INTERNATIONAL STANDARD

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Mopeds — Fuel consumption measurements

Cyclomoteurs — Mesurages de la consommation de carburant

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 734 10 79
E-mail copyright@iso.ch
Web www.iso.ch

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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:

$$d_T = d_0 \times \frac{p_T}{p_0} \times \frac{T_0}{T_T}$$

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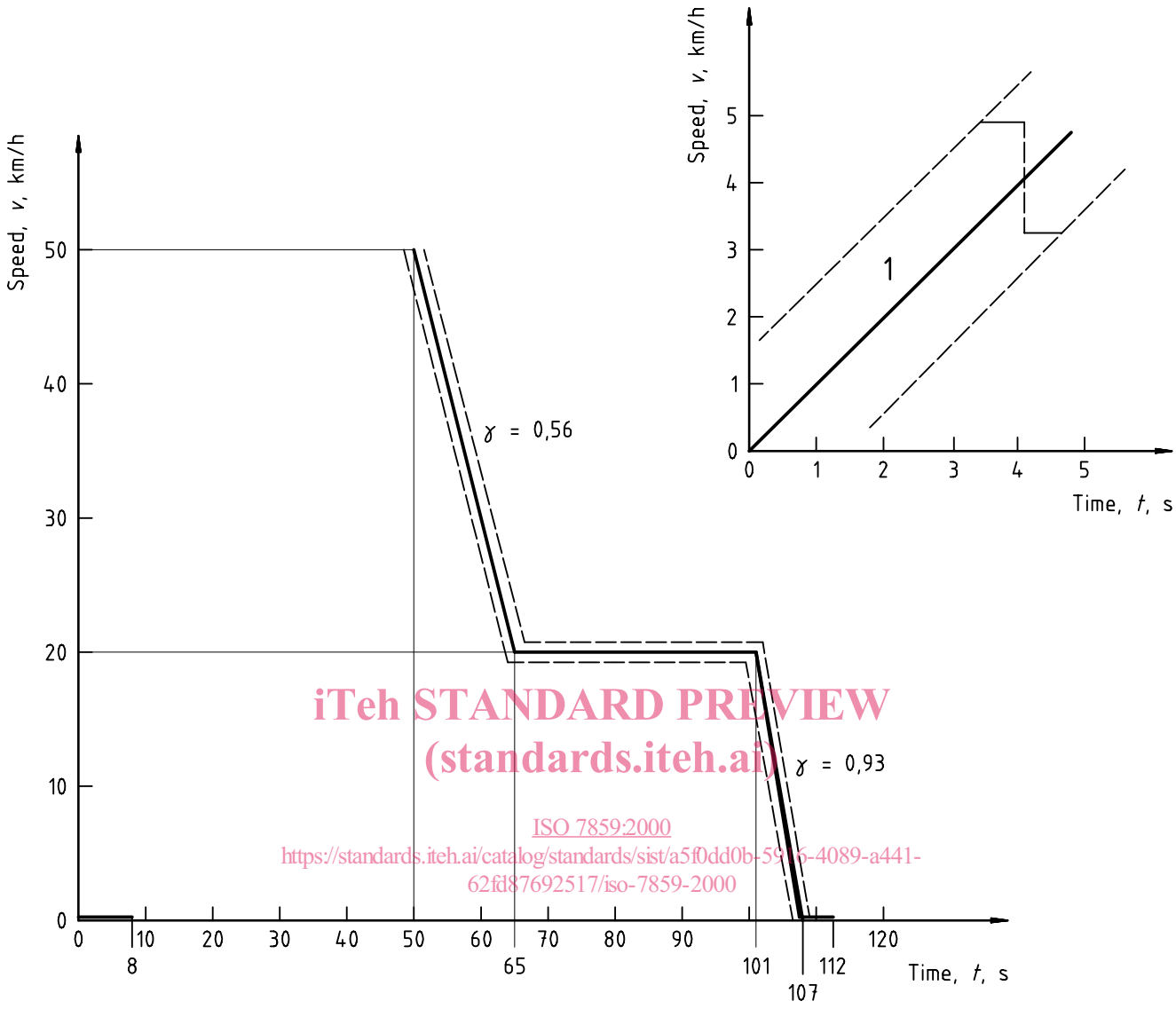
1) Coordinating European Council for the development of performance tests for transportation fuels, lubricants and other fluids.



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/s^2	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	Power absorbed by the chassis dynamometer, P_{v50}
	kg	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.