International Standard

ISO 2710-1

Reciprocating internal combustion engines — Vocabulary —

Part 1: Terms for engine design and operation

Moteurs alternatifs à combustion interne — Vocabulaire —

Partie 1: Termes relatifs à la conception et au fonctionnement du moteur

Third edition
2026-07

Reference number
ISO 2710-1:2026(en)

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

Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines.*

This third edition cancels and replaces the second edition (ISO 2710-1:2017) which has been technically revised.

The main changes are as follows:

— new terms and definitions added and terms no longer used have been deleted.

A list of all parts in the ISO 2710 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.

Reciprocating internal combustion engines — Vocabulary —

Part 1: Terms for engine design and operation

1 Scope

This document defines terms relating to the design and operation of reciprocating internal combustion (RIC) engines.

Further terms relating to components and systems of *RIC engines* (3.1.1) are defined in the ISO 7967 series, and performance is defined in ISO 15550, ISO 14396 and the ISO 3046 series.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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 Main definitions

3.1.1
reciprocating internal combustion engine
RIC engine
mechanism delivering shaft power by the conversion of fuel chemical energy into mechanical work during combustion in one or more cylinders in which working pistons reciprocate

Note 1 to entry: When such a mechanism does not deliver shaft power, but power in the form of hot gas, the mechanism is known as a free piston gas generator.

3.1.2
rotary engine
internal combustion engine with a rotor which makes eccentric circular movements around the engine centreline and reciprocates the intake-compression-expansion-exhaust cycle between the housing

Note 1 to entry: This is not a *reciprocating internal combustion engine* (3.1.1) . It is listed for reference.

3.2 RIC engines classified by ignition method

3.2.1
compression ignition engine
engine in which the ignition is obtained solely from the temperature of the cylinder contents, resulting from their compression (self-ignition)

3.2.2
hot bulb engine
engine in which the ignition is obtained by the temperature of the cylinder contents, resulting not solely from their compression but also from a local hot surface

3.2.3
spark ignition engine
engine in which the ignition is obtained by means of an electric spark

Note 1 to entry: In some countries this engine is also known as an “Otto-engine”.

3.2.4
convertible engine
engine which is designed and equipped so that, by some small changes to the construction of the engine, it can be converted from a *compression ignition engine* (3.2.1) into a *spark ignition engine* (3.2.3) and vice versa

Note 1 to entry: In some cases, the term “convertible engine” means an engine converted from its original purpose to another purpose.

3.2.5
pilot injection engine
engine in which a small quantity of liquid fuel is injected into the cylinders to initiate combustion

3.3 RIC engines classified by fuel type

3.3.1
liquid-fuel engine
engine which operates on a fuel that is liquid at standard ambient conditions

3.3.1.1
diesel engine
compression ignition engine (3.2.1) in which air is compressed and liquid fuel (oil) is introduced into each cylinder near the end of this compression

Note 1 to entry: In engines with an exhaust gas recirculation system (EGR), air with recirculated gas is compressed in the cylinder.

3.3.1.2
spark ignition engine with carburettor
carburettor engine
spark ignition engine (3.2.3) in which a suitable mixture of air and fuel is formed outside the cylinder in a device called a carburettor

3.3.1.3
spark ignition engine with fuel injection
spark ignition engine (3.2.3) in which fuel is injected either into the air intake manifolds or into the cylinders

3.3.1.4
multi-fuel engine
engine designed and equipped so that without modification it can operate on fuels of widely different ignition properties

3.3.1.5
dual-fuel engine
engine system that is designed to simultaneously operate with two fuels, with each fuel being metered separately, where the consumed amount of one of the fuels relative to the other one may vary depending on the operation

Note 1 to entry: fuels may be liquid fuels , gaseous fuels or any combination of these fuel types.

3.3.1.6
methanol internal combustion engine
RIC engine (3.1.1) which operates using methanol as the fuel

3.3.1.7
ammonia internal combustion engine
RIC engine (3.1.1) which operates using ammonia as the fuel

3.3.2
gas engine
engine which operates using gaseous fuel

Note 1 to entry: Major gas fuels recently used for RIC engines are natural gas, biogas, liquefied petroleum gas and wellhead gas.

3.3.2.1
pilot injection gas engine
compression ignition engine (3.2.1) in which a mixture of gaseous fuel and air is compressed and ignited by the *pilot injection* (3.5.1.6) of a small quantity of liquid fuel from the cetane family

3.3.2.2
spark ignition gas engine
gas engine (3.3.2) in which the ignition occurs by means of an electric spark

3.3.2.3
hydrogen internal combustion engine
RIC engine (3.1.1) in which hydrogen is used as the fuel

3.3.2.4
dimethyl ether internal combustion engine
RIC engine (3.1.1) in which dimethyl ether is used as the fuel

3.3.2.5
fuel sharing mode

optional operating mode in which a *dual-fuel engine* (3.3.1.5) operates on a variable ratio of liquid and gas fuels that are simultaneously combusted in the cylinders, which allows increased fuel flexibility

Note 1 to entry: In this mode, which allows increased fuel flexibility, the *dual fuel engine* (3.3.1.5) operates on a variable ratio of liquid and gas fuels, which are simultaneously combusted in the cylinders.

Note 2 to entry: Gas fuel is admitted through the gas admission valves as per normal gas operation.

Note 3 to entry: An additional portion of liquid fuel is injected through the main fuel injection system.

3.4 RIC engines classified by cooling method

3.4.1
liquid-cooled engine
engine in which the cylinders and cylinder heads are directly cooled by liquid

Note 1 to entry: The term “water-cooled engine” is also used when the liquid is predominantly water. The term “oil-cooled engine” is used when the liquid is lubricating oil only.

3.4.2
air-cooled engine
engine in which the cylinders and cylinder heads are directly cooled by air

3.4.3
heat insulated engine
engine in which heat-loss from the cylinder and piston area is minimized by means of insulation

Note 1 to entry: This engine was called “adiabatic engine”, but, because it is impossible to achieve the theoretical adiabatic process in practice, recently it is more commonly called “heat insulated engine”.

3.5 Fuel supply

3.5.1
injection of fuel
introduction, under pressure, of fuel into the combustion air

3.5.1.1
air injection
injection of liquid fuel into the cylinder by means of high pressure air

3.5.1.2
mechanical injection
injection of fuel (3.5.1) solely by raising the fuel pressure until a valve opens

Note 1 to entry: For mechanical injection using liquid fuel, the term “solid injection” is also used.

3.5.1.3
direct injection
injection system in which fuel is injected into an *open combustion chamber* (3.8.2) or the main part of a *divided combustion chamber* (3.8.3)

3.5.1.4
indirect injection
injection system in which fuel is injected into a *divided combustion chamber* (3.8.3)

3.5.1.5
accumulator injection
injection system in which fuel is injected by means of pressure from an accumulator, created before or during the operation of a fuel pump

3.5.1.6
pilot injection
injection in which a small quantity of fuel is injected to start the combustion process and thus obtain smoother combustion with lower peak pressures when the main combustion occurs

Note 1 to entry: This is also called “pre-injection”.

3.5.1.7
post injection
injection in which a small quantity of fuel is injected after the combustion process

3.5.2
induction of fuel
supply into the working cylinder of a mixture of fuel and air, formed outside the cylinder

3.5.2.1
single point injection
SPI
injection system in which fuel is injected into the intake manifold or upstream of it by one or more fuel injectors for all cylinders

3.5.2.2
multi point injection
MPI
injection system in which fuel is injected into the intake port by one or more fuel injectors for one cylinder

3.6 Working cycle

3.6.1
working cycle
complete series of changes in the parameters of the *working medium* (e.g. mass, volume, pressure, and temperature) (3.6.1.1) present in each cylinder of an *RIC engine* (3.1.1) , accomplished before repetition occurs

3.6.1.1
working medium
mixture of air, or air and fuel, and/or *combustion products* (3.8.18), present in the cylinder during the *working cycle* (3.6.1)

3.6.1.2
intake stroke
piston stroke for inhaling *charge air* (3.7.3.1) into the cylinder

3.6.1.3
compression stroke
piston stroke for compressing *charge air* (3.7.3.1) or air-fuel mixture in two stroke or four stroke engines

3.6.1.4
expansion stroke
piston stroke for expanding combustion gas in the cylinder in two stroke or four stroke engines

3.6.1.5
exhaust stroke
piston stroke for exhausting combustion gas out of the cylinder in a four stroke engine

3.6.1.6
expansion ratio
ratio of combustion gas volume at the end of expansion divided by the combustion gas volume at the beginning of expansion in Diesel or *Sabathe cycle* (3.6.6)

3.6.1.7
cut-off ratio
ratio of the cylinder space volume at the end of expansion divided by the cylinder space volume at the beginning of expansion in Otto or *Sabathe cycle* (3.6.6)

3.6.1.8
rate of explosion
ratio of maximum pressure after combustion divided by the maximum pressure at the end of the *compression stroke* (3.6.1.3) of *working medium* (3.6.1.1) in *Otto cycle* (3.6.4) or *Sabathe cycle* (3.6.6)

3.6.2
four-stroke cycle
working cycle (3.6.1) which, for completion, needs four successive strokes of a working piston of a *reciprocating internal combustion engine* (3.1.1)

3.6.2.1
four-stroke engine
engine which works on the *four-stroke cycle* (3.6.2)

3.6.3
two-stroke cycle
working cycle (3.6.1) which, for completion, needs two successive strokes of a working piston of a *reciprocating internal combustion engine* (3.1.1)

3.6.3.1
two-stroke engine
engine which works on the *two-stroke cycle* (3.6.3)