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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 6460-2

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

Part 2: Test cycles and specific test conditions

*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

ICS: 13.040.50; 43.140

ISO/TC 22/SC 38

Secretariat: **UNI**

Voting begins on:
2025-08-12

Voting terminates on:
2025-11-04

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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 documents 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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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 38, *Motorcycles and mopeds*.

This second edition cancels and replaces the second edition (ISO 6460-2:2014), which has been technically revised.

The main changes compared to the previous edition are as follows:

- The description of the test cycle described for the Scope is appropriately placed in the General section of the test cycle.
- Added “UN GTR No.2 (WMTC) “ to the Normative references.
- The test cycle is equivalent to the test cycle specified in WMTC.
- The test cycle specified in European Union Commission Directive 2003/77/EC^[6] is described in [Annex C](#) for information.
- An explanation of the gear shift calculation is included in [Annex D](#) for information.

Introduction

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

The following revisions are mainly made in this document.

- The description of the test cycle described for the Scope is appropriately placed in the General section of the test cycle.
- Added “UN GTR No.2 (WMTC) “ to the Normative references.
- The test cycle is equivalent to the test cycle specified in WMTC.
- Corrected the starting sequence at test cycle start.
- The test cycle specified in European Union Commission Directive 2003/77/EC^[6] is described in [Annex C](#) for information.
- An explanation of the gear shift calculation is included in [Annex D](#) for information.

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

Part 2: Test cycles and specific test conditions

1 Scope

This document specifies the test cycles for measurement for the gaseous exhaust emissions from motorcycles, and for determining the fuel consumption of motorcycles as defined in ISO 3833. It is applicable to motorcycles equipped with a spark ignition engine (four-stroke engine or rotary piston engine).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

ISO 6460-1, *Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption — Part 1: General test requirements*

ISO 7117, *Motorcycles — Measurement method for determining maximum speed*

UN GTR No.2 (WMTC) — *Measurement procedure for two-wheeled motorcycles equipped with a positive or compression ignition engine with regard to the emission of gaseous pollutants, CO₂ emissions and fuel consumption.*

3 Test cycle

3.1 General

The test cycle is equivalent to the test cycle specified in WMTC.

3.2 Test room conditions

The test room with the chassis dynamometer and the gas sample collection device shall have a temperature of 298 K $\pm$ 5 K. The room temperature shall be measured twice in the vicinity of motorcycle cooling blower (fan), both before and after the type 1 test.

3.3 Motorcycle classification

3.3.1 General

[Figure 1](#) gives an overview of the motorcycle classification in terms of engine capacity and maximum motorcycle speed. The numerical values of the engine capacity and maximum motorcycle speed shall not be rounded up or down.

3.3.2 Class 1

Motorcycles that fulfil either of the following specifications belong to class 1:

$50 \text{ cm}^3 < \text{engine capacity} < 150 \text{ cm}^3$ and $v_{\max} \leq 50 \text{ km/h}$ or engine capacity $< 150 \text{ cm}^3$ and $50 \text{ km/h} < v_{\max} < 100 \text{ km/h}$.

3.3.3 Class 2

Motorcycles that fulfil either of the following specifications belong to class 2:

- a) subclass 2-1: engine capacity $< 150 \text{ cm}^3$ and $100 \text{ km/h} \leq v_{\max} < 115 \text{ km/h}$ or engine capacity $\geq 150 \text{ cm}^3$ and $v_{\max} < 115 \text{ km/h}$;
- b) subclass 2-2: $115 \text{ km/h} \leq v_{\max} < 130 \text{ km/h}$.

3.3.4 Class 3

Motorcycles that fulfil either of the following specifications belong to class 3:

- a) subclass 3-1: $130 \text{ km/h} \leq v_{\max} < 140 \text{ km/h}$;
- b) subclass 3-2: $v_{\max} \geq 140 \text{ km/h}$.

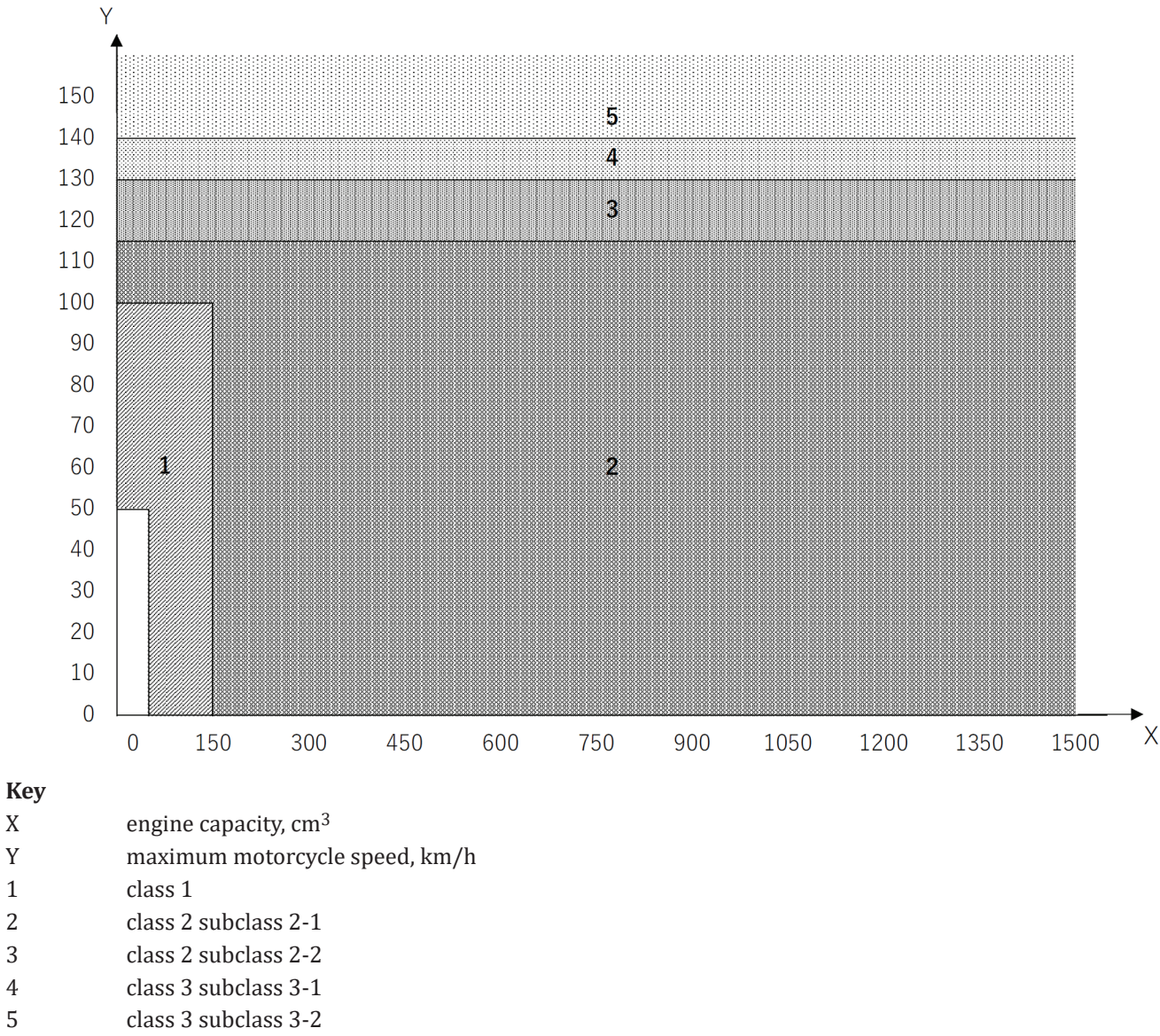


Figure 1 — Motorcycle classification

3.4 Type 1 tests

3.4.1 Driving schedules

3.4.1.1 Test cycles

Test cycles (motorcycle speed patterns) for the type 1 test consists of up to three parts that are shown in 3.8. Depending on the motorcycle class (see 3.3), the following test cycle parts shall be run.

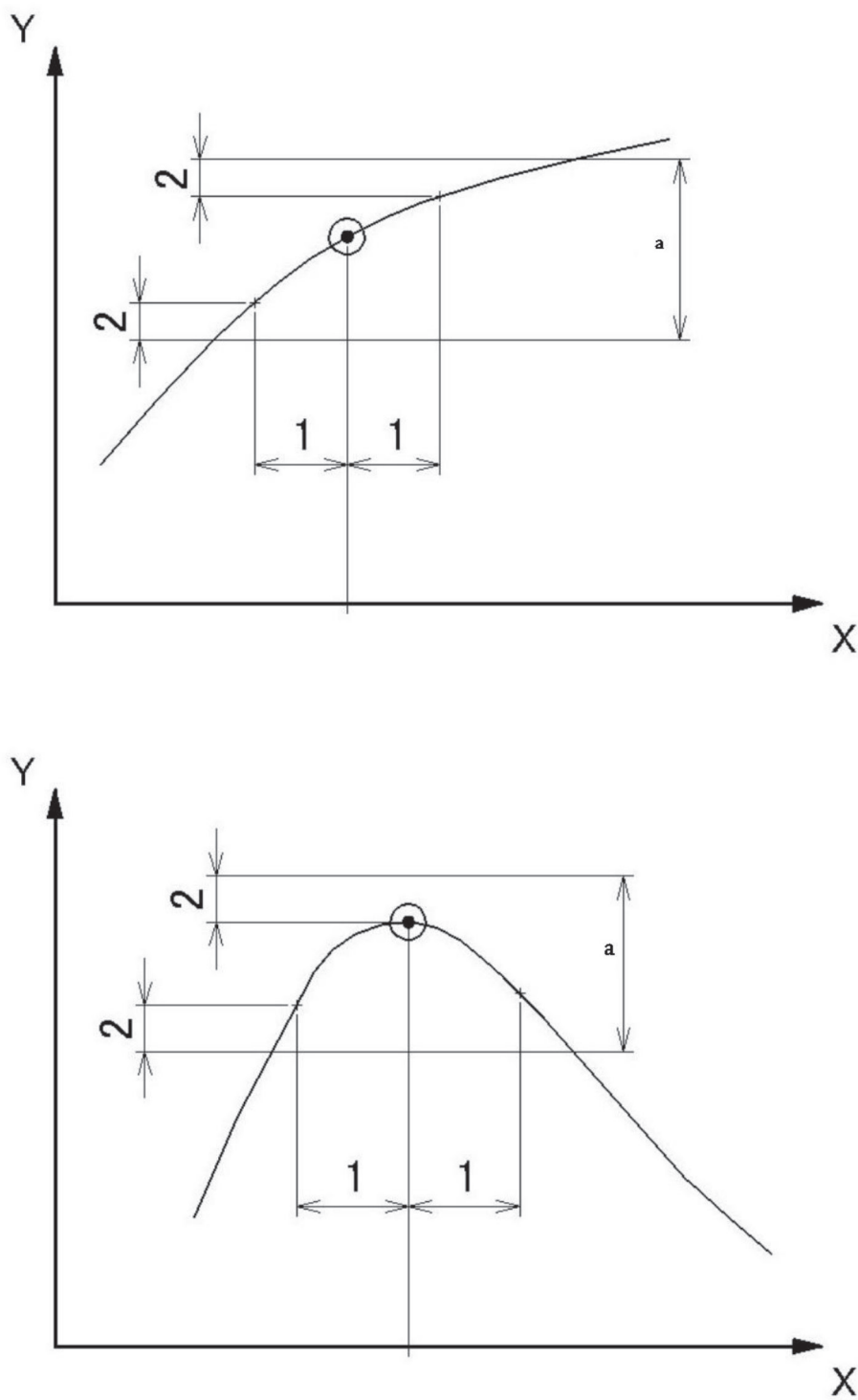
- a) class 1:
 - part 1, reduced speed in cold condition, followed by part 1 reduced speed in hot condition;
- b) class 2:
 - 1) subclass 2-1: part 1, reduced speed in cold condition, followed by part 2, reduced speed in hot condition;

- 2) subclass 2-2: part 1 in cold condition, followed by part 2 in hot condition;
- c) class 3
 - 1) subclass 3-1: part 1 in cold condition, followed by part 2 in hot condition, followed by part 3 reduced speed in hot condition;
 - 2) subclass 3-2: part 1 in cold condition, followed by part 2 in hot condition, followed by part 3 in hot condition.

3.4.1.2 Speed tolerances

The speed tolerance at any given time on the test cycle prescribed in [3.4.1.1](#) is defined by upper and lower limits. The upper limit is 3,2 km/h higher than the highest point on the trace within 1 s of the given time. The lower limit is 3,2 km/h lower than the lowest point on the trace within 1 s of the given time. Speed variations greater than the tolerances (such as can occur during gear changes) are acceptable provided they occur for less than 2 s on any occasion. Speeds lower than those prescribed are acceptable provided the motorcycle is operated at maximum available power during such occurrences. [Figure 2](#) shows the range of acceptable speed tolerances for typical points.

Apart from these exceptions the deviations of the roller speed from the set speed of the cycles shall meet the requirements described above. If not, the test results shall not be used for the further analysis and the run shall be repeated.



Key

X	time
Y	speed
1	1 s
2	3,2 km/h
a	Allowable range.

Figure 2 — Drivers trace, allowable range

3.4.2 Gearshift prescriptions

3.4.2.1 Test motorcycles with automatic transmission

Motorcycles equipped with transfer cases, multiple sprockets, etc., shall be tested in the manufacturer's recommended configuration for street or highway use.

All tests shall be conducted with automatic transmissions in “drive” (highest gear). Automatic clutch-torque converter transmissions may be shifted as manual transmissions at the option of the manufacturer.

Idle modes shall be run with automatic transmissions in “drive” and the wheels braked.

Automatic transmissions shall shift automatically through the normal sequence of gears.

The deceleration modes shall be run in gear using brakes or throttle as necessary to maintain the desired speed.

3.4.2.2 Test motorcycles with manual transmission

3.4.2.2.1 Mandatory requirements

3.4.2.2.1.1 Step 1 — Calculation of shift speeds

Upshift speeds ($v_{1 \rightarrow 2}$ and $v_{i \rightarrow i+1}$) in km/h during acceleration phases shall be calculated in accordance with [Formulae \(1\)](#) and [\(2\)](#).

$$v_{1 \rightarrow 2} = \left[\left(0,5753 \times e^{\left(-1,9 \times \frac{P_n}{m_k + 75} \right)} - 0,1 \right) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_1} \quad (1)$$

$$v_{i \rightarrow i+1} = \left[\left(0,5753 \times e^{\left(-1,9 \times \frac{P_n}{m_k + 75} \right)} \right) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_i}, i = 2 \text{ to } ng - 1 \quad (2)$$

where

- i is the gear number (≥ 2);
- ng is the total number of forward gears;
- P_n is the rated power, in kW;
- m_k is the kerb mass, in kg;
- n_{idle} is the idling speed, in min^{-1} ;
- s is the rated engine speed, in min^{-1} ;
- ndv_i is the ratio between engine speed, in min^{-1} , and motorcycle speed, in km/h, in gear i .

Downshift speeds ($v_{i \rightarrow i-1}$) in km/h during cruise or deceleration phases in gear 4 (4th gear) to ng shall be calculated in accordance with [Formula \(3\)](#).

$$v_{i \rightarrow i-1} = \left[\left(0,5753 \times e^{\left(-1,9 \times \frac{P_n}{m_k + 75} \right)} \right) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_{i-2}}, i = 4 \text{ to } ng \quad (3)$$

where

- i is the gear number (≥ 4);
- ng is the total number of forward gears;
- P_n is the rated power, in kW;
- m_k is the kerb mass, in kg;
- n_{idle} is the idling speed, in min^{-1} ;
- s is the rated engine speed, in min^{-1} ;
- ndv_{i-2} is the ratio between engine speed, in min^{-1} , and motorcycle speed, in km/h, in gear $i-2$.

The downshift speed from gear 3 to gear 2 ($v_{3 \rightarrow 2}$) shall be calculated in accordance with [Formula \(4\)](#).

$$v_{3 \rightarrow 2} = \left[\left(0,5753 \times e^{\left(-1,9 \times \frac{P_n}{m_k + 75} \right)} - 0,1 \right) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_1} \quad (4)$$

where

- P_n is the rated power, in kW;
- m_k is the kerb mass, in kg;
- n_{idle} is the idling speed, in min^{-1} ;
- s is the rated engine speed, in min^{-1} ;
- ndv_1 is the ratio between engine speed, in min^{-1} , and motorcycle speed, in km/h, in gear 1.

The downshift speed from gear 2 to gear 1 ($v_{2 \rightarrow 1}$) shall be calculated in accordance with [Formula \(5\)](#).

$$v_{2 \rightarrow 1} = [0,03 \times (s - n_{idle}) + n_{idle}] \times \frac{1}{ndv_2} \quad (5)$$

where ndv_2 is the ratio between engine speed, in min^{-1} , and motorcycle speed, in km/h, in gear 2.

Since the cruise phases are defined by the phase indicator, slight speed increases could occur and it can be meaningful to apply an upshift. The upshift speeds ($v_{1 \rightarrow 2}$, $v_{2 \rightarrow 3}$ and $v_{i \rightarrow i+1}$) in km/h during cruise phases can be calculated in accordance with [Formulae \(6\) to \(8\)](#).

$$v_{1 \rightarrow 2} = [0,03 \times (s - n_{idle}) + n_{idle}] \times \frac{1}{ndv_2} \quad (6)$$

$$v_{2 \rightarrow 3} = \left[\left(0,5753 \times e^{\left(-1,9 \times \frac{P_n}{m_k + 75} \right)} - 0,1 \right) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_1} \quad (7)$$

$$v_{i \rightarrow i+1} = \left[\left(0,5753 \times e^{\left(-1,9 \times \frac{P_n}{m_k + 75} \right)} \right) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_{i-1}}, i = 3 \text{ to } ng - 1 \quad (8)$$

The results of shift speeds shall be mathematically rounded to the first place of the decimal point.

3.4.2.2.1.2 Step 2 — Gear choice for each cycle sample

In order to avoid different interpretations about acceleration, deceleration, cruise, and stop phases, corresponding indicators are added to the motorcycle speed pattern as integral parts of the cycles (see [Tables 2 to 25](#)).

The appropriate gear for each sample shall then be calculated according to the motorcycle speed ranges resulting from the shift speed formulae [[Formulae \(1\) to \(8\)](#)] and these phase indicators for the cycle parts appropriate for the test motorcycle as follows:

— gear choice for stop phases

For the last 5 s of a stop phase, the gear lever shall be set to gear 1 and the clutch shall be disengaged. For the previous part of a stop phase, the gear lever shall be set to neutral or the clutch shall be disengaged.

— gear choice for acceleration phases:

- gear 1, if $v \leq v_{1 \rightarrow 2}$;
- gear 2, if $v_{1 \rightarrow 2} < v \leq v_{2 \rightarrow 3}$;
- gear 3, if $v_{2 \rightarrow 3} < v \leq v_{3 \rightarrow 4}$;
- gear 4, if $v_{3 \rightarrow 4} < v \leq v_{4 \rightarrow 5}$;
- gear 5, if $v_{4 \rightarrow 5} < v \leq v_{5 \rightarrow 6}$;
- gear 6, if $v > v_{5 \rightarrow 6}$;

— gear choice for deceleration or cruise phases:

- gear 1, if $v < v_{2 \rightarrow 1}$;
- gear 2, if $v < v_{3 \rightarrow 2}$;
- gear 3, if $v_{3 \rightarrow 2} \leq v < v_{4 \rightarrow 3}$;
- gear 4, if $v_{4 \rightarrow 3} \leq v < v_{5 \rightarrow 4}$;
- gear 5, if $v_{5 \rightarrow 4} \leq v < v_{6 \rightarrow 5}$;
- gear 6, if $v \geq v_{4 \rightarrow 5}$.

The clutch shall be disengaged, if

- a) the motorcycle speed drops below 10 km/h,
- b) the engine speed drops below $n_{\text{idle}} + 0,03 \times (s - n_{\text{idle}})$, or
- c) there is a risk of engine stalling during cold start phase.

3.4.2.2.1.3 Step 3 — Corrections according to additional requirements

The gear choice has then to be modified according to the following requirements.

- a) There shall be no gearshift at a transition from an acceleration phase to a deceleration phase. The gear that was used for the last second of the acceleration phase shall be kept for the following deceleration phase unless the speed drops below a downshift speed.
- b) There shall be no upshifts or downshifts by more than one gear, except from gear 2 to neutral during decelerations down to stop. (Example: Gear 4→4→4→4→3→3→3→3→1→1→1→1 will be replaced by gear 4→4→4→4→3→3→3→3→2→1→1→1.)

- c) Upshifts or downshifts for up to 4 s are replaced by the gear before, if the gears before and after are identical. (Examples: Gear 2→3→3→3→2 will be replaced by gear 2→2→2→2→2; gear 4→3→3→3→3→4 will be replaced by gear 4→4→4→4→4→4.)

In the cases of consecutive circumstances, the gear used longer takes over. (Example: Gear 2→2→2→3→3→3→2→2→2→2→3→3→3 will be replaced by 2→2→2→2→2→2→2→2→2→2→3→3→3.)

If used for the same time, dominate a series of succeeding gears with a series of preceding gears. (Example: 2→2→2→3→3→3→2→2→2→3→3→3 will be replaced by 2→2→2→2→2→2→2→2→2→2→3→3→3.)

- d) There shall be no downshift during an acceleration phase.

3.4.2.2.2 Optional provisions

The gear choice may be modified according to the following provisions.

- The use of lower gears than determined by the requirements described in 3.4.2.2.1 is permitted in any cycle phase. Manufacturers' recommendations for gear use shall be followed, if they do not result in higher gears than determined by the requirements described in 3.4.2.2.1.

NOTE 1 The calculation program to be found on the UN website at the URL below can be used as an aid for the gear selection: <https://www.unece.org/trans/main/wp29/wp29wgs/wp29grpe/wmtc.html>.

NOTE 2 Explanations of the approach and the gearshift strategy are given in Annex D

3.5 Type 2 tests

3.5.1 Application

This requirement only applies to all test motorcycles powered by a positive-ignition engine.

3.5.2 Measured gaseous pollutant

The content by volume of carbon monoxide shall be measured immediately after the type 1 test.

3.5.3 Engine test speeds

The test shall be carried out with the engine at normal idling speed and at "high idle" speed. High idle speed is defined by the manufacturer but it shall be higher than 2 000 min⁻¹.

3.5.4 Gear lever position

In the case of test motorcycles with manually operated or semi-automatic shift gearboxes, the test shall be carried out with the gear lever in the "neutral" position and with the clutch engaged. In the case of test motorcycles with automatic-shift gearboxes, the test shall be carried out with the gear selector in either the "neutral" or the "park" position.

3.6 Test procedures

3.6.1 Type 1 tests

3.6.1.1 Emissions tests

3.6.1.1.1 Engine starting and restarting

3.6.1.1.1.1 The engine shall be started according to the manufacturer's recommended starting procedures. The test cycle run shall begin when the engine starts.

3.6.1.1.1.2 Test motorcycles equipped with automatic chokes shall be operated according to the instructions in the manufacturer's operating instructions or owner's manual including choke setting and "kick-down" from cold fast idle. If necessary, braking may be employed to keep the drive wheels from turning.

3.6.1.1.1.3 Test motorcycles equipped with manual chokes shall be operated according to the manufacturer's operating instructions or owner's manual. Where times are provided in the instructions, the point for operation may be specified, within 15 s of the recommended time.

3.6.1.1.1.4 The operator may use the choke, throttle, etc. where necessary to keep the engine running.

3.6.1.1.1.5 If the manufacturer's operating instructions or owner's manual do not specify a warm engine starting procedure, the engine (automatic and manual choke engines) shall be started by opening the throttle about half way and cranking the engine until it starts.

3.6.1.1.1.6 If, during the cold start, the test motorcycle does not start after 10 s of cranking, or 10 cycles of the manual starting mechanism, cranking shall cease and the reason for failure to start determined. The revolution counter on the constant volume sampler shall be turned off and the sample solenoid valves placed in the "standby" position during this diagnostic period. In addition, either the CVS blower shall be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period.

3.6.1.1.1.7 If failure to start is an operational error, the test motorcycle shall be rescheduled for testing from a cold start. If failure to start is caused by motorcycle malfunction, corrective action (following the unscheduled maintenance provisions) of less than 30 min duration may be taken and the test continued. The sampling system shall be reactivated at the same time cranking is started. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by motorcycle malfunction and the test motorcycle cannot be started, the test shall be voided, the motorcycle removed from the dynamometer, corrective action taken (following the unscheduled maintenance provisions), and the motorcycle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

3.6.1.1.1.8 If the test motorcycle does not start during the hot start after 10 s of cranking, or 10 cycles of the manual starting mechanism, cranking shall cease, the test shall be voided, the motorcycle removed from the dynamometer, corrective action taken, and the motorcycle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

3.6.1.1.1.9 If the engine "false starts", the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

3.6.1.1.2 Stalling

3.6.1.1.2.1 If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the test motorcycle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the test motorcycle restarts, the driving schedule indicator shall be reactivated.

3.6.1.1.2.2 If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the test motorcycle shall then be restarted and accelerated to the speed required at that point in the driving schedule and the test continued. During acceleration to this point, shifting shall be performed in accordance with [3.4.2](#).

3.6.1.1.2.3 If the test motorcycle will not restart within 1 min, the test shall be voided, the motorcycle removed from the dynamometer, corrective action taken, and the motorcycle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

3.6.1.2 Drive instructions

3.6.1.2.1 The test motorcycle shall be driven with minimum throttle movement to maintain the desired speed. No simultaneous use of brake and throttle shall be permitted.

3.6.1.2.2 If the test motorcycle cannot accelerate at the specified rate, it shall be operated with the throttle fully opened until the roller speed reaches the value prescribed for that time in the driving schedule.

3.6.1.3 Dynamometer test runs

3.6.1.3.1 The complete dynamometer test consists of consecutive parts as described in [3.4.1](#).

3.6.1.3.2 The following steps shall be taken for each test.

- a) Place drive wheel of test motorcycle on dynamometer without starting engine.
- b) Activate motorcycle cooling fan.
- c) For all test motorcycles, with the sample selector valves in the “standby” position, connect evacuated sample collection bags to the diluted exhaust mixture and dilution air sample collection systems.
- d) Start the CVS (if not already on), the sampling pumps and the temperature recorder. (The heat exchanger of the constant volume sampler, if used, and sample lines shall be preheated to their respective operating temperatures before the test begins.)
- e) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.
 - 1) For gaseous bag samples, the sample flow rate shall be set to the appropriate levels.
 - 2) For hydrocarbon samples, if necessary, the sample flow rate for the flame ionization detection (FID) (or heated flame ionization detection (HFID) in the case of methanol-fuelled motorcycles) shall be set to the appropriate levels.
- f) Attach the flexible exhaust tube to the motorcycle tailpipe(s).
- g) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the exhaust sample bag, the dilution air sample bag, turn the key on, and start cranking the engine.
- h) Put the transmission in gear;
- i) Begin the initial motorcycle acceleration of the driving schedule.
- j) Operate the test motorcycle according to the driving cycles specified in [3.4.1](#).
- k) At the end of the part 1 or part 1 reduced speed in cold condition, simultaneously switch the sample flows from the first sampling bags and samples to the second sampling bags and samples, switch off gas flow measuring device No. 1 and start gas flow measuring device No. 2.
- l) In case of class 3 motorcycles capable of running part 3 of the WMTC, at the end of part 2, simultaneously switch the sample flows from the second sampling bags and samples to the third sampling bags and samples, switch off gas flow measuring device No. 2 and, start gas flow measuring device No. 3.
- m) Before starting a new part, record the measured roll or shaft revolutions and reset the counter or switch to a second counter. As soon as possible, transfer the exhaust and dilution air samples to the analytical system and process the samples according to [3.7.1.1](#), obtaining a stabilized reading of the exhaust bag sample on all analysers within 30 min of the end of the sample collection phase of the test.
- n) Turn the engine off 2 s after the end of the last part of the test.
- o) Immediately after the end of the sample period, turn off the cooling fan.

- p) Turn off the constant volume sampler (CVS).
- q) Disconnect the exhaust tube from the test motorcycle tailpipe(s) and remove the motorcycle from the dynamometer.
- r) For comparison and analysis reasons, second-by-second emissions (diluted gas) data may be monitored as well as the bag results. Type 2 tests

3.6.1.4 Conditions of measurement

3.6.2.1.1 The type 2 test specified in [3.5](#) shall be measured immediately after the type 1 test with the engine at normal idling speed and at high idle.

3.6.2.1.2 The following parameters shall be measured and recorded at normal idling speed and at high idle speed:

- a) the carbon monoxide content by volume of the exhaust gases emitted;
- b) the carbon dioxide content by volume of the exhaust gases emitted;
- c) the engine speed during the test, including any tolerances;
- d) the engine oil temperature at the time of the test.

3.6.1.5 Sampling exhaust gases

3.6.2.2.1 The exhaust outlets shall be provided with an air-tight extension, so that the sampling probe used to collect exhaust gases may be inserted into the exhaust outlet at least 60 cm, without increasing the back pressure of more than 125 mm H₂O, and without disturbance of the test motorcycle running. The shape of this extension shall however be chosen in order to avoid, at the location of the sampling probe, any appreciable dilution of exhaust gases in the air. Where a motorcycle is equipped with an exhaust system having multiple outlets, either these shall be joined to a common pipe or the content of carbon monoxide shall be collected from each of them, the result of the measurement being reached from the arithmetical average of these contents.

3.6.2.2.2 The concentrations in CO (c_{CO}) and CO₂ (c_{CO_2}) shall be determined from the measuring instrument readings or recordings, by use of appropriate calibration curves. The results shall be corrected according to [3.7.2](#).

3.7 Analysis of results

3.7.1 Type 1 tests

3.7.1.1 Gaseous exhaust emission and fuel consumption analysis

3.7.1.1.1 Analysis of the samples contained in the bags

The analysis shall begin as soon as possible and in any event not later than 30 min after the end of the tests, in order to determine

- the concentrations of hydrocarbons, carbon monoxide, nitrogen oxides, and carbon dioxide in the sample of dilution air contained in bag(s) B, and
- the concentrations of hydrocarbons, carbon monoxide, nitrogen oxides, and carbon dioxide in the sample of diluted exhaust mixture contained in bag(s) A.

3.7.1.2 Weighting of results

3.7.1.2.1 In case of repeated measurements, the emission results in g/km and the fuel consumption in L/100 km obtained by the calculation method described in ISO 6460-1 are averaged for each cycle part.

3.7.1.2.2 The (average) result of part 1 or part 1 reduced speed is named R_1 , the (average) result of part 1 in hot condition or part 1 reduced speed in hot condition is named R_{1hot} , the (average) result of part 2 or part 2 reduced speed is named R_2 , and the (average) result of part 3 or part 3 reduced speed is named R_3 . Using these emission results in g/km and the fuel consumption in L/100 km; the final result R , depending on the motorcycle class as defined in 3.3, shall be calculated by means of [Formulae \(9\)](#) to [\(11\)](#).

Class 1

$$R = R_1 \times w_1 + R_{1hot} \times w_{1hot} \quad (9)$$

Class 2

$$R = R_1 \times w_1 + R_2 \times w_2 \quad (10)$$

Class 3

$$R = R_1 \times w_1 + R_2 \times w_2 + R_3 \times w_3 \quad (11)$$

3.7.1.2.3 For each pollutant, the carbon dioxide emission and the fuel consumption the weightings shown in [Table 1](#) shall be used.

Table 1 — Weighting factors for the final emission and fuel consumption results

Motorcycle class	Cycle	Weighting	
Class 1	Part 1, cold	w_1	30 %
	Part 1, hot	w_{1hot}	70 %
Class 2	Part 1, cold	w_1	30 %
	Part 2, hot	w_2	70 %
Class 3	Part 1, cold	w_1	25 %
	Part 2, hot	w_2	50 %
	Part 3, hot	w_3	25 %

3.7.2 Type 2 tests

3.7.2.1 The corrected concentration for carbon monoxide ($c_{CO,ec2}$ and $c_{CO,ec4}$ in per cent volume) is calculated in accordance with [Formula \(12\)](#).

$$c_{CO,ec4} = c_{CO,e} \frac{15}{c_{CO,e} + c_{CO2,e}} \quad (12)$$

3.7.2.2 The concentration in $c_{CO,e}$ measured according to 3.6.2.2 need not be corrected if the total of the concentrations measured, $c_{CO,e} + c_{CO2,e}$, is at least 15 for four-stroke engines.

3.8 Driving cycles for type 1 tests

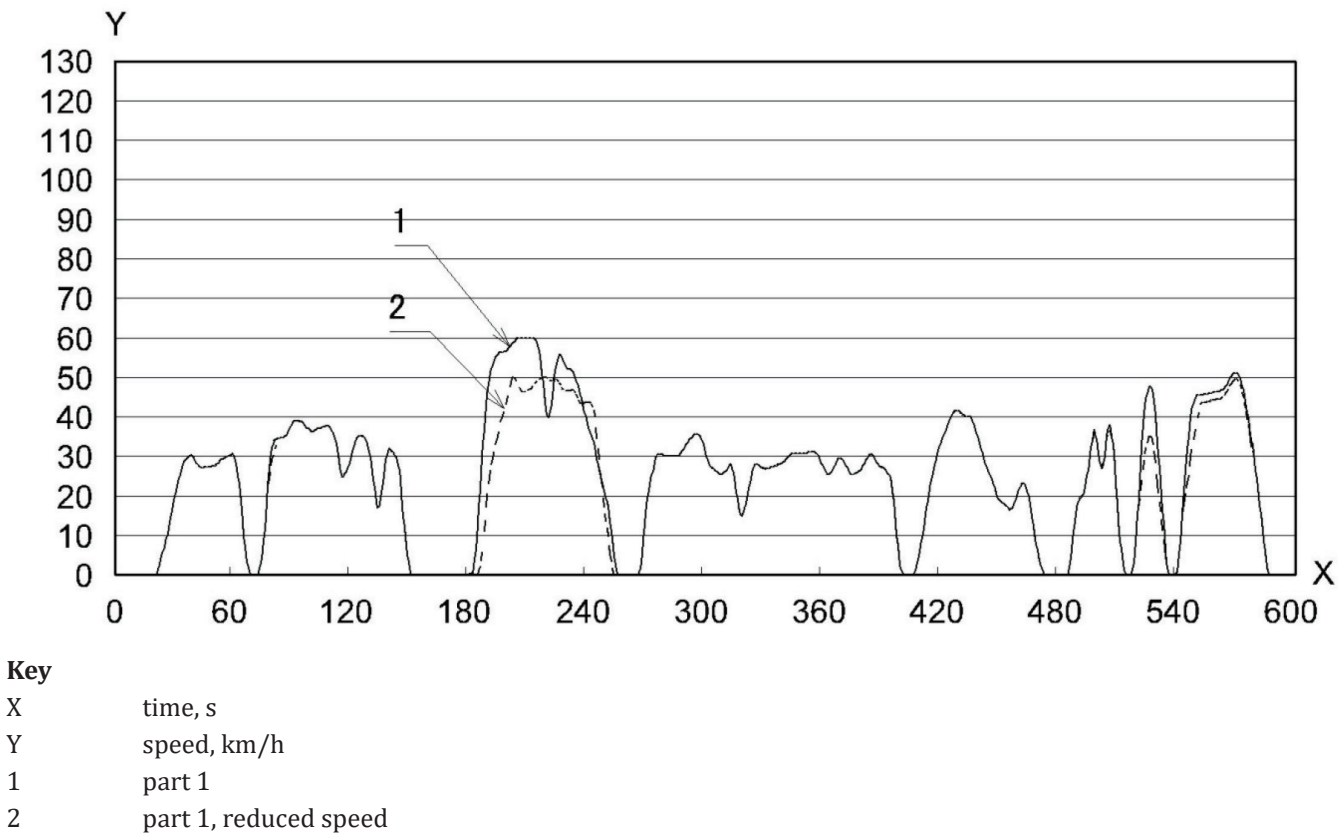


Figure 3 — Cycle part 1

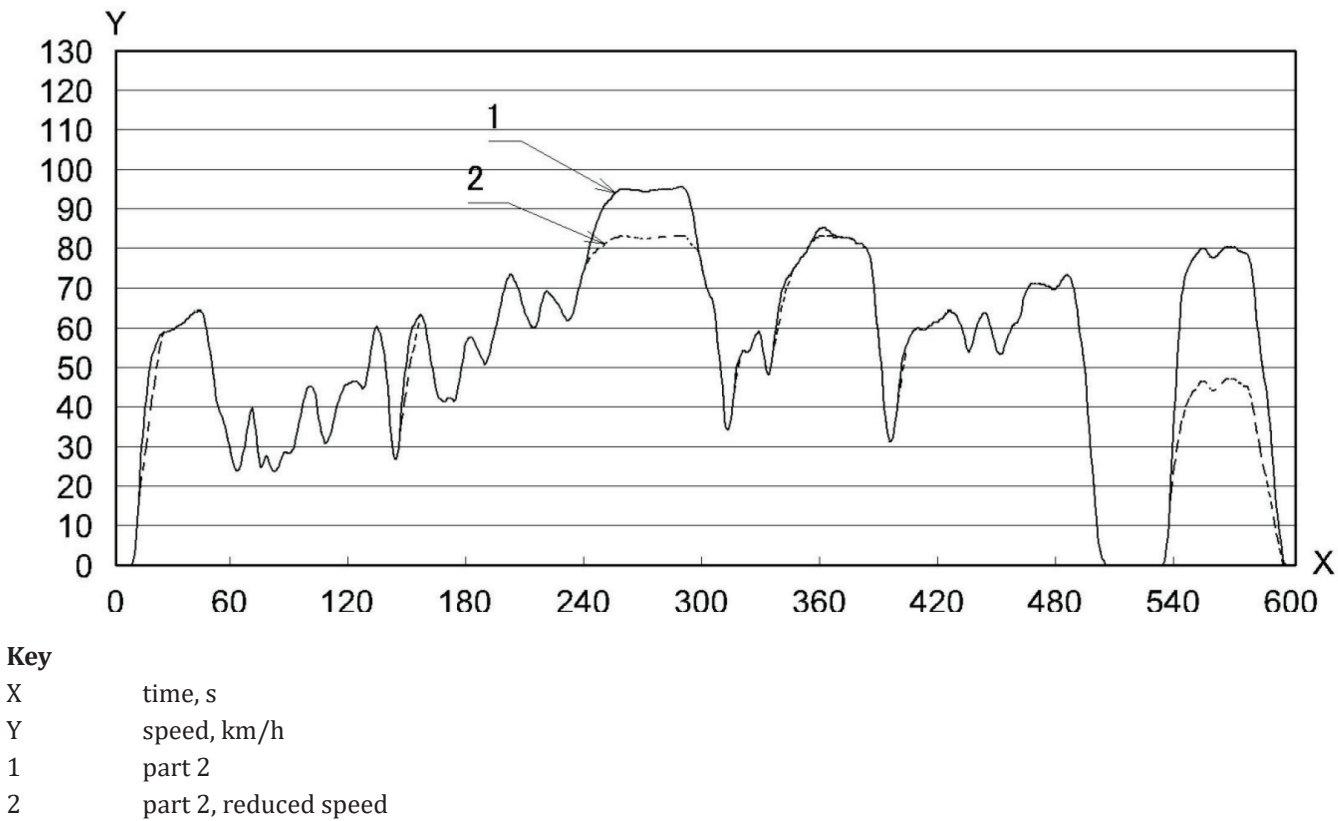


Figure 4 — Cycle part 2 for motorcycle classes 2 and 3