrate.

4.1.4 The engine tropical coolant shall be formulated to meet rust, corrosion, antifoam properties and no freeze protection.

4.1.5 Engine coolant shall be formulated using deionized (demineralized) or distilled water or water with low mineral content. The water used shall meet the requirements given in Table 1

Table 1 — Water requirements

S/N	Property	Specific value	Test method
i.	Chlorides, µg/g	25 max.	ASTM D5827, ASTM D512, ASTM D4327
ii.	Sulfate, µg/g	50 max.	ASTM D5827, ASTM D516, ASTM D4327
iii.	Hardness, as $CaCO_3$, µg/g	20 max.	ASTM D6130, ASTM D1126
iv.	pH, max.	5.5 – 8.5	ASTM D1287, ASTM D1293
v.	Iron, µg/g	1.0 max.	ASTM D6130, ASTM E394

NOTE 1 Use of water type listed in 4.1.5 will minimize formation of hard water scale and avoid introduction of mineral components such as chlorides and sulfates which can increase the corrosion rate of aluminum and iron.

NOTE 2 Functional additives used for purposes other than depression of the freezing point may be included.

4.2 Detailed requirements

4.2.1 The engine coolant concentrates, and the engine coolants shall conform to the physical and chemical requirements prescribed in Table 2 and Table 3.

4.2.2 The requirements listed in Table 3 for engine coolants are prescribed for the coolant as packaged, without further dilution or adjustment.

4.2.3 All coolant concentrates and engine coolants shall conform to the performance requirements listed in Table 4.

4.2.4 Coolant concentrates shall be diluted for performance testing as described in the individual ASTM test methods

4.2.5 Coolants already circulating in the market shall pass the in service basic corrosion test prescribed in Table 5.

Table 2 — Physical and chemical requirements for concentrates

S/N	Property	Requirement	Test method
i.	Relative density 15.5/15.5°C	1.030 – 1.160	ASTM D1122, D5931
ii.	Freezing point,[a,b] °C 50 %vol in DI water	−36.4 max.	ASTM D1177, D6660
iii.	Boiling point UNDILUTED	150 min.	ASTM D1120
iv.	Boiling point,[a, c] °C 50 % vol in DI water	104 min.	ASTM D1120
v.	Ash content, mass %	Report [d]	ASTM D1119
vi.	pH, 50% vol in DI water	7.0 – 11	ASTM D1287
vii.	Water, mass %	5 max.	ASTM D1123
viii.	Reserve alkalinity, ml	Report [d]	ASTM D1121

[a] For purposes of determining conformance with this specification, an observed value shall be rounded "to the nearest unit" in the last right-hand digit used in expressing the specification limit, in accordance with the rounding method of Practice E29.

[b] Test Methods D1177 and D6660 work with glycol/glycerine mixtures. Field test devices based on refractive index and density are under development.

[c] Some precipitate may be observed at the end of the test. This should not be cause for rejection.

[d] Value as agreed upon between the supplier and the customer.

DI – Distilled or Deionised water.

Table 3a — Physical and chemical requirements for engine anti-freeze coolant

S/N	Property	Requirement	Test method
i.	Relative density 15.5/15.5°C	1.065 min	ASTM D1122, ASTM D5931
ii.	Freezing point, [a, b] °C, undiluted	−36.4 max	ASTM D1177, ASTM D6660
iii.	Boiling point,[a,c] °C undiluted	104 min	ASTM D1120
iv.	Ash content, mass %	2.5 max	ASTM D1119
v.	pH, undiluted	7.0 to 11	ASTM D1287
vi.	Reserve alkalinity, ml	Report [d]	ASTM D1121

[a] For purposes of determining conformance with this specification, an observed value shall be rounded "to the nearest unit" in the last right-hand digit used in expressing the specification limit, in accordance with the rounding method of Practice E29.

[b] Test Methods D1177 and D6660 work with glycol/glycerin mixtures. Field test devices based on refractive index and density are under development.

[c] Some precipitate may be observed at the end of the test. This should not be cause for rejection.

[d] Value as agreed upon between the supplier and the customer.

Table 3b — Physical and chemical requirements for tropical coolant

S/N	Property	Requirement	Test method
i.	Relative density 15.5/15.5°C	1.01 min	ASTM D1122
ii.	pH, undiluted	7.0 to 11	ASTM D1287
iii.	Reserve alkalinity, ml	Report [c]	ASTM D1121

[a] For purposes of determining conformance with this specification, an observed value shall be rounded "to the nearest unit" in the last right-hand digit used in expressing the specification limit, in accordance with the rounding method of Practice E29.

[b] Some precipitate may be observed at the end of the test. This should not be cause for rejection.

[c] Value as agreed upon between the supplier and the customer.

Table 4 — Performance requirements

Property	Specific value	Test method
1) Corrosion in glassware		ASTM D1384 (BS 6580)
Test strip	**Weight loss, mg/specimen**	
Copper	10 max.	
Solder	30 max.	
Brass	10 max.	
Steel	10 max.	
Cast iron	10 max.	
Aluminum	30 max.	
2) Simulated service test		ASTM D2570
Test strip	**Weight loss, mg/specimen**	
Copper	20 max.	
Solder	60 max.	
Brass	20 max.	
Steel	20 max.	
Cast iron	20 max.	
Aluminum	60 max.	
3) Corrosion of cast aluminum alloys at heat-rejecting surfaces, mg/cm^2/week	1.0 max.	ASTM D4340
4) Foaming		ASTM D1881
Volume, ml	150 max.	
Break time, s	5 max.	

5) Cavitation-erosion rating for pitting, cavitation, and erosion of the water pump	8 min.	ASTM D2809
NOTE For engine coolant concentrates, test solutions shall be prepared in accordance with the directions provided in the individual ASTM test methods.		

Table 5 — In-service rust and corrosion test

Sampling	• Random samples of the brand to be tested shall be collected by KEBS from different point of sales in the market. • A test tube measuring 150 mm in length and 16mm in diameter shall be used in this test • 25 – 40 mm length mild steel nails will be used for this test. • The surface finish of the nails will be uncoated (refer to nail standards KS EAS 914/2019).
Testing	• The test tube will be filled up to ¾ level with the coolant sample • Three mild steel nails with no rust shall be put inside the test tube containing the coolant sample. • Another set of the mild steel nails shall be placed in a test tube that is ¾ full of ordinary tap water. This will act as the control test. • The two test sets shall be placed securely on a flat surface and be left undisturbed for the duration of the test. • Visual Observations shall be carried out on a weekly basis for one month • At the end of the test the nails will be removed from the two test tubes and visually examined for any traces of rust
Requirements	• No rust should be observed in the steel nails from week 1 to week 4. • If Rust is formed anytime during of the test period then the coolant sample will have failed this test. • The steel nails in the control set (pure water) are expected to form rust throughout the test period • The coolant colour shall not breakdown throughout the test period..
NOTE This test is only to be applied during market surveillance for coolants already in the market. It shall not be applied during the importation of coolants and coolants concentrates.	

4.3 Other requirements

4.3.1 Miscibility

On dilution of the coolant concentrate, any precipitate formed shall be such as to have no detrimental effect on the coolant circulation or on the anti-corrosion properties of the coolant.

NOTE Antifoaming agents may be immiscible, and if present, might be observed as either an oily film or as dispersed droplets.

4.3.2 Storage stability

After conventional undercover storage under normal conditions for a period of 12 months from the date of manufacture, the coolant in an unopened container shall comply with all the other requirements of this standard.

4.3.3 Colour

The coolant shall be coloured.

The coolant dye shall be stable and shall not breakdown throughout the shelf life of the coolant.

5 Packaging and marking

5.1 Packaging

The condition of each container for the coolant shall be such as to have no detrimental effect on the quality of the product during normal transportation and storage. Only containers of the same size filled with coolant from the same batch shall be packed together in a carton.

5.2 Marking

The following information shall be clearly marked on the container of the coolant, or on a label affixed to the container:

a) The name and address (postal address, physical address & phone contact) and registered trade mark of the manufacturer or supplier;

b) The description of the product; Tropical coolant/ summer coolant or antifreeze coolant;

c) Ready to use or concentrate;

d) Change periods as recommended by the equipment manufacturer;

e) Batch number/identification;

f) Quantity; and

g) Date of manufacture and expiry.

Annex A
(informative)

Notes to users

A.1 If the coolant contains a benzoate-nitrate type inhibitor, it should not be filled into or stored in containers that have zinc galvanized fittings that might come into contact with the material. Such contact might cause interaction between the inhibitor and the zinc, with the resultant liberation of hydrogen gas and possible rupture of the container during storage.

A.2 Whenever possible, the dilution of the coolant with water of excessive hardness should be avoided. Furthermore, the addition of other materials to a coolant might be detrimental to the stability and efficiency of the coolant. The indiscriminate mixing of different formulations of engine cooling system coolants (even if from the same manufacturer) should be avoided.

A.3 Service life limitation is important. The engine cooling system coolant covered by this standard becomes a corrosive agent once anti-corrosive agents are depleted. It is recommended that the in-vehicle usage of this coolant should not exceed a period of two years.

Annex B
(normative)

Sampling and compliance with this standard

B.1 Sampling

B.1.1 General

The sampling procedure given in B.1.3 shall be applied in determining whether a lot submitted for inspection and testing complies with the relevant requirements of this standard. The sample so drawn shall be deemed to represent the lot.

B.1.2 Definitions

B.1.2.1
defective
engine cooling system coolant or its container, that fails to comply with the requirements of this standard

B.1.2.2
lot
that quantity of engine cooling system coolant in containers bearing the same batch identification, from one manufacturer, and submitted at any one time for inspection and testing

B.1.3 Samples for inspection and testing

After inspecting the lot for compliance with the relevant requirements of 5.1 and 5.2, use the relevant procedure described in ASTM D 1176 to obtain composite samples from a sufficient number of containers (use the relevant recommendations given in ASTM D 4057 or in ASTM D 4177).

B.2 Compliance with this standard

The lot shall be deemed to comply with the requirements of this standard if, after inspection of the containers or cartons in the lot, and after testing of the samples taken in accordance with B.1.3, no defective is found.

B.3 License to manufacture and distribute engine coolants

1. The manufacture and / or distribution of engine coolants is open to all legally registered companies in the country.
2. The engine coolants manufactured or distributed in B.3.1 shall comply with all the general, detailed and other requirements of this standard.
3. This standard defines engine coolants as only those containing a coolant concentrate. The corollary of this definition is that all coolants manufactured in the country shall be manufactured from either coolant concentrates imported into the country or those manufactured in the country and dully inspected by Kenya Bureau of Standards (KEBS) for conformance to requirements listed in 4.2 of this standard.
4. Issuance of KEBS standardization mark for locally produced coolants shall be issued upon compliance to the following:
    a. evidence of importation of coolant concentrate used to produce coolant submitted for approval or
    b. evidence of purchase of coolant concentrate from an importer of coolant concentrate or

c. evidence of coolant concentrate manufactured locally or procured from a local manufacturer of coolant concentrate or
d. evidence of purchase of coolant from a licensed manufacturer of coolants.

5. The evidence to be submitted in case of importation of coolant concentrate is the pre-export verification of conformity (PVOC)/certificate of analysis (COA).
6. In case of purchase of coolant concentrate or coolant from a licensed manufacturer, the evidence shall comprise of a certificate of analysis and evidence of purchase such as a delivery note or an invoice in the name of the company from the licensed importer.

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