

BS ISO 4106:2012



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Motorcycles — Engine test code — Net power

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National foreword

This British Standard is the UK implementation of ISO 4106:2012.

The UK participation in its preparation was entrusted to Technical Committee AUE/14, Motor cycles and mopeds.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Motorcycles — Engine test code — Net power

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4106 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

This fourth edition cancels and replaces the third edition (ISO 4106:2004), which has been technically revised.

Introduction

The third edition of ISO 4106 (ISO 4106:2004) has many cross-references to ISO 15550, which contains the requirements that are common to all engine applications. Consequently, users of ISO 4106:2004 always have to refer to ISO 4106 and ISO 15550 simultaneously in order to comprehend the full test procedures for motorcycles. In this fourth edition, all the necessary components are described in the text rather than referring to ISO 15550 in order to avoid such inconveniences, and some technical and editorial modifications have also been made for refinement.

ISO 4106 can now be used as a stand-alone International Standard for engine net power measurement of motorcycles.

Motorcycles — Engine test code — Net power

1 Scope

This International Standard specifies methods for evaluating the performance of engines designed for motorcycles as defined in ISO 3833, in particular with a view to the presentation of power curves and specific fuel consumption at full load as a function of engine speed, for net power assessment. It is applicable to reciprocating internal combustion engines (spark-ignition or compression-ignition) — excluding free-piston engines — and rotary piston engines, either naturally aspirated or pressure-charged and equipped with either mechanical pressure-charger or turbocharger. Particular specifications for the test of compression-ignition engines are specified in Annex A.

2 Normative references

The following referenced documents are indispensable for the application 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 2710-1, *Reciprocating internal combustion engines — Vocabulary — Part 1: Terms for engine design and operation*

ISO 3833, *Road vehicles — Types — Terms and definitions*

ISO 15550, *Internal combustion engines — Determination and method for the measurement of engine power — General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2710-1, ISO 15550 and the following apply.

3.1

net power

power obtained on a test bed at the end of the crankshaft or its equivalent at the corresponding engine speed with the equipment and auxiliaries listed in 6.3.1

3.2

corrected net power

net power corrected under the standard reference conditions

3.3

net torque

torque transmitted on a test bed at the end of the crankshaft or its equivalent at the corresponding engine speed with the equipment and auxiliaries listed in 6.3.1

3.4

corrected net torque

net torque corrected under the standard reference conditions

3.5

specific fuel consumption

amount of fuel consumed by an engine per unit of power and time

NOTE The amount of the lubricants for two-stroke cycle engines is excluded.

3.6

auxiliaries

equipment and devices necessary to make the engine acceptable for service in the intended application

4 Symbols

For the purposes of this document, the symbols given in Table 1 apply.

Table 1 — Symbols

Symbol	Designation	Unit
b_e	Specific fuel consumption	g/(kW·h)
p_d	Ambient dry air barometric pressure during the test	kPa
p_r	Standard reference total barometric pressure	kPa
p_{sr}	Standard reference saturated water vapour pressure	kPa
p_{sy}	Ambient saturated water vapour pressure during the test	kPa
p_y	Ambient total barometric pressure during the test	kPa
P	Measured power	kW
P_o	Corrected net power	kW
P_y	Net power	kW
T	Measured torque	N·m
T_o	Corrected net torque	N·m
T_y	Net torque	N·m
t_r	Standard reference ambient air temperature	K
t_y	Engine inlet air temperature during the test	K
α_a	Correction factor for ambient test conditions	—
α_m	Correction factor for efficiency of the transmission	—
η_i	Efficiency of each element constituting the transmission	—
η_t	Efficiency of the transmission which is located between the crankshaft and the measurement point	—
ϕ_r	Standard reference relative humidity	%
ϕ_y	Ambient relative humidity during the test	%

5 Standard reference conditions

For the purpose of determining the power and fuel consumption of an engine, the following standard reference conditions shall be used:

- standard reference total barometric pressure: $p_r = 100$ kPa;
- standard reference air temperature: $t_r = 298$ K;
- standard reference relative humidity: $\phi_r = 30$ %.

NOTE A relative humidity of 30 % at a temperature of 298 K corresponds to a water pressure of 1 kPa. The corresponding dry barometric pressure is 99 kPa.

6 Tests

6.1 General

This test method is used for verifying the net power of an engine type with the declared values. It presents engine performance at full power/torque as a function of engine speed by generating curves of corrected net torque, corrected net power and specific fuel consumption.

6.2 Measuring equipment and instrument accuracy

6.2.1 Torque

The dynamometer torque-measuring system shall have an accuracy of $\pm 1\%$ in the range of scale values required for the test. The torque-measuring system shall be calibrated to take into account friction losses. The accuracy may be $\pm 2\%$ for measurements carried out at a power less than 50 % of maximum power.

6.2.2 Engine speed

The engine-speed measuring system shall have an accuracy of $\pm 0,5\%$.

6.2.3 Fuel flow

The fuel-flow measuring system shall have an accuracy of $\pm 1\%$.

6.2.4 Fuel temperature

The fuel-temperature measuring system shall have an accuracy of $\pm 1\text{ K}$.

6.2.5 Engine inlet air temperature

The air-temperature measuring system shall have an accuracy of $\pm 1\text{ K}$.

6.2.6 Barometric pressure

The barometric-pressure measuring system shall have an accuracy of $\pm 70\text{ Pa}$.

6.2.7 Back pressure in exhaust system

The system used to measure the back pressure (differential pressure) in the exhaust system shall have an accuracy of $\pm 25\text{ Pa}$.

6.2.8 Test room humidity

The test-room-humidity measuring system shall have an accuracy of $\pm 5\%$ in relative humidity.

NOTE In the test atmospheric conditions specified in 6.3.3, the worst relative humidity measurement accuracy of $\pm 5\%$ corresponds to a wet and dry bulb thermometer measurement accuracy of $\pm 0,5\text{ K}$. In the worst case, it is estimated that an accuracy of $\pm 0,5\text{ K}$ in a wet and dry bulb thermometer measurement would have an effect of approximately $\pm 0,3\%$ on the net power measuring result.

6.3 Setting and test conditions

6.3.1 Equipment and auxiliaries

During the test, if the equipment and auxiliaries specified in Table 2 are the standard productions, they shall be installed on the test bench as far as possible in the same position and in the same condition as in the intended application. The equipment and auxiliaries for the test of compression-ignition engines are listed in Annex A.