INTERNATIONAL STANDARD

ISO

6460-1

First edition
2007-08-15

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

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 6460-1:2007
https://standards.iteh.ai/catalog/standards/sist/2e659280-3040-4ef2-b611-
5f767ccb31f3/iso-6460-1-2007

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 6460-1:2007
https://standards.iteh.ai/catalog/standards/sist/2e659280-3040-4ef2-b611-
5f767ccb31f3/iso-6460-1-2007

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 6460-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

ISO 6460-1, together with ISO 6460-2 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*:

⎯ *Part 1: General test requirements*

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

⎯ *Part 3: Fuel consumption measurement at a constant speed*

Introduction

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

ISO 6460 now covers in one single series of standards the two subjects that were previously covered separately by ISO 6460:1981 and ISO 7860:1995. This part of ISO 6460 defines fundamental elements such as the measurement accuracy, test vehicle conditions and the details of the carbon balance method. Measurement of gaseous exhaust emissions and fuel consumption of test cycles can be conducted by means of this part of ISO 6460 and ISO 6460-2:2007. Together with ISO 6460-3, they also give details of those measurements at a constant speed.

While the most up-to-date technologies are reflected in the ISO 6460 series, further technical development in the following aspects will be necessary in the future, when measurement of exhaust gas at a lower level is required:

— cleaning of the background air (i.e. the air in the test room which is used for the dilution air);

— heating of the sampling line;

— control of the test room humidity;

— the exhaust gas analysis system for low level emissions;

— consideration of the evaporated fuel from the test motorcycle.

In addition to the above issues, the chassis dynamometer with electrically simulated inertia is at the stage of practical application. Standardization of the verification method and the allowance of simulated inertia would be necessary for this recent development.

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

Part 1:
General test requirements

1   Scope

This part of ISO 6460 specifies the general test requirements 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, 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 3833, *Road vehicles — Types — Terms and definitions*

ISO 6460-2:2007, *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, *Motorcycles — Methods for setting running resistance on a chassis dynamometer*

3   Terms and definitions

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

3.1
motorcycle kerb mass
total unladen mass of the motorcycle, which is filled with fuel in such a way that the normal container for fuel is filled to at least 90 % of the capacity specified by the manufacturer, and which is fitted with a tool kit and a spare wheel (if obligatory)

3.2
reference mass of the motorcycle
kerb mass of the motorcycle increased by a uniform figure of 75 kg, which represents the mass of a rider

3.3
equivalent inertia
total inertia of the rotating masses of the test bench, determined with respect to the reference mass of the motorcycle

3.4
gaseous exhaust emissions
carbon monoxide, hydrocarbons, nitrogen oxides (gaseous pollutants) and carbon dioxide emitted from motorcycles

4 Symbols

Table 1 — Symbols

Symbols	Definition	Unit [a]
a	mixing ratio of lubrication oil and fuel	—
$c_{CO,d}$	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	%
$c_{NOx,d}$	nitrogen oxides concentration in the dilution air	ppm
$c_{NOx,e}$	nitrogen oxides concentration in the diluted exhaust mixture	ppm
$c_{NOx,ec}$	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
$c_{THC,d}$	hydrocarbon concentration in the dilution air as measured in parts per million carbon equivalent	ppmC
$c_{THC,e}$	hydrocarbon concentration in the diluted exhaust mixture as measured in parts per million carbon equivalent	ppmC
$c_{THC,ec}$	volumetric concentration, expressed in parts per million carbon equivalent, of hydrocarbon in the diluted exhaust mixture, corrected to take account of hydrocarbon in the dilution air	ppmC
C_{THC}	value of HFID (hydrogen flame ionization detection) output	ppm
d_0	relative air density at the standard reference conditions	—
D_f	dilution factor	—
F_c	specific fuel consumption	km/L
F'_c	specific fuel consumption for lubrication oil mixed fuel	km/L
F_{c100}	fuel consumption per 100 km	L/100 km
F_o	lubrication oil consumption for the mixed fuel	km/L
H_a	absolute humidity in grams of water per kilogram of dry air	—
H_d	relative humidity of dilution air	%

Table 1 (*continued*)

Symbols	Definition	Unit [a]
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	venturi correction factor	—
K_2	ratio of pressure to temperature at the standard reference conditions	—
L	running distance actually travelled	km
m_{CO}	mass of carbon monoxide in the exhaust gas	g/km
m_{CO2}	mass of carbon dioxide in the exhaust gas	g/km
m_f	fuel consumed	g
m_{NOx}	mass of nitrogen oxides in the exhaust gas	g/km
m_{Pi}	mass emission of the pollutant i	g
m_{THC}	mass of hydrocarbon in the exhaust gas	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	diluted exhaust mixture absolute pressure 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
Q_a	measured flow rate of venturi at ambient conditions	L/s
Q_{cal}	measured flow rate of venturi using the other gas flowmeter	L/s
$R_{HC,ex}$	atom number ratio of hydrogen and carbon in the exhaust gas	—
$R'_{HC,ex}$	atom number ratio of hydrogen and carbon in the exhaust gas for lubrication oil mixed fuel	—
$R_{HC,f}$	atom number ratio of hydrogen and carbon in the fuel	—
$R_{HC,o}$	atom number ratio of hydrogen and carbon in the lubrication oil	—
$R_{OC,ex}$	atom number ratio of oxygen and carbon in the exhaust gas	—
$R'_{OC,ex}$	atom number ratio of oxygen and carbon in the exhaust gas for lubrication oil mixed fuel	—
$R_{OC,f}$	atom number ratio of oxygen and carbon in the fuel	—
$R_{OC,o}$	atom number ratio of oxygen and carbon in the lubrication oil	—
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

Table 1 (*continued*)

Symbols	Definition	Unit [a]
T_0	air temperature at the standard reference conditions	K
T_1	mean dry bulb temperature during the test in the test room	K
T_2	mean wet bulb temperature during the test in the test room	K
V	measured volume of fuel consumed	L
V_d	dilution air volume	L
V_e	volume of the diluted exhaust mixture expressed corrected to the standard reference conditions	L/km
V_{ex}	exhaust gas volume	L
V_f	fuel volume of lubrication oil mixed fuel	L
$V_{i,e}$	volume of the diluted exhaust mixture in one test under the standard reference conditions	L
V_o	lubrication oil volume of lubrication oil mixed fuel	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	L
α	coefficient of volumetric expansion for the fuel	K^{-1}
ρ_{CO}	carbon monoxide density at the standard reference conditions	g/L
ρ_{CO2}	carbon dioxide density at the standard reference conditions	g/L
ρ_f	fuel density at 293,15 K	g/L
ρ_{NOx}	nitrogen oxides density under the standard reference conditions, expressed in equivalent NO_2	g/L
ρ_o	lubrication oil density at 293,15 K	g/L
ρ_{Pi}	density of the pollutant i under the standard reference conditions	g/L
ρ_{THC}	hydrocarbon density at the standard reference conditions	g/L
ρ_0	air volumetric mass	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:   293,15 K;

relative humidity, H_0:   65 %;

air volumetric mass, ρ_0:   1,205 kg/m^3;

relative air density, d_0:   0,931 9.

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 method 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

7 Measurement equipment

Irrespective of the provisions specified below, any measurement system(s) may be used when the performance of the equipment is proven by the equipment manufacturer to be equivalent to the CVS (constant volume sampling) system.

7.1 Chassis dynamometer

The chassis dynamometer shall be set in accordance with ISO 11486.

7.2 Gas-collection equipment

7.2.1   The gas-collection device shall be a closed type device that can collect all exhaust gases at the motorcycle exhaust outlet(s) providing that it satisfies the backpressure condition of $\pm 1,226$ kPa. An open system may be used as well if it is confirmed that all the exhaust gases are collected. The gas collection shall be such that there is no condensation, which could appreciably modify the nature of exhaust gases at the test temperature.

7.2.2   A connecting tube between the device and the exhaust gas sampling system. This tube, and the device, shall be made of stainless steel or of some other material which does not affect the composition of the gases collected and which withstands the temperature of these gases.

7.2.3   A heat exchanger capable of limiting the temperature variation of the diluted exhaust mixture in the pump intake 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.

7.2.4   A positive displacement pump (PDP) to draw in the diluted exhaust mixture. This pump is equipped with a motor having several strictly controlled uniform speeds. The pump capacity shall be large enough to ensure the intake of all the exhaust gases.

7.2.5   A device using a critical flow venturi (CFV) may also be used.

7.2.6 A device to allow continuous recording of the temperature of diluted exhaust mixture entering the pump.

7.2.7 Two gauges:

— one to ensure the pressure depression of the diluted exhaust mixture entering the pump, relative to atmospheric pressure;

— one to measure the dynamic pressure variation of the positive displacement pump.

7.2.8 A probe located near to, but outside the gas-collecting device, to collect, through a pump, a filter and a flowmeter, samples of the dilution air stream, at constant flow rates, throughout the test.

7.2.9 A sample probe pointed upstream into the diluted exhaust mixture flow, upstream of the positive displacement pump or the critical flow venturi to collect, through a pump, a filter and a flowmeter, samples of the diluted exhaust mixture, at constant flow rates, throughout the test.

The minimum sample flow rate in the two sampling devices described in 7.2.8 and 7.2.9 shall be 150 L/h.

7.2.10 Three-way valves on the sampling system, described in 7.2.8 and 7.2.9, to direct the samples either to their respective bags or to the outside throughout the test.

7.2.11 Gas-tight collection bags for dilution air and diluted exhaust mixture of sufficient capacity so as not to impede normal sample flow, and which will not change the nature of the gaseous exhaust emissions concerned.

The bags shall have an automatic self-locking device and shall be easily and tightly fastened, either to the sampling system or the analysing system at the end of the test.

7.2.12 A revolution counter to count the revolutions of the positive displacement pump throughout the test.

Good care shall be taken with the connecting method and the material or configuration of the connecting parts because there is a possibility that each section (e.g. the adapter and the coupler) of the sampling system will become very hot. If the measurement cannot be performed normally due to heat-damages of the sampling system, an auxiliary cooling device may be used as long as the exhaust gases are not affected.

NOTE 1   With open type devices, there is a risk of incomplete gas collection and gas leakage into the test room, so it is important to make sure that there is no leakage throughout the sampling period.

NOTE 2   If a constant CVS flow rate is used throughout the test cycle that includes low and high speeds all in one, it is advisable that special attention be paid because of higher risk of water condensation in the high speed range.

7.3 Analytical equipment

7.3.1 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 gases to be analysed. The sample probe as well as the tube taking the gases to the analyser shall be at ambient temperature.

7.3.2 Analysers shall be of the following types:

a) for gasoline and LPG:

   1) non-dispersive type with absorption in the infra-red for carbon monoxide and carbon dioxide;

   2) flame ionization type for total hydrocarbons (diluted measurements);

   3) non-dispersive type with absorption in the infra-red for hydrocarbons (direct measurements);

   4) chemiluminescence type for nitrogen oxides;

b) for diesel fuel:

   1) non-dispersive type with absorption in the infra-red for carbon monoxide and carbon dioxide;

   2) heated flame ionization type for total hydrocarbons (diluted measurements);

   3) non-dispersive type with absorption in the infra-red for hydrocarbons (direct measurements);

   4) chemiluminescence type for nitrogen oxides.

7.4   Cooling equipment

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

The above mentioned 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 $0,4 \text{ m}^2$ 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 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.

7.5   Fuel consumption measurement

7.5.1   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.

7.5.2   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 volumetric, 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.

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

7.6 Accuracy of instruments and measurements

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

7.6.2 The speed of the 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.

7.6.3 The ambient temperatures and the temperatures considered in 7.2.3 and 7.2.6 shall be measured with an accuracy of ± 1 K.

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

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

7.6.6 The pressures considered in 7.2.7 shall be measured with an accuracy of ± 0,4 kPa.

7.6.7 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.

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

7.6.9 The duration of cycles and gas collection shall be conducted with an accuracy of ± 1 s. These times shall be measured with an accuracy of 0,1 s.

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

7.6.11 The total flow rate and the sampling flow rates shall be steady with an accuracy of ± 5 %.

7.6.12 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 test fuel shall be selected in accordance with the manufacturer's requirements and 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 motorcycle shall be provided in accordance with ISO 6460-2:2007, Annexes A and B, and in ISO 6460-3:2007, Annex B.

8.3 Conditioning/preparation of the test motorcycle

8.3.1 The engine, transmission and motorcycle shall be run in properly in accordance with the manufacturer's requirements.

8.3.2 The motorcycle shall be adjusted in accordance with the manufacturer's requirements (e.g. the viscosity of the oils, tyre pressures) or, if there is any alteration, the full description shall be given in the test report.

8.3.3 The distribution of the load between the wheels shall be in conformity with the manufacturer's instructions.

8.4 Adjustment of the analytical apparatus

8.4.1 Calibration of the analysers

The calibration gas at the indicated pressure, compatible with the correct functioning of the equipment, shall be passed through the analyser.

The curve of the analyser's deviations shall be drawn as a function of the contents of the various gas cylinders used.

8.4.2 Adjustment of the analysers

The adjustment of the analysers can then be carried out with only one calibration gas having an established content.

8.4.3 Overall response time of the apparatus

The gas from the cylinder that contains the maximum concentration shall be introduced into the end of the sampling probe. A check shall be made to ensure that the indicated value corresponding to the maximum deviation is reached in less than 1 min. If this value is not reached, the analysing circuit shall be inspected from end to end for leaks.

9 System check procedure

9.1 Accuracy of the CVS system

The total accuracy of the CVS system and analytical system shall be determined by introducing a known mass of a pollutant gas into the system whilst it is being operated, as if during a normal test, and then analysing and calculating the pollutant mass, m_{Pi}, according to Equation (1):

$$m_{Pi} = V_{i,e} \times \rho_{Pi} \times c_{Pi,ec} \times 10^{-6}$$ (1)

There is no humidity correction for hydrocarbon and carbon monoxide.

The following two techniques are known to give sufficient accuracy.

9.2 Metering a constant flow of pure gas (CO or C_3H_8) using a critical flow orifice

A known quantity of pure gas (CO or C_3H_8) is fed into the CVS system through the calibrated critical orifice. If the inlet pressure is high enough, the flowrate (q), which is adjusted by means of the critical flow orifice, is independent of orifice outlet pressure (critical flow). If deviations exceeding 5 % occur, the cause of the malfunction shall be located and determined. The CVS system is operated as in a gaseous exhaust emission test for about 5 min to 10 min. The gas collected in the sampling bag is analysed by the usual equipment and the result compared to the concentration of the gas samples known beforehand.

9.3 Metering a limited quantity of pure gas (CO or C_3H_8) by means of a gravimetric technique

The following gravimetric procedure may be used to verify the CVS system. The weight of a small cylinder filled with either carbon monoxide or propane is determined with a precision of ± 0,01 g. For about 5 min to 10 min, the CVS system is operated as in a normal gaseous exhaust emission test, while CO or propane is injected into the system. The quantity of pure gas involved is determined by means of differential weighing. The gas accumulated in the bag is then analysed by means of the equipment normally used for exhaust-gas analysis. The results are then compared to the concentration figures computed previously.