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DRAFT EAST AFRICAN STANDARD

Automotive gasoline (premium motor spirit) — Specification

EAST AFRICAN COMMUNITY

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East African Community
P.O. Box 1096,
Arusha
Tanzania
Tel: + 255 27 2162100
Fax: + 255 27 2162190
E-mail: eac@eachq.org
Web: www.eac-quality.net

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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.

In order to achieve this objective, the Community established an East African Standards Committee mandated to develop and issue East African Standards.

The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. 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 procedures of the Community.

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.

EAS 158 was prepared by Technical Committee EAS/TC 068, *Petroleum and petroleum products*.

This third edition cancels and replaces the second edition (EAS 158:2012), which has been technically revised.

Automotive gasoline (premium motor spirit) — Specification

1 Scope

This Draft East African Standard specifies requirements and methods of sampling and test for automotive gasoline, Premium Motor Spirit (PMS), also commonly known as petrol, for use in spark ignition engines, including those equipped with devices to reduce emitted pollutants. The standard applies to PMS as manufactured, stored, transported and marketed.

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 D86, *Standard test method for distillation of petroleum products at atmospheric pressure*

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

ASTM D323, *Standard test method for vapour pressure of petroleum products (Reid Method)*

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

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

ASTM D1298, *Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*

ASTM D1319, *Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption*

ASTM D2622, *Standard Test Method for Sulphur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry*

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

ASTM D2700, *Standard Test Method for Motor Octane Number of Spark-Ignition Engine Fuel*

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

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

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

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

ASTM D5191, *Standard Test Method for vapour pressure of petroleum products (Mini method)*

ASTM D5443, *Standard Test Method for Paraffin, Naphthene, and Aromatic Hydrocarbon Type Analysis in Petroleum Distillates Through 200°C by Multi-Dimensional Gas Chromatography*

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*

ASTM D5599, *Standard Test Method for determination of oxygenates in gasoline by gas chromatography and oxygen selective flame ionization detection*

EN 237, *Liquid petroleum products — Petrol — Determination of low lead concentrations by atomic absorption spectrometry*

EN 238, *Liquid petroleum products — Petrol — Determination of the benzene content by infrared spectrometry*

EN 1601, *Liquid petroleum products — Unleaded petrol — Determination of organic oxygenate compounds and total oxygen content by gas chromatography (O-FID)*

EN 12177, *Liquid petroleum products — Unleaded Petrol — Determination of benzene content by gas chromatography*

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

EN 13132, *Liquid petroleum products — Unleaded petrol — Determination of organic oxygenate compounds and total organically bound oxygen content by gas chromatography using column switching*

EN 24260, *Petroleum products and hydrocarbons — Determination of Sulphur content — Wickbold combustion method*

IP 30, *Detection of mercaptans, hydrogen sulphide, elemental sulphur and peroxides — Doctor test method*

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

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

IP 154, *Petroleum products — Corrosiveness to copper — Copper strip test*

IP 336, *Petroleum products — Determination of sulphur content — Energy-dispersive-X-ray fluorescence method*

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

IP 429, *Liquid petroleum products — Petrol — Determination of the benzene content by infrared spectrometry*

ISO 1998, *Petroleum industry — Terminology (all parts)*

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

ISO 3405, *Petroleum products — Determination of distillation characteristics at atmospheric pressure*

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

ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test*

ISO 5163, *Petroleum products — Determination of knock characteristics of motor and aviation fuels — Motor method*

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

ISO 6246, *Petroleum products — Gum content of light and middle distillate fuels — Jet evaporation method*

ISO 7536, *Gasoline — Determination of oxidation stability of gasoline — Induction period method*

ISO 8754, *Petroleum products — Determination of sulphur content — Energy-dispersive X-ray fluorescence spectrometry*

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 standard, the terms and definitions given in ISO 1998 and the following apply.

3.1

additive

material added to PMS, usually in small amounts, to impart or enhance desirable properties or to suppress undesirable properties

3.2

marketable

distinct, acceptable smell for safe handling

3.3

marker

substances added to petroleum based products for traceability to protect them against theft or adulteration and also to distinguish between different fuels

3.4

dye

chemical added to fuel for visual identification

4 Requirements

4.1 General requirements

Automotive gasoline shall have

- a) a marketable odour, and
- b) an appearance that is clear, bright and free from suspended particles on visual inspection.

4.2 Specific quality requirements

Automotive gasoline shall comply with the limits specified in Table 1, when tested in accordance with the test methods listed therein.

Table 1 — Specific quality requirements for automotive gasoline

Property	Requirement		Test method
	Min.	Max.	
Research octane number, RON	93	–	ISO 5164 ASTM D2699
Motor octane number, MON	83	–	ISO 5163 ASTM D2700
Lead content, ppm	–	5	EN 237 ASTM D3237/IP 428
Benzene content, % v/v	–	1.0	EN 238/IP 429 EN 12177 ASTM D4420
Total aromatics, % v/v	42		ASTM D1319, ASTM D5580 ASTM D5443
Density (at 20 °C), kg/m ³	716	771	ISO 3675
Density (at 15 °C), kg/m ³	720	775	ASTM D4052 ASTM D1298
Sulphur content, ppm	–	50	EN 24260 ISO 8754
Manganese, ppm	–	2.0	ASTM D2622/IP 336 ISO 20847 ASTM D3831
Oxidation stability, min	360	–	ISO 7536/IP 40 ASTM D525
Existent gum content (solvent washed), mg/100 ml	–	5	ISO 6246 ASTM D381

Property	Requirement		Test method
	Min.	Max.	
Copper strip corrosion (3 h at 50 °C), rating	–	No.1 strip	ISO 2160/IP 154 ASTM D130
Mercaptan sulphur, % m/m	–	0.01	ASTM D3227
Oxygenates	Nil	Nil	EN 1601 EN 13132 ASTM D5599
RVP at 37.8 °C, kPa	–	65	ASTM D323 ASTM D5191 EN 13016-1
FVI ^b	–	93	ASTM D323
Distillation	To be reported		ASTM D86 IP 123
a) Temperature, °C for:			
• Initial boiling point			
• 10 % volume fraction evaporated	–	71	
• 50 % volume fraction evaporated	77	115	
• 90 % volume fraction evaporated	–	180	
• Final boiling point, °C	–	210	
b) Residue, % volume fraction	–	2.0	
c) Evaporated to 70 °C (E70), % volume fraction	To be reported		
Doctor test ^a	To be reported		ASTM D4952/IP 30

Property	Requirement		Test method
	Min.	Max.	
Colour	Red		Visual inspection
<p>^a If negative, no need to carry out Mercaptan sulphur test.</p> <p>^b The flexible volatility index (FVI) is an additional parameter which characterizes the volatility properties of petrol, and is calculated using the formula</p> $\text{FVI} = \text{RVP} + 0.7 \text{ E70}$ <p>where</p> <p>RVP is the Reid vapour pressure, in kilopascals; and</p> <p>E70 is the percentage volume fraction of petrol, evaporated to 70 °C.</p>			

5 Dyes and markers

The use of dyes and markers is allowed.

The dye content shall be reported and shall not alter any parameters of PMS out of the specified range as indicated under Table 1.

6 Additives

In order to improve the fuel performance, the use of additives is allowed. 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 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:

- concerning sulphur, ISO 20847 is unsuitable as an arbitration method;
- concerning benzene content, EN 12177 shall be used;
- concerning oxygen and oxygenates content, EN 1601 shall be used; and
- concerning density, ISO 3675 shall be used.

8 Packing and marking

8.1 Packing

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 normal transportation and storage. The containers shall be acceptably sealed or leak proof, clean, and free from materials soluble in diesel.

8.2 Marking

8.2.1 The following information shall appear in legible and indelible marking on each drum or in the case of petrol filled into bulk storage tanks, in the storage and consignment documents of each road tanker or rail tank wagon:

- a) the supplier's name or brand name or trade mark; and receiver's name;
- b) the words — UNLEADED PETROL/UNLEADED GASOLINEII, or —UNLEADED MOGASII ;
- c) the batch/lot number;
- d) .the quantity in litres or metric tonnes;
- e) the warning —FLAMMABLE MATERIALSII; and
- f) the warning —DANGER PETROLII;

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

8.2.3 Information to be marked on dispensing pumps used for delivering PMS, and the dimensions of the mark shall be in accordance with the requirements of the relevant weights and measures regulations for each member state for the marking of pumps for unleaded petrol.

9 Sampling

9.1 Sampling from storage tanks

Sampling from storage tanks for the purposes of this East African Standard shall be carried out in accordance with relevant procedures of ISO 3170 and ISO 3171 and, additionally, as detailed in 9.2.

9.2 Sampling from petrol pumps

The construction of the cans shall comply with the appropriate safety requirements for cans that are to hold highly flammable materials. They shall be provided with screw caps incorporating a petroleum resistant washer in good condition. A stock of cans shall be kept solely for the purpose of taking gasoline samples.

9.2.1 Sampling cans

Sampling cans shall be of 1-L capacity.

9.2.2 Preparation of cans

New cans shall be rinsed with gasoline before being used, to remove any residual traces of oil left during manufacturing operations or previous sampling, and then allowed to dry. Before use, all cans shall be checked to ensure that they are sound and free from leaks.

9.2.3 Sampling procedure

From the pump nozzle, 1 L gasoline shall be drawn carefully into a cool 1 L can using a clean dry funnel. Immediately afterwards, this sample shall be decanted carefully into the requisite number of 5-L can, using a funnel, filling the cans within 5 mm of the brim.

If more than 1 L is needed, the operation shall be repeated immediately and before the pump has been used for any other purpose. The screw caps shall be tightened fully and the cans checked to ensure that there are no leaks. The sampling procedure shall not be carried out in direct sunlight.

NOTE 1 If carried out in direct sunlight, changes in fuel quality, especially octane level, may occur

NOTE 2 A quantity of 1 L is sufficient for the determination of octane number and certain other tests, but it is advisable to provide each laboratory with 2 L of sample in case further work is needed; it is essential that these 2 L be of identical material.

9.2.5 Storage, labelling and transport

Samples shall be kept in a cool place although it is not necessary to keep them refrigerated. If left in direct sunlight there is a danger that the cans will balloon. Full and legible information relating to the source of the sample shall be attached to the can in such a manner that it will not easily become detached subsequently.

NOTE 1 If required, the sample may be sealed and labelled to maintain its legal integrity.

NOTE 2 If the sample has to be sent to a laboratory by public transport, it will be necessary to comply with the general regulations covering transportation of flammable materials and with the requirements of the transport regulations of petroleum products.

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Bibliography

- [1] ASTM D 1613, *Standard test method for acidity in volatile solvents and chemical intermediates used in paint, varnish, lacquer, and related products*
- [2] ASTM D4953, *Standard test method for vapour pressure of gasoline and gasoline-oxygenate blends (dry method)*
- [3] BS EN 228:2017 *Automotive fuels — Unleaded petrol — Requirements and test methods*
- [4] EN 14517, *Liquid petroleum products — Determination of hydrocarbon types and oxygenates in petrol — Multidimensional gas chromatography method*
- [5] ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*
- [6] ISO 20884, *Petroleum products — Determination of sulfur content of automotive fuels — Wavelength-dispersive X-ray fluorescence spectrometry*
- [7] ISO 20846, *Petroleum products — Determination of sulfur content of automotive fuels — Ultraviolet fluorescence method*
- [8] SANS 1598:2006, *Unleaded petrol*

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