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Motorcycles — Brakes and braking devices — Tests and measurement methods

Motocycles — Freins et dispositifs de freinage — Méthodes d'essai et de mesure

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Contents

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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.

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.

International Standard ISO 8710 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 22, *Motorcycles*.

Annex A forms an integral part of this International Standard.

Motorcycles — Brakes and braking devices — Tests and measurement methods

1 Scope

1.1 This International Standard specifies tests and measurement methods for brakes and braking of motorcycles with two or three wheels, as defined in ISO 3833, which are intended for use on public roads, in order to establish uniform worldwide test procedures for braking systems.

Further complementary tests which may assist in the assessment and development of braking systems are also included.

Reference is made to "L-category" vehicles. UN-ECE Regulation No. 78 defines a solo motorcycle (L_3), a motorcycle with sidecar (L_4) and a vehicle with three symmetrically arranged wheels (L_5).[1)]

The values in square brackets [] are taken from UN-ECE Regulation No. 78 (01 series of amendments).

1.2 This International Standard does not cover motorcycles which are

— controlled by a pedestrian;

— designed for the special use of handicapped persons.

1.3 This International Standard sets out the following types of tests:

— static tests;

— dynamic tests:

basic tests,

wet brake tests,

heat fade tests;

— parking brake tests (where applicable).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements

1) Definitions from UN-ECE Regulation No. 78:

Category L_3: Two-wheeled vehicles with an engine cylinder capacity exceeding 50 cc or a design speed exceeding 50 km/h.

Category L_4: Vehicles with three wheels asymmetrically arranged in relation to the longitudinal median axis, with an engine cylinder capacity exceeding 50 cc or a design speed exceeding 50 km/h (motorcycles with sidecar).

Category L_5: Vehicles with three wheels symmetrically arranged in relation to the longitudinal median axis, with a maximum mass not exceeding 1 000 kg and either an engine cylinder capacity exceeding 50 cc or a design speed exceeding 50 km/h.

based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3779:1983, *Road vehicles — Vehicle identification number (VIN) — Content and structure.*

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

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

ISO 7117:1995, *Motorcycles — Measurement of maximum speed.*

ISO 9132:1990, *Three-wheeled mopeds and motorcycles — Masses — Vocabulary.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 Braking system and components

3.1.1 braking system: Combination of parts (other than the engine) the function of which is progressively to reduce the speed of a moving motorcycle, bring it to a halt and keep it stationary if it is already halted, consisting of

— the control,

— the transmission(s),

— the brake(s).

3.1.2 control: Part operated directly by the rider to supply to the transmission the energy required for braking or controlling the motorcycle.

3.1.3 transmission: Combination of components which provide the functional link between the control and brake.

3.1.4 brake: Parts of the braking system in which the forces opposing the movement of the motorcycle are developed.

3.2 Types of braking systems

3.2.1 independent braking system

(1) [in the case of motorcycles (L_3)]: System which acts on only one wheel.

(2) [in the case of motorcycles with sidecar (L_4)]: System which acts either on one wheel of the motorcycle or simultaneously on the rear wheel and on the sidecar wheel.

(3) [in the case of vehicles with three symmetrically arranged wheels (L_5)]: System which acts on one or two wheels.

3.2.2 combined braking system

(1) [in the case of motorcycles (L_3)]: System whereby at least two brakes on different wheels are actuated by the operation of a single control.

(2) [in the case of motorcycles with sidecar (L_4)]: System which operates at least on the front and the rear wheel.

(3) [in the case of vehicles with three symmetrically arranged wheels (L_5)]: System which operates on all the wheels.

3.3 Motorcycle loading

3.3.1 laden motorcycle: Motorcycle laden so as to reach its manufacturer's maximum total mass as defined in ISO 6726 or ISO 9132, including the mass of the rider and the equipment or instrumentation as described in 5.3, with the mass distribution(s) on the axles as stated by the motorcycle manufacturer.

3.3.2 unladen motorcycle: Motorcycle in the condition vehicle kerb mass as defined in ISO 6726 or in the condition bare chassis mass in working order as defined in ISO 9132, to which are added the mass of the rider, the equipment and instrumentation as described in 5.3.

3.4 maximum speed: Speed which the motorcycle can attain when tested in accordance with ISO 7117.

3.5 Test parameters

3.5.1 test speed, v: Motorcycle speed measured at the moment that the rider begins to actuate the braking system control(s).

3.5.2 mean fully developed deceleration, a: Average deceleration measured (or calculated) from the moment that the brake force is fully developed until the moment that the motorcycle comes to a stop.

3.5.3 stopping distance, L: Distance covered by the motorcycle, measured from the moment that the rider begins to actuate the braking system control until the moment that the motorcycle comes to a stop.

4 Test site conditions

4.1 Test surface

The test surface shall be dry, substantially level (i.e. it shall not have a gradient in excess of 1 %) and shall be free from extraneous materials. The surface shall afford good adhesion (for example: dry asphalt or a surface with a coefficient of friction which exceeds 0,75).

NOTE 1 The parking brake hill-holding test is conducted on a specified gradient.

4.2 Wind speed

The average wind speed shall not exceed 5 m/s.

4.3 Ambient temperature

The ambient temperature shall be between 0 °C and 40 °C.

4.4 Test lane for basic tests and wet brake tests

The test area immediately after the point at which the test is to commence shall be marked with a lane of sufficient length for the motorcycle to be brought to a stop.

In the case of motorcycles (L_3), this lane shall be 2,5 m wide. In the case of motorcycles with sidecar (L_4) and motorcycles with three symmetrically arranged wheels (L_5), this lane shall have a width of 2,5 m plus the motorcycle track.

5 Motorcycle preparation

5.1 Tyres

The tyres shall be inflated to the motorcycle manufacturer's recommended pressure levels.

5.2 Rider and masses carried

The minimum mass of the rider and any test equipment and instrumentation carried on the motorcycle shall be 85 kg.

The mass distribution on the axles for laden motorcycle tests shall be in accordance with the motorcycle manufacturer's specifications and shall be noted in the test report.

5.3 Instrumentation

The motorcycle shall be prepared for the tests specified in table 1 by the provision and/or calibration of existing instruments, as required.

Optional instruments may be added to provide data but care shall be taken to ensure that any equipment does not significantly affect the braking system performance or the dynamic characteristics of the motorcycle.

5.4 Preparation for wet brake test

5.4.1 The equipment shall continuously wet the brake(s) throughout each test run at a flowrate of [15] l/h distributed equally on both sides of each brake.

NOTE 2 Two brakes fitted on one wheel are to be treated as two brakes.

5.4.2 For exposed or partly exposed disc brakes, the prescribed quantity of water shall be directed on the rotating disc in such a manner as to be equally distributed over the disc surface swept by the friction pad(s).

For fully exposed disc brakes, the water shall be directed over the disc surface(s) 45° in advance of the friction pad(s); for partly exposed disc brakes, the water shall be directed over the disc surface(s) 45° in advance of the shield or baffle.

The water shall be directed in a continuous jet, in a direction perpendicular to the disc surface, from single jet nozzles so positioned as to be between the inner extremity and a point two-thirds of the distance, l, from the outer extremity of that part of the disc swept by the friction pads (see figure 1).

5.4.3 For fully enclosed disc brakes, the water shall be directed on to both sides of the shield or baffle.

Where the nozzle(s) would be coincident with a ventilation or inspection port, the water shall be applied 45° in advance of the said port.

5.4.4 Where it is not possible to apply the water in the position specified in 5.4.2 and 5.4.3 owing to the presence of some motorcycle fixed part, the water shall be applied at the first point, exceeding 45°, where uninterrupted application is possible.

5.4.5 For drum brakes, the prescribed amount of water shall be distributed equally on either side of the drum brake unit (on the stationary back plate and on the rotating drum) from nozzles so positioned as to be two-thirds of the distance from the outer circumference of the rotating drum to the wheel hub, provided always that no nozzle shall be within 15° of, or coincident with, a ventilation or inspection port.

Table 1 — Tests and instrumentation

Test	To measure		Example of instrument
	obligatory	optional	
Static test	Control force		Force meter
		Control travel	Linear potentiometer
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
Basic test	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, infrared "gun"
	Control force		Force meter
	Stopping distance		Chalk-pellet gun, third wheel, ink jet marker
	Motorcycle mass		Load cells, weighbridge
		Deceleration	Motometer, third wheel, recording deceleration meter
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
Wet brake test [1]	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, infrared "gun"
	Control force		Force meter
	Motorcycle mass		Load cells, weighbridge
	Deceleration throughout braking stop		Motometer, third wheel, recording deceleration meter
		Stopping distance	Chalk-pellet gun, third wheel, ink jet marker
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer

Test	To measure		Example of instrument
	obligatory	optional	
Heat fade test	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, infrared "gun"
	Control force		Force meter
	Stopping distance		Chalk-pellet gun, third wheel, ink jet marker
	Motorcycle mass		Load cells, weighbridge
	Time		Stopwatch
		Deceleration	Motometer, third wheel, recording deceleration meter
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
Parking brake test	Time		Stopwatch
	Control force		Force meter
		Control travel	Linear potentiometer

1) Where this test result depends on the analysis of a deceleration trace provided by a recording system, the system shall have damping and frequency-response characteristics such that the behaviour of the vehicle under braking is faithfully reproduced.

5.5 Preconditioning

In submitting a vehicle for tests, the presenter shall state what preconditioning measures have been taken in respect of any of the braking system components.

6 Test requirements

6.1 Brakes

Brakes and braking systems shall not be adjusted at any time during the dynamic tests.

6.2 Motorcycle and brakes

For the basic tests and heat fade tests

a) the motorcycle and the brake(s) to be tested shall be substantially free from moisture;

b) the brake(s) shall be cold (100 °C or less) at the start of the test, measured on the disc or on the outside of the drum.

6.3 Application of control forces

The control forces shall be applied rapidly, up to the prescribed level and then be maintained constant during the stop.

6.4 Test sequence

The motorcycles may be submitted to either an individual test or a complete series of tests. When the complete series of tests is conducted, the sequence should be followed for subsequent tests in order to obtain repeatability. For the same reason and to minimize variations, it is recommended that the heat fade test is the final dynamic test.

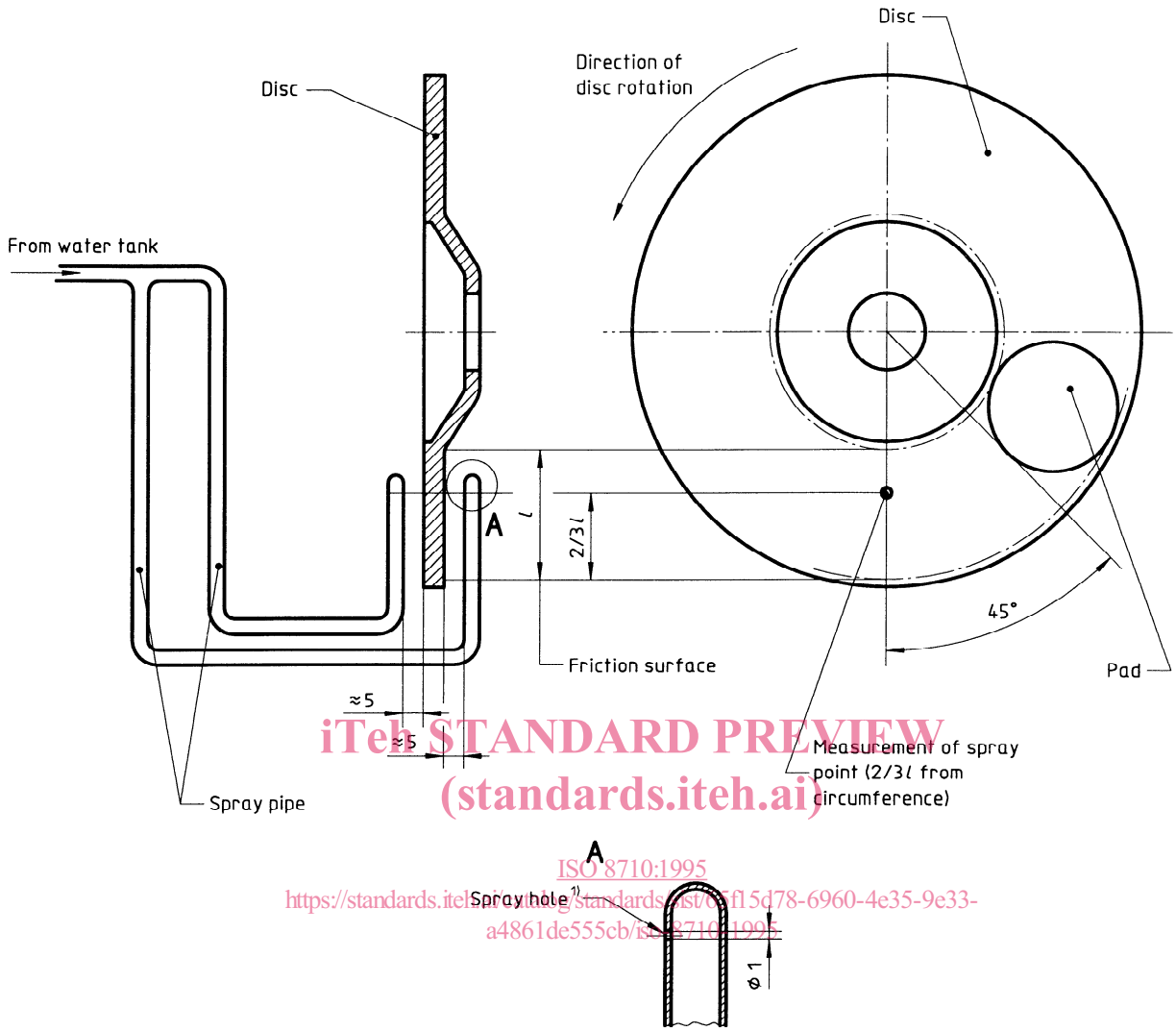
6.5 Rider

During every dynamic test, the rider shall be seated on the saddle as for normal driving and shall maintain the same position throughout the test run.

6.6 Performance

6.6.1 The measured performance of the braking system(s) shall be obtained without wheel(s) locking.

Dimensions in millimetres



1) Spray water shall not be dispersed.

Figure 1

6.6.2 For dynamic tests, the performance of a braking system shall be determined either by measuring the stopping distance, L, in metres, in relation to the test speed, v, or by measuring the mean fully developed deceleration, a, for the stop.

The two methods are nominally related to one another through the following equation

$$L = [0,1]v + \frac{v^2}{25,92a}$$

where

v is the test speed, in kilometres per hour;

a is the mean fully developed deceleration, in metres per second squared.

However one method should be adhered to during a test series and for the comparison of results.

6.7 Test speed tolerance and correction factor

6.7.1 The speeds specified are subject to a tolerance of ± 5 km/h.

6.7.2 If the results are expressed in terms of stopping distance, L, in metres, a correction factor shall be applied to take account of any differences between the recorded test speed, v, and the prescribed test speed, v_p. The corrected stopping distance, L_c, in metres, shall be determined from the equation

$$L_c = \left[\frac{v_p}{v}\right]^2 \times L + \frac{tv_p}{3,6}$$

where

v_p is the prescribed test speed, in kilometres per hour;

v is the (recorded) test speed, in kilometres per hour;

L is the (recorded) stopping distance, in metres;

t is the time, in seconds, from the moment when the rider begins to actuate the braking system control until the moment when the marking (or recording) system begins to mark (or record) on the test surface (or recording paper).

6.8 Test report

The following information shall be recorded in the relevant test report(s) (see annex A):

a) the test condition details (e.g. speeds, control forces, ambient conditions, vehicle identification, motorcycle loading conditions, relevant tyre information, etc.);

b) the results of each test (e.g. mean fully developed deceleration, stopping distance, residual performance, etc.);

c) the sequence in which the tests were performed, where applicable;

d) any deviation of the vehicle from its course, any abnormal vibration, noise, behaviour, etc.

7 Procedure for static test

7.1 Load tests

Each of the load tests (7.1.1 and 7.1.2) shall be performed twice.

7.1.1 Hand-operated brakes

Subject hand lever(s) for braking system(s) to a force of 400 N, applied to a point on the lever's forward surface in a direction normal to a plane defined between the central axis of the fulcrum of the lever and its extreme outer point.

The point shall be [50] mm from the outer end of the lever.

7.1.2 Foot-operated brakes

Subject brake pedal(s) to a force of 750 N, applied at right angles to, and in the centre of, the foot pad.

7.2 Performance

After the load tests, the braking system(s) shall be examined for signs of damage and permanent distortion.

8 Procedure for basic tests

8.1 General

The motorcycle shall be tested [laden] and [unladen].

For each control, a separate test shall be performed.

The prescribed test speed shall be [90] % of the maximum speed of the vehicle, or [60] km/h, whichever is the lower of the two values.

8.2 Test

8.2.1 Approach the starting point for each test at such a speed that the rider can apply the control at the prescribed test speed and at the point at which the test is to commence.

8.2.2 For the approach, select a gear suitable for the prescribed test speed.

8.2.2.1 For motorcycles with a manual gearbox or an automatic transmission where the gearbox can be disengaged manually, immediately before passing the point at which the test is to commence, disengage the drive and enter the centre of the lane. Then keep the drive disengaged for the remainder of the test.

8.2.2.2 For motorcycles with a fully automatic transmission, immediately before passing the point at which the test is to commence, fully close the throttle and enter the centre of the lane. Then carry out the remainder of the test under normal operating conditions for the automatic transmission.

8.2.3 After the front wheel has passed the point at which the test is to commence, actuate the control.

8.2.4 Bring the motorcycle to a smooth, safe stop without deviating at any point from the lane marked on the test area.