ISO/FDIS 17507-1

ISO/TC 193

Secretariat: NEN

Date: 2025-07-17

Natural gas — Calculation of methane number of gaseous fuels for reciprocating internal combustion engines —

Part 1:
MNc method

Gaz naturel — Calcul de l'indice de méthane des combustibles gazeux pour les moteurs alternatifs à combustion interne —

Partie 1: Méthode IMc

FDIS stage

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Contents

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 193, *Natural gas*.

A list of all parts in the ISO 17507 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The globalization of the natural gas market and the drive towards sustainability are increasing the diversity of the supply of gases to the natural gas infrastructure. For example, the introduction of regasified liquefied natural gas (LNG) can result in higher fractions of non-methane hydrocarbons in the natural gas grid than the traditionally distributed pipeline gases for which these hydrocarbons have been removed during processing. Also, the drive towards sustainable gaseous fuels, such as hydrogen and gases derived from biomass, results in the introduction of “new” gas compositions that contain components that do not occur in the traditional natural gas supply. Consequently, the increasing variations in gas composition affect the knock resistance of the gas when used as a fuel. This can affect the operational integrity of reciprocating internal combustion engines.

For the efficient and safe operation of gas engines, it is of great importance to characterize the knock resistance of gaseous fuels accurately. Engine knock is caused by the autoignition of unburned fuel mixture ahead of this mixture being consumed by the propagating flame. Mild engine knock increases pollutant emissions accompanied by gradual build-up of component damage and complete engine failure if not counteracted. Severe knock causes structural damage to critical engine parts, which can quickly lead to catastrophic engine failure. To ensure that gas engines are matched with the expected variations in fuel composition, the knock resistance of the fuel is to be characterized, and subsequently specified, unambiguously.

Traditional methods for characterizing the knock resistance of gaseous fuels, such as the methane number method developed by Anstalt für Verbrennungskraftmaschinen List (AVL) in the 1960s, relate the knock propensity of a given fuel with that of an equivalent methane/hydrogen mixture using a standardized test engine (see References [1], [2] and [3]). Several other methane number methods have since been developed, sometimes based on either the approach or data, or both from the original experimental work performed by AVL.

In recognition of the need to standardize a method for characterizing the knock resistance of gaseous fuels, several existing methods for calculating a methane number have been considered, including the MN_C method outlined in this document. ISO 17507-2 describes the PKI method.

Methods to calculate a methane number are based on the input of the gas composition under investigation. While methods can be fundamentally different in their development approach, ideally the methods produce similar methane numbers for the range of gas compositions they are valid for. Yet, differences in outcome can be observed. Engine manufacturers typically determine the calculation method to be used when specifying a methane number value for their engines as part of their application and warranty statements. In all cases, when specifying a methane number based on either method, or any other method, the method used should be noted.

The MN_C method is based on the original data of the research ~~program~~programme performed by AVL Deutschland (AVL is based in Graz, Austria) GmbH~~[1]~~[1] for FVV (the Research Association for Combustion Engines). The methodology first proposed by Deutz (“Klöckner-Humboldt-Deutz AG~~”)[2],[3]”)~~[2],[3] was later amended in 2005 and 2011 by MWM (“Motoren-Werke Mannheim AG”). A more detailed history of the MN_C method can be found in ~~Annex E.~~Annex E.

The MN_C method takes the components of the gaseous fuel mixture and groups them together into several ternary and binary groups whose methane number has been experimentally determined. It then determines the overall methane number by applying optimization algorithms to the individual component groupings.

Natural gas — Calculation of methane number of gaseous fuels for reciprocating internal combustion engines — —

Part 1: MNC MNc method

1 Scope

This document specifies the MN_C method for the calculation of the methane number of a gaseous fuel, using the composition of the gas as sole input for the calculation.

This document applies to natural gas (and biomethane) and their admixtures with hydrogen.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 14532, Natural gas — Vocabulary

ISO 14912, Gas analysis — Conversion of gas mixture composition data

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14532 and the following apply. ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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— ISO Online browsing platform: available at https://www.iso.org/obphttps://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/https://www.electropedia.org/

3.1 3.1
methane number
MN
numerical rating indicating the knock resistance of a gaseous fuel

Note 1 to entry: It is analogous to the octane number for petrol. The methane number is the volume fraction expressed as the percentage of methane in a methane-hydrogen mixture, that in a test engine under standard conditions has the same knock resistance as the gaseous fuel to be examined.

[SOURCE: ISO/DIS 14532:2025, 3.74]

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