KENYA STANDARD

DKS 2227:2021

ICS 67.080.20

Second Edition

Petroleum and petroleum products— Automotive biodiesel fuel — 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.

This second edition cancels and replaces the first edition (KS 2227:2010), which has been technically revised.

Biodiesel is an ester (more generally methyl ester) usually produced from vegetable oil.

Vegetable oils are obtained classically by simple pressing of oilseeds, such as jatropha seeds, rapeseeds, sunflower, soybeans, etc. All of these oils, however, offer too much viscosity and a cetane number (the ability to auto-ignition) too low, making their direct use in traditional diesel engine difficult.

In order to obtain similar characteristics with respect to conventional fossil diesel fuel, such vegetable oils must undergo a reaction of transesterification with an alcohol (usually methanol, CH3OH) in the presence of a catalyst, usually potassium hydroxide (KOH) or sodium (NaOH). It should be noted that the use of ethanol is also considered, but very rarely used on a commercial scale. The transesterification reaction is carried out at moderate temperature (20-80 °C) and atmospheric pressure.

The production of biodiesel is relatively simple from a technical standpoint, which also allows the construction of small decentralized production units without excessive extra costs. Such a situation represents a definite advantage, thus limiting the transport of raw materials and permitting, in a transition phase, to start with modest sized installations

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Petroleum and petroleum products —Automotive biodiesel fuel — Specification

1 Scope

This Draft Kenya Standard specifies requirements, sampling and test methods for marketed and delivered fatty acid methyl esters (FAME)/ biodiesel to be used either as automotive fuel for diesel engines at 100% concentration, or as an extender for automotive fuel for diesel engines. At 100% concentration, it is applicable to fuel for use in diesel engine vehicles designed or subsequently adapted to run on 100% FAME/biodiesel

2 Normative references

The following referenced 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.

EN 116, Diesel and domestic heating fuels – Determination of cold filter plugging point

EN 590, Automotive fuels - Diesel - Requirements and test methods

EN 12662, Liquid petroleum products - Determination of contamination in middle distillates

EN 14103, Fat and oil derivatives - Fatty Acid Methyl Esters (FAME) – Determination of ester and linolenic acid methyl ester contents

EN 14104, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) - Determination of acid Value

EN 14105, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) – Determination of free and total glycerol and mono-, di-, triglyceride contents - Reference method

EN 14106, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) – Determination of free glycerol content

EN 14107, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) – Determination of phosphorus content by inductively coupled plasma (ICP) emission spectrometry

EN 14108, Fat and oil derivatives - Fatty Acid Methyl Esters (FAME) – Determination of sodium content by atomic absorption spectrometry

EN 14109, Fat and oil derivatives - Fatty Acid Methyl Esters (FAME) – Determination of potassium content by atomic absorption spectrometry

EN 14110, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) - Determination of methanol content

EN 14111, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) – Determination of iodine value

EN 14112, Fat and oil derivatives - Fatty Acid Methyl Esters (FAME) - Determination of oxidation stability (accelerated oxidation test)

EN 14538, Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) – Determination of Ca and Mg content by optical emission spectral analysis with inductively coupled plasma (ICP OES)

ISO 2160, Petroleum products - Corrosiveness to copper - Copper strip test (ISO 2160:1998)

ISO 3104, Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104:1994. incl. ISO Tech. Cor. No 1)

ISO 3170, Petroleum liquids – Manual sampling (ISO 3170:1988/A1:1998)

ISO 3171, Petroleum liquids – Automatic pipeline sampling (ISO 3171:1988)

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 5165, Petroleum products - Determination of the ignition quality of diesel fuels – Cetane engine method

ISO 10370, Petroleum products - Determination of carbon residue (micro method)

ISO 12185, Crude petroleum and petroleum products - Determination of density - Oscillating U tube method

EN ISO 12937, Petroleum products - Determination of water - Coulometric Karl Fisher titration method

ISO 13759, Petroleum products – Determination of alkyl nitrate in diesel fuels –Spectrometric method

EN ISO 20846, Petroleum products – Determination of total sulfur content of liquid petroleum products – Ultraviolet fluorescence method

ISO 20884, Petroleum products – Determination of low sulfur content of automotive fuels – Wave length dispersive X-ray fluorescence spectrometry

ISO/DIS 3679, Petroleum products - Determination of flash point - Rapid equilibrium closed cup method

ISO 3987, Petroleum products - Lubricating oils and additives - Determination of sulfated ash

ASTM D 1160, Distillation of Petroleum Products at Reduced Pressure

ASTM D93, Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

3 Terms and definitions

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

3.1
additive
compound added to the biodiesel fuel to improve either the performance of the biodiesel or its storage stability or both

3.2
biodiesel
fuel comprised of methyl esters of long chain fatty acids derived from vegetable oils

3.3
dyes
chemicals added to fuels for visual identification

3.4
markers
substances added to fuels for traceability to protect them against theft or adulteration and also to distinguish between different fuels

4 Requirements

4.1 General

4.1.1 The automotive biodiesel fuel shall contain, principally, mono-alkyl methyl esters of long chain fatty acids derived from vegetable oil.

4.1.2 Suitable fuel additives without known side effects may be used to help avoid deterioration of driveability and emissions control durability. Other technical means that exhibit an effect equivalent to that of additives can also be used.

4.1.3 The fuel may contain small quantities of colouring materials which are documented as harmless to give it a distinctive colour.

4.1.4 The fuel shall be clear and free of visible water, sediment, suspended matter and any other contaminant that is documented as likely to cause malfunctioning of equipment designed to use this type of fuel, either as a blend or in its 100 % concentration form.

4.2 Physical and chemical properties

The fuel shall comply with all the requirements given in Table 1 when tested in accordance with the methods provided therein.

NOTE: In case of a need for identification of biodiesel, it is recommended that a method based on the characterization of fatty acid methyl esters by LG/GC, in accordance with EN 14331, be used.

Table 1 — Requirements for automotive biodiesel fuel

1	2	3
Property	**Requirements**	**Test method**
FAME content[a], % mass fraction , min	96,5[b]	EN 14103
Density at 20 °C , kg/m^3	860 - 900	ISO 3675 ISO 12185
Kinematic viscosity at 40 °C, mm^2/s	3,5 – 5,0	ISO 3104
Flash point, °C, min.	101	ISO 3104 ASTM D93
Sulphur content, mg/kg, max.	10,0	ISO 20846 ISO 0884
Carbon residue (on 10% distillation residue), % mass fraction, max.	0,3	ISO 10370
Cetane Number, min.	51,0	ISO 5165
Sulphated ash content, % mass fraction, max.	0,02	ISO 3987
Water content, % mass fraction, max.	0,05	ISO 12937
Total contamination, mg/kg, max.	24	EN 12662
Copper strip corrosion (3 h at 50 °C), rating, max.	Class 1	ISO 2160
Oxidation stability, at 110 °C, h, min.	6	EN 14112
Acid value, mg KOH/g, max.	0,5	EN 14104
Iodine value, g of iodine/100 g of FAME, max.	120	EN 14111
Linolenic acid methyl ester, % mass fraction, max.	12	EN 14103
Polyunsaturated (>= 4 double bonds) methyl ester , %, mass fraction, max.	1	- No test method
Methanol content, % mass fraction, max.	0,2	EN 14110
Monoglyceride content, % fraction max.	0,8	EN 14105
Diglyceride content, % mass fraction, max.	0,2	EN 14105
Triglyceride content , mass fraction, max.	0,2	EN 14105
Free glycerol, % mass fraction, max.	0,02	EN 14105 EN 14106
Total glycerol, % mass fraction, max.	0,25	EN 14105
Group I metals (total of Na and K), mg/kg, max.	5,0	EN 14108 EN 14109
Group II metals (total of Ca and Mg)	5,0	prEN 14538[l]
Phosphorus content, mg/kg, max	5	EM 14107
Cold Filter Plugging Point (CFPP), max	6	EN 116

5 Packing

Except when transported in bulk, the biodiesel shall be packed in sound, clean, dry drums not deleteriously affected by the biodiesel. The drums shall be so closed that leakage and contamination of the biodiesel is prevented during normal handling and transport.

6 Marking

The following information shall appear in prominent, legible and indelible marking on each drum or, in the case of biodiesel filled in bulk storage tanks or bulk carriers, in the storage and consignment documents of each bulk carrier:

a) the manufacturer's (or the supplier's) name or the brand name of the product or both;

b) a description of the product, i.e. "BIODIESEL FUEL – PURE";

c) batch identification; and

d) the quantity of the contents.

7 Sampling

Samples shall be taken as described in KS ISO 3170 or KS ISO 3171.

In view of the sensitivity of some of the test methods referred to in this Kenya Standard, particular attention shall be paid to compliance with any guidance on sampling containers, which is included in the test method standard.

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