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DRAFT EAST AFRICAN STANDARD

Gasohol E5 and E10— Specification

EAST AFRICAN COMMUNITY

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Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Conformance ..... Error! Bookmark not defined.

3 Normative references **1**

4 Terms and definitions **2**

5 Symbols (and abbreviated terms) ..... Error! Bookmark not defined.

6 Clause **5**

6.1 Subclause (level 1) ..... Error! Bookmark not defined.

6.1.1 Subclause (level 2) ..... Error! Bookmark not defined.

6.1.2 Subclause (level 2) ..... Error! Bookmark not defined.

6.2 Subclause (level 1) ..... Error! Bookmark not defined.

7 Clause ..... Error! Bookmark not defined.

8 Special ..... Error! Bookmark not defined.

Annex A (normative) Annex title **8**

A.1 General ..... Error! Bookmark not defined.

A.2 Clause ..... Error! Bookmark not defined.

A.2.1 Subclause (level 1) ..... Error! Bookmark not defined.

A.2.2 Subclause (level 1) ..... Error! Bookmark not defined.

A.3 Clause ..... Error! Bookmark not defined.

Annex B (informative) Which styles correspond to which element — Quick reference guide Error! Bookmark not

Bibliography **9**

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 067, *Biofuels.*

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

Gasohol E5 and E10— Specification

1 Scope

This draft East African Standard prescribes the requirements, test methods and sampling, method for gasohol E5 and E10 used as fuel in spark ignition engines.

2 Normative references

The following documents are 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 D1298, Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

ASTM D4052, *Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter*

ASTM D86, *Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure*

ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

IP 123, *Petroleum products — Determination of distillation characteristics at atmospheric pressure*

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

IP154, *Petroleum products — Corrosiveness to copper — Copper strip test*

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

ASTM D4294, *Standard Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry*

ASTM D381, *Standard Test Method for Gum Content in Fuels by Jet Evaporation*

ASTM D4952, *Standard Test Method for Qualitative Analysis for Active Sulfur Species in Fuels and Solvents (Doctor Test)*

ASTM D3227, *Standard Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)*

ASTM D3237, *Standard Test Method for Lead in Gasoline by Atomic Absorption Spectroscopy*

IP 428, *Liquid petroleum products — Petrol — Determination of low lead concentrations by atomic absorption spectrometry*

IP429, *Liquid petroleum products — Petrol — Determination of the benzene content by infrared spectrometry*

ASTM D5580, *Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, p/m-Xylene, o-Xylene, C9 and Heavier Aromatics, and Total Aromatics in Finished Gasoline by Gas Chromatography*

ISO 5164, *Petroleum products — Determination of knock characteristics of motor fuels — Research method*

ASTM D2699, *Standard Test Method for Research Octane Number of Spark-Ignition Engine Fuel*

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*

ASTM D5191, *Standard Test Method for Vapor Pressure of Petroleum Products and Liquid Fuels (Mini Method)*

ISO 3007, *Petroleum products and crude petroleum — Determination of vapour pressure — Reid method*

ASTM D4815, *Standard Test Method for Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C4 Alcohols in Gasoline by Gas Chromatography*

ISO 22854, *Liquid petroleum products — Determination of hydrocarbon types and oxygenates in automotive-motor gasoline and in ethanol (E85) automotive fuel — Multidimensional gas chromatography method*

IP 40, *Petroleum products — Determination of oxidation stability of gasoline — Induction period method*

ISO 7536:1994, *Petroleum products — Determination of oxidation stability of gasoline — Induction period method*

ASTM D525, *Standard Test Method for Oxidation Stability of Gasoline (Induction Period Method)*

ISO 20847, *Petroleum products — Determination of sulphur content of automotive fuels — Energy-dispersive*

X-ray fluorescence spectrometry

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*

ASTM D5191, *Standard Test Method for Vapor Pressure of Petroleum Products and Liquid Fuels (Mini Method)*

EN 13016-1, *Liquid petroleum products — Vapour pressure — Part 1: Determination of air saturated vapour pressure (ASVP) and calculated dry vapour pressure equivalent (DVPE)*

ASTM D5453, *Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence*

ASTM D5580-21, *Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, p/m-Xylene, o-Xylene, C9 and Heavier Aromatics, and Total Aromatics in Finished Gasoline by Gas Chromatography*

ASTM D5599, *Standard Test Method for Determination of Oxygenates in Gasoline by Gas Chromatography and Oxygen Selective Flame Ionization Detection*

ISO 20847, *Petroleum products — Determination of sulphur content of automotive fuels — Energy-dispersive*

X-ray fluorescence spectrometry

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
gasohol
automotive gasoline blended with anhydrous ethanol for use in internal combustion engines.

3.2
anhydrous ethanol
ethanol that has been dehydrated achieving a purity level of over 99.5% formulated for use as a blend stock with automotive gasoline

3.3
denaturant
a noxious chemical substance added to ethanol to render it unpalatable and unfit for human consumption

3.4
oxygenate
a molecule composed of solely of carbon, hydrogen and oxygen used as a fuel additive in gasoline to improve combustion

4 Requirements

4.1 General requirements

4.1.1 Gasohol E5 and E10 shall consist of homogeneous blends of 5% and 10% v/v of anhydrous ethanol and the respective volumes/proportions of automotive gasoline

4.1.2 Automotive gasoline shall be a refined petroleum distillate that meets the requirements of EAS 158 while the blend stock shall be produced from anhydrous ethanol.

4.1.3 Gasohol shall be clear and free from water, suspended matter and sediments

4.1.4 The only oxygenate allowed for the production of gasohol shall be ethanol. Oxygenates such as methanol, ether and acetone shall not be used as blending components except when present as contaminants in the production of anhydrous ethanol.

4.2 Specific requirements

The gasohol E5 and E10 shall comply with the requirements specified in Table 1 when tested in accordance with the methods specified therein.

Table 1 — Specific requirements for gasohol E5 and E10

SL No	Characteristic	Requirement E10	Requirement E5	Test method
i.	Ethanol content, % v/v	10 ± 0.5	5 ± 0.5	Annex A
ii.	Initial boiling point, ^{0}C	To be reported	To be reported	ASTM D86 IP123
iii.	10 % evaporated at ^{o}C	Between 40 ^{o}C – 70 ^{o}C		ASTM D86 IP123
iv.	50 % evaporated at ^{o}C	To be reported		ASTM D86/IP123
v.	90 % evaporated at ^{o}C, max	180		ASTM D86/IP123
vi.	Final boiling point ^{o}C	210 max.	175-205	ASTM D86/IP123
vii.	Oxygen content, %m/m, max	3.7	2.7	ASTM D4815 ISO 22854 EN 1601
viii.	Reid vapour pressure (RVP) at 37.8 ^{o}C, kPa, max	65	67	ASTM D323 ASTM D5191 EN 13016-
ix.	Density@ 20 ^{o}C, Kg/m^3	720-780		ISO 3675/ASTM D4052/ASTM D1298
x.	Colour	Red		Visual
xi.	Initial boiling point, ^{0}C	To be reported		ASTM D86/IP123
xii.	Residue, % v/v, max	2		ASTM D86/IP123
xiii.	Copper corrosion, 3 h at 50 ^{o}C, rating	No. 1 strip,		ISO 2160/IP 154/ASTM D130
xiv.	Sulphur content, mg/Kg, max	10		ASTM D4294 ASTM D20884 ASTM D5453
xv.	Existent gum (solvent washed), mg/100 Ml, max	5		ASTM D381

			ISO 6246
xvi.	Oxidation stability, minutes, min	360	ISO 7536 ASTM D525 IP 40
xvii.	Doctor test[a]	To be reported	ASTM D4952
xviii.	Mercaptan Sulphur, % m/m, max	0.0015	ASTM D3227
xix.	Lead content, mg/kg, max	5	ASTM D3237/IP 428
xx.	Benzene content, %v/v, max	1	IP429/ASTM D5580 ATSM D3606 ASTM D5580/EN 238 EN 12177
xxi.	Research Octane Number, min	93	ISO 516 ASTM D2699
xxii.	FVI[b]	93	ASTM D323 ASTM D5191 EN 13016-1 ISO 3007

[a]If the doctor test is negative, the Mercaptan sulphur test can be omitted

[b]The flexible volatility index (FVI) is an additional parameter which characterizes the volatility properties of petrol, and is calculated using the formula FVI = RVP + 0.7 E70 where

RVP is the Reid vapour pressure, in kilopascals; and

E70 is the percentage volume fraction of petrol, evaporated to 70 °C.

5 Blending, transportation and storage

5.1 The blending of gasohol shall be carried out at licensed blending facilities as per the National Regulations

5.2 Due to the hygroscopic nature of ethanol-gasoline blends, all necessary precautions shall be taken to ensure that transportation, storage, and handling systems are kept as dry as possible to prevent water contamination.

5.3 Fuel containers used for transporting and storage of gasohol shall be regularly inspected and maintained to prevent any compromise in fuel quality. Surfaces in contact with the fuel shall be compatible with ethanol and free from corrosion or degradation.

5.4 Dispensing pumps used for delivering the fuel shall be clearly labelled with the wording ‘‘GASOHOL E5 or GASOHOL E10

6 Dyes, markers and Additives

6.1 Dyes and markers may be added to the fuel in acceptable concentrations as allowed by the National Regulations and shall not alter any parameters of gasohol out of the specified range as indicated in the Table 1.

6.2 Fuel additives may be used to improve the fuel performance. Fuel additives without known harmful side effects are recommended in the appropriate amount to avoid deterioration of driveability and emissions control durability.

7 Precision and dispute

7.1 All test methods referred to in this Draft East African Standard include a precision statement. In cases of dispute, the procedures for resolving the dispute and interpretation of the results based on test method precision, described in ISO 4259, ASTM D 3244 and IP 377 shall be used.

7.2 In cases of dispute:

a) concerning sulphur, ASTM D5453 shall be used;

b) concerning benzene content, ASTM D5580 shall be used; and

c) concerning oxygen and oxygenates content, ASTM D5599 shall be used; and concerning density, ASTM D4052 shall be used.

8 Packaging

8.1 The condition of the containers, rail tankers and road tank vehicles shall be such as not to be detrimental to the quality of the fuel during transportation and storage.

8.2 The containers shall be acceptably sealed or leak proof, clean, and free from materials soluble in gasohol.

9 Labelling

9.1 The following information shall be legibly and indelibly labelled on the portable container, or on a label affixed to the portable container:

a) manufacturer's/distributor's name and physical address;

b) product name as "GASOHOL E5 or GASOHOL E10";

c) the batch number;

d) quantity,

e) safety warning as "FLAMMABLE MATERIALS" and a toxicity and flammability symbols;

f) the warning, "DANGER GASOHOL"

g) country of origin

h) date of blending; and

a) blend ratio.

9.2 For bulk transportation the above information shall be in the documentation accompanying the product and the respective container shall be marked with;

a) the words "FLAMMABLE MATERIAL"; and

b) b) the warning “dangerous goods

9.3 Stickers shall be used in labelling in case of vehicles, which have compartments and transport more than one type of fuel.

9.4 Dispensing pumps used for delivering the fuel shall be clearly labelled with the wording “GASOHOL E5” or “GASOHOL E10”, and the measurement dimensions of such shall be in accordance with the requirements of the relevant weights and measures regulations for each member state.

10 Sampling

Sampling shall be done in accordance with ASTM D4057, ASTM D4177, ISO 3170 or ISO 3171

Annex A
(normative)

Determination of alcohol content in gasohol

A.1 Procedure

Fill distilled water into a clean and dry, 400 mL graduated cylinder to 100 mL mark. Add 100 mL of gasohol to make a total of 200 mL. Stopper the cylinder tightly and shake vigorously while gripping the cylinder around the stopper to prevent spillage. Let the mixture settle for at least 5 (five) min while the cylinder is rested on a level surface.

Observe the two sharply separated phases. Read off the lower phase (alcohol + water) = *X* mL.

A.2 Calculation

Alcohol content, % by volume = (X – 100) %.

Table K.1 — Corrections for application to constant manometer reading

Pressure difference between initial manometer setting and constant manometer reading bar	Correction bar
0.0000	0.0000
0.0069	0.0028
0.0138	0.0055
0.0207	0.0083
0.0276	0.012
0.0345	0.014
0.0414	0.017
0.0483	0.020
0.0552	0.023
0.0621	0.026
0.0690	0.029
0.0759	0.032
0.0828	0.035
0.0896	0.038
0.0965	0.041
0.1034	0.043
0.1103	0.046
0.1172	0.050
0.1241	0.052
0.1310	0.055
0.1379	0.058

Bibliography

KS 515: 2010, *Gasohol 10 % (v/v) — Specification*

