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AGREEMENT

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Automotive fuels - Ethanol E85 - Requirements and test methods

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Foreword

This CEN/CENELEC Workshop Agreement lays down requirements for ethanol-gasoline blends as delivered by the supplier for use in so-called flex-fuel vehicles.

This Workshop Agreement has been prepared under a Mandate given to CEN by the European Commission, and supports EU Directive(s) [1].

This CEN Workshop Agreement is based on current knowledge at the time of publishing, but will require revision when the specification for ethanol as a blending component has been determined by the CEN TC19/WG21 Ethanol Task Force and / or revisions to the specification EN228 Unleaded Petrol occur and / or based on further experiences with the use of Ethanol E85.

In this edition of CWA 15293 all relevant characteristics, requirements and test methods are specified. These specifications are relevant for the driveability of the vehicles and are currently known to prevent harm to the vehicles and their powertrains. National adaptations of this document may choose differently based on either local conditions and / or updated knowledge.

This CEN/CENELEC Workshop Agreement has been prepared by a Workshop, the Secretariat of which is held by the Netherlands Standardization Institute (NEN), with the following participants:

- Abengoa Bioenergia - Spain;
- BioAlcohol Fuel Foundation (BAFF) - Sweden;
- Compañía Logística de Hidrocarburos (CLH) – Spain;
- Ethanol Union – France;
- Ford Motor Company – United Kingdom;
- Royal Nedalco – the Netherlands;
- Sekab – Sweden.

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The date of acceptance for this Workshop Agreement was 23 March 2005.

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Comments or suggestions from the users of this CEN Workshop Agreement are welcome and should be addressed to the CEN Management Centre.

1 Scope

This CEN Workshop Agreement specifies requirements and test methods for marketed and delivered Ethanol E85. It is applicable to Ethanol E85 for use in spark ignition engine vehicles designed to run on Ethanol E85.

Ethanol E85 is a mixture of nominally 85% ethanol and petrol, called E85, but also including the possibility of having different 'seasonal grades' containing more than 70 % ethanol.

NOTE For the purposes of this CEN Workshop Agreement, the terms "% (m/m)" and "% (V/V)" are used to represent respectively the mass fraction and the volume fraction.

2 Normative references

This Workshop Agreement incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Workshop Agreement only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 228, *Automotive fuels – Unleaded petrol – Requirements and test methods*

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

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 ISO 2160, *Petroleum products — Corrosiveness to copper — Copper strip test (ISO 2160:1998).*

EN ISO 3170, *Petroleum liquids – Manual sampling (ISO 3170:2004).*

EN ISO 3171, *Petroleum liquids — Automatic pipeline sampling (ISO 3171:1988).*

EN ISO 3405, *Petroleum products — Determination of distillation characteristics at atmospheric pressure (ISO 3405:2000).*

EN ISO 5163, *Petroleum products — Determination of knock characteristics of motor and aviation fuels — Motor method (ISO 5163:2005).*

EN ISO 5164, *Petroleum products — Determination of knock characteristics of motor fuels — Research method (ISO 5164:2005).*

EN ISO 6246, *Petroleum products — Gum content of light and middle distillate fuels — Jet evaporation method (ISO 6246:1995).*

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

EN ISO 20846, *Petroleum products – Determination of total sulfur content of automotive fuels – Ultraviolet Fluorescence Method (ISO 20846:2004).*

EN ISO 20884, *Petroleum products – Determination of sulfur content of automotive fuels – Wavelength-dispersive X-ray fluorescence spectrometry (ISO 20884:2004)*.

ASTM D 512, *Standard Test Methods for Chloride Ion In Water*.

ASTM D 1613, *Standard test method for acidity in volatile solvents and chemical intermediates used in paint, varnish, lacquer, and related products*.

ASTM D 3231, *Standard Test Method for Phosphorus in Gasoline*.

ASTM D 6423, *Standard Test Method for Determination of pH of Ethanol, Denatured Fuel Ethanol, and Fuel Ethanol (Ed75-Ed85)*

ASTM E 1064, *Standard Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration*.

3 Sampling

Samples shall be taken as described in EN ISO 3170 or EN ISO 3171 and/or in accordance with the requirements of national standards or regulations for the sampling of unleaded petrol.

NOTE Such requirements shall be set out in detail or shall be referred to by reference by the user of the product or by authorities allowing the product on the market

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

It is essential that for sampling of Ethanol E85 the containers used to take and store the samples before test are not contaminated with sulfur.

4 Pump marking

Information to be marked on dispensing pumps used for delivering Ethanol E85, and the dimensions of the mark shall be in accordance with the requirements of national standards or regulations for the marking of pumps for Ethanol E85.

NOTE 1 Such requirements shall be set out in detail or shall be referred to by reference by the user of the product or by authorities allowing the product on the market.

NOTE 2 The recommended designation for Ethanol E85 and its seasonal derivatives is "E85".

5 Requirements and test methods

5.1 Dyes and markers

The use of dyes and markers is allowed.

5.2 Additives

In order to improve the performance quality the use of additives is allowed. Suitable fuel additives without known harmful side-effects are recommended in the appropriate amount, to help to avoid deterioration of driveability and emissions control durability. Other technical means with equivalent effect may also be used.

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NOTE Deposit forming tendency test methods suitable for routine control purposes have not yet been identified and developed.

5.3 Phosphorus, iron, manganese, lead

In order to protect automotive engines and/or catalyst systems, compounds containing phosphorus and/or iron and/or manganese and/or lead shall not be added in Ethanol E85.

5.4 Denaturants

The presence of petrol that conforms with EN 228 is generally considered sufficient to render E85 a denatured product. If the presence of petrol is not recognized as a denaturant of ethanol by the relevant national authority, to avoid material compatibility issues with automotive engines and fuel systems, it is recommended that only methyltertiobutylether (MTBE) and/or ethyltertiobutylether (ETBE) and/or isobutanol and/or tertiary-butyl alcohol (TBA) are used as denaturants.

Any or all of these denaturants may be used alone or together, except isobutanol that is easily removed, where it is advisable to use it in combination with another denaturant.

The quantity (ies) of denaturant(s) is (are) to be decided by national authorities.

NOTE The recommendations of ASTM D 4806 [2] regarding denaturants should be adhered to.

5.5 Generally applicable requirements and test methods

When tested by the methods indicated in Tables 1 and 2, Ethanol E85 shall be in accordance with the limits specified in Tables 1 and 2.

5.6 Climatically dependent requirements and test methods

5.6.1 Water tolerance

Given the known potential for some automotive gasolines to absorb water, suppliers shall ensure that no water segregation occurs under the range of climatic conditions experienced in the country concerned. When there is a risk of water separation, anti-corrosion additives shall be incorporated.

The solubility of hydrocarbon in Ethanol E85 and blends with petrol as may occur in multifuel-capable vehicles decreases with lowering temperature and increasing water content. Separation of the hydrocarbon from the fuel will adversely affect cold starting and driveability and denaturing. Water may affect the calibration of some types of composition sensors of multifuel-capable vehicles.

Table 1 — Requirements and test methods for Ethanol E85

Property	Units	Limits		Test method ^a See 2. Normative references
		Min.	Max.	
Research octane number, RON		95,0	--	EN ISO 5164
Motor octane number, MON		85,0	--	EN ISO 5163
Sulfur content ^b	mg/kg	--	20 ^c	EN ISO 20846 EN ISO 20884
Oxidation stability	minutes	360	--	EN ISO 7536
Existent gum content (solvent washed)	mg/100 ml	--	5	EN ISO 6246
Appearance This shall be determined at ambient temperature or 15°C whichever is higher.		Clear and bright, visibly free of suspended or precipitated contaminants		Visual inspection
Higher alcohols (C3–C8)	% (V/V)	--	2,0	EN 1601
Methanol	% (V/V)		1,0	EN 13132
Ethers (5 or more C atoms)	% (V/V)	--	5,2	
Phosphorus	mg/l	not detectable ^d		ASTM D 3231
Water content	% V/V		0,3	ASTM E 1064
Inorganic chloride content	mg/l		1	ISO 6227
pHe		6,5	9,0	ASTM D 6423
Copper strip corrosion (3 h at 50 °C)	rating	class 1		EN ISO 2160
Acidity, (as acetic acid CH ₃ COOH)	% (m/m) (mg/l)	--	0,005 (40)	ASTM D 1613
^a See also 5.7.1 ^b See also 5.7.2 → <i>tax bond</i> ^c In line with Directive 2003/17/EC [3] the limits will be aligned with those for petrol. In accordance with this Directive, by no later than 1 January 2005 unleaded petrol with a maximum sulfur content of 10 mg/kg should be available on an appropriately balanced geographical basis within the territory of the Member States. By 1 January 2009 all unleaded petrol marketed in the territory of the Member States should have a maximum sulfur content of 10 mg/kg. ^d See also 5.3				

5.6.2 Volatility requirements

To meet hot and cold vehicle driveability requirements under the European seasonal and geographical conditions, 2 volatility classes are defined as given in Table 2. Class A shall at least apply during summer, starting not later than 1 May and ending not before 30 September. Each country shall specify which of the two volatility classes apply during the other period of the year and may include (an) intermediate and/or regional grade(s) which shall be justified by national meteorological data.

When tested by the methods given in Table 2, Ethanol E85 shall be in accordance with the limits specified in this Table.

Table 2 — Climate-related requirements and test methods

Property	Units	Class A	Class B	Test method ^a See 2. Normative references
Ethanol + higher alcohols	% (V/V), min	75	70	EN 1601 EN 13132
Premium grade unleaded petrol as specified in EN 228	% (V/V)	14 - 22	14 - 30	^b
Vapour pressure	kPa, min. kPa, max.	35,0 60,0	50,0 100,0	EN 13016-1 ^c
Final Boiling Point FBP	°C, max.	210	210	EN ISO 3405
Distillation Residue	% (V/V), max.	2	2	EN ISO 3405
^a See also 5.7.1 ^b The unleaded petrol content can be determined as 100 minus the sum of the percentage content of water and alcohols ^c Dry Vapour Pressure Equivalent (DVPE) shall be reported				

5.7 Precision and dispute

5.7.1 All test methods referred to in this Workshop Agreement 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 EN ISO 4259 [4], shall be used.

5.7.2 In cases of national dispute concerning sulfur content, either EN ISO 20846 or EN ISO 20884 shall be called up similar to the reference in the national annex of EN 228.

5.7.3 In cases of dispute concerning oxygen and oxygenates content, EN 1601 shall be used.

Bibliography

- [1] EC Directive on the promotion of the use of biofuels or other renewable fuels for transport, 2003/30/EC, 8 May 2003
- [2] ASTM D 4806, *Standard specification for denatured fuel ethanol for blending with gasolines for use as automotive spark-ignition engine fuel*
- [3] Directive 2003/17/EC amending Directive 98/70/EC relating to the quality of petrol and diesel fuels, 2003/17/EC, 3 March 2003.
- [4] EN ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test (ISO 4259:1992, including Cor. 1: 1993).*