

Base oil — Specification

PUBLIC REVIEW DRAFT

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Foreword

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

Lubricating base oils are lubricant components that provide an oil layer between moving surfaces, and remove heat and wear particles while keeping friction and wear at minimum. To fulfill these requirements, base oils shall possess certain lubricant properties. These properties are in turn dependent on the chemical composition and structures of the hydrocarbon molecules present in the base oil, which are controlled by the refining process and the degree of refining of the base stock.

Lubricant base oils shall be free of PCB (polychlorinated biphenyl) compounds to be suitable for use in commerce. Historically, it has been demonstrated that PCBs are not present in lubricant base oils manufactured from virgin crude petroleum sources.

Lubricant base oils should be essentially free of volatile organic halides because capable refining and re-refining processes would effectively remove all traces of these materials. The presence of volatile organic halides in lubricant base oils indicates contamination with chlorinated solvents.

Lubricant base oils should be essentially free of metallic elements. Sources of metallic elements potentially present in lubricant base oils include crude oil, refining or processing aids, residual lubricant additives, and residual corrosion or wear metals not removed in the re-refining process.

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1 Scope

This Kenya Standard covers the specifications and methods of test for base oils composed of hydrocarbons and intended for use in formulating products including automotive and industrial lubricants.

NOTE This standard applies only to hydrocarbon lubricant base oils. Base oils containing detectable levels of esters, animal fats, vegetable oils, or other materials used as, or blended into, lubricants are not covered by this standard.

2 Normative references

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

ASTM D 91, *Standard test method for precipitation number of lubricating oils*

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

ASTM D 97, *Standard Test Method for pour point of petroleum products*

ASTM D 130, *Standard test method for corrosiveness to copper from petroleum products by copper strip test*

ASTM D 445, *Standard test method for kinematic viscosity of transparent and opaque liquids (and calculation of dynamic viscosity)*

ASTM D 524, *Standard test method for rams bottom carbon residue of petroleum products*

ASTM D 664, *Standard test method for acid number of petroleum products by potentiometric titration*

ASTM D 974, *Standard test method for acid and base number by color-Indicator titration*

ASTM D1298, *Standard test method for density, relative density, or API Gravity of crude petroleum and liquid petroleum products by hydrometer method*

ASTM D1401, *Standard test method for water separability of petroleum oils and synthetic fluids*

ASTM D 1500, *Standard test method for ASTM color of petroleum products (ASTM color scale)*

ASTM D 1744, *Standard test method for determination of water in liquid petroleum products by Karl Fischer reagent*

ASTM D2007, *Standard test method for characteristic groups in rubber extender and processing oils and other petroleum-derived oils by the Clay-Gel absorption chromatographic method*

ASTM D 2270, *Standard Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 and 100°C*

ASTM D 2622, *Standard test method for sulfur in petroleum products by wavelength dispersive x-ray fluorescence spectrometry*

ASTM D 2887, *Standard test method for boiling range distribution of petroleum fractions by gas chromatography*

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ASTM D 3120, *Standard test method for trace quantities of sulfur in light liquid petroleum hydrocarbons by oxidative microcoulometry*

ASTM D 4052, *Standard test method for density, relative density, and api gravity of liquids by digital density meter*

ASTM D 4059, *Standard test method for analysis of polychlorinated biphenyls in insulating liquids by gas chromatography*

ASTM D 4291, *Standard test method for trace ethylene glycol in used engine oil*

ASTM D 4294, *Standard test method for sulfur in petroleum and petroleum products by energy dispersive x-ray fluorescence spectrometry*

ASTM D 4629, *Standard test method for trace nitrogen in liquid petroleum hydrocarbons by syringe/inlet oxidative combustion and chemiluminescence detection*

ASTM D 4739, *Standard test method for base number determination by potentiometric hydrochloric acid titration*

ASTM D 4927, *Standard test methods for elemental analysis of lubricant and additive components — barium, calcium, phosphorus, sulfur, and zinc by wavelength-dispersive x-ray fluorescence spectroscopy*

ASTM D 4929, *Standard test methods for determination of organic chloride content in crude oil*

ASTM D 4951, *Standard test method for determination of additive elements in lubricating oils by inductively coupled plasma atomic emission spectrometry*

ASTM D 5185, *Standard test method for determination of additive elements, wear metals, and contaminants in used lubricating oils and determination of selected elements in base oils by inductively coupled plasma atomic emission spectrometry (ICP-AES)*

ASTM D 5480, *Standard test method for engine oil volatility by gas chromatography*

ASTM D 7042, *Standard test method for dynamic viscosity and density of liquids by stabinger viscometer (and the calculation of kinematic viscosity)*

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

base oil

a base stock or a blend of two or more base stocks used to produce finished lubricants, usually in combination with additives

3.2

base stock

a hydrocarbon lubricant component, other than an additive, that is produced by a single manufacturer to the same specifications (independent of feed source or manufacturer's location), and that is identified by a unique formula number or product identification number, or both

4 Requirements

4.1 Physical properties

The base oil shall meet the physical properties detailed in Table 1.

Table 1 — Physical properties

SL No.	Physical property	Requirement	Test method
i)	Appearance	Bright and clear	visual
ii)	Colour, max.	6	D1500
iii)	Density at 15 °C ,kg/L, min.	To be reported	D1298, D4052
iv)	Flash point, °C, min.	180	D92
v)	Kinematic viscosity at 40 °C and 100 °C, mm ² /s (cSt)	To be reported	D445, D7042
vi)	Viscosity index, min.	90	D2270
vii)	Pour points, °C, max.	-6	D97

4.2 Compositional properties

The base oil shall meet the compositional properties detailed in Table 2.

Table 2 — Compositional properties

SI No.	Property	Requirement	Test method
i)	Micro carbon residue, %, mass, max	0.8 Max.	D4530
ii)	Sulfur, wt % , max	1.8 Max.	D2622, D4294, D3120

4.3 Chemical properties

The base oil shall meet the chemical properties detailed in table 3 below;

Table 3 — Chemical properties

SL No.	Property	Requirement	Test method
i)	Acid number, mg KOH/g, max	0.10	D974 D664
ii)	Base number, mg KOH/g, max	1.2	D4739 D2896
iii)	Total chlorine, mg/kg, max	50	D4929
iv)	Copper corrosion 3 h at 100°C, max	+1	D130
v)	Elemental analysis, mg/kg: Mg, Na, Ba, Cu, B, Pb, Mn, Ni, Si		D5185

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	Al, As, Cd, Ca, Fe, P, Zn, Cr, Sn, Total of all above elements, mg/kg, max	25	(Also, D4628, D4927, D4951 have limited applicability)
vi)	Glycol, mg/kg, max	5	D4291
vii)	PCB (polychlorinated biphenyl) content, mg/kg, max	2	D4059
viii)	Total volatile organic halogens, mg/kg, max	5	EPA 8120
ix)	Water, mg/kg, max	150	D1744, D6304
x)	Ash wt % , max	0.01	D 482

5 Packaging and marking

5.1 Packaging

The condition of each container for the base oil 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 base oil from the same batch, shall be packaged together.

5.2 Marking

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

- the name and address the manufacturer or supplier;
- the description of the product;
- batch number/identification;
- quantity; and
- date of manufacture and expiry