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

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NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 5163:2014 sisaldab Euroopa standardi EN ISO 5163:2014 inglisekeelset teksti.	This Estonian standard EVS-EN ISO 5163:2014 consists of the English text of the European standard EN ISO 5163:2014.
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 04.06.2014.	Date of Availability of the European standard is 04.06.2014.
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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English Version

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

Produits pétroliers - Détermination des caractéristiques antidétonantes des carburants pour moteurs automobiles et aviation - Méthode moteur (ISO 5163:2014)

Mineralölerzeugnisse - Bestimmung der Klopffestigkeit von Otto- und Flugkraftstoffen - Motor-Verfahren (ISO 5163:2014)

This European Standard was approved by CEN on 14 May 2014.

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

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Foreword

This document (EN ISO 5163:2014) has been prepared by Technical Committee ISO/TC 28 "Petroleum products and lubricants" in collaboration with 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of an identical text or by endorsement, at the latest by December 2014, and conflicting national standards shall be withdrawn at the latest by December 2014.

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 ISO 5163:2005.

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.

Endorsement notice

The text of ISO 5163:2014 has been approved by CEN as EN ISO 5163:2014 without any modification.

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Introduction

The purpose of this International Standard is to accord ISO status to a test procedure that is already used in a standardized form all over the world. The procedure in question is published by ASTM International as Standard Test Method D 2700-12. This International Standard is based on combining two former test methods for motor spark-ignition[1] and aviation piston[2] engine concepts

By publishing this International Standard, ISO recognizes that this method is used in its original text in many member countries and that the standard equipment and many of the accessories and materials required for the method are obtainable only from specific manufacturers or suppliers. To carry out the procedure requires reference to annexes and appendices of ASTM D 2700-12. The annexes detail the specific equipment and instrumentation required, the critical component settings and adjustments, and include the working tables of referenced settings. The appendices provide background and additional insight about auxiliary equipment, operational techniques and the concepts relative to proper maintenance of the engine and instrumentation items.

The accumulated motor and aviation-type fuel data relating to knock characteristics determined in many countries has, for many years, been based on the use of the CFR engine and the ASTM octane test methods. Accepted worldwide, petroleum industry octane number requirements for motor and aviation-type fuels are defined by the motor method and associated CFR F-2 Octane Rating Unit[1)], which emphasizes the need for this method and test equipment to be standardized. The initiation of studies to use a different engine for ISO purposes has therefore been considered an unnecessary duplication of effort.

It is further recognized that this method for rating motor and aviation-type fuels, which does include metric operating conditions, is nevertheless an exceptional case in that the CFR engine is manufactured to inch dimensions and requires numerous settings and adjustments to inch dimensions. Application of metrication to these dimensions and tolerances can only be accomplished by strict numerical conversion which would not reflect proper metric engineering practice. Attempts to utilize metric measurement instruments for checking component dimensions to the numerically converted metric values would only introduce an additional source of test variability.

For these reasons, it has been considered desirable by ISO Technical Committee 28, *Petroleum products and lubricants,* to adopt the ASTM D 2700 standard rewritten to comply with the ISO Directives, Part 2, *Rules for the structure and drafting of International Standards*. However, this International Standard refers to annexes and appendices of ASTM D 2700 without change because of their extensive detail. These annexes and appendices are not included in this International Standard because they are published in the Annual Book of ASTM Standards, Section 5.

Due to identified component obsolescence issues, the original, analogue control panel has been replaced by the manufacturer by the new digital panel. Service parts availability for the analogue system will be phased out in the future. Research work was executed by ASTM International[8] to check whether there was statistically observable systemic bias between the 501C and the new digital knock measurement system.

With respect to precision ISO and ASTM technical committees concluded that there was numerically comparable precision for repeatability between the 501C and new panel knock measurement systems, and no statistically observable difference for reproducibility between the 501C and new panel knock measurement systems. For Motor octane number results, the evaluation detected neither a statistically observable bias between the two systems nor sample-specific bias, so the results obtained by the two knock measurement systems are practically equivalent (as obtained, no bias correction required). This means that the new CFR octane panel could be included in the test method.

1) The sole manufacturer of the Model CFR F-2 Octane Rating Unit is Waukesha Engine, Dresser, Inc., 1000 West St. Paul Avenue, Waukesha, WI 53188, USA.

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

1 Scope

This International Standard establishes the rating of liquid spark-ignition engine fuel in terms of an arbitrary scale of octane numbers using a standard single-cylinder, four-stroke cycle, variable-compression ratio, carburetted, CFR engine operated at constant speed. Motor octane number (MON) provides a measure of the knock characteristics of motor fuels in automotive engines under severe conditions of operation. The motor octane number provides a measure of the knock characteristics of aviation fuels in aviation piston engines, by using an equation to correlate to aviation-method octane number or performance number (lean-mixture aviation rating).

This International Standard is applicable for the entire scale range from 0 MON to 120 MON, but the working range is 40 MON to 120 MON. Typical motor fuel testing is in the range of 80 MON to 90 MON. Typical aviation fuel testing is in the range of 98 MON to 102 MON.

This International Standard is applicable for oxygenate-containing fuels containing up to 4,0 % (*m/m*) oxygen and for gasoline containing up to 25 % (*V/V*) ethanol.

NOTE 1 Although 25 % (*V/V*) of ethanol corresponds to approximately 9 % (*m/m*) oxygen, full applicability of this test method for that oxygen range has only been checked for gasoline type of fuels.

NOTE 2 Work is under way to check the possibility to use the method for gasoline containing up to 85 % (*V/V*) ethanol.

NOTE 3 This International Standard specifies operating conditions in SI units but engine measurements may be specified in inch-pound units because these were the units used in the manufacture of the equipment, and thus some references in this International Standard include these units in parenthesis.

NOTE 4 For the purposes of this standard, the terms "% (*m/m*)" and "% (*V/V*)" are used to represent the mass fraction, μ, and the volume fraction, φ, of a material respectively.

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.

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3171, *Petroleum liquids — Automatic pipeline sampling*

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

ISO 4787, *Laboratory glassware — Volumetric instruments — Methods for testing of capacity and for use*

ASTM D2700-12, *Standard Test Method for Motor Octane Number of Spark-Ignition Engine Fuel*