BS ISO 6855-1:2012

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Mopeds — Measurement method for gaseous exhaust emissions and fuel consumption

Part 1: General test requirements

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National foreword

This British Standard is the UK implementation of ISO 6855-1:2012. Together with BS ISO 6855-2:2012 and BS ISO 6855-3:2012, it supersedes BS ISO 7859:2000, which is withdrawn.

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

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

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INTERNATIONAL STANDARD

ISO 6855-1

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

Part 1: General test requirements

Cyclomoteurs — Méthode de mesure des émissions de gaz polluants et de consommation de combustible —

Partie 1: Exigences générales d'essai

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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 6855-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 23, *Mopeds*.

ISO 6855-1 cancels and replaces ISO 6855:1983 and ISO 7859:2000, both of which have been technically revised.

ISO 6855 consists of the following parts, under the general title *Mopeds — 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*

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Introduction

For measurement of moped 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 6855 now covers in one single series of standards the two subjects that were previously covered separately by ISO 6855:1983 and by ISO 7859:2000. This part of ISO 6855 defines fundamental elements such as the measurement accuracy, test vehicle conditions and the details of the carbon balance method. Measurement of gaseous exhaust gas emissions and fuel consumption of test cycles can be conducted with this part of ISO 6855 and ISO 6855-2. Together with ISO 6855-3, they also give details of those measurements at a constant speed.

While the most up-to-date technologies are reflected in the ISO 6855 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 for the evaporated fuel from the test moped.

In addition to the above future 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.

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

Part 1: General test requirements

1 Scope

This part of ISO 6855 specifies the general test requirements for measurement for the gaseous exhaust emissions from mopeds, and for determining the fuel consumption of mopeds as defined in ISO 3833. It is applicable to mopeds equipped with a spark ignition engine (four-stroke engine, two-stroke engine or rotary piston 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 6855-2:2012,*Mopeds — Measurement method for gaseous exhaust emissions and fuel consumption — Part 2: Test cycles and specific test conditions*

ISO 6855-3:2012, *Mopeds — Measurement method for gaseous exhaust emissions and fuel consumption — Part 3: Fuel consumption measurement at a constant speed*

ISO 28981, *Mopeds — Methods for setting the 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.

3.1
moped kerb mass
dry mass of the moped to which is added the mass of the following:

— fuel: tank filled at least to 90 % of the capacity specified by the manufacturer;

— auxiliary equipment usually supplied by the manufacturer in addition to that necessary for normal operation [tool-kit, carrier(s), windscreen(s), protective equipment, etc.]

3.2
reference mass of the moped
kerb mass of the moped 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 moped

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

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
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	%
H_r	relative humidity in the test room	%
H_0	standard relative humidity	%

[a] ppm = parts per million.

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Table 1 *(continued)*

Symbols	Definition	Unit [a]
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	—
r_0	relative air density at the standard reference conditions	—
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

[a] ppm = parts per million.

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Table 1 *(continued)*

Symbols	Definition	Unit [a]
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 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:

a) total barometric pressure, p_0: 101,325 kPa;

b) air temperature, T_0: 293,15 K;

c) relative humidity, H_0: 65 %;

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

e) relative air density, r_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 6855-2.

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6.1.2 The gaseous exhaust emissions measurement at an idling speed

The test shall be carried out in accordance with the procedure described in ISO 6855-2.

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 6855-2.

6.2.2 Fuel consumption at a constant speed

The test shall be carried out in accordance with the procedure describedin ISO 6855-3.

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 CVS (constant volume sampling) system.

7.1 Chassis dynamometer

The chassis dynamometer shall be set in accordance with ISO 28981.

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 moped exhaust outlet(s) while maintaining atmospheric pressure at the exhaust outlet(s). 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 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.

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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 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) non-dispersive type with absorption in the infrared for carbon monoxide and carbon dioxide;

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

c) non-dispersive type with absorption in the infrared for hydrocarbons (direct measurements);

d) chemiluminescence type for nitrogen oxides.

7.4 Cooling equipment

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

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As far as possible, the air speed shall be constant across the whole outlet section.

The blower outlet shall have a cross-section area of at least 0,2 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 moped 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 ± 2 % 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 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 moped shall be measured with an accuracy of ± 1 %.

7.6.2 The speed of the moped 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 ± 2 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.

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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 ± 3 %.

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 moped

The main specifications of the moped shall be provided in accordance with ISO 6855-2:2012, Annexes A and B and with ISO 6855-3:2012, Annex B.

8.3 Conditioning/preparation of the test moped

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

8.3.2 The moped 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.

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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 while it is being operated as if during a normal test and then analysing and calculating the pollutant mass according to Formula (1).

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

There is no humidity correction for hydrocarbon and carbon monoxide.

The two techniques in 9.2 and 9.3 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 flow-rate (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 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 which was 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 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.

10 Procedure for sampling, analysing and measuring the volume of gaseous exhaust emissions

10.1 Operations to be carried out before the moped start up

A schematic diagram is shown in Figure 1 for the representative closed type CVS system with CFV and Figure 2 for the representative closed type CVS system with PDP.

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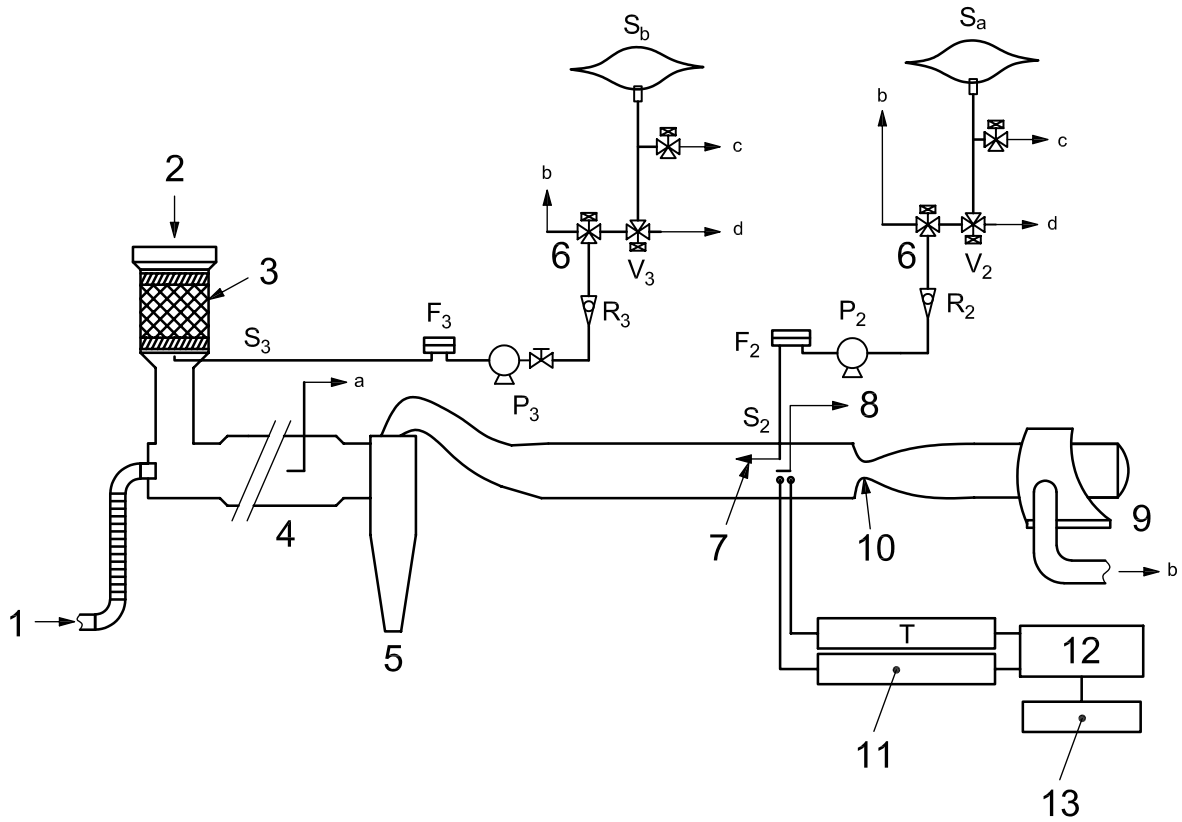

Key

1	exhaust gas	11	pressure gauge
2	dilution air	12	calculator
3	dilution air filter	13	integrator
4	mixing chamber	F_2, F_3	filters
5	cyclone	P_2, P_3	pumps
6	diversion valve	R_2, R_3	flowmeters
7	sampling venturi	S_a, S_b	sampling bags
8	continuous sampling probe	S_2, S_3	probes
9	blower	T	temperature gauge
10	main critical flow venturi	V_2, V_3	valves

a To HFID; special sampling line when HFID is used.
b To atmosphere.
c To exhaust pump.
d To analysing system.

Figure 1 — A schematic diagram for the representative closed type CVS system with CFV

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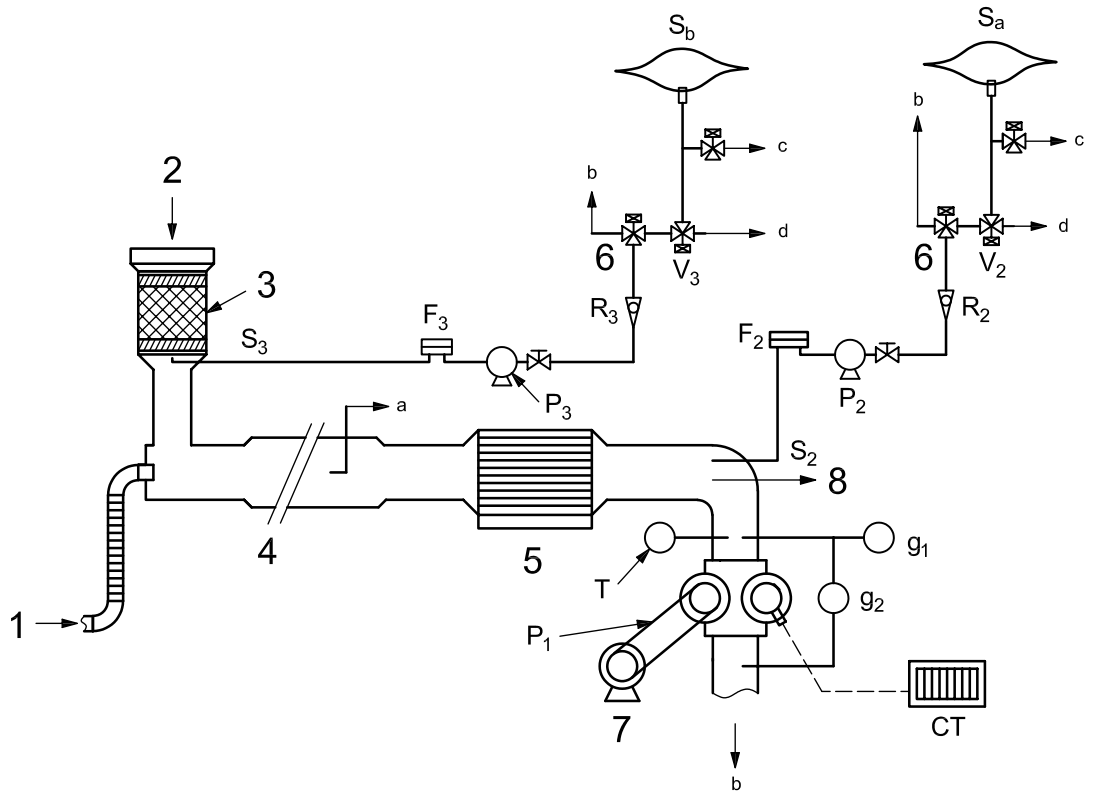

Key

1	exhaust gas	F_2, F_3	filters
2	dilution air	g_1, g_2	pressure gauges
3	dilution air filter	P_1	positive displacement pump
4	mixing chamber	P_2, P_3	pumps
5	heating exchanger	R_2, R_3	flowmeters
6	diversion valve	S_a, S_b	sampling bags
7	motor	S_2, S_3	probes
8	continuous sampling probe	T	temperature gauge
CT	revolution counter	V_2, V_3	valves

a To HFID; special sampling line when HFID is used.
b To atmosphere.
c To exhaust pump.
d To analysing system.

Figure 2 — A schematic diagram for the representative closed type CVS system with PDP

10.1.1 The bags for collecting the samples (S_a and S_b) are emptied and sealed.

10.1.2 The positive displacement pump (P_1) is activated without starting up the revolution counter.

10.1.3 The pumps (P_2 and P_3) for taking the samples are activated with the valves set to divert the gases produced into the atmosphere; the flow through valves (V_2 and V_3) is regulated.

10.1.4 The following recording devices are put into operation: the temperature gauge (T) and the pressure gauges (g_1 and g_2).

10.1.5 The revolution counter (CT) and the roller revolution counter are set to zero.

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10.2 Beginning of sampling and volume measurement

10.2.1 The operations specified in 10.2.2 to 10.2.5 are performed simultaneously.

10.2.2 The diversion valves are set to collect the samples, which have previously been directed towards the atmosphere, continuously through probes (S_2 and S_3) in bags (S_a and S_b).

10.2.3 The moment at which the test begins is indicated on the analogue graphs which record results from the temperature gauge T and the differential pressure gauges (g_1 and g_2).

10.2.4 The counter which records the total number of revolutions of pump (P_1) is started up.

10.2.5 The device which directs a flow of air at the moped, referred to in 7.4, is started up.

10.3 End of sampling and volume measurement

10.3.1 At the end of the test cycle, the operations described in 10.3.2 to 10.3.5 are performed simultaneously.

10.3.2 The diversion valves shall be set to close bags (S_a and S_b) and to discharge into the atmosphere the samples sucked in by pumps (P_2 and P_3) through probes (S_2 and S_3).

10.3.3 The moment at which the test finishes shall be indicated on the analogue graphs referred to in 10.2.3.

10.3.4 The pump (P_1) revolution counter is stopped.

10.3.5 The device which directs a flow of air at the moped, referred to in 7.4, is stopped.

10.4 Analysis

10.4.1 The exhaust gases contained in the bag shall be analysed as soon as possible, unless otherwise specified in ISO 6855-2.

10.4.2 Prior to each sample analysis, the analyser range to be used for each pollutant shall be set to zero with the appropriate span gas.

10.4.3 The analysers shall then be set to the calibration curves by means of span gases of nominal concentrations of 70 % to 100 % of the range.

10.4.4 The analysers' zeros shall then be rechecked. If the reading differs by more than 2 % of the range from that set in 10.4.2, the procedure is repeated.

10.4.5 The samples shall then be analysed.

10.4.6 After the analysis, zero and span points shall be rechecked using the same gases. If these rechecks are within 2 % of those in 10.4.3, the analysis is considered acceptable.

10.4.7 At all points in this clause the flow rates and pressures of the various gases shall be the same as those used during calibration of the analysers.

10.4.8 The figure adopted for the concentration of each gaseous exhaust emission is that read off after stabilization of the measuring device.

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