INTERNATIONAL STANDARD

ISO 7859

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Mopeds — Fuel consumption measurements

Cyclomoteurs — Mesurages de la consommation de carburant

Reference number
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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 7859 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 23, *Mopeds*.

Annexes A and B form a normative part of this International Standard.

Mopeds — Fuel consumption measurements

1 Scope

This International Standard specifies two tests for determining the fuel consumption of mopeds.

It is applicable to mopeds as defined in ISO 3833.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3833:1977, *Road vehicles — Types — Terms and definitions*.

ISO 4164:1978, *Road vehicles — Mopeds — Engine test code — Net power.*

ISO 6726:1988, *Mopeds and motorcycles with two wheels — Masses — Vocabulary.*

ISO 6855:1983, *Road vehicles — Measurement method for gaseous pollutants emitted by mopeds equipped with a controlled ignition engine.*

ISO 6970:1994, *Motorcycles and mopeds — Pollution tests — Chassis dynamometer bench.*

ISO 7116:1995, *Mopeds — Measurement of maximum speed.*

ISO 11486:1993, *Two-wheeled motorcycles — Fuel consumption measurements — Chassis dynamometer setting by coastdown method.*

3 Term and definition

For the purposes of this International Standard, the following term and definition apply.

3.1
reference speed
running speed of the vehicle to be tested for the fuel consumption

4 Tests and test conditions

4.1 Tests

4.1.1 Type 1 test: Measurement of the average fuel consumption during a conventional driving cycle

4.1.1.1 The moped shall be placed on a chassis dynamometer equipped with a brake and an inertia simulation system. A test shall include two cycles as described in 7.1 carried out without interruption.

During the test, the fuel consumption shall be measured by the equipment as described in 7.3.2 and 7.3.3

4.1.1.2 The test shall be carried out in accordance with the method described in clause 7.

4.1.2 Type 2 test: Measurement of fuel consumption at constant speed

The test shall be carried out either on the road or on a chassis dynamometer according to the requirements described in clause 8.

4.2 Atmospheric conditions

— Relative humidity: less than 95 %

— Maximum wind speed: 3 m/s

— Maximum wind speed for gusts: 5 m/s

— Air temperature: 278 K to 303 K

4.3 Standard conditions

— Pressure: p_0 = 100 kPa

— Temperature: T_0 = 293 K

— Relative air density: d_0 = 0,919 7

The relative air density when the moped is tested, calculated using the formula given below, shall not differ by more than 7,5 % from the air density under the standard conditions.

The relative air density shall be calculated by the formula:

$$d_\mathrm{T} = d_0 \times \frac{p_\mathrm{T}}{p_0} \times \frac{T_0}{T_\mathrm{T}}$$

where

d_T is the relative air density at test conditions;

p_T is the test pressure;

T_T is the absolute temperature during the test, in kelvins.

5 Description of the test moped

The moped shall be described according to annex A.

6 Preparation of the test moped

6.1 The moped shall conform in all its components with the production series. If the moped is different from the production series, a full description shall be given in the test report.

6.2 The vehicle shall be properly run in, according to the manufacturer's requirements.

6.3 The viscosity of the oils for the moving mechanical parts and the tyre pressures shall conform to the instructions given by the manufacturer of the moped.

6.4 Before the test, all parts of the moped shall be stabilized at the normal temperature for the moped in use.

6.5 The mass of the moped shall be the kerb mass, as defined in ISO 6726.

6.6 The total test mass including the masses of the rider and the instruments shall be measured before beginning of the test.

6.7 The distribution of the load between the wheels shall conform to the manufacturer's instructions.

6.8 When installing the measuring instruments on the test moped, care shall be taken to minimize their effects on the distribution of the load among the wheels.

6.9 When installing the speed sensor and/or fuel consumption measurement equipment on the outside of the moped, care shall be taken to minimize the additional aerodynamic loss.

6.10 For the test, the following reference fuels shall be used, as appropriate:

— CEC[1)] Specification RF-01-A-80 (see reference [1]);

— CEC[1)] Specification RF-03-A-84 (see reference [2]);

— CEC[1)] Specification RF-05-A-83 (see reference [3]);

— CEC[1)] Specification RF-08-A-85 (see reference [4]).

The lubrication of the engine, including engine lubricated mixture, shall comply, as to grade and quantity of oil, with the manufacturer's recommendations.

7 Measurement of the average fuel consumption of moped during a conventional driving cycle (Type 1 test)

7.1 Operating cycle on the roller bench

7.1.1 Description of the cycle

The operating cycle on the roller bench shall be that indicated in Table 1 and depicted in the graph in Figure 1.

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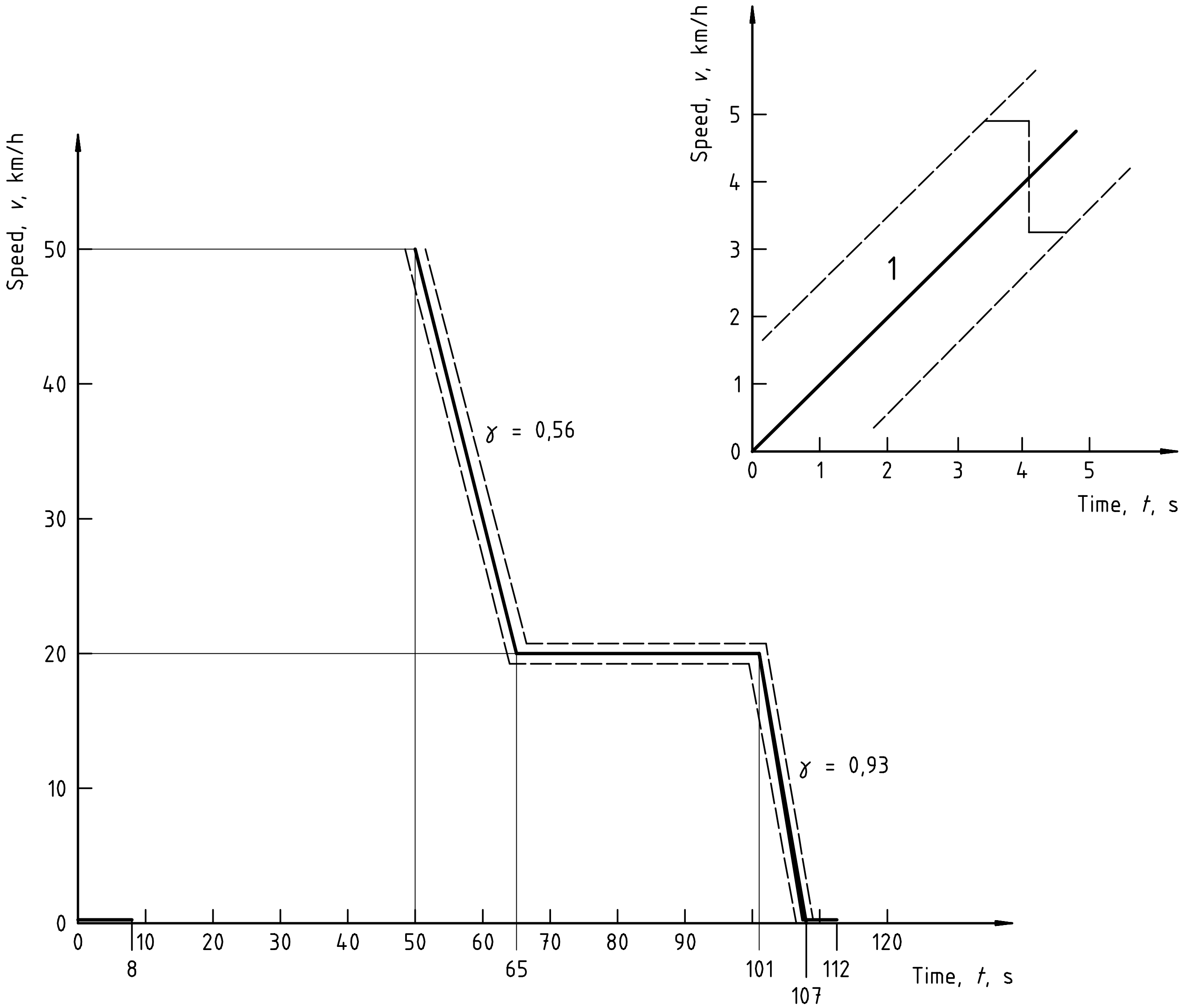
1) Coordinating European Council for the development of performance tests for transportation fuels, lubricants and other fluids.



Key

1 Theoretical graph of the cycle

NOTE Speed (± 1 km/h) and time (± 0,5 s) tolerances are combined geometrically for each point, as shown in the inset.

Figure 1 — Operating cycle on the roller bench (Type 1 test)

7.1.2 General conditions under which the cycle is carried out

Preliminary testing cycles should be carried out, if necessary, to determine how best to actuate the throttle, gear-box, clutch and brake controls so as to achieve a cycle approximating the theoretical cycle within the prescribed limits.

7.1.3 Use of the gear-box

The use of the gear-box shall be, if possible, as specified by the manufacturer; however, in the absence of such instructions, the points indicated in 7.1.3.1 and 7.1.3.2 shall be taken into account.

7.1.3.1 Manual change gear-box

At the constant speed of 20 km/h, the rotating speed of the engine shall be, if possible, within 50 % and 90 % of the speed corresponding to the maximum power of the engine. When this speed can be reached in two or more gears, the vehicle shall be tested with the highest gear engaged.

During acceleration, the vehicle shall be tested with the gear which gives maximum acceleration. A higher gear shall be engaged at the latest when the rotating speed is equal to 110 % of the speed corresponding to the maximum power of the engine. During deceleration, a lower gear shall be engaged before the engine starts to run erratically, at the latest when the engine revolutions are equal to 30 % of the speed corresponding to the maximum power of the engine. No change down to first gear shall be effected during deceleration.

7.1.3.2 Automatic transmission

The position for normal riding shall be used.

Table 1 — Operating cycle on the dynamometer bench

Operation No.	Operation	Acceleration m/s²	Speed km/h	Duration of operation s	Total time s
1	Idling	—	—	8	8
2	Acceleration	Full throttle	0 to max.	—	—
3	Constant speed	Full throttle	max.	57[a]	—
4	Deceleration	– 0,56	max. to 20	—	65
5	Constant speed	—	20	36	101
6	Deceleration	– 0,93	20 to 0	6	107
7	Idling	—	—	5	112

[a] This duration refers to operations 2, 3 and 4 together.

7.1.4 Tolerances

7.1.4.1 A tolerance of ± 1 km/h on the theoretical speed shall be allowed during acceleration, during steady speed, and during deceleration. If the moped decelerates more rapidly without the use of the brakes, the requirements of 7.4.6.3 shall apply.

Speed tolerances greater than those prescribed shall be accepted during phase changes, provided that the tolerances are never exceeded more than 0,5 s in any occasion.

7.1.4.2 The time tolerance shall be ± 0,5 s.

7.1.4.3 The speed and time tolerances shall be combined as indicated in Figure 1.

7.2 Test equipment

7.2.1 Roller bench

The main characteristics of the roller bench shall be as follows:

— number of points of contact between tyre(s) and roller(s): one to each driven wheel;

— roller diameter: ⩾ 400 mm;

— roller surface: polished or knurling metallic;

— equation of the power absorption curve.

The dynamometer shall meet the following conditions:

a) constant simulation of the road load power within ± 3 % for speeds from 20 km/h to 50 km/h;

b) constant maintenance of the absorbed power as set throughout the test period within ± 2 % at the set speed of 50 km/h;

c) when used to determine fuel consumption, the measurement systems for the fuel consumed, for the distance covered and for time shall be simultaneously engaged.

NOTE It can be assumed that the power lost between the tyre(s) and the roller(s) equals the loss between the tyre(s) and the road.

7.2.2 Fuel consumption device

For measuring the fuel consumption, one of the following methods may be used depending on the characteristics of each method and on the type of test to be performed (conventional driving cycle or constant speed):

a) volumetric method;

b) gravimetric method;

c) flowmeter method.

If the fuel supply system of the moped is equipped with a fuel pump, methods a) and b) are not applicable.

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

7.2.2.1 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 B, which does not interfere with the supply of fuel to the engine. When the measuring system is volumetric, the temperature of fuel in the device or in the outlet of the device shall be measured.

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

7.2.2.2 Annex B gives the description and the methods of use of the appropriate devices.

7.3 Preparation of the test

7.3.1 The dynamometer setting

7.3.1.1 General

The dynamometer should be set by one of the coastdown methods described in ISO 11486 according to the type of dynamometer.

If it is not possible to carry out these above mentioned methods, the brake shall be adjusted in accordance with one of the following methods:

— maximum speed (see 7.3.1.2);

— or, fixed value as given in Table 2 (see 7.3.1.3).

7.3.1.2 Maximum speed method

The brake shall be so adjusted as to ensure that the vehicle bench speed, with the throttle fully open, shall be equal to the maximum attainable speed on the road within ± 1 km/h. This maximum attainable speed on the road shall not differ from the maximum design speed specified by the manufacturer by more than ± 2 km/h. In the case where the vehicle is fitted with a device to regulate its maximum road speed, the effect of the regulator will be taken into account.

7.3.1.3 Fixed load values

The power absorbed (P_a) by the brake and the internal frictions of the bench shall be:

— $0 \leqslant P_a \leqslant kv_{12}^3 + 0{,}05\ kv_{12}^3 + 0{,}05\ P_{v50}$ for speeds less than 12 km/h

— $P_a = kv^3 \pm 0{,}05\ kv^3 \pm 0{,}05\ P_{v50}$ for speeds greater than 12 km/h

The inertia simulation system shall be adjusted to obtain a total inertia of the rotating masses representing the moped kerb mass, in accordance with Table 2.

Table 2 — Dynamometer setting of brake — Fixed load valves

Moped reference mass, m [a]	Equivalent inertia kg	Power absorbed by the chassis dynamometer, P_{v50} kW
$m \leqslant 105$	100	0,88
$105 < m \leqslant 115$	110	0,90
$115 < m \leqslant 125$	120	0,91
$125 < m \leqslant 135$	130	0,93
$135 < m \leqslant 145$	140	0,94
$145 < m \leqslant 165$	150	0,96
$165 < m \leqslant 185$	170	0,99
$185 < m \leqslant 205$	190	1,02
$205 < m \leqslant 225$	210	1,05
$225 < m \leqslant 245$	230	1,09
$245 < m \leqslant 270$	260	1,14
$270 < m \leqslant 300$	280	1,17
$300 < m \leqslant 330$	310	1,21
$330 < m \leqslant 360$	340	1,26
$360 < m \leqslant 395$	380	1,33
$395 < m \leqslant 435$	410	1,37
$435 < m \leqslant 475$	—	1,44

[a] As defined in ISO 6855.

NOTE Additional masses may be replaced by another device, provided that it is demonstrated that the results obtained are equivalent.

7.3.2 Description of the dynamometers

7.3.2.1 Dynamometer with fixed load curve

In the case of a dynamometer with hydraulic or aerodynamic absorption, the setting can be done only at one speed point. The absorber should be set to the value F_{pau} (v_0) at the reference speed of 50 km/h. The accuracy shall be ± 5 %.

7.3.2.2 Dynamometer with polygonal function

In the case of a dynamometer with polygonal function, in which the absorption characteristics are determined by load values at a plural speed point, the dynamometer should be set to the value F_{pau} (v_j) obtained at (50, 40, 30 and 20) km/h. The accuracy shall be ± 5 % at 50 km/h, 40 km/h, and 30 km/h and 10 % at 20 km/h.

7.3.2.3 Dynamometer with coefficient control

In the case of a dynamometer with coefficient control, in which the absorption characteristics are determined by given coefficients of a polynomial function, the value of F_{pau} (v_j) should be calculated at 50 km/h, 40 km/h, 30 km/h and 20 km/h with the same accuracy as 7.3.1.2.

Assuming the load characteristics as:

$$F_{pau}(v) = av^2 + bv + c$$

the coefficients, a, b and c should be determined by the polynomial regression method.

7.3.2.4 Dynamometer with F^* polygonal digital setter

In the case of a dynamometer with F^* polygonal digital setter, where a CPU is incorporated in the system, F^* is imputted directly, and Δt, F_f and F_{pau} are automatically measured and calculated to set, on the dynamometer, the target running resistance $F^* = f_0^* + f_2^* v^2$.

7.3.2.5 Dynamometer with f_0^*, f_2^* coefficient digital setter

In the case of a dynamometer with f_0^*, f_2^* coefficient digital setter, where a CPU is incorporated in the system, the target running resistance $F^* = f_0^* + f_2^* v^2$ is automatically set on the dynamometer.

7.3.3 Conditioning of moped

7.3.3.1 Adjustment of the tyre pressures

The tyre pressures shall be those recommended by the manufacturer for normal road use conditions.

7.3.3.2 Load on the driving wheel

The load on the driving wheel shall be within ± 3 % of that of a moped in normal road use with a rider of 75 kg ± 5 kg in the upright position.

7.4 Procedure for tests on the roller bench

7.4.1 Special conditions for carrying out the cycle

7.4.1.1 The temperature in the room housing the roller bench shall be between 293 K and 303 K throughout the test and approximate as closely as possible that of the room in which the moped was conditioned for the test.

7.4.1.2 The moped shall be as nearly level as possible when tested in order to prevent abnormal fuel distribution and, where necessary, engine oil distribution.

7.4.1.3 Throughout the test, a variable speed cooling blower shall be positioned in front of the moped, so as to direct cooling air to the engine 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 is within ± 5 km/h of the corresponding roller speed. At roller speeds of less than 10 km/h, air velocity may be zero. With the manufacturer's agreement, engine cooling may be effected by a constant speed blower giving a current of air delivered at a speed between 20 km/h and 50 km/h. 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 15 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 font of its front wheel. The device used to measure the linear velocity of the air shall be located in the middle of the stream at 20 cm from the air outlet. This velocity shall be nearly as possible across the whole of the blower outlet surface.

7.4.1.4 When the cycle is carried out, the speed considered shall be that of the rollers. During the test, the speed shall be plotted versus time so that the validity of the cycle performed can be assessed.

7.4.2 Starting up the engine

The engine shall be started up by means of the devices provided for this purpose, such as the choke, the starter valve, etc., according to the manufacturer's instructions.

7.4.3 Idling

7.4.3.1 Manual change gear-box

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

7.4.3.1.2 To enable the accelerations to be performed correctly the vehicle shall be placed in first gear, with the clutch disengaged within 5 s before the acceleration following the idling period considered.

7.4.3.2 Automatic transmission

The position for normal idling shall be used.

7.4.4 Accelerations

At the end of each period of idling the acceleration phase shall be effected by fully opening the throttle and, if necessary, using the gear-box to attain maximum speed as quickly as possible.

7.4.5 Constant speed

The constant maximum speed phase shall be effected by holding the throttle fully open, until the deceleration phase commences.

During the constant speed phase at 20 km/h, the throttle position shall, as far as possible, be kept fixed.

7.4.6 Decelerations

7.4.6.1 All decelerations shall be effected by closing the throttle completely, with the clutch remaining engaged. The manual clutch shall be disengaged independently of gear selection, at a speed of 10 km/h.

7.4.6.2 If the rate of deceleration is slower than that prescribed for the corresponding operation, the vehicle's brake shall be used to enable the cycle to be followed.

7.4.6.3 If the rate of deceleration is faster than that prescribed for the corresponding operation, the timing of the theoretical cycle shall be restored by a constant speed or idling period merging into the succeeding constant speed or idling operation. In that case, the requirements of 7.1.4.1 are not applicable.

7.4.6.4 At the end of the second deceleration period (the vehicle being stationary on the roller) the gears shall be in neutral and the clutch engaged.

7.5 Measurement of fuel consumption

Fuel consumption shall be determined by measuring the quantity of fuel consumed during two consecutive operating cycles.

7.6 Calculation of results

7.6.1 If the fuel consumption is measured gravimetrically, the consumption C shall be expressed, in litres per 100 km, by converting the measurement m (fuel consumed expressed in kilograms) by means of the formula:

$$C = \frac{m}{l \times \rho} \times 100$$

where

ρ is the density (mass/volume) of the fuel in the reference conditions (293 K), in kilograms per cubic decimetre;

l is the distance covered during the test, in kilometres.

7.6.2 If the fuel consumption is measured volumetrically, the consumption C shall be expressed in litres per 100 km by the formula:

$$C = \frac{V\left[1 + \alpha\left(T_0 - T_\mathrm{F}\right)\right]}{l} \times 100$$

where

V is the measured volume of fuel consumed, in litres;

α is the coefficient of volumetric expansion for the fuel: for both diesel and petrol fuel this is 0,001 K^{-1};

T_0 is the reference temperature, expressed in kelvins;

T_F is the fuel temperature measured at the burette, expressed in kelvins;

l is the distance covered during the test, in kilometres.

7.6.3 In case of fuel/oil mixture, the volume of oil used during the test shall be deducted.

7.6.4 Whatever the measuring method used, the results shall be expressed in litres per 100 km.

7.7 Presentation of results

7.7.1 The fuel consumption on a conventional driving cycle shall be determined by establishing the arithmetic mean of the amount of fuel consumed, measured in accordance with 7.5 and 7.6, during three consecutive measurements. Between consecutive pairs of cycles, there may be an idling period of not more than 60 s during which no fuel consumption is measured.

7.7.2 If the difference between the extreme measurements is more than 5 % of the mean value of the three measurements, further measurements shall immediately be made to obtain a degree of accuracy of measurements at least equal to 5 %.

7.7.3 The accuracy of measurement, A, shall be calculated by the formula:

$$A = K \times \frac{s}{\sqrt{n}} \times \frac{100}{\overline{C}}$$

where

K is as given in Table 3;

n is the number of measurements;

$$s = \sqrt{\frac{\sum_{i=1}^{n} \left(\overline{C} - C_i\right)^2}{n - 1}}$$

where

C_i is the amount of fuel consumed during the ith measurement;

$\overline{C}$ is the arithmetic means of n values of C.

Table 3 — Correlation of the coefficient K to the number of measurements

n	4	5	6	7	8	9	10	11	12	13	14	15
K	3,2	2,8	2,6	2,5	2,4	2,3	2,3	2,2	2,2	2,2	2,2	2,2
$\frac{K}{\sqrt{n}}$	1,6	1,25	1,06	0,94	0,85	0,77	0,73	0,66	0,64	0,61	0,59	0,57

7.7.4 If an accuracy of measurement at least equal to 5 % is not obtained after ten measurements, the test shall be carried out with another moped of the same type.

8 Constant speed test

8.1 General requirements

8.1.1 Measurement of fuel consumption of a moped based on the constant speed method shall be performed on a road or on a dynamometer.

8.1.2 Fuel shall be supplied to the engine by a device capable of measuring the quantity of fuel supplied with an accuracy of ± 2 %, which does not interfere with the supply of fuel to the engine. Where the measuring system is volumetric, the temperature of fuel in the device or in the outlet of the device shall be measured.

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

8.1.4 Annex B gives the description and the methods of use of the appropriate devices.

8.2 Road measurement method

8.2.1 Rider and riding position

8.2.1.1 The rider shall wear a well-fitting suit (one-piece) or similar clothing and a protective helmet.

8.2.1.2 The rider shall have a mass of 75 kg ± 5 kg and be 1,75 m ± 0,05 m tall.

8.2.1.3 He shall be seated on the seat provided for the rider, with his feet on the foot-rests and his arms normally extended.

This position shall, nevertheless, allow the rider at all times to have proper control of the moped during the test.

The position of the rider should remain unchanged during the whole measurement; the description of the position shall be indicated in the test report or shall be replaced by photographs.

8.2.2 Test track

8.2.2.1 The test track shall allow a steady speed to be maintained. It shall, where possible, form a closed circuit of at least 2 000 m in length, have a minimum radius of 200 m and its surface shall be in good condition (closed circuit track).

The measurement of consumption shall be performed driving a number of complete laps.

8.2.2.2 A straight road may be used provided that a minimum run of 500 m is made in both directions.

8.2.2.3 The test track shall be clean, smooth, covered with asphalt, concrete or similar material. The gradient shall not exceed 2 %.

8.2.2.4 The test track shall be free of any significant film of water.

8.3 Chassis dynamometer measurement method

The chassis dynamometer shall be set by one of the coastdown methods described in ISO 11486 for each reference speed.

8.4 Test method

8.4.1 General requirements

8.4.1.1 The test shall be carried out at the reference speed corresponding to 0,9 v_{max}. The maximum speed of the moped shall be measured as described in ISO 7116.

8.4.1.2 For the test, the reference fuel shall be used. The lubrication of the engine including lubrication by mixture shall comply with the manufacturer's recommendation.

8.4.2 Determination of the consumption

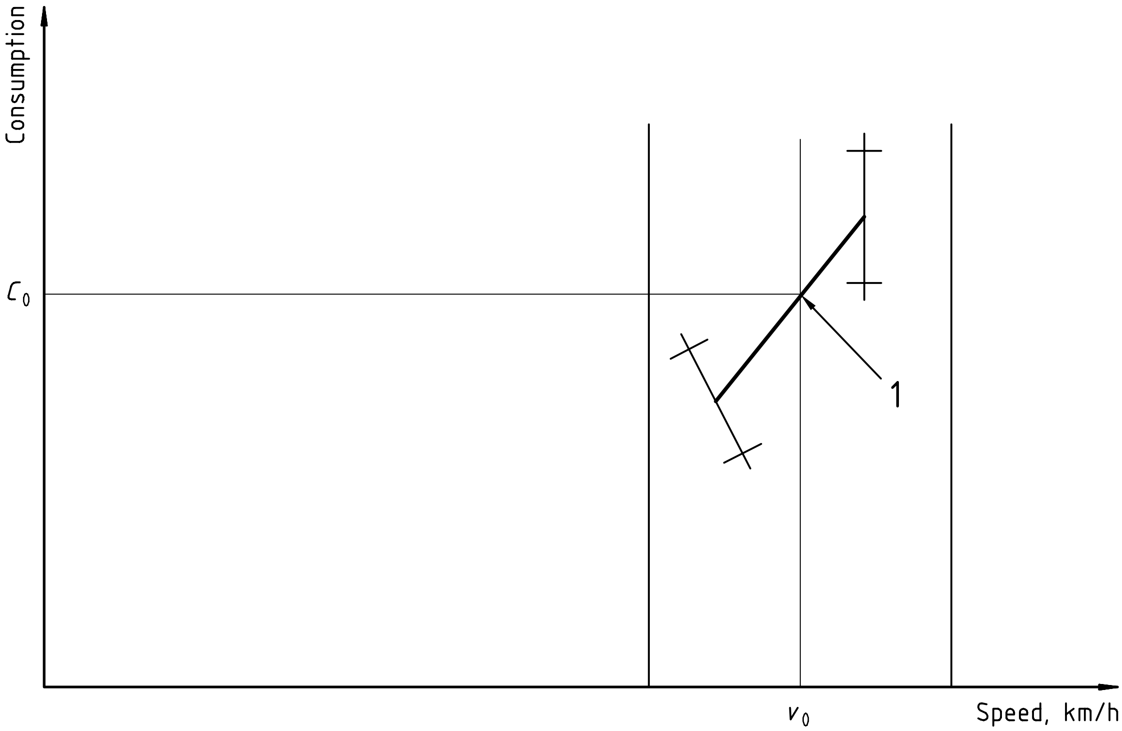
8.4.2.1 To determine the consumption at a steady reference speed (see Figure 2), four tests shall be made: two at an average speed less than the reference speed and two at an average speed exceeding the reference speed. During each test run, the speed shall be kept steady within ± 2 km/h.

The average speed for each test shall not differ from the reference speed by more than 2 km/h.

The fuel consumption for each test run shall be calculated from the formulae in 7.6.

8.4.2.2 The difference between the two lower calculated values shall be not greater than 5 % of their mean value and the same condition shall apply for the two higher calculated values. The value of the fuel consumption at the appropriate reference speed shall be calculated by linear interpolation as shown in Figure 2.

8.4.2.3 If the conditions in 8.4.2.2 are not achieved for either pair of calculated values then the four test runs shall be repeated. If after ten attempts the required consistency has still not been achieved then another moped shall be selected to be tested according to this procedure.



Key

1 Average consumption

NOTE The plotted barred lines correspond to the calculated values for each test run. C_0 is the value calculated for the consumption, at the reference speed v_0 over the test distance.

Figure 2 — Example of calculation for a reference speed of v_0 km/h

Annex A
(normative)

Moped description

Moped
Trade name (trade mark): ....
Model: ....
Manufacturer's name and address: ....
If applicable, name and address of manufacturer's representative: ....
....

Moped mass
Unladen: ....
Reference: ....
Maximum: ....

Gear-box and drive
Gear-box: manual / automatic[2)]
Number of gear ratios (speeds): ....
Gear ratios[3)]:
— first gear: ....
— second gear: ....
— third gear: ....
— fourth gear: ....
— fifth gear: ....
— sixth gear: ....

Drive ratios:
— primary: ....
— final: ....

Tyres
Size front: .... rear: ....
Make: ....

Pressures:

	specified	actual	dynamic tyre radius
— front:	.... kPa	.... kPa	.... mm
— rear:	.... kPa	.... kPa	.... mm

Dynamometer test drive wheel tyre:

— pressure:	.... kPa	.... kPa	.... mm

Engine description [4)] [5)]
Make: ....
Model: ....
Cycle: two stroke / four stroke[2)]
Number and layout of cylinders: ....
Engine size:
— bore: .... mm
— stroke: .... mm
— cubic capacity: .... cm^3

2) Strike out as applicable.

3) In the case of power-driven vehicles equipped with automatic shift gear-boxes, give all pertinent technical data.

4) In the case of unconventional engines and systems, particulars equivalent to those mentioned here shall be supplied.

5) Drawings of the combustion chamber and of the piston, including the piston rings shall be supplied.

Compression ratio [6] [7]: .... :1
Reference fuel: ....
Cooling system: water/air/other (specify) [8] : ....
Device for recycling crank-case gases: yes/no [8] [9]
Air filter type[9]: ....
System of lubrication: ....
[two stroke engines: separate / by mixture[8]]

Additional anti-pollution devices
(if not covered by another heading): .... yes / no [8] [9]

Air intake and fuel feed

Descriptions and diagrams of air intakes and their accessories (dashpot, heating device, additional air intakes, etc.) shall be supplied.

Fuel feed
— by carburettor(s)/injection system[8]
— number of carburettors (if applicable): ....
— make: ....
— type: ....
Choke: manual / automatic[8] Closure setting[7] : ....

Fuel feed settings[7] ....
— jets: ....
— Venturis: ....
— float-chamber level: .... or Curve of fuel delivery plotted
— mass of float: .... against air flow [8][9]
— float needle:...

Feed pump[10]
Make: ....
Type: ....
Pressure[7]: ....
Delivery: .... mm^3 per stroke at pump speed of.. r/min[7]

Injector(s)[10]
Make: ....
Type: ....
Calibration: .... kPa [7]

Valve timing
Timing for mechanically operated valves: ....
Maximum lift of valves and angles of opening and closing in relation to head centres: ....
....
Reference and(or) setting clearance [8]: ....
Distribution by ports (two stroke engine): ....
Volume of crank-case cavity with piston at tdc: ....
Reed valves: yes / no [8] [9]

A description with dimensioned drawing of inlet ports, scavenging and exhaust, with corresponding timing diagram shall be supplied.

6) Compression ratio = (Volume combustion chamber + Cylinder capacity)/Volume combustion chamber.

7) Specify the tolerance.

8) Strike out as applicable.

9) Diagrams and prescriptions shall be supplied.

10) A characteristic graph may be supplied instead.

Ignition
Ignition system type: ....
Make: ....
Model: ....
Ignition advance curve[11]: ....
Ignition timing[11]: ....
Contact-point gap[11]: ....
Dwell angle: ....

Exhaust system[12] ....
Description: ....

Additional information on test conditions
Fuel used: ....
Lubricant used: ....
— make: ....
— type: ....
(State percentage of oil in mixture of lubricant and fuel mixed)

Engine performance
Idling speed: .... r/min[11]
Engine speed at maximum power: .... r/min[11]
Maximum power (ISO 4164 reference method): .... kW

11) Specify the tolerance.

12) Diagrams and prescriptions shall be supplied.

Annex B
(normative)

Equipment for measuring the fuel consumption of mopeds

B.1 Measuring methods

B.1.1 Volumetric method

The volumetric method uses a container with a known volume, allowing the volume of the fuel consumed to be calculated.

This container can have a “constant” or a “variable” volume.

A “constant” volume container only allows the reading of a fixed quantity of fuel that has been determined beforehand. This prefixed quantity depends on the volume of the container itself or on the markings on the container.

A “variable” volume container is a container with division markings which allows the reading of a volume that has not been determined beforehand.

B.1.2 Gravimetric method

The gravimetric method uses a weighing device to determine the mass of the consumed fuel. This device can be of the “constant” or the “variable” mass type.

A “constant” mass device only allows the reading of a fixed quantity of fuel that has been determined beforehand. This fixed quantity depends of the device itself and on its characteristics.

A “variable” mass device allows the reading of a quantity of fuel that has not been determined beforehand.

B.1.3 Flowmeter method

The flowmeter method uses devices allowing measurement, in a continuous or discontinuous way, of the quantified mass or volume of fuel passing through during a certain time interval.

The continuous device gives an indication with respect to the flow while the discontinuous type gives an indication based on counting small elementary volumes.

B.2 Installation of the measuring equipment

B.2.1 General remarks

B.2.1.1 Whatever the measuring method used, the installation of the equipment shall in no case disturb or modify significantly the fuel feed system of the moped.

This requirement refers mainly to pressure drops, diameters and lengths of fuel feed pipes.

B.2.1.2 The condition given in B.2.1.1 is considered to have been met:

a) when the carbon balance method is used (see ISO 6855 and ISO 6970);

b) if the mounting of the installation for the volumetric or gravimetric methods is executed according to Figures 3 and 5;

c) if the flowmeter method is used; the flowmeter can be located as in Figure 4 if the pressure drop across the system is less than 0,1 kPa [1 mbar[13)]].

B.2.1.3 Another installation location may be used if it has been proved that this does not influence the fuel feeding of the moped.

B.2.1.4 To reduce the possibility of pressure loss in the fuel pipes it is recommended that:

$$d_1 \leqslant d_2 = d_3$$

where

d_1 is the original fuel pipe diameter;

d_2 and d_3 are the fuel pipe diameters of the measuring device.

B.2.2 Volumetric method

B.2.2.1 A schematic diagram is shown in Figure B.1.

B.2.2.1.1 The burette shall be placed at the side of the fuel tank in such a way that:

$$h_\mathrm{a} \leqslant h_\mathrm{u} - h_l + 0{,}3$$

where the values are expressed in metres.

B.2.2.1.2 Care shall be taken that the pressure in the burette is not influenced by wind pressure acting on the air vent of the burette.

B.2.3 Flowmeter method

B.2.3.1 The flowmeter shall be designed in such a way that the overall pressure loss through the device is not greater than 0,1 kPa [1 mbar[13)]].

B.2.3.2 A schematic diagram of the flowmeter is shown in Figure B.2.

B.2.3.3 The accuracy shall be within ± 2 % for the range of all the flows registered during the test.

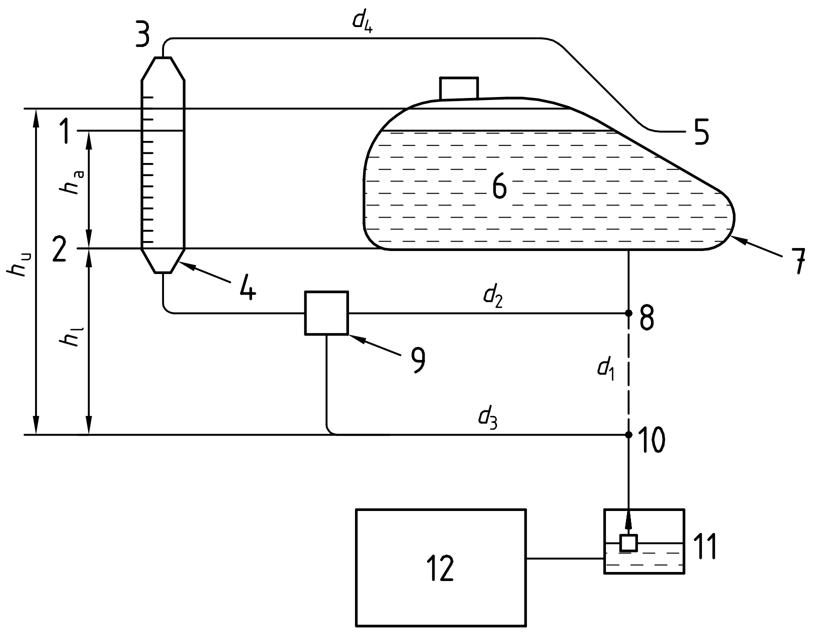
B.2.4 Gravimetric method

B.2.4.1 A schematic diagram is shown in Figure B.3.

B.2.4.2 The scales shall have an accuracy better than 1% and a sensitivity of not less than 0,1 g.

B.2.4.3 The density (mass/volume) shall be measured with an accuracy of 10^{-3} and then converted to the reference conditions.

13) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2

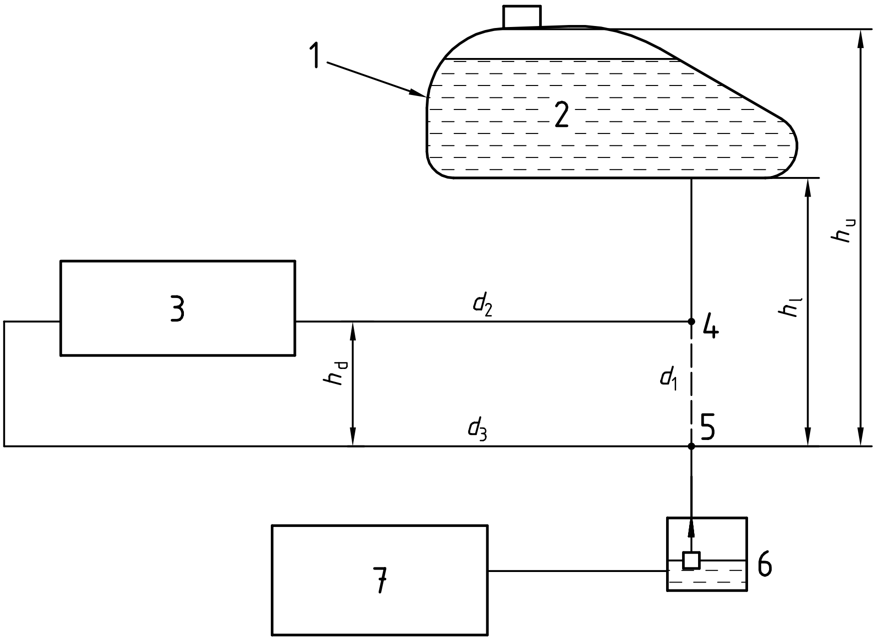


Key

1 On circuit
2 Off circuit
3 Burette air vent
4 Burette
5 End of burette air vent pipe
6 Fuel
7 Fuel tank
8 Fuel tank outlet
9 Three-way valve
10 Carburettor fuel inlet
11 Carburettor float chamber
12 Engine

h_u Upper head of fuel, in millimetres of gasoline
h_l Lower head of fuel, in millimetres of gasoline
h_a Height measured by burette, in millimetres
d_1 Original fuel pipe diameter
d_2 Fuel pipe diameter of the measuring device
d_3 Fuel pipe diameter of the measuring device
d_4 Burette air vent pipe

Figure B.1 — Volumetric method

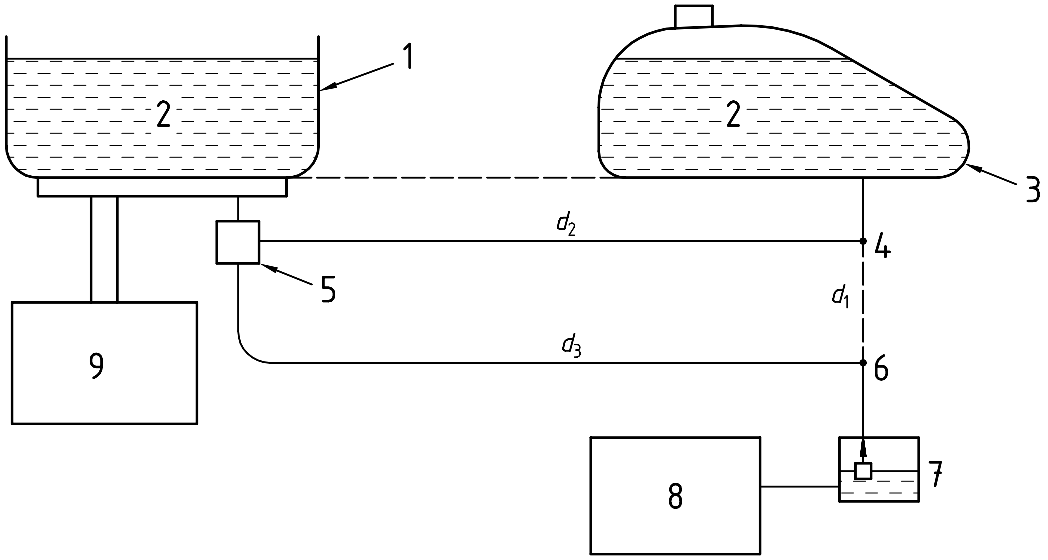


Key

1 Fuel tank
2 Fuel
3 Flowmeter
4 Fuel tank outlet
5 Carburettor fuel inlet
6 Carburettor float chamber
7 Engine

h_u Upper head of fuel, in millimetres of petrol
h_l Lower head of fuel, in millimetres of petrol
h_d Pressure drop across flowmeter, in millimetres of petrol
d_1 Original fuel pipe diameter
d_2 Fuel pipe diameter of the measuring device
d_3 Fuel pipe diameter of the measuring device

Figure B.2 — Flowmeter method



Key

1 Auxiliary tank
2 Fuel
3 Fuel tank
4 Fuel tank outlet
5 Three-way valve
6 Carburettor fuel inlet
7 Carburettor float chamber
8 Engine
9 Scales

d_1 Original fuel pipe diameter
d_2 Fuel pipe diameter of the measuring device
d_3 Fuel pipe diameter of the measuring device

Figure B.3 — Gravimetric method

Bibliography

[1] CEC Specification RF-01-A-80 (issued August 1980). Type: Premium gasoline, leaded.

[2] CEC Specification RF-03-A-84 (issued September 1984). Type: Diesel fuel.

[3] CEC Specification RF-05-A-83 (issued January 1983). Type: Regular gasoline, unleaded.

[4] CEC Specification RF-08-A-85 (issued September 1985). Type: Premium gasoline, unleaded.

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