

### SLOVENSKI STANDARD SIST-TP CEN/TR 15993:2013

01-april-2013

Nadomešča: SIST-TP CEN/TR 15993:2010

## Goriva za motorna vozila - Gorivo etanol (E85) za motorna vozila - Ozadje zahtevanih parametrov in njihovih omejitev ter določb

Automotive fuels - Ethanol (E85) automotive fuel - Background to the parameters required and their respective limits and determination

Kraftstoffe für Kraftfahrzeuge - Ethanol-Kraftstoff (E85) - Hintergrund für die geforderten Parameter und deren jeweiligen Grenzwerte und Bestimmung

Carburants pour automobiles - Essence pour automobile Ethanol (E85) - Informations sur les paramètres requiset leurs limites et détermination respectives 4c6095fb188c/sist-tp-cen-tr-15993-2013

Ta slovenski standard je istoveten z: CEN/TR 15993:2013

#### ICS:

 71.080.60
 Alkoholi. Etri

 75.160.20
 Tekoča goriva

Alcohols. Ethers Liquid fuels

SIST-TP CEN/TR 15993:2013

en

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#### SIST-TP CEN/TR 15993:2013

### TECHNICAL REPORT RAPPORT TECHNIQUE TECHNISCHER BERICHT

### **CEN/TR 15993**

February 2013

ICS 75.160.20; 71.080.60

Supersedes CEN/TR 15993:2010

**English Version** 

#### Automotive fuels - Ethanol (E85) automotive fuel - Background to the parameters required and their respective limits and determination

Carburants pour automobiles - Essence pour automobile Ethanol (E85) - Informations sur les paramètres requis et leurs limites et détermination respectives Kraftstoffe für Kraftfahrzeuge - Ethanol-Kraftstoff (E85) -Hintergrund der geforderten Parameter und deren jeweiligen Grenzwerte und Bestimmung

This Technical Report was approved by CEN on 21 May 2011. It has been drawn up by the Technical Committee CEN/TC 19.

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EUROPEAN COMMITTEE FOR STANDARDIZATION COMITÉ EUROPÉEN DE NORMALISATION EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. CEN/TR 15993:2013: E

#### SIST-TP CEN/TR 15993:2013

#### CEN/TR 15993:2013 (E)

### Contents

Foreword			
1	Scope	.4	
2	Summary of the ethanol fuel (E85) taskforce work	.4	
3 3.1 3.2 3.3	Record of the work to date Context The Ethanol (E85) automotive fuel Task Force Planning	.4 .4 .5 7	
4 4.1 4.2 4.2.1	The draft ethanol (E85) automotive fuel specification Parameters included Considerations on the parameters Denaturants	.8 .8 .9 .9	
4.2.2 4.2.3	RON MON Ethanol content and higher alcohols	.9 10	
4.2.4	Vapour pressure	12	
4.2.5 4.2.6 4.2.7	Density Sulfur content Oxidation stabilityITch.STANDARD.PREVIEW	13 13 14	
4.2.8	Existent gum content (solvent washed)	14	
4.2.9 4.2.10	Oxygenates content	14 16	
4.2.11	Water content	16	
4.2.12	Chloride content. https://standards.iteh.ai/catalog/standards/sist/71f139bb-0611-4b63-b745-	17	
4.2.13	Copper strip corrosion	18	
4.2.15	Copper content	18	
4.2.16	Sulfate content	19	
4.2.17	Conductivity	19	
4.2.18	pHe	20	
4.2.19	Additives	20 20	
4.2.21	Biologically sourced ethanol	20	
4.2.22	Guidelines	21	
4.3	Parameters considered and not included in the draft specification	21	
4.3.1	Appearance	21	
4.3.2 4.3.3	Lead	21 21	
5	Acknowledgement.	21	
Biblico	Bibliography 22		

#### Foreword

This document (CEN/TR 15993:2013) 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/TR 15993:2010.

The original Technical Report presented all decisions that led to the proposed draft of prCEN/TS 15293:2009 in order to support the enquiry ballot. This document includes all decisions that have been made following comments and further investigations leading to the effective publication of the ethanol (E85) automotive fuel specification as CEN/TS 15293:2011. In addition, it presents all further details leading to the effective revision of that CEN/TS into a full European Standard.

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#### 1 Scope

This Technical Report explains the requirements and test methods for marketed and delivered ethanol (E85) automotive fuel according to CEN/TS 15293 [3]. It provides background information to judge the (approval of the) final text of the standard and gives guidance and explanations to the producers, blenders, marketers and users of ethanol (E85) automotive fuel.

NOTE 1 This document is directly related to CEN/TS 15293:2011 [3] and will be updated once further publications take place.

NOTE 2 For the purposes of this document, the terms "% (*m/m*)" and "% (*V/V*)" are used to represent the mass fraction,  $\mu$ , and the volume fraction,  $\varphi$ , respectively.

#### 2 Summary of the ethanol fuel (E85) taskforce work

At the 2007 plenary meeting, CEN/TC 19 decided to register the following work item as described in its active programme of work: "Automotive fuels — Ethanol E85 — Requirements and test methods", under responsibility of WG 21. The scope was to develop a CEN Standard on the basis of CWA 15293 [4]and existing related national standards and to check for the most appropriate wording of the title of the standard.

The work on the specification was developed during a series of Ethanol (E85) automotive fuel Task Force (TF E85) meetings between October 2007 and May 2009, and is presented by means of this Technical Report. The draft standard, referenced by the identification CEN/TS 15293, comprised a set of properties and limit values to define an adequate quality of the ethanol (E85) automotive fuel and recommendations for precautions to be taken (see Table 1 in CEN/TS 15293:2011 [3]).

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The draft standard was presented to CEN/TC 19/WG 21 in November 2008, together with a request to allow the TF some additional time to finalise discussions and to study data that still needed to be generated from field experience, both of refinery and ethanol production. Following that November meeting, a draft enquiry text was developed and this was presented in January 2009 to WG 21 and thereafter to CEN/CCMC.

It should be noted that the draft standard had been considered on the basis of the ethanol blend component specification EN 15376 2007 [2] and the former version of the EN 228 (unleaded petrol) standard [1]. Revision discussion on those documents has been included in the discussions in the last two years. However, CEN/TS 15293 still contains some pending issues, which are noted as such in the text.

Many of the test methods proposed by the test methods experts are being examined to determine their applicability to ethanol (E85) fuel and to determine if their precision is sufficient to support the limit values proposed. This activity is being undertaken in several other CEN working groups where the specialists in methods are present.

An automatic link has been established between the gasoline and ethanol (EN 228 and EN 15376 respectively) standards and the ethanol (E85) automotive fuel (CEN/TS 15293) standard so that modifications to one will be coherent with the other.

#### 3 Record of the work to date

#### 3.1 Context

The European Commission is following a policy of promoting renewable energy use in Europe, and to this end is encouraging the extension of automotive gasoline fuel with a proportion of renewably-sourced ethyl alcohol (referred to in this document as ethanol).

In order to facilitate a transparent and stable market in ethanol, it is necessary to establish an ethanol (E85) automotive fuel standard for Europe that will ensure a uniform high quality fuel for problem-free ethanol use as a gasoline fuel.

To this end, the Comité Européen de Normalisation (CEN) Technical Committee 19, responsible for Automotive Fuels Standards, accepted the CWA revision as a work item on its programme to be developed in Working Group 21, responsible for Automotive Gasoline management.

The intention of CEN/TC 19 was to redraft the CWA into a CEN standard based on the publication of EN 15376 and EN 228, also taking into account the developments in Sweden, France and Germany. Discussion in WG 21 had indicated that there were still test method questions to be solved and thus national initiatives were not halted.

CEN/TC 19, having considered the proposal for a new work item, as documented in N 1318 and supported by WG 21, noting the request from UPEI in document N 1326R, decided to register the following work item as described in N 1318 in its active programme of work: "Automotive fuels — Ethanol E85 — Requirements and test methods", under the responsibility of WG 21. The scope was to develop a CEN Standard on the basis of CWA 15293 and existing related national standards and to check for the most appropriate wording of the title of the standard. The Task Force E85 was created.

The aim of the CWA was to keep the specification simple and straightforward, allowing cars to be introduced into the market. The original idea was to ensure basic car functionality, for which the existing CWA succeeded. However, as flexi-fuel vehicles were soon to fall under the Emission Legislation, more stringent fuel requirements were needed. The existing CWA was not able to support EURO V vehicles.

CWA 15293 and its successor(s) should specify requirements and test methods for marketed and delivered Ethanol (E85) automotive fuel. 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 15 % petrol, but it also includes the possibility of having different 'seasonal grades' containing more than 50 % ethanol.

This document is the report on the work to date carried out by the TF E85 (see 3.2) towards establishing a European Standard for Ethanol (E85) automotive fuel.

#### SIST-TP CEN/TR 15993:2013

#### 3.2 The Ethanol (E85) automotive fuel Task Force 139bb-0611-4b63-b745-

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CEN, in anticipation of a mandate from the Commission, requested TC 19/WG 21 to convene a task force and begin work on a draft ethanol (E85) automotive fuel standard. A call was made to the industries concerned by the mandate for experts to participate in the TF E85. The experts who have contributed to the work over the years are listed in Table 1. Revision work on CEN/TS 15293 had been discussed from meeting 9 onwards, whereas the former version of this document had been finalised at meeting 8.

#### CEN/TR 15993:2013 (E)

#### Table 1 — Membership of the taskforce

Name	Organisation	Country	
Auger Celine (from meetings 2 to 9)	Renault	France	
Baldini Luca	ENI	Italy	
Bennett John	Afton Chemical	United Kingdom	
Bernard Joerg	Suedzuecker	Germany	
Betlejewski Marek (from meetings 2 to 7)	PKN Orlen	Poland	
Colbert Dane	Ethanol Union	France	
Costenoble Ortwin (TF Secretary)	NEN	Netherlands	
Crépeau Gerald (Convenor)	PSA Peugeot Citroën	France	
Elliott Nigel	Exxon Mobil	United Kingdom	
Engelen Benoit	Total	Belgium	
Feuerhelm Tom	DIN/FAM	Germany	
Gameson Thomas	Abengoa Bioenergia	Spain	
Gibarroux Germain (since meeting 10)	Renault	France	
Grand Jean-Gabriel (until meeting 2)	Renault	France	
Hermans Pierre (until meeting 10) en STAN	Exxonmobil	Belgium	
Jeuland Nicolas (since meeting 5) (stand	arpds.iteh.ai)	France	
King Stan (until meeting 9)	Afton Chemical	CEFIC-ATC	
Koppen Piet (since meeting 8)	Standards/sist/71f139bb-0611-4b63-b7	A Netherlands	
Kronström Börje 4c6095fb188	Svenska Shell93-2013	Sweden	
Lloyd Robin (until meeting 4)	Argent Energy	United Kingdom	
Leber Edwin (until meeting 8)	Opel	Germany	
Manuelli Pascal	Total	France	
Mirabella Walter	Lyondell	Italy	
Nilsson Magnus (until meeting 10)	General Motors Powertrain	Sweden	
Olofsson Mathias (until meeting 10)	SEKAB	Sweden	
Pollak Vanda (since meeting 6)	Hungrana	Hungary	
Rantanen – Kolehmainen Leena (since meeting 6)	Nesteoil	Finland	
Rappange Aly (until meeting 10)	Royal Nedalco	Netherlands	
Suanders Bob (since meeting 8)	EI	United Kingdom	
Schuermans Kurt (since meeting 7)	Chevron	Netherlands	
Sijben Jo (from meetings 4 to 10)	Proces Design Center	Netherlands	
Skret Iwona (until meeting 6)	Instytut Technologii Nafty	Poland	
Sniegula Agnieska (since meeting 8)	PKN Orlen	Poland	
Spaans Han (until meeting 9)	AC Analytical Controls	Netherlands	
Tittarelli Paolo	SSC	Italy	

Following his retirement as TF project leader, due to his change of profession, Mr. Bennett handed over the work to Mr. Crépeau during the 2<sup>nd</sup> meeting and his contribution to the work and initiatives of this TF is hereby warmly acknowledged.

The task force has met on the following occasions:

- a) 30<sup>th</sup> October 2007 Brussels, 1<sup>st</sup> meeting,
- b) 15<sup>th</sup> January 2008 Brussels, 2<sup>nd</sup> meeting,
- c) 5<sup>th</sup> March 2008 Hamburg, 3<sup>rd</sup> meeting,
- d) 18<sup>th</sup> April 2008 London, 4<sup>th</sup> meeting,
- e) 3<sup>rd</sup> July 2008 Brussels, 5<sup>th</sup> meeting,
- f) 11<sup>th</sup> September 2008 Brussels, 6<sup>th</sup> meeting,
- g) 4<sup>th</sup>/5<sup>th</sup> December 2008 Paris, 7<sup>th</sup> meeting,
- h) 23<sup>rd</sup> April 2009 Paris, 8th meeting,
- i) 23<sup>rd</sup> September 2009 Paris, 9<sup>th</sup> meeting,
- j) 18<sup>th</sup> February 2010 Brussels, 10<sup>th</sup> meeting.

Following the finalisation of the ethanol specification at the level of 10% blending, it was debated and concluded to merge the TF 85 with the Ethanol TF. At the end of 2010, both taskforces were disbanded.

#### 3.3 Planning

#### SIST-TP CEN/TR 15993:2013

The initial planning was: enquiry text ready in August 2008, the comments known in April 2009 and the final text to be delivered to CEN/CCMC in November 2009 on tr-15993-2013

WG 21 had advised the use of EN 228 as the blending component and had supported a six month extension allowance for the E85 specification for the necessary updating of test methods and seasonal grades. Next, it agreed that no shortened procedure, such as a UAP, should be used. Thus, renewed planning was pursued and prEN 15239 was published for ballot in May 2009.

However, the TF encountered several open issues due to the uncertainty of the guarantee of the octane in the future with the integration of Blending Oxygenate Base-stock (BOB) in all European markets and its impact on ethanol (E85) fuels. In addition, the test methods precision for chlorine content at 1 mg/kg or below and the high-boiler requirement were under evaluation. Furthermore, time was required to collect data on the current market, resulting in a better specification proposal. At the end of 2009, the TF still planned to aim at a submission for formal vote halfway through 2010; although being revised, this CEN Technical Report shall, support the ballots. After the CEN enquiry, considering the technical comments and the suggested necessary updates, the deliverable on prEN15293 had been changed into a CEN Technical Specification with its submission to CEN/CCMC on 27<sup>th</sup> of March, 2010.

CEN/TS 15293 was ratified by CEN on 28<sup>th</sup> September 2010 and was published as CEN/TS 15293:2011. CEN/TC 19 intends to further revise this Technical Specification, but it needs to rely on test method precision data (availability).

#### 4 The draft ethanol (E85) automotive fuel specification

#### 4.1 Parameters included

Ethanol (E85) automotive fuel should be based on unleaded petrol complying with EN 228 and ethanol complying with EN 15376.

The parameters chosen by the TF E85 are those presented in Table 1 (general requirements) and Table 2 (seasonal requirements) of CEN/TS 15293:2011. After the 10<sup>th</sup> meeting, all the parameters were agreed upon in full consensus. The applicability of all the test methods had been checked within CEN/TC 19 or were under an improvement process (like the oxygenates content determinations), with the exception of octane. An overview of the assessment is presented in Table 2. Nevertheless, for octane, it was suggested to include any new or adapted methodology in the next revision like the alternatives indicated in DIN 51617-1. If this were to be done during the first quarter of 2011, all the parameters would be in line with an applicable method.

E85	Test Method	Applicability	Annex A
Property		for E85 fuel	completed
Density	EN ISO 12185		
Oxidation stability	EN ISO 7536		
Existent gum content (solvent washed)	EN ISO 6246		
Copper strip corrosion (3 h at 50 °C)	EN ISO 2160 7		
Acidity, (as acetic acid CH3COOH)	EN 15491		
pHe (standa	rds.eve5490i)		
electrical conductivity	EN 15938		
Methanol SIST-TP CH	<u>N/TR 1 EN31601</u>		
Higher alcohols1(G3//G5) lards.iteh.ai/catalog/sta	ndards/siEN1160/bb-0611	-4b63-b745-	
Ethers (5 or more C atoms) 4c6095fb188c/sis	t-tp-cen-EN 36012013		
Water content	EN 15489		
	EN 15692		
Inorganic chloride content	EN 15492		
Copper content	EN 15488		
	EN 15837		
Phosphorus	EN 15487		
	EN 15837		
Sulfur content	EN 15485		
	EN 15486		
Sulphate	EN 15492		
Ethanol + higher saturated alcohols			
content	EN 1601		
Vapour pressure	EN 13016-1		

#### Table 2 — Test method assessment

#### CEN/TR 15993:2013 (E)

Further works	Methods	Applicability for E85 fuel	Annex A to be completed
Research octane number	EN ISO 5164		
Motor octane number	EN ISO 5163		
Research octane number	DIN 51756-7		
Motor octane number	DIN 51756-7		
High boiling component			

#### Table 2 — Test method assessment (continued)

#### Legend

4.2.1

Applicability OK
Applicability OK but revised method standard necessary (prEN 15293, Annex A to be completed)
Applicability NOK
Comments to be integrated very soon
Comments already integrated

NOTE For rejected parameters see 4.3.

#### 4.2 Considerations on the parameters

### Denaturants iTeh STANDARD PREVIEW

# The presence of petrol that conforms to EN 228 is generally considered sufficient to render Ethanol (E85) a denatured product. The taskforce E85 considers it necessary to follow the same line of requirement as set out before by CEN/TC 19 regarding denaturants in EN 15376 and thus that requirement is copied.

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#### 4.2.2 RON MON

In Europe, E85 Flex Fuels Vehicles (FFV) are engineered to take advantage of the higher octane value of 85% ethanol. Originally, the CWA was drafted on the assumption that EN 228 would be used for blending and the engine ignitions are tuned to these specification limits. The difference between E0 to E85 RON range were analysed and the combustion potentials with higher octane fuels were demonstrated. The impact of energy

analysed and the combustion potentials with higher octane fuels were demonstrated. The impact of energy content loss, the knocking effect and the ignition timing was explained. The car manufacturers calibrated for E0 and E85 fuels based on an oxygen (ethanol) sensor. It was necessary to limit the variation on RON/MON for the E85 fuel because a lower value on RON/MON was not suitable for engine calibration and could potentially damage the engine. Furthermore, it was impossible to test for EN 228 quality at the fuelling station in E85. If in the future EN 228 at E10 level is used, it will be the finished E10 that meets the EN 228 boundaries. FFVs needed to be able to run on RON 95, but for optimisation reasons (car makers calibrate on the full range of fuels used in the FFV) they would need a minimum of 104/90 for the E85. If the octane was not measured (and EN 228 would not be required for the petroleum part), other elements like paraffin needed to be limited and calorific value needed to be tested. Moreover, it was shown that the 104/90 RON/MON proposal was also for optimisation of the fuel economy.

The European automobile manufacturers (ACEA) suggested 104,0 RON and 90,0 MON minimum limits and the ethanol producers agreed to support the car makers in their need to use the better octane.

The oil industry mentioned that the only available petrol for blending would be BOB, which meets EN 228 after addition of ethanol. They suggested defining an alternative proposal requiring blending with EN 228 minus the octane specification. After a lot of discussion inside TF E85 covering several meetings, all stakeholders concluded that the final RON/MON depended on the quality of the BOB (typical BOB RON could be down to 92), but suspected that in E85 it would be close to 104/88.