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Motorcycles — Brakes and brake systems — Tests and measurement methods

Motocyles — Freins et systèmes de freinage — Méthodes d'essai et de mesure

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

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

This second edition cancels and replaces the first edition (ISO 8710:1995), which has been technically revised.

Motorcycles — Brakes and brake systems — Tests and measurement methods

1 Scope

This International Standard specifies tests and measurement methods for service brake systems and, where applicable, associated parking brake systems of two-wheeled motorcycles (3-3), motorcycles with sidecar (3-4) and tricycles (3-5) which are intended for use on public roads, in order to establish uniform worldwide test procedures for braking systems.

This International Standard does not cover motorcycles which:

— have a maximum speed of less than 25 km/h;

— are equipped for disabled riders.

This International Standard sets out the following types of tests:

— dynamic tests:

  — dry stop test (single brake control actuated);

  — dry stop test (all service brake controls actuated);

  — high speed test;

  — wet brake test;

  — heat fade test;

— parking brake system test;

— failure tests:

  — partial failure test (for split service brake systems);

  — power-assisted brake system failure test.

NOTE The test methods (application, condition of the motorcycle, test procedure and parameters, measurement of performances) for all the tests defined in this International Standard are equivalent to the corresponding test methods prescribed by UNECE Global Technical Regulation No. 3.

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 3779, *Road vehicles — Vehicle identification number (VIN) — Content and structure*

ISO 7117, *Motorcycles — Measurement method for determining maximum speed*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Vehicle categories

NOTE Vehicle categories as defined in this clause correspond to those given in UNECE Special Resolution No. 1.

3.1.1
category 3 vehicle
power driven vehicle with 2 or 3 wheels designed and constructed for the carriage of persons, of goods, or of persons and goods

3.1.1.1
category 3-3 vehicle
two-wheeled motorcycle
two-wheeled vehicle with an engine cylinder capacity exceeding 50 cm^3 in the case of a thermic engine or a maximum design speed exceeding 50 km/h, whatever the means of propulsion

3.1.1.2
category 3-4 vehicle
motorcycle with sidecar
vehicle with three wheels asymmetrically arranged in relation to the longitudinal median plane with an engine cylinder capacity exceeding 50 cm^3 in the case of a thermic engine or a maximum design speed exceeding 50 km/h, whatever the means of propulsion

3.1.1.3
category 3-5 vehicle
tricycle
vehicle with three wheels symmetrically arranged in relation to the longitudinal median plane with an engine cylinder capacity exceeding 50 cm^3 in the case of a thermic engine or a maximum design speed exceeding 50 km/h, whatever the means of propulsion

3.2 Brake system and components

3.2.1
brake system
combination of parts (other than the engine), consisting of the control, the transmission(s) and the brake(s), 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

3.2.2
control
part actuated directly by the rider to supply to the transmission or control the energy required for braking the motorcycle

3.2.3
transmission
combination of components which provide the functional link between the control and the brake

3.2.4
brake
parts of the brake system in which the forces opposing the movement of the motorcycle are developed

3.3 Types of brake systems

3.3.1
service brake system
brake system which is used for slowing the motorcycle when in motion

3.3.1.1
single brake system
service brake system which acts on only one axle

3.3.1.2
combined brake system
CBS
⟨two-wheeled motorcycles⟩ service brake system whereby at least two brakes on different wheels are actuated by the operation of a single control

3.3.1.3
combined brake system
CBS
⟨motorcycles with sidecar⟩ service brake system whereby the brakes on at least the front and the rear wheel are actuated by the operation of a single control

NOTE If the rear wheel and the sidecar wheel are braked by the same brake system, this is regarded as the rear brake.

3.3.1.4
combined brake system
CBS
⟨tricycles⟩ service brake system whereby the brakes on all the wheels are actuated by the operation of a single control

3.3.1.5
secondary brake system
second service brake system on a vehicle equipped with a combined brake system

3.3.1.6
split service brake system
SSBS
service brake system that operates the brakes on all wheels, consisting of two or more subsystems actuated by a single control designed so that a single failure in any subsystem does not impair the operation of any other subsystem

NOTE An example of a single failure in a subsystem is a leakage type failure of a hydraulic subsystem.

3.3.2
power-assisted brake system
brake system in which the energy necessary to produce the braking force is supplied by the physical effort of the rider assisted by one or more energy supplying devices

EXAMPLE Vacuum assisted (with vacuum booster).

3.4 Motorcycle loading

NOTE Vehicle masses as defined in this clause correspond to those given in UNECE Special Resolution No. 1.

3.4.1
laden motorcycle
motorcycle laden so as to reach its gross vehicle mass

3.4.2
lightly loaded motorcycle
motorcycle in the condition of mass in running order to which 15 kg are added, in order to account for the test equipment as described in 5.4

3.4.3
gross vehicle mass
maximum mass of the fully laden solo vehicle, based on its construction and design performances, as declared by the manufacturer

3.4.4
mass in running order
sum of unladen vehicle mass and 75 kg, in order to account for the driver's mass

3.4.5
unladen vehicle mass
mass of the vehicle with bodywork and all factory fitted equipment, electrical and auxiliary equipment for normal operation of vehicle, including liquids (fuel tank filled to at least 90 % of the rated capacity and the other liquid containing systems to 100 % of the capacity specified by the manufacturer), tools, fire extinguisher, standard spare parts, chocks and spare wheel, if fitted

3.5 Test parameters

3.5.1
test speed
V
motorcycle speed measured at the moment the rider begins to actuate the brake control(s)

NOTE For tests where simultaneous actuation of two controls is specified, the motorcycle speed is taken from the moment the first control is actuated.

3.5.2
mean fully developed deceleration
MFDD
d_m
average deceleration calculated from the moment the motorcycle reaches 80 % of the test speed until the moment the motorcycle reaches 10 % of the test speed

3.5.3
stopping distance
S
distance travelled by the motorcycle, measured from the moment the rider begins to actuate the braking system control until the moment the motorcycle comes to a stop

NOTE For tests where simultaneous actuation of two controls is specified, the distance travelled is taken from the moment the first control is actuated.

3.6
baseline test
stop or series of stops carried out in order to confirm the performance of the brake prior to subjecting it to a further test, such as the heating procedure or wet brake stop

3.7
engine disconnected
condition when the engine is no longer connected to the driving wheel(s)

3.8
initial brake temperature
temperature of the hottest brake before any brake application

3.9
maximum speed
V_{max}
speed which the motorcycle can attain when tested in accordance with ISO 7117

3.10
peak braking coefficient
PBC
measure of tyre to road surface friction based on the maximum deceleration of a rolling tyre

3.11
wheel lock
condition that occurs when there is a slip ratio of 1,00

4 Test site conditions

4.1 Test surface

The test surface for dynamic tests shall be clean, dry and substantially level (i.e. it shall not have a gradient in excess of 1 %). The surface shall afford good adhesion, i.e. it shall have a nominal peak braking coefficient (PBC) of 0,9, unless otherwise specified.

The parking brake system test is conducted on a specified gradient. The specified test slope shall have a clean and dry surface that does not deform under the weight of the motorcycle.

4.2 Wind speed

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

4.3 Ambient temperature

The ambient temperature shall be between 4 °C and 45 °C.

4.4 Test lane for dynamic 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 two-wheeled motorcycles (3-3), this lane shall be 2,5 m wide. In the case of motorcycles with sidecar (3-4) and tricycles (3-5), this lane shall have a width of 2,5 m plus the motorcycle width.

5 Motorcycle preparation

5.1 Tyres

The tyres shall be inflated to the motorcycle manufacturer's recommended pressure levels as appropriate to the vehicle loading condition for the test.

5.2 Engine idle speed

The engine idle speed shall be set to the motorcycle manufacturer's specification.

5.3 Mass distribution

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.

5.4 Instrumentation

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

Optional instruments may be added to provide data, but care shall be taken to ensure that no equipment significantly affects the brake system performance or the dynamic characteristics of the motorcycle.

Table 1 — Test sequence and related instrumentation

Test	Parameter (to measure/calculate)		Example of instrument
	Obligatory	**Optional**	
0. Burnishing procedure[a]	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Motorcycle mass		Load cells, weighbridge
	Deceleration		Motometer, third wheel, recording deceleration meter
1. Dry stop test (single brake control actuated)	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Stopping distance or MFDD (see 6.9.2)		Chalk-pellet gun, third wheel, ink jet marker Motometer, third wheel, recording deceleration meter
	Motorcycle mass		Load cells, weighbridge
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
2. Dry stop test (all service brake controls actuated)	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Stopping distance or MFDD (see 6.9.2)		Chalk-pellet gun, third wheel, ink jet marker Motometer, third wheel, recording deceleration meter
	Motorcycle mass		Load cells, weighbridge
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer

Table 1 (*continued*)

Test	Parameter (to measure/calculate)		Example of instrument
	Obligatory	**Optional**	
3. High speed test	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Stopping distance or MFDD (see 6.9.2)		Chalk-pellet gun, third wheel, ink jet marker Motometer, third wheel, recording deceleration meter
	Motorcycle mass		Load cells, weighbridge
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
4. Wet brake test[a]	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Motorcycle mass		Load cells, weighbridge
	Deceleration throughout braking stop		Motometer, third wheel, recording deceleration meter
	Distance		Third wheel
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
5. Heat fade test[a]	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Stopping distance or MFDD (see 6.9.2)		Chalk-pellet gun, third wheel, ink jet marker Motometer, third wheel, recording deceleration meter
	Motorcycle mass		Load cells, weighbridge
	Time		Stopwatch
	Distance		Third wheel
	Deceleration throughout braking stop		Motometer, third wheel, recording deceleration meter
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
6. Parking brake system test	Time		Stopwatch
	Control force		Force meter
	Motorcycle mass		Load cells, weighbridge
	Brake temperature		Rubbing thermocouple, embedded thermocouple
		Control travel	Linear potentiometer

Table 1 (*continued*)

Test	Parameter (to measure/calculate)		Example of instrument
	Obligatory	**Optional**	
7. Partial failure test	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Stopping distance or MFDD (see 6.9.2)		Chalk-pellet gun, third wheel, ink jet marker Motometer, third wheel, recording deceleration meter
	Motorcycle mass		Load cells, weighbridge
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer
8. Power-assisted brake system failure test	Speed		Calibrated speedometer, photoelectronic measuring systems
	Brake temperature		Rubbing thermocouple, embedded thermocouple
	Control force		Force meter
	Stopping distance or MFDD (see 6.9.2)		Chalk-pellet gun, third wheel, ink jet marker Motometer, third wheel, recording deceleration meter
	Motorcycle mass		Load cells, weighbridge
		Force in transmission	Hydraulic pressure transducer, cable tension transducer
		Control travel	Linear potentiometer

[a] 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 motorcycle under braking is faithfully reproduced.

5.5 Burnishing

5.5.1 General

Prior to submitting a motorcycle for tests, the motorcycle brakes shall be burnished. This procedure may be completed by the motorcycle's manufacturer.

5.5.2 Motorcycle condition

The motorcycle condition shall be as follows:

a) motorcycle lightly loaded;

b) engine disconnected.

NOTE If the mass of the lightly loaded motorcycle exceeds the mass of the laden motorcycle, the laden condition is used for the purposes of this subclause.