Liquid petroleum products - Determination of ignition delay and derived cetane number (DCN) of middle distillate fuels by combustion in a constant volume chamber

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 15195:2014 sisaldab Euroopa standardi EN 15195:2014 inglisekeelset teksti.	This Estonian standard EVS-EN 15195:2014 consists of the English text of the European standard EN 15195:2014.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 12.11.2014.	Date of Availability of the European standard is 12.11.2014.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 15195

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English Version

Liquid petroleum products - Determination of ignition delay and derived cetane number (DCN) of middle distillate fuels by combustion in a constant volume chamber

Produits pétroliers liquides - Détermination de délai d'inflammation et de l'indice de cétane dérivé (ICD) des distillats moyens par combustion dans une enceinte à volume constant

Flüssige Mineralölerzeugnisse - Bestimmung des Zündverzugs und der abgeleiteten Cetanzahl (ACZ) von Kraftstoffen aus Mitteldestillaten in einer Verbrennungskammer mit konstantem Volumen

This European Standard was approved by CEN on 20 September 2014.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 15195:2014) 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 May 2015 and conflicting national standards shall be withdrawn at the latest by May 2015.

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 EN 15195:2007.

Based on new data sets used and experience in the field, the major updates towards the former version are:

— based on recent data from EI and ASTM correlation schemes precision of the method has been improved (by around 25 %) and a common global precision statement for EN 15195 has been incorporated (see also the Introduction) [9];

— the ignition delay range has been expanded to 2,8 ms to 6,3 ms (71 DCN to 34 DCN), where it used to be 3,3 ms to 6,4 ms (61 DCN to 34 DCN);

— the scope has been expanded to from diesel blends with 7 % (*V/V*) up to 30 % (*V/V*) of FAME;

— the test procedure has been updated following experience in the market;

— the standard operating and test conditions have been more precisely defined;

— the calibration information has been improved;

— an alternative system cleaning procedure has been introduced in Annex B.

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

Introduction

This document is derived from joint standardization work in the Energy Institute and ASTM International. It has originally been based on IP 498/06 [1] published by the Energy Institute and harmonized with equivalent ASTM [2] Standards.

The described method is an alternative quantitative determination of the cetane number of middle distillate fuels intended for use in compression ignition engines. Correlation studies between this method and EN ISO 5165 have been done and the results of this are incorporated in this European Standard.

The basis of this method is the derived cetane number correlation equation as given in Clause 13. The on-going validation of the equation is monitored and evaluated through the existing monthly American and European fuel exchange programs. The validation data will be reviewed by CEN/TC 19 with a frequency of at least every two years. As a result of the review, CEN/TC 19 may make the decision to, if necessary, modify the existing equation/correlation or develop a new one. As part of this review, the sample types will be examined, and if certain types are underrepresented, further steps may be taken to evaluate how they perform.

For the moment the basics of one type of apparatus are described[1]. Once more correlation data on different types of derived cetane number testing equipment is available, CEN/TC 19 will consider revising this European Standard.

[1] The injection pump in the currently described apparatus is covered by a patent.

1 Scope

This European Standard specifies a test method for the quantitative determination of ignition delay of middle distillate fuels intended for use in compression ignition engines. The method utilizes a constant volume combustion chamber designed for operation by compression ignition, and employing direct injection of fuel into compressed air that is controlled to a specified pressure and temperature. An equation is given to calculate the derived cetane number (DCN) from the ignition delay measurement.

This European Standard is applicable to diesel fuels, including those containing fatty acid methyl esters (FAME) up to 30 % (*V/V*). The method is also applicable to middle distillate fuels of non-petroleum origin, oil-sands based fuels, blends of fuel containing biodiesel material, diesel fuel oils containing cetane number improver additives and low-sulfur diesel fuel oils. However, users applying this standard especially to unconventional distillate fuels are warned that the relationship between derived cetane number and combustion behaviour in real engines is not yet fully understood.

The test method is also applicable to the quantitative determination of the ignition characteristics of FAME, especially the ignition delay. However the correlation data available were inconclusive about the precision of the equation. So the determination of derived cetane number for FAME fuel, also known as B100, has not been included in the precision determination as in Clause 12[2)].

This European Standard covers the ignition delay range from 2,8 ms to 6,3 ms (71 DCN to 34 DCN). The combustion analyser can measure shorter or longer ignition delays, but precision is not known. For these shorter or longer ignition delays the correlation equation for DCN is given in Annex D.

NOTE 1 There is no information about how DCNs outside the 34 to 71 range compares to EN ISO 5165.

NOTE 2 For the purpose of this European Standard, the expression "% (*V/V*)" is used to represent the volume fraction and "% (*m/m*)" the mass fraction.

WARNING — The use of this standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696)*

EN ISO 5165:1998, *Petroleum products — Determination of the ignition quality of diesel fuels — Cetane engine method (ISO 5165:1998)*

ISO 1998-2:1998, *Petroleum industry — Terminology — Part 2: Properties and tests*

ISO 4010, *Diesel engines — Calibrating nozzle, delay pintle type*

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2) A further Round Robin study for B100 samples is being considered by CEN.

IP 537, Determination of the purity of Derived Cetane Number reference materials — Gas chromatography method

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1998-2:1998 and the following apply.

3.1
cetane number
CN
measure of the ignition performance of a diesel fuel in a standardized engine test on a scale defined by reference fuels

Note 1 to entry: It is expressed as the percentage by volume of hexadecane (cetane) in a reference blend having the same ignition delay as the fuel for analysis. The higher the cetane number, the shorter the ignition delay.

Note 2 to entry: ISO 1998-2 expresses it as “number on a conventional scale, indicating the ignition quality of a diesel fuel under standardized conditions”, but for this document the definition as given is chosen as with new equipment on the market since 1998 the reference to an engine has become essential.

3.2
ignition delay
ID
period of time, in milliseconds, between the start of fuel injection and the start of combustion

Note 1 to entry: In the context of this standard, this period is determined by movement and pressure sensors in the instrument.

3.3
derived cetane number
DCN
number calculated by using an equation that correlates a combustion analyser's ignition delay to the cetane number

3.4
accepted reference value
ARV
value agreed upon as a reference for comparison

Note 1 to entry: The value is derived as (1) a theoretical or established value, based in scientific principles, (2) an assigned value, based on experimental work of some national or international organization, or (3) a consensus value based on collaborative experimental work under the auspices of a scientific or engineering group.

3.5
quality control sample
QC
stable and homogenous material(s) similar in nature to the materials under test, properly stored to ensure integrity, and available in sufficient quantity for repeated long-term testing

3.6
calibration reference fluid
stable and homogenous fluid used to calibrate the performance of the combustion analyzer

3.7
verification reference fluid
stable and homogenous fluid used to verify the performance of the combustion analyzer