



International  
Standard

**ISO 17507-1**

**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*

**First edition  
2025-12**

iTeh Standards  
(<https://standards.itih.ai>)  
Document Preview

[ISO 17507-1:2025](https://standards.itih.ai/catalog/standards/iso/98ea4b0e-007d-4aa7-815f-ef4d4b2c8666/iso-17507-1-2025)

<https://standards.itih.ai/catalog/standards/iso/98ea4b0e-007d-4aa7-815f-ef4d4b2c8666/iso-17507-1-2025>

**iTeh Standards**  
**(<https://standards.itih.ai>)**  
**Document Preview**

ISO 17507-1:2025

<https://standards.itih.ai/catalog/standards/iso/98ea4b0e-007d-4aa7-815f-ef4d4b2c8666/iso-17507-1-2025>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b>	<b>iv</b>
<b>Introduction</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Abbreviated terms</b>	<b>2</b>
<b>5 MN<sub>C</sub> method</b>	<b>2</b>
5.1 Introduction	2
5.2 Applicability	2
5.2.1 Standard gaseous fuel composition range	2
5.2.2 Handling of other gaseous fuel components	3
5.3 Methodology to calculate the MN <sub>C</sub>	4
5.4 Expression of results	4
5.5 Uncertainty error and bias	4
<b>6 Example calculations</b>	<b>5</b>
6.1 Example 1	5
6.1.1 Simplification of the composition of the gaseous fuel	5
6.1.2 Selection of the ternary systems	5
6.1.3 Sub-division of the inert-free mixture into the selected partial mixtures	8
6.1.4 Calculation of the methane number of the partial mixtures	8
6.1.5 Criteria for not using ternary systems for final calculation of the MN <sub>C</sub>	9
6.1.6 Adjustment of the composition and fraction of the partial mixtures	9
6.1.7 Calculation of the methane number of the simplified mixture	10
6.1.8 Calculation of the methane number of the gaseous fuel	10
6.2 Example 2	10
6.2.1 Simplification of the composition of the gaseous fuel	10
6.2.2 Calculation of fitness of the ternary systems	11
6.2.3 Selection of ternary mixtures	11
6.2.4 Calculation of the methane number	11
6.3 Example 3	11
6.3.1 Simplification of the composition of the gaseous fuel	11
6.3.2 Calculation of fitness of the ternary systems	11
6.3.3 Selection of ternary mixtures	12
6.3.4 Calculation of the methane number	12
6.3.5 Additional numerical examples	13
<b>Annex A (normative) Numerical results of calculations for a variety of compositions for software validation purposes</b>	<b>14</b>
<b>Annex B (informative) Tools for users of the MN<sub>C</sub> Method</b>	<b>27</b>
<b>Annex C (normative) Uncertainty error and bias</b>	<b>28</b>
<b>Annex D (informative) Natural gas-based fuels for reciprocating internal combustion engines</b>	<b>30</b>
<b>Annex E (informative) Basis of the MN<sub>C</sub> method</b>	<b>31</b>
<b>Bibliography</b>	<b>36</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 193, *Natural gas*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 408, *Biomethane and other renewable and low-carbon methane rich gases*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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](http://www.iso.org/members.html).

## 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 programme performed by AVL Deutschland (AVL is based in Graz, Austria) GmbH<sup>[1]</sup> for FVV (the Research Association for Combustion Engines). The methodology first proposed by Deutz (“Klöckner-Humboldt-Deutz AG”)<sup>[2],[3]</sup> 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](#).

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.

