International Standard

ISO 15501-1

Fourth edition
2025-12

Road vehicles — Compressed natural gas (CNG) fuel systems —

Part 1: Safety requirements

Véhicules routiers — Systèmes d'alimentation en gaz naturel comprimé (GNC) —

Partie 1: Exigences de sécurité

Reference number
ISO 15501-1:2025(en)

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Published in Switzerland

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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).

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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.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

This fourth edition cancels and replaces the third edition (ISO 15501-1:2016), which has been technically revised. It also incorporates the Amendment ISO 15501-1:2016/Amd. 1:2021.

The main changes are as follows:

— normative references have been updated;

— terminological entries have been updated;

— the reference to the series PRD has been removed;

— an electronic control unit requirement has been added;

— an electrical connections requirement has been added;

— the minimum receptacle clearance has been updated;

— vent line closures requirements have been added;

— gas temperature sensor requirements have been added.

A list of all parts in the ISO 15501 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

For the purposes of this document, all fuel system components in contact with natural gas have been considered suitable for natural gas as defined in ISO 15403-1.

When applying this document, it is to be understood that a safety device to prevent overfilling the vehicle's fuel system is part of the refuelling station. The pressure gauge has not been considered as a safety component.

When necessary, technical solutions regarding functional requirements are given in Annex A.

This document refers to a service pressure of 20 MPa (200 bar).

NOTE 1 1 bar = 0,1 MPa = 10^5 Pa. 1 MPa = 1 N/mm^2.

NOTE 2 This document is based upon a service pressure for natural gas as fuel of 20 MPa (200 bar) settled at 15 °C. Other service pressures can be accommodated by adjusting the pressure by the appropriate factor (ratio). For example, a 25 MPa (250 bar) service pressure system will require pressures to be multiplied by 1,25.

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Road vehicles — Compressed natural gas (CNG) fuel systems —

Part 1: Safety requirements

1 Scope

This document specifies the minimum safety requirements applicable for the functionality of compressed natural gas (CNG) on-board fuel systems intended for use on the types of motor vehicles defined in ISO 3833. This document is applicable to vehicles using compressed natural gas in accordance with ISO 15403-1, including mono-fuel, bi-fuel or dual-fuel applications, original-production and converted vehicles.

All matters relating to the skills of installers and converters have been excluded from this document.

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 1176, *Road vehicles — Masses — Vocabulary and codes*

ISO 7637-1, *Road vehicles — Electrical disturbances from conduction and coupling — Part 1: Vocabulary and general considerations*

ISO 7637-2, *Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only*

ISO 11439, *Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles*

ISO 11451-1, *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

ISO 11451-2, *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 2: Off-vehicle radiation sources*

ISO 11451-4, *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 4: Harness excitation methods*

ISO 11452-1, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

ISO 11452-2, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 2: Absorber-lined shielded enclosure*

ISO 11452-3, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 3: Transverse electromagnetic (TEM) cell*

ISO 11452-4, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 4: Harness excitation methods*

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ISO 11452-5, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 5: Stripline*

ISO 14469, *Road vehicles — Compressed natural gas (CNG) refuelling connector*

ISO 15500 (all parts), *Road vehicles — Compressed natural gas (CNG) fuel system components*

ISO 15501-2, *Road vehicles — Compressed natural gas (CNG) fuel systems — Part 2: Test methods*

ISO 20653, *Road vehicles — Degrees of protection (IP code) — Protection of electrical equipment against foreign objects, water and access*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1176, ISO 15500-6, ISO 15500-7, ISO 15500-9, ISO 15500-12, ISO 15500-13, ISO 15500-14 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

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

3.1
service pressure
settled pressure at a uniform gas temperature of 15 °C

Note 1 to entry: The ISO 15501 series is based on a service pressure for natural gas used as fuel of 20 MPa (200 bar), settled at 15 °C. Other service pressures can be accommodated by adjusting the pressure by the appropriate factor (ratio). For example, a 25 MPa (250 bar) service pressure system will require pressures to be multiplied by 1,25.

3.2
CNG on-board fuel system
compressed natural gas fuel system comprising cylinder, or cylinders according to ISO 11439, mounting, one or more refuelling receptacles according to ISO 14469, and the components described in the ISO 15500 series

3.3
main shut-off valve
automatic valve designed to isolate a high-pressure source

3.4
vehicle mass

3.4.1
maximum authorized mass
vehicle mass determined as a maximum by the administrative authority for operating conditions laid down by that authority

Note 1 to entry: For vehicles coupled with a trailer or a semi-trailer which exerts a significant vertical load on the coupling device or the fifth wheel, this load, divided by standard acceleration of gravity, is included in the maximum design total mass or maximum authorized total mass.

Note 2 to entry: For semi-trailers, the maximum authorized total mass including the vertical load on the fifth wheel is determined by the administrative authority taking into account the characteristics of the towing vehicle.

[SOURCE: ISO 1176:1990, 4.8, modified — The original term was "maximum authorized total mass".]

3.5
vehicle categories

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3.5.1
category M
power-driven vehicles having at least four wheels and used for the carriage of passengers

3.5.1.1
category M1
vehicles used for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat

3.5.1.2
category M2
vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat and having a *maximum authorized mass* (3.4.1) not exceeding 5 000 kg

3.5.1.3
category M3
vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat and having a *maximum authorized mass* (3.4.1) exceeding 5 000 kg

3.5.2
category N
power-driven vehicles having at least four wheels and used for the carriage of goods

3.5.2.1
category N1
vehicles used for the carriage of goods and having a *maximum authorized mass* (3.4.1) not exceeding 3 500 kg

3.5.2.2
category N2
vehicles used for the carriage of goods and having a *maximum authorized mass* (3.4.1) exceeding 3 500 kg, but not exceeding 12 000 kg

3.5.2.3
category N3
vehicles used for the carriage of goods and having a *maximum authorized mass* (3.4.1) exceeding 12 000 kg

3.6
electronic control unit
ECU
device which controls the compressed natural gas demand of the engine and establishes the cut-off of the automatic valve in case of a broken fuel supply pipe or in case of stalling of the engine, or during a crash

3.7
pressure relief device
PRD
one-time-use device triggered by excessive temperature or temperature and pressure acting in series or in parallel which vents gas to protect the cylinder from rupture

3.8
pressure relief valve
PRV
discharge valve
self-closing device which opens to prevent a pre-determined pressure being exceeded

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