
**Motorcycles — Measurement method for
gaseous exhaust emissions and fuel
consumption —**

**Part 2:
Test cycles and specific test conditions**

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Motorcycles — Méthode de mesure des émissions de gaz
d'échappement et de la consommation de carburant —
Partie 2: Conditions d'essai spécifiques et cycles d'essai*

ISO 6460-2:2007

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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Test cycle	1
3.1 Introduction	1
3.2 Type 1 test	2
3.3 Type 2 test	8
4 Presentation of results	9
Annex A (normative) Presentation of results for gaseous exhaust emissions	10
Annex B (normative) Presentation of results of fuel consumption	13
Annex C (informative) Test cycles	16
Bibliography	21

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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 6460-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

ISO 6460-2, together with ISO 6460-1 and ISO 6460-3, cancels and replaces ISO 6460:1981 and ISO 7860:1995, which have been technically revised.

ISO 6460 consists of the following parts, under the general title *Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption*: [ISO 6460-2:2007](https://standards.iteh.ai/catalog/standards/sist/834331ba-3708-4775-a5c4-f2f61e45696c/iso-6460-2-2007)

- *Part 1: General test requirements*
- *Part 2: Test cycles and specific test conditions*
- *Part 3: Fuel consumption measurement at a constant speed*

Introduction

This part of ISO 6460 has been prepared to provide details of the typical test cycles for measurement of exhaust gas and fuel consumption. The measurements can be carried out by referring to this part of ISO 6460 and to ISO 6460-1.

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Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption —

Part 2: Test cycles and specific test conditions

1 Scope

This part of ISO 6460 defines test cycles for measurement for the gaseous emissions from motorcycles, as well as for determining the fuel consumption of motorcycles as defined in ISO 3833, equipped with a spark ignition engine (four-stroke engine, two-stroke engine or rotary piston engine) or a compression ignition engine.

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 4106, *Motorcycles — Engine test code — Net power* <https://standards.iteh.ai/catalog/standards/sist/834331ba-3708-4775-a5c4-2f61e45696c/iso-6460-2-2007>
- ISO 7117, *Motorcycles — Measurement of maximum speed*

3 Test cycle

3.1 Introduction

The test cycle is equivalent to the test cycle specified in European Union Commission Directive 2003/77/EC^[7].

The motorcycle shall be placed on a chassis dynamometer equipped with a brake and flywheel. The urban driving cycle (UDC) test shall be conducted over six elementary urban cycles lasting a total 1 170 s without interruption. The urban driving cycle (UDC)/extra-urban driving cycle (EUDC) test shall be conducted over six elementary urban cycles plus one extra-urban cycle lasting a total of 1 570 s without interruption.

During the test, the exhaust gases shall be diluted with air so that the flow volume of the mixture remains constant. Throughout the test, a continuous flow of samples of the mixture shall be passed into one or more bags so that concentrations (average test values) of carbon monoxide, unburnt hydrocarbons, oxides of nitrogen and carbon dioxide can be determined.

A selection of other test cycles adopted or to be adopted by several countries is described in Annex C for information purposes.

3.2 Type 1 test

3.2.1 Operating cycle on the chassis dynamometer

3.2.1.1 Description of cycle

The operating cycles on the chassis dynamometer are indicated in 3.2.4.

3.2.1.2 General conditions for carrying out the cycle

Preliminary test cycles shall be carried out if necessary to determine how best to actuate the accelerator and brake controls so as to achieve a cycle approximating the theoretical cycle within the prescribed limits.

3.2.1.3 Use of the gearbox

3.2.1.3.1 Use of the gearbox is determined as described below.

- a) At constant speed, the engine speed shall as far as possible remain between 50 % and 90 % of the maximum speed. If this speed can be achieved using more than one gear, the engine is tested using the highest gear.
- b) With respect to the urban cycle, during acceleration the engine shall be tested using the gear which allows maximum acceleration. The next higher gear is engaged, at the latest, when the engine speed has reached 110 % of the speed at which the maximum net power output occurs. If a motorcycle reaches a speed of 20 km/h in first gear or 35 km/h in second gear, the next higher gear shall be engaged at these speeds.

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In these cases, no other change into higher gears is permitted. If, during the acceleration phase, the gears are changed at fixed motorcycle speeds, the constant speed phase which follows shall be performed with the gear which is engaged when the motorcycle begins the constant speed phase, irrespective of the engine speed.

- c) During deceleration, the next lower gear shall be engaged before the engine reaches virtual idling speed or when the engine speed has fallen to 30 % of the speed of the maximum net power, whichever occurs first. First gear shall not be engaged during deceleration.

3.2.1.3.2 Motorcycles equipped with automatic gearboxes shall be tested with the highest gear engaged (drive). The accelerator shall be operated in such a way as to obtain as steady an acceleration as possible, so that the transmission engages the different gears in the normal order. The tolerances specified in 3.2.1.4 apply.

3.2.1.3.3 For carrying out the extra-urban cycle, the gearbox shall be used in accordance with the manufacturer's recommendation.

Acceleration shall continue throughout the period represented by the straight line connecting the end of each period of idling with the beginning of the next following period of constant speed. The tolerances given in 3.2.1.4 apply.

3.2.1.4 Tolerances

3.2.1.4.1 The theoretical speed shall be maintained to a tolerance of ± 2 km/h during all phases. Speed tolerances greater than those prescribed are permitted during phase changes provided that the tolerances are never exceeded for more than 0,5 s on any one occasion, in all cases subject to the provisions of 3.2.2.5.2 and 3.2.2.6.3.

3.2.1.4.2 A tolerance of $\pm 0,5$ s above or below the theoretical times shall be allowed.

3.2.1.4.3 The speed and time tolerances are combined as indicated in 3.2.4.

3.2.1.4.4 The distance travelled during the cycle shall be measured with a tolerance of $\pm 2\%$.

3.2.2 Procedure for chassis dynamometer tests

3.2.2.1 Special conditions for carrying out the cycle

3.2.2.1.1 The temperature in the premises where the chassis dynamometer bench is situated shall be between 293 K and 303 K throughout the test, and shall be as close as possible to the temperature of the premises where the motorcycle was conditioned.

3.2.2.1.2 The motorcycle shall as far as possible be horizontal during the test so as to avoid any abnormal distribution of the fuel.

3.2.2.1.3 During the test, the motorcycle speed shall be plotted against time in order to check that the cycles have been performed correctly.

3.2.2.1.4 The temperatures of the cooling water and the crankcase oil may be recorded.

3.2.2.2 Starting up the engine

3.2.2.2.1 Once the preliminary operations on the equipment for collecting, diluting, analysing and measuring the gases have been carried out, the engine is started up by means of the devices provided for that purpose, such as the choke, the starter valve, etc., in accordance with the manufacturer's instructions.

3.2.2.2.2 The first cycle begins when the taking of samples and the measuring of the pump rotations commence.

3.2.2.3 Use of the manual choke

The choke shall be cut out as soon as possible and in principle before acceleration from 0 km/h to 50 km/h. If this requirement cannot be met, the moment of actual cut-out shall be indicated. The choke shall be adjusted in accordance with the manufacturer's instructions.

3.2.2.4 Idling

3.2.2.4.1 Manual-shift gearboxes

3.2.2.4.1.1 During periods of idling, the clutch shall be engaged and the gears shall be in neutral.

3.2.2.4.1.2 To enable the accelerations to be performed in accordance with the normal cycle, the vehicle shall be put in first gear, with the clutch disengaged, 5 s before the start of the acceleration following the idling period in question.

3.2.2.4.1.3 The first idling period at the beginning of the cycle consists of 6 s of idling in neutral with the clutch engaged, and 5 s in first gear with the clutch disengaged.

3.2.2.4.1.4 For the idling periods during each cycle, the corresponding times are 16 s in neutral and 5 s in first gear with the clutch disengaged.

3.2.2.4.1.5 The last idling period in the cycle consists of 7 s in neutral with the clutch engaged.

3.2.2.4.2 Semi-automatic gearboxes

The manufacturer's instructions for driving in town or, in their absence, instructions applicable to manual gearboxes shall be followed.

3.2.2.4.3 Automatic gearboxes

The selector shall not be operated at any time during the test unless the manufacturer specifies otherwise. In the latter case, the procedure for manual gearboxes applies.

3.2.2.5 Accelerations

3.2.2.5.1 Accelerations shall be effected so as to ensure that the rate of acceleration is as constant as possible throughout the operation.

3.2.2.5.2 If the acceleration capacities of the motorcycle are not sufficient to perform the acceleration cycles within the prescribed tolerances, the motorcycle shall be driven with the throttle completely open until the speed prescribed for the cycle has been reached. The cycle may then continue normally.

3.2.2.6 Decelerations

3.2.2.6.1 All decelerations shall be effected by completely closing the throttle, the clutch remaining engaged. The engine shall be disengaged at a speed of 10 km/h.

3.2.2.6.2 If the period of deceleration is longer than that prescribed for the corresponding phase, the vehicle's brakes are used to keep to the cycle.

3.2.2.6.3 If the period of deceleration is shorter than that prescribed for the corresponding phase, the timing of the theoretical cycle is restored by a steady-state or an idling period merging into the following steady-state or idling operation. In this case, 3.2.1.4.3 is not applicable.

3.2.2.6.4 At the end of the deceleration period (stopping motorcycle on the rollers), the gear shall be put into neutral and the clutch engaged.

3.2.2.7 Constant speeds

3.2.2.7.1 "Pumping" or the closing of the throttle shall be avoided when passing from acceleration to the following constant speed.

3.2.2.7.2 Periods of constant speed shall be achieved by keeping the accelerator position fixed.

3.2.3 Analysis

The exhaust gases contained in the bag shall be analysed as soon as possible and in any event not later than 20 min after the end of the test cycle.

3.2.4 Breakdown of the operating cycles

The operating cycle of the urban driving cycle (UDC) on the chassis dynamometer is described in Table 1, and the operation cycle of the extra-urban driving cycle (EUDC) on the chassis dynamometer is described in Table 2. The operating cycle of UDC is described in Figure 1 and the operating cycle of UDC/EUDC is described in Figure 2.

In EUDC on the chassis dynamometer, for motorcycles with a permitted maximum speed of 110 km/h, the maximum speed for EUDC shall be restricted to 90 km/h and the operation cycle on the chassis dynamometer is described in Table 3. The operating cycle of UDC/EUDC for motorcycles with a permitted maximum speed of 110 km/h is described in Figure 2.

Table 1 — UDC operating cycle on the chassis dynamometer

Operation no.	Operation	Phase	Acceleration m/s ²	Speed km/h	Duration of each		Cumulative time s	Distance covered m
					operation s	phase s		
1	Idling	1	0	0	11	11	11	0
2	Acceleration	2	1,04	0 to 15	4	4	15	8
3	Constant speed	3	0	15	8	8	23	34
4	Deceleration	4	-0,69	15 to 10	2	5	25	7
5	Deceleration, clutch disengaged		-0,92	10 to 0	3		28	4
6	Idling	5	0	0	21	21	49	0
7	Acceleration	6	0,74	0 to 32	12	12	61	54
8	Constant speed	7	0	32	24	24	85	214
9	Deceleration	8	-0,75	32 to 10	8	11	93	48
10	Deceleration, clutch disengaged		-0,92	10 to 0	3		96	4
11	Idling	9	0	0	21	21	117	0
12	Acceleration	10	0,53	0 to 50	26	26	143	183
13	Constant speed	11	0	50	12	12	155	167
14	Deceleration	12	-0,52	50 to 35	8	8	163	95
15	Constant speed	13	0	35	13	13	176	127
16	Deceleration	14	-0,68	35 to 10	9	12	185	64
17	Deceleration, clutch disengaged		-0,92	10 to 0	3		188	4
18	Idling	15	0	0	7	7	195	0
Total distance covered								1 013