DD CEN/TS 15293:2011

BSI Standards Publication

Automotive fuels — Ethanol (E85) automotive fuel — Requirements and test methods

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National foreword

This Draft for Development is the UK implementation of CEN/TS 15293:2011.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than 3 years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards.*

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee PTI/2, Liquid Fuels.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 66918 7

ICS 75.160.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This Draft for Development was published under the authority of the Standards Policy and Strategy Committee on 28 February 2011.

Amendments issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 15293

February 2011

ICS 75.160.20

Supersedes CWA 15293:2005

English Version

Automotive fuels - Ethanol (E85) automotive fuel - Requirements and test methods

Carburants pour automobiles - Carburant pour automobiles Ethanol (E85) - Exigences et méthodes d'essai

Kraftstoff für Kraftfahrzeuge - Ethanolkraftstoff (E85) für Kraftfahrzeuge - Anforderungen und Prüfverfahren

This Technical Specification (CEN/TS) was approved by CEN on 28 September 2010 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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Ref. No. CEN/TS 15293:2011: E

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Foreword

This document (CEN/TS 15293:2011) 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.

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

This document supersedes CEN/CWA 15293:2005.

Significant technical changes between this European Standard and the CEN Workshop agreement are:

— the fuel requirements do allow the car manufacturers to optimize the ignition setting over the whole range of 0 % (*V/V*) to 85 % (*V/V*) of ethanol, whereas former limits of for instance vapour pressure and MON/RON were calculated on the basis of the percentage. This should give the user the benefit of the improved octane of the alcohol, even though some limits are set as indicative pending further field data;

— the requirements towards contaminants originating mainly from ethanol are aligned with the meanwhile published EN 15376. As alignment of units for elemental contaminants is pursued, a mean density value of 0,78 g/cm^3 has been used;

— the specification has been set to allow for the use of denatured and undenatured ethanol as a blending component, depending on national legislation;

— newly developed ethanol test methods are used, which show a better applicability to Ethanol (E85) automotive fuel. Most of the test methods have been assessed for their effective applicability;

— the climate requirements do allow different percentages of ethanol to be blended, based on field experience, of which some limits are still under study.

Furthermore, some of the determination methods referenced are still being investigated in terms of correct application and precision. This, and the fact that production processes need to be assessed on possibility to achieve the required or future limits, underlines the choice for a CEN Technical Specification as an intermediate step.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Technical Specification specifies requirements and test methods for marketed and delivered Ethanol (E85) automotive fuel. It is applicable to Ethanol (E85) automotive fuel for use in spark ignition engine vehicles designed to run on Ethanol (E85).

Ethanol (E85) automotive fuel is a mixture of nominally 85 % (*V/V*) ethanol complying to EN 15376 and petrol complying to EN 228, but also including the possibility of having different "seasonal grades" containing more than 50 % (*V/V*) ethanol.

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 referenced documents are indispensable for the application 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 228, *Automotive fuels — Unleaded petrol — Requirements and test methods*

EN 1601:1997, *Liquid petroleum products — Unleaded petrol — Determination of organic oxygenate compounds and total organically bound oxygen content by gas chromatography (O-FID)*

EN 13016-1:2007, *Liquid petroleum products — Vapour pressure — Part 1: Determination of air saturated vapour pressure (ASVP) and calculated dry vapour pressure equivalent (DVPE)*

EN 15376, *Automotive fuels — Ethanol as a blending component for petrol —Requirements and test methods*

EN 15485:2007, *Ethanol as a blending component for petrol — Determination of sulfur content — Wavelength dispersive X-ray fluorescence spectrometric method*

EN 15486:2007, *Ethanol as a blending component for petrol — Determination of sulfur content — Ultraviolet fluorescence method*

EN 15487:2007, *Ethanol as a blending component for petrol — Determination of phosphorus content — Ammonium molybdate spectrometric method*

EN 15488:2007, *Ethanol as a blending component for petrol — Determination of copper content — Graphite furnace atomic absorption spectrometric method*

EN 15489:2007, *Ethanol as a blending component for petrol — Determination of water content — Karl Fischer coulometric titration method*

EN 15491:2007, *Ethanol as a blending component for petrol — Determination of total acidity — Colour indicator titration method*

prEN 15492:2010, *Ethanol as a blending component for petrol — Determination of inorganic chloride and sulfate content — Ion chromatographic method*

EN 15692:2009, *Ethanol as a blending component for petrol — Determination of water content — Karl Fischer potentiometric titration method*

EN 15837:2009, *Ethanol as a blending component for petrol — Determination of phosphorus, copper and sulfur content — Direct method by inductively coupled plasma optical emission spectrometry (ICP OES)*

EN 15938:2010, *Automotive fuels — Ethanol blending component and ethanol (E85) automotive fuel — Determination of electrical conductivity*

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

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

EN ISO 3171:1999, *Petroleum liquids — Automatic pipeline sampling (ISO 3171:1988)*

EN ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test (ISO 4259:2006)*

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

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

EN ISO 6246:1997, *Petroleum products — Gum content of light and middle distillate fuels — Jet evaporation method (ISO 6246:1995)*

EN ISO 7536:1996, *Petroleum products — Determination of oxidation stability of gasoline — Induction period method (ISO 7536:1994)*

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

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 Ethanol (E85) automotive fuel. The national requirements shall be set out in detail or shall be referred to by reference in a national annex to this European Standard.

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

It is essential that for sampling of Ethanol (E85) automotive fuel the containers used to take and store the samples before testing are free from any contamination.

4 Pump marking

Information to be marked on dispensing pumps used for delivering Ethanol (E85) automotive fuel, 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) automotive fuel. Such requirements shall be set out in detail or shall be referred to by reference in a national annex to this European Standard.

NOTE The recommended designation for Ethanol (E85) automotive fuel and its seasonal derivatives is "E85".

5 Requirements and test methods

5.1 Dyes and markers

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

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.

CAUTION — Ethanol (E85) automotive fuel shall be free from any adulterant or contaminant that may render the fuel unacceptable for use in petrol engine vehicles designed to run on unleaded petrol and ethanol (E85) automotive fuel.

NOTE Test methods for deposit forming tendency that are suitable for routine control purposes have not yet been identified and developed.

5.3 Phosphorus

In order to protect automotive catalyst systems, phosphorus containing additives shall not be used in Ethanol (E85) automotive fuel.

5.4 Denaturants

The presence of petrol that conforms to EN 228 is generally considered sufficient to render Ethanol (E85) automotive fuel 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 to select denaturants from the list below that are known to be non harmful to vehicle systems:

— Ethyltertbutylether (ETBE);

— Methyltertbutylether (MTBE);

— Tertiary Butyl Alcohol (TBA);

— 2-methyl-1-propanol (isobutanol); and

— 2-propanol (isopropanol).

The concentration of denaturant(s) is at the discretion of national authorities, but the final Ethanol (E85) automotive fuel shall still conform to the requirements as given in Table 1 and Table 2.

NOTE The recommendations of ASTM D4806 [4] regarding denaturants should be regarded.

5.5 Generally applicable requirements and test methods

5.5.1 Overall requirements

Ethanol (E85) automotive fuel is a mixture of on the basis of ethanol complying to EN 15376 and petrol complying to EN 228. When tested by the methods indicated in Table 1, Ethanol (E85) automotive fuel shall be in accordance with the limits specified in Table 1. The test methods listed in Table 1 have been found

applicable to Ethanol (E85) automotive fuel, either by full assessment or by theoretical evaluation. In the latter case, these findings are under practical validation by CEN.

Table 1 — Requirements and test methods for ethanol (E85) automotive fuel

Property	Units	Limits Min.	Limits Max.	Test Method [a] (See Clause 2)
Density (at 15 °C)	kg/m^3	760,0	800,0	EN ISO 12185
Oxidation stability	min	360	--	EN ISO 7536
Existent gum content (solvent washed)	mg/100 ml	--	5	EN ISO 6246
Copper strip corrosion (3 h at 50 °C)	rating	class 1		EN ISO 2160
Total acidity (expressed as acetic acid)	% (*m/m*)		0,005	EN 15491
Electrical conductivity [b]	µS/cm		1,5	EN 15938
Methanol content	% *(V/V)*	--	1,0	EN 1601 [d]
Higher saturated (C3-C5) mono-alcohols content	% *(V/V)*	--	6,0	EN 1601 [d]
Ethers (five or more C atoms) content	% *(V/V)*	--	11,0	EN 1601 [d]
Water content [c]	*% (m/m)*	--	0,400	EN 15489 [e] EN 15692 [e]
Inorganic chloride content	mg/kg	--	1,2 [f]	prEN 15492 [g]
Copper content [c]	mg/kg	--	0,10	EN 15488 [h] EN 15837 [i]
Phosphorus content [c]	mg/l	--	0,15	EN 15487 [k] EN 15837 [i]
Sulfur content [c]	mg/kg	--	10,0	EN 15485 [l] EN 15486 [m]
Sulfate content	mg/kg	--	4,0 [n]	prEN 15492 [g]

[a] See also 5.7.1.

[b] If the required limit is not met, one should check for effects of corrosion inhibitors on conductivity. In that case, a pHe between 6,5 and 9,0, determined by means of either EN 15490 [9] or ASTM D6423-99 [11], indicates compliance of the sample. Limit as such under consideration.

[c] See also 5.7.2.

[d] Work within CEN has revealed that the regular ethanol determination method [8] cannot be applied. See also A.2. Test method applicability of this method and others is under consideration by CEN.

[e] See also A.3.

[f] This limit is to be validated in the future following test method, production and distribution assessment.

[g] See also A.4.

[h] See also A.5.

[i] See also A.6.

[k] See also A.7.

[l] See also A.8.

[m] See also A.9.

[n] This limit is to be validated and might be lowered following production and distribution assessment.

Additional procedural requirements to be followed are indicated in Annex A.

NOTE 1 Details behind the considerations that have led to these requirements and test methods have been published by CEN [5].

NOTE 2 Precision data specific for Ethanol (E85) automotive fuel will be developed by CEN in the future.

5.5.2 Octane

The Research Octane Number (RON) of the Ethanol (E85) automotive fuel is targeted at 104 at minimum, which in the normal situation is achieved. As the test method by which RON is to be measured, EN ISO 5163, with the updates indicated in A.10, is to be assessed for application, this level should only be used indicative.

The Motor Octane Number (MON) of the Ethanol (E85) automotive fuel should be 88,0 at minimum, which in the normal situation is achieved. As the test method by which MON is to be measured, EN ISO 5164, with the updates indicated in A.10, is to be assessed for application, this level should only be used indicative.

NOTE For further background and clarification regarding these indicative requirements, see Annex B

5.6 Climatically dependent requirements and test methods

5.6.1 Water tolerance

Given the known potential for ethanol and some automotive petrol 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) automotive fuel 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.

NOTE For further information on preventing contamination by water or sediment that may occur in the supply chain it is advisable to check CEN/TR 15367-2 [6]. A third part on prevention of cross-contamination is also available [7].

5.6.2 Volatility requirements

To meet hot and cold vehicle driveability requirements under the European seasonal and geographical conditions, four 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 after 30 September. Each country shall specify which of the four 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 indicated in Table 2, Ethanol (E85) automotive fuel shall be in accordance with the limits specified in Table 2.

Table 2 — Climate-related requirements and test methods

Property	Units	Class a		Class b		Class c		Class d		Test Method [a]
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	See Clause 2
Vapour pressure	kPa	35,0	60,0	50,0	80,0	55,0	80,0	60,0	-	EN 13016-1 [b]
Ethanol + higher saturated alcohols content [c]	% (*V/V*)	70	85	70	85	60	85	50	85	EN 1601

[a] See also 5.7.1.

[b] Dry Vapour Pressure Equivalent (DVPE) shall be reported.

[c] Work within CEN has revealed that the regular determination method for ethanol [8] cannot be applied. See 5.1 and A.2.

5.7 Precision and dispute

5.7.1 Resolution of disputes

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, shall be used.

5.7.2 Arbitration test methods

In cases of dispute on water content, EN 15489 shall be used.

In cases of disputes concerning copper content, EN 15837 shall be used.

In cases of disputes concerning phosphorus content, EN 15837 shall be used.

In cases of disputes concerning sulfur content, interlaboratory testing has not identified statistical differences in precision at the specified levels.

Annex A
(normative)

Required updates to determination methods

A.1 General

The various existing test methods have been studied and several necessary procedural steps to make them applicable to Ethanol (E85) automotive fuel have been defined. When tested by the methods indicated in Tables 1 and 2, the following procedures shall be followed for the respective test methods.

NOTE All of the test methods mentioned in this annex have not yet been fully evaluated for their precision with regards to Ethanol (E85) automotive fuel application, but it is assumed that there are no major deviations.

A.2 EN 1601

For gas chromatographic determination by EN 1601, changes apply and will be later defined by CEN/TC 19/WG 9.

To dilute at 1,5 the E85 fuel has an incidence on the determination of the content of other oxygenated components at low content in the E85 fuel. The limits of detection in diluted E85 fuel can be estimated at 0,1 % (*V/V*), which induces the fact that oxygenated compounds with low content could not be identified by the regular petrol gas chromatographic methods.

Work within CEN has revealed that the regular ethanol determination method [8] cannot be applied

A.3 EN 15489 and EN 15692

For these Karl Fischer water determination methods no changes apply.

A.4 EN 15492

If national regulations or GLP demand the use of ion chromatography by a finalised standard like EN 15492:2008, instead of by prEN 15492:2010, to determine the contaminants in Ethanol (E85) automotive fuel the following procedure shall replace the third and fourth paragraphs of 9.1.

Pipette 25 ml (V_E) of E85 sample into a 100 ml separating funnel, add 25 ml of water (4.3) and shake vigorously. After phase separation, transfer the aqueous/ethanolic phase into an evaporating dish (5.6). Place the dish on the boiling water bath (5.5) and allow to dry.

Place the dish in the oven (5.8) at 105 °C for 30 min and then transfer the dish in a desiccator (5.7). Allow the dish to cool for 30 min.

Add 5 ml of water (4.3) and heat gently to dissolve the residue. Collect the treatment water in a 25 ml (V_S) volumetric flask. Repeat the treatment with water (4.3) three times. Fill the flask to the mark with water (4.3).

NOTE It is not necessary to evaporate to dryness but to remove ethanol.

A.5 EN 15488

Using graphite furnace atomic absorption spectrometry by EN 15488:2007 minor changes apply and will be later defined by CEN/TC 19/WG 27.

A.6 EN 15837

A.6.1 Preparation of the calibration solution

When preparing the calibration solution using EN 15837:2009, the inductively coupled plasma optical emission spectrometry method, to determine the contaminants in Ethanol (E85) automotive fuel, the first paragraph of Clause 7 shall be substituted with the following:

Dilute the standard solution (4.1 to 4.3) with water (4.4) in five 100 ml volumetric flasks to obtain calibration solutions having element concentrations as specified in Table 2.

A.6.2 Sample analysis

When analyzing the sample using EN 15837:2009 to determine the contaminants in Ethanol (E85) automotive fuel, the following procedural steps shall be followed after the first paragraph of Clause 9.

Pipette 25 ml of E85 sample into a 100 ml separating funnel, add 25 ml of water (4.4) and shake vigorously. After phase separation, transfer the aqueous/ethanolic phase into an evaporating dish of capacity 100 ml to 250 ml.

Place the evaporating dish on a boiling water bath and allow to dry.

Place the dish in the oven, thermostatically controlled at (105 ± 2) °C for 30 min and then transfer the dish in a desiccator with moisture content indicator. Allow the dish to cool for 30 min.

Add 5 ml of water (4.4) and heat gently to dissolve the residue. Collect the treatment water in a 25 ml volumetric flask. Repeat the treatment with water (4.4) three times. Fill the flask to the mark with water (4.4).

NOTE It is not necessary to evaporate to dryness but to remove ethanol.

A.7 EN 15487

Using EN 15487:2007, the ammonium molybdate spectrometric method, to determine the phosphorus content in Ethanol (E85) automotive fuel, the following procedural steps shall be substituted for 8.1 to 8.3.

Pipette 25 ml of sample into a 100 ml separating funnel, add 25 ml of water (4.2) and shake vigorously. After phase separation, transfer the aqueous/ethanolic phase into an evaporating dish (5.2).

Place the dish on the boiling water bath (5.1) and allow to dry. Place the dish in the oven (5.7) at 105 °C for 30 min and then transfer the dish in a desiccator (5.6). Allow the dish to cool for 30 min.

NOTE It is not necessary to evaporate to dryness but to remove ethanol.

Add 5 ml of water (4.2) and heat gently to dissolve the residue. Collect the treatment water in a 25 ml volumetric flask. Repeat the treatment with water (4.2) three times to transfer quantitatively the residue.

Add to the flask, while swirling, 0,5 ml of ascorbic acid (4.6) followed by 1 ml acid molybdate solution (4.7). Fill the flask to the mark with water (4.2).

A.8 EN 15485

Using wavelength dispersive X-ray fluorescence spectrometry by EN 15485:2007, to determine the sulfur content in Ethanol (E85) automotive fuel, one shall use a 75 % (*V/V*) ethanol and 25 % (*V/V*) heptane (with sulfur content < 1 mg/kg) mixture as the blank solution, instead of the one indicated in 7.1.

A.9 EN 15486

For the ultraviolet fluorescence spectrometry determination by EN 15486:2007 minor changes apply and will be later defined by CEN/TC 19/WG 27.

A.10 EN ISO 5164 and EN ISO 5163

Recommendations/modifications to the knock resistance determination methods EN ISO 5164 and EN ISO 5163 to be applied for the ethanol (E85) automotive fuel:

a) Jet/Nozzle

Engine CFR shall be equipped with a (adjustable) nozzle of the carburetor making it possible to regulate fuel flow rate in the engine, in order that the fuel/air report of the mixture produces a maximum intensity of knock (respect of one of the recommendations of the standards).

b) Calibration

Updates for 10.3.5 and 5.8 of EN ISO 5164:2005 and EN ISO 5163:2005.

1) If the RON or MON < 100, the reference fuels shall be iso-octane/heptane blends;

2) if the RON or MON > 100, the calibration shall be carried out starting from two high octane reference fuels. These fuels are synthetic products prepared in the laboratory. They are preparations of tetraethyl lead (TEL) in iso-octane.

Nevertheless, the RON test method cannot determine the octane without the use of leaded reference fuels. Lead is no longer in use in road fuels apart from deminimus levels allowed for older vehicles or in leaded jet fuel. Use of lead is likely to result in the contamination of octane engines leading to a lead memory effect that can influence other EN 228 petrol octane determinations. Tetra-ethlyl lead compounds are very poisonous and therefore dangerous to handle. Most test labs no longer have lead handling facilities.

A revised test method is therefore required to be developed by CEN using non-leaded reference materials with an appropriate precision statement (see also Annex B).

Annex B
(informative)

Octane number considerations

E85 fuel has a lower energy content than petrol and hence the volumetric fuel consumption of Flex Fuel Vehicles (FFV) will be degraded when operating on E85 quality versus petrol. Some of this loss of volumetric fuel consumption performance can be restored by taking advantage of the higher octane of the E85 fuel by means of engine optimisation (ignition timing, compression ratio, etc.). Engine calibration is determined by the oxygen content of the fuel so in order to allow a safe engine calibration a minimum indicative octane level is required to allow the vehicle manufacturers to ensure that they maximise the fuel economy and at the same time avoid engine knock and hence potential engine damage.

There is limited experience of E85 octane levels at the time of drafting this standard as octane boost due to ethanol content varies according to the base EN 228 petrol quality. There is some evidence however that RON and MON levels will be in the region of 104 and 88 respectively. So these are the levels used for the engine calibration. Because of this uncertainty and test method issues with octane measurement above 100 RON it has not been possible to include a mandatory octane specification in the full table of requirements.

In future revisions of this standard it is expected that the above minimum indicative octane levels may be revised in line with market experience.

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] *Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC*

[3] *Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC*

[4] ASTM D4806, *Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel*

[5] CEN/TR 15993 [1)], *Automotive fuels — Ethanol (E85) automotive fuel — Background to the parameters required and their respective limits and determination*

[6] CEN/TR 15367-2, *Petroleum products — Guide for good housekeeping — Part 2: Automotive petrol fuels*

[7] CEN/TR 15367-3, *Petroleum products — Guide for good housekeeping — Part 3: Prevention of cross contamination*

[8] EN 15721, *Ethanol as a blending component for petrol — Determination of higher alcohols, methanol and volatile impurities — Gas chromatographic method*

[9] EN 15490:2007, *Ethanol as a blending component for petrol — Determination of pHe*

[10] EN 15769:2009, *Ethanol as a blending component of petrol — Determination of appearance — Visual method*

[11] ASTM D6423-99, *Standard Test Method for Determination of pHe of Ethanol, Denatured Fuel Ethanol, and Fuel Ethanol (Ed75-Ed85)*

1) Is under revision.

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