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Bencinsko gorivo za male motorje z notranjim zgorevanjem - Zahteve in preskusne metode

Petrol fuel for small internal combustion engines - Requirements and test methods

Kraftstoffe für Verbrennungsmotoren - Alkylatkraftstoff für Kleinmotoren - Anforderungen und Prüfverfahren

Essences pour petits moteurs à combustion interne - Exigences et méthodes d'essai

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Petrol fuel for small internal combustion engines - Requirements and test methods

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Exigences et méthodes d'essai

Benzin für Kleinmotoren - Anforderungen und
Prüfverfahren

This European Standard was approved by CEN on 7 May 2023.

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Contents	Page
European foreword	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Pump marking	7
5 Requirements and testing	7
5.1 General requirements	7
5.2 Two-stroke oil	7
5.3 Dyes and markers	7
5.4 Additives	7
5.4.1 General	7
5.4.2 Metallic octane boosters	7
5.4.3 Phosphorus	7
5.5 Generally applicable requirements and test methods	7
5.6 Climatically dependent requirements and test methods - Volatility requirements	9
5.7 Expression of results for the octane number	9
5.8 Precision and case of dispute	10
5.8.1 Resolution of disputes	10
5.8.2 Information on test methods in case of dispute	10
Annex A (normative) A method for separating the oil fraction	11
Annex B (normative) Determination of oil content volume in petrol for two-stroke engines	12
B.1 General	12
B.2 Procedure	12
B.3 Precision	12
Annex C (normative) Pump labelling	13
Bibliography	14

European foreword

This document (EN 17867:2023) has been prepared by Technical Committee CEN/TC 19 “Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2023, and conflicting national standards shall be withdrawn at the latest by December 2023.

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

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Introduction

This document is intended to provide a quality standard for petrol fuels for small engines with the aim of reducing emissions for industrial safety and environmental reasons and extending the lifetime of devices.

Petrol fuels from an alkylate production process as specified in this document are mainly composed of paraffinic hydrocarbons, contain only small amounts of olefins and are substantially free of aromatic compounds, especially benzene. They are oxygen free, low in sulfur and are mainly used for small engines (chain saws, mowing machines etc.) requiring pure petrol fuels or petrol fuels with an admixture of engine oil depending on the design of the engine. Typically these fuels are produced in alkylation units but other production methods are possible.

This document describes both a petrol fuel for externally lubricated four-stroke engines and a petrol fuel for mixture-lubricated engines containing a lubricating oil component.

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1 Scope

This document specifies requirements on petrol fuel for use as fuel in small engines, together with the methods to be applied for testing these properties.

This document specifies requirements for two types of petrol fuel having low aromatics and sulfur content:

- one type for use in four-stroke engines with separate lubrication; and
- one mixed petrol fuel type for use in mixture-lubricated engines.

Testing the properties of the added engine oil is out of the scope of this document.

NOTE For the purposes of this document, the terms “% (m/m)” and “% (V/V)” are used to represent respectively the mass fraction and the volume fraction.

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.

EN 13016-1:2018, *Liquid petroleum products - Vapour pressure - Part 1: Determination of air saturated vapour pressure (ASVP) and calculated dry vapour pressure equivalent (DVPE)*

EN 13016-3:2018, *Liquid petroleum products - Vapour pressure - Part 3: Determination of vapour pressure and calculated dry vapour pressure equivalent (DVPE) (Triple Expansion Method)*

EN 16942, *Fuels - Identification of vehicle compatibility - Graphical expression for consumer information*

EN ISO 2160, *Petroleum products - Corrosiveness to copper - Copper strip test (ISO 2160)*

EN ISO 3405:2019, *Petroleum and related products from natural or synthetic sources - Determination of distillation characteristics at atmospheric pressure (ISO 3405:2019)*

EN ISO 3675, *Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method (ISO 3675)*

EN ISO 4259-2, *Petroleum and related products - Precision of measurement methods and results - Part 2: Interpretation and application of precision data in relation to methods of test (ISO 4259-2)*

EN ISO 5163:2014, *Petroleum products - Determination of knock characteristics of motor and aviation fuels - Motor method (ISO 5163:2014)*

EN ISO 5164:2014, *Petroleum products - Determination of knock characteristics of motor fuels - Research method (ISO 5164:2014)*

EN ISO 6246:2017¹, *Petroleum products - Gum content of fuels - Jet evaporation method (ISO 6246:2017)*

EN ISO 12185, *Crude petroleum and petroleum products - Determination of density - Oscillating U-tube method (ISO 12185:1996)*

EN ISO 20846:2019, *Petroleum products - Determination of sulfur content of automotive fuels - Ultraviolet fluorescence method (ISO 20846:2019)*

¹ As impacted by EN ISO 6246:2017/A1:2019.

EN 17867:2023 (E)

EN ISO 20884:2019, *Petroleum products - Determination of sulfur content of automotive fuels - Wavelength-dispersive X-ray fluorescence spectrometry (ISO 20884:2019)*

EN ISO 22854:2021, *Liquid petroleum products - Determination of hydrocarbon types and oxygenates in automotive-motor gasoline and in ethanol (E85) automotive fuel - Multidimensional gas chromatography method (ISO 22854:2021)*

ISO 13738, *Lubricants, industrial oils and related products (class L) — Family E (Internal combustion engine oils) — Specifications for two-stroke-cycle gasoline engine oils (categories EGB, EGC and EGD)*

ASTM D5134, *Standard Test Method for Detailed Analysis of Petroleum Naphthas through n-Nonane by Capillary Gas Chromatography*

JASO M345, *Two-stroke-cycle gasoline engine — Engine oils — Classifications*

3 Terms and definitions

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

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1
small engine
positive-ignition engine with a reference performance below 19 kW intended for use in both hand-held machines and devices, and ground-based machines and devices

Note 1 to entry: Hand-held machines are devices such as chain saws, brush cutters, blowing equipment etc. and ground-based machines are devices such as mowing machines, snow mobiles, ride-on mowers, shredders, motor hoes, etc.

3.2
alkylate production process
highly branched isoparaffin mixtures gained by alkylation of C4 olefins in the presence of concentrated sulfuric acid/hydrofluoric acid or strongly acidic zeolite catalysts at relatively low temperatures

Note 1 to entry: Alkylate-based petrol fuels are largely composed of C8 isoparaffins and often contain isooctane as major part.

3.3
base petrol fuel
petrol fuel without two-stroke oil (3.4)

3.4
two-stroke oil
engine oil used to mix with base petrol fuel to produce two-stroke petrol fuel

3.5
two-stroke mixture
petrol fuel with two-stroke oil (3.4)

Note 1 to entry: Content of two-stroke oil is calculated without consideration of the solvent serving as solubilising agent.

4 Pump marking

Information to be marked on dispensing pumps and nozzles used for delivering small engine petrol fuel, and the dimensions of the mark shall be in accordance with EN 16942 and Annex C.

5 Requirements and testing

5.1 General requirements

Petrol fuel shall be free from any adulterant or contaminant that can render the fuel unacceptable for use in small engines designed to run on petrol fuel for small engines. Synthetic hydrocarbons and renewable hydrocarbons are allowed in any proportions provided that the final blend complies with the requirements of this document.

The co-processing of renewable feedstock at refineries is also allowed provided that the final petrol fuel meets the requirements of this document.

5.2 Two-stroke oil

The two-stroke oil used shall comply with at least one of the following specifications as classified in JASO M345 (JASO FB/FC/FD) or ISO 13738 (ISO-L-EGB/EGC/EGD).

Relating to the sulphated ash content the limit values of JASO FD or ISO-L-EGD apply.

5.3 Dyes and markers

The use of dyes and markers is permitted provided that they do not cause harmful side effects to engines and fuel distribution systems.

5.4 Additives

5.4.1 General

In order to improve the performance quality the use of additives is allowed. The addition of suitable additives without known harmful side effects is permitted if they help to improve the performance of the petrol fuel in the engine.

5.4.2 Metallic octane boosters

The use of organometallic boosters like methylcyclopentadienyl manganese tricarbonyl (MMT), lead or ferrocene is not permitted.

5.4.3 Phosphorus

In order to protect catalyst systems, phosphorus-containing additives shall not be used in petrol fuel or two-stroke mixture for small engines.

5.5 Generally applicable requirements and test methods

When tested by the methods indicated in Table 1, petrol fuel for small engines shall be in accordance with the limits specified in Table 1. The test methods listed in Table 1 have been found applicable to the fuel, either by full assessment or by theoretical evaluation.

Table 1 — Generally applicable requirements and test methods

Property	Unit	Limit value for base petrol fuel		Limit value for two-stroke mixture		Test methods
		min	max	min	max	
Research octane number, RON		93,0	-	93,0 ^b	-	EN ISO 5164:2014 ^e
Motor octane number, MON		90,0	-	90,0 ^b	-	EN ISO 5163:2014 ^{a e}
Density at 15 °C	kg/m ³	680,0	720,0	680,0	720,0	EN ISO 3675 EN ISO 12185 ^h
Sulfur content	mg/kg	-	10,0	-	20,0	EN ISO 20884:2019 ^h EN ISO 20846:2019
Copper strip corrosion (3 h at 50 °C)		-	1	-	1 ^b	EN ISO 2160
Appearance		clear and bright				visual inspection
Olefin content	% (V/V)	-	1,0	-	1,0 ^b	EN ISO 22854:2021 ^c
Aromatic content	% (V/V)	-	1,0	-	1,0 ^b	EN ISO 22854:2021 ^c
Benzene content	% (V/V)	-	0,08	-	0,08 ^b	EN ISO 22854:2021 ^c
Oxygen content	% (m/m)	-	0,10	-	0,10 ^a	EN ISO 22854:2021 ^c
n-Hexane content	% (V/V)	-	0,5	-	0,5 ^b	EN ISO 22854 ^c ASTM D5134
Cyclohexane compounds (≤C8)	% (V/V)	-	2,0	-	2,0 ^b	EN ISO 22854 ^c
Vapour pressure (DVPE) ^f	kPa	55,0	65,0	55,0	65,0	EN 13016-1:2018 ^h EN 13016-3:2018
Distillation						EN ISO 3405:2019
Evaporated at 70 °C, E70	% (V/V)	15,0	42,0	15,0 ^b	42,0 ^b	
Evaporated at 100 °C, E100	% (V/V)	40,0	72,0	40,0 ^b	72,0 ^b	
Evaporated at 150 °C, E150	% (V/V)	75,0	-	75,0 ^b	-	
Final boiling point, FBP	°C	-	200,0	-	200,0 ^b	
Distillation residue ^j	% (V/V)	-	1	-	3	
Two-stroke oil content ^g	% (V/V)	-	-	1,5	2,0	EN ISO 6246 ^d