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

Part 1: General test requirements

Motocycles — Méthode de mesure des émissions de gaz d'échappement et de la consommation de carburant —

Partie 1: Exigences générales d'essai

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Foreword

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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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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 32, *Road vehicles*, Subcommittee SC 38, *Motorcycles and mopeds*.

This second edition cancels and replaces the first edition (ISO 6460-1:2007), which has been technically revised. It also incorporates the Amendment ISO 6460-1:2007/Amd.1:2015.

The main changes are as follows:

— addition of a detailed description of a critical flow venturi (CFV) as a flow measurement principle to the CVS system;

— permission to use of the subsonic venturi (SSV) as a flow measurement principle to the CVS system;

— addition for the measurement of methane (CH_4) concentration, either a GC-FID (flame ionization detector with gas chromatograph) or an NMC-FID (flame ionization detector with non-methane cutter);

— addition of a calculation method for non-methane hydrocarbons (NMHC);

— permission to determine the ratio of hydrogen and carbon (R_{HC}) and the ratio of oxygen and carbon (R_{OC}) by the content analysis of fuel;

— addition of calculation methods for the mass of the gaseous exhaust emissions and the fuel consumption when using oxygenated fuels;

— deletion of descriptions related two-stroke engines and diesel fuel.

A list of all parts in the ISO 6460 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.

Introduction

For the measurement of motorcycle fuel consumption, the carbon balance method, where the fuel consumption is calculated from analysis of the carbon quantity in the exhaust emissions, is now widely used in addition to the conventional fuel flow measurement. Therefore, the measurement of exhaust emissions pollutants and fuel consumption are inseparably related to each other.

This document defines the fundamental elements such as the measurement accuracy, test motorcycle conditions and the details of the carbon balance method. The measurement of gaseous exhaust emissions and fuel consumption during test cycles can be conducted by means of this document and ISO 6460-2. Additionally with ISO 6460-3, these three documents provide details of those measurements at a constant speed.

The following revisions are mainly made in this document.

— The detailed description of a critical flow venturi (CFV), adopted by most of the manufacturers as well as a positive displacement pump (PDP), is added as a flow measurement principle to the CVS system. Also, the use of the subsonic venturi (SSV) is also permitted as a CVS flow measurement principle.

— For measurement of methane (CH_4) concentration in the diluted exhaust mixture, either a GC-FID (flame ionization detector with gas chromatograph) or an NMC-FID (flame ionization detector with non-methane cutter) shall be used as the analytical instrument. The formula for calculating non-methane hydrocarbons (NMHC) is also defined.

— Instead of obtaining the ratio of hydrogen and carbon (R_{HC}) and the ratio of oxygen and carbon (R_{OC}) from the exhaust emissions analysis, R_{HC} and R_{OC} shall be determined by the fuel analysis. In addition, when using the oxygenated fuels such as gasoline (E5) and gasoline (E10), the mass of the gaseous exhaust emissions and the fuel consumption also can be calculated.

— As there has been no need for newly development of two-stroke engines and compression ignition engines in recent years, the description regarding two-stroke engines and diesel fuel is to be deleted. If these are required, see ISO 6460-1:2007.

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

Part 1: General test requirements

1 Scope

This document specifies the general test requirements for measurement of 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 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 3833, *Road vehicles — Types — Terms and definitions*

ISO 6460-2:2014, *Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption — Part 2: Test cycles and specific test conditions*

ISO 6460-3:2007, *Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption — Part 3: Fuel consumption measurement at a constant speed*

ISO 11486:2006, *Motorcycles — Methods for setting running resistance on a chassis dynamometer*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3833 and the following apply.

ISO and IEC maintain terminological 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
equivalent inertia
total inertia of the rotating masses of the chassis dynamometer, determined with respect to the reference mass of the test motorcycle, which is total unladen mass of the test motorcycle increased by a uniform figure of 75 kg, which represents the mass of a rider

Note 1 to entry: Total unladen mass of the test motorcycle includes mass of the vehicle with bodywork and all fitted equipment, electrical and auxiliary equipment for normal operation of vehicle, including liquids, tools, fire extinguisher, standard spare parts, chocks and spare wheel, if fitted.

The fuel tank shall be filled to at least 90 % of rated capacity and the other liquid containing systems to 100 % of the capacity specified by the manufacturer.

3.2
gaseous exhaust emissions

emissions of gaseous pollutants from the tailpipe of test motorcycles, such as carbon monoxide (CO), total hydrocarbons (THC), non-methane hydrocarbons (NMHC), nitrogen oxides (NOx) as gaseous pollutants and carbon dioxide (CO_2)

4 Symbols

Table 1 — Symbols

Symbols	Definition	Unit [a]
$c_{CH4,d}$	methane concentration in the dilution air, expressed in ppm carbon equivalent	ppmC
$c_{CH4,e}$	methane concentration in the diluted exhaust mixture, expressed in ppm carbon equivalent	ppmC
$c_{CH4,ec}$	volumetric concentration of methane in the diluted exhaust mixture, expressed in ppm carbon equivalent, corrected to take account of methane in the dilution air	ppmC
$c_{CO,d}$	carbon monoxide concentration in the dilution air	ppm
$c_{CO,dm}$	carbon monoxide concentration in the dilution air with the water vapour and carbon dioxide absorbent	ppm
$c_{CO,e}$	carbon monoxide concentration in the diluted exhaust mixture	ppm
$c_{CO,ec}$	volumetric concentration of carbon monoxide in the diluted exhaust mixture, corrected to take account of carbon monoxide in the dilution air	ppm
$c_{CO,em}$	carbon monoxide concentration in the diluted exhaust mixture with the water vapour and carbon dioxide absorbent	ppm
$c_{CO2,d}$	carbon dioxide concentration in the dilution air	%
$c_{CO2,e}$	carbon dioxide concentration in the diluted exhaust mixture	%
$c_{CO2,ec}$	volumetric concentration of carbon dioxide in the diluted exhaust mixture, corrected to take account of carbon dioxide in the dilution air	%
$c_{HC(w/\ NMC)}$	hydrocarbon concentration measured by the NMC-FID with sample gas flowing through the NMC, expressed in ppm carbon equivalent	ppmC
$c_{HC(w/\ NMC),d}$	hydrocarbon concentration in the dilution air with sample gas flowing through the NMC, expressed in ppm carbon equivalent	ppmC
$c_{HC(w/\ NMC),e}$	hydrocarbon concentration in the diluted exhaust mixture with sample gas flowing through the NMC, expressed in ppm carbon equivalent	ppmC
$c_{HC(w/\ NMC),ec}$	volumetric concentration of hydrocarbon in the diluted exhaust mixture with sample gas flowing through the NMC, expressed in ppm carbon equivalent, corrected to take account of hydrocarbon in the dilution air	ppmC
$c_{HC(w/o\ NMC)}$	hydrocarbon concentration measured by the NMC-FID with sample gas bypassing the NMC, expressed in ppm carbon equivalent	ppmC
$c_{HC(w/o\ NMC),d}$	hydrocarbon concentration in the dilution air with sample gas bypassing the NMC, expressed in ppm carbon equivalent	ppmC
$c_{HC(w/o\ NMC),e}$	hydrocarbon concentration in the diluted exhaust mixture with sample gas bypassing the NMC, expressed in ppm carbon equivalent	ppmC
$c_{HC(w/o\ NMC),ec}$	volumetric concentration of hydrocarbon in the diluted exhaust mixture with sample gas bypassing the NMC, ppm C, expressed in ppm carbon equivalent, corrected to take account of hydrocarbon in the dilution air	ppmC
$c_{NMHC,ec}$	volumetric concentration of non-methane hydrocarbon in the diluted exhaust mixture, expressed in ppm carbon equivalent, corrected to take account of non-methane hydrocarbon in the dilution air	ppmC
$c_{NOx,d}$	nitrogen oxides concentration in the dilution air	ppm
$c_{NOx,e}$	nitrogen oxides concentration in the diluted exhaust mixture	ppm

[a] ppm = parts per million.

Table 1 *(continued)*

Symbols	Definition	Unit [a]
$c_{NOx,ec}$	volumetric concentration of nitrogen oxides in the diluted exhaust mixture, corrected to take account of nitrogen oxides in the dilution air	ppm
$c_{O2,d}$	oxygen concentration in the dilution air	%
$c_{Pi,ec}$	concentration of the pollutant *i* in the diluted exhaust mixture, corrected to take account of the amount of the pollutant *i* contained in the dilution air	ppm
$c_{THC,d}$	total hydrocarbon concentration in the dilution air, expressed in ppm carbon equivalent	ppmC
$c_{THC,e}$	total hydrocarbon concentration in the diluted exhaust mixture, expressed in ppm carbon equivalent	ppmC
$c_{THC,ec}$	volumetric concentration of total hydrocarbon in the diluted exhaust mixture, expressed in ppm carbon equivalent, corrected to take account of total hydrocarbon in the dilution air	ppmC
C_d	discharge coefficient of the SSV	—
d_{in}	diameter of the SSV inlet pipe inner	m
d_v	diameter of the SSV throat	m
D_f	dilution factor	—
E_E	ethane conversion efficiency	—
E_M	methane conversion efficiency	—
F_c	specific fuel consumption	km/l
F_{c100}	fuel consumption per 100 km	l/100 km
H_a	absolute humidity in grams of water per kilogram of dry air	—
H_d	relative humidity of dilution air	%
H_r	relative humidity in the test room	%
H_0	standard relative humidity	%
K_H	humidity correction factor used for the calculation of the mass emissions of nitrogen oxides	—
k_1	critical flow venturi correction factor	—
k_2	ratio of pressure to temperature at the standard reference conditions	—
k_3	collection of constants and unit conversions	—
m_{CO}	mass of carbon monoxide in the gaseous exhaust emissions	g/km
m_{CO2}	mass of carbon dioxide in the gaseous exhaust emissions	g/km
m_F	mass of fuel consumed	g
m_{NMHC}	mass of non-methane hydrocarbon in the gaseous exhaust emissions	g/km
m_{NOx}	mass of nitrogen oxides in the gaseous exhaust emissions	g/km
m_{Pi}	mass emission of the pollutant *i*	g
m_{THC}	mass of total hydrocarbon in the gaseous exhaust emissions	g/km
N	number of revolutions of positive displacement pump during the test while samples are being collected	—
p_a	mean barometric pressure during the test in the test room	kPa
p_d	saturated water vapour pressure during the test in the test room	kPa
p_p	absolute pressure of the diluted exhaust mixture at the inlet of positive displacement pump	kPa
p_v	absolute pressure at the venturi inlet	kPa
$p_{v(t)}$	absolute pressure of the diluted exhaust mixture at the venturi inlet	kPa
p_0	total barometric pressure at the standard reference conditions	kPa

[a] ppm = parts per million.

Table 1 *(continued)*

Symbols	Definition	Unit [a]
Q_a	measured flow rate of venturi using the other gas flowmeter	m^3/s
Q_{cal}	measured flow rate of venturi at standard reference conditions	m^3/s
r_x	ratio of the SSV throat pressure to inlet absolute static pressure, $1-(\Delta p / p_v)$	—
r_y	ratio of the SSV throat diameter d_v to the inlet pipe inner diameter d_{in}, d_v / d_{in}	—
$R_{HC,ex}$	atom number ratio of hydrogen and carbon in the gaseous exhaust emissions	—
$R_{HC,F}$	atom number ratio of hydrogen and carbon in the fuel	—
$R_{OC,ex}$	atom number ratio of oxygen and carbon in the gaseous exhaust emissions	—
$R_{OC,F}$	atom number ratio of oxygen and carbon in the fuel	—
$R_{f,CH4}$	response factor of CH_4 for an FID	—
$R_{f,C3H6}$	response factor of C_3H_6 for an FID	—
$R_{f,C3H8}$	response factor of C_3H_8 for an FID	
$R_{f,C7H8}$	response factor of C_7H_8 for an FID	—
S	running distance actually travelled	km
t	time	s
t_{test}	total test time	s
T_a	measured ambient temperature during the test in the test room	K
T_F	fuel temperature measured at the burette	K
T_p	temperature of diluted exhaust mixture at the positive displacement pump inlet during the test while samples are being collected	K
T_v	temperature at the venturi inlet	K
$T_{v(t)}$	temperature of diluted exhaust mixture at the venturi inlet	K
T_0	air temperature at the standard reference conditions	K
V	measured volume of fuel consumed	l
V_d	dilution air volume	m^3
V_e	volume of the diluted exhaust mixture expressed corrected to the standard reference conditions	m^3/km
V_{ex}	gaseous exhaust emissions volume	m^3
$V_{i,e}$	volume of the diluted exhaust mixture in one test under the standard reference conditions	l
V_p	diluted exhaust mixture volume pumped by the positive displacement pump per one revolution	l
V_s	total diluted exhaust mixture volume during one test	m^3
α	coefficient of volumetric expansion for the fuel	K^{-1}
ρ_{CO}	carbon monoxide density at the standard reference conditions	g/m^3
ρ_{CO2}	carbon dioxide density at the standard reference conditions	g/m^3
ρ_F	fuel density at 288,15 K	kg/l
ρ_{NMHC}	non-methane hydrocarbon density at the standard reference conditions	g/m^3
ρ_{NOx}	nitrogen oxides density at the standard reference conditions, expressed in equivalent NO_2	g/m^3
ρ_{Pi}	density of the pollutant *i* at the standard reference conditions	g/l
ρ_{THC}	total hydrocarbon density at the standard reference conditions	g/m^3
ρ_0	air volumetric mass at the standard reference conditions	kg/m^3

[a] ppm = parts per million.

5 Standard reference conditions

The standard reference conditions shall be as follows:

Total barometric pressure, p_0:	101,325 kPa;
Air temperature, T_0:	273,15 K;
Relative humidity, H_0:	65 %;
Air volumetric mass, ρ_0:	1,293 kg/m^3.

6 Tests

6.1 Measurement of gaseous exhaust emissions

6.1.1 Average gaseous exhaust emissions during conventional test cycles

The test shall be carried out in accordance with the procedure described in ISO 6460-2. The appropriate test cycle shall be selected.

6.1.2 Measurement of gaseous exhaust emissions at an idling speed

The test shall be carried out in accordance with the procedure described in ISO 6460-2.

6.2 Measurement of fuel consumption

6.2.1 Average fuel consumption during conventional test cycles

The test shall be carried out in accordance with the procedure described in ISO 6460-2. The appropriate test cycle shall be selected.

6.2.2 Fuel consumption at a constant speed

The test shall be carried out in accordance with the procedure described in ISO 6460-3.

7 Measurement equipment

7.1 General

Irrespective of the provisions in this clause, any measurement system(s) may be used when the performance of the equipment is proven by the equipment manufacturer to be equivalent to the constant volume sampler (CVS) system.

7.2 Chassis dynamometer

The chassis dynamometer shall be set in accordance with ISO 11486. The equivalent inertia mass for the table method shall be in accordance with ISO 11486:2006, Table 4.

7.3 Gas-collection equipment

7.3.1 The gas-collection equipment shall be a closed type system that can collect all exhaust emissions at the motorcycle exhaust outlet(s) providing that it satisfies the backpressure condition of ±1,25 kPa. An open type system may be used as well if it is confirmed that all the exhaust emissions are collected.

The exhaust emissions collection shall be such that there is no condensation, which may appreciably modify the nature of exhaust emissions at the test temperature.

7.3.2 The gas-collection equipment and connecting tube between the gas-collection equipment and the exhaust emissions sampling system shall be made of stainless steel or of some other material which does not affect the composition of the exhaust emissions collected and which withstands the temperature of the exhaust emissions.

7.3.3 The CVS system with a critical flow venturi (CFV) or the CVS system with a positive displacement pump (PDP) shall be used for the exhaust emissions sampling system.

7.3.3.1 The CVS system with CFV shall be applicable to the requirements in this subclause.

a) The capacity of CFV shall be large enough to ensure the inlet of all the diluted exhaust mixture.

b) An instrument capable of calculating the venturi flow rate based on the measuring results of temperature and absolute pressure of the diluted exhaust mixture sucked into CFV shall be equipped.

c) A dilution air sampling probe of the closed type exhaust emissions sampling system shall be set at the lower reaches of the dilution air filter. This sampling probe shall be capable of collecting the dilution air at a constant flow rate through the sampling pump, the filter and the flow meter during the test. The dilution air sampling probe of the open type exhaust emissions sampling system shall be set in the vicinity of and outside of the exhaust emissions sampling system of the open type CVS system. This sampling probe shall be capable of collecting the dilution air at a constant flow rate through the sampling pump, the filter and the flow meter during the test.

d) A diluted exhaust mixture sampling probe pointing to the upper reaches of the diluted exhaust mixture shall be set at the upper part in the vicinity of CFV inlet. The diluted exhaust mixture shall be collected at the flow rate in proportion to the diluted exhaust mixture flow rate through the sampling pump, the filter and the flow meter during the test.

e) A flow rate integrator for integrating the diluted exhaust mixture flow rate during the test shall be equipped.

7.3.3.2 The CVS system with PDP shall be applicable to the requirements in this subclause.

a) A heat exchanger shall be capable of limiting the temperature variation of the diluted exhaust mixture at PDP inlet to ±5 K throughout the test. This exchanger shall be equipped with a preheating system capable of bringing the exchanger to its operating temperature (with the tolerance of ±5 K) before the test begins.

b) PDP for drawing in the diluted exhaust mixture shall be equipped with a motor capable of controlling the diluted exhaust mixture flow speed to several constant speeds strictly. The capacity of PDP shall be large enough to ensure the intake of all the exhaust emissions.

c) A device capable of continuous recording of the temperature of the diluted exhaust mixture entering PDP shall be equipped. A device to allow continuous recording of the temperature of the diluted exhaust mixture entering PDP shall be equipped.

d) An instrument capable of measuring the pressure depression of the diluted exhaust mixture entering PDP relative to the atmospheric pressure and an instrument capable of measuring the pressure difference between the inlet and the outlet of PDP shall be equipped.

e) A dilution air sampling probe of the closed type exhaust emissions sampling system shall be set at the lower reaches of the dilution air filter. This sampling probe shall be capable of collecting the dilution air through the sampling pump, the filter and the flow meter at a constant flow rate during the test. A dilution air sampling probe of the open type exhaust emissions sampling system shall be set in the vicinity of and outside of the exhaust emissions sampling system of the open type CVS system. This sampling probe shall be capable of collecting the dilution air at a constant flow rate through the sampling pump, the filter and the flow meter during the test.

f) A diluted exhaust mixture sampling probe pointing to the upper reaches of the diluted exhaust mixture shall be set at the upper reaches of PDP. This sampling probe shall be capable of collecting the diluted exhaust mixture at a constant flow rate through the sampling pump, the filter and the flow meter during the test.

g) A revolution counter for counting the revolution of PDP during the test shall be equipped.

7.3.4 A device using a subsonic venturi (SSV) may also be used. The use of SSV for the CVS system is based on the principles of flow mechanics. The flow rate of the diluted exhaust mixture is maintained at a subsonic velocity which is calculated from the physical dimensions of the subsonic venturi and measurement of the absolute temperature and pressure at the venturi inlet and the pressure in the throat of the venturi. The flow rate is continually computed and integrated throughout the test.

7.3.5 In the case of the CVS system with CFV, the sampling venturi shall be set at the place where the temperature and the absolute pressure are same as those of the main critical flow venturi inlet. The sampling flow rates in proportion to the diluted exhaust mixture flow rate shall be obtained.

In the case of the CVS system with PDP, the diluted exhaust mixture flow rate and the sampling flow rates shall be steady within ±5 %.

If the device cannot compensate for variations in the temperature of the mixture of exhaust emissions and dilution air at the measuring point, a heat exchanger shall be used to maintain the temperature to within ±6 K of the specified operating temperature for the CVS with PDP, and ±11 K for the CVS with CFV and SSV.

7.3.6 A sampling system shall be equipped with the valves directing the samples either to the sampling bags or to the atmosphere. The minimum sampling flow rate shall be 150 l/h.

7.3.7 The sampling bags shall be airtight for collecting the dilution air and the diluted exhaust mixture, and shall have sufficient capacity so as not to impede the normal sample flow and not to change the nature of the exhaust emissions to be measured. The sampling bags shall be equipped with the automatic self-locking devices, and shall be easily and tightly connected either to the sampling system during the sampling period and to the analysing system at the end of the test.

NOTE 1 Pay attention to the connecting method and the material or configuration of the connecting parts because there is a possibility that each section (e.g. adapters, couplers) of the sampling system becomes very hot. If the measurement cannot be performed normally due to the heat-damages of the sampling system, an auxiliary cooling device is used as long as the exhaust emissions are not affected.

NOTE 2 In the case of the open type exhaust emissions sampling system, there is a risk of the incomplete exhaust emissions collection and the exhaust emissions leakage into the test room. So it is important to make sure that there is no leakage during the sampling period.

NOTE 3 If a constant CVS flow rate is used during the test using the test cycles including low speeds and high speeds, it is important to pay attention to the water condensation in the high-speed range.

7.4 Analytical equipment

7.4.1 The sample probe shall consist of a sampling tube leading into the collecting bags, or of a drainage tube. This sample probe shall be made of stainless steel or of some other material that will not adversely affect the composition of the exhaust emissions to be analysed. The temperature of the tubes connecting to the analyser, including the sampling probe, shall be same as the ambient temperature or above.

7.4.2 Analysers shall be of the following types:

a) non-dispersive infrared absorption (NDIR) type for CO and CO_2;

b) flame ionization (FID) type for THC;

c) either a gas chromatograph combined with an FID (GC-FID), or an FID combined with a non-methane cutter (NMC-FID) for methane (CH_4);

d) chemiluminescence (CLD) type for NOx.

7.5 Cooling equipment

Throughout the test, a variable speed cooling blower shall be positioned in front of the test motorcycle, so as to direct the cooling air to the test motorcycle in a manner which simulates actual operating conditions. The blower speed shall be such that, within the operating range of 10 km/h to 50 km/h, the linear velocity of the air at the blower outlet should be within ±5 km/h of the corresponding roller speed. At the range of over 50 km/h, the linear velocity of the air shall be within ±10 % of roller speed. At the roller speeds of less than 10 km/h, air velocity may be zero.

The air velocity shall be determined as an averaged value of 9 measuring points which are located at the centre of each rectangle dividing the whole of the blower outlet into 9 areas (dividing both of horizontal and vertical sides of the blower outlet into 3 equal parts). Each value at those 9 points shall be within ±10 % of the average value of the 9 points.

The blower outlet shall have a cross section area of at least 0,4 m^2 and the bottom of the blower outlet shall be between 5 cm and 20 cm above floor level. The blower outlet shall be perpendicular to the longitudinal axis of the test motorcycle between 30 cm and 45 cm in front of its front wheel. The device used to measure the linear velocity of the air shall be located at between 0 cm and 20 cm from the air outlet.

7.6 Fuel consumption measurement

7.6.1 One of the following methods shall be used to measure the fuel consumption, depending on the characteristics of each method and on the type of test to be performed (conventional test cycle or constant speed):

a) carbon balance method;

b) volumetric method;

c) gravimetric method;

d) flowmeter method.

The carbon balance method shall be applied in accordance with 12.1.

Other methods may be used if it can be proved that the results given are equivalent.

7.6.2 Fuel shall be supplied to the engine by a device capable of measuring the quantity of fuel supplied with an accuracy of ±1 % in accordance with Annex A, and which does not interfere with the supply of fuel to the engine. When the measuring system is the volumetric method or the flowmeter method, the temperature of the fuel in the device or in the device outlet shall be measured.

Switching from the normal supply system to the measuring supply system shall be done by means of a valve system and shall take no more than 0,2 s.

Annex A gives the description and the methods of use of the appropriate devices for fuel flow measurement.

7.7 Accuracy of instruments and measurements

7.7.1 The distance travelled by the test motorcycle shall be measured with an accuracy of ±1 %.

7.7.2 The speed of the test motorcycle shall be measured with an accuracy of ±1 % to the resolution of 0,1 km/h. For speeds less than 10 km/h, the speed shall be measured to the resolution of 0,1 km/h.

7.7.3 The ambient temperatures shall be measured with an accuracy of ±1 K.

7.7.4 The atmospheric pressure shall be measured with an accuracy of ±0,2 kPa.

7.7.5 The relative humidity of the ambient air shall be measured with an accuracy of ±5 %.

7.7.6 The pressures considered in 7.3.3.1 b) and 7.3.3.2 d) shall be measured with an accuracy of ±0,4 kPa.

7.7.7 The analysers shall have a measuring range compatible with the accuracy required to measure the content of the various pollutants and carbon dioxide with an accuracy of ±1 %, regardless of the accuracy of the calibration gases. The overall response time of the analysing circuit shall be less than 1 min.

7.7.8 The cooling air speed shall be measured with an accuracy of ±5 km/h.

7.7.9 The duration of test cycles and the exhaust emissions collection shall be controlled with an accuracy of ±1 s. These times shall be measured with an accuracy of 0,1 s.

7.7.10 The total volume of the diluted exhaust mixture shall be measured with an accuracy of ±2 %.

7.7.11 For the fuel consumption measurement at a constant speed specified in ISO 6460-3, the wind speed on the test road shall be measured with an accuracy of ±5 % to the resolution of 0,1 m/s.

8 Preparing the test

8.1 Engine fuel and lubricants

The specification of test fuel shall be reported. An example of the record form is given in Annex B.

With regard to grade and quantity of oil, the lubrication of the engine shall comply with the manufacturer's recommendation.

8.2 Description of the test motorcycle

The main specifications of the test motorcycle shall be provided in accordance with ISO 6460-2:2014, Annexes A and B, and in ISO 6460-3:2007, Annex B.

8.3 Conditioning/preparation of the test motorcycle

8.3.1 The test motorcycle shall be run in properly in accordance with the manufacturer's requirements.

8.3.2 The test motorcycle shall be adjusted in accordance with the manufacturer's requirements (e.g. tyre pressures, chain tension). If there is any alteration, the full description shall be given in the test report.